ABSTRACT BOOK

As of October 10, 2025

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The Three-Body Problem in Bimaxillary Orthognathic Relapse: A Comprehensive Analysis of Transformation Patterns in Segments and Osteosynthesis Using A Novel Registration Strategy

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Abstract

Introduction

This study investigated the underlying causes of postoperative relapse in bimaxillary orthognathic surgery, focusing on the transformation patterns of bone segments and osteosynthesis hardware. Conventional relapse quantification typically relies on sagittal translation and the development of occlusion. A novel registration strategy was employed to precisely and comprehensively quantify the movement of the titanium plate. Hypothesis for the underlying mechanism of significant skeletal relapse was then proposed.

Methods and Materials

A retrospective analysis was conducted on 16 patients who underwent revision surgery due to significant skeletal relapse after bimaxillary orthognathic surgery. Cone-beam computed tomography (CBCT) scans were obtained at two time points: immediately post- surgery (T1) and before revision surgery (T2). By employing transformation matrix and a modified semi-automatic registration method, the relapse of each bone segment and the displacement of titanium plates were quantified. Statistical analyses were performed to reveal the patterns of both relapse of osteosynthesis failure and to evaluate the correlation between the movements of each structure.

Results

The study identified significant counterclockwise rotation of the proximal mandibular segment and clockwise rotation of the distal segment, with notable displacement of the posterior portion of the titanium plates. The maxilla demonstrated limited role in relapse. The novel registration strategy demonstrated excellent reproducibility (ICC > 0.95). These relapse patterns suggested that osteosynthesis failure, particularly in the posterior region, may be a direct cause of relapse. The relapse of the posterior part of the plates was an average 9.5-degree counterclockwise rotation within the bone. Significant correlations were found between the rotation of bone segments and the posterior part of the plates, indicating that muscular forces might be the fundamental driver of relapse.

Conclusion

This study performed a thorough analysis of relapse patterns in orthognathic surgery, highlighting the critical role of osteosynthesis failure, particularly in the posterior part. The findings suggested that the perimandibular musculature exerts forces on both the proximal and distal segments, leading to rotational changes. A comprehensive explanation attempt for the relapse was presented, discussing the roles of muscular forces, bone remodeling, and osteosynthesis detachment. The hypothesis offered a reference fofuture preventive strategies.

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Craniocervical Pathology in Children with Multi-suture Craniosynostosis: Incidence and management

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Abstract

Introduction

Craniocervical pathology, most significantly Chiari-I Malformation (CIM), is commonly associated with both syndromic and non-syndromic craniosynostosis, including multisuture and lambdoid craniosynostosis (CS). It is thought to be acquired from abnormal skull development resulting in diminished cranial volumes and cerebellar tonsillar herniation.

The optimal management of craniocervical pathology in the setting of craniosynostosis is not well established.

Objective

We described and analyzed the incidence and management of complex craniocervcial pathology in multisuture craniosynostosis patients at our institution over an 11-year period.

Method

Retrospective study of all multisuture craniosynostosis patients that were treated at a single institution and were subsequently diagnosed with craniocervcial pathology between September 2009 to August 2023. Demographics, clinical data, imaging studies, operative interventions and clinical follow-up were evaluated.

Results

Of the 75 multisuture craniosynostosis children treated at TCH, 23 (30.7%) were diagnosed with CIM and various associated craniocervical anomalies after their initial CS surgery. Types of pathology included: Chiari only (n=19), Chiari and Klippel-Feil (n=4) and Chiari and craniocervical stenosis (n=1). Most of the patients were male (n=13), syndromic (n=14), had pancraniosynostosis (n=11) and had shunts (n=14) (Table 1). Seven patients with CIM (30%) underwent craniocervical surgery: posterior fossa decompression with duraplasty (PFDD) (n=4), PFDD and occipital-cervical (OC) fusion (n=2), posterior vault distraction with posterior fossa decompression (n=1), and endonasal odontoid resection (n=2). The median age at surgery was 124 months and the median follow-up was 23 months (Table 2). Children with CIM who underwent surgery were more likely to have Crouzon syndrome, most often presented with headaches and gait ataxia, had a more acute clivo-axial angle (CXA), and had a higher incidence of cervicothoracic syrinx and craniocervical stenosis (Table 3).

Conclusion

CIM is often seen in children with multisuture syndromic and non-syndromic craniosynostosis. After initial surgery for CS, almost 1/3 of patients in our series underwent surgery to treat CIM.

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Secondary craniosynostosis following strip craniotomy: Identification and treatment

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Abstract
The management of sagittal craniosynostosis in infancy with strip craniotomy and post- operative helmet therapy has been used to treat sagittal craniosynostosis for nearly 30 years. Centers across the world use this method as a first line treatment of craniosynostosis when the child presents to the surgeon in early infancy. This is a case report with literature review of a child with sagittal craniosynostosis treated in infancy with strip craniotomy and post-op helmet therapy. This child subsequently developed a secondary craniosynostosis of both coronal sutures. This secondary craniosynostosis was treated with posterior cranial vault distraction.

Our patient presented at 2 months of age with clinical signs of sagittal craniosynostosis and cephalic ratio (CR) of 0.70. This was confirmed by CT scan. The child was treated with a minimal access endoscopic assisted strip craniectomy at three months of age. His cephalic ratio was monitored post-operatively and the child's head shape changed from an initial scaphocephalic presentation (CR of 0.70) to a brachycephalic presentation (CR 91.2) over the time frame of nine months. At 15 months old, he was treated with a posterior cranial vault distraction with a cephalic ratio correction from 91.2 to 80.2. At 18 months post-op he maintains his expansion.

Secondary craniosynostosis following strip craniotomy with post-operative cranial orthosis for craniosynostosis is a rare phenomenon. This can be an incidental finding on long term follow-up CT scanning that has no clinical implications, whereas in other cases such as this case, it mandates additional intervention. In this case, diagnosis of secondary craniosynostosis was identified and treated with a novel solution of a posterior cranial vault distraction with computer generated cutting guides and pre-planned distraction vectors.
For future cases of sagittal craniosynostosis cases treated with strip craniotomy, the suspicion of a secondary craniosynostosis should be assessed throughout the child's time in cranial molding orthosis.

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Respiratory outcomes in Apert syndromes

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Eric Arnaud **Elle Vandervoord** **Giovanna Paternoster** **Roman H Khonsari**

Abstract
Apert syndrome is a rare condition (1/50-80.000 living births) associating a faciocraniosynostosis and fusions of limb extremities of variable gravity.
Patients and Methods
A retrospective study was conducted among a cohort of 59 patients seen in a single institution over a 24 year period. Among them 24 (group A) were operated on with a frontofacial monobloc advancement distraction (FFMBA) at a mean 3 years of age. The 35 other patients (group B) underwent the classical two stage strategy : Frontoorbital advancement (FOA) followed by a Le Fort 3 facial advancement at a mean 12.5 years of age. This strategy is reserved for the patients with minimal obstructive sleep apnea syndrome, although 6/35 came secondarily to our instution with a severe OSAS.
Polysomnography was the reference examination to assess OSAS with the ApneaHypopnea index (AHI) considered normal if AHI<5/h.
Results
Preoperatively, 49% of all patients did not present with OSAS.
The patients with OSAS were in majority treated primarily in our instution with FFMBA. All of them improved, but among them 7/24 necessitated a secondary LE Fort 3 at age 6 to correct completely the OSAS. In group A the two tracheostomy could be removed. In group B, the patients treated primarily at our institution did not present severe OSAS primarily, and were cured after facial advancement. The secondarily referred Apert patients with severe OSAS were moderately improved by Le Fort 3, and presented a poor mental outcome.
In the group of FFMBA alone the AHI preop was 11.3 and postop 5,8 In the group of FFMBA+LF3, the AHI preop was 24 and postop 7.8 All patients benefitted from early removal of tonsils and adenoids.
Discussion
Among syndromic craniosynostoses, Apert syndrome present less frequently a severe OSAS. However, Polysomnography should be systematical to screen all patients in a reference center to decide the strategy.
For the patients with OSAS primary FFMBA provided a better general outcome, even if some of them necessitated an early secondary LF3 advancement to correct the OSAS. All tracheostomies could be removed in that group, some of them remainded dependant on CPAP.

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Endoscopic Spring Mediated Cranioplasty for Management of Coronal Craniosynostosis

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Abstract

Background

Spring mediated cranioplasty (SMC) is a safe and effective treatment for craniosynostosis. The authors describe their experience with the largest cohort of endoscopic SMC for coronal craniosynostosis to date.

Methods

We retrospectively reviewed patients who underwent endoscopic coronal suturectomy and SMC between 2017-2023. Patients were analyzed based on demographics, operative details, and outcomes. In brief, a 15mm incision was made over the midpoint of the affected coronal suture. A 1cm suturectomy was performed with endoscopic assistance. The initial 14 patients in our cohort had one spring placed at the level of the frontozygomatic suture, however, to promote optimal expansion of the supraorbital rim, we modified our technique to include placement of two springs, with a second at the mid-forehead.

Results

Seventeen patients underwent endoscopic suturectomy and spring placement, with a mean follow up of 25 months. Patients were diagnosed and underwent surgery at a mean age of 4 months. Mean intra-operative blood loss was 35ml (range 10-100ml) and mean intra-operative blood transfusion volume was 45ml (range 0-120ml). The median spring force was 9N (range 6-9.5N). After transitioning to two springs, the median force of the first spring was 8N (range 7.5-9N) and the second spring at the supraorbital position was 7.8N (range 7.5-8N). The average length of stay was 1 day (range 1-3 days). Springs allowed 35mm (median, 28-44mm range) expansion at the time of the final skull radiograph and were removed at a mean of 4 months post-operatively. To date, no patient has undergone open revision. No intra-operative complications occurred. Six post-operative complications occurred including superficial surgical site infection managed with oral antibiotics (n=1), an exposed spring(n=1) requiring local wound care, a dislodged spring requiring a return to the operating room(n=3), and suture re-fusion requiring repeat suturectomy (n=1).

Conclusions

We report the largest experience of endoscopic SMC for treatment of coronal craniosynostosis, associated with low patient morbidity and inpatient stay. Two springs, (zygomaticofrontal suture and mid-forehead) are recommended for optimal expansion of the supraorbital rim.

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Prevalence of Incidental Normocephalic Craniosynostosis: Findings from a Large Cohort Study

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Abstract

Craniosynostosis involves premature fusion of cranial sutures, potentially causing craniofacial deformities and increased intracranial pressure. However, emerging evidence of normocephalic sagittal craniosynostosis challenges traditional surgical management paradigms. In a retrospective cross-sectional study (2012–2022) at Siriraj Hospital, a tertiary referral centre in Thailand, we examined cranial computed tomography scans of 1364 patients aged 1–20 years. Three- dimensional imaging analyses were used to assess suture fusion, and demographic and clinical data were collected.
Statistical methods were used to evaluate the prevalence and ensure reliability of the findings.

Complete fusion was rare: coronal (1/1364; 0.007%), sagittal (19/1364; 1.39%), lambdoid (2/1364; 0.15%), and squamosal (24/1364; 1.76%). Partial fusion occurred in the sagittal (39/1364; 2.86%), squamosal (42/1364; 3.08%), coronal (22/1364; 1.61%), and lambdoid (22/1364; 1.61%) sutures. Notably, these patients exhibited normocephalic morphology, suggesting that certain instances of early suture fusion may represent normal anatomical variants rather than pathological synostosis. Normocephalic craniosynostosis involving coronal, sagittal, lambdoid, and squamosal sutures was detected within this contemporary Thai cohort. These findings underscore the need for meticulous clinical assessments to distinguish benign variants from true pathological conditions, thereby informing more nuanced, individualised treatment strategies.

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Assessing Medical Student Attentional Bias in Unicoronal Craniosynostosis: An Eye-Tracking Study

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Abstract

Purpose

Unicoronal craniosynostosis (UCS) is a congenital craniofacial condition that poses diagnostic challenges in a primary care setting. Misdiagnosis of UCS is commonly mistaken for more benign conditions, potentially due to the decrease in basic anatomy exposure amongst medical trainees in Canada. Along with minimal exposure to plastic surgery throughout medical school, a medical student's ability to identify craniofacial asymmetries may be impeded. This study aimed to analyze eye-tracking patterns of medical students when viewing images of children with/without UCS. By investigating dwell time variations at distinct interest areas of the face, the objective was to gain insight into attentional biases that highlight areas of potential diagnostic inaccuracies and educational gaps.

Methods

Thirty medical students participated in viewing images of children with and without UCS. After each image, they approximated the child's age to minimize attentional biases. Eye movements were recorded using a table-mounted eye-tracking device, and dwell times for eight facial regions (forehead, lower face, brows, eyes, nose, mouth, left ear, right ear) were compared.

Results

A Wilcoxon signed-rank test revealed that participants spent significantly more time focusing on the brow region in UCS images than in control images ($P<0.001$) but significantly less time on the nose ($P<0.05$). No significant differences were found in the other six areas. When analyzing attentional distribution on each side of the face, UCS images were divided into sides ipsilateral and contralateral to the fused suture. Participants focused significantly more on the contralateral side of the forehead in UCS images ($P<0.05$), with no significant differences seen when control images were split into left and right halves

Conclusion

Medical students demonstrated biased attention patterns toward craniofacial deformities. This study provides evidence for the existence of attentional biases when viewing children with UCS with implications for initial diagnosis and surgical correction.

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The Role of Adenoid Hypertrophy in Craniofacial Microsomia Patients with Obstructive Sleep Apnea A Retrospective Study

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Abstract

Objective

Early mandibular distraction osteogenesis (MDO) is recommended for children with craniofacial microsomia (CFM) and obstructive sleep apnea (OSA). However, its efficacy remains limited, with success rates of 36.4%–60%. The role of adenoid hypertrophy (AH) in persistent OSA post-MDO has not been adequately studied. This study investigates the impact of AH on MDO outcomes and explores its role in the etiology and treatment of OSA in CFM patients.

Methods

A retrospective analysis was conducted on 72 CFM patients undergoing MDO. Preoperative adenoid size was assessed using adenoid/nasopharyngeal (A/N) ratios from cranial CT scans. Polysomnographic data, including pre- and postoperative obstructive apnea-hypopnea index (OAHI), were analyzed. Patients were classified into effective and ineffective groups based on postoperative OSA improvement. Statistical correlations between A/N ratios, OSA severity, and treatment outcomes were examined.

Results

AH prevalence among CFM patients with OSA was 62.5%. A/N ratios correlated significantly with postoperative OAHI ($r = 0.256$, $p = 0.034$), but not with preoperative OAHI. The ineffective group had higher A/N ratios than the effective group (0.69 ± 0.13 vs. 0.64 ± 0.12). The overall MDO effectiveness rate for OSA was 47.22%, with patients presenting severe OSA showing greater improvement.

Conclusion

Adenoid hypertrophy plays a significant role in persistent OSA post-MDO, particularly in mild to moderate cases. Preoperative AH assessment and targeted interventions, such as adenoidectomy, can enhance MDO outcomes. These findings highlight the need to address both skeletal and soft tissue factors for optimal OSA management in CFM patients.

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Presentation, Diagnosis, and Management of Progressive Postnatal Pansynostosis in Crouzon Syndrome: An Illustrative Case Series

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Abstract

Background

Progressive postnatal pansynostosis (PPP) is a rare and insidious form of craniosynostosis characterized by the latent fusion of cranial sutures in infancy, most commonly occurring in patients with Crouzon syndrome. The presentation of PPP can be subtle and often remains undetected until the manifestation of symptoms related to increased intracranial pressure (ICP) such as papilledema and central sleep apnea. Therefore, timely diagnosis of PPP is critical for preventing downstream sequelae of elevated ICP and optimizing long-term outcomes. The authors provide detailed descriptions of the clinical course and management of four patients with Crouzon syndrome who subsequently developed PPP to increase physician awareness of the clinical signs and symptoms of such a rare and insidious disorder.

Methods

A retrospective review of patients with Crouzon syndrome who were treated at our institution was performed and four patients with PPP were identified for inclusion in this case series.

Results

Four of 43 patients with Crouzon syndrome (9.3%) developed progressive postnatal pansynostosis. All four patients presented with normal head shape and open sutures at birth and exhibited delayed suture closure between 16 months and 3 years of age. All four (100%) developed prominent bregma which presents as a bulging cranium at the point of intersection between the coronal and sagittal sutures. Other signs and symptoms included declining head circumference percentile (50%) , headaches (75%), and sleep apnea symptoms (75%). These presentations prompted diagnostic work up which showed signs of increased ICP, including papilledema (100%), hydrocephalus (75%), central sleep apnea (75%), and Chiari I malformation (100%). All four were treated successfully with cranial vault expansion.

Conclusions

We recommend carefully monitoring patients with Crouzon syndrome for PPP, even if they have patent sutures and a normal head shape at birth. Clinical suspicion for PPP should be raised with physical exam findings of bregma, declining head circumference percentile and symptoms of sleep apnea or headaches. If clinical suspicion arises, a diagnostic workup for increased ICP should be performed to guide possible interventions.

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Quantitative Analysis of Male versus Female Frontal Bone and Orbital Skeletal Morphology: Establishing Population Averages and Variability

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Abstract

Introduction

This study investigates sex-based differences in the frontal bone and orbital regions by quantitatively describing morphological variability in an adult cis-gender population.

Methods

We analyzed head computerized tomography scans of healthy adults taken prior to orthognathic surgery. Patients with a history of craniofacial trauma, genetic syndromes, metabolic growth disorders, or exogenous hormone exposure were excluded. Standardized sets of 501 digital landmarks were used to capture surface morphometrics of the forehead, supraorbital ridges, and orbital rims. Generalized Procrustes Analysis aligned landmarked crania, and Principal Component Analysis evaluated sex-based variance. Robust Rank Aggregation integrated differences in male and female mean values, linear discriminant analysis weights and magnitudes, and random forest feature importance scores to rank the features most predictive of sex.

Results

A total of 154 patients were analyzed, including 70 males and 84 females imaged at ages 23.6±7.7 and 26.0±11.1 years, respectively. A ranked list of 119 features with significant aggregate rank scores ($p<0.05$) most predictive of sex was generated. These features clustered around the (1) upper forehead, (2) glabella and medial brow prominences, and (3) outer infraorbital rims, primarily in the anterior-posterior direction. Euclidean distances were calculated to assess overall positional differences in three-dimensional space. The average male and female forehead centers differed by 2.80 mm overall, with the male forehead center positioned 2.20 mm superiorly and 1.72 mm posteriorly. Differences decreased when moving cephalically toward bregma. The glabella differed by 2.12 mm overall, with the male glabella positioned 1.60 mm anteriorly and 1.43 mm inferiorly. Moving laterally along the brow ridges, differences decreased from 1.94 mm near the glabella to 0.35 mm at the frontozygomatic sutures. In the orbital rims, distances averaged across sides showed the greatest male versus female difference of 1.98 mm at the orbitale, with the male orbitale positioned 1.90 mm posteriorly and 0.17 mm superiorly.

Conclusions

Key regions of sex-based morphological variability were identified in the upper facial third. These findings offer an objective framework for further studies on skeletal dimorphisms, and provide preliminary data to guide preoperative counseling and surgical planning for feminizing procedures of the upper facial third and orbits.

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Novel 3D-Printed Aids for Total Ear Reconstruction

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Abstract

Background

Microtia is a congenital external ear anomaly that presents significant reconstructive challenges. Total ear reconstruction for microtia types 3 and 4 requires precise anatomical replication and optimal implant positioning to achieve both aesthetic and functional success. Traditional techniques rely on manual measurements and intraoperative modifications, which can introduce inaccuracies and prolong surgical time.

Objective

This study introduces a novel 3D-printing approach for auricular reconstruction, integrating advanced imaging and printing technologies to enhance preoperative planning and implant customization.

Methods

Utilizing 3D facial scanning (CR-Scan Ferret Pro™) and CrealityScan™ software, patient-specific models of the unaffected ear were generated. These models facilitated the creation of 3D-printed jigs for accurate implant positioning and vascular mapping. Custom porous polyethylene (PPE) implants were designed as single-piece structures to ensure anatomical precision and reduce intraoperative adjustments.

Results

The use of 3D-printed jigs significantly improved preoperative marking accuracy and surgical efficiency. Custom PPE implants provided enhanced symmetry, durability, and reduced intraoperative assembly time.

Conclusion

This innovative technique streamlines surgical workflows, minimizes human error, and improves reconstructive outcomes in microtia patients. By integrating 3D technology, this approach represents a paradigm shift in total ear reconstruction, offering safer, more efficient, and precise surgical interventions.

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Impact of Age at Surgery or Surgical and Anesthesia Duration on Early Development in Single Suture Craniosynostosis

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Abstract

Introduction

Mild delays in development for children with isolated single suture craniosynostosis (CS) have been reported. Older surgery age and longer surgical and anesthesia duration have been posited as possible risk factors for lower developmental outcomes.

Aims

As part of a prospective longitudinal study, this presentation examined the impact of surgical age and surgical/ anesthesia duration on development at 36 months controlling for sociodemographics.

Methods

Patients were included if they had non-syndromic single suture CS with open calvarial vault remodeling ± fronto-orbital advancement by the same surgeon and neurosurgeon and completed Bayley Scales of Infant and Toddler Development – Third Edition (Bayley-III) evaluations around 36 months. Regressions were run for Cognitive, Receptive and Expressive Language, and Fine and Gross Motor subtests including sex, socioeconomic status (SES), parental immigration, surgery age, surgery time, and anesthesia time.

Results

Participants (N=128) had sagittal (44.5%), unicoronal (28.9%), or metopic (26.6%) CS and were mostly male (67.2%), Latino (55.5%), had public insurance (62.5%), had history of parental immigration to the US (fathers 50.0%; mothers 42.2%), and an even distribution of SES. Participants had surgery at a mean age of 8.3±4.1 (range 3 to 33 months) with 95% of surgeries completed by age 14 months. Average surgery time was 212±60 minutes and mean anesthesia time was 311±62 minutes. Bayley-III evaluations were at a mean age of 36.9±2.5 months with average range mean scores and 18% who scored below the 10th percentile. Regressions were significant (P = .018 to <.001) with adjusted R2 ranging from 0.08 to 0.25. Although sex, SES, and parental immigration explained a significant amount of variance (Beta = 0.24 to 0.40), there were no significant findings for age of surgery or the duration of surgery or anesthesia.

Conclusions

Development at age 36 months was in the average range. Variance across domains of development was explained by sociodemographic variables. There was no association of age of surgery or duration of surgery and anesthesia with developmental outcomes in this sample with most surgeries completed by 14 months. As there was a delay present for nearly 1 in 5 participants, developmental surveillance is recommended.

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Alar base symmetry in orthognathic surgery: Patients with unilateral cleft

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Abstract

Background

Patients with unilateral cleft lip and palate (UCLP) often present with nasal asymmetry, particularly alar base retrusion on the cleft side. This asymmetry can impact the outcomes of orthognathic surgery (OGS) and should be carefully considered during treatment planning.

Methods

This retrospective study analyzed 84 patients with Class III malocclusion at Chang Gung Memorial Hospital in Taiwan using cone beam computed tomography (CBCT). Among them, 42 had complete unilateral cleft lip and palate (UCLP), while the remaining 42 served as the control group with no cleft.

Preoperative virtual surgical planning was conducted for all patients, and pre- and postoperative images were analyzed to evaluate anteroposterior changes in bone and soft tissue at the alar base.

Results

In the UCLP group, alar base asymmetry was observed preoperatively. On the cleft side, the piriform region's bone was retruded in 32 patients, while the overlying soft tissue was thicker in 38 patients. Despite the bone being set back, the mean skin surface position appeared more anterior in 28 cases.After surgery, there was no significant change in the underlying bone discrepancy ($p = 0.288$), but the overall symmetry of the skin surface improved ($p = 0.013$). The ratio of soft tissue movement to bone advancement differed between the cleft and noncleft sides, with a lower response on the cleft side (0.56 ± 0.30 vs. 0.77 ± 0.33, $p < 0.001$). In contrast, the control group exhibited a balanced ratio of soft tissue adaptation on both sides (0.76 ± 0.19 vs. 0.79 ± 0.27, $p = 0.544$).

Conclusions

This study demonstrates that OGS improves alar base symmetry in UCLP patients. However, the soft tissue response to bone movement differs between the cleft and noncleft sides, with less adaptation on the cleft side. These findings emphasize the need for precise treatment planning to achieve optimal aesthetic outcomes.

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The Surgical Burden of Neurocristopathies: Prevalence, Craniofacial Involvement, and Plastic Surgery Needs

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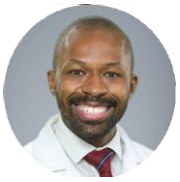
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Abstract

Background

Neural crest cells (NCCs) contribute to craniofacial bones, cartilage, peripheral nerves, and melanocytes. Disruptions in NCC development result in neurocristopathies (NCPs), a diverse group of congenital disorders often presenting with craniofacial anomalies such as cleft lip and palate, Treacher Collins syndrome, and DiGeorge syndrome. These conditions significantly impact function and aesthetics, requiring pediatric and craniofacial plastic surgery. Congenital anomalies affect 1 in 33 newborns in the U.S. and 6–7% globally, ranking among the leading causes of infant and childhood mortality. While NCPs are estimated to account for 20–30% of birth defects, these figures lack rigorous validation. Despite their clinical significance, the prevalence and surgical burden of NCPs remain underrecognized, particularly in PRS. This study provides a comprehensive analysis of NCP prevalence, defect types, and PRS intervention rates, distinguishing between functional and aesthetic surgical needs.

Methods

A systematic review following PRISMA 2020 guidelines identified 96 NCPs from PubMed, MEDLINE, and Scopus. Conditions were categorized into three groups: (1) Craniofacial Bone & Cartilage (CFS B&C), (2) Craniofacial Other (CFS Other; sensory structures), and (3) Posterior Body (non-craniofacial structures such as the heart and enteric nervous system). Defects were classified by tissue involvement, and PRS needs were categorized as functional (physiological restoration), aesthetic (cosmetic enhancement), or mixed. Standardized prevalence rates were calculated.

Results

Among the 96 NCPs, 74% required PRS. The highest surgical involvement was observed in the CFS B&C group (100%, $p < 0.001$), followed by CFS Other (69.2%, $p = 0.02$) and Posterior Trunk (34.4%, $p < 0.001$). Mixed bone-cartilage defects had the highest surgical intervention rate (100%, $p < 0.001$). CFS cases were 2.25 times more likely to require PRS than non-CFS cases (RR = 2.25, 95% CI: 1.78–2.85, $p < 0.001$). Functional procedures were predominant (77%), while aesthetic procedures (23%) were critical for psychosocial well-being. Estimated NCP prevalence was 4.24% of live births.

Conclusion

NCPs may account for 60–70% of congenital anomalies, exceeding historical estimates. Craniofacial involvement drives PRS demand, emphasizing the need for defect-specific surgical pathways and interdisciplinary collaboration to optimize outcomes globally.

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Would hyaluronic acid-induced mental bone resorption be a concern? A prospective controlled cohort study and an updated retrospective cohort study

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Xiaoshuang Guo



Xiaolei Jin

Abstract

Background

Hyaluronic acid (HA) is a widely used filler for face contouring and is generally believed to be safe and effective. However, there have been reports of HA-related bone erosion in the chin area without clear scientific data regarding its existence, incidence, and severity. This exploratory study was to evaluate HA-related mental bone resorption through a prospective, controlled, observer-blind, nonrandomized clinical trial and a retrospective cohort study.

Method

On the one hand, a prospective, controlled, nonrandomized, single-shot HA-injection clinical trial was conducted. Computed tomographic scans were collected at baseline and at 6-12 months of follow-up for both HA-injection and control groups. On the other hand, an updated retrospective cohort study compared the HA-injection with a blank control group. The primary outcomes composed of three quantitative parameters [bone resorption index (BRI M and BRI N), bone resorption thickness ratio] and one subjective evaluation index (severity ranking). Information about demographics, complications, and injection volume were also recorded.

Results

From June 2021 to March 2023, 78 patients were prospectively recruited for the study. There was a significant association between HA-injection and bone resorption [BRI M: pre (84.24±8.10%) vs post (79.21±8.70%), P <0.001; BRI N : pre 92.50% (73, 144%) vs 87.99% (63, 132%), P <0.001; bone thickness ratio: HA 24.08% (0, 48%) vs control 0 (0, 17%), P <0.001]. However, there was no difference in large-volume (>1 ml) and small- volume (≦1 ml) injection subgroups [bone resorption thickness ratio: (21.50±10.91%) vs (24.51±11.92%), P =0.350]. The imaging manifestation revealed discernible bone resorption in 35.90% of the patients, with an median bone resorption thickness ratio of 24.08%.
Between October of 2019 and March 2023, 95 HA-injection patients (190 semimandibular cases), 95 normal controls were enrolled. The BRI M was significantly lower in the HA- injection group compared to the controls (P <0.001).

Conclusion

HA may induce bone resorption in the mentum. Large-scale randomized controlled clinical trial is warranted for further confirmation. Patients should be informed of this potential complication.

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Development and Evaluation of Novel Interlocking Three-Dimensional Plate 2.0 System for Managing Mandibular Fractures

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Abstract

Background

Mandibular fractures are the most common craniomaxillofacial fractures, often causing disturbances in mastication. Definitive treatment involves internal fixation using 2.0 system plates and screws, such as the three- dimensional (3D) plates design. However, conventional 3D plates have fixed shape, making it inflexible and difficult to avoid vital anatomical structures or fracture lines. Thus, an interlocking 3D plate with adjustable configurations was developed to maintain stability and avoid critical structures.

Objective

This study aims to analyze the biomechanics, biocompatibility, bone healing, and usability of the novel interlocking 3D plate.

Methods

Finite element analysis established the feasibility of the interlocking 3D plate design. Biomechanical evaluation used ten goat mandibles to assess mechanical strength and stability. Biocompatibility, bone healing, and bone biological markers were evaluated in an animal study with twenty-eight goats. Biocompatibility was assessed through radiological and histopathological (Hematoxylin-Eosin staining) evaluations of inflammatory responses. Bone healing was assessed through bone density and Masson Trichrome staining. Biological bone markers were evaluated through immunohistochemistry and ELISA testing by measuring the level of Osteocalcin, Bone-ALP, and Cathepsin-D on the goat's blood serum. Usability was tested by nine plastic surgeons who assessed comfort and application time on a synthetic mandibular model.

Results

The biomechanical evaluation showed that the interlocking 3D plate better- maintained fracture stability while allowing controlled micro-movement. Biocompatibility results indicated lower tissue reaction and inflammatory response compared to the standard plate. The interlocking 3D plate facilitated faster bone healing, with significant improvements in bone formation and density. The biological bone markers (Osteocalcin, Bone-ALP, and Cathepsin-D) were evaluated through ELISA serum and Immunohistochemistry test. Increased levels of Osteocalcin and bone-ALP through serum, and Cathepsin through immunohistochemistry evaluation were found to be in accordance with the previous literatures, where they increase during the remodelling phase. However, the analysis revealed no correlation between the two evaluation methods of the three biological bone markers due to uncontrollable variables. The usability study demonstrated that the interlocking 3D plate was as easy to use as the standard plate, with no significant differences in application time.

Conclusion

The interlocking 3D plate shows significant potential as a viable alternative for managing mandibular fractures.

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Quantitative Analysis of Sexual Dimorphism in Three-Dimensional Facial Anthropometry in an Asian Population: Implications for Facial Feminisation Surgery

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Orapa Pongsri


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Abstract

Background

Facial feminisation surgery (FFS) is a vital procedure in plastic and craniofacial surgery that aims to transform masculine facial characteristics into feminine ones. Understanding anthropometric differences between male and female faces is essential for optimising surgical outcomes.

Objective

This study aims to quantify and analyse three-dimensional (3D) facial anthropometric measurements among healthy Asian males and females, identifying key dimorphic features to guide FFS.

Methods

We conducted a prospective study involving 40 healthy Asian subjects (20 males and 20 females) aged 18-45 years (mean age: 28.6; mean BMI: 21.8 kg/m²). The Vectra® XT 3D imaging system captured precise facial photographs. Measurements were assessed across three anatomical regions: upper third (forehead and brow), middle third (periorbital, zygomatic, and nasal areas), and lower third (mouth, chin, and mandible). Statistical analyses employed independent t-tests with significance set at $p < 0.05$.

Results

No significant demographic differences in age or BMI were observed between genders. Key findings indicated that males exhibited greater facial height (196.7 mm vs. 190.3 mm, $p = 0.023$), zygomatic width (127.9 mm vs. 120.7 mm, $p < 0.001$), and mandibular width (124.4 mm vs. 113.8 mm, $p < 0.001$). Females demonstrated a more pronounced forehead curvature (forehead curve ratio: 1.030 vs. 1.011, $p < 0.001$) and palpebral slant (9.4° vs. 6.2°, $p < 0.001$), along with obtuse columella-labial angles (109.6° vs. 104.6°, $p = 0.032$). Males showed higher nasal height (43.7 mm vs. 37.9 mm, $p < 0.001$), tip projection (23.9 mm vs. 19.8 mm, $p < 0.001$), as well as more acute glabellar angles (146.8° vs. 150.9°, $p = 0.025$) and nasofrontal angles (137.1° vs. 142.6°, $p = 0.011$). In the lower face, females exhibited a more obtuse gonial angle (135.4° vs. 129.6°, $p = 0.002$) and shorter upper lip height (23.9 mm vs. 26.0 mm, $p = 0.007$).

Conclusions

This study offers scientific data on facial anthropometric differences in an Asian population, emphasising the importance of ethnic-specific considerations in gender-affirming surgeries. Surgical principles should focus on reducing prominence, creating obtuse angles, and incorporating lifting procedures. These insights enhance preoperative planning and improve surgical outcomes for FFS.

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Standardized classification of infants with Robin sequence using MicroNAPS

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Cory Resnick

Abstract

Background

MicroNAPS, a classification scheme for infants with Robin sequence (RS) intended to guide treatment decisions, consists of 5 elements: micrognathia, nutrition, airway, palatal clefting, and syndromes/comorbidities. Scoring of the first 4 elements is well- defined, but assignment of the syndromes/comorbidities score (S score) introduces subjectivity by necessitating judgement regarding the clinical impact of the diagnosis. A database of comorbid diagnoses associated with RS and consensus-based S scores for each is needed for the MicroNAPS system to be reproducible.

Methods

Diagnoses known to be associated with RS were identified from existing literature. Preliminary severity grades were applied. A series of electronic surveys were distributed to RS experts seeking agreement or recommendation and explanation for updated scoring, according to Delphi technique, until at least 75% consensus was achieved for each item. A previously published series of 100 infants were re-scored according to the resulting grades, and changes from initial scoring were assessed.

Results

170 associated syndromes and comorbidities were identified. Complete responses were received from 20 of the 35 experts (57.1%) surveyed. Consensus on S scores was achieved for all but 3 diagnoses (98.2%) after 4 rounds of surveys. Re-scoring of the published series found 25 (25%) changes in S scores resulting in 5 modifications to R stages.

Conclusions

We have compiled a comprehensive list of syndromes and comorbid diagnoses associated with RS and achieved expert consensus regarding the impact to early treatment decision making for most. This list, assigned S scores, and a complete MicroNAPS calculator are publicly available at www.prscalculator.com.

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A Global Survey of Craniofacial Fellowship Training: Key Insights

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Abstract

Background

Craniofacial surgery fellowships provide advanced training for surgeons specialising in complex craniofacial conditions. However, program structure, curriculum, and funding vary globally. The aim of this study was to assess current fellowship training practices through an international survey.

Methods

A survey distributed via the International Society of Craniofacial Surgery (ISCFS) received responses from 45 centers worldwide, 23 (51%) of which reported formal fellowship programs. Data were collected on trainee backgrounds, program structure, curriculum, case exposure, funding, and post-fellowship career retention.

Results

Fellowship programs primarily train plastic surgeons (83%), with some inclusion of maxillofacial surgeons (35%), neurosurgeons (17%), and otolaryngologists (13%). Most fellowships (90%) last one year; whilst entry requirements vary, with 60% requiring board certification. Formal curricula exist in 48% of programs, predominantly in North America, while European programs rely more on mentor-guided training.

Despite curricular variability, key training components are common: all programs involve supervised clinical exposure, 75% offer didactic teaching, and 61% permit some independent operating. Additionally, 87% require research involvement, and 78% address ethical aspects of craniofacial surgery. Certification varies: 50% provide a formal completion certificate, while a few programs conduct exit examinations.

Fellows gain exposure to a broad range of conditions, including craniosynostosis (93%), orthognathic surgery (100%), and rare clefts (84%), with some centers offering ultra-specialised cases. Funding is primarily institutional (57%) or university- based (22%), but self-funding is required in certain regions.

Post-fellowship retention rates are strong, with approximately 60% of graduates continuing in craniofacial surgery. Some centers report retention rates as high as 100%, particularly in North America and Europe.

Conclusion

This first-of-its-kind survey offers a comprehensive overview of craniofacial fellowship training worldwide. While regional differences exist, common themes emerge: most programs last one year, provide broad clinical exposure, and emphasize multidisciplinary care and research. Despite a shared goal of producing skilled craniofacial surgeons, variations in curricula, certification, and funding reflect the diversity of healthcare systems and potential inequities between regions. The findings of this study can inform efforts by ISCFS to harmonise training standards, share best practices, and make training more accessible/standardised across all regions - while preserving the valuable diversity of educational approaches.

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Morphological Severity and Outcomes in Isolated Metopic Craniosynostosis: Associations with Genetic, Perioperative, and Comorbidity Factors

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Abstract

Isolated metopic craniosynostosis (MCS) presents with a range of severity, yet the relationship between cranial morphology and clinical outcomes remains unclear. In this study, we applied both an unsupervised machine learning algorithm to derive Cranial Morphology Deviation (CMD) and a supervised machine learning algorithm to generate the Metopic Severity Score (MSS), allowing for an objective, data-driven assessment of phenotypic severity. We retrospectively analyzed 101 patients with MCS who underwent CT imaging at our institution, comparing CMD and MSS across key clinical outcomes using independent t-tests and Pearson correlation. No significant association was found between CMD or MSS and the likelihood of an interesting genetic test result (CMD: 151.24 ± 4.17 vs. 157.22 ± 7.07, $p = 0.470$; MSS: 4.08 ± 0.27 vs. 4.51 ± 0.54, $p = 0.481$). Among comorbidities, patients with medical conditions had significantly lower MSS (3.70 ± 0.33 vs. 4.74 ± 0.34, $p = 0.032$), while CMD differences were not statistically significant. Older age at the time of CT correlated with higher MSS ($p < 0.001$) and a weak but significant increase in CMD ($p = 0.038$), while younger patients were more likely to undergo surgery ($p = 0.063$). Notably, patients who underwent surgery had substantially higher CMD (166.21 ± 3.56 vs. 124.00 ± 5.60, $p < 0.00001$) and MSS (5.21 ± 0.25 vs. 2.00 ± 0.28, $p = p < 0.00001$), highlighting a strong association between these cranial metrics and surgical intervention.Patients requiring ICU admission had significantly higher CMD (164.75 ± 4.11 vs. 138.59 ± 5.49, $p = 0.00025$) and MSS (5.21 ± 0.29 vs. 2.98± 0.33, $p < 0.00001$), as did those who developed postoperative complications (CMD: 167.39 ± 7.66 vs. 149.68 ± 3.97, $p = 0.0499$; MSS: 5.33 ± 0.49 vs. 3.95 ± 0.27, $p = 0.0207$). These findings demonstrate that machine learning-derived CMD and MSS are strong predictors of ICU admission, postoperative complications, and surgical intervention, while their relationship to genetic findings and medical comorbidities remains less clear. By leveraging objective phenotypic severity metrics, this approach may enhance perioperative risk assessment and guide clinical decision-making in MCS.

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Dynamic osteodistraction with springs – the Gothenburg experience of spring-assisted cranioplasty

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Abstract
Surgical treatment of craniosynostosis includes a wide range of techniques. Although a variety of more extensive cranioplasties have been employed to enhance outcomes, efforts to identify less invasive surgical approaches with better results continue. Since the introduction of springs as a tool for craniosynostosis surgery in 1997 at Sahlgrenska University Hospital in Gothenburg, Sweden, several studies have established their utility as an efficient surgical method. Because springs are currently used in the majority of our surgeries addressing craniosynostosis in children, this review summarizes our extensive experience with this method in more than 750 surgeries.

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The Versatility of Maxillary π-shaped Osteotomy in the Correction of Dentomaxillofacial Deformities

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Tao Wang


Yanwu Liu


Wenyang Li


Xiang Gao


Jiang Deng


Chongqing Yu

Abstract

Aim

The maxillary basement of Angles Class III Skeletal deformities often presents with the "shrinkage like" phenomenon of insufficient volume. In spite of pre-surgical orthodontic -orthognathic surgery approach, especially surgery first approach, defects such as nasal base depression and even upper front teeth lip tilt are often not settled in satisfactory with aesthetics. Traditionally, several compensatory measures, such as extraction of the bilateral first bicuspids, SARPE, MARPE, etc. are used to relatively or absolutely expand the maxillary horizontally for next step of orthognathic surgery to coordinate. The ultimate effect is still difficult to achieve. Padding the nasal base with free self-bone grafting and some biomaterial is the last resort option. "π"-shaped osteotomy of the maxilla has been put into use for hundreds cases for over 10 years to compensate for these shortcomings. During recent 2 years, it has also been applied to correct more complex deformities such as Ⅱ sub division Ⅱ with short face, bi-maxillary protruding with underdeveloped maxillary body, etc.

Method

During operation, maxillary bilateral first premolars are extracted or not depending on specific indications. After careful gingival separation, the maxillary anterior segmental osteotomy is then performed. Anterior segmental front teeth-alveolar bone complex is rotated clockwise and lift a little upwards as to decompensate the excessive forward leaning teeth.Another step of bilateral osteotomy is made along the nasal floor. Then the width of the maxillary arch can be adjusted by polishing the osseous interference and releasing muco-periosteum tension. At last, stable platform for the post-operative orthodontic treatment is obtained with splint and rigid internal fixation.

Conclusion

Less complication occurs comparing with traditional Y-shape segmental osteotomy. For example the nasal-oral fistula, the reason is that at the bilateral nasal floor osteotomy region, the bony palatal plate is the thinnest, the palatal mucous membrane is the thickest. The second advantage is that sub-periosteal dissection can obtain easier palatal expansion and contraction then one line osteotomy. The maxillary π-shaped osteotomy provides a versatile and reliable measures to break down quite a few barriers, such as increasing the indications of surgical first approach, improving the multi-deformity therapeutic outcome, reducing complication rate.

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Correlation analysis of airway-facial phenotype in Crouzon syndrome by geometric morphometrics: A promising method for non-radiation airway evaluation

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Josef Yehong Zhong

Abstract

Aim

This study aimed to verify the correlation of the airway-facial phenotype and visualize the morphological variation in Crouzon syndrome patients. Additionally, to develop a non- radiation methodology for airway assessments.

Method: In this study, 22 patients diagnosed with Crouzon syndrome (Age: 7.80 ± 5.63 years; Gender distribution: 11 females and 11 males) were analysed. The soft tissue surface and airway were three-dimensionally reconstructed, and the entire facial phenotype was topologized and converted into spatial coordinates. Geometric morphometrics was employed to verify the correlation and visualize dynamic phenotypic variation associated with airway volume. A total of 276 linear variables were automatically derived from 24 anatomical landmarks, and principal component analysis (PCA) identified the 20 most significant parameters for airway evaluation. Correlation analyses between parameters and airway volume were performed. Then, patients were classified into three groups based on airway volume, and the differences among the groups were compared for evaluating the differentiating effectiveness of parameters.

Results

The facial phenotype was strongly correlated with the airway (coefficient: 0.758). Morphological variation was characterized by (i) mandibular protrusion and anticlockwise rotation; (ii) midface retrusion; (iii) supraorbital frontward and (iv) lengthening of the facial height. All the anthropometric parameters were strongly associated with the airway, and the differences among the groups were statistically significant.

Conclusion: This study confirmed the strong correlation between facial phenotype and airway parameters in Crouzon syndrome patients. Despite the development of the airway, pathological midface retrusion was still aggravated, suggesting that surgical intervention was inevitable. Three-dimensional facial anthropometry has potential as a non-radiation examination for airway evaluation.

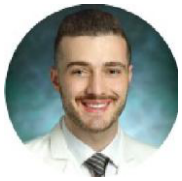
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Referral Gaps and Risk Factors for Long-Term Headaches in Patients with Craniofacial Fractures

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Abstract

Background

Post-traumatic headache (PTH) affects up to 80% of patients with mild-to- moderate traumatic brain injury (TBI), contributing to significant morbidity and healthcare burden. While early diagnosis and treatment can help prevent persistent headaches, neurology referral rates remain low. This study aims to (1) identify risk factors for PTH >1 year and (2) assess the frequency of neurology referrals in patients with craniofacial trauma.

Methods

We retrospectively reviewed adult trauma patients who presented with frontal sinus, orbital, and mandibular fractures between (2018-2019). Our primary outcome was the frequency of persistent and new-onset PTH assessed >1 year of injury. Multivariable logistic regression was performed to identify risk factors for long-term PTH.

Results

Among 622 patients with craniofacial fractures, 166 (27%) presented with PTH, and 310 (50%) exhibited signs or symptoms related to TBI. Despite this, 248 (80%) of these patients were not referred to neurology/neurosurgery. Among 81 patients who were not referred and had follow-up >1 year, 10 (12%) reported persistent or new-onset PTH. Among 229 patients with follow-up >1 year, 9 (3.9%) developed new-onset migraines, and 34 (14.8%) experienced persistent or new-onset PTH. Significant risk factors for persistent or new-onset PTH >1 year included a history of pre-trauma headaches (aOR [95% CI] 5 [2-15], P=0.004) and abnormal head CT findings on presentation (aOR [95% CI] 4 [1-14], P=0.03).

Conclusion

Patients with craniofacial fractures, particularly those with pre-trauma headaches and abnormal head CT findings on presentation, should be vigilantly monitored for PTH, and referred early to neurology to prevent long-term morbidity.

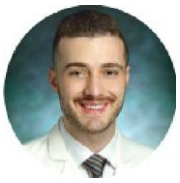
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A Risk Calculator for Predicting Enophthalmos Following Orbital Fracture Repair

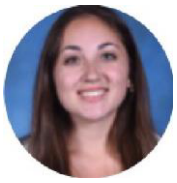
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Abstract

Purpose

Enophthalmos is an undesired outcome of orbital fracture repair (OFR). Risk factors for postoperative enophthalmos remain unclear. We sought to develop and validate a risk calculator for more accurate prediction of this outcome.

Methods

We retrospectively reviewed adult trauma patients who underwent OFR at two trauma centers over 8 years. Patients with postoperative follow-up <2 weeks were excluded. Our primary outcome was incidence of postoperative enophthalmos at ≥2 weeks following OFR. The C-statistic (area under the ROC curve) and Hosmer-Lemeshow tests were used to assess the accuracy of the risk model.

Results

Of 501 patients with OFR, 349 were included. Twenty-seven (7.7%) patients had postoperative enophthalmos. The risk model was developed and partially validated using patient data from 2015 to 2019 (n=253), and fully validated from 2020 to 2022 (n=96). Risk factors for postoperative enophthalmos were: older age, preoperative enophthalmos, medial wall involvement, near-total orbital floor defects, and delayed surgical repair beyond 1 month from injury. There was an incremental increase in the odds of postoperative enophthalmos with longer duration from injury to surgery. Our risk model showed very good discrimination (C-statistic=84.5%) and calibration (P=0.83). It was highly accurate in predicting enophthalmos using the validation dataset (C-statistic=0.89). For a risk cut-off of 9.5%, the sensitivity and negative predictive value were 85% and 99%, respectively.

Conclusion

We designed the first validated risk calculator that can be used to rule out enophthalmos following OFR. Our risk calculator enables surgeons to preoperatively predict the absence of postoperative enophthalmos in 99% of cases.

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Application of Frontale Priority Strategy in Surgical Correction of Hypertelorism Secondary to Craniosynostosis

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Abstract

Objective

To investigate the clinical efficacy of the frontal-cranial priority strategy in the surgical management of patients with orbital hypertelorism caused by craniosynostosis.

Methods

Six patients with craniosynostosis-induced hypertelorism (4 cases of plagiocephaly, 2 cases of brachycephaly) treated at our center from March 2023 to May 2024 were included. The frontale priority strategy was implemented under the guidance of digital design and intraoperative guidance. This approach prioritized the reconstruction of an integrated frontal-bone morphology as the foundational framework for subsequent orbital repositioning and reshaping. Pre- and postoperative imaging changes, surgical complications, and parental satisfaction were systematically recorded to evaluate clinical outcomes.

Results

Postoperative interorbital distance (IOD) was corrected to 16 mm in 4 pediatric patients and 22 mm and 20 mm in 2 adult patients, respectively. The mean cranial vault asymmetry index (CVAI) improved from 0.86 to 0.98 in plagiocephalic patients. Supraorbital depressions resolved postoperatively, with restored brow prominence and smooth orbital transitions. Intraoperative blood loss ranged from 400 to 2000 mL. No severe complications, such as mortality, visual impairment, cerebrospinal fluid leakage, bone resorption, or wound dehiscence, were observed. Two adult patients received additional 5-day antibiotic therapy due to elevated white blood cell counts and C-reactive protein levels on postoperative day 7. All families expressed satisfaction with aesthetic improvements.

Conclusion

The integration of the frontale priority strategy with digital technology facilitates rapid and precise establishment of a reference framework for cranio-orbital remodeling during surgical correction of craniosynostosis- associated hypertelorism. This approach demonstrates significant potential for optimizing postoperative outcomes and minimizing complications.

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Temperature-Sensitive Mesoporous Polydopamine Hydrogel Loaded with Core Oral Probiotics for Antibacterial and Tissue Repair Treatment of Peri-Implantitis

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Di Yan



Ze Hui Wang

Abstract

Background

Peri-implantitis is a major cause of implant failure, with a prevalence of 22%-51%. Similar to periodontitis, peri-implantitis is associated with bacterial infection, leading to inflammation, bone resorption, and potential implant loss. Due to the absence of periodontal ligament, the peri-implant tissue has lower vascularization and immune defense, making the destruction more rapid and severe. Restoring microbial homeostasis around implants is crucial for effective antibacterial therapy and tissue repair.

Methods

We identified core pathogenic and probiotic bacteria in peri-implantitis using 16s rRNA sequencing and formulated a temperature-sensitive hydrogel containing mesoporous polydopamine (MPDA) loaded with core oral probiotics. MPDA enhances drug loading and bioavailability, while the hydrogel provides controlled release and a protective barrier. The physical and chemical properties of the hydrogel were analyzed using SEM, TEM, DLS, and FTIR. In vitro experiments evaluated its antibacterial efficacy and biocompatibility with gingival epithelial cells. In vivo studies in a rabbit peri- implantitis model assessed tissue repair and inflammation markers through Micro-CT, histological staining, and protein expression analysis.

Results

The hydrogel demonstrated excellent biocompatibility, sustained probiotic release, and effective suppression of peri- implantitis-related pathogens. In vivo studies showed significant reduction in inflammation and enhanced tissue regeneration.

Conclusion

This probiotic-loaded MPDA hydrogel offers a promising non-antibiotic strategy for peri-implantitis treatment by restoring microbial balance and promoting tissue healing.

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Single-stage virtual surgical planning (VSP)-guided resection and custom polyetheretherketone (PEEK) implant reconstruction of complex oncologic and dysplastic defects of the craniofacial skeleton

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Abstract

Background

Traditional management of composite craniofacial lesions involved staged resection and reconstruction, requiring multiple surgeries with risks of scalp flap contracture, scarring, and anatomic distortion. Advances in virtual surgical planning (VSP) and intraoperative guided navigation now allow for single-stage, multi-disciplinary resection- reconstruction. While custom polyetheretherketone (PEEK) implants have been shown safe for calvarial reconstruction, limited studies exist on VSP-guided one-stage extirpation and reconstruction. We describe our experience with VSP-guided oncologic resection and custom-fabricated PEEK implant reconstruction in the largest series of such patients reported in the literature to date.

Methods

We retrospectively reviewed patients who underwent single-stage composite craniofacial lesion resection and PEEK reconstruction at a tertiary referral center (Sept 2019–Jan 2025). Preoperative VSP was performed collaboratively by plastic and neurosurgery teams to design cutting guides and implants. Data analyzed included demographics, defect location, operative details, hospital stay, blood loss, follow-up, and complications.

Results

Eleven patients (6 female, mean age 51 years) underwent single-stage VSP-guided extirpation and immediate PEEK implant reconstruction. Tumor pathology included meningiomas (n=3), fibrous dysplasia (n=2), metastases (n=3), glioma (n=1), hemangioma, hemangiopericytoma, and invasive dermoid cyst (n=1 each). Defects involved the fronto- orbital-temporal-skull base (6/11) or occipital/parietal regions (5/11). Median (interquartile range) hospital length of stay and long-term follow up were 3(3.5) and 321(518) days, respectively. 4/11 patients developed postoperative CSF leak or extradural fluid collections, two of which required reoperation for ventricular drainage. One PEEK implant removal was required due to ventriculitis. Otherwise, no other PEEK related complications were noted. Patients were satisfied with the aesthetic outcomes of reconstruction

Conclusions

A multidisciplinary approach to VSP-guided single-stage resection and PEEK implant reconstruction offers plastic surgeons and neurosurgeons a novel way to address complex malignant/dysplastic lesions of the craniofacial skeleton, including those involving critical neurovascular structures. These procedures can be performed safely and effectively with excellent outcomes and low complication rates. Single-stage resection and reconstruction offers potential reductions in healthcare utilization due to decreased costs associated with OR time, anesthesia and hospital admission relative to a traditional multi-stage approach. The burden on the patient is also decreased with a more efficient approach to surgical management.

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Spring-Mediated Cranioplasty for Sagittal Synostosis: Does it Contribute to Synostosis of the Uninvolved Sutures?

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Abstract

Background

Spring-mediated cranioplasty (SMC) is widely used in the treatment of sagittal synostosis, with numerous studies evaluating its clinical outcomes. However, prior studies have rarely described an association with secondary synostosis, particularly unicoronal synostosis (UCS). This study evaluates the early postoperative course of patients who underwent SMC, focusing on the incidence of UCS.

Methods

All patients presenting with sagittal synostosis between January 2021 and December 2023 were reviewed. Patients were categorized into three surgical techniques: extended suturectomy with postsurgical orthotic, SMC, and open calvarial vault remodeling (CVR). Those undergoing SMC for non-syndromic sagittal synostosis were included. Pre-spring placement and pre-spring removal CT scans were reviewed alongside clinical photographs and measurements. Surgical operative records and pre and post operative progress notes were also reviewed.

Results

Ten patients who underwent SMC for sagittal synostosis were included. The mean age at spring placement was 4 ± 1.3 months. The mean number of springs used was two, with a mean total spring force of 18 ± 5.1N, mean anterior spring force of 7.6 ± 1.2N, and mean posterior spring force of 8.8 ± 0.9N. Cephalic index improved from 68.5 ± 3.4 preoperatively to 79 ± 3.9 at time of spring removal. Springs were removed at a mean interval of 4 months. Three patients (30%) were found to have left UCS on pre-removal CT scans. All three patients presented clinically with asymmetric elevation of the parietal bone opposite of the fused suture. Two of these three underwent suturectomy at the time of spring removal due to developing frontal orbital asymmetry.

Conclusions

In this study, 30% of patients treated with spring mediated cranioplasty for sagittal synostosis developed secondary unicoronal synostosis in the early postoperative period prior to spring removal, as evidenced on CT imaging. This has not previously been reported in the literature, and this novel finding warrants further investigation to explore its relationship with spring placement timing, location, and force.

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Exploring the Development and Future Directions of Facial Bone Contouring: A Bibliometric And Visualization Analysis from 2005 to 2025

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Li Teng

Abstract

Background

Facial bone contouring has gained popularity over the past two decades in Oriental, yet comprehensive bibliometric analysis in this field remains lacking. The study aims to evaluate the global research landscape of facial bone contouring to identify current hotspots and future research directions.

Methods

Data were extracted from Web of Science Core Collection and analyzed using VOSviewer, CiteSpace and ArcGIS for bibliometric visualization, including annual publication trends, journals, authors, institution, countries and keywords.

Results

This bibliometric analysis examined 936 publications (2005-2025), showing consistent growth publications. Journal of Craniofacial Surgery contributed the highest publication volume, while Journal of Oral and Maxillofacial Surgery exhibited the highest citation impact per article. China led in publication volume, followed by the US and South Korea. The top five research institutions were concentrated in China and South Korea, with Peking Union Medical College&Chinese Academy of Medical Sciences ranking first. Among authors, Gui Lai is the most productive author, whereas Hu Jing received the highest citations per article. Keyword timezone analysis revealed three distinct research phases: technical foundation (2005-2011), technical refinement (2012-2017), and digitalization and interdisciplinary integration (2018-present).

Conclusions

Facial bone contouring has become an increasingly popular area in plastic surgery. Bibliometric analysis reveals China, the US, and South Korea as the predominant contributors to this field. Current research hotspots include digital surgical technique and facial gender-affirming surgery, while future directions should emphasize long-term outcome studies, international multicenter collaborations, and the integration of artificial intelligence with advanced biomaterials to drive innovation in surgical techniques and outcomes.

Keywords

Facial bone contouring; Bibliometric analysis; Craniofacial surgery

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Incidence of Oronasal Fistula after LeFort I Osteotomy in Patients with History of Cleft Palate

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Abstract

Background

Up to 45% of children with cleft palate develop maxillary hypoplasia which is generally corrected by LeFort I osteotomy and advancement (LF1). LF1 can be associated with velopharyngeal insufficiency (VPI) and oronasal fistulas (ONF) which can cause concerns with speech and feeding. This study aimed to identify the incidence of ONF after LF1 in patients with cleft palate with or without cleft lip (CP ± CL).

Methods

Patients with CP ± CL undergoing LF1 between January 2015 and July 2024 were considered. Patients without all reported data measures were excluded. Data were gathered using clinical documentation. Demographic variables, preexisting/iatrogenic fistulas, pre-operative symptoms of VPI, degree of maxillary advancement, formation of oronasal fistula, development of hypernasal speech, and audible nasal air emission were analyzed.

Results

Fifty-two patients were included. 44.2% were male, and 55.7% were female. The mean age of patients at LF1 was 17.8 years. Mean maxillary advancement (MMA) was 8.2mm (± 4.0mm, R: 3-24mm). For patients undergoing distraction (n=4), MMA was 18.3mm (± 6.2, R: 13-24). Six patients (11.5%) were noted to have ONF post-LF1. Two of these patients had preexisting fistulas which were repaired prior to LF1. Of the six patients, two had asymptomatic fistulas. Four patients had symptomatic fistulas, resulting in one or more of: audible nasal air emission, nasal regurgitation, or hypernasality. Average postoperative fistula size was 5.8 mm (± 7.1, n=6, R: 1-20mm). All fistulas were within the hard palate. Ten patients (19.2%) developed hypernasal speech and eight patients (15.3%) developed audible nasal air emission during speech post-LF1.

Conclusions

This study identified the incidence of ONF following LF1 in patients with history of CP repair, and presenting symptomology. These results highlight the necessity for thorough preoperative evaluation, careful intraoperative techniques to avoid violation of the palate, and vigilant postoperative monitoring to improve patient outcomes.

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From fusion to function, clinical insights and therapeutic strategies in Syngnathia

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Abstract

Background

Syngnathia is a very rare craniofacial anomaly, referring to different forms of fusion of the upper and lower jaw, with or without involvement of the temporomandibular joint (TMJ). Due to its rarity, limited knowledge is available about the clinical manifestation and, in specific, about treatment strategies. The aim of the study is to map out the clinical manifestation and the currently used treatment options by collection information systematically in a case series.

Methods

Within the European Reference Network of Craniofacial Anomalies and ENT disorders, a call was sent out to identify cases of syngnathia. With the involved centers, a clinical checklist was developed in several meetings and approved by all member centers. Data was collected via the checklist and radiological images and photographs were collected additionally. Furthermore, a comparison with previously reported cases from the literature was made.

Results

A total of twelve cases of syngnathia were identified. Cases included bony and fibrous syngnathia, as well as a combination. The majority of the patients were diagnosed directly after birth. Most cases were associated with additional (craniofacial) anomalies. Syndromes occurred in four of the cases. In six cases, the TMJ was involved. Treatment strategies varied and timing of the first surgery differed between four days and nine years, sometimes leading to relapse of the syngnathia. Feeding problems occurred in all patients. The need for a tracheal stoma was reported in eight patients. In literature, mild cases (such as oral bands) are more often reported, requiring a fundamentally different clinical treatment strategy that more severe cases.

Conclusion

This study presents the largest case series of syngnathia so far, emphasizing the high occurrence of oral health problems in the population. Suggestions for adjustment of a clinical classification system are made. When it comes down to clinical practice, treatment teams should be aware that respiratory problems and feeding problems may occur directly or shortly after birth. Concerning treatment decisions, caution should be taken with early release operations.

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Aesthetic Refinements in Craniosynostosis patients during Adolescence

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Abstract

In craniosynostosis, primary treatment early in life focuses on solving neurological, optical, and respiratory problems. When patients are young adults, along with problems such as midface hypoplasia, exorbitism, and Class III malocclusion, normalization of many functions and facial appearance is necessary. The sagittal disharmony between maxillar- mandibular growth is corrected using combined multi-segmental osteotomies to obtain normo-occlusion, as in classic orthognathic surgery. We present a clinical series of 38 patients, aged 16 - 23 years, with syndromic craniosynostosis who underwent fronto-orbital advancements, monoblocks, and subcranial Le Fort III.

In our patients, the differential midface hypoplasia, resulting from a combination of the disease`s natural history and particular surgical history, has been corrected using bone distraction techniques and multi-piece osteotomies. When procedures are combined, a simultaneous soft tissue expansion is added. Resulting quality increases, avoiding relapses and complications, best osteotomy stability, better functional result quality, and occlusal stability. Facial fat grafting, lateral canthopexies, and rhinoplasties with cartilage grafts have been added to improve aesthetics and harmony, through a simpler set of facial procedures. Important points to observe:

1. When making surgical decisions, patients must be individualized, and the surgeon must differentiate between two problems: visual perception versus the quantitative reality of facial bone structure. This implies that visual perception of certain facial relationships may be quite disparate from their quantitative measurement.
2. Perception must always take precedence. We can frequently observe the perception of an excessively low face projection together with an excessive lower face height. These combined facts produce an excessive profile concavity and subsequently an abnormal lip relationship, with the lower lip far in advance of the upper lip.
3. Together with severe hypoplasia of the upper jaw, it is also common to observe an associated anterior open bite of variable degrees. These anatomical abnormalities are the reasons for planning segmental osteotomy use.
4. Combining osteotomies and bone distraction minimizes surgery, preserves bone vascularity, adds simultaneous tissue expansion and new-bone formation, and produces more bone volume, giving orthodontically the opportunity to achieve better occlusal stability.
5. Combining osteotomies, distraction, and aesthetic procedures simultaneously produces excellent functional-aesthetic results, increasing patients' self-esteem.

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Redefining grade II-B hemifacial microsomia treatment using mandibular distraction after 20 years of follow-up

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Abstract

Mandibular distraction can successfully correct functional and aesthetic problems in hemifacial microsomia patients. It does not affect CF growth, resulting in a good prognosis and long-term stability. Many surgical groups agree on hemifacial microsomia grades I and II-A distraction as primary treatment. However, mandibular distraction for grade II-B is controversial due to poor results, the need for reoperations, and high costs. Different surgeons today prefer to use free bone grafts, some microsurgical bone procedures to reconstruct the ascending ramus, waiting until age 18, and performing bimaxillary orthognathic surgery.

A series of 24 patients is presented, 11 male and 13 female, in whom mandibular distraction was used as primary treatment between 3 and 6 years old, and with clinical-radiological follow-up over 20 years. All the patients received orthodontics: pre-surgical, during bone elongation and consolidation periods, and subsequently until reaching skeletal maturity at 18. The performed mandibular distraction technique has included: an intraoral approach and minimal ramus dissection to preserve bone vascularity, external devices to produce vertical vectors and healthy bone formation, and overcorrecting the CO-GO distance according to the patient's age. The new ramus length immediately produced a posterior open bite and contralateral crossbite, which were progressively corrected over the next 8 months using correct orthodontic maneuvers. After the procedures, the patients were monitored throughout their growth and development years. The following facts were observed: facial bone and soft tissue growth, and the presence of negative psycho-social effects. For this reason, facial soft tissue hypoplasia in the affected hemi-face was corrected using 2 to 3 facial lipo-structuring procedures, improving facial symmetry and contours, and the patient´s self- esteem was balanced. Using fat grafting and ear reconstruction, we can eliminate the feeling of growing up with a different facial appearance.

Of the 24 patients, only 4 required bimaxillary orthognathic surgery. The indications were facial asymmetry and a malocclusion with a tilt greater than 6 degrees above the horizontal plane. In all patients, during the young adult period, additional aesthetic procedures were performed: aesthetic-functional rhinoplasties, asymmetrical chin osteotomies, lipo-injections to accentuate the definition of facial contours, and final refinements of the reconstructed ear.

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Microtia: Lessons Gleaned from 1012 Reconstruction Operations over the last 6 years

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Xia Chen

Abstract

Aims

Ear reconstructive surgery has seen further improvements and become more mature. We adopt a more comprehensive approach based on our own experience which is safe, stable and mature, and relatively easy for young doctors to learn and implement.

Background

Organ reconstruction is one of the most challenging tasks in plastic and reconstructive surgery. This is particularly true of ear reconstruction, which requires enormous attention to detail.

Methods

We set out details and precautions for each step of the pre-operation, intra-operation and post-operation stages of the ear reconstruction process for microtia patients. We cover pre-operative screening and assessment of surgical conditions, the design of intra-operative incisions, flap separations, costal cartilage extraction, framework carving and cranial ear angle surgery, as well as postoperative care, follow-up and complications management.

Results

Over the last six years, our surgical team carried out 1012 microtia ear reconstructions, at the rate of 3-4 per week. This approach presents the key learnings from this high volume of operations. Two typical cases involving different types of microtia will be presented in order to illustrate the process of total ear reconstruction.

Conclusions

We describe in detail the pre-operative and intra-operation stages of the ear reconstruction process. We share our cumulative surgical experience gained over 20 years, especially the latest practical lessons gleaned over the last six years.

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Islanding the facial artery myomucosal flap: how I do it

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Xiaozhen Lin

Abstract

Backgrounds

The facial artery myomucosal (FAMM) flap has become a reliable option for reconstructing minor oral defects. Its islanded variant represents a critical advancement, enabling the harvest of larger myomucosal tissue while enhancing rotational flexibility through complete vascular pedicle isolation.

Despite its utility, detailed protocols for islanded FAMM flap elevation remain sparse. This case series outlines a standardized technique for harvesting islanded FAMM flaps to reconstruct moderate oral tongue or floor of mouth defects following early-stage oral squamous cell carcinoma resection, supported by surgical video documentation.

Surgical technique

The facial artery was isolated during neck dissection (levels I-V), and the external jugular vein was also preserved until venous drainage pattern (common facial or external jugular) was confirmed. The flap was harvested utilizing intraoral or lower-lip split approaches. Anatomical boundaries were defined anteriorly 1 cm from the oral commissure to preserve orbicularis oris integrity, posteriorly at the pterygomandibular raphe, and superiorly/inferiorly at vestibular grooves. Parotid papilla preservation ensured salivary duct protection. Dissection began with a distal incision and submuscular exploration to identify the vascular pedicle between the buccinator and buccal fat pad. Retrograde elevation along the facial artery/venous axis followed neck dissection. Meticulous skeletonization of facial vessels from the marginal mandibular nerve enabled full pedicle mobilization. The flap was transposed via a submandibular tunnel for defect repair, while the donor site was covered with buccal fat pad.

Results

Seven islanded FAMM flaps (mean dimensions: 3×5 cm) achieved 100% viability. Mean operative time was 514±66.2 minutes. Venous drainage variations in two cases required adaptations: one preserved the external cervical vein, while the other underwent anastomosis to the common facial vein. Histological analysis confirmed complete mucosalization of transposed buccal fat pads with no trismus developed. No locoregional recurrence was observed in at least 12-month follow-ups.

Conclusion

The islanded FAMM flap offers a reliable, minimally morbid option for moderate oral defects, prioritizing vascular precision, nerve preservation, and adaptive venous management. Its efficacy supports broader adoption in patients unsuitable for microsurgery.

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Mechanism of HDAC4-mediated maxillary osteoblast proliferation through regulation of PCNA

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Xiaofeng Wang



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Abstract

Objective

Craniofacial manifestations are present in nearly one-third of congenital birth defects, with maxillary bone developmental anomalies being the most common contributing factor. Jaw bone developmental disorders are prevalent in congenital malformations such as cleft palate, cleidocranial dysplasia, and Treacher Collins syndrome. These developmental anomalies involve complex molecular mechanisms, including the coordinated action of transcription factors, signaling molecules, and epigenetic regulators. Notably, histone deacetylase 4 (HDAC4) plays a crucial regulatory role in cranial neural crest cell migration and differentiation, as well as in palatal formation and fusion. However, the specific mechanisms by which HDAC4 regulates maxillary bone osteogenesis remain largely unexplored.

Methods

In this study, we employed a comprehensive approach combining immunohistochemical staining, immunofluorescence staining, and whole-mount in situ hybridization to delineate the spatiotemporal expression pattern of Hdac4 during murine craniofacial development. Utilizing Cre-mediated recombination technology, we conditionally knocked out the Hdac4 gene in cranial neural crest cells (CNCCs) to assess its impact on maxillary bone development. Additionally, we established in vitro cell models integrated with RNA sequencing (RNA-seq) and Cut&Tag techniques to further elucidate the molecular mechanisms underlying Hdac4 regulation.

Results

Comparative analysis of wild-type and Hdac4fl/fl; Wnt1-Cre mice revealed distinct spatiotemporal expression patterns of Hdac4 in the maxilla during various embryonic developmental stages, confirming its involvement in craniofacial skeletal development. Postnatal analysis through embryonic skeletal staining and micro-computed tomography (micro-CT) demonstrated that Hdac4fl/fl; Wnt1-Cre mice developed microcephaly and malocclusion. Immunofluorescence staining coupled with in vitro cell line studies showed that Hdac4 knockdown significantly inhibited osteoblast proliferation.

Furthermore, RNA-seq, Cut&Tag, and co-immunoprecipitation (Co-IP) analyses suggested potential interactions between Hdac4 and cell cycle regulatory genes.

Conclusion

This study provides the first comprehensive evidence of Hdac4's expression patterns and regulatory roles in craniofacial development. These findings significantly enhance our understanding of HDAC4's involvement in skeletal system development and offer critical insights into the etiopathogenesis of maxillary hypoplasia and cleft palate.

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Quantifying Cranial and Facial Shape Changes in Single-Suture Craniosynostosis: A Preliminary Study of Endoscopic Assisted Craniosynostosis Surgery and Orthotic Therapy Using 3D Morphable Models

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Abstract

Introduction: Craniosynostosis results from premature cranial suture fusion, disrupting skull and facial growth. Surgical treatment aims to correct deformities and mitigate risks of intracranial pressure and developmental delay. Open cranial vault remodeling restores head shape, while endoscopic-assisted strip craniectomy allows early intervention, followed by orthotic therapy to guide cranial development. Objective outcome measures remain limited.

Aims: This study quantifies cranial and facial changes in patients treated with endoscopic surgery and orthotic therapy.

Methods: Patients with single-suture craniosynostosis (metopic, sagittal, coronal, lambdoid) underwent endoscopic-assisted strip craniectomy and orthotic therapy (2021 to 2024). 3D photogrammetry scans were collected presurgery, postsurgery (before orthotic therapy), and after orthotic treatment. A reference morphable model reconstructed a normal head shape, allowing quantification of deviations at each time point.

Results: Preliminary analysis demonstrated progressive normalization of cranial shape. Surgery occurred at 3.9 ± 1.3 months, with 1–3 orthoses used over 5.6 ± 1.9 months. Mean treatment completion age was 10.1 ± 1.2 months. Cranial deviations improved: metopic (2.49 ± 2.09 mm to 2.07 ± 1.31 mm), sagittal (1.81 ± 1.48 mm to 1.50 ± 1.11 mm), coronal (2.69 ± 1.98 mm to 2.13 ± 1.55 mm), and lambdoid (2.41 ± 1.88 mm to 1.88 ± 1.47 mm). Ocular hypotelorism in metopic cases improved by 1.9 mm. Cephalic index normalized (sagittal: 72.3% to 79.3%), and cranial vault asymmetry index improved (0.8% in coronal/lambdoid).

Conclusion: Endoscopic surgery and orthotic therapy effectively correct cranial deformities. Individualized 3D models enhance diagnosis, treatment planning, and outcome assessment, improving clinical workflows.

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Updated Classification of Vascular Anomalies. A living document from the International Society for the Study of Vascular Anomalies Classification Group

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Abstract

Introduction

The International Society for the Study of Vascular Anomalies developed in 1996 a Classification of Vascular Anomalies that became internationally accepted. The main feature was the division of vascular anomalies in 2 categories, vascular tumors and malformations. Major revisions occurred in 2014 and 2018, for updates and inclusion of newly described lesions. Major advances occurred in recent years, with improved understanding of genetic basis of vascular anomalies and its relevance in therapeutics. It created a demand for a new revision of ISSVA Classification, and the process is presented in this study.

Methods

A group was created in 2019, joining experts from different specialties and coordinated by ISSVA Scientific Committee, to reevaluate the 2018 Classification on each subtype of vascular anomaly, considering the clinical presentation, histological subtypes, flow velocity and genetic aspects. After several multidisciplinary online discussions and in person meetings at ISSVA Congresses (2022, 2023 and 2024) the proposal for the new classification was presented for ISSVA Members ratification, after an opening window for comments and suggestions. A new tool was created, named "Glossary of Vascular Anomalies", along the contours of a medical dictionary.

Results

A new layout of the classification was designed. The visualization begins with a general "Landing Page" where the basic division into vascular tumors and malformations are specified. For vascular tumors, the subdivision was kept between Benign, Borderline and Malignant tumors. For vascular malformations, the divisions were presented as Fast- flow lesions, Slow-flow lesions, and Developmental Anomalies of Named Vessels. A Full Classification Table page with all updated modifications followed the Landing Page. All changes and new terms are described in detail and summarized in a table. The glossary lists and explains, in alphabetic order, all technical terms, abbreviations, acronyms, eponyms, genes and syndromes related to vascular anomalies.

Conclusions

The presented updated ISSVA classification of vascular anomalies reflects our evolving understanding of vascular anomalies which will be continuously updated by a dedicated Committee of ISSVA.

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Normative Growth Values of Inter-Orbital Distance from Birth to Adulthood

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Abstract

Background

In the management of patients with craniomaxillofacial deformities, it is imperative to understand normal anthropometric growth of the cranium. Although there have been advances in three-dimensional (3D) computed tomography (CT) images, there is an absence of normative growth curves of interorbital distance (IOD) in a diverse population of healthy children using current imaging technology. The goal of this study is to establish normative craniometric growth curves in a healthy population of children (ages 0-18 years).

Methods

CT scans of 115 patients who underwent cranial imaging at a tertiary children's hospital were included. Patients with head trauma, hydrocephalus or pathologic cranial dysmorphology (plagiocephaly/craniosynostosis) were excluded. Patients were stratified into 23 age groups of 5 patients each (0-2 months, 3-5 months, 6-8 months, 9-11 months, 12-17 months, 18-23 months, and yearly from 2-18 years). Primary outcomes of IOD were analyzed using CT scans. IOD was defined as the distance between the two dacrya (the dacryon is the point of junction of the maxillary, lacrimal, and frontal bones on the medial wall of the orbit), this measurement was taken in the axial plane at the level where the dacryon was first observed to be the most prominent. Primary outcomes were plotted across age intervals, along with best-fit logarithmic curves.

Results

IOD ranged from 15.9 mm to 22.8 mm in our cohort overall. The mean IOD was 15.9 mm at birth, peaked to 22.8 mm at the 18 year period, and was shorter in all female cohorts. The transition from the 3-5 month old cohort to the 6-8 month old cohort experienced the greatest increase with an average increase of 7.6% across both gender groups ($p = 0.022$). There was a statistical difference in IOD between males and females at ages 17 years of age (22.8 mm vs 17.2 mm, $p = 0.047$) and 18 years of age (22.6 mm vs 18.2 mm, $p = 0.041$).

Conclusion

Is important to contextualize cranial pathology, and to define an anatomic end-point in craniofacial reconstruction.

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Validation and Training Efficacy of Immersive Virtual Reality in Orthognathic Surgical Education: A Comparative Study

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Teng Wan



Xudong Wang

Abstract

Introduction

This study aimed to validate the realism of an immersive virtual reality (iVR) surgical training system for orthognathic surgery and compare its educational efficacy against traditional training methods in medical students and professionals.

Materials and Methods

Two sequential phases were conducted. Phase 1 (Validation): Seven experienced surgeons and seven inexperienced students tested the self-developed iVR system and rated its fidelity (virtual environment, instruments, anatomy, procedural accuracy) and usability via questionnaires. Phase 2 (Comparative Evaluation): Twenty fifth-year medical students were randomized into a VR group (10 sessions using the iVR system) or a traditional group (10 sessions with manuals/videos) after an initial lecture. The traditional group completed one iVR familiarization session pre- assessment. Performance metrics included assessment scores, procedural time, instrument/angular errors, prompts, and timeouts.

Results

Phase 1: Participants strongly endorsed the iVR system's fidelity (mean 4.35/5) and educational utility, though most reported dizziness/fatigue after 1-hour use.

Phase 2: The VR group outperformed the traditional group in assessment scores (94.67 vs. 87.65), faster completion time, fewer instrument selection errors, and reduced angular deviations, with comparable prompt usage between groups.

Conclusion

The iVR system demonstrated high authenticity and superior efficacy over conventional methods in orthognathic surgical training. While it holds promise as a supplemental or alternative educational tool, optimizing usability (e.g., mitigating fatigue) is required. This study establishes iVR's potential to enhance surgical education through immersive, risk-free simulation.

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Segmental Two-Jaw Surgery with Anterior Osteotomy: A Strategic Approach for Functional Correction and Facial Aesthetic Refinement

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Heung Sik PARK

Abstract
Segmental two-jaw surgery with anterior osteotomy is an advanced technique increasingly recognized for its ability to simultaneously address complex functional and aesthetic challenges in patients with dentofacial deformities. By precisely combining anterior segmentation with rotational jaw movements, this approach enables multi-vector skeletal repositioning that optimizes occlusal relationships and soft tissue contours—often without requiring prolonged preoperative orthodontics.

In carefully selected patients, the adoption of a surgery-first protocol can yield immediate aesthetic and functional benefits, significantly enhancing patient satisfaction while reducing the total duration of orthodontic treatment. The presentation will outline key selection criteria for this protocol, focusing on occlusal stability and the predictability of dental alignment.

This approach is particularly effective in managing:

- anterior open bite
- vertical maxillary excess with excessive gingival display
- protruded anterior dentoalveolar segments
- dental and skeletal midline discrepancies
- mandibular retrusion
- lower facial imbalance and profile deficiency

Rotational jaw movements—either clockwise or counterclockwise—allow for fine-tuned control of occlusal plane inclination, facial height, and anterior projection. When integrated with adjunctive facial contouring procedures such as mandibular angle reduction, zygomatic reshaping, and genioplasty, this technique supports comprehensive facial balance and harmony. Additionally, it has demonstrated benefits in enhancing upper airway dimensions, especially in retrognathic patients, contributing to improved breathing function and long-term skeletal stability.

Clinical case series will be presented, incorporating detailed cephalometric analyses, pre- and post-operative photographs, and 3D CT imaging to illustrate surgical planning, execution, and outcomes. Emphasis will be placed on advanced planning tools, including virtual surgical planning (VSP), as well as key technical considerations such as segment design, sequencing, fixation strategy, and complication avoidance.

This presentation is intended for an interdisciplinary audience seeking a strategic, outcome-driven approach to functional correction, aesthetic facial refinement, and airway optimization.

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Integrating Photogrammetry with Mixed Reality Platforms for Intraoperative Feedback during Cranial Vault Remodeling

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Kiefer Forseth



Michael Brandel



Julia Schmidt



Alexander Khalessi



Benjamin Massenburg



Michael Levy



Amanda Gosman

Abstract

Introduction

Premature fusion of cranial sutures results in cranial and skullbase deformity. Surgical intervention for craniosynostosis simultaneously improves cosmetic development and reduces intracranial pressure. This can be accomplished with fronto-orbital advancement (FOA) in metopic and unilateral coronal synostoses. Intraoperative feedback on symmetry in vault remodeling is currently limited to subjective judgement.

Methods

An iPhone 15 acquired simultaneous video and LiDAR for 60 seconds after bony exposure and after calvarial remodeling via FOA. Scale-invariant features were extracted and matched between frames, enabling camera pose estimation and dense point cloud reconstruction of scene geometry. The pre- and post-remodeling point clouds were aligned using M-estimator sample consensus of fast point feature histogram descriptors, which identified and registered the intact biparietal convexity. This allowed for measurement of symmetry, intracranial volume expansion and comparison to preoperative plan. This was then verified aligning data to a skull mesh derived from the preoperative CT.

Results

Intraoperative imaging was completed in 11 patients. Absolute error (mean 2.3mm) was measured between landmarks on the preoperative CT mesh and the pre-remodeling point cloud. Relative error (mean 1.7%) was measured using the affine scaling factor between pre- and post-remodeling point clouds. Cranial vault volume was calculated above a plane traversing the nasion and bilateral zygomatic roots, and the mean increase in intracranial volume from FOA was 93 +/- 21cc. Cranial vault symmetry highlighted areas requiring correction, and these masks were projected onto the surgical scene through a mixed reality platform, enabled by the co-registration to the preoperative CT.

Conclusion

Pairing widely available camera technology with this fast and robust algorithmic pipeline can deliver timely, objective intraoperative feedback to guide the definitive correction of cranial vault deformity without ionizing radiation.

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Quantification of Similarity Between Planned Facial Feminization Surgery and Assigned Female at Birth Subjects

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Albert Rancu



Paula Flores-Perez



Samira Glaeser-Khan



Omar Allam



Martin Kauke-Navarro



Michael Alperovich

Abstract

Background

Three-dimensional virtual surgical planning (VSP) has become increasingly utilized for facial feminization surgery (FFS) to create personalized and accurate postoperative results. However, few studies have evaluated the similarity between these plans and assigned-female-at-birth (AFAB) skulls.

Methods

Patients who underwent FFS procedures including frontal sinus setback, suprabrow contouring, genioplasty, and gonial angle reduction at a single academic institution were identified. Materialise (Leuven, Belgium) 3D virtual surgical plans were designed prior to the operation, and computed tomography (CT) scans for AFAB subjects were provided upon request by the New Mexico Decedent Imaging Database (NMDID). Craniofacial landmarks to isolate the forehead, chin, and gonial angle regions were placed using Mimics (Materialise, Leuven, Belgium). Measurements of planned osseous changes were compared to benchmark values derived from the group of five AFAB subjects to determine the degree of similarity between the surgical plan and anthropomorphically feminine features. Surface area and volume AFAB similarity for each region were compared using an ANOVA analysis. Statistically significant differences between groups were subsequently determined using pairwise t-tests with a Bonferroni correction.

Results

A total of 80 patients and 188 FFS procedures (69 forehead operations, 74 genioplasties, 45 bilateral gonial angle reductions) were included in this study. Regarding surface area changes, both forehead (86.5% ± 11.0%, $p<0.05$) and genioplasty procedures (88.4% ± 10.9%, $p<0.005$) were found to have a greater AFAB similarity score than gonial angle reduction (81.0% ± 11.7%). Conversely, planned genioplasty volume (85.5% ± 11.5%) had a significantly greater similarity to anthropomorphically feminine measurements than forehead procedures (74.7% ± 20.7%, $p<0.0005$) or gonial angle reduction (70.3% ± 16.7%, $p<0.0001$).

Conclusions

Virtual surgical plans are an increasingly utilized tool during facial gender-affirming surgery to provide patients with more feminine characteristics. This study presents, to our knowledge, the largest and most comprehensive analysis of how well these plans approximate AFAB craniofacial features. By introducing this framework for analysis, this study provides insight into improving FFS preoperative planning and patient counseling.

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Virtual Surgical Planning for Facial Feminization Surgery: A Comparison of Three-Dimensional Plans and Actual Results

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Abstract

Background

Facial feminization surgery is an expanding area of craniofacial surgery that is a mainstay of gender-affirming care and includes procedures such as frontal sinus setback, genioplasty, and gonial angle reduction. Functionally, these procedures alter phenotypically masculine traits thereby increasing concordance between physical appearance and self- identified gender in transgender women. Due to the complex interplay of soft tissue and bony alterations, virtual surgical planning (VSP) has become standard practice for these surgeries. Despite their increasing use, the conformity of post- operative results to the plan has not been explored extensively in the literature in the context of FFS.

Methods

Virtual surgical plans for FFS procedures (frontal sinus setback, suprabrow contouring, genioplasty, and gonial angle reduction) were analyzed using craniofacial landmarks and compared to postoperative computed tomography (CT) imaging to identify common regions of interest including the forehead, chin, and gonial angle. Conformity of volume, surface area, and other region-specific measurements to the plan was assessed using ANOVA and post-hoc pairwise t- test analysis.

Results

A total of 80 patients underwent preoperative VSP and postoperative CT imaging. Conformity of volume to the plan was greatest for the forehead (92.9%) compared to the chin (81.8%, $p<0.0001$) and the gonial angle (57.3%, $p<0.0001$). The same trend was observed for regional surface area where forehead procedures had significantly greater fidelity to the plan (95.8%) than genioplasty (89.6%, $p<0.0001$) and gonial angle reduction (73.0%, $p<0.0001$).

Conclusion

The current study, to our knowledge, represents the most extensive analysis of VSP accuracy in live FFS patients to date. Forehead procedures had greater conformity to the plan than genioplasty and gonial angle reduction. Deviations from the VSP offer insights into intra-operative surgeon judgement and opportunities to improve preoperative FFS planning.

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Automatic identification of hard and soft tissue landmarks in cone-beam computed tomography via deep learning with diversity datasets: a methodological study and its clinical validity

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Li Huang


Lisong Lin

Abstract

Background

Cephalometric analysis in three dimensional computed tomography (3D-CT) relies on medical expertise and is time-consuming. This study aimed to approach a novel artificial intelligence (AI) method for precise soft and hard tissue CBCT landmark identification across malocclusion types.

Methods

A total of 498 CBCT images were collected. Following the calibration procedure, two experienced clinicians identified 45 landmarks on the CBCT images using Checkpoint software (ITK, Davis, Calif, USA) with multiple reconstruction planes to create the ground truth (GT). Our model employed U-Net as its feature extraction framework and integrated a custom-designed Efficient Global Attention (EGA) module to predict landmark positions. To evaluate algorithm accuracy, we computed both the mean radial error (MRE) and successful detection rate (SDR) between reference and predicted landmarks. Furthermore, we compared 71 cephalometric measurements derived from manual and AI-based landmark identification across 75 randomly selected samples using paired t-tests and intraclass correlation coefficients (ICC).

Results

Each landmark prediction took approximately 4.2 s on a conventional graphics processing unit. The overall MRE for the 45 landmarks was 1.79 ± 1.14 mm, and the SDR was 59.11%, 90.26%, and 97.25% within 2-, 3-, and 4-mm error ranges of manual marking, respectively. Box plot analysis of measurement discrepancies between AI and GT revealed minimal outliers in 13 parameters, which were excluded from further analysis. Paired t-test analysis revealed statistically significant differences in 10 out of 71 parameters (14.08%), including: Co-Go(R)-MSP, Go-Me(L), Go-Me(L)-MSP, Me- MSP, CoR-MSP, GoL-MSP, U1-SN, U1-SN-MSP, U1-NA-MSP, and Pogs to Ns vert, the mean absolute differences were all below 2 mm/2°, except for U1-SN which was 2.13 ±1.71°. ICC analysis demonstrated excellent agreement between AI and GT measurements, with only 3 out of 71 parameters (4.23%) exhibiting ICC values below 0.90 (PP-HF-MSP, Me-MSP, and 6OP-HF). The remaining 68 parameters (95.77%) showed ICC values exceeding 0.90.

Conclusions

Our algorithm shows clinical validity, accuracy, and robustness for automatic CBCT landmark detection across malformations. AI with selective manual verification (e.g., Go/U1i in mixed dentition) ensures precise 3D cephalometric measurements. This approach demonstrates promise for convenient 3D-CT landmark identification and large-scale research analysis.

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IDENTIFICATION OF GENETIC VARIANTS IN MICROTIA USING NEXT GENERATION SEQUENCING (NGS)

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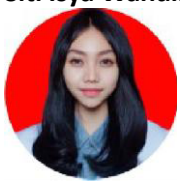
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Abstract

Background

Genetic research on microtia remains limited to select populations or specific familial clusters, with no comprehensive exploration of its full genetic spectrum. To date, no definitive causative gene has been identified for both familial and sporadic microtia, and there is no established genetic database for microtia in Indonesia. This study seeks to address these gaps by employing Whole Exome Sequencing (WES), a next-generation sequencing (NGS) technology capable of massively parallel DNA sequencing, providing broader and deeper genetic insights than traditional Sanger sequencing. This approach holds promise for the identification of genetic biomarkers that could inform precision diagnostics and therapeutics.

Objective

To determine the frequency and genotype-phenotype correlations among syndromic, non-syndromic, familial, and sporadic microtia cases in Indonesia using NGS technology, ultimately establishing a national reference database.

Methods

46 patients diagnosed with microtia recruited from Universitas Airlangga Hospital and Dr. Sardjito General Hospital (2018–2023). Genomic DNA was isolated, and WES was performed and bioinformatic analysis was conducted to identify causative genes and variants.

Results

Six novel variants were discovered in previously implicated genes: FOXI3 (2 familial syndromic cases), SF3B4(1 sporadic syndromic), CYP26A1 (2 variants in 2 sporadic syndromic cases), and SIX1 (1 familial syndromic). Additionally, three potentially novel genes were identified: TFCP2L1 (1 familial syndromic), IPKK (1 sporadic syndromic), and RABEP1 (1 sporadic non-syndromic). A possible compound heterozygous variant was found in SIRT5 (1 sporadic syndromic case).

Conclusion

Novel variants were identified in 92% of syndromic microtia cases, and novel genes in 90%. In non- syndromic

cases, 8% harbored novel variants and 10% novel genes. Among familial cases, 25% showed novel variants and 30% novel genes; sporadic cases showed 75% and 70% respectively. These findings demonstrate significant genotype-phenotype correlations in syndromic, non-syndromic, except familial, sporadic microtia cases.

Keywords
Microtia genetics, Whole Exome Sequencing, Phenotype, Congenital anomaly

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Incidence of Ocular Abnormalities in Metopic Craniosynostosis: Cranial Vault Reconstruction versus Endoscopic Suturectomy

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John Ha



Krystal Tomei



Faruk Orge



Howard Wang

Abstract

Background

Metopic craniosynostosis can be treated with open cranial vault reconstruction (CVR) or endoscopic suturectomy (ESC). The aim of this study is to compare the ocular outcomes between CVR and ESC subjects.

Methods

A retrospective cohort study was conducted using the TriNetX Research Network. Subjects with non-syndromic metopic craniosynostosis undergoing CVR or ESC were identified using ICD-10 and CPT codes. Ocular disorders, including strabismus, amblyopia, and ametropia, were analyzed along with reoperations and complications. Relative risk (RR) and 95% confidence intervals (CI) were calculated.

Results

MCS is associated with a high incidence of ocular abnormalities with 41.65% being diagnosed with one or more motility or refractive errors. Out of the 533 subjects included in the study (CVR: 393; ESC: 140), ocular abnormalities were significantly higher in the CVR group compared to ESC (46.6% vs. 28.6%; RR = 1.63; 95%CI: 1.23, 2.16).

Strabismus (17.6% vs. 7.9%; RR = 2.12; 95%CI: 1.15, 3.89), ametropia (31.8% vs. 7.9%; RR = 3.12; 95%CI: 1.86, 5.24), and astigmatism (18.1% vs. 2.14%; RR=8.43; 95%CI: 2.70, 26.34) were all significantly more common in CVR subjects.

Conclusions

CVR for metopic craniosynostosis is associated with a higher risk of ocular disorders, particularly strabismus and ametropia, compared to ESC. These findings highlight the need for routine ophthalmologic evaluation and represent another consideration in selecting treatment options.

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3D printed titanium porous implants for the reconstruction of zygomaticomaxillary complex: a study to evaluate efficacy and safety

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Nenghao Jin



Huawei Liu

Abstract

Background

Maxillary and zygomatic bone defects caused by oral and maxillofacial malignant tumors or trauma can not only lead to maxillofacial collapse and eyeball depression diplopia, but also seriously affect the face and function. The anatomy of this region is complex. There is a high incidence of complications related to zygomaticomaxillary complex defect with simple titanium mesh. Therefore, it is a great challenge for maxillofacial surgeons to repair the defects in this region.

Methods

This study aims to evaluate the strength performance of three-dimensional mesh titanium alloy scaffolds with different pore diameters (no pore, 0.5 mm pore, 3 mm pore, 5 mm pore). Further analysis will be conducted on the biomechanical strength of titanium alloy scaffolds filled with autologous bone chips, artificial bone powder, and other materials for the functional reconstruction of the zygomatic maxillary complex. The study involves the use of 3D-printed titanium alloy scaffolds combined with anterolateral thigh flaps to reconstruct zygomaticomaxillary complex defects, with assessments of implantation accuracy, local finite element analysis, and scaffold safety.

Results

The 3 mm pores titanium alloy scaffold filled with autologous bone chips demonstrated superior mechanical strength compared to scaffolds with other pore diameters. A total of six clinical cases were successfully completed, all of which underwent reconstruction using the 3D mesh titanium alloy scaffold filled with autologous bone chips in combination with an anterolateral thigh (ALT) flap. Postoperatively, none of the titanium scaffolds exhibited rejection or infection, and all ALT flaps survived successfully. The average implantation accuracy error was 1.04 ± 0.23 mm. Finite element analysis (FEA) revealed that the overall mechanical load on the prosthesis was -800 N, while inverse analysis indicated a surface soft tissue load of -2 N. All patients expressed satisfaction with their facial contour, with an average satisfaction score of 9 on the Visual Analog Scale (VAS).

Conclusion

The three-dimensional mesh titanium alloy scaffold with a 3 mm pore diameter filled with autologous bone chips holds significant clinical value for reconstructing zygomaticomaxillary complex defects. Through optimized design, it reduces the risk of titanium mesh exposure and improves facial contour satisfaction.

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Hemi One-piece distraction osteogenesis for unilateral coronal craniosynostosis

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Ho Hyung Lee



Jong-Woo Choi

Abstract

Background
Unilateral coronal craniosynostosis, a common form of anterior plagiocephaly, traditionally requires invasive procedures involving osteotomies on both sides of the skull. To minimize invasiveness and preserve normal sutures, we introduced a novel technique—hemi one-piece distraction osteogenesis (DO)—which targets only the affected side.

Methods
This retrospective study included patients treated between March 2005 and March 2023. Twenty-one patients underwent conventional one-piece DO, and five underwent the hemi one-piece DO. The hemi technique preserves the intact contralateral sutures, avoiding transverse osteotomies and dural detachment. A latency period of seven days preceded distraction at 1 mm/day, followed by 8–12 weeks of consolidation. Perioperative metrics and cranial indices were analyzed using non-parametric statistical methods.

Results
Both groups achieved satisfactory correction of cranial asymmetry. The hemi one-piece group showed significantly shorter total operation time (168 vs. 338 mins), reduced plastic surgery time (20 vs. 69 mins), and lower transfusion volumes (0 vs. 80 mL, $p = 0.1$). Improvements were observed in cephalic index (pre-op 103.8 to 86.6) and endocranial axis (162.9° to 173.0°). No cases required full-thickness osteotomy, and no major complications were reported. Notably, hemi DO facilitated natural forehead contouring with minimal invasiveness.

Conclusion
Hemi one-piece distraction osteogenesis offers a less invasive yet effective alternative for unilateral coronal synostosis. By avoiding manipulation of the unaffected suture and minimizing dural disruption, this technique achieves excellent morphological and functional outcomes while reducing operative burden. Though preliminary findings are promising, further long-term studies are needed to validate its efficacy and durability.

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Free Superficial Circumflex Iliac Artery/Superficial Inferior Epigastric Artery Adipofascial Flaps for Facial Reconstruction of Linear Scleroderma

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Jiangmiao Xie **Wenchao Zhang** **Elan Yang** **Xiao Long** **Ang Zeng**

Abstract

Background

Linear scleroderma is an autoimmune connective disorder characterized by a saber- shaped facial deformity. The superficial circumflex iliac artery/superficial inferior epigastric artery (SCIA/ SIEA) adipofascial flap is versatile for facial reconstruction, providing excellent aesthetic outcomes and minimal donor-site morbidity. Thus, this study aimed to share our experience of successfully treating linear scleroderma using single-stage SCIA/SIEA adipofascial flap microsurgery transplantation.

Methods

To correct asymmetric facial malformations, the SCIA/SIEA adipofascial flap transplantation was performed on five individuals with linear scleroderma. The flap was harvested by two patterns based on SCIA or SIEA patterns and diameters. For most linear defects, an unilobe adipofascial flap could provide enough volume. Vessel with a larger diameter was selected as the target vessel. When they had equal diameters, the SCIA was preferred because it is right below the incision, which made the dissection easily. For multifoci defect, when SCIA and SIEA branched off from the femoral artery, choose the trunk of the dominant vessel and one of its perforators (either SCIA or SIEA) along the way to form a heart-shaped flap. If SCIA and SIEA both appeared large and shared a common trunk, we dissected both pedicles and included their relevant adipofascial tissue. If SIEA was absent or hypoplastic, we preferred the superficial branch of the SCIA and included its cephalic perforators. After microvascular anastomosis at the recipient site, the flap was anchored to the deep fascia peripherally with several 3-0 vicryl sutures. Donor and recipient vessels, postoperative complications, aesthetic outcomes, and patient satisfaction were recorded.

Results

All flaps survived with zero necrosis. Regarding the donor artery, SIEA was performed on 1 patient (1 of 5) and SCIA on 2 patients (2 of 5), and the remaining 2 patients (2 of 5) used the common trunk. Patients maintained a satisfactory facial counter-correction 6 to 10 years postoperatively. The complications included localized desquamate and hypotrichosis.

Conclusions

Free SCIA/SIEA adipofascial flaps improved facial linear scleroderma's long-term functional and morphological outcomes. This SCIA/SIEA adipofascial flap offers low mortality, invisible scars, and stable aesthetic outcomes compared with anterolateral thigh flap, parascapular flaps, and fat transplantation.

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Learning curve for frontofacial Monobloc Advancement in one Japanese craniofacial team

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YOSHIAKI SAKAMOTO



Tomoru Miwa



Kentaro Tomita



Takenobu Ishii

Abstract

Background
Distinct early fronto-orbital advancement and a sequential Le Fort III procedure later in life were previously preferred. However, with the widespread integration of distraction into craniofacial surgery the frontofacial monobloc advancements become more favorable. Even so, it is considered that Monobloc advancement is high difficulty weapon, and the facilities that perform it are all world-famous Craniofacial Units. This time, our unit underwent a generational change as a Craniofacial Unit and performed monobloc advancement. We examined the learning curve and its outcomes.

Methods
From 2014 to 2024, our unit performed 20 Monobloc advancement. Among them, 14 Crouzon syndrome, 5 Pfeiffer syndrome, and one Beare Stevenson syndrome. In these 20 consecutive cases, the operating time, blood loss and complications were investigated.

Results
The average surgery time for all 20 cases was 294±84 minutes. When this was divided into four groups of five cases each, the surgery time decreased with experience, with the order being 420±79, 333±58, 301±32, and 234±13, and there was a tendency for the surgery time to stabilise. The amount of bleeding did not correlate with the operation time, and there was a tendency for it to be higher in cases where there had been a history of previous surgery on the frontal region, such as FOA or suturectomy. The complications were meningitis in one case, bone resorption in one case, recurrent nerve paralysis in one case, and local infection of the extension device in three cases.

Conclusions
In Japan, unlike in Europe and the United States, there are a very large number of facilities that provide treatment for craniosynostosis, and it is not possible to gain sufficient treatment experience at a single facility. It has been found that there is a learning curve for monobloc advancement, and that it stabilises after around 15 cases. In order to achieve safe and stable treatment results, I think that the future challenge in Japan will be to centralise patients at specific facilities.

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a Study of Deprogramming Occlusal Pad for the Effect of Condyle of Patients with Temporomandibular Joint Disc Anterior Displacement Based on MRI

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Xin Nie **Qing Yuan** **Huimin Long**

Abstract

Background
Temporomandibular joint disc anterior displacement(ADD) may affect the growth of condyle, result in abnormal mandibular development, thus cause the mandibular retraction or facial asymmetry et al. A newer type of deprogramming occlusal pad can more objectively obtain the most comfortable and stable personalized position of the condyle, which may be a useful treatment in the early prevention of mandibular dysplasia in ADD patients.

Objective
To preliminarily evaluate the effect of this deprogramming occlusal pad on condylar growth and condylar bone status in ADD patients.

Methods
50 patients(100 joints in total) with bilateral ADD were included and divided into the condylar immature group(group A: age≤22 years old) and the condylar mature group (group B: age>22 years old). MRI was used to evaluate the changes of condylar height, condylar bone status and other parameters before and after treatment.

Results
The M(P25,P75) of the mean condylar height of 100 joints before treatment was 24.41(21.13, 26.28)mm and 24.49(20.88,26.61)mm after treatment, the difference (before treatment-after treatment) was -0.19(-0.67,0.35)mm, there was statistical difference before and after treatment (P<0.05). The average condylar height of group A was 22.65±4.00mm before treatment and 22.92±4.01mm after treatment, the difference(before treatment-after treatment) was -0.27±0.56mm, there was statistical difference before and after treatment (P<0.05), while the average condylar height of group B was 25.21±2.98mm before treatment and 25.17±3.00mm after treatment, the difference(before treatment-after treatment) was 0.04±0.71mm, there was no statistical difference before and after treatment (P>0.05). Meanwhile, there was statistical difference in the mean condylar difference between the two groups (P<0.05). There were 93.00% of the condylar bones remained stable or osteogenic after the treatment with the deprogramming occlusal pad.a total of 23(39.67%) of the condylar bones had osteogenesis in group A and had no osteogenesis in group B (P<0.001).

Conclusion
This kind of deprogramming occlusal pad has a positive effect on the growth and remodeling of the condyle for patients with ADD with immature condyle, and has certain application value in the early intervention of mandibular dysplasia.

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Functional repair of mandibular bone defects using the scaffold-driven double-barrel fibula flap designed based on preoperative biomechanical and digital data

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Abstract

Objective
To design a scaffold-driven double-barrel fibula flap (DBFF) using 3D-printed titanium scaffolds and autologous fibula flaps based on preoperative biomechanical and digital data, thus achieving an immediate dental implantation following functional repairing of large mandibular bone defects under the guidance of intraoperative fluoroscopy.

Methods
Three models of mandibular bone defects at different sites were reconstructed using 3D-printed titanium scaffolds (diameter of struts, 0.5 mm; diameter of porous scaffold, 5.0 mm) and autologous fibula flaps, according to the DBFF protocol. Preoperative biomechanical analysis and digital design of the implant; intraoperative one-stage DBFF and dental implantation under the guidance of digital guide plate; and postoperative assessment of the accuracy of implantation and occlusion at 1 week and 6 months were performed.

Results
The scaffold-driven DBFF using 3D-printed titanium scaffolds and autologous fibula flaps with the strut diameter of 0.5 mm and porous scaffold diameter of 5.0 mm satisfied the biomechanical requirements and promoted the regeneration of mandibular bone. After the healing of autogenous fibula, a minimal stress shielding of the titanium scaffold greatly reduced the risk of long-term complications. An immediate dental implantation did not pose a negative impact on the overall reconstruction of mandibular bones. At postoperative 6 months, the overall displacement of the scaffold was satisfactory within 1 mm. Electroconvulsive therapy (ECT) visualized evident osteogenic repair in the scaffold.

Conclusion
The scaffold-driven DBFF using 3D-printed titanium scaffolds and autologous fibula flaps can effectively repair the mandibular bone defects, with less use of autologous bone mass, high safety and good aesthetics.

Key words
scaffold-driven DBFF, titanium scaffolds, mandibular bone defects, stress distribution

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A 6 Year Multicenter NSQIP Study of Perioperative Complications in Pediatric Patients Undergoing Orthognathic Surgery

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Abstract

Background
Orthognathic surgery is the gold standard to correct dentofacial abnormalities and improve both aesthetic concerns and functional deficits. Le Fort I (LF1) osteotomy and bilateral sagittal split osteotomy (BSSO) are commonly used techniques in orthognathic surgery. In patients with cleft lip and/or palate (CL/P), LF1 osteotomy is particularly useful for correcting midface hypoplasia, while BSSO may be indicated in cases of mandibular discrepancies. Risks and complications of these procedures have been previously described for adult patients but are comparatively lacking in patients under the age of 18.

Materials and Methods
A retrospective cohort study was conducted of orthognathic procedures performed in North America between 2018 and 2023 using the American College of Surgeons National Surgical Quality Improvement Program Pediatric dataset (NSQIP- P). Patients 12-18 years old who underwent LF1, BSSO or both were included. Medical and surgical complications within thirty days of the original procedure were assessed, including readmissions or reoperation.

Results
The study included 1,744 patients, including 967 LF1 only, 293 BSSO only, and 484 bimaxillary [TS1] procedures. Simultaneous genioglossus advancement was performed in 188 (10.8%) patients. The average age was 16.5 years (SD 1.3). There were 625 male patients (35.8%) and 1,119 female patients (64.2%). The average ASA was 1.8. There were 1,102 inpatient surgeries (63.2%) and 642 outpatient surgeries (36.8%). The overall 30-day complication rate was 6.5%, including: readmission 2.2%, superficial incisional surgical site infection (SSI) 1.1%, blood transfusion 1.5%, and reoperation 2.4%. Postoperative length of stay averaged 1.8 days (SD 1.6). The overall 30-day complication rate in patients undergoing single jaw surgery was 6.8%) while the rate in patients undergoing double-jaw surgery was 5.6% (p=0.386).

Conclusions
The perioperative adverse event rate amongst this cohort of patients was 6.5%, with readmission rates being 2.2% and reoperation needed in 2.4% of patients. Single- and double-jaw procedures have similar adverse event rates.

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An Alternative Posterosuperior-Auricular Fascia Flap for Ear Elevation During Microtia Reconstruction

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Ruhong Zhang

Abstract

Background
Advances in staged total auricular reconstruction have resulted in improved anterior auricular appearance; however, satisfactory post-reconstruction aesthetics of the retroauricular fold remain challenging. The postauricular appearance of the reconstructed ear depends largely upon optimizing the covering material. When used as the covering soft tissue for ear elevation, a flap containing primarily the upper portion of the retroauricular fascia has potential advantages over the conventional book cover-type retroauricular fascia flap.

Methods
We developed a geometrically-designed, posterosuperior-auricular fascia flap to replace the conventional retroauricular fascia flap for ear elevation. During the second- stage operation, the posterosuperior-auricular fascia flap is rotated downward and turned over to wrap around the inner strut and entire posterior auricular surface.

Results
Compared to the conventional book cover-type retroauricular fascia flap, the novel posterosuperior-auricular fascia flap was easier to harvest. The modified flap produced a thin and natural contour of the postauricular surface, as well as reduced the incidence of postauricular hypertrophic scarring (from 24.7% to 13.2%, p=0.03) and partial skin graft necrosis (from 43.4% to 31.2%, p=0.01).

Conclusions
The geometrically-designed posterosuperior-auricular fascia flap improves ear elevation. Compared to the conventional book cover-type retroauricular fascia flap, this covering tissue is easier to perform. It was highly vascularized, well-defined and thinner, yields reliable results. Thus, favorable postauricular surface results can be achieved during auricular reconstruction by using the modified fascia flap.

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Age at Craniosynostosis Surgery is Correlated with Increased Speech Language Delays

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Abstract

Background

The relationship between timing of craniosynostosis surgery and neurocognitive outcomes has been previously described. However, there is a paucity of literature evaluating language acquisition and speech development in children who have received surgery for craniosynostosis. The goal of this study was to evaluate the relationship between age at surgery and the prevalence of speech delays among patients with non-syndromic and syndromic craniosynostosis.

Methods

Patients with craniosynostosis presenting to an academic medical center from 2012-2023 were included in this retrospective cohort study. Patients with hearing loss, cleft palate, or other abnormalities known to affect speech were excluded. Language acquisition and developmental speech delay diagnoses were noted, and average age at surgery was compared for non-syndromic craniosynostosis (NSC) patients with and without speech delay. Odds ratio for speech delay due to age at surgery were calculated with univariable regression. Multivariable regression was used to control for suture type and social vulnerability index (SVI).

Results

143 patients with craniosynostosis had complete records for analysis. 20 of 125 NSC patients (16.0%) and 9 of 18 syndromic craniosynostosis patients (50.0%) had a speech delay diagnosis. The average age of surgery for NSC patients with a developmental speech delay was 11.4 months vs 7.0 months for patients without a diagnosis (p= 0.026). NSC patients who underwent surgery after 12 months of age had an increased univariate risk of speech delay (OR = 6.60, p=0.004) and an increased multivariable risk after controlling for suture type (OR = 6.66, p=0.006) compared to patients who underwent surgery before 6 months of age. However, SVI and affected suture (metopic vs. sagittal) were not associated with a significant increase in speech delay odds.

Conclusion

For patients with non-syndromic craniosynostosis, an age of surgery for greater than 12 months increases the rates of speech development and language acquisition delays. These data can assist craniofacial surgeons in counseling patients and assessing optimal surgical timing.

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AIDY (Application of Artificial Intelligence to Dysmorphology): a new smartphone application for automatic detection of genetic syndromes on 2D photographs

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Abstract

Introduction

Thirty to 40% of the 7,000 rare diseases present craniofacial anomalies. Identifying these facial features requires the expert eye of dysmorphologists, and diagnosis in this field is based on experience. Diagnostic wandering, i.e. the time between first consultation and identification of the rare syndrome, is greater than 5 years in nearly 25% of cases in occidental countries. This wandering is even more important in low-income countries, where children often have no access to the healthcare system, and even less to clinicians or geneticists specialized in dysmorphology. We set out to develop and evaluate the performance of a new mobile application based on an AI algorithm on 2D photographs in a very large database, with a wide range of genetically proven syndromes, of different ages, genders and ethnicities.

Methods

We included images from the photographic database of our Maxillofacial and Plastic Surgery Department and Medical Genetics Department. This database contains 1,042,468 photographs of 22,000 patients followed in the department since 1981. Data were split into 80% training, 10% validation, and 10% testing. The ArcFace R-100 model, pre-trained on Glint360K, was further trained on our data, including over 500 rare genetic syndromes and non-syndromic control patients. Performance was assessed using AUC, top-1, and top-3 accuracies for overall classification. We also created a typical synthetic face, by genetic syndrome, using a Probabilistic Diffusion Model.

Results

Our model correctly classified 71.3% (61.8 - 79.6) of patients (top-1 accuracy). Top-3 accuracy was 93.5%. We have generated and validated a synthetic face by syndrome, with controlled ethnic diversity, with the aim of increasing our database, and improving the training of health professionals in dysmorphology.

Conclusion

We were able to build a robust AI tool, enabling automated analysis of facial phenotype on 2D photographs of children with various genetic syndromes, using a functional smartphone application.

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15 Year Results of Fronto-Orbital Advancement and Remodeling using Distraction Osteogenesis

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Abstract

Conventional frontoorbital advancement and calvarial remodeling procedures are the mainstream treatment technique for the syndromic and non-syndromic craniosynostosis. However, syndromic patients requiring an advancement of more than 10 mm. in craniofacial skeleton, distraction osteogenesis achieves more stable and predictable results. In the initial reports describing the fronto-orbital distraction technique, bone segments were advanced preserving their attachments with the dura. This approach does not allow for the remodeling of the frontal segment. However, in the technique described herein, the fronto- orbital segment is separated from dura, remodeled, and advanced as a bone graft using distractors.

The present study aimed to present the long-term and quantitative results (bone resorption amount, bone defect area) of this technique.

Between 2009 and 2025, a total of 54 craniosynostosis patients requiring fronto-orbital advancement of more than 10 mm. underwent fronto-orbital advancement and remodeling using distraction osteogenesis. Twenty-seven of 54 patients who met all inclusion criteria of this study were retrospectively reviewed. The mean age at the time of surgery was 19.03±9.19 months; the mean follow-up was 86.04 ± 34.98 months. The mean distraction amount was over 19 mm. No significant difference was found between frontal and occipital bone density measurements at the cortex and medulla. The mean total defect area was 4.79 ±4.43cm^2 and the mean number of bone defects was 4.8 ± 2.2. The cephalic index decreased from 98.56 ± 6.39 to 87.63 ± 4.54, and 59.3% of the patients reached the normal range in the late postoperative period.

Waiting period prior to initiating distraction allows sufficient adhesion between the dura and the frontal bone segment and absence of the extradural dead space lowers the rate of intracranial osteogenesis appears to be safe and effective. Distraction of the frontal bone as a graft does not lead to bone resorption, and new bone formation and improvements in head shape can be achieved.

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IGFBP2/AMPK signaling mediates osteogenic differentiation of cranial suture mesenchymal stem cells

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Abstract

Background
Cranial suture mesenchymal stem cells (SuSCs) play a critical role in maintaining the function of cranial suture. Premature fusion of cranial sutures leads to craniosynostosis. The aim of the current study was to investigate the role of IGFBP2 in osteogenic differentiation of SuSCs.

Methods
Human cranial suture mesenchymal cells were isolated and identified firstly. Then, whole exome sequencing was performed on the fused and contralateral SuSCs, and IGFBP2 gene was screened as a key factor by quantitative PCR. The effect of IGFBP2 receptor binding domain peptide or transfection of lentivirus-shIGFBP2 on osteogenic differentiation ability and downstream key molecules of SuSCs were observed.

Results
IGFBP2 was highly expressed in normal SuSCs by sequencing analysis and qPCR. Furthermore, IGFBP2 receptor binding domain peptides could up-regulate the phosphorylation of AMPK and FOXO1 in normal cells, increase the expression of osteogenic differentiation related genes, and enhance the osteogenic differentiation. However, after transfection of lentivirus-shIGFBP2 in the fused suture derived SuSCs, IGFBP2 gene and protein levels significantly reduced, the phosphorylation of AMPK and FOXO1 were inhibited, and the ability of osteogenic differentiation was remarkably weakened.

Conclusions
Our studies reveal that IGFBP2 activating AMPK signaling pathway may be an important mechanism to regulate the osteogenic differentiation of SuSCs. Clarifying the key role of IGFBP2 in these cells may provide a new strategy for the treatment of craniosynostosis.

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40 Years' Circumnavigation of Craniofacial NF Tumors

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Abstract

NF1 plexiform tumors, benign and malignant, continue to pose multiple and vexing problems of the craniofacial region, including destruction of bone, skin, motor nerves, vision, airway and death. The major challenges are: determination of precise sensory nerve tumor origin; preservation of normal structures; radical resection in one or few procedures; reconstruction of destroyed anatomy; and special considerations for suspected or proven malignant peripheral nerve sheath tumors (MPNST).

This presentation will encompass examples of all nerves from the brain and cervical spine—a circumnavigation— responsible for NF1 tumors of the craniofacial region. A close interaction with neuroradiologists is key to establishing a precise roadmap of tumor location and number of involved nerves, and possible need for studies beyond MRI with contrast media. The craniofacial surgeon is most often left with the responsibility of "ship captain" in determining the need for other specialists including neurosurgeon, ophthalmologist and ENT surgeon.

The appropriate timing of surgery for craniofacial NF has historically been controversial due to a high tumor recurrence rate, the inadvertent destruction of normal structures, the possible negative influence on growth, and the hope by pediatric oncologists of successful medical treatments. A coherent surgical strategy is presented which addresses these issues and will hopefully confirm the legitimacy of early, radical surgery when feasible.

The dreaded onset of MPNST is discussed from its diagnosis, surgical strategy, avoidance of complications, and possible avenues of future treatment besides surgery. Successful and unsuccessful cases are presented. The inherent need
of lifelong surveillance for most NF patients with plexiform tumors is encouraged.

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Skeletal Stability of Occlusal Plane Rotational Orthognathic Surgery: A cephalometric analysis

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Jong Woo CHOI

Abstract

Background
This study describes the long-term skeletal outcomes of occlusal plane rotational orthognathic surgery, shifting from traditional maxillomandibular complex (MMC) advancement or setback by tailoring the direction and magnitude of rotation based on clinical and occlusal characteristics.
Methods
Patients undergoing MMC rotation via Le Fort I osteotomy and bilateral sagittal split ramus osteotomy were divided into four groups reflecting distinct occlusal and clinical characteristics: Group A (Class III malocclusion, posterior impaction with clockwise rotation), Group B (cleft-related Class III malocclusion, anterior lengthening with clockwise rotation), Group C (Class II malocclusion with sleep apnea, posterior lengthening with counterclockwise rotation), and Group D (Class II malocclusion with vertical maxillary excess, anterior impaction with counterclockwise rotation).
Cephalometric landmarks were analyzed preoperatively (T0), immediately postoperatively (T1), and 3 years postoperatively (T2). Postsurgical relapse was categorized as clinically insignificant (<2 mm/<2°), potentially significant (2-4 mm/2-4°), and highly significant (>4 mm/>4°).
Results
The study included 76 patients (A: 29; B: 22; C: 15; D: 10), with a mean evaluation period of 5.03 days at T1 and 36.5 months at T2. Group B exhibited significant horizontal and vertical relapse at the cephalometric A-point, with 54.5% showing potentially significant horizontal relapse and 45.5% showing vertical relapse. At the cephalometric B-point, 3.4% of Group A, 31.8% of Group B, and 13.3% of Group C demonstrated potentially significant vertical changes.
Conclusion
Occlusal plane rotational orthognathic surgery provides reliable skeletal stability when tailored to distinct clinical contexts, offering a versatile approach for aesthetic and functional correction.

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Characterizing Midline Cleft Lip: Comorbidities and Surgical Techniques

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Abstract
Midline cleft lip (MCL) is an exceptionally rare congenital anomaly, representing less than 1% of cleft lip and palate cases and arising from incomplete fusion of the medial nasal prominences. This retrospective study reviewed 20 patients treated for MCL at a tertiary children's hospital between 2005 and 2023 to better understand associated anomalies and surgical outcomes. Of the cohort, 70% were female, 20% were born prematurely, and 20% had a diagnosed craniofacial syndrome. While 40% presented with isolated cleft lip, 60% had cleft lip and palate. Central nervous system anomalies were common, including corpus callosum agenesis (50%), holoprosencephaly (30%), and encephalocele (15%). The median age at repair was 6.4 months, with an average follow-up of 10.4 years. Surgical repair involved wedge excision of midline tissue with straight-line closure ± triangular flaps, release of aberrant orbicularis oris muscle insertions from the maxilla, and gingivobuccal sulcus release with supraperiosteal dissection for soft tissue mobilization. There were no intraoperative complications; however, two patients developed postoperative infections and 25% required revision surgery. These findings underscore the strong association between MCL and CNS anomalies, highlight the overall safety of current surgical approaches, and emphasize the importance of long-term follow-up and further refinement of techniques to reduce the need for revision procedures. Future research should aim to establish standardized protocols for this unique patient population.

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The Role of Genetics on Neurocognitive Outcomes in Nonsyndromic Metopic Craniosynostosis

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Abstract

Background

Despite optimal surgical management in nonsyndromic craniosynostosis, behavioral and neurocognitive deficits persist in many treated children. The effect of timing and type of surgical intervention on neurocognitive outcomes have been extensively studied. Previous work has additionally identified an association between genetics and neurodevelopmental and behavioral delays in children with surgically treated nonsyndromic craniosynostosis. This study evaluated associations between genetic variants and neurocognitive and behavioral outcomes in children with surgically corrected nonsyndromic metopic craniosynostosis.

Methods

Children aged 6 to 18 years with surgically corrected nonsyndromic metopic synostosis were recruited from three academic institutions. Administered neurocognitive assessments included the KTEA-3, WASI-II, and BEERY. Parents completed four behavioral surveys: Conners-3, BRIEF-2, SRS-2, and CBCL. Exome sequencing was performed on each child and their parents' DNA samples. Genetic findings were grouped based on presence of high vs. non-high pLI genes (Group 1), missense or damaging de novo mutations (Group 2), and damaging de novo mutations alone (Group 3). Neurocognitive outcomes were analyzed using t-tests and ANCOVA, controlling for sociodemographic risk and age at surgery. Behavioral outcomes were assessed using chi-square and logistic regression models.

Results

Thirty-eight children were included of whom 36 completed neurocognitive testing and 35 completed all behavioral assessments. Group 2 patients (those with missense or damaging de novo mutations) had significantly lower scores on the KTEA writing subtest ($p=0.03$) and BEERY motor coordination section ($p=0.04$) after controlling for covariates. No other significant associations were observed across groups for either neurocognitive or behavioral outcomes.

Conclusion

Damaging de novo mutations may be associated with lower performance in select motor and academic domains among children with surgically corrected metopic craniosynostosis. These preliminary findings support ongoing investigation into the genetic underpinnings of neurodevelopment in this population.

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Implementation of treatment strategy for diverse presentation of craniofacial clefts: a study from Safdarjung hospital India

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Abstract

Introduction
Complex Craniofacial cleft with big defect in craniofacial region and projecting dura as well as herniation of brain are primarily treated by neurosurgeon and plastic surgeon. The Neurosurgeon manage the herniated cranial compartment and facial deformity corrected by plastic surgeon. If it's not a collective effort most of the time residual projection and or big defect in craniofacial region and or wide apart orbits, maxillae, nasoethmoidal sinuses etc. remain untouched.

Methods and Procedures
From 2007 to 2025 total 1800 (M:F 35.7:64.3)cases of true craniofacial anomalies where registered. this doesn't include the cleft of the lip, palate, microtia and minor soft tissue deformity like preauricular tag, congenital sinuses etc. Planning for correction of the facial appearance requires many difficult complex procedures in reference of previous surgical interventions. after intervention of variety of craniofacial anomalies, we could lay down the treatment strategy of the craniofacial clefts like transcranial approach is mandatory in majority and severely deformed cases. extracranial approach is suitable only in cases where no cranial communication, and deformity confined to only soft tissue.

Conclusion
The treatment plan for soft tissue defect was outlined in form of surgical, fat grafting, and flaps. Redo hypertelorism or revision surgical procedures for eg. Residual nasal deformity, residual hypertelorism was modified to use bone graft, nasal bridge reduction by bone shaving and reshaping by bone substitute and dermal matrix. Multiple stages for correction of supraorbital rim hypoplasia, malar depression, occlusal can't, eye brow defects, nasal alar defect and forehead deformity were outlined and procedure divided according to similar defects. Use of metal compound for fixation of bone also given attention, to reduce implant related complications. Not to create problem in future.

Discussion
The surgical hindrance, pitfall and selection of best methods for common defects of craniofacial clefts are outlined and followed in majority of clefts. The surgical planning and method used for particular defect was Individualized .In patients presented late the nasal deformity corrected by bone shaving and bridge reduction. In bifid nose the rib cartilage graft was preferred & in atresia of nasal canal drilling of bone and lined by skin graft.

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Application of Implant Robots in Functional Reconstruction After Mandibular Defects: A 5-Year Randomized Controlled Trial

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Abstract

Objective
To evaluate the long-term impact of robotic-assisted implant surgery on peri- implant tissue health in patients undergoing functional reconstruction after mandibular defects.

Methods
This 5-year randomized controlled trial enrolled 60 patients with segmental mandibular defects requiring implant-supported prosthetic rehabilitation. Participants were randomly assigned to a robotic-assisted implant placement group (n=30) or a conventional freehand surgery group (n=30). The primary outcomes included peri-implant soft tissue health indicators such as probing depth (PD), peri-implant pocket depth (PPD), bleeding on probing (BOP), and plaque index (PI). Assessments were conducted at 6 months, 12 months, and annually up to 5 years. Secondary outcomes included surgical accuracy, incidence of peri-implantitis, and implant survival rate.

Results
At the 5-year follow-up, the robotic-assisted group demonstrated significantly better peri-implant health. Mean PD and PPD were lower in the robotic group (PD: 2.4±0.4 mm vs. 3.1±0.6 mm; $p<0.01$), with fewer sites showing BOP (13.8% vs. 26.4%; $p<0.05$). The mean PI score was also reduced (19.6% vs. 30.2%; $p<0.05$). The incidence of peri-implantitis was lower in the robotic group (6.7% vs. 13.3%), though not statistically significant ($p=0.12$). The robotic group showed improved surgical accuracy (mean deviation: 0.8±0.3 mm vs. 1.5±0.4mm; $p<0.01$), which may have contributed to better peri-implant outcomes.

Conclusion
Robotic-assisted implant placement enhances peri-implant soft tissue health and surgical precision in mandibular defect reconstruction compared to conventional techniques. These findings support the adoption of robotic technology in complex implant cases to improve long-term outcomes and reduce peri-implant complications.

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Unoperated children with trigonocephaly: The Liverpool Experience

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Abstract

Introduction

Trigonocephaly is the second commonest form of craniosynostosis caused by premature closure of the metopic suture. Fronto-orbital advancement and remodelling (FOAR) is the commonest surgical procedure that is offered to these patients worldwide which is aimed at reducing the risk of raised intracranial pressure and improving aesthetics. In recent years, there is increasing consensus in the craniofacial community that FOAR is primarily an aesthetic procedure as this group of patients are not at significant risk of raised ICP and the deformity may improve over time.

Methods

Service evaluation including a retrospective observational study based on a prospectively collected database of patients diagnosed with trigonocephaly from 2006 - 2023 that were initially treated with a conservative approach at Alder Hey Children's Hospital, Liverpool, UK.

Results

168 patients were included in the study. 116 males and 52 females. Grading of severity was subjective with 18 having moderate phenotype and none categorised as severe. 98% of our patients were managed conservatively in view of their mild phenotypic features. The rest were due to parental choice (N=4) and for medical reasons (N=1). 2 patients (1.2%) had papilloedema on initial ophthalmological examination. However, further invasive ICP monitoring revealed no raised ICP supporting conservative management in patient 1 and patient 2 underwent VP shunting for treatment of hydrocephalus. The prevalence of raised ICP in our unoperated trigonocephaly cohort therefore is zero.

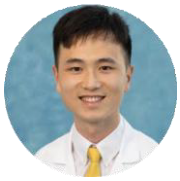
Conclusion

None of our patients managed conservatively required conversion to surgery supporting the already existing literature that suggests trigonocephaly has low risk of raised ICP. The project has been valuable providing an insight of local practice and highlighting the need for alignment in some aspects of care aiming to standardize outcomes.

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Neurodevelopmental Outcomes Among Children with Non-syndromic Craniosynostosis: A Propensity Score-Matched Analysis

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Abstract

Background

Previous studies have shown that non-syndromic craniosynostosis (NSCS) is associated with higher rates of cognitive, developmental, and motor delays. The purpose of this study is to compare the rates of delays among different types of NSCS.

Methods

A retrospective cohort study was performed using TriNetX, a multi-institutional database. Patients with sagittal (SCS), metopic (MCS), and coronal (CCS) craniosynostosis were propensity-score matched 1:1 with aged-matched and unaffected controls. Lambdoid craniosynostosis was excluded due to limited number of subjects within the database.

Outcomes analyzed included psychiatric disorders, intellectual disability, speech and language disorders, neurodevelopmental disorders (including autism spectrum disorder and attention-deficit/hyperactivity disorder), motor disorders, and intracranial pressure (ICP) abnormalities.

Results

A total of 2,611 children with SCS (mean age 9.88 ± 6.14 years), 1,408 with MCS (8.97 ± 5.18 years), and 2,478 with CCS (8.01 ± 4.12 years) were included. All three groups had higher rates of intellectual disabilities (SCS: RR=3.65, 2.14 – 6.22; MCS: RR=6.2, 3.19 – 12.04; CCS: RR=7.1, 3.67 – 13.73) and motor delays (SCS: RR=1.47, 1.26 – 1.71; MCS: RR=2.12, 1.74 – 2.57; CCS: RR=2.13, 1.85 – 2.46) compared to controls. Among the three subtypes, the MCS group had the most severe outcomes in terms of neurodevelopmental disorders (RR=1.36, 1.16-1.61), speech and language disorders (RR=1.49, 1.29 – 1.72), and psychiatric disorders (RR=1.25, 1.14 – 1.31).

The rate of ICP abnormalities was the highest in patients with SCS (RR=12.5, 6.58 - 23.85) compared to MCS (RR=4.90, 2.49 – 9.63) and CCS (RR=1.90, 0.89 – 4.08) groups. In contrast, the SCS group had the lowest rates of intellectual disability, motor delays, psychiatric disorders, speech and language delays and neurodevelopmental disorders. The rates of psychiatric disorders (RR=0.91, 0.83 – 0.98), speech and language delays (RR=0.97, 0.86 – 1.10), neurodevelopmental disorders (RR=0.90, 0.79 – 1.03) in patients with SCS was actually lower than unaffected controls.

Conclusion

Our results demonstrate that there are high rates of intellectual disabilities and motor disorders in children with NSCS. MCS is associated with the most severe phenotype compared to SCS and CCS. Despite SCS having the highest rates of elevated ICP, it is generally associated with a lower rate of developmental delays and behavioral/psychiatric disorders.

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The Effect of Early Hormone Therapy on Frontal Sinus Anatomy in Patients Presenting for Feminizing Facial Contouring Surgery

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Alexander Andrew Argame



Iris Deng



James Lee

Abstract

Purpose

While the effects of estrogen hormone therapy (HT) on the body are well- described, the impact of early HT on frontal sinus anatomy is pertinent for frontal setback procedures but unknown in the literature. This study is the first of its kind to quantify the differences in frontal sinus anatomy associated with early hormone therapy.

Methods

A retrospective review of 104 patients presenting for facial feminization from 2018 to 2024 in a multi-institutional healthcare system was performed. Patient history, including age at HT initiation, duration, surgical history, and demographics, was collected. Patients were categorized into early (HT started before age 21) and late (HT started at or after age 21) groups, with patients matched by HT duration. Preoperative CT scans were analyzed for nasofrontal angle, nasofrontal suture to mid-sellar distance, anterior table thickness, sinus depth, projection, height, and width. Statistical analysis included multivariable regression, chi-square tests, t-tests, and Mann-Whitney U tests.

Results

A total of 104 patients were included (52 per group). Mean age at CT was 24.6 ± 8.1 years in the early group and 41.1 ± 13.2 in the late group. Median HT duration was 2.6 vs. 3.0 years. Late HT patients had significantly greater left anterior table thickness (3.1 ± 1.1 mm early vs. 3.8 ± 1.6 mm late, $p=0.02$), left sinus projection (17.6 ± 3.8 mm vs. 21.6 ± 6.7 mm, $p<0.001$), right sinus depth (14.6 ± 4.5 mm vs. 12.2 ± 3.2 mm, $p=0.004$), and right sinus projection (17.7 ± 4.3 mm vs. 19.9 ± 4.9 mm, $p=0.01$). No significant differences were found in nasofrontal angle, mid-sellar distance, left sinus depth, right anterior table thickness, sinus height, or width. Frontal sinus aplasia was observed in 10 (19.2%) early HT patients and 4 (7.7%) late HT patients ($p=0.09$). Age at CT was not an independent predictor of sinus depth or projection.

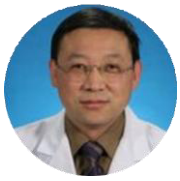
Conclusion

Early hormone treatment was significantly associated with decreased frontal sinus measurements in multiple dimensions. This may decrease the degree of frontal sinus manipulation indicated to achieve feminine contours and these data support early HT initiation to minimize development of masculine frontal sinus characteristics.

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Optic nerve canal decompression for optic nerve lesion following craniofacial injury: the significant of optic nerve sheath divided

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Abstract

Object
Until now the pathophysiology of traumatic optic nerve lesion is not clear, its treatment remains controversy. The surgery, conservative and just observe all be recommended for traumatic optic nerve lesion, even some authors think that result is same with treatment as no treatment. The dilemma maybe results from no effect of method used or the methods used is not suitable. If latter is true, the surgical technique should be innovated. When the optic nerve is injuried by external force, theoretically it would undergo degeneration and edema, meantime pressure within optic nerve canal became high. From decompression of craniectomy, we learn that the dural should be divided so as to compensate the high intracranial pressure and its influence. Based on this concept, decompression of the optic nerve canal should include the resecting the wall of canal and dividing the sheath.

Methods
719 cases with traumatic optic nerve injury were treated in our department from 2005 years to 2024 years. These patients could be divided into 2 groups, one received pure bone decompression, others received bone decompression plus optic nerve sheath divided. Their clinical materials are retrospectively reviewed including symptom, image and surgical methods as well as results.

Results
Before 2019 years 601 cases were treated with pure canal bone decompression, and after that time 118 cases with traumatic optic nerve injury undertook canal bone decompression with optic nerve sheath divided including faciform ligament. All 719 cases lost their vision in eye injuried before operation.
Of 601 cases, 6 recovered normal vision; 19 finger counting; 21 light sense; others remained blind at 6months following operation. Of 118 cases, 19 cases recovered light sense; 31 cases counting finger; 43cases with normal vision; other remained blind after 6months of postoperation.

Conclusion
The surgery for traumatic optic nerve lesion should be performed as soon as possible. The decompression should conclude bone decompression and dural opening.

Keywords
optic nerve lesion; optic canal decompression; optic nerve sheath divided; vision; craniofacial injury

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Defining Outcomes in Facial Gender-Affirming Surgery: A Systematic Review to Inform Core Outcome Set Development

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Abstract

Background

Facial gender-affirming surgery (FGAS) is a cornerstone of care for many transgender and nonbinary individuals, significantly impacting gender congruence, psychosocial well-being, and quality of life. However, outcomes in FGAS are inconsistently defined and variably measured, limiting the ability to compare techniques, evaluate safety and efficacy, and standardize care. This systematic review aimed to characterize the current landscape of outcome reporting in FGAS and identify gaps that hinder the development of a standardized core outcome set (COS).

Methods

We performed a systematic search of PubMed and Scopus through March 2025 to identify studies reporting outcomes for any FGAS procedure, including bony and soft tissue contouring of the forehead, nose, midface, jaw, and chin. Extracted data included the type of procedure, study design, population (transfeminine, transmasculine, nonbinary), anatomical region, outcome domains, instruments used, satisfaction reporting, and whether outcomes were clinician- or patient-reported. Methodological quality was assessed using the MINORS tool.

Results

A total of 295 studies met inclusion criteria. Outcome domains varied widely across procedures and studies. Aesthetic outcomes were most commonly reported and often evaluated through surgeon opinion or pre/post photography, with only 12% of studies employing validated outcome instruments. Functional outcomes such as speech changes were underreported. Patient-reported satisfaction was discussed in around half of the studies, but less than 10% used structured or validated patient- reported outcome measures (PROMs). Definitions of “success” were inconsistently stated, and most studies did not include long-term follow-up. Many studies stated that “all patients were satisfied” without providing any numerical data or proof. The majority of research was conducted in high- income countries, further limiting generalizability.

Conclusion

This review demonstrates substantial heterogeneity in FGAS outcome reporting and highlights the urgent need for a standardized COS that incorporates both clinical outcomes and patient priorities. Establishing such a framework will enhance evidence-based practice, improve the comparability of studies, and promote more equitable, patient-centered care globally. These findings support ongoing efforts to define consensus outcomes for FGAS and provide the foundational evidence necessary for future Delphi consensus-building and guideline development.

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Le Fort III Bipartition Osteotomy for Craniofacial Reconstruction in Cases of the Rare ALX1-Related Frontonasal Dysplasia

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Abstract

ALX1-related frontonasal dysplasia (FND) (OMIM 613456), known as fronto-facio-nasal dysostosis (OMIM 229400) formerly, is a rare congenital condition caused by developmental failure of the facial prominences. The phenotype includes cranial, ophthalmic, nasal, and orofacial anomalies. This report describes the use of Le Fort III bipartition osteotomy to facilitate bilateral cleft lip palate (BCLP) repair in four patients with severe FND. We also highlight the genetic basis involving the ALX1.

Four patients presented with BCLP, anophthalmia, nasal anomalies, calvarial bone defects without extracranial involvement. In the first case, with a frontal bone defect and wide BCLP, bipartition osteotomy with paramedian bone resection was performed to reduce maxillary segment distance. In the second case, Le Fort III bipartition osteotomy was performed via transconjunctival and buccal sulcus approaches. Although typically used for anterior and inferior midface advancement, the procedure was modified to facilitate closure of a wide cleft lip with a severely protruded premaxilla. The premaxilla was placed in an anterior and superior position, requiring significant advancement of the lateral lip and cheek flaps.

Extensive flap undermining and medial mobilization of the zygomaticomaxillary segments minimized the intermaxillary gap, allowing cleft lip closure with a modified Millard technique in the same session. All patients recovered uneventfully postoperatively.

Further genetic analysis was conducted in two families. Using Affymetrix 250K SNP array genotyping and homozygosity mapping, the condition was mapped to chromosome 12q21.3. In the first case, a homozygous deletion including the ALX1 gene, essential for early chondrogenesis, was identified. In the second case, a homozygous donor-splice-site mutation in ALX1 was detected, reinforcing the idea that complete loss of ALX1 function severely impairs early craniofacial development, particularly the coordinated fusion of the frontonasal, nasomedial, nasolateral, and maxillary processes.

In conclusion, ALX1-related frontonasal dysplasia represents a complex, rare, and challenging-to-treat craniofacial anomaly. The craniofacial features observed, along with ALX1 mutations identified in our center, reaffirm the gene's critical role in early embryogenesis, particularly in the fusion of facial prominences. This report not only proposea new effective approach for selected cases with markedly wide clefts but identified the gene locus of a rare anomaly, also.

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Development of a Novel Large-Animal Model for Craniofacial Microsomia: Proportional Skeletal Defects in Mandibular Ramus and Zygomatic Arch

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Abstract

Background
Craniofacial microsomia (CFM) involves complex skeletal asymmetries, including mandibular and zygomatic arch deficiencies, leading to facial deformities and occlusal plane cant. Current animal models inadequately replicate these features, hindering the development of customized temporomandibular joint prostheses for CFM.

Objective
This study aimed to develop a miniature pig model that mimics the proportional craniofacial skeletal defects observed in severe CFM, serving as a platform for future TMJ reconstruction studies.

Methods
Three miniature pigs underwent preoperative CT imaging and digital surgical planning. Proportional mandibular ramus and zygomatic arch defects were created on the surgical side to reflect measurements from clinical CFM patients. Craniofacial morphology, masticatory efficiency, and maximum mouth opening (MMO) were assessed preoperatively and postoperatively at 3 and 13 weeks.

Results
At 13 weeks, craniofacial asymmetry closely resembled CFM. The ramus height and zygomatic arch surgical side to nonsurgical side ratios were reduced by 30% (P = 0.003) and 52% (P = 0.003), respectively, compared to preoperative values. Despite significant occlusal plane cant (P = 0.011), maxillary height and chin deviation showed non- significant changes. Functional outcomes, including MMO and masticatory efficiency, were preserved.

Conclusion
This model successfully replicates craniofacial skeletal defects characteristic of severe CFM. It offers a quantitative framework for testing TMJ prostheses, advancing reconstructive approaches for craniofacial deformities.

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Impact of orthognathic surgery on emotional expression and smile aesthetics in Chinese patients as measured by FaceReader: a before and after study

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Abstract

Background

The attractiveness of a person's smile is influenced by many factors including gingival display, incisor show, and facial asymmetries amongst others. Malocclusion has long been recognized as having a significant and negative impact on the aesthetics of one's smile. Addressing dentofacial deformities is one of the major treatment goals in orthodontic/orthognathic interventions, to improve both functional and aesthetic outcomes. We aimed to quantify and measure the impact of orthognathic surgery on a patient's expression of happiness with their smile, so as to address the current gap in research on dentofacial deformities where outcomes are highly subjective.

Methods

We utilized FaceReader, a commercially available and previously validated artificial intelligence (AI) system to analyze pre- and post-operative facial photographs of 216 Chinese patients who underwent orthognathic surgery between January 1st, 2021, and December 31st, 2022. The AI software measures seven cardinal emotions and associated facial action units, providing an objective evaluation of emotional outcomes.

Results

Our results indicated a significant increase, postoperatively, in patients' expression of "happiness" when smiling, accompanied by a concomitant decrease in their estimated age. Patients with insufficient incisor show and open bite experienced notable improvements in emotional expression, while those with a gummy smile showed no significant change. Our study also stratifies results based on malocclusion classification (class I, II, III) and identified consistent improvement in emotional outcome scores across both class II and III patients.

Conclusion

Our findings highlight the potential of AI in providing objective insights into emotional changes following orthognathic surgery.

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Development and Evaluation of a Cooperative Robotic System for the Bilateral Sagittal Split Osteotomy Using an In-Plane Motion Constraint

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Jacob Hammond


Hisashi Ishida


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Edgar Soto


Pasha Shakoori


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Russell Taylor

Abstract

Background

In bilateral sagittal split osteotomy (BSSO), there is a high risk of neurosensory disturbance and injury due to the complexity of the anatomical space and limited visualization. Robot- assisted surgery can provide stable, tremor-free control of the surgical tool during the procedure. We aimed to develop and validate a cooperatively controlled robot system to enhance the precision of BSSO.

Methods

We designed a cooperatively controlled robot system using the Galen robotic platform. This system had two modes: haptic guidance to align the surgical saw to the planned osteotomy plane and an active constraint to restrict deviations from the osteotomy plane. A medical student, resident, and attending each performed both a freehand and a robot-assisted osteotomy on 3D printed mandible models from six patients. The cut volume from the difference between pre- and postoperative CT scans was computed. The distance from each cut voxel to the planned plane was used to the determine accuracy and precision of the osteotomy. The NASA Task Load Index (TLX) survey assessed the mental workload of both types of operations.

Results

When cutting freehand, the student's osteotomies had the highest deviation from the planned plane (2.16 +/- 0.98 mm) compared to the resident (1.74 +/- 0.95 mm) and the attending (1.64 +/- 0.85 mm). The robot-assisted cuts resulted in significantly lower deviations from the planned plane, indicating accuracy, and lower standard deviations, indicating precision (student: 0.71 +/- 0.53 mm, p=0.0015; resident: 0.53 +/- 0.35 mm, p=0.0010; attending: 0.63 +/- 0.24 mm, p=0.0024). The NASA TLX survey showed that the robot-assisted system made the mental, temporal, and physical demands of BSSO easier for the attending and the resident, whereas the student found both freehand and robot- assisted procedures to be difficult.

Conclusions

Cooperatively controlled robot system can significantly enhance the precision of the surgical cutting in BSSO. All participants were able to improve performance with robotic assistance, effectively narrowing the skill gap.

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Outcomes of Pediatric Maxillofacial Giant Cell Lesion Management in Syndromic versus Non-Syndromic Patients: A 21-Year Review

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Abstract

Background

Maxillofacial giant cell lesions (GCLs) may occur in isolation or as part of a genetic syndrome, where they are often multifocal. The functional deficits and psychosocial impact necessitate urgent treatment; however, a consensus on management is lacking given the rarity and the variable presentation in children. This study aims to compare the treatment and outcomes of pediatric maxillofacial GCLs in syndromic and non-syndromic subjects.

Methods

A retrospective cohort study of pediatric subjects with histologically confirmed maxillofacial GCLs at a tertiary children's hospital between 2003-2024 was performed. Patients with incomplete documentation and less than 6 months of follow-up were excluded. The predictor variable was syndromic diagnosis. The primary outcome was tumor recurrence. The secondary outcome was final disease status (remission, progressive, or non-progressive lesion). Demographics including syndromic diagnosis, tumor characteristics, and adjuvant pharmacologic therapy, including duration of treatment and side effects, were collected. Lesions were classified as aggressive or non-aggressive according to Chuong et al. Univariate and bivariate statistics were used to compare treatment characteristics and outcomes between syndromic and non-syndromic cohorts, with statistical significance determined by p-values < 0.05. Time to tumor recurrence was estimated using Kaplan-Meier analysis.

Results

The sample was composed of 28 subjects (16 non-syndromic, 12 syndromic), with a mean age of 10.7 ± 4.8 years and 17 (60.7%) were male. Overall, 96.4% of lesions were aggressive. Non- syndromic subjects were more frequently treated with adjuvant pharmacologic therapy compared to syndromic subjects (75.0% vs. 25.0%, $p=0.020$). Recurrence occurred in one non-syndromic subject (6.2%) and 50% of syndromic subjects ($p=0.008$). The estimated median time to recurrence was 89 weeks. Remission was achieved in 100% of the non-syndromic cohort and only 8.3% of the syndromic cohort ($p<0.001$).

Conclusion

The results of this study demonstrated that syndromic subjects were less likely to receive adjuvant pharmacologic therapy for the management of pediatric maxillofacial giant cell lesions and exhibited higher recurrence and lower remission rates compared to their non-syndromic counterparts. These findings emphasize the importance of long- term surveillance and anticipatory counseling for families of syndromic patients.

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Microtia in Indonesia: Characteristics and Family History Analysis on the Presence of Other Congenital Anomalies in Patients With Microtia

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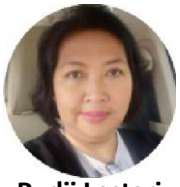
Indri Lakhsmi Putri



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Abstract

Objective

This study aims to characterize the clinical profile of microtia in Indonesia and explore the influence of familial traits on its severity, particularly in relation to the presence of additional congenital anomalies. Patients were categorized as having either isolated or syndromic microtia.

Design

A descriptive-analytical study with a cross-sectional approach

Setting

Data collection was carried out through structured interviews conducted either in person or via video calls/Zoom by doctors and clinicians. This process was managed by the Microtia & Craniofacial Center at Universitas Airlangga Hospital.

Participants

A total of 354 respondents participated in the study, consisting of individuals with microtia as well as their family members and relatives

Interventions

This study involved no clinical or medical interventions.

Main Outcome Measures

Descriptive data were collected to outline the characteristics of microtia in the Indonesian population. Statistical analysis was performed to assess the association between family history and the presence of other congenital anomalies

Results

Familial microtia—defined as microtia occurring in individuals with a family history of microtia or related conditions such as preauricular tags and fistulas—was significantly associated with syndromic microtia (P = .018). An odds ratio of 3.191 indicates that individuals with familial microtia have a threefold higher likelihood of developing isolated microtia compared to those with sporadic cases.

Conclusions

Microtia in Indonesia most commonly affects males (78%), typically appears unilaterally on the right ear (55.9%), and is frequently classified as third-degree Hunter microtia (64.4%). The majority of cases are isolated (72%) and sporadic (88.1%). However, a positive family history substantially increases the probability of isolated microtia, emphasizing the importance of genetic and familial factors in clinical assessment and diagnosis.

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Chronic Mouth Breathing Induces Multi-Organ Transcriptomic Dysregulation in Growing Rats: A Mechanistic Link to Neurodegeneration and Circadian Disruption

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Abstract

During the growth period, chronic mouth breathing is associated with dentofacial deformities, but its impact on the molecular level of multiple organs remains unclear. This study aimed to elucidate the transcriptomic changes across multiple organs induced by chronic mouth breathing in growing rats and identify potential key pathways. Male rats were divided into mouth breathing and control groups (n = 4 per group), with nasal obstruction maintained daily from 9:00 am to 5:00 pm for 2 weeks to induce mouth breathing. Subsequently, mRNA sequencing (RNA-Seq) was performed on heart, liver, kidney, and condyle tissues. The results showed that the heart exhibited the most pronounced transcriptomic changes (4,315 differentially expressed genes, DEGs), followed by the liver (2,999 DEGs), condyle (2,992 DEGs) and kidney (1,613 DEGs). Enrichment analysis revealed shared neurodegenerative pathways (e.g., Alzheimer's and Parkinson's diseases) and circadian rhythm disruption in the heart and condyle tissues, while the liver exhibited dysregulation in lipid/amino acid metabolism. Immune pathways (e.g., B/T cell receptor signaling) were downregulated in the heart and condyle. Gene Set Enrichment Analysis identified 101 co-DEGs across organs, which were enriched in mitosis and cell cycle regulation. Protein-protein interaction networks highlighted hub genes in mitotic control (e.g., Bub1, Aspm) and circadian rhythms (e.g., Dbp, Nr1d1). Dysregulation of oxidative stress and inflammatory pathways suggested systemic effects. These findings provide mechanistic insights into the systematic effects of chronic mouth breathing, proposing a potential link to obstructive sleep apnea (OSA) pathogenesis via neurodegenerative and circadian dysregulation pathways.

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Comparing Maxillofacial and Axial/Appendicular Giant Cell Lesions in Pediatric Patients: Management Strategies and Outcomes

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Abstract

Background

Giant cell lesions (GCL) are benign, but locally aggressive bone tumors that typically present in children and young adults. Limited data compares the treatment and outcomes between MF and AA GCLs, particularly in the pediatric population. This study compares the classification, management, and outcomes between MF and AA GCLs in pediatric patients to elucidate optimal treatment approaches.

Methods

A retrospective cohort study of patients with histologic diagnosis of GCLs at a tertiary children's hospital from July 2002 to July 2024 was conducted, excluding those with syndromic diagnoses and <6 months of follow-up. Tumors were classified by location and clinical behavior. MF lesions were classified as aggressive vs. nonaggressive according to Chuong et al. AA lesions were graded from I to III based on the Campanacci grading system. Outcomes included tumor recurrence and long-term disease status (remission, non-progressive, and progressive lesion).

Results

Overall, 29 patients met inclusion criteria (16 MF, 13 AA). Mean follow-up time was 4.0 ± 3.1 years. There were 15 aggressive MF GCLs (93.8%), and 6 Grade III AA GCLs (46.2%). There were no cases of metastasis. In total, 93.1% of patients underwent surgical management. MF lesions more frequently received adjuvant pharmacologic therapy ($p<0.001$), while surgical adjuvants were more frequently employed in AA lesions ($p=0.025$). Recurrence occurred in one (6.2%) MF and three (23.1%) AA lesions ($p=0.19$). Long-term remission rates were significantly higher in aggressive MF lesions (100%) compared to aggressive AA lesions (62.5%, $p=0.039$). All five Campanacci grade III AA lesions either recurred, following curettage with surgical adjuvants, or did not achieve remission.

Conclusions

This study demonstrated overlapping characteristics between MF and AA GCLs. Despite the similarities, there were distinct approaches to management wherein adjuvant pharmacologic therapies were favored in the MF cohort, while surgical adjuvants were favored in the AA cohort. Aggressive AA lesions had a higher rate of recurrence and lower remission rates compared to MF lesions. Grade III AA lesions may therefore warrant increased surveillance and may benefit from the addition of adjuvant pharmacologic therapy.

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Development and Validation of a 3D Printed Mandible Model for Bilateral Sagittal Split Osteotomy Surgical Simulation

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Abstract

Background

Mandibular bilateral sagittal split osteotomy (BSSO) is commonly used in orthognathic surgery. The greatest risk of BSSO is damage to the inferior alveolar nerve, resulting in facial numbness and poor quality of life. A lack of surgical experience is associated with a higher risk of complications, and as a result, BSSO surgical training is critical. Existing training tools, such as cadavers and anatomical models, may be expensive, limit options for repeated practice, and lack patient- specificity. We aimed to create a low-cost, biomechanically accurate mandibular model for surgical training to prevent such complications.

Methods

A virtual three-dimensional (3D) model of a human mandible was segmented from computed tomography scans and printed using nine resin mixtures. Two residents and two attending surgeons performed user testing to determine which resin mixture had the most realistic haptic feedback. Biomechanical properties, such as tensile strength, yield strength, and Young's modulus were calculated for each resin mixture. After identifying the preferred resin mixture, we conducted mock-operative tests to compare the force required to cut through our resin mix 3D printed model, a human cadaveric mandible, a commercially available model, and an off-the-shelf resin 3D printed model (FormLabs White resin).

Results

A mix of 45% Anycubic Colored Ultraviolet Resin and 55% Siraya Tech Tenacious was found to best mimic human bone. Surgeons reported feeling an accurate proprioceptive transition between cancellous and cortical bone. The osteotomy force profiles were similar across our resin mix 3D printed (2.7±1.7 N), cadaveric (3.2±1.8 N), and commercial (2.7±1.7 N) mandibles. The maximum cut force was similar across our 3D printed resin model (6.2 N), the cadaveric model (6.6 N), and the commercially available model (6.3 N). The off-the-shelf resin 3D printed model had a higher osteotomy force profile (4.3±2.5 N) and maximum cut force (8.9 N). It took 18 hours to print one row of four mandibles and the total cost per 3D printed mandible was $2.48.

Discussion

We developed and validated a low-cost method for 3D printed patient-specific mandibular models for BSSO surgical simulation. Future directions include evaluating these models for surgical training to prevent complications.

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A Preclinical Evaluation of Electromagnetic Navigation Robot-Assisted Mandibular Distraction Osteogenesis in Craniofacial Microsomia: Model and Animal Experiments

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Byeong Seop Kim



Gang Chai

Abstract

This study evaluated the feasibility, accuracy, and safety of robot-assisted mandibular distraction osteogenesis (MDO) using electromagnetic navigation through both model and animal experiments. In the model surgical experiment, 3D- printed mandibular models derived from five patients with Pruzansky-Kaban type II (IIa: 4; IIb: 1) were used to compare robot-assisted and conventional surgery. Experimental group showed significantly reduced distance error ($t = 9.311$, $P < 0.001$) and angular error ($t = 5.385$, $P = 0.001$). The accuracy of distractor placement was also significantly higher in the experimental group, while the distance error ($t=3.048$, $P=0.016$) and angular error ($t=3.524$, $P=0.024$) were significantly reduced. In the animal study, twelve New Zealand rabbits were randomly divided into experimental groups and control groups. The experimental group exhibited lower distance errors ($t = 2.591$, $P = 0.011$) and angular errors ($t = 4.276$, $P = 0.002$), reduced distractor position errors ($t = 3.222$, $P = 0.009$) and angular errors ($t = 4.697$, $P = 0.001$), and a superior distraction effect ($t = 4.096$, $P = 0.002$). There was no significant difference in the osteotomy time and bleeding; however, the overall operative and preparation times were increased in the experimental group, with a reduced rate of teeth damage. These findings support the clinical potential of electromagnetic navigation robot-assisted MDO in enhancing surgical precision and safety.

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U.S. Insurance Trends in Reduction Mammoplasty and Facial Feminization Surgery: A Comparative Analysis

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Abstract

Introduction

Reduction mammoplasty is a well-established plastic surgery procedure with broad insurance coverage while facial feminization surgery (FFS) coverage varies widely by insurance policy. As a result, patients may be incentivized to temporarily seek coverage from plans favorable for gender-affirming procedures. This is a novel study analyzing the insurance trends among FFS patients compared to a control group of similar, non-gender- affirming breast reduction (BR) patients.

Methods

A retrospective analysis was performed on patients who underwent BR and FFS between January 2018 to February 2024 within a single insurance, multi-institutional, integrated healthcare system. Patients aged 26-64 with commercial medical insurance plans were included. Patients on government-sponsored insurance, on parental-sponsored insurance, or awaiting additional operations were excluded. BR and FFS patients were matched based on gender, age, and race. Insurance status was assessed at 1 year and 2 years post-operatively. Statistical significance was set at $p<0.05$.

Results

Among 148 (49.8%) BR and 149 (50.2%) FFS patients, the mean age was 43.0 years old with no significant difference (42.73 vs 43.23 years old, p=0.70). The majority of patients were Caucasian (n=174, 58.6%), followed by Hispanic (n=88, 29.6%), Black (n=14, 4.7%), and other racial groups (n=21, 7.1%).

There was no significant difference in mean length of continuous coverage by the same insurance company between the two groups (35.3 months BR vs. 34.5 months FFS, p=0.75). At one year postoperatively, 121/148 (81.8%) BR patients and 122/149 (81.9%) FFS patients retained their insurer (p=0.99). At two years, retention was (89/148) 60.1% for BR patients and 88/149 (59.1%) for FFS patients (p=0.85). Re-enrollment rates after changing insurers were also comparable (BR 5.4%, FFS 6.0%, p=0.85).

Conclusion

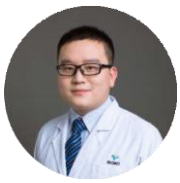
Insurance continuity did not differ significantly between BR and FFS at one and two years postoperatively in a single-payer integrated healthcare system. This suggest that transgender patients are not more likely to relinquish their insurance coverage after receiving gender-affirming facial surgery when compared to gender, age, and race-matched patients undergoing reduction mammoplasty. Increasing transgender populations in insurance companies covering FFS may reflect long-term gains in insured membership.

Future research should explore factors influencing long-term coverage retention in gender diverse populations.

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Free-floating bone flap posterior cranial vault release in syndromic craniosynostosis

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Abstract

The aim of this study was to investigate the efficacy of non-detachable free-floating bone flap posterior cranial vault release (FFBF-PCVR) in syndromic craniosynostosis.
A retrospective review was completed of subjects who underwent FFBF-PCVR at 4 time-points: within 3 months preoperatively, 7 days postoperatively, 3 months postoperatively and at the last follow-up postoperatively. Volumetric and craniometric data, the ratio of ventricular diameter, and the cerebellar tonsillar descent were measured after FFBF-PCVR by using computed tomographic and magnetic resonance imaging.
A total of 19 patients underwent FFBF-PCVR. The mean age was 11.7 months (range 4–36 months). The mid cranial height, posterior cranial height, and anterior posterior diameter length significantly increased from preoperative to postoperative 7 days, from postoperative 7 days to postoperative3 months, and from postoperative 3 months to the last follow-up. There was a significant increase in pre- to 7 days postoperative intracranial volume (16 ± 246.56 cm^3, $p < 0.001$; respectively), 3 months postoperative intracranial volume (1228.03 ± 249.61 cm^3, $p < 0.001$; respectively), and intracranial volume at last follow-up (1390.25 ± 219.99 cm^3, $p < 0.001$; respectively). There was a significant increase in 7 days' postoperative to 3 months' postoperative intracranial volume ($p < 0.001$; respectively), and intracranial volume at last follow-up ($p < 0.001$; respectively). There was a significant increase in 3 months postoperative to intracranial volume at last follow-up ($p < 0.001$). The mean intracranial volume increased by an average of 36.6 percent (range, 18.1 to 79.2 percent) at last follow-up. The degree of hydrocephalus in the preoperative child was (45.77% ± 9.17%), and at the last follow-up after surgery, the degree of hydrocephalus was (35.02 ± 9.50%), $p < 0.01$). Preoperatively, 14 patients (73.7 percent) had radiographic evidence of Chiari malformation type I. The cerebellar tonsillar descent, measured using pre- and postoperative MRI, decreased in all patients after FFBF-PCVR (preoperative: 7.5 ± 1.4 mm, postoperative: 5.3 ± 1.7 mm; $p = 0.001$).
FFBF-PCVR can efficiently expand the posterior cranial vault with only one surgical procedure. Moreover, it helps to relieve hydrocephalus and cerebellar tonsillar herniation.

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A New Approach to Bid Farewell to Zygomatic Bone Sagging and Nonunion - Rectangular Osteotomy for Zygomatic Bone Reduction

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Abstract

This study focuses on the "rectangular osteotomy zygoma reduction surgery", aiming to explore the causes of zygoma rotation, displacement, sagging and nonunion in zygoma reduction surgeries, and to improve postoperative satisfaction while reducing the incidence of these complications. Biomechanical analysis reveals that the masseter muscle attached to the zygomatic arch lacks an antagonist. After zygomatic complex and arch disconnection, the free bone segments may rotate and sag under masseter pull. In traditional "L" and "I" osteotomies, fixation at the zygomaticoalveolar ridge is vulnerable to masseter force and thin sinus walls, risking displacement and plate fracture.

Our rectangular osteotomy design counters masseter forces through three components (F1, F2, F3) and fixes titanium plates at the orbital margin, enhancing stability. Since 2018, 838 cases have been performed, with a 6-month to 3-year follow-up. Of these, 799 cases were satisfactory, while 39 were not, mainly due to excessive narrowing, flat appearance, asymmetry, or nasolabial fold deepening. Postoperative CT scans showed no nonunion or displacement. The rectangular osteotomy method proves effective, aligning with Asian biomechanics to prevent post-surgery zygoma complications.

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The Anti-aging Strategy for Facial Soft Tissue Sagging After Zygomatic Osteotomy

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Abstract

The zygomatic-zygomatic arch complex, as an irregular osseous structure, maintains facial skeletal-muscular balance through coordinated interaction with surrounding bones. The overlying soft tissue architecture consists of layered structures from superficial to deep: skin, subcutaneous adipose tissue, SMAS, sub-SMAS adipose tissue, and periosteum. This osteo-soft tissue complex sustains facial soft tissue harmony. Given its anatomical connections with multiple myofascial attachments (including temporalis, zygomaticus, masseter muscles, SMAS system, and malar fat pad), alterations in biomechanical loading patterns and soft tissue displacement frequently occur post-osteotomy due to modified myofascial insertion points. These changes lead to significant midfacial anatomical and aesthetic-functional modifications, predisposing patients to postoperative soft tissue laxity and ptosis. Consequently, establishing accurate postoperative assessment protocols and optimizing therapeutic strategies for midfacial support restoration has become a critical focus for both patients and surgeons following zygomatic reduction surgery.

This study investigates the morphological impacts of zygomatic osteotomy techniques on facial contour. Utilizing Mimics 18.0 (Materialise, Belgium) for three-dimensional cranial CT reconstruction at 12-month follow-up, we systematically evaluate post-osteotomy dimensional changes across cutaneous and soft tissue layers. We aim to achieve enhanced clinical outcomes and mitigate postoperative soft tissue descent in midface rejuvenation procedures through stratified treatment protocols based on quantitative assessment results.

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The Biomechanical Properties of A Modified Distraction Device Used in Mandibular Distraction Osteogenesis for Craniofacial Microsomia Patients: A Simulation Finite Element Analysis Study

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Anna Liu



Xiaojun Tang

Abstract

Objective
Finite element analysis (FEA) of the biomechanical properties of the modified extraoral distractor device used in the mandibular distraction of craniofacial microsomia patients.

Materials and Methods
Finite element analysis (FEA) models of 5 patients under 2 working conditions, the instance when the distractor is activated and when the distractor participates in mastication, were included in the current study. To conduct the FEA, load boundary conditions (35.6 N on the distractor for the first working condition and 50 N on the unoperated side, 100 N and 200 N on both sides for the second working condition) were applied. Besides, constraint boundary conditions and contact conditions were also applied.

Results
With 5 or 3 bioabsorbable screws fixing the upper fixing plate, the maximal displacement of the mandible was <3 mm and the maximal stress distributed on distractor and bioabsorbable screws was less than the yield strength of corresponding materials under the 2 working conditions when setting 50 N on the unoperated side and 100 N on both sides for the second working condition. However, when setting 200 N on both sides for the second working condition, the maximal displacement of the mandible slightly increased, and stress distributed on distractor and bioabsorbable screws exceeded the yield strength of corresponding materials in some patients.

Conclusion
In most cases, both 5 and 3 poly-L-lactic acidscrews could firmly fix the distractor on the mandible without plastic deformation, although the situation would be different when the mastication force was too powerful.

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Accuracy of patient-specific implants in midfacial surgery of patients with craniofacial anomalies

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Abstract

Introduction
Virtual surgical planning (VSP) with patient-specific guides and implants have improved surgical accuracy by translating digital planning into the operating room. However, their effectiveness in complex reconstructions remains largely unverified, due to a lack of quantitative positional-error data. Therefore this study aims to evaluate the positional deviation of bone segments and screws from the VSP after guided midfacial corrections in craniofacial anomalies.

Methods
Patients with craniofacial anomalies (Apert, Crouzon, craniofrontonasal dysplasia, fibrous dysplasia) that received guided surgical correction of the maxilla, zygoma or orbit between 2016 and 2025 were included in our study (IRB-approval: MEC-2025-0156). Image segmentation of pre- and postoperative (CB)CT scans was performed to create digital 3D models for the zygoma, maxilla, orbita, and the remaining skull. Postoperative models were registered to the preoperative plan, and positional differences between the postoperative and planned segments were calculated. In addition, the accuracy of screw positions was assessed by aligning the postoperative and planned bone segments and measuring the remaining difference.

Results
Twelve patients were included and underwent advancement of (bilateral) zygomas (n=9), LeFort I (n=7), and orbita (n=3), guided by 3D-printed surgical guides and patient-specific implants. The results indicate that the overall average translation deviation between postoperative and planned bone segments were -0.10 ± 0.86 mm (left-right), -1.89 ± 1.39 mm (anterior- posterior), -0.52 ± 1.38 mm (superior-inferior). Average rotations were minimal < 2°, except for the zygoma left and right in pitch, 3.34 ± 3.53° and 2.25 ± 5.27° and yaw, 7.46 ± 3.07° and -6.78 ± 2.95°. Screw-positioning measurements (n=134) yielded an average accuracy of 1.18 ± 0.97 mm.

Conclusion
VSP translated well to the operating room, with <1.2 mm screw accuracy. Nonetheless, posterior drift and inward zygoma rotation remain challenging.

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Predictors of Epilepsy in Syndromic Craniosynostosis

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Abstract

Background
Epilepsy is rarely observed in patients with craniofacial syndromes, with few reports in the literature devoted to identifying epilepsy predictors for this patient population. This study aims to determine potential predictors of epilepsy in syndromic craniosynostosis.

Methods
This retrospective study analyzed data from 476 patients with Apert, Crouzon, or Pfeiffer syndromes treated at two craniofacial centers between 2007 and 2022. Patients were divided into two groups: those diagnosed with epilepsy (Group A) and those without (Group B). Independent variables included age, number of surgeries, previous surgery performed elsewhere, neurosurgical complication during craniofacial surgery, Chiari malformation type I, meningitis, systemic complication, encephalomalacia, hydrocephalus, placement of a ventriculoperitoneal shunt, and family history of epilepsy. These variables were compared between groups. Statistical analyses were conducted using logistic regression models to identify significant epilepsy.

Results
Epilepsy was diagnosed in 24 patients, resulting in a prevalence of 5%. Significant predictors of epilepsy included previous surgeries performed elsewhere and neurosurgical complications during craniofacial surgery, with odds ratios of 853 and 902, respectively. These factors suggest that epilepsy in this population is primarily acquired rather than congenital.

Conclusion
The study identified a higher prevalence of epilepsy among children with syndromic craniosynostosis compared to the general population. Intracranial complications, particularly those associated with surgeries performed outside specialized centers, are key predictors of epilepsy. These findings emphasize the importance of specialized surgical care to mitigate epilepsy risk in this patient population.

Keywords
syndromic craniosynostosis, epilepsy, predictors, craniofacial surgery.

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A Novel Phenotype of Calvarial Thickening and Increased Rates of Premature Calvarial Suture Closure in Children with Chronic Lung Disease

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Abstract

Background

Calvarial thickening has been documented as a sequela of many different types of conditions, including genetic syndromes, hematologic, endocrinologic, and neurologic disorders. The purpose of this study is to characterize a novel type of calvarial thickening and provide objective measurements of skull thickness and calvarial suture morphology in patients with bronchopulmonary dysplasia (BPD).

Methods

Patients admitted to the CHOP NICU and treated by the medical chronic lung disease team between July 2015 – August 2020 were retrospectively reviewed. Inclusion required a head computed tomography (CT) scans to determine the presence of calvarial thickening. Electronic medical records were reviewed. Thickness analysis was performed using Materialise Mimics. Bone masks were generated. The frontal, parietal, temporal, and occipital bones were segmented. Bone thickness maps were created and average thickness was recorded. Data were analyzed with appropriate statistics.

Results

The chronic lung disease team treated 398 patients during the study interval of which, 58 patients (18.2%) had head CTs available. Twenty-eight (48.3%) were found to have calvarial thickening. The rate of premature suture closure in the study population was 36.2% (21 of 58 patients), with 50.0% of affected cohort having evidence of premature suture closure on the first CT scan. Multivariate logistic regression identified two risk factors, requiring invasive ventilation at six months of age and FiO2 requirement at six months of age. Increased head circumference at birth protected against the development of calvarial thickening.

Conclusions

We have described a novel subset of patients with chronic lung disease of prematurity who have calvarial thickening with remarkably high rates of premature closure of cranial sutures. The exact etiology of the association is unknown. In this patient population with radiographic evidence of premature suture closure, operative decision should be made after considering unequivocal evidence of elevated intracranial pressure or dysmorphology, and balanced against the risk of the procedure.

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Long-term occlusal stability following hypertelorism correction via facial bipartition and box osteotomy

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Abstract

Background

Few studies address the long-term effects of hypertelorism correction on occlusal status. The objective of this study is to assess long-term occlusal stability following hypertelorism correction via facial bipartition and box osteotomy.

Methods

An observational retrospective study was performed on 22 consecutive patients with a rare facial cleft and/or craniofrontonasal dysplasia who underwent hypertelorism correction between 2008 and 2019. Patients with Apert, Crouzon or Pfeiffer syndromes or patients completing less than 5 years of follow up were excluded. Occlusal analysis was stratified via the Angle classification system utilizing standardized clinical photographs and lateral cephalograms. Assessed variables were age at the time of operation, diagnosis, operation performed, preoperative and postoperative occlusion status during a 1 to 5 year midterm period, and a long-term period greater than 5 years. Occlusion status outcomes were stratified as deteriorated, stable, and improved. Demographics and complications were verified.

Results

A total of 22 patients were included in this study. All included patients were operated on by the same surgical team and completed at least five years of follow-up. The average respective patient age at time of operation was 8.8 years of age for patients undergoing facial bipartition, and 15.8 years for patients undergoing box osteotomy. Average follow up duration was 9 years. Ten patients were diagnosed with craniofrontonasal dysplasia, and 12 patients were diagnosed with rare facial cleft. Eight patients were preoperatively classified as having Angle system Class III malocclusion, and 14 patients were preoperatively classified as having Angle system Class I. Deteriorated outcomes occurred in two Angle Class I patients (9.1%), changing from Angle Class I to Class III, and requiring orthognathic procedures at facial growth conclusion (n=2). Occlusion outcomes of all eight patients with Angle Class III malocclusion remained stable (n=8/36.4%). Occlusion outcomes of twelve of the fourteen patients with Angle Class I remained stable (54.5%), and no orthognathic procedures were needed. One patient experienced an infection resulting in frontal bone loss (n=1).

Conclusion

Long-term Angle occlusion outcomes suggest that hypertelorism correction results in predominantly stable occlusion status, and is unlikely to adversely affect long-term occlusal status.

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Design and Practice of Mandibular Angle Surgery Preserving the Physiological Curve of the Mandible

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Abstract

This presentation meticulously explores the design and implementation of mandibular angle surgery, with a prime focus on preserving the physiological curve of the mandible. Initially, it expounds upon the aesthetic criteria specific to the mandibular angle in the context of Orientals. This encompasses an elliptical contour of the lower face, a mandibular border that is smooth and exhibits a well - defined angle, and a crucial relationship between the horizontal line of the oral commissure and the inflection point of the mandibular angle. Additionally, prevalent challenges encountered in such surgical procedures are elucidated, such as the deviation of the mandibular bone's center of gravity and the presence of non - physiological lines.The primary surgical aims are to effectively reduce the width of the lower face and re - establish the natural configuration of the mandibular angle. The three - dimensional modification of the mandible entails osteotomy of the mandibular border in the vertical plane, anterior displacement of the posterior border of the ascending ramus in the anteroposterior direction, and the treatment of the outer plate and dental arch in the mediolateral aspect. The author proposes that the osteotomy line of the mandibular border be set at the golden section (ranging from 0.5 to 0.618), and the osteotomy line of the ascending ramus be determined based on the angle of anterior displacement.The anterior displacement of the mandibular angle has the advantages of shortening the lateral facial distance and rectifying reverse arcs. However, it is not without risks, such as the potential for condylar fractures. Moreover, there are issues related to the smoothness of the angle, the synchrony of inner and outer plate resection, and the presence of visual blind spots. Subsequent to resection, the treatment of the outer plate, whether through splitting or grinding, has a significant impact on the width of the lower face. Although splitting can achieve a substantial narrowing of the face, it may lead to late - stage hyperplasia and absorption of the inner plate, which can be attributed to factors such as infection and improper drainage. In summary, this study provides invaluable insights for the practice of mandibular angle surgery.

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Influence from tough neck status and other risk factors to vascularized free flap loss in head and neck reconstruction: A cohort study and predictive model

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Pingchuan Ma **Longjiang Li** **Chunjie Li**

Abstract

Objectives
This cohort study aimed to confirm the relationship between tough neck status (patients who have received the same side neck dissection) and free flap survival, systematically identify potential risk factors and develop a predictive model for head and neck free flap loss.

Methods
We analyzed free flap surgeries between July, 2021 to June 2024 in West China Hospital of Stomatology and divided them into training set and testing set. The correction between tough neck status and free flap loss was evaluated and other potential risk factors were analyzed in training set. A predictive model was established and validated in testing set.

Results
1975 free flaps surgeries were included in analysis. In training set (n=1506), 61 of them were identified as tough neck status. The incidence of flap loss in tough neck patients (4.9%, 3/61) is not significantly different to that of ordinary patients (P=0.552). Similar results were also exhibited in terms of surgical site infection (P=1.000) and unplanned surgery (P=0.938). In multivariate analysis, patients with liver disease (P=0.001), maxilla disease (P=0.001), titanium plate use (P=0.033), and surgical site infection (P<0.001) exhibited a higher incidence of flap loss. The predictive model was developed based on these four factors and the calculated AUC area was 0.782 in testing set.

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Computer-assisted Craniosynostosis Diagnosis on 3D Head Scan

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Abstract

Objective

Craniosynostosis is a condition characterized by the premature fusion of cranial sutures, leading to abnormal infant's skull growth. Early detection and monitoring are critical for effective treatment planning, but current diagnostic methods often involve radiation exposure or expensive 3D scanning systems. We present a novel, low-cost photogrammetric scanning system for the acquisition of neonatal heads, coupled with a machine learning algorithm for the classification of healthy vs craniosynostosis patients, both in pre-diagnostic and monitoring phases.

Method

A customized photogrammetric scanner has been developed for infant's head acquisition. It consists of a 3D printed dual-layer hemispherical structure, with the maximum radius of 325mm, containing 20 synchronized cameras and a diffused LED lighting. The system employs 12 MP Raspberry Pi Camera Module 3 controlled by five Raspberry Pi 4, with each Pi managing four cameras through adapter modules. The acquired images are processed in Agisoft Metashape to generate 3D models. These models undergo automated analysis to evaluate head deformity through the extraction of several cephalometric indices and parameters that become the inputs of a machine learning algorithm for the classification between healthy and pathological patients. The algorithm is trained and validated using a dataset of 152 head models, comprising 94 healthy infants and 58 patients diagnosed with various craniosynostosis types.

Results

The 3D scanner enables high reconstruction accuracy (~2mm from reference) and rapid acquisition (less than a second) that make it easily acceptable into clinical settings. Machine Learning shows good classification performances in differentiating between healthy infants and those with craniosynostosis (~ 80%).

Conclusion

The integration of this non-invasive, radiation-free 3D scanner with machine learning classifier provides a safe and effective screening and monitoring tool for the identification of cranial deformities in craniosynostosis. The entire acquisition system costs approximately €2500, making it significantly more affordable than commercial alternatives; additionally, its ease of use makes it suitable for widespread deployment also by novel operators. Future work will focus on clinical validation of our 3D scanner, creating a dataset of photogrammetric scans that can be used to refine the machine learning algorithm.

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Risk Factors for Prolonged Ventilator Dependence Following Bilateral Mandibular Distraction Osteogenesis in Pierre Robin Sequence: A Single-Institution Study of 121 Patients

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Tao Han


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Abstract

Background

Bilateral mandibular distraction osteogenesis (MDO) is is a common surgical approach used for the Pierre Robin Sequence(PRS) patient ,which significantly improve respiratory and feeding outcomes. However, limited research has focused on risk factors influencing postoperative ventilator removal. This study aimed to identify factors affecting the duration of ventilator dependence after MDO in one year patient cohort.

Methods

We conducted a retrospective analysis of all PRS patients who underwent MDO at our institution between 2023 and 2024. Preoperative data were collected, and univariate and multivariate logistic regression analyses were performed to identify risk factors for delayed ventilator removal.

Results

Among 121 patients (mean age: 29.85 ± 22.64 days), the mean ventilator duration was 33.05 ± 59 hours, with 69.4% (84/121) weaned within 24 hours. Preoperative ventilator dependence, pneumonia, preterm birth, and low birth weight were significantly associated with prolonged intubation (*p* < 0.05). Age, sex, cleft palate, and congenital heart disease did not show statistical significance. Multivariate analysis demonstrated pneumonia as an independent risk factor for delayed ventilator removal.

Conclusions

Pneumonia significantly prolongs postoperative intubation duration and may increase the risk of ventilator-associated complications. These findings provide targeted insights for optimizing perioperative management in PRS infants undergoing MDO.

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Conservative Management of Mandibular Fractures in Pediatric Patients during the Growing Phase with Splint Fiber and Ligature Arch Wire

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Lifeng Li **Xiaoyi Hu**

Abstract

Purpose
The purpose of this article is to discuss the effective management of mandibular fractures in pediatric patients during the growing phase of the mandible using splint fiber and ligature wire.

Methods
A retrospective study examined pediatric patients with mandibular fractures who were treated using the splint (Quartz) fiber and ligature wire technique. Data on gender, age, location or site of the fracture, and development of tooth stage were collected from the patient's medical records. Descriptive statistics were used to analyze the data and evaluate the effectiveness of the splint (Quartz) fiber technique for treating mandibular fractures in pediatric patients.

Results
Out of 256 subjects, 6 pediatric patients with mandibular fractures were selected, resulting in an incidence rate of 2.34% with an equal sex ratio. Mental or symphysis fracture was the most common site for fracture in children, accounting for 100% of cases. Right mandibular angle fracture was observed in 16.7% of patients, while 50% of the group (3 individuals) suffered from left condylar fracture and 16.7% had a bilateral condylar fracture. Treatment with Quartz splint fiber and circumdental arch wiring using ligature wire was successful with no observed post-treatment complications or malocclusion. The splint fiber was worn for 30 days and the circumdental arch wiring was for the same. Healing of bone fracture yields good results after 12 weeks. Follow-up care is crucial to monitor for complications, in this study, no post- treatment complications were observed

Conclusion
The treatment of pediatric mandibular fractures is complex and requires careful consideration of various factors. Conservative management should be the first choice, with open reduction and internal fixation reserved for specific cases. The use of quartz splint fiber and ligature wire is an effective treatment option for stabilizing the mandible and providing occlusal stability in growing children. A fiber splint along with ligature wire can also be used as an alternative treatment to avoid any adverse effects on the growth and development of the mandible and permanent teeth. A multidisciplinary approach is essential to achieving the best outcomes for pediatric patients with mandibular fractures.

Keywords
Maxillofacial trauma, Mandible fracture, Condyle, Ramus, Quartz Splint

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Mechanistic Study on M2exo-Biomimetic DNA Tetrahedron-Delivered Melatonin for Modulating Inflammatory Microenvironment to Promote Senescent Jawbone Regeneration

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Abstract

Objectives

The regeneration of aged jawbone presents dual challenges: diminished osteogenic capacity of senescent bone marrow mesenchymal stem cells (BMSCs) and a hostile inflammatory microenvironment. While tetrahedral DNA nanostructures (TDNs) have demonstrated potential in suppressing cellular senescence and activating osteogenic differentiation, their clinical application is limited by poor stability, insufficient targeting specificity, and restricted bioactivity in complex inflammatory microenvironments. To address these limitations, we developed an innovative M2 macrophage-derived exosome (M2exo)-biomimetic TDN composite system (M2exo@TDN-Mel) for enhanced aged jawbone regeneration.

Methods

The nanocomposite was fabricated through self-assembly of TDNs followed by melatonin (Mel) loading and M2exo coating via electroporation. Comprehensive characterization included polyacrylamide gel electrophoresis (PAGE), transmission electron microscopy (TEM), nanoparticle tracking analysis (NTA), and drug release profiling. In vitro studies evaluated cellular uptake efficiency, ROS scavenging capacity, and osteogenic differentiation potential in LPS-stimulated BMSCs. Macrophage polarization was assessed through marker expression analysis (iNOS, CD86, IL-10, ARG1). Mechanistic studies employed RNA sequencing and Western blot to investigate NF-κB/NLRP3 pathway modulation. Therapeutic efficacy was validated in aged rat mandibular defect models using micro-CT and histological analyses.

Results

The M2exo@TDN-Mel system demonstrated successful fabrication with high encapsulation efficiency and sustained drug release kinetics. Cellular uptake studies revealed significantly enhanced internalization under inflammatory conditions compared to non-coated controls. The nanocomposite exhibited dual therapeutic effects, effectively reducing intracellular ROS levels while promoting osteogenic differentiation of senescent BMSCs. Notably, the system induced macrophage polarization from pro-inflammatory M1 to anti-inflammatory M2 phenotype, as evidenced by decreasing the expression of iNOS and CD86 while increasing IL-10 and ARG1. Molecular analyses confirmed substantial downregulation of NF-κB/ NLRP3 pathway components. In vivo studies showed markedly improved bone regeneration in aged rat mandibular defects, with superior bone formation compared to control groups.

Conclusions

M2exo@TDN-Mel achieves synergistic modulation of the ROS scavenging-osteogenic differentiation cascade in aged BMSCs. Concurrently, the M2exo biomimetic membrane targets inflammatory macrophages and mediates their reprogramming, suppressing the release of pro-inflammatory cytokines via inhibition of the NF-κB/NLRP3 signaling pathway. Ultimately, this system enables efficient repair of jawbone defects in aged rats.

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Short-scar Deep Plane Facelift for Facial Contouring Related Laxity

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Xi Fu

Abstract

Objective
While reduction malarplasty and gonioplasty effectively address skeletal disproportion, subsequent soft tissue laxity presents a unique reconstructive challenge in younger patients. This study investigates the efficacy of a short-scar deep plane facelift technique specifically designed to correct post-contouring facial sagging while minimizing visible scarring.
Methods
Twelve consecutive patients (mean age 36.5 ± 3.2 years; range 31-42) presenting with midface and jawline laxity following facial contouring surgery underwent a modified deep plane lift between April 2023 and February 2025. The surgical protocol featured three key innovations: 1. Incision design: beveled temporal hair tuft-sparing incision extending to the helical crus (or tragus posterior edge if needed).
Dissection: Subcutaneous undermining (5 mm beyond SMAS incision) followed by sub-SMAS dissection under the platysma, above the buccal fascia, and along the surface of the zygomaticus major muscle, to the nasolabial fold and nasofacial crease, including complete release of premasseteric and zygomatic ligaments ("tent-lift" technique).
Flap Advancement: Composite flap anchored to parotid-masseteric and deep temporal fascia using 3-0 Ethibond sutures.
Results
All patients achieved significant mid/lower facial rejuvenation with 2–24 months of follow-up. No complications (asymmetry, hematoma, nerve injury, or parotid damage) were observed.
Conclusion
The short-scar deep plane facelift is a safe and effective solution for skin laxity after facial contouring surgery, offering stable outcomes with minimal scarring.

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Moving beyond surgical excellence: A qualitative systematic review into the perspectives and experiences of children, adolescents, and adults living with a rare congenital craniofacial condition and their parents

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Lars Kölby



Marizela Kljajic

Abstract

Introduction

This qualitative systematic review aims to get a better understanding of what it means to live with a rare congenital craniofacial condition according to patients and their parents. It marks the start of a series of qualitative and quantitative studies, in which patient(s) (representatives) with rare congenital craniofacial conditions and parents are involved, that focus on their research needs and daily challenges. In these initiatives, individuals from multiple European countries are involved. Eight patient representatives provided input to this study.

Methods
After a systematic search, 1291 studies were screened and 32 qualitative and mixed methods articles (> 691 participants) were included. ENTREQ, Cochrane, and COREQ checklists were used for reporting qualitative evidence synthesis and assessment of reporting of included studies.

Results
Studies predominantly included parents' perspectives and used mixed samples of diagnosis and sometimes combined the parent and patient perspectives. The results sections of the articles were analysed inductively using Thematic Synthesis (i.e. line-by-line coding, generating descriptive and analytical themes). Five analytical themes were identified that describe experiences and perspectives: 1) Healthcare experiences, 2) Raising and Growing up, 3) Development of character, 4) Physical impact of the condition, and 5) Social experiences. Underlying themes illustrate that the different aspects throughout life are intertwined, that relationships in all different domains play an important role in shaping perspectives, and that experiences may change over time. Furthermore, it demonstrates that living with a craniofacial condition and undergoing treatment is multifaceted and that the perspectives of patients and parents may differ.

Conclusion
Well-being and quality of life of patients and their parents are dependent on many different aspects, and surgeons and other healthcare professionals should tailor their skills, expertise, and support to individual-specific needs besides medical indications and move beyond surgical excellence.

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Relating postnatal craniofacial growth in mouse, pig and human

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Abstract

Background

Mouse and pig have been widely used as animal models of choice for preclinical testing of various technologies in human craniofacial system. This study was to compare the craniofacial growth rates to identify analogous age relations from birth to puberty between mouse, pig and human.

Methods: CT datasets of 277 normal human individuals (age: 0-11.5 years), 32 miniature and standard pigs (Yucatan and domestic breeds, age: 0-6 months), and 34 wild-type mice (age: embryonic day E18.5-postnatal day P42), were used for the 3D skull reconstruction. 35 cross-species anatomical landmarks (LMs) were identified and placed on each reconstruction, then several 2D and 3D measurements were taken, including 6 linear dimensions and intracranial volume (ICV). A simple size estimator, cranial module (CM, average of max. cranial length, height and breadth) and two cranial indices were computed from linear dimensions, and the growth rates of ICV were calculated. Principal component analyses (PCA) were carried out to compare ontogenetic patterns of overall cranial form (size and shape) and shape among the three species.

Results

The overall cranial size of pigs and humans appears to vary within a similar range. For example, CM increases from approximately 50 to 100 in Yucatan minipigs and 50 to 140 in standard pigs from birth to 6month of age. This is similar to an increase from 45 to 155 in humans from birth to 11.5 years. ICV increases nearly linearly with overall cranial size throughout postnatal ontogeny in all three species, though at different rates. For example, ICVs reach 50% and 80% of puberty sizes by P5 and P14 in mouse, 1 and 3 months in standard pig, 0.5 and 2 months in Yucatan pig, and 0.5 and 2 years in human. PCA further indicates that the patterns of cranial form changes in pig are more similar to that of human than of mice.

Conclusion

This study compares the allometric craniofacial growth trajectories in mouse, pig and human. The pattern of cranial form ontogeny in pigs is closer to humans than mice which are smaller but manifest a more similar calvarial suture morphology and fusion pattern to humans.

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Assessing hydrocephalus and cerebellar ectopia in Apert syndrome patients undergoing posterior vault distraction osteogenesis

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Enrico Ghizoni **Cesar Augusto Raposo-Amaral** **Felipe Landgraf** **Cassio Eduardo Raposo-Amaral**

Abstract

Purpose
Posterior vault distraction osteogenesis (PVDO) has been employed over the past fifteen years to treat various clinical features commonly associated with Apert syndrome. The primary objective of this study is to evaluate the efficacy of PVDO in addressing elevated intracranial pressure (ICP) and ectopia of the cerebellar tonsils (ECT) in young patients with Apert syndrome. Additionally, we aim to assess the prevalence of hydrocephalus in Apert syndrome patients who have undergone PVDO.

Methods
This retrospective study involved a cohort of 40 consecutive patients diagnosed with syndromic craniosynostosis (SC) and Apert syndrome, who underwent PVDO between 2012 and 2022. Each patient received at least one year of follow-up care post-surgery. We verified demographic data, diagnoses, surgical details, and outcomes through medical records, clinical photographs, radiologic examinations, and interviews with the parents of the patients.

Results
The average age of patients when PVDO was performed was 12.91 ± 10 months. The average posterior advancement distance achieved per patient was 22.68 ± 5.26 mm, and the average hospital stay was 3.56 ± 2.44 days. Blood transfusion data indicated an average volume of 98.47 ml (17.63 ml/kg). Among the cohort, five patients (14%) presented with ECT preoperatively; PVDO completely resolved ECT in three of these patients (60%). One of these three patients later developed syringomyelia, necessitating extra-dural foramen magnum decompression. The remaining four patients were asymptomatic regarding ECT for at least one year post-surgery and did not require further treatment. Additionally, two patients developed hydrocephalus, which required the placement of a ventriculoperitoneal shunt.

Conclusions
This study demonstrates that PVDO is effective in significantly reducing symptoms of diagnosed elevated ICP and addresses ECT in 60% of patients with Apert syndrome. Hydrocephalus is an uncommon condition in this population, and the effectiveness of PVDO in treating hydrocephalus remains uncertain.

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Characterizing normal craniofacial growth to 18 years of age

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Talitha Asmaria

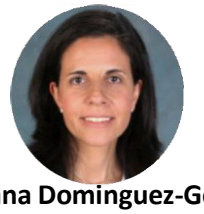

Ce Liang


Maxime Taverne


Nicolas Kogane


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Susana Dominguez-Gonzalez


Roman Khonsari


Mehran Moazen

Abstract

Background

Understanding the natural development of the human craniofacial system is critical in optimising clinical management of craniosynostosis. This study was to (1) carry out a detailed characterisation of size changes in human cranium from 0 to 18 years of age; (2) evaluate the overall ontogenetic growth trajectory and developmental patterns of craniofacial components; (3) predict average cranial models at specific ages.

Methods

Based on our prior study of characterizing the postnatal craniofacial growth (age: 0-4 years, n=217), a total of 110 CT datasets of normal individuals from 4 to 18 years of age were collected and reconstructed. Changes in overall cranial size were quantified through a series of 2D and 3D measurements, including 47 linear dimensions and 4 volumes/cavities, based on 88 anatomical landmarks. Geometric morphometric analyses were then carried out using 2304 surface semi-landmarks placed on each skull models. Here, the overall growth trajectory and ontogenetic morphological variations were evaluated, and the average cranial models were generated.

Results

The overall cranial size shows rapid increase over the first 6 years of life, followed by a plateau trend in later childhood and adolescence. The intracranial volume varies in a similar pattern as cranial size, with mean values of 490, 1350, and 1500ml at 0, 6 and 18 years of age. Bilateral orbital volume increases rapidly from around 10 ml at birth to 42 ml at 6-year-age, stabilising until 12 years then increasing to around 52ml at 18 years. Nasal cavity volume increases linearly from approximate 5 to 40ml from 0 to 18 years of age. From the linear and volumetric measurements, our results indicate that males are larger than females and that sexual dimorphism becomes more pronounce with age. According to principal component analysis, the cranium (size and shape) exhibits larger morphological variation within the first year of life, than that of 1-6 and 6-18 years. However, the varying mode of cranial shape alters significantly before and after roughly 4.5 years of age.

Conclusions

This study highlights the allometric growth trajectories, with accelerated growth over 0-6 months, then the rates gradually decrease between 0.5-4 years and 4-18 years.

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Complications of prone positioning in craniofacial surgery. A review of 595 cases in the Oxford Craniofacial Unit, UK

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Abstract

Craniofacial surgery in the prone position is undertaken when access to the posterior skull is required. Most operations were total calvarial remodelling, calvarial expansion, posterior remodelling or posterior expansion. A securely fastened endotracheal tube is the airway device of choice. In the event of a cardiac arrest, chest compressions and defibrillation can be commenced in the prone position. The authors analysed a series of 595 craniofacial prone procedures performed in the Oxford Craniofacial Unit over the last 30 years. 40 complications were identified. Postoperative vision loss (2 cases), accidental extubation (7 cases), blocked endotracheal tube (1 case) and cardiovascular complications, including hypovolemia, cardiac arrest and death (1 case), were the most notable. The most common surgical complications were dural tear (24%), pyrexia (20%), emissary vein bleed (3%), moderate bleeding (less than 1 blood volume) (2.5%), sinus tear (2.5%), subdural haematoma (1.3%), persistent CSF leak (1%), mastoid air sinus breach (1%), and major bleeding (more than 1 blood volume) (0.8%). Ophthalmic complications range from corneal abrasions to postoperative visual loss. The authors previously published the two cases of central retinal artery occlusion (CRAO) from this cohort. Spontaneous cases of CRAO have been reported with prolonged oral TXA use but not following intraoperative use. Ischaemic optic neuropathy can occur without any pressure on the globe. The security and patency of the airway must be checked after proning the patient. If it has become dislodged, the patient can be turned supine on the patient trolley and reintubated. In the context of raised ICP, our unit tries to avoid prone positioning (21 out of 30 patients since 2019). Since avoiding the prone position and TXA in patients with raised ICP, we have had no further cases of CRAO. This review highlights that proning is not without risk and should only be undertaken in high volume units, trained in managing the perioperative care of prone patients. If surgically feasible, the prone position should be avoided whenever possible.

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Research on the accuracy of multi-dimensional dynamic navigation based on MR in genioplasty

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Mingzhe Wan


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Min Hou

Abstract

Objective

In this study, mixed reality（MR）technology and optical positioning system were combined to construct a mixed reality dynamic navigation surgical system, and the simulation experiment of genioplasty was carried out in the mandibular resin model to explore the accuracy of the new navigation system.

Methods

12 patients were selected from December 2023 to December 2024 who received genioplasty in Tianjin Stomatological Hospital. All patients were photographed by cranial CBCT, and the scanned data were saved in DICOM format and imported into ProPlan CMF software for 3D model reconstruction and virtual surgical planning. 24 samples of mandible models were printed with photosensitive resin materials , which were divided into the experimental group and the control group. Anatomical landmarks such as tooth cusps and fossas were used for registration experiments. The experimental group used the mixed reality surgical navigation system, in which the surgeon wore a HoloLens 2 to perform genioplasty under the 3D virtual surgical planning, tracked the mandibular resin model and the surgical osteotomy instrument at the same time with the help of the Aimooe optical positioning system. In the control group, a 3D printed osteotomy guide was used to guide the operation. Postoperative models were assessed using CBCT to evaluate surgical accuracy.

Results

In the experimental group, the fiducial registration error was (0.51±0.08) mm. The distance error between each measurement point in the osteotomy plane and the preoperative planning in the experimental group was (1.67±0.48) mm and (1.45±0.47) mm in the control group. Regarding the angle change of the osteotomy plane was (2.77±1.83) ° in the experimental group and (2.06±1.35) ° in the control group. There was no significant difference in the measurement indexes between two groups (P>0.05).

Conclusion

The system achieved comparable accuracy to digital osteotomy guides, aligning with clinical standards for genioplasty. The new navigation system enables real-time visualization and tracking the osteotomy depth and angle of the surgical instruments and has significant clinical implications for avoiding injury to important blood vessels and nerves during deep facial surgeries.

Keywords

Mixed Reality, Optical Positioning, Registration Genioplasty, Resin Model

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Comparison of monoblock distraction and front-orbital + Le Fort III distraction

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Abstract

Introduction

For the treatment of craniosynostosis with midface involvement, there are two main surgical approaches: the conventional monoblock distraction, which involves osteotomizing the frontal bone and distracting it as a single unit with the orbital and midface structures, and the front-orbital plus Le Fort III distraction, which combines fronto-orbital distraction with Le Fort III osteotomy.In this study, we compared the two techniques and evaluated their indications, advantages, and disadvantages.

Subjects and Methods

The study included eight cases of syndromic craniosynostosis in which the frontal-orbital bones and midface were simultaneously distracted. The cases were categorized as follows: Crouzon syndrome (4 cases), Pfeiffer syndrome (2 cases), and Apert syndrome (2 cases). The surgical procedures were monoblock distraction and front-orbital + Le Fort III distraction, with four cases each being compared and analyzed. The devices used were either internal fixation or external fixation, with some cases employing a combination of both.

Result

Using 3D software measurements, both surgical procedures demonstrated equivalent cranial volume expansion and airway enlargement due to cranial and maxillary advancement. Additionally,

improvements in occlusion and facial appearance were observed. Compared to the monoblock group, the front-orbital plus Le Fort III group had a lower age at surgery and less blood loss, but no significant difference in surgical time was noted between the two groups.

Discussion

In recent years, we have been performing early posterior cranial distraction followed by fronto-orbital advancement (FOA) for patients with syndromic craniosynostosis. In cases with poor respiratory status or older children, we occasionally perform FOA including the midface. In this study, we compared two different surgical techniques. Compared to monoblock distraction, front-orbital + Le Fort III distraction has advantages such as less blood loss and relatively low invasiveness because the forehead is not detached from the dura mater, and the extension direction of the fronto-orbital and midface can be adjusted. On the other hand, disadvantages include the inability to reshape deformed forehead regions and the inability to perform the procedure in older children with well- developed frontal sinuses. It is considered desirable to select the appropriate technique based on the specific case.

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A Multi-Institutional Analysis of Frontal Sinus Volume in Normocephalic Sagittal Craniosynostosis

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Alexander Velazquez **Michael Lebhar** **Todd Nichols** **Laura Humphries** **Ian Hoppe**

Abstract

Purpose

This study aimed to investigate frontal sinus volume as a potential indicator of cranial compensatory growth in unoperated normocephalic nonsyndromic sagittal craniosynostosis (NNSC) patients. Previous research has suggested that frontal sinus volume may be suppressed in unoperated craniosynostosis due to intracranial space conservation. This multi- institutional study combines patient cohorts from two institutions to further explore this phenomenon.

Methods

Head computed tomography (CT) scans from 49 unoperated NNSC patients were analyzed and compared to age- and sex-matched controls. Frontal sinus volumes were measured using Materialise Mimics, and statistical analysis was performed. Inclusion criteria required the presence of a frontal sinus for volume measurement in both cases and controls. The presence or absence of frontal sinus pneumatization was compared between the groups.

Results

Out of 49 NNSC patients, 14 (28.6%) demonstrated the presence of a frontal sinus, compared to 100% of age- and sex- matched controls *Check P value*. Among the 27 newly included patients, 8 (29.6%) had a frontal sinus, reinforcing prior findings of reduced frontal sinus development in this population. When compared with controls, Pearson correlation analysis continued to show a strong association between NNSC and decreased-to-absent frontal sinus volume ($r = 0.987$, $P < 0.001$).

Conclusion

The expanded dataset from two institutions confirms a strong correlation between NNSC and decreased frontal sinus volume, suggesting that the restricted frontal sinus may serve as a radiographic marker of compensatory cranial changes. This study provides further evidence that frontal sinus absence may be an indicator of altered skull development and potentially elevated intracranial pressure in these patients. Future studies should investigate the clinical implications of this finding, particularly in relation to surgical decision-making.

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Evaluating Surgical Outcomes and Syndromic Correlates in Patients with Bicoronal Synostosis: A Comprehensive Study at Great Ormond Street Hospital (2009-2024)

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Abstract

Introduction

Bicoronal craniosynostosis (BCS) requires individualized treatment strategies to address both functional and aesthetic concerns. This study retrospectively analyzes 50 patients operatively managed at Great Ormond Street Hospital (GOSH) between 2009 and 2024. We evaluated the effectiveness of different surgical interventions and their long-term outcomes.

Methods

A structured review of the GOSH craniofacial surgical database identified patients with BCS who underwent at least one procedure. Patient baseline characteristics and demographics were documented along with outcome measures, such as; incidence of raised ICP and need for reoperation.

Results

50 patients (33 females, 17 males) underwent a total of 121 procedures. Follow up period averaged 4.6 years (range 7 months - 14.6 years). Eighty eight percent were syndromic. The most common indication for the first procedure was aesthetic concerns (48%), followed by raised intracranial pressure (ICP), 44%. The most frequently performed first procedure was Spring Assisted Posterior Vault Expansion (SAPVE) (31 cases, 62%), followed by Fronto-Orbital Remodeling (FOR) (10 cases, 20%). 54.8% of the SAPVE procedures were for Aesthetic Concerns and 70% of FORs were for Aesthetic Concerns. Twenty one patients (42%) required an independent second procedure. The most common independent second procedure was Posterior Vault Expansion (PVE) with springs (6 patients, 28.6%) followed by a combined procedure of FOR and removal of PVE springs (5 patients, 23.8%). Raised ICP was the most frequent indication (10 patients, 47.6%). 18 patients (36%) underwent 3 or more procedures. All ICP bolt placements except one led to further surgery within two months.

Conclusion and discussion

Managing patients with BCS poses unique challenges and complexities. FGFR2-Apert cases demonstrated the highest rate of raised ICP and functional secondary interventions, while TWIST and FGFR3-Muenke required more aesthetic refinements. Patients who underwent an FOR as an initial procedure predominantly underwent secondary procedures for elevated ICP, whilst, PVE followed by FOR was the most effective surgical sequence for optimising aesthetic and functional outcomes. This balances the treatment of the early risk of raised ICP followed by more lasting aesthetic results with a FOR at an older age, thus emphasizing the importance of long-term surgical planning to enhance outcomes in bicoronal craniosynostosis.

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"Triangular ostectomy" for effective removal of bony interference during orthognathic surgery with help of virtual surgical plan

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Hao Wu


Hao Sun


Xudong Wang

Abstract

Background

Sagittal split ramus osteotomy (SSRO) is a common surgery to treat laterognathism. Unfortunately, the proximal and distal segments do not always align passively. Herein, we developed a novel ostectomy method with help of virtual surgical plan, named as "triangular ostectomy" to remove interference fast and accurately. In this study, we compared this new technology with traditional grinding method and PBO technique to reveal the suitability of "triangular ostectomy".

Materials

12 patients with laterognathism were involved who had orthognathic surgery at the Department of Oral and Maxillofacial Surgery, Ninth People's Hospital from July 2022 to March 2023. All SSRO surgeries were performed using the modified Hunsuck technique. 8 cases used the "triangle ostectomy" technique with preoperative 3D simulation to analyze the bony interference. 1 case used the modified Ellis technique and 3 cases used the traditional grinding method. The operating time was recorded.

Results and Discussion

The average operation time for "triangle ostectomy" technique was 4.2 minutes; where PBO technique cost 15 minutes and traditional grinding method cost 8 minutes. The "triangle ostectomy" technique significantly reduced surgical times and got an accurate removal of bony interference successfully. There were several operation tips. (1) Before operating on maxilla, the mandibular flap can be performed previously. And the mandible osteotomy can be completed in advance without splitting. (2) The best chance for "triangle ostectomy" is the time just after bilateral sagittal split was completed, when the distal segment can be moved to the biggest extent. At this point, the bony interference can be easily exposed, and the osteotomy can be much safer.

(3) The tunnel retractor should be placed deeply behind the distal segment to fully expose the lingula. (4) The assistant should pull the distal segment outwardly and rotate it clockwise for better exposure.

Conclusion

The surgical modification proposed in this study, which involves performing a "triangular ostectomy" below the lingual with help of virtual surgical plan, can quickly and accurately eliminate the bony interference of proximal and distal segments. Especially treated patient with severe facial asymmetry, this technique to remove bony interference should be taken into consideration.

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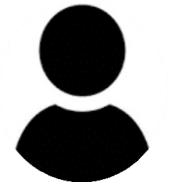
Indications for emergency surgery in pediatric orbital floor fractures: Orbital content entrapment and computed tomography findings

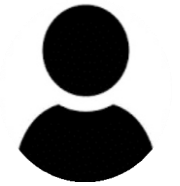
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Chunyan zhao


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Akiko Yamashita


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Kenichi Shimada

Abstract

Background
In pediatric orbital fractures, it is often difficult to ascertain whether muscle or orbital fat is truly entrapped or is merely flanked by bony fragments. This study was conducted to compare intraoperative findings with preoperative computed tomographic impressions in instances of confirmed orbital content entrapment.

Methods
A retrospective chart review was undertaken, limited to pediatric patients suffering orbital fractures between February 2002 and January, 2023. Subjects were assigned to one of two groups (entrapment or non-entrapment), reflecting the presence or absence of orbital content incarceration. Preoperative computed tomographic scans were reviewed in all instances for between-group comparison of orbital floor bone gaps in coronal views.

Results
fourteen patients qualified as entrapment, as opposed to eight categorized as non-entrapment. Group demographics were similar in terms of age and gender. Orbital floor bone gaps ranged from 1–3 mm in patients with entrapment, whereas members of the non-entrapment subset displayed gaps >4 mm. Postoperative diplopia fully resolved within 12 months, except in one patient with entrapment (3-mm bone gap) and a missing rectus on imaging who remained slightly diplopic in downward gaze.

Conclusions
Orbital floor bone gap <3 mm may well constitute a new indication for emergency surgical treatment of pediatric orbital fractures, even in minimally symptomatic states (no oculocardiac reflex or moderate diplopia), to ensure the integrity of inferior rectus muscle and its fibrous connections.

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Impact of Preoperative Intramedullary Injection of Fibrin Sealant on reducing Hemorrhage in Mandibular Osteotomy: A Prospective RCT Study

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Zhang Yichi

Abstract

Background
Mandibular angle osteotomy is a common craniofacial plastic surgery procedure. During the surgery, the large exposure area of the medullary cavity of the mandible and the substantial blood loss occur. The conventional use of bone wax for hemostasis can cause foreign body reactions, hence there is a need to find a method with fewer side effects and better efficacy in controlling bleeding from the medullary cavity.

Objective
The purpose of this study was to evaluate the effect and feasibility of directly injecting fibrin sealant into the medullary cavity in patients undergoing mandibular angle osteotomy to reduce intraoperative bleeding.

Methods
Between July 2024 and January 2025, a total of 30 patients undergoing MAO were randomly assigned to either the control group (n = 16) or the fibrin sealant group (n = 14).

Results
The fibrin sealant treatment group had significantly less bleeding during the osteotomy procedure compared to the control group (a reduction of 71.86% in osteotomy bleeding), with a 15.4% decrease in total intraoperative blood loss and reduced postoperative drainage. There was no significant difference in the incidence of postoperative complications.

Conclusion
Direct injection of fibrin sealant into the medullary cavity of the mandible significantly reduced intraoperative bleeding, particularly during the osteotomy, with a reduction of 71.86%, providing a new treatment option for patients undergoing MAO to reduce intraoperative bleeding and as an alternative to the use of bone wax.

Keywords
Mandibular Osteotomy; Hemorrhage; Fibrin Sealant; Randomized Controlled Trial

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Mechanism of HDAC4 in Inhibiting Osteoporosis and Promoting Skull Defect Regeneration

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Shuai Wang



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Abstract

Objective

To investigate the role of HDAC4 in bone homeostasis under pathological conditions and its regenerative effects on skull defects in osteoporotic states.

Materials and Methods

Single-cell RNA sequencing data were analyzed to identify transcriptomic alterations in bone marrow mesenchymal stem cells (BMSCs) under osteoporotic conditions, pinpointing critical BMSC subpopulations regulated by HDAC4. Transgenic mouse models were constructed to investigate the impact of Hdac4 knockout in Pdgfra-positive cells on osteoporosis.

Exosome induction experiments were performed to assess biological effects of Hdac4-knockdown BMSCs on osteogenic- related cells. An ovariectomized (OVX) mouse model with skull defects was established to validate Hdac4's role in bone regeneration in vivo.

Results

Hdac4 knockout in specific BMSC subpopulations inhibited osteoporosis progression, increased trabecular bone mass, and altered cortical bone thickness. Hdac4-deficient BMSCs suppressed apoptosis and enhanced osteogenic differentiation of osteogenic-related cells via intercellular communication, thereby promoting osteogenesis. Extracellular vesicles derived from Hdac4-knockdown BMSCs facilitated skull defect regeneration in osteoporotic mice.

Conclusions

HDAC4 regulates osteogenic activity by modulating intercellular communication and intrinsic biological functions of BMSCs. Extracellular vesicles from Hdac4-deficient BMSCs represent a potential bioactive material for enhancing bone regeneration.

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A Quantitative Scoring System for Craniofacial Bone Atrophy in Parry Romberg Syndrome: The PRS-HAI and Occlusal Cant Framework

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Zhaojian Wang



Xiaolei Jin

Abstract

Background
Parry-Romberg syndrome (PRS) is a rare disorder characterized by progressive craniofacial atrophy, including bony structures. However, no standardized method currently exists to quantify osseous involvement. This study aims to develop and validate a novel scoring system for evaluating craniofacial bone atrophy in PRS.

Method
A retrospective analysis of 48 PRS patients was conducted using three-dimensional CT-based measurements. Symmetry indices were calculated for key craniofacial regions, leading to the development of the Parry-Romberg Syndrome-Hard Tissue Atrophy Index (PRS-HAI) to stratify bone atrophy severity. The PRS-HAI was then correlated with occlusal cant (OC), a clinical marker of skeletal deformity.

Results
The PRS-HAI effectively classified patients into mild, moderate, and severe atrophy categories, demonstrating significant differences across severity groups ($p < 0.001$). An inverse correlation between PRS-HAI and OC was observed ($R = -0.843$), offering a quantitative foundation for assessing skeletal atrophy and occlusal deformity. A treatment algorithm based on PRS-HAI and OC grades was proposed to guide surgical interventions.

Conclusions
The combined scoring system of PRS-HAI and OC provides a standardized, quantitative framework for assessing craniofacial bone atrophy, facilitating tailored surgical strategies and advancing clinical research. Prospective studies are needed to validate its clinical applicability and long-term utility.

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Evaluation of Bone Regeneration Following Suturectomy Using Absorbable Plates in Early Surgery for Syndromic Craniosynostosis

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Mariko Noto



Keisuke Imai

Abstract

Introduction

We perform suturectomy using absorbable plates in patients with syndromic craniosynostosis under 3 months of age. This technique provides natural cranial expansion during rapid intracranial volume expansion by inhibiting bone formation and fusion in the early postoperative period and improves a severely deformed cranial shape. However, the prolonged inhibition of bone formation may result in large residual bone defects, which may complicate future midfacial osteotomies. Therefore, adequate bone regeneration after plate resorption is essential. Here, we report our findings regarding the postoperative course of bone formation.

Subjects and Methods

Between January 2015 and December 2021, we retrospectively analyzed patients with syndromic craniosynostosis presenting with severe intracranial hypertension and bilateral coronal synostosis, who underwent this procedure and were followed for at least 2years postoperatively. We performed suturectomy with an 8 mm width resection, and a sheet-type absorbable plate (Lactosorb®) was interposed bilaterally between the resected bone edges for fixation. Bone defects were assessed using three-dimensional computed tomography (CT) images obtained postoperatively. Using Mimics software, we measured the volume of the bone defect and evaluated the progression of bone regeneration and intracranial volume changes.

Results

This study included five patients (two boys and three girls) with Apert syndrome. The mean age upon surgery was 61.5 days (range; 25–87 days) and mean follow-up period for CT-based bone defect evaluation was 55.1 months (range; 27– 102 months). Two years postoperatively, the average increase in intracranial volume was 769 mL (682–880 mL) and mean percentage of bone regeneration was 97.6% (96–99.9%).

Conclusion

This surgical technique allows prompt postoperative cranial expansion following suturectomy in patients with syndromic craniosynostosis who present with bilateral coronal synostosis. Improvement in intracranial hypertension was achieved, and sufficient bone regeneration occurred after plate resorption without significant residual bone defects. These findings suggest that secondary cranioplasty and/or future midface advancement can be easily performed with fewer complications.

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Multi-Linear 3D Craniofacial Infant Shape Model Comprising Skin and Bone Surface

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Abstract

We present our multilinear shape model of the infant cranium. We collected a large set of 3D photographs, including multi- longitudinal data. Each scan was landmarked in the facial region, and the entire head was registered using non-rigid iterative closest point. Head-skull mesh pairs were extracted from a second dataset of CT scans. The skulls were labelled using a dense landmarking scheme that marked both sides of all major cranial sutures. The registered template mesh consists of disconnected components in order to match the suture borders. For skulls with fused sutures, the disconnected mesh components were coupled at the boundaries. Our skull model accurately depicts the course and fusion of all major sutures, combining the cranium with the mandible to enable detailed growth modelling. We constructed a multilinear principal component analysis (PCA) model by reprojecting a linear autoencoder back to PCA space after training it to disentangle identity, expression, and time-related variances in our dataset. The time dimension was learnt from babies treated for positional cranial deformities, thus encoding growth, weight fluctuations, and cranial shape adjustments. Three fields of clinical application will be presented. Firstly, in the case of positional plagiocephaly, we correlated the cranial vault asymmetry index (CVAI) with our model space to enable the model to correct the asymmetry in this patient group. Secondly, we tested synostosis correction for different clinical entities. For metopic synostosis, the metopic index was combined with the cephalic index to ensure an optimal head length-to-width ratio. Changing the model space to reflect only a healthy metopic index would lengthen the skull to an undesirable extent. Finally, a set of 12 measurements was applied to ensure healthy distribution of the entire cranial volume, as demonstrated with sagittal synostosis. Thirdly, the model enables face and skull inference in both directions. Soft tissue inference achieved a vertex reconstruction error of 1.8 ± 1.1 mm via ridge regression. Conversely, our model infers neurocranial skull structures from soft tissue with an accuracy of 2.7 ± 1.6 mm. Further clinical testing of the 3D Craniofacial Infant Shape Model is required for diagnosis, treatment planning and surveillance, and outcome analysis.

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Evaluation of a Facial Dysmorphology Analysis Algorithm (Face2Gene) in Identifying Treacher Collins Syndrome Among Diverse Population

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Abstract

Background
Treacher Collins Syndrome (TCS) is an uncommon congenital disease of the craniofacial complex. While there are classic facial manifestations of TCS, they do present with a wide range of variability. Face2gene (F2G) is a deep- learning algorithm that can provide differential diagnosis of syndromes via analysis of 2-dimensional facial images. This may aid in better recognition of TCS and earlier referral for multidisciplinary management. In low-resource countries, AI- assisted diagnosis may play an increasingly important role in the telemanagement of such syndromes. However, the database for F2G tend to be skewed towards identifying facial gestalts from the Caucasian population. Our primary aim is to evaluate and compare the performance of F2G in TCS patients of different racial groups. The secondary aim will be to co-relate the pathognomonic facial features of these TCS patients with the diagnostic confidence by F2G.

Methods
Publicly available images of TCS patients of Caucasian, Chinese and Indian race were sourced for and screened prior to inclusion for clinical evaluation of facial dysmorphological features. Next, the diagnostic sensitivity & gestalt score via F2G for each image were then derived. Statistical analysis for correlation between clinically identified features and F2G-derived gestalt scores for the TCS patients was performed.

Results
A total of 127 images of TCS patients were analysed by F2G. Within the suggested list of 30 differential diagnosis, the top diagnosis of TCS suggested by F2G was found in 93.7% of all images. An accuracy of 82.6%, 95.7% and 96.3% was found in the Indian, Chinese and Caucasian samples respectively. A higher prevalence of malar hypoplasia was observed clinically amongst the Caucasian and Chinese cohorts as compared to that of the Indian cohort ($P < 0.001$). The F2G algorithm accurately predicted TCS with higher gestalt scores when malar hypoplasia ($P=0.006$) and Tessier cleft 6 ($P=0.023$) were present.

Conclusion
Despite the subtle variations in facial gestalts of TCS amongst racial groups, F2G had a high overall diagnostic accuracy of 93.7%. Further optimisation of AI-technology may lead to better recognition and earlier referral for multidisciplinary care for TCS patients.

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Advance of Facial Bone Contouring Surgery in China

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Abstract

Bony facial contouring surgery mainly focus on zygoma and mandible. Overview of facial bone contouring surgery development in China. Introduction of procedures of zygomatic reduction and mandible reduction, such as mandibular angle reduction, margin reduction and chin reduction procedures. Discussion of pre-surgical design, template assisted, navigator assisted and robot-assisted advancement facial bone contouring surgery. Discussion of complication of facial bone contouring surgery. Conclusion of the surgery: Safety is the first priority. Narrowing frontal view of face can keep obvious results. For patient with stylish purpose need to be double check and confirmed. For patient with physiognomy (fortune reason) and transgender purpose will be cautious.

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Mechanism of Trans-sutural Distraction Osteogenesis via Macrophage BMP2 Axis

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Peiyang Zhang **Yuan Liao** **Hongsen Bi** **Zhenmin Zhao**

Abstract
Background & Purpose
Trans-sutural distraction osteogenesis (TSDO) is a minimally invasive therapy for midfacial hypoplasia in children, yet its molecular mechanisms remain unclear, leading to challenges such as prolonged treatment cycles and postoperative relapse. This study integrates clinical imaging and single cell sequencing to elucidate how mechanical stress activates macrophages to secrete BMP2, thereby regulating osteogenic differentiation of suture mesenchymal stem cells (SuSCs).
Methods & Results
Clinical Analysis
3D-CT reconstruction of pediatric patients revealed significant osteogenesis in the zygomaticomaxillary suture post-TSDO, with widened frontozygomatic and sphenozygomatic sutures and improved ANB angles ($p<0.05$).
Murine Model
Micro-CT demonstrated increased bone mineral density (BMD) and bone volume fraction (BV/TV) in the zygomaticomaxillary suture. Histology confirmed elevated osteoblast activity, vascularization, and collagen deposition.
Single-Cell Profiling
The suture microenvironment identified a macrophage subset (Mph_Cluster0) that upregulated BMP2 secretion under mechanical stress. This activated BMPR2 on SuSCs, enhancing osteogenic marker OPN expression.
Mechanistic Validation
Multiplex immunofluorescence showed spatial co-localization of BMP2+IL10+ macrophages and BMPR2+OPN+ SuSCs. Gpc3 knockdown amplified BMP2-driven osteogenesis, suggesting its role in Wnt-mediated negative feedback to prevent suture fusion.
Innovation & Significance
Immune-Driven Osteogenesis
Mechanical stress polarizes macrophages toward an M2- like phenotype, secreting BMP2 and IL10 to promote SuSCs differentiation.
Dual Regulatory Network
BMP2-BMPR2-OPN axis drives osteogenesis, while Gpc3 sustains suture patency via Wnt/β-catenin, balancing bone formation and remodeling.
Clinical Translation
Targeting BMP2 delivery or modulating Gpc3/Wnt signaling could shorten TSDO duration and reduce relapse risks.
Conclusion
This study pioneers the mechanistic link between mechanical stress, macrophage immunomodulation, and stem cell osteogenesis in TSDO. The macrophage-BMP2-Wnt axis provides a framework for personalized treatment strategies, addressing current limitations in craniofacial regenerative surgery.

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Comparative Analysis of Closed Percutaneous Screw Reduction and Open Reduction with Internal Fixation for Frontal Sinus Fractures

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Guven Ozan Kaplan **Kutluhan Yusuf Kucuk** **Murat Kara** **Mert Calis** **Gokhan Tuncbilek**

Abstract

The primary objective of the surgery for isolated anterior table fractures is to restore the normal contour of the forehead and prevent visible late-term deformities. The traditional approach involves the reduction and fixation of the fractured segment through a bicoronal incision using mini plates and screws . Nevertheless, the bicoronal incision is associated with complications, including alopecia, frontal hypoesthesia, infection, and hypertrophic scars. Alternatively, minimally invasive techniques such as closed percutaneous screw reduction can be employed. The aim of this study was to compare closed percutaneous screw reduction to traditional open reduction-internal fixation (OR-IF) for the treatment of isolated anterior table fractures. In closed reduction group, the largest bone fragments that allow screw placement were marked on the skin. A stab incision was made at the center of the bone fragments, and auto-drive intermaxillary fixation screws were carefully placed, taking care not to cause any further downward displacement of the bone. Surgical steel wires were tied around the screws, and traction force was applied synchronously in a controlled manner until the reduction of the bone fragments was achieved. No additional fixation was necessary. Both groups were evaluated in terms of operative variables, complications, and treatment success. Of 32 patients included, 19 patients underwent OR- IF, while 13 underwent percutaneous screw reduction. The median operative time, length of hospital stays, and treatment cost of the OR-IF group were 100 minutes (range 60-130), 4 days (range 3-9), and $727 (range $642-$1291), respectively. The same variables for the closed reduction group were 30 minutes (range 20-40), 2 days (range 1-2), and $303 (range $252-$349), respectively. The closed reduction group exhibited a shorter operative time ($p< 0.001$), reduced length of hospital stays ($p< 0.001$), lower treatment cost ($p< 0.001$), and a lower complication rate ($p=0.025$) compared to the OR-IF group. Late-term outcomes in both groups showed no visible contour changes or step deformities. In conclusion, the percutaneous screw reduction technique is a safe and effective option with minimal morbidity in the treatment of isolated anterior table fractures. Therefore, traditional OR-IF should be reserved for fractures that are not suitable for reduction using minimally.

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Retrospective Study of Surgical Navigation and Screw-track Transfer Guide Plate in Treating Orbital Zygomatic Trauma

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Jie Yuan **Min Wie** **Huichuan Duan**

Abstract

Objective
To explore the effect of surgical navigation and screw-track transfer guide plate in orbital zygomatic trauma therapy.

Patients and Methods
In 56 orbital zygomatic trauma patients（46 was treated in 1 month post-trauma, 10 was treated in 1-10 years post-trauma with hypertelorism）, open reduction and internal fixation (ORIF) within little incision or U shape/Box osteotomy were used with surgical navigation (n=53) or screw-track transfer guide plate (n=3).

Result
All patients recovered well and without complications. Both methods could increase the repositon accuracy, especially in concealed site. Furthermore, screw-track transfer guide plate could improve the reposition efficiency, which was quicker than surgical navigation.

Conclusion
Both methods could increase the reposition accuracy, screw-track transfer technique could improve the reposition efficiency further.

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Clinical Outcomes and Complications Following Mandibular Distraction Osteogenesis in Pierre Robin Sequence

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Abstract

Background

Pierre Robin sequence (PRS) is clinically characterized by the triad of glossoptosis, micrognathia, and respiratory distress. In children with PRS, mandibular distraction osteogenesis (MDO) is routinely performed to alleviate airway obstruction; however, concerns remain regarding the efficacy of MDO in relieving clinical symptoms, potential facial nerve dysfunction, and other complications.

Methods

A retrospective review of a prospectively collected database was performed to identify patients with PRS who underwent MDO at the Children's Hospital of Fudan University between June 2018 and December 2024 and completed at least 3 months of follow-up after device removal. Data collected included patient demographics and complications such as facial nerve injury. Logistic regression analysis was performed to investigate predictors of outcomes and complications.

Results

The study enrolled 55 patients (36 males,65.45%; 19 females,34.55%). The mean age at MDO was 58.41 ± 53.99 days. The average length of mandibular distraction was 11.14 ± 2.08 mm, the average duration of intubation was 8.89 ± 4.85 days, and the average time to hardware removal was 126.44 ± 19.13 days. All patients underwent surgery to relieve airway obstruction. Six patients (10.90%) presented with surgery-related complications, among whom 5 patients (9.09%) presented with facial nerve dysfunction, one patient presented with surgical site infection(1/55,1.81%) manifested as cutaneous sinus tracts secondary to foreign body reactions to the device. Other postoperative complications included ventilator-associated pneumonia(15/55,27.27%) and enteric infection(1/55,1.81%). Facial nerve dysfunction manifests as drooping of the oral commissure or facial asymmetry during movement, typically involving the marginal mandibular branch, with two patients demonstrating no significant improvement during the follow-up period. 89.09% pediatric patients' parents/caregivers reported "very satisfied" with the surgical outcomes, with the remaining 10.90% rating the results as "satisfied". All patients exhibited satisfactory postoperative nutritional and respiratory status, and weight gain showed no significant difference compared to that of age-matched non-PRS children.

Conclusions

In this review of PRS patients, MDO demonstrated favorable therapeutic outcomes with a low incidence of procedure-related complications.

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Discussion on the Design of Contralateral Stress Interruption in Distraction Osteogenesis for Hemifacial Microsomia

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Abstract

Background
In unilateral mandibular distraction osteogenesis, the contralateral condyle shows coronal and transverse external rotation, and the contralateral mandibular arch shows bulging. For patients with severe deformities, the risk of temporomandibular joint ankylosis after distraction osteogenesis cannot be ignored, and the alignment of the upper and lower dental arches also needs to be considered. To address these issues, this article explores the design of contralateral stress interruption in hemifacial microsomia distraction osteogenesis treatment.

Cases and Methods
A retrospective analysis was conducted on the design data of 42 patients with hemifacial microsomia who underwent unilateral distraction osteogenesis in our department from 2018 to 2023. Three-dimensional image measurements were used to assess the coronal and transverse plane external rotation angles of the contralateral condyle and the degree of contralateral mandibular arch protrusion. If the coronal or transverse plane external rotation of the contralateral condyle exceeded 10 degrees, or the mandibular arch protrusion exceeded three tooth positions, a contralateral stress interruption design was adopted for bilateral distraction osteogenesis treatment.

Results
Among the 42 patients included in the study, 22 met the criteria for the stress interruption design and received bilateral distraction osteogenesis treatment. The treatment outcomes were consistent with the design plan. Postoperative follow-up showed that the patients' occlusal relationships were significantly improved, the temporomandibular joint movement functions were basically normal, and the facial asymmetry was significantly alleviated.

Conclusion
The application of contralateral stress interruption design in bilateral distraction osteogenesis for some patients with hemifacial microsomia has a good clinical effect, which can effectively improve the occlusion and facial symmetry problems.

Key words
Hemifacial microsomia, distraction osteogenesis, stress interruption, condyle, mandibular arch.

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Individualized Surgical Treatment for Different Types of Syndromic Craniosynostosis: Design, Implementation and Outcomes

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Xu Liang



Wei Min

Abstract

Syndromic craniosynostosis is characterized by a series of craniofacial deformities caused by the premature closure of multiple cranial sutures. The main clinical manifestations include abnormal skull shape, exophthalmos, maxillary retrusion, and midface hypoplasia. Craniosynostosis includes many subtypes, and there are significant differences in the clinical manifestations among these subtypes. For example, in Crouzon syndrome, subtypes such as cranial, craniofacial, and maxillary types may present with varying degrees of exophthalmos, abnormal skull shape or maxillary retrusion. The ratio of retrusion of the patients' maxilla, zygoma and other bones is also not uniform in one patient. The traditional surgical methods such as Lefort III or monobloc osteotomy have simply improved the overall appearance, but they lack fine adjustments to regional structures and hardly achieve perfect results. Therefore, it is of great significance to change the traditional single surgical approach and instead adopt a segmented osteotomy and adjustment of bone segments. Thus, before surgery, it is essential to compare and measure the changes in key craniofacial points of the patient, such as the supraorbital point, infraorbital point, anterior nasal spine point, zygomaticofrontal point, and zygomaticomaxillary point, using normal children of the same age as a reference. By doing so, the severity of deformities in different regions can be assessed. Based on this information, individualized osteotomy methods can be developed, with precise control over the amount and direction of movement of each bone segment. During Jan 2024 to Feb 2025, totally 9 patients were performed the individual surgical treatmen in our department. All the patients received an obviously improvement of the depression mid-face and the ratio of each mid-face bones. Only 1 patient underwent modified monobloc osteotomy had cerebrospinal fluid rhinorrhea early after operation and was recovered after lying in bed for another 7 days. And there were no other severe complications in another 8 patients. Therefore, the individual surgical method based on the measurement data pre- operations could obtain satisfied outcomes in craniosynostosis patients.

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The repair of orbital blowout fractures with endoscopy-assisted-My experience

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Jincao Yu

Abstract

Objective
To evaluate the clinical outcomes of endoscopy-assisted repair of orbital blowout fractures.

Methods
Between 2019 and 2024, a total of 69 patients with orbital blowout fractures were admitted to the hospital, comprising 41 males and 28 females with a mean age of 28.1 years. The causes of injury included blunt trauma in 42 cases and assault-related injuries (punches) in 27 cases. All patients underwent standard ophthalmologic examinations, supplemented by computed tomography (CT) scans of the orbit and periorbital bones. Based on anatomical classification, fractures were categorized as follows: 23 cases involving the orbital floor, 18 cases involving the medial wall, and 28 cases involving both the orbital floor and medial wall. The surgical procedure involved an initial forced duction test, followed by a conjunctival incision to access the subperiosteal space of the orbit. Under endoscopic guidance—introduced either through the conjunctival approach or the maxillary and ethmoidal sinus approach, the fracture margins, particularly the posterior edge, were fully exposed. An appropriately sized or tailored resorbable orbital plate or titanium mesh was then precisely positioned at the fracture site with the aid of the endoscope. After copious irrigation, the conjunctival flap was repositioned and the incision closed. A repeated forced duction test was performed to confirm unrestricted ocular movement, followed by the application of antibiotic ointment to the ocular surface and pressure dressing over the surgical site.

Results
Patients were followed for 3–6 months, and both aesthetic and functional outcomes were assessed. Among the 69 cases, residual enophthalmos persisted in 3 patients. Visual acuity remained stable in 68 patients; 1 patient experienced transient postoperative visual decline, despite satisfactory implant positioning confirmed by follow-up CT, Vision substantially recovered after one week of corticosteroid therapy. Postoperative diplopia was observed in 12 patients during the early postoperative period but resolved spontaneously within 8 weeks in most cases.

Conclusion
Endoscopy-assisted precise repair of orbital blowout fractures is an effective and safe technique, offering a reliable option for the accurate management of orbital fractures.

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An evaluation of complications when using internal distraction devices in cranial vault surgery. - The Oxford experience

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Abstract

Introduction

In the Oxford Craniofacial Unit, internal distraction devices are used predominantly in posterior calvarial expansion surgery (PVD) and in selective cases of frontoorbital advancement and remodelling procedures (FOARD) and a small number of lateral calvarial expansion procedures (LCD) in order to increase intracranial volume and correct craniocerebral disproportion. This study reviews the results and complication rates in a large single centre series.

Method

A retrospective analysis was done of all calvarial expansion cases using internal distractors performed in Oxford between 2007 & 2024.

Results

In total 89 operations (67 PD, 20 FOARD, 2 LCD) were performed in 80 patients with 37 case complications (42%). Device infection & scalp necrosis were most common. Devices were removed early in 23 cases, although the planned distraction length was attained in all but 8 (9%). 17 cases (19%) had one or more unanticipated operation (mean 1.4). There were no complications in the 2 LCD cases. There was no difference between PVD & FOARD outcomes.

Conclusion

Although complications related to internal distraction devices remain a salient feature of PVD & FOARD, distraction goals were attained in over 90% of cases with surgically challenging turribrachycephaly.

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Double Jaw surgery for a patient with Gnathodiaphyseal Dysplasia (GDD): A case report and literature review

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Abstract

Gnathodiaphyseal Dysplasia is a rare autosomal-dominant disease caused by a mutation in GDD1. Patients typically present with pathological fractures, muscle weakness, and jawbone deformities. This genetic disorder has long been misdiagnosed as Osteogenesis Imperfecta until 2004 when the genetic basis of this disorder was identified, allowing it to be differentiated from Osteogenesis Imperfecta and Fibrous Dysplasia. However, despite that discovery, clinicians are still largely unaware of this entity and continue to label and treat it as a variation of Osteogenesis Imperfecta.

This report describes a 21-year-old male with GDD presenting with numerous fractures and Angle Class III malocclusion. He was treated with LeFort 1 advancement and Bilateral Sagittal Split Osteotomy of the mandible with setback procedures. No complications were seen and 2-year follow-up showed stable dental occlusion.

This is the first report describing orthognathic surgery safely performed on a patient with GDD1. Other procedures may be possible, but more research is needed to develop best practices for this rare disorder.

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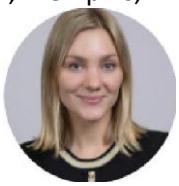
Equivalent Neurodevelopmental Outcomes in Sagittal Craniosynostosis (SCS) Patients Treated with Endoscopic Strip-Craniectomy (ESC) versus Open Calvarial-Vault Remodeling (CVR).

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Abstract

Purpose

Comparisons between endoscopic strip-craniectomy (ESC) versus calvarial-vault remodeling (CVR) for treatment of sagittal-craniosynostosis (SCS) are limited by patient cohorts from separate institutions/geographies. Thus, we aimed to compare prospective neurocognitive testing and long-term outcomes of SCS patients treated with ESC or CVR, operated on and followed at a single institution.

Methods

Non-syndromic SCS patients >3 years old, with >2 year follow up, who underwent ESC with post-operative helmeting or CVR at a single institution, were included for longitudinal comparison. Developmental diagnoses included global, motor, speech, and academic delay. Mental health diagnoses included autism, Attention-Deficit/Hyperactivity Disorder, anxiety, conduct, mood disorders, and personality disorders. Prospective cognitive testing was offered for patients >6 years, comprising a double-blinded neurodevelopmental battery: Wechsler-Abbreviated-Scale (performance, verbal, full-scale IQ) and Beery-Buktenica test (visuomotor, visual-perception, motor-coordination).

Results

Ninety SCS patients were identified, 33 ESC and 57 CVR. CVR patients were older at surgery (mean 10.1 vs 2.6 month; $p<0.001$), with higher estimated blood loss (22.9 vs 8.2 mL/kg; $p<0.001$), and intraoperative transfusions (17.2 vs 8.1 mL/kg; $p<0.001$). At mean follow up 3.7 years, there were no differences in reoperation-rate (12.3% CVR and 3.1% ESC), neuro-developmental (13.2% CVR vs 9.7% ESC) or psychiatric diagnoses (3.6% CVR, 0% ESC). Multivariate analysis similarly revealed no influence of surgery type on developmental outcome. Twenty-two patients completed neurocognitive testing, 9 ESC and 13 CVR, without difference in testing age (7.5yrs CVR, 6.7yrs ESC). ESC patients came from families with higher household incomes ($p=0.019$). There were no other differences in patient demographics including race/ethnicity, socioeconomic status scores, parental education, parental ages, or comorbidities). Patients who underwent ESC had higher abridged Full-2 IQ (111.99 vs 96.4; $p=0.035$) and visual perception scores (71.9 percentile vs 48.5 percentile; $p=0.028$) compared with CVR patients. While ESC trended towards higher verbal IQ (109.4 v 98.0), performance IQ (111.0 vs 97.6), and full-4 score IQ (110.6 vs 96.1), no significant differences existed. When controlling for household-income, there were no differences in neurodevelopment.

Conclusion

Patients receiving ESC or CVR for SCS at a single institution have similar prospective and longitudinal neurodevelopmental outcomes when controlling for demographic differences.

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SOX18-Mediated Endothelial-Mesenchymal Transition in CDH5^{+} Cells during Mandibular Distraction Osteogenesis

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Abstract

Bone defects (BD) caused by trauma, infection, congenital anomalies, or neoplasia are major contributors to physical disability. Distraction osteogenesis (DO) is a highly effective strategy for bone regeneration; however, the underlying mechanisms remain incompletely understood. In this study, canine mandibular DO and BD models were established. Histological analysis demonstrated that DO markedly increase the mineralized volume fraction, attributable to enhanced angiogenesis. Moreover, the angiogenic marker VEGF was partially co-expressed with the early osteogenic transcription factor RUNX2, suggesting that distraction-induced mechanical stimulation promotes endothelial-to-mesenchymal transition (EndMT), a distinct process facilitating vascularized bone regeneration. To further elucidate cellular heterogeneity, single- cell RNA sequencing was performed on mandibular DO and BD calluses, identifying CDH5^{+} endothelial cells (ECs) as the principal angiogenic population during DO. Trajectory analysis revealed that ECs exhibited a differentiation trajectory toward mesenchymal stem cell (MSC)-like phenotypes, indicative of EndMT activation. Immunofluorescence co-staining of VIM, Slug, and CD31 confirmed that EndMT was triggered by mechanical stretch but regressed following the loss of mechanical stimulation. Furthermore, CDH5^{+} ECs were isolated and characterized from DO and BD calluses, with DO- ECs exhibiting superior angiogenic potential compared to BD-ECs. Mechanical stimulation also significantly enhanced the angiogenic capacity of BD-ECs and upregulated the expression of osteogenesis- and EndMT-associated genes.
Integrative analysis of scATAC-seq and scRNA-seq datasets identified SOX18 as a potential key regulator. SOX18 was found to be overexpressed in BD-ECs, and Gene Ontology enrichment analysis revealed skeletal system development and blood vessel development as the most significantly enriched biological processes. Subsequently, SOX18- overexpressing ECs were assembled into organoids and subcutaneously implanted into nude mice, resulting in bone formation observed eight weeks later. Finally, an endothelial cell-targeted adeno-associated viral (AAV) vector was utilized to overexpress SOX18 in mandibular DO and BD calluses (AAV-SOX18), which markedly enhanced new bone formation during mandibular defect regeneration. Collectively, these findings demonstrate that continuous mechanical stretch activates SOX18 expression, thereby orchestrating EndMT and promoting vascularized bone regeneration. This study provides fundamental insights into the mechanobiological regulation of vascularization and bone repair, particularly in the context of craniomaxillofacial defect reconstruction.

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DIAGNOSTIC VALUE OF ARTIFICIAL INTELLIGENCE IN IDENTIFICATION OF FACIAL FRACTURES BASED ON CT-SCAN IMAGES

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Abstract

Background

Diagnosis of craniomaxillofacial fractures through CT scan image requires experiences, accuracy, and time due to complex anatomical structure. Misdiagnosis can affect the management, prognosis, and quality of life of patients. Currently, an artificial intelligence algorithm has been developed based on the UNETR 3D Swim model for craniomaxillofacial fracture detection. This algorithm exhibit a potential to be a valuable tools in clinical settings for diagnosing craniomaxillofacial fractures.

Methods

This study aims to determine the diagnostic accuracy of artificial intelligence algorithms in the identification of facial fractures from head CT scan images. Sixty-six CT scan data of adult patient with suspected craniofacial injuries imaged at Emergency Department of Dr. Cipto Mangunkusumo Hospital consecutively obtained from December 2023 to December 2024 were included. Scans were independently reviewed by a plastic surgeon, neurosurgeon, radiologist, and the artificial intelligence model. Diagnostic accuracy was calculated using sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV).

Results

The training set and the validation set included 19 and 47 samples of CT Scans respectively. Each CT Scan data was divided into 10 anatomical regions (right and left mandible, right and left zygoma, upper central midface partition, right and left intermediate central midface partition, lower central midface partition, skull base, and cranial fault), each representing samples that were tabulated in diagnostic test table. The developed model demonstrated a sensitivity of 79.71% and a specificity of 79.65% in fracture detection within the training dataset. Analysis of the remaining data is ongoing, and comprehensive results will be presented in the final manuscript.

Conclusion

This study demonstrates potential of artificial intelligence-based algorithm to detect facial fractures from the

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Extracellular Vesicles Mediate Skeletal Muscle–Bone Crosstalk During Craniofacial Distraction Osteogenesis

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Abstract

Background

Distraction osteogenesis (DO) is an effective technique for bone regeneration, where skeletal muscle provides critical mechanical and biochemical support. However, the mechanisms linking muscle-derived signals to bone healing remain incompletely understood. We observed that mechanical stimulation of C2C12 myoblasts enhanced the release of extracellular vesicles (EVs) enriched in nicotinate phosphoribosyltransferase (Naprt), a key enzyme in NAD^+ biosynthesis. We hypothesized that these EVs mediate metabolic reprogramming in bone marrow mesenchymal stem cells (BMSCs) to promote osteogenesis during DO.

Methods

C2C12 myoblasts were subjected to cyclic mechanical stretching to simulate physiological stimulation. Activation of mechanotransduction pathways, including YAP/TEAD1 signaling, was confirmed by Western blotting and immunofluorescence. Proteomic analysis of EVs derived from stretched C2C12 cells revealed significant Naprt upregulation. To investigate Naprt's role, CRISPR-Cas9 genome editing was employed to generate Naprt-knockout C2C12 cells, and corresponding Naprt-deficient EVs were collected. BMSCs were treated with Naprt-enriched or Naprt-deficient EVs. SIRT1 and SIRT3 were silenced in BMSCs by lentiviral shRNA knockdown. Subsequent analyses included intracellular NAD^+ quantification, SIRT1/SIRT3 activation, acetylation status of PGC-1α, RUNX2, and SOD2, and assays for mitochondrial function and osteogenic differentiation. In vivo, a rat mandibular DO model was established to assess the effects of Naprt-enriched EVs using micro-CT, histology, and biomechanical testing.

Results

Mechanical stimulation activated YAP pathways in C2C12 cells and increased Naprt levels in secreted EVs. Treatment with Naprt-enriched EVs elevated NAD^+ levels in BMSCs, activating SIRT1 and SIRT3. SIRT1-mediated deacetylation of RUNX2, YAP, and FOXO3a enhanced osteogenic transcription, while SIRT3-driven deacetylation of PGC-1α and SOD2 improved mitochondrial bioenergetics and reduced oxidative stress. EV treatment promoted osteogenic differentiation and suppressed osteoclastogenesis by increasing OPG and decreasing RANKL expression. In vivo, Naprt-enriched EVs significantly enhanced new bone formation, improved mineral density, and increased mechanical strength during DO.

Conclusion

Mechanically stimulated muscle-derived EVs regulate bone regeneration during distraction osteogenesis via NAD^+- dependent activation of SIRT1 and SIRT3. These findings reveal a novel mechanotransduction–metabolic axis in muscle- bone crosstalk and suggest therapeutic strategies to enhance bone healing.

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Impact of Unilateral and Bilateral Distraction Osteogenesis on Long-Term Masseter Morphology in HFM Patients

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Liu Jiayu **Chen Yiyang**

Abstract

Objective

This study aimed to investigate the differential effects of unilateral versus bilateral mandibular distraction osteogenesis (DO) on long-term masseter morphology, mandibular structure, and facial symmetry in patients with hemifacial microsomia (HFM) through three-dimensional morphometric analysis.

Methods

A total of 20 Pruzansky II-classified HFM patients (10 IIA and 10 IIB) who underwent sequential treatment at our institution from May 2013 to February 2023 were enrolled. Thirteen patients received unilateral DO, while seven underwent bilateral DO. Craniofacial three-dimensional CT scans were obtained preoperatively (T0), before distractor removal (T1), and at least one year post-removal (T2). Mimics 21.0 software was utilized to measure masseter morphology parameters (length [ML], width [MW], thickness [MT], volume [MV], healthy/affected-side volume ratio) and mandibular parameters (ramus height [MRH], mandibular plane angle [α]). Paired t-tests and Pearson/ Spearman correlation analyses were performed using GraphPad Prism 5 to evaluate associations between surgical approaches and parameter changes.

Results

In the short-term postoperative period (T1), both unilateral and bilateral groups exhibited significant increases in affected-side masseter parameters (ML, MW, MT, MV) compared to preoperative values ($P<0.05$), with no significant changes observed on the healthy side. At long-term follow-up (T2), the bilateral group demonstrated significant increases in masseter volume on both healthy and affected sides ($P<0.05$), whereas the unilateral group showed significant volume growth only on the healthy side ($P<0.05$), with no significant changes on the affected side. Regarding mandibular parameters, both groups exhibited significant reductions in mandibular plane angle (α) and ramus height ratio (MRH) postoperatively (T1, $P<0.05$). However, at long-term follow- up, the bilateral group maintained significant improvements ($P<0.05$), while the unilateral group reverted to preoperative levels ($P>0.05$). Masseter changes were significantly correlated with surgical approach ($P<0.05$) but not with HFM subtype.

Conclusion

Bilateral DO promotes synchronized growth of masseter volume on both sides, reconstructs mandibular morphology, improves facial symmetry, and achieves stable long-term outcomes. In contrast, unilateral DO provides only short-term improvements in affected-side masseter and mandibular parameters, with limited sustainability. Bilateral DO holds critical clinical significance for restoring natural mandibular growth patterns and establishing occlusal balance in congenital HFM.

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Multicentered Evaluation of Free Fibular Flap for Mandibula Reconstruction with In-House 3D Model Guiding Fabrication Using Mirroring Technique Compared to Segmenting Technique

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Abstract

Background

The use of Virtual Surgical Planning (VSP) in Mandibular Reconstruction with Free Fibular Flap (FFF) in Cipto Mangunkusumo hospital (RSCM), Jakarta, Indonesia has been routinely implemented. However, data regarding clinical and radiological outcome evaluations are lacking. This study aims to develop a standard operating procedure to fabricate in-house 3D models using mirroring and segmenting techniques as intraoperative aid in mandibular reconstruction with FFF.

Methods

In this randomized controlled clinical trial, 34 patients with mandibular tumors reconstructed with FFF in RSCM, University of Indonesia Hospital, and Persahabatan Hospital in 2024. Subjects were randomly divided into two groups: 17 patients in the 3D segmenting group and 17 patients in the mirroring group. Clinical outcomes were assessed using facial asymmetry indices derived from clinical photographs and head X-ray. Cephalometric points were quantitatively measured using ImageJ® software and then compared with SPSS 27.0.

Results

There were no significant differences in demographic characteristics (age, gender, tumor characteristics), mandibular defect (Brown's classification), or fibular segmentation between the two groups ($p>0.05$). Quantitative analysis revealed slightly better asymmetry indices in the segmenting group compared to the mirroring group. However, statistical comparison showed that these differences were not significant ($p > 0.05$).

Discussion

Although the segmenting technique resulted in a slightly better asymmetry index compared to the mirroring technique, the difference was not statistically significant. The advantage of the segmenting technique is its easier use in the operating room, but it is less flexible if there are changes in the extent of tumor resection. This study utilized in-house 3D printing, allowing for faster and more cost-effective production. Limitations of

this study include the absence of a control group, the lack of an engineering team, and a long interval between CT-scan and surgery. This study can be referred for future research virtual surgical planning in FFF.

Conclusion

Both techniques in 3D model fabrication shows comparable clinical and radiological outcomes. While segmenting offered minor advantages in facial symmetry and intraoperative handling, the differences were not statistically significant. Design technique selection should consider preoperative condition and surgical complexity to optimize outcome in future cases.

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Skeletal class III malocclusion?

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Abstract

Background

Skeletal Class III malocclusion often results in midface depression due to maxillary hypoplasia, severely impacting aesthetics and mental health. Improving midface depression is the primary motivation for treatment and a significant factor in orthognathic planning. While the sagittal position of the maxilla critically influences midface aesthetics, no consensus exists on the optimal parameters to guide maxillary repositioning for optimal midface aesthetics.

Methods

The 82 patients of skeletal Class III malocclusion were included in this study. The SCTs were taken before and 6 months after surgery. The Mimics and ProPlan CMF were applied to perform three-dimensional reconstruction. The twenty-eight parameters of craniofacial bones and soft tissues, including horizontal/sagittal linear distances, angular measurements, and nasal-related indices were measured. The statistical analysis between twenty-eight facial parameters and SNA, A-N and GALL by the GraphPad Prism.

Results

In two SNA groups (SNA< 80º and SNA≥80º), there were statistical differences in four indexes (superior nasolabial angle, bilateral ∠1 and left ∠3) ($P<0.05$). There were statistical differences in nine indexes (tip projection, superior nasolabial angle, left cheek convexity, subnasal depth, bilateral nasal alar depth, right ∠1, bilateral ∠2) in two A-N groups (A-N<0 and A-N≥0) ($P<0.05$). The three indexes (bilateral cheek convexity, right ∠1) had statistical differences in two GALL groups (upper incisor point to GALL <-2 and upper incisor point to GALL ≥-2) ($P<0.05$). Compared with the SNA (10 parameters) and GALL (9 parameters), the amount and intensity of correlation between A-N and the midfacial soft tissue parameters were best ($P <0.05$). Furthermore, the nineteen postoperative patients which the A-N was in the normal range (0±2mm) were included and divided into two groups according SNA (80 º≤SNA≤85 º, n=11; SNA>85 º or <80 º, n=8). The results showed that there was no significant statistical difference in the midface soft tissue measurement between the two groups.

Conclusion

Compared with SNA and GALL, the A-N had higher correlation with most midface soft tissue parameters, and could more sensitively reflect the profile changes of midface soft tissue.

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Spatiotemporal Multi-Omics Atlas of Temporomandibular Joint Development in Mouse Embryos

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Abstract

Objective

To decipher the spatiotemporal dynamics and molecular mechanisms underlying temporomandibular joint (TMJ) development in mouse embryos, with a focus on TMJ disc formation.

Methods

TMJ tissues from embryonic day 14.5 (E14.5), 16.5, and 18.5 mouse embryos were analyzed using histological staining, immunofluorescence, Raman spectroscopy, and spatial transcriptomics.

Results

Histological analysis revealed that the development of TMJ in mouse embryos commenced on E14.5. At this stage, mesenchymal cells aggregated to form the condylar and temporal primordia, while the interzone was populated with mesenchymal cells. By E16.5, a reduction in the size of the interzone was observed, alongside the initial formation of the superior joint cavity. At this point, the surface of the condyle began to adopt a shape resembling that of TMJ disc; however, formation of the inferior joint cavity had not yet occurred. On E18.5, formation of the inferior joint cavity took place, indicating that the TMJ disc existed independently of the condyle at this time. Notably, during this process, no significant apoptosis was detected between the TMJ disc and condylar cartilage. Further investigations demonstrated that at E16.5, condylar cartilage actively secretes hyaluronic acid (HA) and exhibits high levels of *Has2* gene expression. In contrast, by E18.5 there is a marked decrease in both HA secretion and *Has2* gene expression within condylar cartilage.

Conclusions

The development of TMJ in mouse embryos commences at E14.5, with the formation of TMJ disc initiating at E16.5 and reaching completion by E18.5. The spatiotemporally regulated HA secretion likely orchestrates inferior joint cavity morphogenesis. Our multi-omics atlas provides a comprehensive resource for understanding craniofacial joint development.

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Titanium mesh vs. Poly-Caprolactone/Tricalcium Phosphate (PCL/TCP) Implant in Orbital Fracture Reconstruction: Long Term Follow-up

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Thiam Chye Lim

Abstract

Introduction

Controversy exists regarding the choice of implant material for orbital floor reconstructions. This study aims to compare the effectiveness of titanium mesh and PCL/TCP (poly(ε-caprolactone)/tricalcium phosphate) implant for repairing traumatisch orbital fractures.

Methods

A total of 19 patients with orbital floor reconstructions operated at the National University Health System, Singapore were included in this prospective study between November 2010 and June 2013. Titanium mesh was used in 10 patients, while PCL/TCP implant was used in the other 9 patients. Patients were evaluated for the worsening of visual acuity, presence or absence of infraorbital nerve paresthesia, extra-ocular muscle function, enophthalmos and diplopia. Post-operative complications such as infection, early resorption, extrusion and persistent pain were also recorded.

Results

Restoration of orbital wall continuity was successful in all patients. Follow-up duration was at least 1 year. There was no statistically significant difference in worsening of visual acuity, presence or absence of infraorbital nerve paresthesia, extra-ocular muscle function and enophthalmos. Even though there was no statistically significant difference in diplopia between the 2 treatment groups pre-operatively, there were more patients who had diplopia following titanium mesh post-operatively ($P < 0.05$). One patient had persistent diplopia, enopthalmos and lateral rectus muscle dysfunction post-operatively, but declined further corrective surgery. There was no infection, early resorption, extrusion or persistent pain. At the 10 year follow-up time point, 9 patients in each group were available for reassessment. There were no long term complications in both the groups of patient. **Conclusions**

Both groups showed satisfactory results. PCL/TCP composite can be used to fabricate biodegradable fixators for the reconstruction of orbital wall fractures and are equivalent to the Titanium implants for reconstruction.

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Augmented Reality and Optical Tracking in an Auto-Registered Holographic Navigation System for MandibularDistraction Osteogenesis

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Abstract

Objective

Precise control of the distraction vector is critical for successful mandibular distraction osteogenesis (MDO). This study developed a non-overlay augmented reality (AR) navigation system combined with optical tracking and individualized automated registration to guide real-time surgical execution in MDO.

Methods

The system utilized HoloLens 2 to project non-overlapping holograms. 30 mandibular models were divided into AR, surgical guide (SG), and freehand (FH) groups; 32 Beagle dogs into AR, SG, FH, and traditional navigation (TN) groups; and 2 human cadaveric heads were treated with AR navigation alone. Outcomes included osteotomy accuracy, distraction vector deviation, distractor positioning error, intraoperative challenges, and operative time.

Results

In model experiments, the AR group achieved significantly higher precision than the FH group and comparable results to the SG group. Animal experiments showed AR outperformed FH and TN groups, and exhibited superior distractor positioning compared to SG. In cadaveric studies, the AR system achieved distractor centroid deviations of 0.75–0.89 mm and distraction vector angular errors of 1.39°– 2.48°, with operative times of 78–91 minutes.

Conclusion

The non-overlay AR navigation system enables accurate real-time guidance in MDO, enhancing surgical precision, stability, and efficiency.

Keywords

Augmented Reality; Optical Positioning; Distraction Osteogenesis; Distraction Vector

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Mixed Reality in Craniofacial Reconstruction

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Wilson Lu


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Thiam Chye Lim

Abstract

Introduction

Mixed reality (MR) has emerged as a tool for intra-operative navigation. It guides osteotomy pathways and validates bony movement. We describe our experience with MR in the management of patients requiring complex craniofacial reconstruction (congenital craniofacial malformations and facial fractures).

Methodology

Pre-operative virtual planning was performed (Brainlab Elements Contouring® 4.0, Brainlab®, Munich, Germany) and Standard Tessellation Language (STL) files of 3D skull models were uploaded onto the HoloLens 2® MR glasses (Microsoft®, Washington, USA). Registration and superimposition were done with Virtual Surgery Intelligence® software (apoQlar®, Hamburg, Germany). The software automatically superimposes the hologram onto the patient's skull. For patients requiring osteotomies, initial osteotomy lines were marked with a pencil based on the holograms. These were validated with conventional adjuncts (intra-operative navigation or cutting guides). MR was subsequently used to determine the adequacy of bony repositioning. These were validated with conventional intra-operative navigation.

Results

The osteotomy lines marked using MR and conventional adjuncts were concordant. The adequacy of bony repositioning as determined using MR and conventional intra-operative navigation were concordant. MR allows visualization and manipulation of superimposed holograms on patients in real time. Surgeons can maintain continuous line-of-sight within the operative field and receive immediate feedback.

Conclusion

MR has the potential to function as an adjunct and possible replacement for conventional cutting guides and intra-operative navigation. It has the potential to decrease operative time and improve patient outcomes.

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Reconstruction of Craniomaxillofacial Emergency Traumatic Fractures

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Abstract

Objective

To explore the application efficacy of a multidisciplinary team (MDT)-based approach in the aesthetic and functional reconstruction of craniomaxillofacial emergency traumatic fractures, aiming to achieve optimal outcomes in both functional recovery and cosmetic restoration.

Methods

A retrospective analysis was conducted on 87 cases of craniomaxillofacial trauma patients treated via the MDT model over a 5-year period at the Department of Plastic Surgery, Peking University Third Hospital. The MDT included specialists from neurosurgery, ophthalmology, otolaryngology, oral and maxillofacial surgery, anesthesiology, radiology, critical care medicine, and orthopedics. Comprehensive evaluations and individualized treatment plans were formulated using three-dimensional digital reconstruction and 3D printing technology for precise surgical design. Minimally invasive techniques with concealed incisions were prioritized to ensure both functional repair and aesthetic outcomes.

Results

Implementation of the MDT model significantly reduced diagnostic and therapeutic errors (e.g., misdiagnosis, missed diagnoses, and inappropriate treatments), shortened the average diagnosis-to-treatment duration, decreased medical costs, and achieved patient satisfaction. Postoperative follow-up demonstrated accurate fracture reduction, restored occlusal function, improved facial symmetry, and aesthetically favorable scar concealment in all cases.

Conclusion

The MDT-based integrated approach effectively addresses the challenges of complex craniomaxillofacial trauma repair, synergizing multidisciplinary expertise with advanced technologies to optimize functional and aesthetic outcomes. This model holds significant clinical value and warrants broader adoption in trauma management protocols.

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Neurocognitive and behavioral outcomes in metopic synostosis: relation to severity and surgical timing

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Abstract

Background

Developmental and behavioral problems are frequently reported in patients with metopic synostosis. The effect of pre-operative severity and surgical timing on developmental and behavioral outcomes is a topic of debate and research remains inconclusive. This study aims to describe neurocognitive profiles in patients with metopic synostosis and assess its relation with pre- operative severity and surgical timing.

Methods

This is a retrospective study of all patients with non-syndromic metopic synostosis who had fronto-orbital advancement at Sophia Children's Hospital Erasmus Medical Center between 2006-2018. Outcomes of psychological/ psychiatric diagnostic assessments were collected. CranioRate was used to determine pre-operative severity based on CT-scans.

Results

Among all 228 patients following FOA at the median age of 10 months [IQR 8-12], parental concerns were present in 47.6%. In total, 73 patients underwent psychological/psychiatric diagnostic assessment at our center because of parental concerns about the child's developmental/behavioral. Lower mean IQ scores were found on most indices compared to the norm, which reached significance in the full-scale IQ (FSIQ) and processing speed index (PSI). Multiple linear regression showed no significant association between FSIQ and pre-operative severity or surgical timing, while controlling for other factors. No differences were found between pre-operative severity and surgical timing in patients with and without behavioral diagnoses. Among the assessed patients, 43/96 had a diagnosis of attention deficit/hyperactivity disorder (ADHD) and 11/96 a diagnosis of autism spectrum disorder (ASD), which are 18.9% and 4.8% of the total cohort respectively. In the general population, the prevalence of ADHD is 8% and ASD 1.85%.

Conclusion

Pre-operative severity and surgical timing are not associated with cognitive and behavioral outcomes in children with metopic synostosis. In almost half of patients with metopic synostosis, parental concerns exist regarding cognitive development and behavioral functioning, which is reflected in the increased prevalence of ADHD and ASD.

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Mandibular Angle Osteotomy via Intraoral Approach: A 15-year Experience from a Single Plastic Surgery Center in China

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Abstract

Background

Mandibular angle osteotomy (MAO) using an intraoral approach is a common procedure for correcting square facial contours in the Asian population. While previous retrospective studies have primarily focused on complications rates, limited research has examined time-related trends and the epidemiological characteristics of the surgical population. A comprehensive study with a large sample size and long-term follow-up is crucial to enhance outcomes, minimize complications, provide evidence-based insights, and consolidate clinical experience.

Methods

This retrospective study reviewed 3,501 MAO cases performed via an intraoral approach between January 2008 and December 2022. Patients were categorized into three cohorts based on admission dates: group A (January 2008 to December 2012), group B (January 2013 to December 2017), and group C (January 2018 to December 2022). Demographic data, complication rates, and patient-reported satisfaction scores were analyzed across the groups.

Results

The average ages for groups A, B, and C were 27.38±6.94, 27.41±6.42, and 28.57±6.65 years, respectively, with group C patients being significantly older than those in group B ($P < 0.001$). Gender distribution showed 48 males and 825 females in group A; 93 males and 1,097 females in group B; and 122 males and 1,316 females in group C, with significant difference between groups A and B ($P = 0.039$). Complication rates were 13.05% (114 cases) in group A, 5.54% (66 cases) in group B, and 2.50% (36 cases) in group C. Postoperative satisfaction scores for groups A, B, and C were 3.32±0.64, 3.86±0.54, and 4.42±0.58, respectively, with significant improvements across groups ($P < 0.05$).

Conclusions

The demand for MAO has steadily increased, particularly among individuals aged 21 to 40, with a predominance of female patients. Expanding indications have led to more cases involving middle-aged, elderly, and male patients. Advancements in surgical techniques have contributed to better aesthetic outcomes and lower complication rates. The use of modified osteotomy procedures and digital technologies has enabled safer, more precise surgeries across diverse populations, resulting in significant improvements in lower facial contours.

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TDN@Ast IV-Apt promotes osteogenesis of JBMSCs during distraction osteogenesis by enhancing m^{6}A methylation-mediated mitochondrial transfer fromEPCs

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Abstract
Distraction osteogenesis (DO) is an effective strategy for the treatment of craniofacial bone defects and developmental deformities. However, its clinical application remains limited by the slow rate of osteogenesis, prolonged consolidation period, and high incidence of complications. Previous studies have identified the critical role of N6-methyladenosine (m6A) RNA methylation in early angiogenesis during DO; nevertheless, efficient and safe strategies to activate RNA methylation and enhance bone regeneration are still lacking. In this study, we demonstrated that Astragaloside IV (Ast) promotes the osteogenic differentiation of jaw bone marrow mesenchymal stem cells (JBMSCs) and the angiogenic capacity of endothelial progenitor cells (EPCs). To further enhance the therapeutic potential of Ast, we developed a tetrahedral DNA nanostructure-based delivery system (TDN@Ast-Apt02), which significantly improved the stability, bioavailability, and endothelial cell-targeting specificity of Ast. Through a co-culture system, we found that TDN@Ast-Apt02 markedly enhanced the angiogenic capacity of EPCs, suppressed FTO expression, and elevated m6A methylation levels. Moreover, TDN@Ast-Apt02 promoted mitochondrial transfer to JBMSCs, thereby enhancing mitochondrial bioenergetics and significantly boosting their osteogenic differentiation potential. In vitro results further confirmed that TDN@Ast-Apt02 could shorten the consolidation period of DO and accelerate bone regeneration in bone defect (BD) models. This study systematically elucidates the mechanism by which TDN@Ast-Apt02 synergistically promotes vascularized bone regeneration through the regulation of the m6A signaling pathway and highlights its potential application in craniofacial bone repair, providing a novel precision intervention strategy for the treatment of complex bone defects.

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Digital Versus Conventional Surgical Guides in Bimaxillary Surgery: A Comparative Study of Precision, Efficiency, and Patient Outcomes

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Abstract

Background

Precise jaw repositioning is essential for successful bimaxillary surgery. Conventional resin occlusal splints have long been used for intraoperative guidance but are limited by accuracy and workflow efficiency. Digital surgical guide systems offer a promising alternative; however, comparative evidence on their clinical benefits remains scarce.

Methods

This retrospective study included patients who underwent bimaxillary surgery at the Affiliated Friendship Plastic Surgery Hospital of Nanjing Medical University between April 2017 and September 2024. The conventional resin occlusal splint (CROS) group (April 2017–June 2023) underwent surgery using plaster model simulations and manual fabricated splint. The digital guide (DT) group (July 2023–September 2024) followed a fully digital workflow incorporating 3D planning and guide fabrication. Operative time, intraoperative blood loss, and complication rates were recorded. Patient satisfaction was evaluated using the FACE-Q questionnaire. Statistical analyses was performed using SPSS 26.0.

Results

All surgeries were completed successfully without major complications. Postoperative malocclusion was observed in both groups. Transient numbness of the chin and lower lip occurred in five CROS patients and one DT patient, resolving over time. There were no significant differences between the groups in operative time (272.81 ± 46.26 min vs. 290 ± 47.15 min, $P = 0.343$) or intraoperative blood loss (265 ± 35.96 mL vs. 256.67 ± 23.09 mL, $P = 0.463$). Both groups demonstrated significant improvements in FACE-Q scores for overall facial appearance, lower face and jaw contour, and psychosocial well-being ($P < 0.001$). The DT group, however, showed greater improvements and higher satisfaction levels compared to the CROS group.

Conclusion

Digital surgical guide -assisted system bimaxillary surgery provides enhanced precision andneuroprotection, particularly by reducing the risk of inferior alveolar nerve injury. While operative time is comparable to traditional methods, digital technology streamlines the workflow by minimizing intraoperative bone adjustments. Higher patient satisfaction and improved aesthetic outcomes support broader clinical adoption of digital guide systems in orthognathic surgery.

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New Productive Force: The Preliminary Report of First Craniofacial Surgical Robot IST Multicenter Clinical Trial in China

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Abstract

This paper presents the authors' team's research on a craniofacial surgical robot developed in China. Initiated in 2011 with government funding, the craniofacial surgical robot project was officially launched in Shanghai, developed jointly by the Ninth People's Hospital affiliated with Shanghai Jiao Tong University School of Medicine and the Shanghai Jiao Tong University medical-engineering team. Currently, based on multiple rounds of model surgeries, animal experiments, and clinical trials, our team is applying for approval as a Class III medical device from the National Medical Products Administration.

(NMPA). As an innovative tool in the field of craniofacial surgery, it fills a technological gap within the country.

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Concurrent Posterior Vault Expansion and Extradural Chiari Decompression in Syndromic and Non-Syndromic Craniosynostosis: A Case Series of Eight Patients

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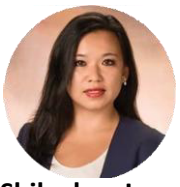

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Abstract

Background

Chiari malformation (CM) may occur in patients with craniosynostosis, and the presence of both in anatomically similar locations may allow for simultaneous treatment. In this study, we analyze concurrent posterior vault distraction osteogenesis (PVDO) or posterior vault reconstruction (PVR) with extradural Chiari decompression for management of suspected increased intracranial pressure (ICP) in patients with syndromic and atypical non-syndromic craniosynostosis.

Methods

We collected demographic, perioperative, and outcomes data of patients who underwent concurrent PVDO/PVR and extradural Chiari decompression at a single institution from 2008-2024. Patients with pre- and post-operative CT or MRI were included. Of particular interest was patient/caregiver reported symptomatology and radiographic findings related to CM reported by a board-certified neuroradiologist. Patient symptoms were assessed immediately post-operation and at latest follow-up. Descriptive, Chi-square, and Fisher's exact tests were utilized for analysis.

Results

8 patients met inclusion criteria. 50% (n=4) had syndromic craniosynostosis and 50% (n=4) non-syndromic craniosynostosis; half (n=4) underwent PVDO, and half (n=4) underwent PVR. 1 patient (12.5%) had a post-operative complication (distractor infection), with no long-term sequelae. 100% (n=8) had resolution of clinical symptoms at first follow-up, and 85.7% (n=6/7) at last follow-up. 50.0% (n=4) of patients had improvement and 50.0% (n=4) had a stable presentation of CM on post-operative imaging. While most patients with radiologic improvement of their CM were in the PVDO group compared to PVR (75% (n=3/4), vs. 25% (n=1/4), p=0.49), this study was underpowered to detect a significant difference between techniques.

Conclusions

Posterior vault expansion with extradural Chiari decompression in patients with concomitant suspected increased ICP and craniosynostosis appears safe and relatively effective at extended follow-up. Additional study of its long-term effects, patient selection, and comparison of PVDO vs PVR is warranted.

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Occlusal Plane Stability After Curvilinear Mandibular Distraction Osteogenesis

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Abstract

Background

Curvilinear mandibular distraction osteogenesis (MDO) allows for mandibular lengthening in the sagittal and vertical planes. However, the stability of these movements is less understood. This study examines the stability of the occlusal plane changes seen in patients who have undergone curvilinear mandibular distraction, with and without peri-operative orthodontics at extended follow-up.

Methods

A retrospective review of demographic, perioperative and distraction data was performed on all patients who underwent isolated curvilinear MDO at our institution from January 2009 to December 2024. Cephalometric analysis was conducted on pre-operative, immediate post-operative, and extended post-operative lateral cephalograms, lateral radiographs, or computed tomography scans with special attention paid to Sella-nasion-B point angle (SNB), SN-mandibular plane angle (MPA), and SN-occlusal plane angle (OPA). Paired t-tests, student's t test, and repeated measures ANOVA were used to compare pre-operative, immediate post-operative, and extended post-operative cephalometrics.

Results

25 patients underwent curvilinear MDO in mixed dentition and had requisite pre-op and immediate post-op imaging, of which 15 had adequate extended post-operative imaging. Average age at surgery was 8±5 years, with an average follow- up of 4±3 years. The most common diagnoses in the cohort were Treacher Collins (24.0%, n=6), Hemifacial Microsomia (12.0%, n=3), and Goldenhar Syndrome (12.0%, n=3). 32% (n=8) of patients were tracheostomy dependent pre- operatively, with 50.0% (n=4) decannulated post-operatively. Average distraction distance was 30±8 millimeters. 56% (n=14) underwent post-operative orthodontic treatment. The average SNB angle improved from 69±6º pre-op to 76±7º postop ($p<0.001$) and was maintained at 73±7º at 4-year follow-up ($p<0.001$). MPA improved from 57±12º pre-op to 48±11º postop ($p<0.001$) and 53±12º at 4-year follow up ($p=0.003$). Preop OPA changed from 30±11º pre-op to 23±6º postop ($p<0.001$) and 26±6º at 4-year post-operative evaluation ($p=0.005$). OPA relapse was similar when stratified by diagnosis and post-operative orthodontics ($p>0.05$).

Conclusions

Curvilinear MDO results in significant cephalometric improvements in SNB, MPA, and OPA. While there is some expected relapse in these measurements at extended follow-up, these improvements remain significantly improved at 4-year follow- up. Further investigation into relapse differences of long-term results is needed to understand the optimal patient selection.

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The Impact of Red Blood Cell Count and Hemoglobin Levels on Bone Remodeling in Mandibular Angle Osteotomy

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Abstract

Background

Previous studies have shown that bone remodeling in the mandibular angle region (MAR), including both bone regeneration and resorption, can lead to suboptimal aesthetic outcomes following mandibular angle osteotomy (MAO). Understanding patient- related factors that influence bone remodeling is crucial for preoperative planning to minimize revision surgery risks. This study investigates the correlation between age, clinical classification, and preoperative laboratory test results with postoperative MAR bone remodeling.

Methods

From January 2015 to December 2022, medical records of patients who underwent MAO were retrospectively reviewed. Postoperative (within one week) and long-term follow-up (at least six months) three-dimensional (3D) mandibular reconstructions were analyzed using GeoMagic Wrap 2021 for deviation analysis. Based on morphological changes in the MAR, patients were qualitatively categorized into three groups: group S (Bone Stability), group RG (Bone Regeneration), and group RS (Bone Resorption). Binary logistic regression was used to assess correlations between bone remodeling and factors such as age, clinical classification, and preoperative laboratory test results (complete blood count and and biochemical tests).

Results

135 patients met the inclusion criteria. Significant differences were observed in red blood cell (RBC) count and hemoglobin(Hb) level (P=0.001, P=0.004,respectively). An increase of 1×10^{12} in preoperative peripheral red blood cell count and 1 g/L in hemoglobin levels, was associated with a 2.558- and 1.036-times increase in the likelihood of postoperative bone regeneration, respectively. (OR:2.558,95% CI:1.098-5.958,P=0.030;OR:1.036, 95% CI: 1.006–1.066, P=0.017).

Conclusions

Bone resorption and regeneration were observed in the MAR after MAO. Preoperative RBC count and Hb levels were significantly associated with bone remodeling in the MAR.

Key words

prominent mandibular angle; mandibular angle osteotomy; bone regeneration; bone resorption

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Long-Term Outcomes after Orbital Hypertelorism Correction: An Assessment of Photogrammetric and Patient-Reported Outcomes

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Abstract

Background

Orbital Hypertelorism (OHT) can be corrected surgically utilizing a four-wall box osteotomy, facial bipartition, or medial orbital composite unit translocation (MOCUT). While these procedures have been shown to decrease interorbital distance, the impact of OHT correction on periorbital symmetry and patient-reported outcomes (PROs) has been less well described. This study assesses objective periorbital symmetry and PROs after OHT correction at long-term follow-up.

Methods

Patients who underwent OHT correction at a single institution from 2000-2024 and had 2D pre-operative and >6 months post-operative photographs were included. Hypertelorism index (HI) and periorbital symmetry measurements were calculated using ImageJ. Measurements were compared at pre-operative, 1-year post-operation, and at long-term follow- up (average 9-years post-operation), with a ratio of 1 considered perfect symmetry. FACE-Q surveys were administered to assess patient satisfaction post-operatively across the domains of facial appearance, function, and health-related quality of life and converted to Rasch scores (0-100 scale).

Results

30 patients were included, 7 of which completed the FACE-Q. 60.0% (n=18) were patients with frontonasal dysplasia, 17% (n=5) facial cleft, and 13% (n=4) with encephalocele. Mean age at surgery was 8±5 years. 70% (n=21) underwent four wall box osteotomy, 17% (n=5) facial bipartition, and 13% (n=4) MOCUT. HI improved from pre-operation (1.8±0.6) to 1-year (1.4±0.3) and long-term (1.4±0.3) post-operation ($p<0.001$). Palpebral height ratio was significantly worse 1-year (0.9±0.1 vs. 1.0±0.2, $p=0.03$) and long-term (0.9±0.1 vs. 1.0±0.2, $p=0.02$) post-operation as compared to pre-operation. At long- term follow-up, canthal tilt difference (4.3±4.9º vs. 1.8±2.2º, $p=0.03$) was significantly worse than pre-operation. Post- operative FACE-Q scores were low in domains of facial appearance (face, forehead, nose, head shape, and eyes). Patient satisfaction

was lowest when evaluating appearance of eyes (Median 21 [IQR 7]) and head shape (Median 16 [IQR 6]), and highest when evaluating forehead appearance (Median 31 [IQR 15]).

Conclusions

As anticipated, the degree of interorbital distance as assessed by HI at 1-year and long-term follow up is improved with surgical correction of OHT. However, canthal tilt difference and palpebral height asymmetry worsen post-operatively. Patient satisfaction with appearance remains low despite surgical intervention at long-term follow-up.

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A Comparison of Resorbable and Titanium Fixation for Posterior Vault Distraction Osteogenesis

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Abstract

Background

Posterior vault distraction osteogenesis (PVDO) with semi-buried, bilateral cranial vault distractors may be fixed with resorbable fixation Synthes Rapidsorb Injectable Polymer System (IPS) or titanium screws. In this study, we compare clinical outcomes among patients who underwent PVDO with IPS fixation and those who underwent PVDO with traditional titanium fixation.

Methods

Patients with craniosynostosis who underwent PVDO with resorbable fixation from October 2019 to January 2025 were matched to patients who underwent PVDO with traditional titanium fixation from September 2013 to January 2025. Distractor removal operative time and clinical outcomes were collected and compared. Descriptive statistics, Mann Whitney U tests, independent t-tests, and chi-squared were utilized for analysis.

Results

Eighty-four patients met inclusion criteria, 42 (50.0%) of which underwent PVDO with titanium screw fixation and 42 (50.0%) with IPS fixation. The average age at surgery was 4±4 years old. 42.9% (n=36) of patients had an identifiable syndromic diagnosis, with no difference between cohorts (47.6%, n=20 vs. 38.1%, n=16, p=0.4). The most common indications for surgery were multi-suture craniosynostosis (69.0%, n=58), bicoronal craniosynostosis (13.1%, n=11), and sagittal craniosynostosis (11.9%, n=10). Average anterior-to-posterior distraction distance was 30.9±7.9 mm, with no difference between cohorts (31.4±6.8 vs. 30.3±8.9, p=0.5). Distractor removal procedure time was significantly shorter in the IPS cohort compared to the titanium fixation cohort (37.4±12.6 minutes vs. 50.2±16.1, p<0.001), resulting in a 25% reduction in operative time. One patient (1.1%) experienced a hardware malfunction post-operatively (distractor hinge fracture in IPS cohort) but was able to successfully complete distraction. There was no difference in hardware malfunctions (2.4%, n=1 vs. 0.0%, n=0, p=0.3) or post-operative complications (23.8%, n=10 vs. 14.3%, n=6, p=0.3) between cohorts.

Conclusions

Resorbable fixation in PVDO maintains effective stable fixation while decreasing distractor removal time as compared to traditional titanium hardware fixation. Future long-term studies are needed to further elucidate the applications of resorbable fixation in distraction osteogenesis.

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Dual Graph Convolution Approach for Maxillofacial Postoperative Facial Prediction

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Abstract
Predicting postoperative facial appearance plays a crucial role in helping surgeons design orthognathic surgery plans and effectively communicate with patients. Traditional biomechanical prediction techniques often involve complex calculations and time-consuming manual interventions, which hinder their practical application in clinical settings. Deep learning-based approaches, however, have shown promise in enhancing computational efficiency and delivering similar levels of accuracy. Nevertheless, current deep learning methods typically learn facial features from point clouds and process facial regions independently, limiting their ability to capture the intricate details and topology of the facial surface. Moreover, these methods predict displacements for all facial points in a single step, which makes them susceptible to weak supervision during training and prone to generating distorted results. To overcome these challenges, we introduce a new dual graph convolutional model for postoperative facial appearance prediction. This model accounts for facial surface geometry by utilizing two graphs derived from the facial mesh in both Euclidean and geodesic spaces and translates bone movements into facial changes within these dual spaces. Additionally, we incorporate a coarse-to-fine strategy, initially making coarse predictions on meshes with fewer vertices, followed by refinement with additional vertices to enhance prediction accuracy. Experiments conducted on real clinical datasets show that our method outperforms state-of-the-art deep learning approaches, both qualitatively and quantitatively.

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Craniofacial Surgery Redefined: Machine Learning as the Catalyst for Precision, Automation, and Human-AI Synergy

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Abstract

Machine learning (ML) is revolutionizing craniomaxillofacial surgery by tackling the dual challenges of intricate anatomical complexity and functional-aesthetic requirements. This comprehensive review maps ML's transformative impact across four clinical pillars: medical imaging interpretation, treatment decision optimization, and intelligent surgical simulation and outcome evaluation.In the realm of medical imaging, convolutional neural networks (CNNs) and 3D U-Net architectures deliver submillimeter precision in craniofacial structure segmentation (Dice coefficient >0.89 for temporomandibular joint segmentation) and automated landmark detection (mean error 0.94 mm in 2D cephalometry), though their generalizability remains constrained by device variability and sample quantity. Diagnostic ML models achieve 90-95% detection accuracy for fractures, odontogenic cysts, and craniosynostosis, with attention mechanisms enhancing interpretability.When applied to treatment optimization, multimodal ML systems synthesize 2D/3D imaging with electronic health records to guide orthognathic interventions, demonstrating >90% accuracy in surgical plan selection and intraoperative bleeding prediction through ensemble algorithms like BR-XGBoost. Surgical simulation platforms leverage ML-powered biomechanics (e.g., PointNet++-based soft-tissue deformation modeling) and transformer-driven osteotomy planning to bridge virtual and operative realities. Postoperatively, 3D photogrammetry and symmetry indices provide quantitative aesthetic assessments, reducing subjective bias.Persistent barriers hinder clinical translation: data annotation burdens, small-cohort overfitting, and algorithmic opacity demand urgent resolution. Emerging paradigms — privacy-preserving federated learning and explainable AI interfaces pave the way for multi-institutional collaboration. Future advancement hinges on standardized imaging protocols, human- AI co-design frameworks, and prospective validation through randomized controlled trials. This paradigm shift toward adaptive, clinician-guided ML systems heralds a new era of patient-specific precision in craniomaxillofacial care.

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Establishment and Application of the Lower Eyelid Assessment Based on 3DFacial Images

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Abstract

Background

Three-dimensional (3D) stereophotogrammetry has been widely used in clinical field. However, no studies have assessed its reliability in measuring the lower eyelid region. Besides, the lower eyelid region is a critical component of the face. It is essential to establish anthropometric reference values for the evaluation of aging, surgical planning, and assessment of outcomes in periocular aesthetic and rejuvenation procedures.

Methods

Fifty-eight participants (116 eyes) were recruited with a mean age of 39.14±11.25 years. Two sets of VECTRA 3D images were taken for each subject, and each set of images was individually measured twice by two raters. Twenty- seven landmarks were identified in the lower eyelid region, and then 19 linear, 4 curvilinear, 7 angular and 2 areal metrics were assessed for intrarater, interrater and intramethod reliability. Then, three-dimensional facial images were obtained from 84 healthy Chinese individuals aged between 20-35 and 50-65 years, as well as eight patients aged between 20-35 who presented with eyelid bags. All the images were measured, and the results were compared among different age groups, genders, and young patients with or without eyelid bags.

Results

High reliability was demonstrated in this 3D imaging-based lower eyelid anthropometry, with the highest reliability observed in intrarater measurements, followed by interrater and intramethod measurements. Compared to females, males exhibited a more elongated palpebral fissure, lower tear trough and lid-cheek junction, smaller inner and outer canthus angles, as well as a larger area and proportion of the lower palpebral region. As age progressed, the height and width of the palpebral fissure and inner canthus angle decreased gradually, which was accompanied by sagging of the tear trough and lid-cheek junction, an increase in lower eyelid area, and swelling of the lower eyelid.

Conclusion

3D stereophotogrammetry is reliable for lower eyelid anthropometry. Males exhibited a higher proportion of the brow-eye unit occupied by the lower eyelid region, and elderly individuals displayed noticeable drooping of the tear trough and lid-cheek junction. These findings can serve as standard references for aesthetic procedures and reconstructive periocular operations.

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Anti-sagging Method in Reduction Malarplasty for Chinese patients

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Abstract

Background

In the East, a broad and prominent malar is considered to express an aggressive and unpleasing impression; therefore, patients seek to improve their appearance through malar reduction. Although most of the techniques have been greatly improved, still there are some pitfalls in the form of cheek sagging or bone nonunion. In this study, we performed a reduction malarplasty using a firm bracing system to minimize major postoperative complications.

Method

This was a retrospective study evaluating the results of a total of 157 patients (139 women and 18 men) who underwent reduction malarplasty using a bracing system via intraoral and periauricular. The age of the patients ranged from 17 to 44 with a mean age of 25.3 years. The mean follow-up period was 9.4 months. All patients underwent routine physical and laboratory examinations. Facial photographs in the frontal, oblique, and submentovertical views were taken. Patients with severe facial asymmetry and facial deformities were excluded from the study. Preoperative states and patients' desires were considered. In some patients, combined malarplasty with mandibular angle reduction or genioplasty was performed.

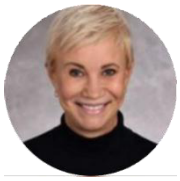
Results

A total of 157 patients who underwent this modi- fied reduction malarplasty between January 2015 and January 2024 were retrospectively reviewed. Decent postoperative facial stability and satisfactory aesthetic results were realized among all patients. Major complications such as severe asymmetry or bone nonunion were not observed in our patients. Conclusion Based on a thorough anatomic understanding of zygoma and masseter action, we modified previous L-shaped reduction malarplasty through constructing a firm bracing system on the malar complex. Satisfactory surgical outcomes were obtained. Our method is an ideal surgical method to effectively reduce the height and width of the zygomatic arch and prevent complications such as bone nonunion and cheek drooping.

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Building and sustaining a process for systematic collection of occlusal photos and dental health evaluations in a cleft/craniofacial orthodontic practice.

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Patricia Beals



Thomas Sitzman

Abstract

Introduction

Standardized measurement of dental outcomes enables teams to evaluate their care delivery and to identify future treatment needs. However, collecting measures consistently on all patients remains a challenge for centers.

Methods

Beginning in April 2020, our team sought to collect specific facial and occlusal photographs and to measure carries burden (using the decayed, missing, filled teeth index, DMFT) on all patients by age 6. Initial efforts focused on identification of those with cleft condition who were within the eligible age window. We then provided education those involved on the benefits of collecting dental outcomes. Next, we used Plan-Do-Study-Act (PDSA) cycles to address barriers to patient recall and to collecting data during a standard clinic visit. Once we met our goal for measure collection, our efforts transitioned to sustaining our new processes. We assigned recall activities, included information on measure collection for all new staff members, and continued to scan our daily clinic schedules for children within the measurement age window. We monitored the proportion of all six-year-old children for whom both occlusal photos and DMFT index was collected every 3 months.

Results

Our team-initiated efforts at dental outcome collection in April 2020. Over the first 12 months, we focused on education and improving patient recall; these efforts resulted in an increase in dental outcome measurement from 0% to 53% ($p<0.001$). Over the following 15 months, we focused on addressing barriers during clinic; these efforts resulted in a further increase from 53% to 89% ($p<0.001$). We then transitioned our efforts to sustaining this performance; during the past 24 months we have met our goal of dental outcome collection for >85% of children in 5 of 8 quarters (63%).

Conclusion

Collection of dental outcomes in a cleft/craniofacial orthodontic practice can be achieved by focusing on building support among team members, recalling patients at key timepoints, and hard-wiring processes for measure collection in the routine activities of providers and staff. Sustaining performance requires continued support of these processes, particularly efforts at patient recall.

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Simulating Fronto-Orbital Distraction for Unicoronal Synostosis Intervention

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Abstract

Background: Unicoronal synostosis (UCS) occurs when one of the coronal sutures fuses prematurely, causing facial and calvarial asymmetry. Fronto-orbital distraction (FOD) has shown promising results for USC intervention; however, optimal surgical and treatment parameters have not been quantified, and outcomes often rely on the surgeon's experience. The aim of this study was to quantify simulated surgical outcomes for FOD using finite element (FE) methods.

Methods: A patient-specific FE model of a UCS patient was developed using CT data obtained from Sahlgrenska University Hospital in Sweden, predicting cranial growth from pre-operation (23 days) to the distractor removal date (336 days). 36 different surgical scenarios were simulated to evaluate the effects of three parameters: distraction angle (20°, 30°, and 40° relative to the Frankfurt plane), distraction length (20mm, 30mm, and 40mm), and the number of applied distractors (single and dual distractors). The outcomes were examined using orbital index difference (OID), orbital dystopia angle (ODA) and validated against post-operative CT data.

Results: Distraction length was identified as the most impactful parameter, with 40mm distraction yielding superior outcomes across all scenarios. Distraction angle was also identified as the second most impactful parameter, with a 40° angle achieving marginally better outcomes than 30° and 20°. For single distractors, the optimal scenario (40° angle, 40mm distraction) achieved an ODA of 2.2° and an OID of 0.2%. Dual distractors exhibited marginally better outcomes than single distractor scenarios, with the optimal scenario (40° angle, 40mm primary and 20mm secondary distraction) achieving an ODA of 1.9° and an OID of 0.2%. In dual distractor scenarios, when the secondary distraction exceeds 20mm, significant orbital distortion is present, with the ectoconchion displaying detachment.

Conclusion: This computational study presents a quantitative framework for surgical planning, which may enhance the precision of USC interventions. Although dual distractors demonstrated marginally superior outcomes, the increased risk and surgical complexity outweigh the benefits, suggesting the use of single distractors with a 40° angle and 40mm distraction as optimal for FOD. Future research should test these findings across a larger cohort and explore the effects of soft tissue (i.e. masticatory muscles) changes to further refine surgical protocols.

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Personalized Surgical Decision-Making in Patients with Sagittal Craniosynostosis

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Skyler Palmer



Connor Elkhill



Ines Cruz-Guerrero



Diego Gomez



David Khechoyan



Phuong Nguyen



Brooke French



Antonio Porras

Abstract

Introduction

The choice of surgical treatment of patients with sagittal craniosynostosis is based on patient age, severity, and surgeon practice; no tools exist to objectively identify the optimal treatment approach. This work evaluates how age, sex, and phenotypic severity affect morphologic outcomes of patients with sagittal craniosynostosis to support personalized optimal treatment selection.

Methods

We collected pre- and post-surgical 3D photograms of patients with non-syndromic single sagittal (N=280) craniosynostosis from our institution, grouped into endoscopic strip craniectomy (ESC) followed by helmet therapy or open cranial vault remodeling (CVR). We compared their pre- and post-surgical 3D photograms using Craniosynostosis Risk Score (CRS) and a novel Craniosynostosis Severity Index (CSI) that improves the sensitivity of existing metrics of phenotypic severity to local malformations and represents the number of standard deviations away from the average anomalies in the age- and sex-matched normative population. Then, we quantified the impact of age, sex, and pre-surgical severity on outcomes to support personalized treatment selections.

Results

64 patients underwent ESC (age at surgery 123±52 days) and 216 underwent CVR (age at surgery 221±150 days, $p<0.001$). Patients undergoing ESC showed significant postoperative improvement in CRS (91%±21% to 52%±36%, $p<0.001$) and CSI (2.76±0.92 to 1.45 ± 0.68, $p<0.001$). Patients undergoing CVR showed significant improvement in CRS (87%±23% to 46%±32%, $p<0.001$) and CSI (2.74±0.82 to 1.61±0.65, $p<0.001$). Our model demonstrated that ESC provides better morphologic outcomes in patients younger than five months. For patients 5-8 months of age, ESC provides improved outcomes in non-severe phenotypes ($CSI<2.5$). For severe phenotypes ($CSI\geq2.5$) CVR provides improved outcomes. After eight months of age, CVR overperforms ESC independent of severity.

Conclusion

Given its improved morphologic outcomes and safety compared to CVR, ESC may be the preferred treatment for sagittal craniosynostosis in patients younger than five months, or younger than eight months with non-severe phenotypes. Our study highlights the importance of non-invasive phenotypic evaluation using 3D photogrammetry for treatment decision. Our data-driven model provides a personalized decision tool to support the selection of personalized optimal treatments, which could help reduce existing variability in treatment decision and outcomes.

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CT Imaging Signs of Intracranial Hypertension and Volumetric Anomalies in Apert Syndrome: Insights for Early Surgical Intervention

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Abstract

Background

Intracranial hypertension (ICH) is a key consideration requiring surgical treatment in patients with Apert syndrome (AS). However, its early presentation may be subtle and nonspecific, and there are no reliable non-invasive indicators. Recent work has demonstrated that children with non-acute chronic ICH display cranial density loss and bone thickening. We used routinely acquired CT images and a normative model of cranial bone development to deliver the first quantitative assessment of localized cranial bone and volumetric anomalies associated with ICH in children with AS to support their surgical management.

Methods

Children with AS with pre-operative CT scans were retrospectively identified at two tertiary institutions. Patients with prior craniofacial interventions were excluded. After cranial segmentation from the images, local cranial bone thickness, density (Hounsefield Units, HU), and intracranial volume anomalies were quantified using a normative model adjusting for age and sex. These anomalies were also quantified in two reference cohorts from prior work: patients with non-syndromic bicoronal craniosynostosis (NSBC), and normative subjects. Statistical comparisons were performed using Mann-Whitney U-tests.

Results

Sixteen patients with AS (age 4.84 ± 8.37 months), 24 with NSBC (6.34 ± 7.42 months), and 671 normative subjects (11.81 ± 9.09 months) were identified. Children with AS exhibited increased total ICV (+147.23 mL, $p<0.001$) and occipital volume deficits (−48.73 mL, $p<0.001$) compared to normative subjects. They also had decreased cranial bone density (-158.43 ± 76.40 HU, $p<0.001$), particularly in the frontal and parietal bones, and increased calvarial thickness (0.53 ± 0.21 mm, $p<0.001$) relative to normative subjects. Compared to NSBC, patients with AS showed greater ICV expansion ($p<0.001$) and bone density loss ($p=0.011$), with no differences in occipital volume restriction ($p=0.33$) or bone thickness ($p=0.67$).

Conclusions

By five months of age, children with AS exhibit distinctive cranial adaptations suggestive of chronic ICH, including decreased cranial density and increased bone thickness. Our findings suggest potential benefits from earlier cranial vault surgery to prevent neurologic complications. Furthermore, the quantified posterior volume deficits and compensatory anterior volume overdevelopment supports posterior vault distraction as an initial surgical approach. Routinely acquired CT imaging can identify structural changes associated with ICH and guide personalized surgical timing.

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Data-driven Surgical Decision-Making in Patients with Metopic Craniosynostosis

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Abstract

Introduction

The choice of the surgical treatment of metopic craniosynostosis is often based on patient age, severity, and surgeon practice, and no tools exist to objectively identify the optimal treatment approach. This work evaluates how age, sex, and phenotypic severity affect the morphologic outcomes of patients with metopic craniosynostosis to support their optimal treatment selection.

Methods

We collected pre- and post-surgical 3D photograms of patients with non-syndromic single metopic (N=69) craniosynostosis from our institution, grouped into endoscopic strip craniectomy (ESC) followed by helmet therapy or open cranial vault remodeling (CVR). We compared their pre- and post-surgical 3D photograms using the Craniosynostosis Risk Score (CRS) and a novel Craniosynostosis Severity Index (CSI) improves the sensitivity of existing metrics of phenotypic severity to local malformations, which quantifies the number of standard deviations away from the average anomalies in the normative population. Then, we used a mixed effects model to quantify the impact of age, sex, and pre-surgical severity on 1-year treatment outcomes to support personalized treatment selections.

Results

22 patients underwent ESC (age at surgery 110 ± 23 days) and 47 underwent CVR (age at surgery 330±175 days, $p<0.001$). Patients undergoing ESC showed significant postoperative improvements in CRS (86% ±25% to 38%±39%, $p<0.001$) and CSI (2.07±1.23 to 1.07±0.44, $p=0.01$). Patients undergoing CVR showed significant improvement in CRS (78% ± 26% to 38% ± 32%, $p<0.001$) but not in CSI (1.59±1.11 to 1.05±0.25, $p=0.15$). Our mixed effects model demonstrated that ESC provides favorable morphologic outcomes in patients <3 months of age independently from phenotypic severity. For patients between 3-4 months of age, morphologic outcomes are comparable across techniques. For patients older than 4 months, CVR is expected to provide improved morphologic outcomes.

Conclusion

ESC may be the preferred treatment for patients with metopic craniosynostosis younger than four months since it provides improved safety and quantifiable morphologic outcomes. After four months of age, slower brain growth and cranial thickening limit the effectiveness of helmet therapy and CVR may be preferred. Our data-driven study underscores the importance of early interventions and may reduce morphologic outcome variability associated with subjective treatment selections.

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Personalized Prediction of Pre- and Post-Surgical Development of Patients with Craniosynostosis using Transformer Neural Networks

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Abstract

While the surgical treatment of craniosynostosis has traditionally involved open cranial vault remodeling (CVR), endoscopic strip craniectomy (ESC) followed by helmet therapy has become a popular alternative due to its reduced risks. However, the lack of methods to predict anatomical changes after surgery has led to uncertainty about which surgical intervention is optimal for each patient. We present a novel deep learning method to predict the anatomical development of a patient with craniosynostosis before and after either CVR or ESC.

We retrospectively curated sequences of pre- and post-surgical 3D photograms from patients with diverse phenotypes of craniosynostosis acquired between 2012 and 2024. We designed a temporally aware transformer-based neural network that was trained using the 3D photogram sequences of 80% of our patients along with information about age at imaging, age at surgery, sex, surgical approach and craniosynostosis diagnosis to predict personalized anatomical development before and after treatment. Performance was evaluated by quantifying the local distances between the observed head anatomy on each longitudinal 3D photogram and the generated head anatomies for each patient in a stratified hold-out dataset including 20% of our patients.

A total of 2,224 3D photograms (490 pre-surgical and 1,734 post-surgical) from 505 patients (348 male, 157 female, age at surgery 7.4 ± 5.5 months, 376 receiving CVR and 129 ESC) who underwent treatment for metopic (N=79), sagittal (N=321), unicoronal (N=41), bicoronal (N=21), lambdoid (N=7) and complex multiple suture craniosynostosis (N=36) were identified. We trained our model using 1,807 3D photograms of 405 patients and used 367 photograms of 100 patients for evaluation. Our model achieved an average prediction error of 2.07 ± 1.45 mm in CVR and 1.93 ± 1.20 mm in ESC. The error was not significantly different between surgical approaches ($p = 0.33$), or between pre- (2.34 ± 1.42 mm) and post- surgical predictions (2.01 ± 1.39 mm, $p = 0.14$).

We present the first method that enables personalized predictions of pre- and post-surgical development for patients with craniosynostosis. Using a non-invasive and low-cost imaging modality, our post-surgical predictions can support personalized treatment selections to optimize surgical outcomes.

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A Three-Dimensional Cleft Lip Incision-Design iOS Application Using Gamification: Pilot Study Results

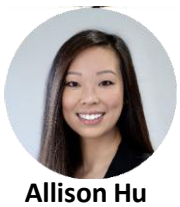
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Abstract

Background

Deliberate practice is required for the development of new skills, yet opportunities for cleft lip surgical training remain limited. Traditionally, surgeon learning, or refinement of cleft lip anatomical marking and incision design has relied on two- dimensional images, which do not accurately capture the three-dimensional relationships of landmarks, or physical models, which are often costly and inaccessible. We developed an interactive iOS app that allows users to manipulate 3D cleft lip models, mark key anatomic landmarks and incisions, and receive automated scoring based on expert-defined markings.

Methods

The Cleft Incision Design app, built in Xcode (v.16.1) using Swift 5, features anonymized preoperative 3D photographs of patients with unilateral cleft lip. Users can rotate and move these models in three-dimensional space and mark key anatomic points and incisional lines using a stylus or their finger. Within the app, user markings are compared to expert- defined references, and the marked points are assigned an accuracy score from 0-100. Medical students and plastic surgery trainees participated in a one-hour training session covering anatomic subunit approximation technique unilateral cleft lip landmarks. Pre- and post-tests were administered through the app, and self-reported understanding and confidence 7-point Likert scale scores were analyzed.

Results

A total of 21 surgical trainees and medical students participated. Marking accuracy scores significantly improved from pre- test (36.8±27.6) to post-test (69.5±8.3, $p=0.0017$). Self-reported understanding (2.98±1.89 vs. 4.62±1.35, $p<0.0001$) and confidence (2.61±1.72 vs. 4.28±1.47, $p<0.0001$) in cleft lip marking also increased significantly. Pre-test scores varied with training level, with higher scores corresponding with more advanced training ($p=0.016$), while post-test scores normalized across training levels.

Conclusions

This novel app enhances accessibility to 3D cleft lip marking education, providing an interactive platform with real-time feedback. Training with the app led to significant improvements in both accuracy and confidence, highlighting its potential as a valuable educational tool for accelerating the learning curve in cleft lip repair.

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Rigorous Study of Cranial Suture Closure Timing in the Era of High Resolution CT Imaging: A Radiographic Analysis of 1119 Pediatric Head CT Scans

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Abstract

Purpose

Classical teaching suggests that the sagittal, coronal, and lambdoid sutures normally begin to close during the third decade of life. Therefore, in pediatric patients, the incidental finding of a closed suture is often alarming and raises concerns for potential craniosynostosis. Distinguishing craniosynostosis from normocephalic cranial suture closure can be challenging, particularly when a closed suture is discovered in an otherwise asymptomatic patient. This study investigates the prevalence of incidentally discovered cranial suture closure in healthy pediatric patients and its effects on cranial vault morphology.

Methods

A cross-sectional review was performed of patients aged 0 to 18 who underwent head CT imaging in our institution's pediatric emergency department from May 2014 to April 2024. All scans were reviewed on axial images by one of three attending neuroradiologists for the presence of open, partially fused, or completely fused metopic, sagittal, coronal, and lambdoid sutures. Patient age and demographics were also collected.

Results

A total of 1,119 scans met inclusion criteria. Complete or partial sagittal suture closure was observed in 11.1% of patients, with coronal and lambdoid closure in 2.8% and 1.6%, respectively. Most patients under age three had open sagittal sutures (99.3%), decreasing to 83% by age nine. Metopic suture closure followed established patterns, with over 75% closure rates by 21 months. Multivariable regression revealed sagittal suture closure was associated with decreased cephalic index (β=-0.8, p=0.026), though 83.1% of these patients remained normocephalic. However, among patients with cephalic index

Conclusions

Our study found that up to 17% of pediatric patients may experience normocephalic partial (8.9%) or complete (8.4%) sagittal suture closure by age 18. While sagittal suture closure was linked to a decreased cephalic index, most patients with incidental closure maintain normocephaly.

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Volumetric Orthognathic Surgery for the correction of facial deformities: an integrated three-dimensional approach to occlusal restoration and aesthetic rebalancing of soft tissue volumes.

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Abstract

Volumetric Orthognathic Surgery (VOS) is an evolving surgical philosophy that enhances traditional skeletal and occlusal approaches by integrating the concept of volumetric balance of facial soft tissues. Historically, the correction of facial deformities has focused primarily on skeletal and occlusal correction, often overlooking the role of soft tissues. This study presents the "VOS planning procedure" as applied to a series of cases, aiming to evaluate its effectiveness and predictability in the management of severe dentoskeletal malocclusions and craniofacial deformities. A total of 50 patients affected by severe dentoskeletal malocclusions—including syndromic conditions such as cleft lip/ palate, hemifacial microsomia, facial dysostosis, and sequelae of craniosynostosis—were treated using the VOS approach, a 3D protocol that analyzes both hard and soft tissues in terms of volumetric units (mm^3) rather than traditional linear or angular measurements. For each patient, a comprehensive preoperative assessment (T0) was conducted using CT scans and 3D facial scans. Surgical simulations (SS) were generated based on volumetric evaluations to guide both skeletal repositioning and soft tissue outcome prediction. Postoperative follow-up was performed at 6 months (T1) using the same imaging modalities. Comparisons among T1, SS, and T2 were carried out to assess skeletal alignment, soft tissue volume changes, clinical balance, occlusal function, and the reproducibility of the VOS planning process. The application of VOS led to significant improvements in both skeletal and soft tissue results. All patients achieved functional occlusion and improved facial aesthetics. The predicted soft tissue changes were consistent with postoperative outcomes, particularly in syndromic patients, where soft tissue management is critical. The comparison between postoperative imaging and SS confirmed high accuracy in forecasting aesthetic and functional results. VOS offers a comprehensive approach to the treatment of dentofacial deformities by simultaneously addressing skeletal and soft tissue adjustment. The results demonstrate the method's effectiveness and reproducibility. In patients with malformations—traditionally treated with a focus on occlusal and skeletal correction—this represents an important paradigm shift: rather than treating soft tissue aesthetics as secondary, or negligible, VOS places them at the core of planning, proving essential even in dysmorphic patients to achieve balanced, harmonious results.

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Reshape the mandibular angle with the combination of SSRO surgery and gonioplasty

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Abstract

The application and efficacy of supplementing SSRO with simultaneous gonioplasty at the same region is vital for reshaping the mandibular angle. A retrospective analysis was conducted on patients with dentomaxillofacial deformities, who simultaneously underwent SSRO and gonioplasty. The shared trait of the involved patients is the basic procedure of SSRO. Simultaneously, some plasty at the same region of mandibular angle were supplemented, such as MAO, MASO and bone graft between the internal and outer osseous lamella. Besides, some operations were involved at other regions in 23 cases totally, including LeFort I osteotomy (with/without segmentalization), zygomatic arch reduction, genioplasty and AMSO. All cases underwent preoperative digital design and three-dimension printing of surgical plate. CBCT and 3D-reconstruction were performed at specific intervals after surgery and compared with digital prediction and simulation. In this way, the accuracy and clinical effect of preoperative digital design were evaluated. All the surgeries were successful, and the patient was discharged after one-stage surgery. Neither damage on inferior alveolar artery or nerve, nor unexpected fractures or reoperation occurred among the patients. The therapeutic efficacy was satisfactory. The surgery schedules at the mandibular angle region were as follows: 1) SSRO should be conducted posterior to circum-angle long-line and/or curved MAO, if involved. 2) SSRO should be performed in advance and followed by MASO, if MASO rather than long-line or curved MAO was supplemented. 3). SSRO should be carried out after circum- angle long-line and/or curved MAO, but before MASO, if they were all involved. According to the results, the plumpness of the mandibular angle on both sides could be adjusted by supplementing SSRO with MASO or bone graft between the internal and outer osseous lamella. The combination of SSRO with MAO adjusted not only the symmetry of the mandibular ramus height on both sides, but also the profile of the mandibular contour, as well as the fullness of the mandibular angle in some way. Supplementing the orthognathic surgery with plasty on other maxillofacial regions, one-stage operation could effectively improve the patient's appearance and avoid the second surgery of adjustment, to some extent.

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Experimental and Clinical Study on Non-Vascularized Fibular Flap for Mandibular Defect Reconstruction and Fibular Regeneration

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Abstract

Background & Purpose

Reconstruction of large mandibular defects (>5 cm) remains a major challenge in oral and maxillofacial surgery. Although vascularized fibular flaps (VFFs) are the current gold standard, non-vascularized fibular flaps (NVFFs) offer advantages such as simplified surgical procedures and shorter operation times, making them valuable for select cases. However, the osteointegration mechanisms of NVFFs and donor-site fibular regeneration remain unclear, and clinical selection criteria lack standardization. This study aims to evaluate the feasibility of NVFFs for mandibular reconstruction through animal experiments and clinical retrospective analysis, identifying key success factors to guide clinical decision-making.

Methods

Animal Study: Five Diannan small-ear pigs underwent bilateral mandibular defect models (5–6 cm), reconstructed with NVFFs either with (n=4) or without (n=1) periosteal preservation. Postoperative evaluation included imaging (CT 3D reconstruction, X-ray) and histology (HE/Masson staining) to assess osteointegration and fibular regeneration.

Clinical Study: Retrospective analysis of 176 mandibular reconstruction cases (11 NVFF vs. 165 VFF, 2002–2025) comparing operative time, complication rates, bone healing time, and functional recovery. Data were analyzed using SPSS 22.0 with significance set at $P<0.05$.

Results

Animal Study: Periosteum-preserved NVFFs achieved 80% osteointegration (8/10), significantly higher than non-preserved ($P<0.05$). Donor-site fibular regeneration was 95.9±6.7% (preserved) vs. 62.4% (control). Ischemia time ≤30 minutes had no significant impact on bone resorption (1.8% vs.6.5%;$P>0.05$).

Clinical Study:72.7% (8/11) of NVFF cases achieved infection-free healing, while 27.3% developed chronic infections with graft resorption (18.2–46.7%).Multivariate analysis identified periosteal integrity (OR=4.2) and fixation stability ($P=0.038$) as key success predictors.NVFF operative time was significantly shorter than VFF (142±23 vs. 278±41 min;$P<0.001$).

Conclusion

NVFFs are viable for mandibular defects ≤6 cm, with success dependent on strict periosteal preservation and stable fixation. Animal experiments demonstrated enhanced osteointegration and donor-site regeneration with periosteal preservation, while clinical data emphasized careful case selection, particularly avoiding complex scenarios like osteoradionecrosis. This study provides theoretical and technical support for NVFF applications.

Key words

Mandibular reconstruction; Avascular bone grafting; Fibular osteogenesis; Periosteal conservation; Outcomes research

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Establishing High-Standard Craniofacial Care in Ukraine: A Partnership for Sustainable Surgical Development

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Abstract

Craniosynostosis, particularly in complex forms, requires early diagnosis, staged surgical interventions, and multidisciplinary follow-up to optimize developmental, neurological, and aesthetic outcomes. Such care is typically centralized in high-income countries with coordinated specialist teams. Until recently, Ukraine—a country of nearly 40 million people—lacked a multidisciplinary center for managing these cases, despite international recommendations suggesting at least one unit per 10 million people. In 2021, amid ongoing conflict and logistical challenges in transferring patients abroad, a partnership began between Necker-Enfants Malades Hospital in Paris (the French national reference center for craniosynostosis) and Okhmatdyt Hospital in Kyiv (Ukraine's largest pediatric facility). The goal was to develop a sustainable craniofacial unit in Kyiv, modeled on international standards and adapted to the local context. The collaboration combined clinical care and capacity building. Ukrainian surgeons advanced their training in complex craniosynostosis through regular online multidisciplinary meetings with French specialists—maxillofacial and neurosurgeons, ENT physicians, geneticists, and ophthalmologists. The Ukrainian team also traveled to Paris for surgical observation and hands-on workshops, joined by an anesthesiologist and a scrub nurse. Since 2021, six missions by the French craniofacial team to Kyiv have enabled over 10 complex surgeries to be performed jointly—many for the first time in Ukraine. These included fronto-orbital advancements, monobloc, box osteotomy, facial bipartition, and Le Fort III osteotomy. Outcomes have been comparable to those achieved in Paris, with no major complications. To date, more than 100 patients from across Ukraine have been jointly evaluated for craniofacial care. The next mission is planned for July 2025. This initiative shows that even in wartime, respectful international collaboration can support the development of high- standard craniofacial care. This collaboration has laid the foundations for sustainable local expertise and long-term patient care in complex craniosynostosis in Ukraine. Encouraged by this success, we have initiated similar partnerships with Georgia and Armenia, which show great promise. We look forward to expanding these collaborative efforts in the future.

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Clinical study on the effect of Le-Fort Ⅰ advancement of maxilla on the anatomic morphology of nasal base in patients with skeletal Class III

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Abstract

Objectives

To examine nasal base soft tissue morphology changes in skeletal class III patients after maxillary advancement in orthognathic surgery.

Materials and Methods

Twenty-four patients who underwent LeFort I osteotomy advancement at the Stomatological Hospital affiliated with the School of Medicine of Nanjing University were collected from February 2022 to February 2024. Spiral CT images were acquired one week before surgery and over six months postoperatively. Three-dimensional reconstruction and morphology measurements of paranasal and subnasal regions were performed using Mimics and 3-Matic software. Statistical analysis was performed using GraphPad Prism software.

Results

The distance of maxillary advancement was (4.09 ± 1.35) mm. In the paranasal region: the width of the alar, the width of the alar base, the prominence of alar, the prominence of alar base, the prominence of cheek points, the angle related to the alar base point, the volume and curvature of the bilateral paranasal region all increased. The advancement distance was significantly correlated with the increase in the prominence of alar points, the prominence of alar base points, and the increase in the angle between the line connecting the base points and the infraorbital points and the coronal plane. In the subnasal region: the subnasal length, the prominence of the subnasal, the prominence of the soft tissue A point, the upper angle of the nasolabial angle, the volume and curvature of the subnasal region all increased, while the nasal length and the facial protrusion angle decreased. The advancement distance was significantly correlated with the increase in the prominence of the soft tissue A point, the increase in the upper angle of the nasolabial angle, and the increase in the volume of the subnasal region.

Conclusion

Post-maxillary advancement, the nasal alar expanded, nasal length diminished, subnasal length augmented, and soft tissue protrusion intensified; the curvature change rates in the paranasal and subnasal regions were sustained at 0.2–0.3 and 0.4, respectively. The advancement procedure can significantly enhance nasal basal depression.

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Two-Stage Mandibular Symmetry Improvement after BSSRO: A CBCT Analysis of 60 Consecutive Patients with Asymmetric Prognathism

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Shunchao Yan



Guoping Wu

Abstract

Background

The remodeling process of asymmetrically prognathic mandibles following bilateral sagittal split ramus osteotomy (BSSRO) remains incompletely understood. This study aims to elucidate the dynamic process of the mandibular symmetry following BSSRO.

Method

A retrospective analysis was conducted on 60 consecutive patients with asymmetric prognathism who underwent BSSRO between January 2018 to December 2023. CBCT scans were obtained at three different time points: preoperatively (T0, within 2 weeks before surgery), immediately postoperatively (T1, within 2 days) and long-term postoperatively (T2, at least 6 months later). Mandibular symmetry was quantified using root mean square error (RMSE), derived from spatial discrepancies between the deviated mandible and its mirrored counterpart. Additionally, positional discrepancies of 12 landmark points and volumetric differences of 6 mandibular segments were assessed using paired t-test for interpreting the mandibular remodeling process during and after surgery.

Results

All patients underwent the Dal Pont modified BSSRO and recovered without severe complications. At T0, the averaged RMSE was 2.729, which significantly decreased to 2.163 immediately after BSSRO ($p < 0.0001$), a further declined to 1.916 at T2 ($p < 0.001$), suggesting there were two stages of mandibular symmetry improvement. During T0-T1, significant corrections were observed in transverse discrepancies in CoG-C (center of gravity-chin), MF and CoG-B (center of gravity-body). However, BSSRO increased sagittal discrepancies in Go and Cd, as well as vertical discrepancies in CoG-R (center of gravity-ramus), while volumetric asymmetry enhanced in three mandibular segments (Chin: $p=0.002$; Body: $p=0.003$; Ramus: $p < 0.001$). During T1-T2, significant reductions occurred in transverse and vertical discrepancies of Go and vertical discrepancies of CoG-R, with resolution of volumetric asymmetry in the mandibular body ($p=0.001$) and ramus ($p < 0.001$).

Conclusions

Mandibular symmetry improvement after BSSRO occurs in two distinct stages: an initial surgical correction of positional discrepancies, followed by a long-term remodeling phase that refines morphological symmetry. These findings underscore the dynamic nature of mandibular adaptation and highlight the importance of extended follow-up in assessing orthognathic outcomes. Future research should explore how surgical and orthodontic variables optimize this process for individualized patient care.

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Combined Partial Coronoidectomy and Reduction Malarplasty in Patients with Elongated Coronoid Processes: Outcomes and Comparative Efficacy

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Chongxu Qiao



Guoping Wu

Abstract

Background

Reduction malarplasty is one of the most frequently performed facial contouring procedures in Asia. However, patients with elongated coronoid processes may experience postoperative complications such as restricted mouth opening. Building on our previous research, this study evaluates the efficacy of simultaneous partial coronoidectomy in mitigating these complications by comparing outcomes between patients undergoing reduction malarplasty with or without concurrent coronoidectomy.

Methods

We conducted a retrospective cohort study of patients with radiologically confirmed elongated coronoid processes who underwent reduction malarplasty between April 2019 and September 2024. Participants were divided into two groups: Group A, who received simultaneous partial coronoidectomy (n=27), and Group B, who underwent malarplasty alone (n=27). All procedures were performed by the same surgeon using an L-shaped osteotomy for zygomatic reduction. Preoperative, immediate postoperative (within 7 days), and 6-month postoperative assessments were conducted using cone-beam computed tomography (CBCT). Zygomatic stability was evaluated using Mimics and Geomagic software, with root mean square error (RMSE) used to quantify positional changes. Surgical outcomes were assessed based on CBCT findings, and postoperative complication rates, and patient-reported FACE-Q satisfaction scores.

Results

Group A reported no serious complications, whereas group B experienced six cases, including nonunion (n=3), temporomandibular joint disorders (n=2), and facial asymmetry (n=1). An independent samples t-test revealed significantly lower RMSE values in group A ($t(52) = 2.68$, $P < 0.05$), indicating better postoperative skeletal stability. While FACE-Q scores improved in both groups, group A demonstrated significantly higher satisfaction.

Conclusions

For patients with elongated coronoid processes, combining partial coronoidectomy with reduction malarplasty enhances postoperative skeletal stability, reduces complications, and improves patient-reported aesthetic outcomes compared to malarplasty alone. This integrated approach offers a clinically superior alternative for optimizing both functional and aesthetic results.

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Pre-surgical Taping for Wide Facial Cleft

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Lobredia Zarasade



Shania Priza Adelia

Abstract

Introduction & Objectives

Facial clefts could be presented with very wide clefts that require preoperative intervention to reduce the gap. The presurgical taping is widely used for cleft lips, whereas pre-orthodontic devices are not used, for cost-effective reasons. In concept, the facial cleft is also similar to the cleft lip & palate, where the molding of the facial bones is effective before three months of age because of the mother's estrogen hormone. This nonsurgical method of mobilizing and approximating the soft tissues of the cleft has been accomplished effectively and inexpensively, compare to the using of tissue expander which require additional costs, time, and surgery. This article is to bring out the effectiveness of soft tissue taping for wide facial cleft.

Methods

Serial Case reports of three babies with wide facial clefts were treated with applying of presurgical tape over several months. Two babies were applied initially at 1-month old (A1,A2) and 1 baby at 5-months old (B). Some clinical features, and results were measured and evaluated pre- and post-treatment.

Results

The group A showed significant results, with 40% - 60% reduction in size of the gap between bone and soft tissue segments. Baby A1 with 30mm wide cleft become 10mm after using presurgical taping for 6 months and the pre- maxilla that shifting to the left side become more symmetric and less protruded. Baby A2 also showed a good result from 25-30mm before and 15mm after taping several months. Meanwhile in baby B the result is not successful. At beginning there was reduction of gap 4 mm after 2 months using taping, but then back relapse to the initial wide and remains stagnant for 7 months.

Conclusion

Presurgical taping can be applied in wide facial cleft baby with significant result includes reducing cleft width, molding the maxillary arches, mobilizing the soft tissues of the lip and midface, and facilitating definitive cleft repair. This is a simple and affordable method and eliminates the potential additional operation. Presurgical taping must be applied initially at age before 3 months old.

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Factors influencing blood loss in front-orbital advancement and remodeling: A retrospective review of 231 cases

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Abstract

Fronto-orbital advancement and remodeling (FOAR) is associated with substantial blood loss. Although transfusions are considered an effective approach to managing blood loss, they still carry risks such as transfusion-related reactions. To mitigate these risks and unpredictable effects of blood products on coagulation physiology, our institution has adopted conservative transfusion strategy rather than standard proactive approach of initiating transfusion at the time of scalp incision. However, its suitability may be limited in patients requiring higher transfusion volumes. Therefore the objective of study is understanding the factors contributing to intraoperative blood loss during FOAR, identifying high-risk groups, minimizing blood loss and modifying replacement strategies to ensure patient safety. To this end, a retrospective review was conducted on 231 craniosynostosis patients who underwent FOAR between 2003 and 2023. The total amount of blood loss was assessed based on the measured volume of blood collected in suction canisters (excluding irrigation fluids) and visual assessment of blood absorbed by surgical sponges, drapes. As a result, younger patients (<18 months) demonstrated higher weight-adjusted blood loss. Patients with multiple suture synostosis, syndromic craniosynostosis, elevated intracranial pressure (ICP), dural tears had significantly higher total and weight-adjusted blood loss. Blood loss was positively correlated with operative time. Patients administered tranexamic acid intraoperatively experienced significantly lower blood loss. Multiple linear regression analysis identified the presence of syndrome, dural tears and operative time as statistically significant predictors of total and weight-adjusted blood loss. Patients with higher intraoperative transfusion volumes demonstrated continued higher need for transfusions postoperatively. In conclusion, this study, to the best of our knowledge, is the largest investigation of factors influencing blood loss in FOAR. Significant risk factors for increased blood loss include syndromic craniosynostosis, multiple suture synostosis, elevated ICP, dural tears, prolonged operative time. Tranexamic acid demonstrates beneficial effects in reducing blood loss. Patients requiring higher intraoperative transfusion volumes should be closely monitored postoperatively for ongoing transfusion needs and blood products should be readily available. Consequently, preoperative assessment of risk factors is essential, and the transfusion strategy should be tailored according to patient's individual risk profile for excessive blood loss, whether categorized as high or low risk.

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Comparison of Bone Quality Among Orthognathic Surgery Patients with Cleft Lip and Palate, Non-Cleft Patients, and the Normal Population

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Abstract

In patients with cleft lip and palate, it has been previously confirmed that there is a delay in maxillary bone development. Maxillary hypoplasia observed in cleft patients has been primarily evaluated as a growth restriction in different planes. Nevertheless, this hypoplasia can manifest not only as a growth restriction but also as decreased bone quality. This reduction in bone quality may affect the stability of fixation during surgery and influence the overall surgical outcomes. This study aims to quantitatively evaluate the bone quality of orthognathic surgery patients with and without cleft lip and palate. Bone quality was evaluated by measuring bone thickness (mm) and bone density (Hounsfield Unit, HU) from standard anatomical points on the craniofacial skeleton on computed tomography images and compared among cleft orthognathic patients (Group I), non-cleft orthognathic patients (Group II), and a healthy control group (Group III). Each group consisted of 24 patients, and there were no statistically significant differences among the groups regarding gender distribution or age. Group I exhibited significantly lower bone density and thickness in both the medial and lateral buttresses compared to Groups II and III ($p=0.001$). However, no significant differences in bone density or thickness were observed between Groups II and III ($p=0.234$). Within Group I, the lateral buttress density and thickness were significantly higher than those of the medial buttress ($p=0.01$). Additionally, both medial and lateral buttress density and thickness on the cleft side were significantly lower than on the non-cleft side ($p=0.01$). In cleft patients, the bone quality of both buttresses is decreased, with the cleft side and medial buttress being more affected than the non-cleft side and lateral buttress. To the best of our knowledge, this study is the first to quantitatively investigate maxillofacial bone quality in cleft lip and palate orthognathic surgery patients from both densitometric and craniometric perspectives. As a result, cleft orthognathic patients should be evaluated distinctly due to differences in bone morphology. Special attention should be given during the fixation of the medial buttress and cleft side. Additionally, surgeons may consider modifying fixation strategies to more rigid fixation methods, given the decreased bone quality.

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Evaluation of Single Monocortical Miniplate Fixation in the Treatment of Mandibular Angle Fractures

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ERSOY KONAŞ


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MERT ÇALIŞ

Abstract

The aim of this study is to examine the outcomes of superiorly placed monocortical single miniplate fixation in the treatment of mandibular angle fractures and evaluate treatment efficacy through craniometric measurements. Postoperative craniometrics were cvompared with both the preoperative measurements and the control group. Patients treated for mandibular angle fractures between 2014 and 2022 were involved in this study. Patients followed up for at least 6 months and having both preoperative and postoperative maxillofacial computed tomography (CT) scans were included in the patient group. Patient with history of previous maxillofacial fracture and, history of congenital craniofacial malformation were excluded from the study. Age and sex-matched patients without maxillofacial fractures on CT images were included in the control group. Thirty-nine (31 male, 8 female) patients who met the study criteria were included. The mean age of the patients was 26.7 years and the mean follow-up was 3.0 years. During the surgery, a single miniplate was placed along the medial side of the external oblique ridge and secured using 2.0 mm screws. All patients were followed using maxillomandibular fixation (MMF) for 2 weeks. Complications were observed in 6 patients, with 4 treated surgically and 2 managed the preoperative and postoperative measurements of the gonial angle and condyle- midsagittal plane distance on both the fracture side and the contralateral side. The only significant difference was found in comparison of the degree of the mentum deviation (P=0.001). Postoperative mandibular morphometry was comparable to that of the control group. Single miniplate fixation corrects mentum deviation without resulting in any changes in condyle position and can achieve healthy mandibular morphometry. To the best of our knowledge, this is the first and pioneering clinical study to evaluate the treatment outcomes of the single miniplate fixation method in treating mandibular angle fractures using craniometric measurements.

As a result, functionally stable fixation using a superiorly placed single miniplate is a reliable method in the treatment of mandibular angle fractures due to its low complication rate and favorable outcomes.

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Management of Rare Central Giant Cell Granuloma with Fungal Spores in Two Male Siblings; Conservative and Radical Approaches Due to Varying Craniofacial Surgical Skills

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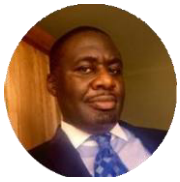
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Abstract

Background

Giant cell granuloma (GCG) is a benign bone lesion primarily affecting the mandible and the maxilla. The most common extragnathic site is the cranial base and small bones of the hand and legs. Although typically sporadic, familial occurrences are rare. The presence of fungal spores within GCGS is an unusual finding which can complicate diagnosis and management.

Methods

This case report discusses the management of rare giant cell granulomas with fungal spores in two male siblings. It illustrates the contrasting surgical approaches required due to the differing craniofacial surgical expertise available.

Results

A 21-year-old male presented with painless swelling on his right forehead, diagnosed as central giant cell granuloma. Due to limitations in local surgical expertise, a more conservative approach involving serial curettage and peripheral ostectomy was undertaken. Histopathological examination of the curetted tissue also revealed the presence of fungal spores, and a tailored amphotericin B regimen was administered. Recurrence occurred after three years, with the lesion spreading to involve the ethmoidal and sphenoidal sinuses with skull base erosion. Two years later, the younger brother also presented with similar swelling, in the exact location as his brother. This time, due to the availability of advanced craniofacial surgical skills, a radical en bloc resection with immediate reconstruction with split cranial bone graft was performed, achieving complete lesion removal and satisfactory functional and aesthetic outcomes. This was followed by a tailed amphotericin B regimen. The patient is now doing well with no recurrence after 8 years post-op.

Conclusion

This unique report of rare familial GCGS with the incidental finding of fungal spores underscores the importance of comprehensive histopathological evaluation. It highlights the influence of available surgical expertise on the management strategies for craniofacial lesions. Further research is warranted to elucidate the potential role of common exposure and potential genetic influence in this case.

Key Words

Giant Cell Granuloma, Fungal Spores, Craniofacial Surgery

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Spatiotemporal single-cell atlas of coronal suture development in Crouzon syndrome

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Abstract

Crouzon syndrome, characterized by the premature fusion of the coronal suture, leads to abnormal skull development, yet the cellular and molecular dynamics underlying this disorder during development remain incompletely understood. Here, we present a comprehensive spatiotemporal atlas of coronal suture development in a Crouzon syndrome mouse model using single-cell RNA sequencing (scRNA-seq) and spatial transcriptomics (ST) across three critical developmental stages: E14.5, E18.5, and P3. By integrating scRNA-seq and ST data, we constructed a high-resolution map of cell types and their spatial organization within the coronal sutures. Our analysis revealed distinct niche composition, cellular trajectories, gene expression patterns, and cell-cell communication networks associated with suture patency and closure. By comparing differences between the disease and control groups from embryonic to postnatal stages, we identified key transcriptional regulators driving premature suture fusion and highlighted critical divergence points in developmental trajectories that could serve as potential therapeutic targets. This spatiotemporal single-cell atlas provides a resource for understanding the development of the coronal suture and the underlying mechanisms of Crouzon syndrome.

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ANO5 p.I616F mutation drives florid cemento-osseous dysplasia by disrupting transmembrane domain structure and calcium signaling

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Abstract

Background

To date, genetic studies on florid cemento-osseous dysplasia (FCOD) remain limited. This study aimed to elucidate the clinical features and genetic basis of FCOD in Chinese populations, with particular emphasis on identifying pathogenic *ANO5* variants and their mechanistic contributions to disease development.

Methods

Clinical data from 17 FCOD patients diagnosed between May 2015 and December 2024 at Kunming Medical University Affiliated Stomatological Hospital were retrospectively analyzed. Whole-exome sequencing was performed on a familial cohort (8 individuals). Identified mutations were validated using Sanger sequencing. Pathogenicity was predicted via SIFT, PolyPhen-2, and MutationTaster, while protein structural alterations were modeled with AlphaFold 2. Histological assessment included H&E staining, Masson trichrome, RUNX2 immunohistochemistry, and TRAP staining to quantify osteoclastic activity.

Results

Among the 17 FCOD patients included in this study, 10 (58.8%) were female, with a mean age of 47.9 ± 14.2 years. Genetic analysis identified *ANO5* mutations in five cases, including a novel variant (p.I616F). Pedigree analysis confirmed that p.I616F was a heterozygous mutation, and bioinformatics prediction indicated its likely pathogenicity. Structural modeling further demonstrated that this mutation disrupted the α-helix of *ANO5* and altered the catalytic site's conformation. Additionally, histological evaluation revealed significantly elevated RUNX2 expression and increased osteoclast activity in the jawbone tissues of FCOD patients.

Conclusion

This study is the first to report the association between the *ANO5* gene *p.I616F* mutation and familial florid cemento-osseous dysplasia (FFOD). The mutation may contribute to disease pathogenesis by disrupting bone remodeling signaling pathways, offering novel insights into the molecular diagnosis and potential targeted therapies for FCOD.

Keywords

Florid cemento-osseous dysplasia; *ANO5*; Missense mutation; Bone remodeling; Genotype-phenotype correlation

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Long-Term Stability of Patient-Specific 3D-Printed Titanium Fixation Plates in LeFort I Osteotomy

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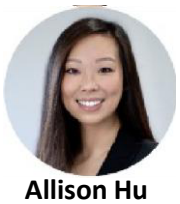

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Abstract

Background

While the stability of LeFort I osteotomies is well established, data evaluating the long-term outcomes of custom 3D- printed titanium fixation plates are limited. With the growing use of virtual surgical planning (VSP) and CAD/CAM technology, patient-specific implants are increasingly used in orthognathic surgery. This study investigates the long-term stability of patient-specific 3D-printed titanium plates in LeFort I osteotomy.

Methods

Patients who underwent LeFort I osteotomy at our institution between 2015 and 2023 were retrospectively reviewed. Inclusion required preoperative, immediate postoperative (≤30 days), and long-term postoperative (≥360 days) CT scans or lateral cephalograms. Patients with additional surgical interventions between imaging timepoints were excluded. The Sella-Nasion-A Point (SNA) angle was measured using Dolphin Imaging Software (v8.0). Percent relapse in the sagittal plane was calculated as the change in SNA toward the preoperative value, divided by the initial operative change.

Results

Sixty-eight patients met inclusion criteria: 10 with traditional fixation (TF) and 58 with 3D-printed patient-specific implants (PSI). Most (94.1%) underwent advancement; 5.9% had setback. The average operative change in SNA was 7.05°, with significant relapse observed at long-term follow-up (22.6%, $p<0.001$). PSI fixation resulted in significantly less relapse than TF (21.96% vs 43.76%, $p=0.031$). Despite relapse, 86.2% (50/58) of PSI patients-maintained Class I occlusion long term. After controlling for age, sex, surgeon, magnitude of operative change, concurrent mandibular osteotomy, and timing of follow-up, there were no significant differences in relapse for patients with cleft palate ($p=0.687$), congenital syndromes ($p=0.321$), or prior maxillary surgery ($p=0.182$).

Conclusions

This is the largest cohort to date assessing long-term relapse in LeFort I osteotomies with 3D-printed titanium plates. Although minor relapse occurred beyond the first year, clinical impact was minimal, with most PSI patients retaining Class I occlusion. Notably, patients with cleft, syndromic diagnoses, or prior surgery experienced no greater relapse, suggesting the ability of patient-specific plates to provide similar stability across a wide range of patient phenotypes.

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Predictive Modeling of Mandibular Distraction Osteogenesis Success to Treat Tongue-Based Obstructive Apnea: Results of a 16-Year, Hospital- Wide Intervention Trial

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Abstract

Background

Congenital micrognathia is frequently associated with tongue-based airway obstruction (TBAO) and Robin Sequence. Selecting the most appropriate treatment among alternatives including positioning, airway stenting, mandibular distraction osteogenesis (MDO), and tracheostomy among others, remain suboptimal. We sought to develop a prediction tool for optimizing use of MDO in the treatment paradigm of TBAO.

Methods

A retrospective review was conducted of patients with micrognathia and TBAO managed at our institution between 2007 and 2023. Patient demographics, medical histories, treatment interventions, and outcomes were extracted, with Random Forest modeling applied to identify predictors of MDO failure using clinical variables including birthweight, gestational age, syndromic status, and response to prone positioning.

Results

A total of 344 patients met inclusion criteria. Tracheostomy rates among patients with TBAO due to micrognathia decreased from 48.3% (70/145) before 2011 to 15.7% (31/199) after 2011, coinciding with the adoption of mandibular distraction osteogenesis ($p<0.001$). Success with MDO was associated with non-syndromic status (43.5% vs 81.0%, $p=0.002$), greater gestational age (37.8 vs 37.1 weeks, $p=0.027$), higher APGAR scores (6.5 vs 4.9, $p=0.001$), and absence of cardiac anomalies (29.8% vs 66.7%, $p=0.001$), neurologic disorders (14.3% vs 71.4%, $p<0.001$), and lower airway pathology (15.5% vs 76.2%, $p<0.001$). A random forest model trained with these variables predicted MDO success with an improved negative predictive value of 0.500 versus 0.221 for the GILLS score, while maintaining similar positive predictive value (0.925 vs 0.947).

Conclusions

Mandibular distraction osteogenesis has significantly reduced tracheostomy rates in patients with micrognathia and tongue-based airway obstruction. This predictive Random Forest model highlights key characteristics to consider in clinical decision-making.

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Demystifying Maxillomandibular Fibrous Dysplasia and its Impact on Dental Development

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Abstract

Background

Fibrous dysplasia of the jaw (FDJ) is a rare fibro-osseous skeletal disorder that affects the maxilla and/or mandible, often resulting in significant dental complications. However, its impact on dentition and occlusion remains poorly characterized. This study aims to analyze the dental and orthodontic sequelae of FDJ to enhance clinical management and improve patient care.

Methods

A retrospective cohort study was conducted on patients with maxillomandibular fibrous dysplasia seen at our institution from 2015 to 2023. Medical records and CT imaging were reviewed to assess disease distribution, dental pathology, occlusion, and orthodontic treatment outcomes.

Results

Among 39 patients with FDJ, 30 (76.9%) had direct dentoalveolar involvement. Malocclusion was documented in 29 (74.4%) patients, with Angle's class 1 in 26 (66.7%), class 2 in 10 (25.6%), and class 3 in 3 (7.7%). Dental abnormalities included retained primary teeth (n=5, 12.8%), dental caries (n=7, 17.9%), enamel hypoplasia (n=1, 2.6%), and loss of permanent dentition (n=3, 7.7%). In patients with retention of primary teeth, imaging revealed displacement of the permanent dentition below. Orthodontic treatment was documented in 17 patients (43.6%), with younger age at initiation associated with higher likelihood of requiring repeat orthodontic treatment (p=0.0289).

Conclusions

FDJ presents significant dental challenges, with high rates of malocclusion and dentoalveolar involvement. While some patients experienced toot pain and rapid disease progression resulting in need for surgical intervention, most patients achieved stable occlusion into adulthood, highlighting that orthodontic treatment is generally successful with appropriate timing and multidisciplinary management. Despite concerns about disease progression, adult dentition is typically preserved, and early intervention can be effective when closely monitored.

416

Apert and Crouzon Syndrome: Morphological analysis of posterior cranial fossa under posterior cranial vault expansion

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Abstract

Background

Posterior cranial vault expansion (PCVE) is a surgical technique for addressing intracranial volume deficiencies in syndromic craniosynostosis, particularly in the posterior fossa. However, specific morphological variations of this region among healthy individuals and Apert or Crouzon patients remain understudied. This study aims to provide a detailed morphological analysis of the posterior fossa in these groups, both before and after PCVE.

Method

Head CT scans were retrospectively reviewed for 28 patients with Apert (n = 13) and Crouzon (n = 15) syndromes who underwent PCVE via distractors, springs or free-floating bone flap method. Scans were obtained preoperatively (age: 0–25 months) and at postoperative stages (age: 6–56 months). Intracranial volume (ICV) and posterior fossa volume (PFV) were measured and computed at both time points. Geometric morphometric methods were then applied to analyze shape changes in the intracranial cavity and posterior fossa, using 37 anatomical landmarks and 200 semilandmarks. The volumetric and shape data were compared with those of an age-matched control group (n=51) to assess the overall intracranial and posterior
fossa morphology.

Results

Preoperatively, patients with Apert syndrome exhibited larger PFV and ICV (89.26±36.86 and 1039.91±272.79cm^3) compared with both Crouzon patients (66.52±14.53 and 1010.58±272.30cm^3) and controls. Crouzon patients, however, showed greater variability. Postoperatively, Apert patient demonstrated significant increases in PFV to an average of 129.34±31.98cm^3 and in the PFV/ICV ratio (rising from 8.28±2.05% to 9.11±2.00%). In contrast, Crouzon patients showed limited PFV gains, with PFV/ICV ratios often decreasing to around 6.45±1.19%. Despite having lower PFV and ICV overall, Crouzon patients displayed more normal intracranial and posterior fossa shapes than Apert patients at both pre- and post-operative stages. Although the shape of intracranial cavity showed minor postoperative improvements in both Apert and Crouzon patients, the posterior fossa shape demonstrated no significant change.

Conclusion

Our study demonstrated significant morphological differences in Apert and Crouzon patients pre- and post-operatively under PCVE. These findings highlight the need for further refinement of surgical techniques and close postoperative monitoring, particularly for patients with Crouzon syndrome, to optimize outcomes and address persistent posterior fossa deficits.

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Using Machine Learning for the Objective Evaluation of Surgical Outcomes in Sagittal Craniosynostosis

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Abstract

Background

Sagittal craniosynostosis (SC) arises when the sagittal suture closes prematurely, resulting in a scaphocephalic head shape that often necessitates surgical intervention. The optimal surgical technique remains under discussion, with spring-assisted cranioplasty (SAC) and open calvarial vault remodelling (CVR) each presenting distinct advantages and risks. The Swap Disentangled Variational Autoencoder (SD-VAE) was applied to objectively evaluate surgical outcomes, assessing both global and regional head shape changes.

Materials and Methods

This study used CT, MRI, and 3D photography data from SC patients to train an SD-VAE model. The model analysed cranial morphology to compare SAC and CVR outcomes with those of a healthy control group. Data augmentation addressed class imbalance and limited sample size, while linear and quadratic discriminant analyses were employed to visualise and classify SD-VAE outputs for diagnostic purposes.

Results

A total of 240 pre-operative scans were used for training of the model, with 58 paired pre- and post-operative scans utilised to compare SAC and CVR outcomes. SD-VAE successfully diagnosed SC and predicted the surgical approach based on pre-operative morphology. Both SAC and CVR were effective in normalising cranial shape, although regional improvements varied.

Conclusion

SD-VAE provides a promising tool for the objective evaluation of cranial morphology in children with SC. By offering detailed insights into both global and regional surgical outcomes, SD-VAE supports improved clinical decision-making. Future research should investigate its predictive capabilities and its potential to assist in treatment planning.

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Orbital and Cranial Growth Trends From Infancy Through Adolescence in 1119 Computed Tomography Scans

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Abstract

Background

Understanding normative orbital and cranial growth from infancy through adolescence is imperative to planning surgical technique and timing including for orbital reconstruction after trauma, oncologic resection, or congenital abnormalities. In our age of generative artificial intelligence, simulation, and virtual surgical planning, large sets of high- fidelity data are necessary to generate age-specific morphometric references. We present growth trends of the pediatric orbital and upper facial skeleton in the largest cohort to date.

Methods

All head CT scans performed in a tertiary pediatric emergency department between 2014 and 2024 for any indication were collected, excluding those with skull fracture, craniofacial disease, intracranial abnormality, or ventricular shunt. Orbital width, height, and depth, and intraocular, interzygomatic, occipitofrontal, and biparietal distances were measured using cross-sectional images on NilRead Diagnostic Image Viewer. Graphs and Gompertz models were generated in R (v.4.4.1). Growth plateaus were defined as the point where average growth rate falls below 2% of total value range. A bootstrap analysis of 1000 repetitions was performed to identify and compare growth plateaus across measurements and sexes.

Results

A total of 1119 CT scans were analyzed, with an age range of 0 to 18 years (mean 8.35 years) and a gender distribution of 62.5% male (n = 699 patients). Growth curves were asymptotic in shape with highest growth rates before age 2. Biparietal diameter reaches growth plateau first at 4.65 years, followed by occipitofrontal diameter at 6.64 years ($p < 0.001$). Orbital width, interzygomatic distance, and interocular distance plateau later at 17.1, 18.1, and 18.2 years, respectively. For orbital measurements, females reached growth plateau on average 0.6 years before males ($p < 0.05$ for 6 of 7 metrics).

Conclusions

This large dataset of pediatric CT scans supports the following trends in cranial and orbital growth: 1) cranial growth reaches its growth plateau at 5 years, before the growth plateaus of orbital dimensions, 2) orbital height and depth reach their plateau around age 7.5, while orbital and zygomatic width continue with a rapid rate of growth until 18 years, and 3) the female cranial and orbital skeletons reach peak growth 0.6 years earlier than males.

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A Computed Tomography Analysis of Factors Impacting Inferior Rectus Muscle Rounding in Isolated Fractures of the Orbital Floor

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Abstract

Purpose

In patients with isolated fractures of the orbital floor, early identification of those at risk for delayed enophthalmos remains a challenge. Fracture characteristics including location and defect size have empirically been used as indication guidelines for surgical repair. Inferior rectus muscle rounding was first described by Matic *et al.* as a potential predictor of late enophthalmos. Since then, inferior rectus rounding has commonly been referenced in algorithms and indices designed to stratify thresholds for surgical repair of isolated orbital floor fractures. In this study, we aimed to determine the correlations between radiographic characteristics of orbital floor fractures and inferior rectus muscle rounding.

Method

A single institution analysis of unilateral isolated orbital floor fractures between 2008-2024 was performed. Computed Tomography was reviewed using standard bone and soft-tissue windows and 1-mm cuts. Fracture area was approximated as the product of sagittal defects and dichotomized as lesser or greater than 150mm^2. Fracture location was classified based on the average size of the posterior shelf and dichotomized as lesser or greater than 13mm. Inferior rectus morphology was assessed on coronal Computed Tomography and classified as rounded if height-to-width ratio of the muscle >0.99. Pearson's chi-square test was used to assess the relationship between study variables.

Results

A total of 79 patients were included in the analysis. The majority of patients were male (68.4%) and <40 years old (60.8%). Rounding was not associated with fracture morphology (p=0.99), size (p=0.19) or position (p=0.21). In this analysis, posteriorly positioned fractures were associated with larger fracture size (>1.5cm^2; p<0.01).

Conclusions

Fracture morphology, size and position do not independently influence inferior rectus rounding in unilateral isolated orbital floor fractures.

Learning Objectives

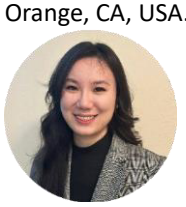
Participants will be able to identify risk factors for delayed enophthalmos; Participants will be able to describe the impact of fracture characteristics on inferior rectus rounding.

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Beyond the Bite: Parent and Caretaker Perspectives on Mental Health Support and Preventative Measures After Pediatric Dog Bite Injuries

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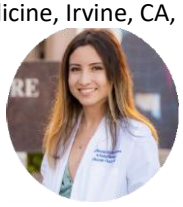
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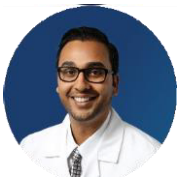
Lana Mamoun



Jonathan Picos



Leonardo Alaniz



Raj Vyas



Miles Pfaff

Abstract

Background

Dog bites are a significant public health concern, with craniofacial injury comprising a substantial proportion of cases. Few studies have examined the consequences of dog bite-related craniofacial injuries on mental health and safety in pediatric patients. This study aims to compare mental health needs and safety concerns of children sustaining craniofacial versus non- craniofacial dog bites through parental and caretaker perspectives.

Methods

A retrospective chart review was conducted to identify dog bite-related emergency room visits at a tertiary hospital in patients aged 17 years or younger from January 2017 to December 2018. Parents, guardians, and caretakers of patients were contacted to complete a structured phone interview assessing perspectives on dog bite prevention and mental health needs. Patient demographics and injury characteristics were collected. Statistical analyses were performed using SPSS.

Results

A total of 458 pediatric patients were identified. Of these, 49.1% responded; 125 (27.3%) completed the 18-question survey and 98 (21.4%) declined participation. Among the 225 patients included for chart review, craniofacial injuries accounted for 51.6% of cases. The mean age at injury was significantly younger for patients with craniofacial injuries compared to non-craniofacial injuries (5.4 vs 8.2 years, $p<0.001$). Craniofacial injuries were significantly associated to deeper wound depth ($p<0.001$), higher rate of surgical intervention ($p<0.001$) and more plastic surgery involvement ($p=0.003$). Parents of children with craniofacial injuries expressed greater concern about the possibility of dog bites occurring (p=0.033) and reported more fear of dogs in their children after the injury ($p=0.01$) compared to those with non-craniofacial injuries. Overall, 63.2% respondent believed that providing information on how to safely own a dog could have prevented the dog bite, 83.2% supported offering mental health services after a dog bite, and 72% endorsed improved education for dog owner. No significant difference was found in parental belief between injury groups.

Conclusion

Craniofacial injuries account for a majority of pediatric dog bites and are associated with younger age and increased need for plastic surgery intervention. Our findings highlight strong parental belief for offering mental health services and the need for enhanced education on responsible dog ownership for pediatric dog bite prevention.

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Can We "Overcorrect" Our Way to Normal Appearance in Metopic Craniosynostosis?: A Single-Center's 33 Year Odyssey

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Abstract

Introduction

To better expand the anterior cranial fossa and account for growth and relapse after traditional front-orbital advancement (FOA), an intentional "overcorrection" technique was adopted by our institution in 2012. This study compares long-term clinical and aesthetic outcomes between traditional (T-FOA) and overcorrection (O-FOA) approaches.

Methods

A retrospective review was performed of all children who underwent FOA for isolated metopic craniosynostosis from 1987 to 2020. Patients with ≥4 years follow-up were included. The Whitaker classification system was used for aesthetic assessment.

Results

Of the 270 patients who FOA, 161 (61.5%) patients met inclusion criteria (n=100 (60.2%) T-FOA and n=66 (39.8%) O-FOA). Mean age at surgery was 10.9±6.3 months with follow-up 9.5±4.1 years. The O-FOA cohort had similar preoperative (73.5±7.6 vs 75.6±6.1 mm, p=0.098) bitemporal widths, however postoperative (100.1±6.9 vvs 91.9±7.5, p<0.001) and absolute difference in increase in bitemporal width (18.0±5.1 vs 24.8±5.4, p<0.001) were higher in the O- FOA cohort. There were 13 (7.8%) surgical complications, and 40 (24.1%) patients underwent at least one secondary surgery, more commonly in the T-FOA cohort (35.0% vs 7.6%, p<0.001). In the intermediate term, T-FOA patients had higher Whitaker scores (2.2±1.0 vs 1.5±0.8, p<0.001) and were more likely to have palpable bony irregularities (64.0% vs 21.2%, p<0.001), visible irregularity (68.0% vs 48.5%, p=0.012), and lateral orbital retrusion (48.0% vs 15.2%, p<0.001) compared to O-FOA. However, in subgroup analysis of patients ≥10 years old postoperatively (n=85), aesthetic outcomes (Whitaker 2.1±1.0 vs 2.4±1.0, p=0.167) and revisions (48.6 vs 26.7%, p=0.122) were comparable between the cohorts. Longer follow-up duration was associated with an increased likelihood of revision (β=0.054, *p*<0.001), higher Whitaker score (β=0.079, p<0.001), and greater incidence of temporal hollowing (β=0.038, p=0.001) when controlling for potential confounders.

Conclusion

FOA with overcorrection is a safe and effective approach for improving aesthetic outcomes in the intermediate term. Its association with aesthetic decline over time highlights the importance of long-term follow-up until skeletal maturity. Further research is needed to better understand the underlying causes of relapse.

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Comprehensive treatment of patients with severe Parry-Romberg syndrome: from the view of orthodontist

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Abstract

Objective

To explore multidisciplinary treatment strategies for patients with severe Parry-Romberg syndrome (PRS), a rare disorder characterised by unilateral progressive atrophy of facial skin, subcutaneous tissues, muscles and bones, the severity of which can be classified as mild, moderate or severe according to the extent of atrophy in the trigeminal innervation area. Mild, moderate and severe, with severe cases requiring a systematic treatment plan due to extensive soft tissue/craniofacial bone atrophy, chin deviation and occlusal plane abnormalities.

Methods

For patients with severe PRS, a staged combination treatment was implemented: 1) reconstruction of the jawbone infrastructure through alveolar bone augmentation; 2) combined orthodontic-orthognathic treatment (preoperative orthodontics including alignment and leveling of the upper and lower arch and decompensation of both arches; orthognathic surgery including maxilla decanting and mandibular derotation to correct jaw deformity; and postoperative orthodontic adjustment for detailing the occlusion); 3) zygomaticomandibular complex Medpor prosthesis implantation to repair the bony contour; 4) free fat grafting to supplement the soft tissue volume; and 5) orofacial anguloplasty and lip reshaping to fine tune the lip shape.

Results

After treatment, facial symmetry was significantly improved, the bony support of the zygomatico-mandibular complex was restored, the occlusal plane deviation and mandibular deviation were corrected, and the aesthetic balance between the soft tissue volume and the lip shape was achieved to achieve the dual restoration of function and appearance. The result is a functional and cosmetic restoration.

Conclusion

For patients with severe PRS accompanied by extensive craniomaxillofacial atrophy and occlusal deformity, the sequential treatment model of 'reconstruction of bony structure - restoration of occlusal function - remodelling of soft tissue morphology' is adopted, integrating oral and maxillofacial surgery, orthodontics and plastic surgery techniques, which can effectively solve the complex deformity. The use of 'bone structure reconstruction - occlusal function restoration- soft tissue morphology remodelling' sequential treatment model, integrating oral and maxillofacial surgery, orthodontics and plastic surgery, can effectively solve the complex deformity. This study provides a standardised treatment path for the clinical management of severe PRS.

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Modified Paranasal Bone Grafting Reduced Vertical Maxillary Recurrence after Le Fort │Osteotomy

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Lei Zhang

Abstract

Purpose

To evaluate if the modified paranasal bone grafting can reduce the recurrence of Le Fort I osteotomy for maxillary downward.

Methods

A total of 30 patients with a large maxillary downward movement (>3 mm) during orthognathic surgery were included in the study. Patients were divided into modified paranasal bone grafting group and non-modified paranasal bone grafting group. Three-dimensional measurements of the maxillary position were taken using maxillofacial CT data at preoperative(T0), 3 days postoperatively(T1), and 6 months postoperatively (T2). Meanwhile, CT scans of T1 and T2 were used to calculate the changes in bone thickness. SPSS 22.0 software package was used for data analysis.

Results

At 6 months after operation, in the vertical direction, the recurrence amount of U1 in the modified paranasal bone grafting group was (0.54±0.35)mm, and the recurrence amount of U1 in the non-modified paranasal bone grafting group was (1.18±0.76)mm(P=0.3997). There was no significant difference in recurrence between the two groups in the anteroposterior and horizontal directions. In the modified group, the bone graft thickness was reduced by (11.75 ± 6.25)%, and that of the non-modified group was (33.77±11.56)%(P<0.0001).

Conclusion

Modified nasal bone graft can effectively reduce the absorption of bone graft and decrease the vertical recurrence of maxilla.

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Comprehensive Orthognathic Facialplasty (COFP): A Holistic Strategy for Achieving Balanced Facial Aesthetics and Function

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Takahiro Yamamoto

Abstract

Background

Conventional orthognathic surgery (OGS) has primarily focused on skeletal corrections for functional improvement, such as occlusion and airway management. However, as aesthetic demands have risen, particularly the pursuit of a “small and balanced face” (Kogao) in East Asia, the limitations of OGS alone have become increasingly evident.

Purpose

This study introduces Comprehensive Orthognathic Facialplasty (COFP), a multidisciplinary approach that integrates OGS, Facial Bone Contouring Surgery (FBCS), and advanced soft tissue management, to address both skeletal and aesthetic concerns simultaneously.

Methods

COFP combines skeletal realignment with soft tissue refinement techniques such as rhinoplasty, facelift, neck lift, lip lift, and fat management. Through this integration, COFP overcomes the typical soft tissue limitations encountered after skeletal movement, including lip thinning, skin sagging, and nasal deformities. Furthermore, functional risks such as airway narrowing (leading to OSAS), temporomandibular joint disorders, and tongue size mismatch are carefully considered during treatment planning.

Results

By coordinating bone and soft tissue adjustments, COFP enables more aggressive yet harmonious skeletal planning without compromising facial balance. It enhances aesthetic outcomes, improves long-term stability, and offers patients a natural, refined appearance tailored to their individual anatomy and functional needs.

Conclusion

COFP represents an evolution beyond conventional orthognathic surgery, providing a comprehensive framework that simultaneously pursues aesthetic refinement and functional preservation. This approach is essential for the future of orthognathic surgery to become not just a medical treatment, but a culturally accepted and sophisticated form of facial design.

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Nanostructured Magnesium Alloys for Distraction Osteogenesis in a Methicillin-resistant Staphylococcus Aureus (MRSA)-Infected Minipig Model

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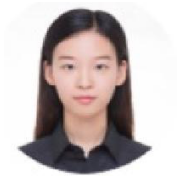

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Abstract

Background

Titanium-based implants often require surgical removal, either for intended indications such as distraction or due to unintended complications such as infection or exposure. Magnesium-based alloys have been found to be biocompatible, antimicrobial, and may resorb naturally in the body. The purpose of this study is to evaluate the in vivo biocompatibility, load-bearing ability, and antimicrobial properties of magnesium-based implants intended for craniomaxillofacial surgery in the presence of a bacterial infection.

Methods

Internal distraction devices (IDDs), without mechanisms for gearing to open or close, were developed using a magnesium-based alloy. These devices were implanted into four Yucatan miniature pigs following an inverted L-shaped osteotomy of the mandible, simulating the initial phase of mandibular distraction surgery. Each pig received two IDDs, one on either side of the hemimandible, and was infected with a bacterial solution containing Methicillin-resistant Staphylococcus Aureus (MRSA). Over a 12-week period, the pigs underwent biweekly blood draws. CT scans were taken preoperatively, immediately postoperatively, and at six and 12 weeks. After sacrifice, samples of each pig's mandible, internal organs, and blood were collected and examined histologically to assess biocompatibility, osseous healing, and device degradation.

Results

By the time of sacrifice, the magnesium implants were partially resorbed, and the mandible had fully healed at the site of the osteotomy. Histological examination of the mandible and nearby masseter muscles showed no signs of abnormal inflammation. Inductively Coupled Plasma (ICP) analysis indicated that magnesium levels in the blood and major organs (heart, liver, kidney, spleen, brain) remained within normal limits. Across all four pigs, the implants' volume decreased and there was no surgical site infections observed throughout the study period despite being initially infected with a MRSA bacterial solution.

Conclusion

Magnesium-based implants may be safe and effective for use in craniomaxillofacial surgery by demonstrating potential biocompatibility, structural strength, and degradation properties. These magnesium implants could offer a promising alternative to traditional, non-resorbable titanium devices and potentially eliminate the need for additional surgeries to remove hardware. Future studies include testing a geared magnesium-based IDD to study bone growth in this minipig model.

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Delays in Surgical Care for Head and Neck Cancer Patients: The Impact of Insurance Status and Social Vulnerability

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Abstract

Background

Free flap reconstruction remains the gold standard for restoration following resection of advanced head and neck (H&N) cancer. However, disparities in access to specialty care can delay critical treatment. This study investigates how patient race, insurance status, and social vulnerability affect time to care in patients undergoing H&N cancer resection and reconstruction.

Methods

A retrospective review was conducted for patients treated at a tertiary care center between 2016 and 2024. All patients underwent oncologic resection by oral surgery, with or without subsequent free flap reconstruction by plastic surgery. Sociodemographic variables included race, insurance type (public, private, uninsured) and the Social Vulnerability Index (SVI), a U.S.-based composite metric of community-level socioeconomic and health factors. SVI quartiles were categorized from least (Q1) to most vulnerable (Q4). Time intervals from symptom onset to initial encounter, and from encounter to surgery, were compared using ANOVA and post-hoc Tukey's HSD tests.

Results

Among 183 patients, most were White (71%), had public insurance (59.6%), and resided in lower vulnerability areas (Q1: 32.8%). Patients in the most vulnerable communities experienced the longest delays from symptom onset to initial healthcare encounter (Q4 = 345.4 days vs. Q3 = 140.9, Q2 = 177.7; $p < 0.05$). Uninsured patients had significantly longer wait times from encounter to surgery (uninsured = 59.0 days vs. public = 34.1, private = 28.0; $p < 0.05$).

Conclusion

Patients facing social or financial barriers experience substantial delays in receiving surgical care for head and neck cancer. Community-level vulnerability is associated with late presentation, and lack of insurance contributes to longer surgical scheduling delays. These findings underscore the importance of addressing health system inequities to ensure timely, equitable access to complex oncologic and reconstructive care - an issue relevant to global health systems seeking to reduce treatment disparities.

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Assessment of orbital growth parameters in a healthy Caucasian paediatric population based on CT-scan measurements

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Boris LAURE



Anne Morice

Abstract

Background

The pattern of human orbital growth is an important point of facial development to investigate, due to the many craniofacial abnormalities which can interfere with it. Defining growth patterns is mandatory for guiding diagnostic, evaluation and surgical approach in children with craniofacial abnormalities. However, craniofacial morphology varies across genetic and ethnicities. Although several studies report Asian and American facial characteristics including normal interorbital distance, there is a lack of data concerning Caucasian paediatric healthy populations.Our study aimed to analyse orbital bone growth based on 3D CT-scan measurements in a healthy paediatric Caucasian population in France.

Methods

A retrospective cohort study was conducted, based on craniofacial CT-scans performed at the Pediatric University Hospital of Tours, France, between 2010 and 2024, in patients aged from 3 months to 10 years. To assess orbital growth, several anatomical landmarks and interorbital distances were defined, including the bony inner interorbital distance (IOD), and the bony lateral orbital distance (LOD). The IOD/LOD ratio was calculated. Mean +/- SD was calculated for IOD, LOD, and IOD/LOD ratio, and statistical comparisons between male's and female's values and between each age group were performed using Mann-Whitney test.

Results

466 CT-scans were analysed in our study (216 females and 250 males), with at least 2 series of measurements for each CT-scan. Intra-observer variability was less than 5%. For each age group, 36 (+/- 4) CT-scans were analysed, Female/ Male ratio was 46.4%, without statistical differences between male and female rates per age group. The average interorbital distances increased progressively with age, from 18.76 +/- 1.17mm at 3 months of age to 22.79 +/- 1.73 mm at 10 years of age. The most important increase of IOD and LOD values was observed during the first 2 years of age ($p<0.01$) and between 7 and 8 years of age ($p<0.05$). The IOD/LOD ratio remained constant with age, showing isometric growth of the orbits.

Conclusion

Our study provides detailed age- and sex-specific normative data of orbital measurements in Caucasian children based on CT-scans. Our results highlighted similar orbital growth patterns between Caucasian, American and Asian populations.

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Incidence and Anatomical Manifestations of High-Riding Jugular Bulb in Patients with Different types of Craniofacial Microsomia

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Chen Ke

Abstract

Background

High-riding jugular bulb (HJB), a vascular anomaly characterized by an abnormally elevated position of the jugular bulb, has not yet been reported in the context of craniofacial microsomia (CFM).

Purpose

To evaluate the frequency of HJB among children with different types of craniofacial microsomia.

Material and Methods

Patient demographics such as age, sex, Pruzansky-Kaban types, diameters of the right and left JB, and presence and laterality of HJB were recorded and analyzed. Patients were grouped as with HJB and without HJB; the variables were compared between these two groups. The patients were divided into subgroups according to Pruzansky- Kaban classification, with comparative analysis of HJB incidence rates and associated variables across subgroups. The Shapiro-Wilk test, histograms, and Q-Q, Mann-Whitney U-test, Pearson's chi-square test, and Fisher's exact test were used.

Results

CT images of 85 patients with unilateral craniofacial microsomia (170 JBs) were evaluated. Overall, 65.8% of patients had HJB. Notably, 16 patients had bilateral HJB. Of all JBs, 39.5% were high riding. The incidence of HJB in Type III patients was significantly higher than in Types I, IIa, and IIb, with no significant differences among these three groups. The median diameter of HJB was significantly higher in children with bilateral HJB compared to children without HJB ($P<0.001$). Among Pruzansky-Kaban Type I patients, 8 (53.5%) had unilateral HJB and 2 (13.3%) had bilateral HJB; among Type IIa patients, 27 (55.1%) had unilateral HJB and 4 (8.1%) had bilateral HJB; among Type IIb patients, 7 (46.7%) had unilateral HJB and 2 (13.3%) had bilateral HJB; among Type III patients, 2 (28.5%) had unilateral HJB and 4 (57.1%) had bilateral HJB.

Conclusion

The incidence of high jugular bulb in CFM patients is higher than previously reported in normal populations. Overall, 65.8% of patients with craniofacial microsomia had HJB, with a high rate of bilateral HJB occurrence. The incidence was higher in more severe malformations, which may be associated with clinical manifestations such as tinnitus and hearing loss. Further investigation is needed to explore these relationships.

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The GOSH Severity Score: A validated method for grading functional severity of patients with complex craniosynostosis

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Owase Jeelani


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Abstract

Introduction

In 2020 Dr Richard Hopper wrote that comparisons between sub- and transcranial approaches to midface advancement "*Require a transparent comparison of long-term outcomes in a similar population.*" Our aim has been to devise and validate a method for assessing the overall level of functional severity of children with syndromic craniosynostosis to provide those "*Similar populations"*. Instead of concentrating on a single disability the Great Ormond Street Hospital (GOSH) severity score describes the overall functional severity of patients with complex forms of craniosynostosis by examining the ages at which intervention for the three most serious complications were required.

Method

The GOSH system assigns a score to the age group in which patients underwent their first intervention for airway obstruction, eye protection and/or raised intracranial pressure(ICP), whether alone or combined. Age groupings were 0-1, 2-3, 4-11, 11+ years/no intervention. Age-related scores for a first intervention were 1, 2, 3 & 4 points respectively. This provided totals ranging from 3 (most affected) to 12 (least affected). For validation, data for ages at first interventions were taken from the hospital's computerised records (EPIC). Intraclass correlation coefficient (ICC) was used to calculate consistency — 0.9-1.0 indicating excellent, 0.75-0.89 good, 0.50-0.74 moderate, 0.0-0.49 poor consistencies.

Results

7 assessors reviewed records of 9 patients with Crouzon syndrome with an overall ICC of: 0.945. Individual ICC for airway, eye and ICP protection were 0.851, 0.958 and 0.936 respectively.

Discussion

The GOSH functional severity score is deliberately weighted towards the youngest age groups as early interventions are only required in the most severely affected patients. It is simple to calculate, objective and in our hands has been validated with an excellent ICC. It avoids subjective assessments of the need for appearance change. Although restricted here to Crouzon syndrome it is equally applicable to other complex forms of syndromic craniosynostosis. Finally, it satisfies Dr Hopper's call for a system that defines *Similar population*s by providing a level playing field when results of functional interventions for children with syndromic craniosynostosis from different craniofacial units are compared.

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Opioid Prescribing Patterns Following Pediatric Cleft and Craniofacial Surgery: A National Analysis of 16,806 Surgical Encounters

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Ashlie Elver


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Abstract

Background

Despite efforts to reduce opioid use in children, opioid prescribing remains common in pediatric craniofacial surgery. These procedures vary widely in invasiveness and frequency, yet standardized, evidence-based pain management guidelines remain limited. This study characterizes opioid prescribing patterns following cleft and craniofacial procedures using national data.

Methods

A retrospective cohort analysis was conducted using the 2023 Pediatric National Surgical Quality Improvement Program (PNSQIP) database. Surgical encounters involving cleft and craniofacial procedures were identified by CPT codes and categorized into seven procedural groups. The primary outcome was opioid prescription at discharge. Demographics, operative variables, and complication rates were compared between opioid and non-opioid groups. Statistical significance was defined as $p < 0.05$.

Results

Among 16,806 surgical encounters (20,625 CPT-coded procedures), 43.2% were associated with an opioid prescription. Opioid recipients were older (7.00 vs. 5.36 years; $p < 0.001$) and differed significantly in ASA classification, operative time, anesthesia time, and inpatient status (all $p < 0.001$). Opioid prescribing varied significantly by procedure category ($p < 0.001$), with highest rates in orthognathic/midface osteotomies (68.1%) and lowest in otolaryngology adjunctive procedures (14.5%). Oxycodone accounted for 73.4% of prescriptions; codeine and tramadol were rarely used.

Conclusion

Opioid prescribing after pediatric craniofacial surgery varies widely by procedure type and patient factors, highlighting a lack of standardized postoperative protocols. These findings establish national benchmarks for opioid use and identify high-utilization procedures as key targets for enhanced recovery and opioid-sparing initiatives. Development of procedure- specific guidelines may improve stewardship and support safe, effective pediatric pain management.

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Cost and Safety Analysis of Postoperative Admission Practices in Craniosynostosis Repair: ICU vs. Surgical Ward

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Abstract

Background

In the United States, most centers routinely admit pediatric patients to the intensive care unit (ICU) following craniosynostosis repair. At the authors' institution, a paradigm shift was implemented two decades ago: direct postoperative ward admission of stable patients with non-syndromic craniosynostosis and ASA class I–II. This study evaluates the financial implications of this approach by comparing hospitalization charges for ward versus ICU admissions, including patients who required upgraded care. This topic has become increasingly relevant as minimally invasive techniques have made routine ICU admission less critical.

Methods

A retrospective review was performed of all patients who underwent craniosynostosis repair between 2000 and 2024. ICU and ward charges were estimated based on average per-night costs from a cohort of 76 patients treated between 2014– 2019, adjusted to 2024 USD. Charges reflect hospitalization costs only, excluding procedural and other fees.

Results

Among 764 patients, 720 (94.2%) were admitted directly to the surgical ward (59.3% open repair, 40.7% endoscopic repair; mean length of stay [LOS] 2.4 ± 1.2 days), and 44 (5.8%) were admitted directly to the ICU (79.5% open repair, 20.5% endoscopic repair; mean LOS 7.8 ± 12.5 days). Average cost per night was $5,276 on the ward and $11,148 in the ICU. Average total hospitalization charges were $16,495 ± 33,931 overall; $12,899 ± 8,600 for patients admitted to the ward, and $75,343 ± 124,230 for patients admitted to the ICU. Admission to the ward versus ICU resulted in an estimated $62,444 savings per patient, totaling approximately $45 million over the study period. Each ICU day averted saved about $5,872 compared to a day on the ward. Six patients (0.8%) initially admitted to the ward required ICU upgrade for events such as seizure (n=2), respiratory distress (n=1), high fever (n=1), inadequate pain control (n=1), and clinically significant blood loss requiring monitoring (n=1).

Conclusions

Over the past 24 years, admission to the surgical floor rather than the intensive care unit has resulted in an estimated health system cost savings of 45 million dollars. Direct floor admission post-craniosynostosis repair appears safe, while reducing costs and average LOS compared to ICU admission.

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Refining Constricted Ear Reconstruction: Clinical Application of the Park Algorithm Supported by a Systematic Review

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Valencia Jane Martin



Kristaninta Bangun

Abstract

Background

Constricted ear deformities pose significant reconstructive challenges, requiring tailored surgical approaches based on cartilage deficiency and auricular anatomy. Park's algorithmic method (2016) is widely cited for its systematic adaptability; however, alternative techniques continue to evolve.

Methods

A systematic review was conducted according to PRISMA guidelines. Comprehensive database searches were performed in PubMed, MEDLINE, Embase, and Scopus. After screening and eligibility assessment, 12 studies were included. Additionally, we report on two patients at our center with Tanzer type I, IIA, and IIB constricted ears who were treated using Park's algorithm. Postoperative evaluations utilizing the FACE-Q Craniofacial module demonstrated high levels of patient satisfaction and positive aesthetic restoration.

Results

The included studies employed various surgical techniques, including V-Y advancement flaps with cartilage grafting, costal cartilage frameworks, Z-plasty, T-bar reconstruction, and subtotal ear reconstruction. Park's algorithmic approach consistently demonstrated high aesthetic satisfaction, reproducibility, and low complication rates. Our institutional experience corroborated these findings through objective patient-reported outcomes.

Conclusion

Park's method remains highly adaptable across the spectrum of constricted ear severities. Other approaches offer less invasive alternatives for milder deformities but may be insufficient for severe cases. Objective patient-reported outcomes further support the efficacy of the algorithmic approach in achieving both functional and aesthetic restoration.

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The combined surgical and brachiterapy protocol in management of malignant orbital neoplasm in the “bambino gesu” pediatric hospital

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Abstract

Malignant solid tumors in pediatric age are most often located in the head and neck district. The treatment protocol in pediatric malignancies almost always involves medical therapy combined with radiation therapy after biopsy and diagnostic framing. The role of surgery is secondary and limited to selected cases. Sarcomas are a group of neoplasms that arise very frequently in the craniofacial region; especially in the orbital and masticatory regions. Cases in which complete surgical excision is required often generate in dilemma between performing a wide resection resulting in permanent disability or performing a nonradical and more life-threatening surgery for the child. Performing largely demolitive surgeries as done by protocol in adults is almost never allowed in pediatric cancer surgery. For this reason, at the Children's Hospital “Baby Jesus” and “A. Gemelli” University Hospital in Rome, we have started a combined protocol of surgery and brachytherapy in selected cases of orbital neoplasms. Brachytherapy is a procedure that in recent years has had a very important development and evolution in the treatment of malignant neoplasms in adults; in contrast, in pediatric age it is little used due to the low compliance of children. Protocol surgical treatment in malignant orbital neoplasms involves complete enucleation or evisceration of the orbital contents, generating significant functional and cosmetic impairment. In pediatric age, this type of protocol is almost never applied to prevent the child from having a normal life. In selected cases, we have developed a combination treatment in which after surgical complete resection of the residual neoplasm, brachytherapy rods are applied and are stabilized with titanium plates. Surgical resection has done with complete preservation of the eye and his structures. the child is subsequently transferred to the intensive care unit and remains sedated for the following days. Starting the day after surgery, the patient undergoes 2 daily cycles of brachytherapy. as soon as the brachytherapy treatment established according to the neoplasm is finished, the brachytherapy rods are removed and the patient is gradually awakened. 6 months after the end of treatment, the stabilization plate is removed and the surgical scars revised.

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Decreased Incidence of Intraoperative Blood Transfusion in Endoscopic Strip Craniectomy Performed Using a Diamond Burr Drill Bit

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Abstract

Background

While endoscopically assisted surgery for craniosynostosis offers advantages over open repair with respect to blood loss and overall perioperative morbidity, intraoperative blood loss during craniectomy remains a significant concern due to the infant's small overall blood volume. A diamond drill bit can provide continuous hemostasis to the bone edges during cutting, and we designed attachable dural retractors to optimize safety. We describe our technique and compare our outcomes using our diamond burr technique with those where the strip craniectomy was performed using traditional instrumentation (scissors, rongeurs, and/or non-diamond burr).

Methods

Patients underwent endoscopic strip craniectomy for single suture craniosynostosis between 2012 and 2024 at a single institution by two pediatric neurosurgeons and three craniofacial surgeons. The primary outcomes were estimated blood loss and transfusion requirements. Secondary outcomes were operative duration, hospital length of stay, intraoperative durotomy, and persistent calvarial defect after one year.

Results

A total of 83 patients met inclusion criteria. Strip craniectomy was performed with the diamond burr drill (DB) in 68 patients and with traditional instrumentation (control) in 15. The median (IQR) intraoperative blood loss for the DB group was 20 (10-40) mL versus 30 (20-75) mL in the control group. The median (IQR) operative duration was 128 (104-156) min and 114 (103-126) min respectively. The incidence of intraoperative blood transfusion was 16.2% and 53.3% respectively. Multivariable analysis was performed controlling for age, weight, involved suture, and administration of tranexamic acid (TXA). Use of DB was associated with significantly less estimated blood loss (β=-45.0 mL, p=0.0006) and a significantly lower odds of intraoperative blood transfusion (OR 0.144, p=0.0042). In patients who did receive a blood transfusion, use of DB was not associated with differences in intraoperative transfusion volume or postoperative transfusion requirement. DB was not associated with differences in the incidence of durotomy, persistent calvarial defect, operative duration, or hospital length of stay.

Conclusions

Performing endoscopic strip craniectomy using a diamond burr drill bit with an attached dural retractor results in significantly less intraoperative blood loss and significantly lower odds of requiring an intraoperative blood transfusion when compared to traditional endoscopic instrumentation.

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Multicenter study: CLEFT-Q appearance outcomes at the end of treatment for patients with a cleft lip and/or palate

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Abstract

Introduction

The diversity in surgical approaches and outcomes emphasizes the need for standardized treatment protocols in cleft care. Patient-Reported Outcome Measures (PROMs), such as the CLEFT-Q, are valuable tools for assessing patient perspectives on appearance, function, and quality of life. The International Consortium for Health Outcomes Measurement (ICHOM) has developed a standardized protocol for CL/P treatment and follow-up, incorporating the CLEFT-Q. Erasmus Medical Center (EMC) and University Medical Center Utrecht (UMCU) have implemented this standard. By comparing CLEFT-Q outcomes, a first evaluation of appearance through PROMs is provided. The appearance domain includes the dental, jaw, and face scales. Additionally, this study assesses factors influencing end-of-treatment satisfaction in CL/P patients.

Methods

All patients treated at EMC and UMCU since 2016 were included. CLEFT-Q outcomes were analyzed using ANOVA with Bonferroni correction and Pearson correlation.

Results

A total of 292 patients were included (EMC: 188, UMCU: 104). No significant differences were found between centers for the dental, jaw, or face scales. Compared to a normative population, the CL/P group scored significantly higher on the face scale ($p = 0.001$). Significant differences in jaw and face scores were observed across cleft subtypes (CL, CLA, CLAP, CP) ($p = 0.001$ and $p = 0.006$). No gender differences were found. Patients who no longer desired lip and/or nose revision reported higher face scores than patients still desiring revision ($p = 0.005$ and $p < 0.001$). Patients who no longer desired prosthetic teeth scored significantly higher than patients still desiring prosthetic treatment across all appearance scales ($p = 0.000$–0.048).

Conclusion

End-of-treatment appearance satisfaction among CL/P patients is comparable to non-cleft peers. Subtype, revision status, and prosthetic teeth significantly influence outcomes. No differences were found between the two cleft centers, both using nearly identical treatment protocols. ICHOM-based data may be used for benchmarking cleft outcomes across European and global cleft centers. This study is the first test within the ERN using the CLEFT-Q and utilizes data expected to be included in the future European cleft registry.

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Free vs Local Tissue Transfer and Reconstruction in Pediatric Head & Neck Cancer Patients: A Comparable Complication Outcome Review

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Abstract

Background

Microsurgical reconstruction in pediatric head and neck cancer patients may be underutilized due to technical challenges. While adult oncologic reconstruction is well-characterized, comparative outcomes of free versus local flaps in children remain limited. This study examines postoperative outcomes between free and local tissue transfer in pediatric patients undergoing head and neck malignant tumor resection and reconstruction.

Methods

We conducted a retrospective review of patients who underwent reconstruction following head and neck tumor resection at a major children's hospital from 2007 to 2024. Local flaps were defined as those based on named axial vessels not requiring microsurgical anastomosis. Primary outcomes included flap failure, wound healing complications, recipient and donor site revision, operative time, length of hospital stay, readmission, and follow-up duration. Chi-square and Student t-tests were used for statistical comparisons.

Results

Forty patients (mean age 9.9 years) were included: 17 underwent free flap reconstruction, and 23 underwent local flap reconstruction. Common free flaps included anterolateral thigh (35.3%) and fibula (35.3%), while common local flaps included temporalis muscle (26.1%) and pectoralis muscle (13.0%). Primary diagnoses included osteosarcoma (20.0%) and rhabdomyosarcoma (12.5%). Flap survival rate was 97.5%. Compared to the free flap group, local flap patients had significantly higher revision rates for exposed hardware and wound dehiscence ($p=0.030$), but shorter operative times and hospital stays ($p<0.05$). There were no significant differences in flap failure, follow-up duration, or readmission rates between groups.

Conclusion

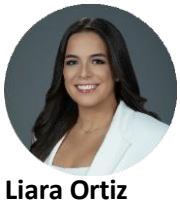
Local flap reconstruction was associated with higher revision rates due to wound complications, whereas free flaps provided more reliable soft and hard tissue coverage with a comparable overall complication profile. These findings support the feasibility and safety of free tissue transfer in pediatric oncologic reconstruction. When performed by experienced microsurgeons with careful patient selection, free flaps can expand reconstructive options and improve long- term outcomes in this vulnerable population.

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Craniofacial and Upper Limb Anomalies Following Prenatal Methotrexate Exposure: A Systematic Review

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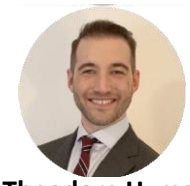

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Abstract

Background

Methotrexate (MTX), a folate antagonist used in the management of ectopic pregnancies and autoimmune conditions, has well-documented teratogenic potential, particularly during early embryogenesis. It is linked to anomalies in rapidly dividing tissues, including craniofacial (CF) and upper limb (UL) structures. This systematic review characterizes craniofacial and upper limb manifestations reported following prenatal MTX exposure.

Methods

Following PRISMA 2020 guidelines, a systematic PubMed search between 2000-2025 identified studies reporting MTX embryopathy. Eligible studies included case reports, case series, cohort, and case-controls reporting prenatal MTX exposure and associated CF or UL anomalies. Extracted data included study characteristics, MTX exposure, maternal factors, and clinical outcomes such as CF and UL anomalies, birth data, neurodevelopment, and surgical interventions. Due to heterogeneity, a descriptive analysis was performed.

Results

Nineteen studies encompassing 32 cases of prenatal MTX exposure were included. Exposure occurred primarily during the first trimester, often between 3 and 8 weeks post-conception, and in some cases followed attempted pregnancy termination protocols. Reported doses included low-dose weekly regimens (7.5–25 mg/week) and single 50 mg/m² doses. Misoprostol co-exposure was documented in 10 of 32 cases (31%). Craniofacial anomalies were reported in 87.5% (28/32), including micrognathia, low-set ears, hypertelorism, cleft palate, and craniosynostosis. Upper limb anomalies were present in 65.6% (21/32), predominantly radial ray defects, hypoplastic thumbs, clinodactyly, and ectrodactyly. Multi- system involvement was observed, with cardiac (21.9%), renal (15.6%), gastrointestinal (15.6%), and central nervous system (12.5%) anomalies reported in addition to craniofacial or upper limb findings. Craniosynostosis was identified in 7 cases, most commonly involving the coronal and lambdoid sutures. Long-term follow-up and quality-of-life assessments were not systematically reported. Developmental delay, growth restriction, or motor delays were noted in 7 cases during infancy or early childhood. Among craniosynostosis cases, surgical intervention was performed in 6 of 7 patients. No surgical interventions for upper limb anomalies were described.

Conclusion

This systematic review highlights the variability and severity of craniofacial and upper limb anomalies associated with prenatal methotrexate exposure. Although rare, these anomalies are often clinically significant and may require surgical intervention. These findings reinforce the need for careful counseling regarding MTX use during pregnancy.

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Posterolateral orbital wall – sphenoid wing reconstruction in orbital neurofibromatosis patients, experiences of a single clinic

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Abstract

Neurofibromatosis type 1 (NF-1) is a common, well-known neurocutaneous syndrome. Many manifestations related to the orbit can be present. Manifestations such as plexiform neurofibromas, optic gliomas, Lisch nodules and characteristic skeletal dysplastic changes of the sphenoid bone are among well-established diagnostic criteria. Intraorbital located PNFs can cause a characteristic dysmorphism, which is previously described as orbital/ orbitopalpebral/orbitofacial/orbitotemporal neurofibromatosis. Aplasia or dysplasia of the sphenoid wing is also a common finding of NF-1. Fronto- temporal lobe herniation into the orbit and consequent orbital pulsation phenomenon can be found in such cases. Goals of reconstruction in orbital neurofibromatosis are mainly posterolateral wall reconstruction of the orbit, decompressive/corrective attempts to cerebrospinal fluid circulation if indicated, resection of the present plexiform neurofibromas using either transcranial or periorbital surgical approaches. In this study, 3 rare cases of orbital neurofibromatosis who have undergone posterolateral orbital wall — sphenoid wing reconstruction in our clinic are described. In all three cases the main clinical symptoms were ptosis, orbital dystopia, orbital pulsasion phenomenon. Computerized tomography imaging revealed sphenoid wing aplasia with concurrent fronto-temporal lobe herniation into the orbit with dural ectasia. Corrective surgeries were planned using transcranial approach. Frontal bone and ipsilateral supra-orbital bar were removed. Defective posterolateral orbital walls and fronto-temporal lobes were seen to be closely related and tightly attached to the periorbita. Brain lobes were microsurgically dissected from their orbital attachments. Alloplastic titanium mesh was fixated to the removed supraorbital bar and re-inserted to original anatomic location in 2 patients. In remaining 1 patient defect was reconstructed with bone grafts. Supraorbital bar and frontal bone were fixated using miniplates. In one patient ptosis was detected postoperatively and was thought to be related to relative compression of the CN III at the neo-supraorbital fissure and IV corticosteroids were administered. Ptosis and previous orbital pulsation were relieved with no requirements of further surgical attempts. No other complications were seen in any of the patients. In conclusion, sphenoid wing reconstruction is indicated in orbital neurofibromatosis to address the orbital pulsation phenomenon.

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Characterisation of genetic diagnoses in our bilateral lambdoid and sagittal craniosynostosis population

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Chris Parks

Abstract

Introduction

Bilateral lambdoid and sagittal craniosynostosis (BLSS) is a rare multisuture craniosynostosis which can be an isolated entity or part of a syndromic condition. The true incidence of BLSS as well as the proportion of these with underlying genetic causes are unknown. Furthermore, craniofacial genetics is a rapidly advancing field and there are new tests that are offered today which did not exist in the last two decades. In this study we aim to characterise the genetic profile of our BLSS cohort at a quaternary supraregional referral centre in the UK.

Method

Patients with BLSS were identified retrospectively from our database of 5400 cases between years 2006 and 2025. The patients underwent CT and MRI imaging preoperatively and their diagnosis was confirmed on imaging. The patients had genetic testing performed to screen for a genetic etiology (R416 for the *SMAD6* gene and the R99 panel for *FRGR1, FGFR2, FGFR3, TWIST1, TCF12, ERF* and *EFNB1*genes). In addition, for those who tested negative, further chromosome microarray analysis and whole genome sequencing were offered.

Results

Fifteen patients with BLSS were identified and they presented to our service at a median age of 15 months (range 4 to 82 months). Genetic variants were found in three patients (20%) (IL11RA Craniosynostosis and Dental anomalies, KMT2D Kabuki, BRWD3 X-linked Intellectual Disability). Further three patients are awaiting results from R416 and R99 and another three for whole genome sequencing.

Conclusion

The majority of our BLSS population presented as isolated cases with no identifiable genetic etiology. Genetic variants were found in a subset of individuals who exhibited additional features such as developmental delay, intellectual disability, or other congenital anomalies, and the variants identified were heterogeneous in nature. Therefore, whole genome sequencing may be particularly valuable in this subset of individuals to uncover potential underlying genetic causes.

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Preliminary application of mixed reality-based surgical navigation system in craniomaxillofacial trauma

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Abstract

Purpose

This study aimed to build a surgical navigation system based on mixed reality (MR) and optical positioning technique and evaluate its clinical applicability in skeletal reconstruction after craniomaxillofacial trauma.

Methods

We first integrated the software and hardware platforms of the MR-based surgical navigation system that consisted of three main components, including the MR displayer Microsoft HoloLens 2 (Microsoft Corporation, USA), infrared optical localization and tracking device Polaris Vicra (Northern Digital Inc, Canada), workstation for PC data communication (Dell Corporation, USA). The system workflow was explored as follows: 1) preoperative planning, 2) optical image registration, 3) spatial calibration on the HoloLens side, 4) data transfer, and 5) real-time dynamic tracking . The feasibility of the MR-based surgical navigation system in skeletal reconstruction after craniomaxillofacial trauma was verified via zygomatico-maxillary complex (ZMC) reduction experiment of the skull model. After three-point fixation of ZMC in the zygomaxillary suture, zygomatic arch root, and zygomaticofrontal suture, the superimposition of the virtual model with the real model was verified. And the preliminary clinical study for a patient with posttraumatic frontal bone defect was carried out. SPSS 22.0 software was used for statistical processing, and the data were described by mean ± standard deviation for measurement data.

Results

The prototype of MR-based surgical navigation system was established successfully. The system error of this system was 1.23mm ± 0.52mm, the target registration error was 2.83mm ± 1.18mm. In addition, with the guidance of the MR-based navigation system, after preoperative planning, optical image registration, and spatial calibration of the MR side, the virtual head model was ultimately superimposed on the patient's real head, and it was also visually presented to the operator at the HoloLens side to assist the surgeon in localizing and verifying polyetheretherketone (PEEK) implant. The frontal bone defect was successfully reconstructed, and the clinical outcome was satisfactory.

Conclusion

The MR-based surgical navigation system has its advantages in virtual reality fusion effect and dynamic navigation stability. It provides a new method for doctor-patient communications, education, preoperative planning, and intraoperative navigation in craniomaxillofacial surgery.

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Chiari malformation in syndromic and non-syndromic lambdoid craniosynostosis: a longitudinal cohort study

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Jochem Spoor **Iris Cuperus** **Marie-Lise van Veelen** **Irene Mathijssen**

Abstract

Introduction

Literature regarding the association between CM1 and lambdoid synostosis is mainly focused on patients with multisuture and/or syndromic forms of craniosynostosis. We aimed to investigate the association between CM1 and lambdoid synostosis in all types of lambdoid-involved craniosynostosis and try to distinguish the impact of the lambdoid suture itself versus the underlying diagnosis.

Methods

We conducted a retrospective cohort study of all patients with radiologically confirmed lambdoid synostosis born between 2000 and 2024. A distinction was made between clinically non-syndromic and syndromic cases. The later were further specified as 'known craniosynostosis syndromes' (Crouzon, Apert, Muenke, Saethre-Chotzen, IL11RA, ERF, TCF12, and craniofrontonasal dysplasia), 'syndromic other' (ZIC1, HUWE-1, partial trisomia 5q11.1q14.3, CFC syndrome, trisomia 13, BCL11B, 14q32.32 interstitial deletion), and syndromic with unknown genetic mutation.

Results

From our cohort of 2193 patients with craniosynostosis, 131 patients with lambdoid synostosis were included; 22/131 had unilambdoid synostosis only (11/22 non-syndromic and 11/22 syndromic), 4/131 had bilateral lambdoid synostosis only (4/4 syndromic), and 105/131 had multisuture synostosis (13/105 non-syndromic and 92/105 syndromic). All but 17 patients underwent a vault expansion within the first year of life. Foramen magnum decompression was not routinely performed. Overall, 3/22 (14%) patients with unilambdoid synostosis only developed CM1, 8/22 (36%) patients with multisuture synostosis with unilambdoid involvement, and 40/87 (46%) patients with multisuture synostosis with bilambdoid involvement. In patients with multisuture craniosynostosis, CM1 developed in 7/11 (64%) syndromic patients without a known genetic mutation, followed by 23/46 (50%) Crouzon, 6/13 (46%) non-syndromic , 6/19 (31%) 'syndromic other', and 6/20 (30%)patients of the combined other 'known syndromes'. Ultimately, 13/51 (25%) patients with CM1 received CM1-associated surgery (9 Crouzon and 4 'syndromic other').

Discussion

Routine MR-brain to screen for CM1 appears not to be indicated in unisutural unilambdoid synostosis, regardless of a syndromic diagnosis. Initial screening with a baseline MR-brain seems to be indicated for all types of multisutural craniosynostosis with lambdoid involvement. Patients should be counseled on which symptoms warrant follow-up. The clinical relevance of CM1 appears to be more related to the underlying diagnosis than to the impact of the suture on skull growth alone.

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Integration of 3D Morphable Models in Clinical Practice: An All Surfaces Approach

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Abstract

Vault remodelling is the mainstay of craniosynostosis management. 3D morphometric analysis focusses on surface geometry pre and post op as a method of analysing, typically, aesthetic outcome, often without reference to a mean shapes. The northern craniofacial service in Liverpool has developed use of morphable models of the dura and of the head. Dura automated vault expansion and remodelling (DAVE-R)[1] compares a patients dural surface with an age matched normal to judge surface discrepancy and Liverpool York Head Model (LYHM)[2] compares subjects with mean head shapes for assessment of surface positions and aesthetic outcome. We present the method using clinical examples. 24 patients (15 male and 9 female) had vault surgery in '24/'25 with sagittal (13) other single suture (4) or multisuture fusion(7). 4 had raised intracranial pressure and 5 had a history of previous surgery.In the scaphocephaly group, mean pre op cranial index was 65 and mean post op was 80. Across the population, surface analysis gave a mean volume increase pre to post op of 303ml and significant Procrustes difference shape improvement of 0.035 (both P <0.05). Use of initial DAVE-R derived planning resulted in a precise prediction of where space was needed in all cases and enabled a bespoke operative plan together with expected volume expansion. Morphometric analysis using LYHM demonstrated normalisation in all cases with clear visualisation where change had taken place and close correlation with DAVE-R derived expected volumes (range 170-350ml).In conclusion, DAVE-R was particularly useful in the more complex cohort of patients, enabling precise individually tailored surgery while surface modelling and traditional anthropometrics post operatively confirms that DAVE-R is consistent with excellent aesthetics and complements traditional morphometric analysis. Based on these methods, a clinical panel was developed and will be presented. Dura-based automated vault expansion remodelling (DAVE-R): automated planning of volume expansion in fronto- orbital advancement for trigonocephaly. Child's Nervous System 40 (12), 4003-4011 Statistical modeling of craniofacial shape and texture. International Journal of Computer Vision 128 (2), 547-571.

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The use of artificial intelligence in the planning of orthognathic surgery: Prospective 'Man versus Machine' validation of a prototype for automated surgical planning

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Abstract

Objectives

As orthognathic surgery planning remains sophisticated and highly experience-dependent, deep learning methods have been explored to predict orthognathic surgery plans from 3D cephalometric analyses, offering a more precise understanding of normal bone structures to assist in surgical planning. With the large orthognathic patient turnover in our centre (>1000 cases/year) a large dataset is available to train a neural network for automated 3-dimensional planning of Caucasian patients and a prototype was developed.

Material and Methods

A neural network was trained on 137 samples, retrospectively collected from 2021 to 2022 and operated in the Department of Oral and Craniomaxillofacial Surgery of AZ Monica Hospital in Antwerp or the University Hospital of Antwerp. All patients underwent a Le Fort I osteotomy and a bilateral sagittal split ramus osteotomy (BSSO. Pre-operative CBCT data and smile dynamics were collected for every patient. Based on this neural network, a pipeline software prototype (Robovision AI, Ghent, Belgium) was designed that could generate an automated orthognathic planning. The prediction accuracy of the prototype was validated 'man versus machine' for 56 cases of bi-maxillary surgery.

Results

Both maxillary and mandibular translations have an error of less than 2 mm. With exception of the maxillary sagittal movements, the AI tends to overcorrect the translational movement, as indicated by their negative values. Pitch movements have a difference of 1.2 +/- 3.1 for the mandible and 1.4 +/- 2.8 for the maxilla. The trained neural network tends to undercorrect slightly the pitch. The neural network demonstrates a high degree of accuracy in predicting translational movements, with the sagittal mandibular parameters exhibiting the strongest correlation coefficient (r = 0.73). A high correlation coefficient is noted for the mandibular pitch movements (r = 0,83).

Conclusion

The pipeline software prototype, based on a trained neural network, can perform an automated orthognathic surgical planning with high accuracy and good clinically practical effectiveness. In the absence of a ground truth for unequivocal orthognathic planning, the software could generate an orthognathic treatment plan, that was comparable with an acceptable standard deviation to a conventional planning made by an experienced surgeon.

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Predictive Modeling of 3D Mandibular Growth – A Statistical Shape Analysis and Validation Study

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Abstract

Introduction

The mandibular deformity in patients with various craniofacial conditions, e.g. Robin sequence, is associated with persistently disturbed growth. This has long-term clinical implications. Timely evaluation of disturbed mandibular growth can serve as a prognostic marker for surgical treatment planning. This study aimed to develop and validate a normative statistical shape model for predictive modeling of 3D mandibular growth.

Methods

An open-source dataset of 3D triangular meshes of the mandible from CT-scans of individuals aged 0–22 years was used (N=667, 66.9% male) (1). Partial least squares regression was employed to construct a 3D morphable model. Extracted shape variables served as inputs for a predictive model of mandibular shape changes using non-linear regression. An external dataset of longitudinal 3D triangular meshes derived from 20 CT-scans of 8 patients (75.0% female) at 8.2-22.9 years of age was leveraged for prediction validation. The model predictions were evaluated using Root Mean Square Error (RMSE) and per-vertex mean distance error.

Results

The first shape variable explained 95.0% of variance with a significant age correlation (Spearman R=0.87, P>0.001). Mandibular shape changes by age followed a non-linear trend with significant sex differences from 15 years of age. The validation samples exhibited consistent longitudinal tracking along the first shape variable. For the predictions, the RMSE ranged between 0.48-1.13 mm. The mean per-vertex distance error was 1.25±0.69 mm. A 3D color mapping showed greater prediction error for the condylar head and gonial angle and less error for the mandibular ramus and body. A smaller age difference between the mandibular shape input and the predicted mandibular shape was associated with lower error (Spearman's R =0.92, P>0.001).

Conclusion

Besides overall size increases, the mandible demonstrates body elongation, increase in ramus height, and decrease in gonial and mental angles with age, stabilizing by age 16 years. A sex difference is apparent from 15 years of age. Using a 3D morphable model, an accurate prediction of normative 3D mandibular growth can be achieved.

References

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Custom-made vs. conventional external halo systems in monobloc osteogenic distraction in patients with syndromic craniosynostosis

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Abstract

Background

Osteogenic distraction reduces surgical time and complications when compared with previous monobloc advancement surgery. At 12 de Octubre Hospital Craniofacial Unit (Madrid, Spain), custom-made systems for monobloc advancement surgery have been used since 2013. The goal of this study is to assess the differences between custom-made and traditional halo systems. Mainly regarding surgical time and complications.

Methods

A retrospective observational study was conducted. Patients treated for monobloc advancement surgery for craniofacial syndromes at 12 de Octubre Hospital since 2006 were included. The cohort was divided in two groups: patients treated with conventional systems (RED II; KLS-Martin, Tuttlingen, Germany) and with custom-made systems (STAR RED; KLS-Martin). Surgical complications were defined as frontal bone necrosis, surgical site infection, revision surgery for impaired distraction, CSF leak, meningitis, seizures, major hemorrhage (massive transfusion during the first 24 hours). Surgical time and complications were analyzed using R software.

Results

32 patients underwent monobloc surgery from 2006 to 2024. 19 were men and 13 were women. Mean age at surgery was 5.84 years old. Crouzon syndrome was the most common diagnosis. 8 patients received the classic system and 24 patients received the custom-made system. Mean surgical time was 356 minutes in the custom-made group and 402 in the conventional system group. 7 patients developed major postoperative complications in the former group, while 9 patients in the latter group. In the custom-made group there were no complications related with movement of the halo, fracture of the bone or infection in the insertion point of the cranial region. In the group with classic system there were 2 patients with need for reintervention to

reposition the device and one patient suffered a cranial fracture while wearing the conventional halo because of a low-energy fall.

Conclusions

Custom made systems for monobloc osteogenic distraction are a good alternative to conventional cranial distraction systems in cases with bone defects. They seem to reduced postoperative complications rate and time of surgery.

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Microtia as a Marker for Craniofacial Microsomia: Prevalence and Phenotypic Correlation in Indonesia

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Abstract

Background

Microtia is a congenital malformation of the external ear that is frequently associated with craniofacial microsomia (CFM), a complex condition involving underdevelopment of facial structures derived from the first and second branchial arches. Identifying microtia as a potential clinical marker for CFM may aid early diagnosis and management, especially in low-resource settings.

Objective

This study aims to determine the prevalence of craniofacial microsomia in patients with microtia and to evaluate the phenotypic correlation between the severity of microtia and associated craniofacial anomalies in an Indonesian population.

Methods

A cross-sectional descriptive study was conducted using medical records of patients diagnosed with microtia at three tertiary referral centers in Indonesia between 2018 and 2023. Patients were evaluated for diagnostic criteria of CFM based on the OMENS classification system, and the degree of microtia was graded using the Marx classification.

Results

Among 152 patients with microtia, 89 (58.6%) were found to have features consistent with craniofacial microsomia. The majority of CFM cases were unilateral and more prevalent in males. A significant positive correlation was found between the severity of microtia and the extent of mandibular hypoplasia ($p < 0.05$). Other associated anomalies included facial nerve palsy, soft tissue deficiency, and ocular abnormalities.

Conclusion

Over half of microtia cases in this cohort were associated with craniofacial microsomia, supporting the role of microtia as a clinical marker for further evaluation of CFM. Early recognition of these correlations is essential for comprehensive multidisciplinary management, particularly in resource-limited regions such as Indonesia.

Keywords

microtia, craniofacial microsomia, prevalence, phenotypic correlation, Indonesia, congenital anomalies

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Incidence of persistent metopic suture in Thailand

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Abstract

Background

The metopic suture normally fuses during early childhood, usually by two years of age. Persistence of the metopic suture beyond this period, termed persistent metopic suture, is an anatomic variant that can mimic pathology on imaging. Its developmental significance and morphological classification have been underexplored in Southeast Asian populations.

Objective

To determine the incidence of persistent metopic suture at Siriraj Hospital and to evaluate its characteristics based on Lottering staging and its association with cranial development, including anterior fontanelle closure.

Methods

This retrospective study analyzed 1,315 cranial CT scans from patients aged 24 months to 25 years performed between January 2012 and December 2022. Three- dimensional volume-rendered CT images were reviewed to assess the metopic suture status, classified by Lottering's four-stage system: Stage 1 (completely open), Stage 2 (partial fusion, width <2 mm), Stage 3 (near-complete fusion), and Stage 4 (complete fusion). Persistent metopic suture was defined as Stage 1 or 2 patency beyond the expected age of closure. Anterior fontanelle closure was also evaluated. Statistical comparisons between patients with persistent and fused metopic sutures included chi- square tests and logistic regression analyses.

Results

The incidence of persistent metopic suture was 3.35% (44/1,315). According to Lottering staging, 2 patients (4.5%) were Stage 1 (fully open) and 15 patients (34.1%) were Stage 2 (partially fused with separation <2 mm). Most persistent cases were classified as Stage 3 (61.4%), indicating nearly complete fusion with minor residual gaps. There were no significant differences in sex distribution (59.1% male in persistent group vs 64.0% in fused group; p=0.614) or cephalic index (p=0.411).

Conclusion

Persistent metopic suture occurs in approximately 3.3% of patients, most often presenting as partial fusion (Stage 2–3 by Lottering classification). It represents a benign anatomical variant without major cranial shape abnormalities. Awareness of its CT appearance and typical staging prevents misinterpretation, especially in trauma evaluations. Minor association with anterior fontanelle closure delay suggests variation in midline frontal ossification but does not imply pathology.

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Contemporary Management of the Midface in Apert Syndrome

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Abstract

Background

This study examines temporal trends in surgical techniques and associated outcomes for five osteotomy approaches employed in the treatment of the Apert midface. Drawing from both clinical assessments and photogrammetric analyses, we present our institutional rationale for selecting specific osteotomy methods to address distinct phenotypic manifestations of midfacial dysmorphology in Apert syndrome.

Methods

We retrospectively reviewed patients with Apert syndrome who underwent midface distraction procedures from 2000 to 2025. Patients were temporally divided by the year 2012 to assess differences in surgical approach. Postoperative facial dimension changes, surgical and perioperative characteristics, and complications data were compared across techniques.

Results

A total of 46 patients with Apert syndrome underwent 48 midface distraction procedures at an average age 9.0±3.9: 25 (52.1%) in the early cohort and 23 (47.9%) in the late cohort. The use of segmental osteotomies for frontofacial advancement increased from 0 (0.0%) before 2012 to 12 (52.2%) from 2012 onwards (p<0.001). Monobloc with bipartition was the only technique that decreased intercanthal distance (-1.3±1.7, p=0.001), and Le Fort II with zygomatic repositioning achieved the greatest bilateral change in canthal tilt of 7.9°±1.9° (p>0.05). Monobloc with Le Fort II achieved the greatest increase in facial convexity of 34.3°±12.5° (p=0.012). Severity of complications, stratified by Clavien-Dindo grade, was similar between transcranial and subcranial procedures (47.4% vs 37.9%, p=0.517) and between segmental and monolithic osteotomies (41.7% vs 41.7%, p=1.000).

Conclusions

Our findings highlight a progressive shift toward multi-piece osteotomies in addressing the complex aesthetic and functional challenges of the Apert midface. Recognizing the diverse patterns of midfacial hypoplasia, segmentation offers more targeted and effective normalization of craniofacial form in patients with Apert syndrome.

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The APERT Severity Scale: A Quantitative Tool for Risk Stratification in Apert Syndrome

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Abstract

Introduction

Apert syndrome is a rare congenital disorder caused by FGFR2 mutations, characterized by craniosynostosis, midface hypoplasia, and syndactyly. The condition's multisystem complexity and lack of standardized surgical guidelines complicate diagnosis and treatment. This study introduces a quantitative severity scale for Apert syndrome to support objective risk stratification and personalized care.

Methods

A retrospective review was performed of all children with Apert syndrome from 1988 to 2024 at our institution. Inclusion criteria were patients aged ≥11 years at most recent follow-up. An initial severity scale was developed based on clinical data and comprehensive literature review, evaluating five domains of the Apert phenotype. Severity scoring was performed using clinical photographs and documentation from the initial consultation, prior to any surgical intervention. Relationships among subscores, total severity scores, and surgical interventions were analyzed.

Results

A total of 65 patients with Apert syndrome were identified, of which 37 (56.9%) met inclusion criteria (male n=18, 48.6%). At mean follow-up of 17.0±5.0 years old, patients underwent an average of 4.4±2.2 craniofacial surgeries, with fronto-orbital advancement and Le Fort III distraction being the most common. Patients were scored 1 (least severe) to 3 (most severe) in five domains: Airway compromise, Pressure (intracranial), Eyes, Retrusion of midface, and Turribrachycephaly (APERT), with total scores from 5–15. Severity categories were defined as mild (5-7), moderate (8-11), and severe (12-15). Among 37 patients, 15 (40.5%) were classified as mild, 20 (54.1%) as moderate, and 2 (5.4%) as severe, with an average score of 8.1±1.8. Higher APERT scores significantly correlated with increased frequency of craniofacial surgical interventions ($r=0.851$, $p<0.001$). Subscores for airway, pressure, eye, and turribrachycephaly domains were also associated with surgical frequency. Multivariate regression confirmed total score as an independent predictor of surgical volume. An APERT score ≥9 predicted ≥6 surgeries with 100% sensitivity and 86.7% specificity (accuracy 89.2%).

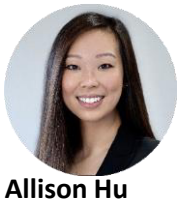
Conclusion

The APERT score is the first quantitative classification of Apert syndrome severity, correlating with phenotypic burden and surgical volume. Implementation of the APERT scale may enhance clinical communication, facilitate cross-institutional comparisons, and improve risk stratification in the management of Apert syndrome.

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Ocular Morbidity and Visual Outcomes in Rare Craniofacial Clefts: A Contemporary Cohort Study of 102 Cases

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Abstract

Background

Craniofacial clefts are rare congenital anomalies with heterogeneous presentations and significant functional and reconstructive challenges. This study characterizes periorbital pathology, surgical burden, and visual outcomes in patients with rare craniofacial clefts to inform clinical management and long-term care strategies.

Methods

A retrospective cohort study was conducted of patients with rare craniofacial clefts. Clefts were categorized into superior periorbital (Tessier 9 to 11), inferior periorbital (3 to 6, 8), superior medial (12 to 14), inferior medial (0 to 2), and lateral (7).

Results

Among 102 subjects, mean follow-up was 9.6±7.5 years. Thirteen (12.7%) had superior periorbital clefts, 32 (31.4%) had inferior periorbital clefts, 22 (21.6%) had superior medial clefts, 35 (34.3%) had inferior medial clefts, and 44 (43.1%) had lateral clefts. Eighty-two (80.4%) had one or more periorbital abnormalities, including ocular surface pathology (n=41, 40.2%), strabismus (n=26, 25.5%), nasolacrimal duct obstruction (n=25, 23.5%), and microphthalmos/ cryptophthalmos/anophthalmos (n=20, 19.6%). Sixty-four (63.3%) subjects underwent 484 periorbital procedures. Poor vision in one or both eyes was observed in 39 patients (38.2%). Patients with poor vision had a higher number of clefts (2.3 vs 1.6, p=0.002) and were more likely to have superior and inferior periorbital clefts, superior medial clefts, and intraocular anomalies (p<0.020). On multivariate analysis, inferior periorbital (β=2.285, p=0.004), inferior medial (β=2.026, p=0.023), superior medial clefts (β=1.969, p=0.028), and globe anomalies (e.g., microphthalmia, coloboma), were independent predictors of poor vision (p<0.030). Superior periorbital clefts were associated with ocular surface pathology (β=2.086, p=0.016) but not poor vision after adjusting for confounders.

Conclusions

Over one-third of patients with rare craniofacial clefts experience vision loss. Contrary to traditional assumptions that superior clefts pose the greatest threat to vision, inferior clefts carry a disproportionately high risk of visual impairment, driven by both congenital globe anomalies and acquired surface pathology. These findings underscore the need for early, cleft-specific ophthalmologic evaluation and coordinated multidisciplinary care to prevent irreversible vision loss and guide reconstructive planning.

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Indications and Trends in Emergent Airway and Ocular Interventions for Syndromic Craniosynostosis: A 40-Year Retrospective Review

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Abstract

Background

Airway obstruction in syndromic craniosynostosis arises from a combination of midface retrusion, glossoptosis, and laryngotracheal anomalies, often necessitating early tracheostomy to ensure adequate ventilation. Concurrently, severe proptosis and lagophthalmos place these patients at high risk for exposure keratopathy, corneal ulceration, and vision loss, making tarsorrhaphy a critical emergent intervention. Despite these risks, the incidence and indications for urgent airway and ocular interventions in syndromic craniosynostosis remain poorly characterized.

Methods

A retrospective review was performed on patients diagnosed with Crouzon, Apert, Pfeiffer, Muenke, and Saethre-Chotzen syndromes between 1985 and 2025. Demographic and clinical data were collected, including rates and indications for tracheostomy and tarsorrhaphy.

Results

A total of 261 patients with syndromic craniosynostosis were identified, with an even sex distribution (n=132, 50.6% female). Syndromic breakdown: Crouzon (n=78, 29.9%), Apert (n=65, 24.9%), Saethre-Chotzen (n=47, 18.0%), Muenke (n=38, 14.6%), and Pfeiffer (n=33, 12.6%). Tracheostomy was performed in 29 patients (11.1%), most frequently for tracheal sleeve (n=10, 34.5%), multilevel airway obstruction (n=6, 20.7%), and obstructive sleep apnea (n=6, 20.7%). Tarsorrhaphy was required in 22 patients (8.4%). Incidence of tracheostomy and tarsorrhaphy varied by syndrome, with highest rates observed in Pfeiffer syndrome patients (n=16, 48.5% and n=14, 42.4%, respectively), followed by Apert (n=5, 7.7% for both) and Crouzon (n=6, 7.7% and n=3, 3.8%, respectively). In patients with tracheal sleeves, incidence of tracheostomy decreased over time.

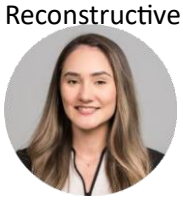
Conclusion

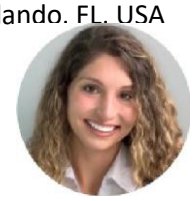
Urgent airway and ocular interventions remain essential components of early management in syndromic craniosynostosis, particularly among patients with Pfeiffer syndrome with complex airway anatomy. The decline in tracheostomy rates among patients with tracheal sleeves may reflect evolving surgical practices and multidisciplinary airway management strategies. These findings underscore the need for early identification of high-risk features and coordinated care to reduce morbidity in this vulnerable population.

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Objective Analysis of Levator Veli Palatini in Cleft Patients via Intraoperative MRI: A Novel Paradigm in Cleft Care

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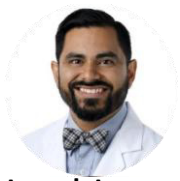

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Abstract

Background

Cleft palate repair aims to restore velopharyngeal function by repositioning the levator veli palatini (LVP) muscle and reconstructing the velar anatomy. While intraoperative assessment traditionally relies on surface level visualization, intraoperative magnetic resonance imaging (iMRI) provides real-time, high-resolution imaging of the deep anatomical structures to be manipulated during the operation. This study investigates the feasibility of iMRI use for surgical analysis and quantitative assessment of results.

Methods

In this study, seven patients between the ages of 11 and 13 months undergoing primary palatoplasty were evaluated using iMRI. Pre- and postoperative measurements of LVP length, origin-to-origin, velar length, effective velar length, velopharyngeal depth, and angles of origin were compared to normative data. Paired sample t-tests and root mean square error (RMSE) analysis evaluated differences between preoperative, postoperative, and control measurements.

Results

Novel assessment of the preoperative cleft anatomy, including detailed analysis for the LVP size, position and anatomical variation were performed. Postoperatively, mean LVP length increased by 8.437 mm ($p < 0.001$), reducing RMSE calculated relative to normal anatomy from 15.421 preoperatively to 7.88 postoperatively. Post-surgically, mean reconstructed velar length was 27.97 ± 5.4, 7.723 mm longer than the control group ($p < 0.01$). After surgery, mean EVL increased by 3.323 mm ($p < 0.05$). Surgical repair established an intravelar segment length comparable to normal anatomy (17.0 ± 1.46 mm post-palatoplasty vs. 15.9 ± 2.06 mm in normative data). No significant differences were noted after data was normalized relative to weight, length

and head size.

Discussion

This study is the first compilation of a series of detailed anatomical analysis of the un-operated levator veli palatini muscles in infants at the time of surgical repair. Real-time quantitative assessment of cleft palate repair, intraoperative surgical planning and objective evaluation of outcomes was performed. Findings suggest that the un- operated levator sling has significant variability in shape, size and orientation. Postoperatively, the LVP length, IVL, and EVL may serve as markers of surgical success. The study demonstrates the feasibility of intraoperative MRI, opening the door for future studies comparing anatomic outcomes between surgical approaches.

513

Isolated Squamosal Synostosis: A Rare Craniosynostosis Subtype Revisited Through Cohort Analysis

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Abstract

Background

Squamosal suture craniosynostosis is rare in isolation and the presentation and management of these patients is not well described. This study aims to characterize the clinical manifestations of isolated squamosal synostosis (ISS).

Methods

Patients with ISS were identified through review of computed tomography (3DCT) imaging from 2008-2025. Patients with syndromic diagnoses were excluded. Patients were reviewed for age at presentation, presenting concern, laterality of involved sutures, signs of elevated intracranial pressure, and management strategy.

Results

Twenty patients had ISS. Three patients were diagnosed unilateral ISS and were diagnosed at 1.4±0.6 years of age. None had signs of intracranial hypertension, and none required surgery for abnormal head shape. Of the 17 bilateral cases, 6 were completely fused and 11 were partially fused (age at diagnosis 5.0±3.9 years versus 2.7±3.1 years, respectively). Average cephalic index in complete cases was 76.0±2.8% versus 80.9±6.4% in partial cases (p=0.104). Concern for intracranial hypertension pre-operatively was more frequent in patients with bilateral complete ISS (66.7%) than partial (36.4%). Papilledema was more frequently discovered in patients with bilateral complete ISS (50.0%) than partial (33.3%). Vault remodeling was pursued in 4/6 patients (66.7%) with bilateral complete ISS and 6/11 (54.5%) patients with bilateral partial ISS. Of those who underwent surgery (n=10), most underwent posterior vault distraction osteogenesis (n=5, 50.0%), followed by fronto- orbital advancement (n=3, 30.0%), and posterior vault reconstruction (n=2, 20.0%). In all patients who underwent surgery, hard and soft signs of intracranial hypertension improved (100.0%).

Conclusions

This study reviewed a cohort of patients with isolated squamous craniosynostosis and assessed the presentation and management of patients with unilateral and bilateral disease. Patients with unilateral ISS presented similar to deformational plagiocephaly and did not require surgery for intracranial hypertension. Bilateral ISS was more closely associated with intracranial hypertension, even more so when considering cases of complete suture fusion. Bilateral ISS warrants close observation and appears to respond to CVR.

514

Clinical and Aesthetic Outcomes of Neo-Frontobandeau Technique for Fronto-Orbital Advancement

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Abstract

Background

Conventional frontal-orbital advancement (FOA) effectively expands the cranial vault but is associated with long-term sequelae including temporal hollowing, bony contour irregularities, and supraorbital retrusion. Here we compare clinical and aesthetic outcomes between patients who underwent single-segment neo-frontobandeau FOA (NB) to conventional FOA in patients with nonsyndromic anterior cranial vault dysmorphology.

Methods

We retrospectively reviewed all children who underwent FOA between 2013-2023 and had clinical and photogrammetric follow-up of more than 18 months. Clinical and treatment data was abstracted, and pre-operative severity was assessed by CranioRate. Comprehensive outcome assessments of standardized photographs was performed by masked reviewers.

Results

Twenty-five patients who underwent NB FOA were age- and sex-matched to 25 patients who underwent conventional FOA. Mean age at surgery was 1.3±0.8 years and at follow-up assessment was 3.9±1.5 years. Preoperatively, there were no differences in cranial dysmorphology severity measures between cohorts. On comprehensive Likert-scale assessment, patients treated with NB (n=25) showed superior temporal hollowing (4.2 ± 0.8 vs 3.5 ± 1.2, p<.001), frontal bone irregularity (4.5 ± 0.7 vs 3.6 ± 1.2, p<.001), sagittal frontal convexity (4.2 ± 0.9 vs 3.6 ± 1.2, p<.001), and supraorbital retrusion (3.9 ± 1.0 vs 3.5 ± 1.0, p=.010) scores compared to patients with FOA (n=25). In subgroup analysis of patients with metopic craniosynostosis treated with NB (n=16) or conventional FOA (n=25), all of these findings held (p<.01).

Conclusions

The neo-frontobandeau FOA technique for anterior cranial vault morphology may provide improved aesthetic outcomes and stability of result at early follow-up.

515

Posterior Cranial Vault Remodeling vs Spring-Mediated Remodeling for Sagittal Synostosis: An Outcome Analysis of 377 Patients

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Abstract

Background

A range of surgical modalities - including spring-mediated cranioplasty (SMC), suturectomy with postoperative helmet therapy, to various open vault reconstruction techniques — are employed in the treatment of sagittal craniosynostosis. This study evaluated treatment selection patterns, complications, and long-term outcomes to contrast technique differences.

Methods

A retrospective review was performed of all children with isolated non-syndromic sagittal craniosynostosis from 2012-2024 at our institution. Patients who underwent spring-mediated cranioplasty (SMC) or posterior cranial vault remodeling (PVR) as their index procedure were included. Cephalic index (CI) was used as a quantitative measure of head shape outcomes.

Results

Among 377 sagittal synostosis patients (n=287, 76.1% male), 239 (59.6%) underwent SMC at a mean age of 3.6 ± 0.9 months, and 138 (34.4%) underwent PVR at a mean age of 32.6 ± 27.9 months. Staged procedures were planned in 36 (9.5%) patients, the majority of whom presented over two years of age (mean age 30.7±23.0 months), with most undergoing posterior remodeling followed by anterior remodeling (n=35, 97.2%). CI improved from mean 69.2±5.3 to 74.7±4.8 (average increase: 5.9±4.3), with no significant differences between surgical groups in preoperative CI, postoperative CI, or change in CI ($p>0.05$). Secondary surgery was more frequent in the PVR compared to SMR cohort (10.9% vs 4.6%, $p=0.021$), with a mean time to revision of 2.0±2.4 years. Revision patterns differed by technique: posterior vault revisions were more common in the SMC cohort (81.8% vs 20.0%, $p=0.002$), whereas anterior vault revisions were more common after PVR (80.0% vs 9.1%, $p<0.001$). Major and minor complications were seen in 5 (1.3%) patients and 9 (2.4%) patients, respectively. Complication and revision rates did not differ by age at surgery (<12 vs. ≥12 months). On multivariate regression, posterior vault reconstruction (β=1.818, p=0.001) and low preoperative CI (β=-11.108, p=0.040) were independently predictive of higher revision risk when controlling for age at surgery, surgical technique, staged procedures, and other potential confounders.

Conclusions

Both SMC and open reconstruction demonstrate low complication and revision rates. Lower baseline CI and open PVR are independent predictors of reoperation, informing surgical planning and patient counseling.

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Sex-Based Differences in Zygomatic Morphology: Implications for Facial Feminization Surgery

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Abstract

Background

Facial feminization surgery (FFS) is a key component of gender-affirming care and involves modification of both soft tissue and skeletal features. While sex-based differences in the forehead, orbit, brow, and jaw have been well characterized, the zygoma remains relatively understudied despite its critical role in midfacial width and contour. A deeper understanding of zygomatic sexual dimorphism is essential for achieving harmonious, feminine facial aesthetics. This study aimed to perform a comprehensive morphometric analysis of the zygomatic bone and its overlying soft tissue in male and female individuals.

Methods

A cohort of male and female subjects was evaluated using both two-dimensional (2D) lateral photographs and three-dimensional (3D) imaging. Anatomical landmarks were used to assess projection of the zygoma and frontal bone, as well as overlying soft tissue thickness. Projection was measured in both lateral and anterior vectors, with specific attention to the zygomatic summit, frontal bossing, and soft tissue fullness.

Results

Females demonstrated significantly smaller bony dimensions across all zygomatic measurements, including maximum anterior projection (78.7±5.0 vs 85.2±5.2 mm, p=0.001), distance between zygomatic summits (90.0±5.9 vs 98.1±4.4 mm, p<0.001), and zygomatic arch width (123.2±5.3 vs 131.4±4.8 mm, p<0.001). In contrast, soft tissue measurements at the same landmarks were not significantly different between sexes. The discrepancy between bony and soft tissue measurements was significantly greater in females than in males at the zygomatic summit (13.4±5.2 vs 9.7±4.6 mm, p=0.023) and in the inter-summit distance (7.05±1.0 mm vs 5.7±1.4 mm, p=0.001). The zygomatic angle was more obtuse in females (139.7±3.9° vs 136.7±2.9°, p=0.024), with no difference in lateralization (35.6±2.7° vs 35.6±2.9°, p=0.944). 3D analysis revealed no sex-based differences in horizontal or anterior projection, but vertical height of the zygoma was significantly shorter in females (10.3±3.0 vs 13.4±3.7, p=0.021).

Conclusion

These findings underscore the importance of addressing both skeletal reduction and soft tissue dynamics when planning zygomatic modification in FFS. Specifically, optimizing vertical height, increasing zygomatic angulation, and preserving or augmenting soft tissue volume may contribute to a more balanced and feminine facial appearance.

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Endoscopic-Assisted vs Open Fronto-Orbital Distraction Osteogenesis for Unilateral Coronal Synostosis: A Comparative Photogrammetric Analysis

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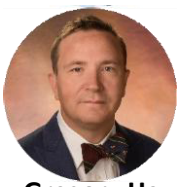

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Abstract

Introduction

In an effort to maximize benefit and minimize morbidity when performing fronto-orbital distraction osteogenesis (FODO) for unilateral coronal synostosis (UCS), we have transitioned to an endoscopic-assisted approach ("endo FODO"). This study evaluates and compares the photogrammetric outcomes of patients undergoing endo-FODO versus the traditional open approach.

Methods

We retrospectively reviewed patients with UCS treated between 2013 and 2025. Photogrammetric analyses were conducted one to three years postoperatively, assessing periorbital symmetry using margin reflex distance 1 (MRD1), palpebral height, canthal tilt, and orbital dystopia angle (ODA). Outcomes at one to three years postoperatively were compared between patients who underwent endo-FODO and age- and sex-matched controls who underwent open FODO. Differences between pre- and postoperative periorbital symmetry ratios, canthal tilt symmetry, and orbital dystopia angle (ODA) were calculated.

Results

Twenty-four patients were included (n=12 per group), with similar ages at surgery (endo-FODO: 5.9±1.8 months; open FODO: 5.6±1.5 months, p=0.665) and follow-up intervals (1.7±0.9 vs. 1.8±0.9 years, p=0.822). Patients who underwent endo-FODO demonstrated significant improvements in margin-refex distance 1 (MRD1) symmetry ratio (p=0.048), palpebral height symmetry ratio (p=0.004), canthal tilt symmetry (p=0.003), and ODA (p=0.001). Patients who underwent open FODO likewise demonstrated significant improvements in MRD1 symmetry ratio (p=0.004), palpebral height symmetry ratio (p=0.012), canthal tilt symmetry (p=0.046), and ODA (p<0.001). All postoperative measurements as well as degrees of improvement were similar between groups (p>0.05).

Conclusions

Both endoscopic-assisted and open FODO approaches yielded significant, comparable enhancements in periorbital symmetry and orbital alignment at approximately two years post-surgery. These findings support endo-FODO as a viable, minimally invasive alternative to open techniques. Long-term follow-up through cranial maturity remains necessary to determine the sustained efficacy and aesthetic outcomes of this approach.

518

A novel method to predict the existence of bridging veins between the superior sagittal sinus and the skull to prevent hemorrhage during endoscopic strip craniectomy for sagittal craniosynostosis

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Suresh Magge

Abstract

Introduction

Endoscopic strip craniectomy followed by helmet therapy has become a relatively common treatment for nonsyndromic craniosynostosis. The purpose of this study was to examine the incidence of bridging veins between the superior sagittal sinus and the skull that can potentially lead to serious bleeding during surgery if not identified before making the craniectomy. We identify a novel method to predict the existence and location of bridging veins before surgery.

Methods

This was retrospective study of patients with nonsyndromic sagittal craniosynostosis who were treated with endoscopic strip craniectomy by the senior author (SNM).

Results

87 patients were included in this series with nonsyndromic sagittal craniosynostosis. Mean age at surgery was 3.4 months. Mean EBL was 32 cc. Of these patients, 5 patients had an identifiable bridging vein connecting the superior sagittal sinus through a hole in the skull to the subcutaneous space. In these patients, a small hole in the skull overlying the superior sagittal sinus can often be seen on the preoperative CT. In all of these cases, the bridging vein was identified, coagulated, and cut before the strip craniectomy was performed, preventing serious bleeding from occurring.

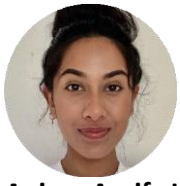
Conclusions

In this series, 5/87 patients (5.7 percent) with sagittal craniosynostosis were identified to have a bridging vein connecting the superior sagittal sinus to the subcutaneous space through a small hole in the skull. While the percentage is small, a failure to identify a bridging vein before making the craniectomy can potentially lead to serious bleeding. We identify a new method to predict the existence and location of bridging veins based on preoperative CT. If a bridging vein is present, a small hole in the skull overlying the superior sagittal sinus can often be seen on the preoperative CT, corresponding to the area of the bridging vein. If this finding is seen, the surgeon should pay particular attention this this area of the skull while performing endoscopy and coagulate/cut any bridging vein that may be present. This method can be used to enhance the safety of endoscopic strip craniectomy for sagittal craniosynostosis.

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Predicting Risk of Raised ICP after Passive Vault Remodelling in Scaphocephaly

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Abstract

Background

Scaphocephaly patients undergo vault expansion to address head shape and reduce risk of raised intracranial pressure (ICP). However, aggressive advancement is limited by scalp closure and reconstruction technique. Therefore, despite undergoing passive vault remodelling (PVR), patients may represent with symptoms of raised ICP or persistently abnormal vault morphology — ultimately necessitating revision by a second operation, such as total vault remodelling (TVR). Here, we use a novel virtual surgical planning tool, the 'Dura-Based Automated Vault Expansion- Remodelling' (DAVE-R) model to predict which patients require revision surgery for ICP.

Methods

Scaphocephaly patients who had undergone PVR were identified from a prospectively maintained database. Individualised DAVE-R models were constructed for each patient by registering pre, first and second post-operative scans to a normative atlas. Patients were grouped into three cohorts based on outcomes: (1) controlled scaphocephaly group not requiring revision; patients requiring revision due to (2) head shape and (3) raised ICP. DAVE-R models were used to calculate biparietal diameter, height difference and intracranial volume between pre, 1st post operative and 2nd poster operative time point using a Wilcoxon Signed Rank test.

Results

Thirteen scaphocephaly patients had undergone revision surgery. Average age of entire cohort at PVR was 3.8 months. For revision patients, there was a significant difference between the ideal post-operative intra-cranial volume (dictated by DAVE-R model), and the actual normalised percentage increase in volume after PVR (<0.05). This difference became non-significant after re-operation by TVR. The same trend was observed for bi-parietal diameter (<0.05) and height difference increase (<0.05). This indicates that individualised DAVE-R models can predict the ideal volume, biparietal diameter and height increase needed to prevent re-operation following a PVR. Additionally, the patients re- operated for shape were operated on at a younger age (24.7 months) than those re-operated for raised ICP (41.0 months). This indicates that those re-operated for shape may have always required re-operation if left longer, wherein older age might unmask inadequate remodelling resulting in raised ICP.

Conclusions

DAVE-R is a novel, individualised virtual surgical planning tool that can be used to predict which patients are at risk of developing raised ICP following PVR.

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Correlation between a traffic light system for clinical assessment of scaphocephaly severity compared to a computerised morphometric model

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Abstract

Introduction

Sagittal synostosis is the most common type of craniosynostosis. Typical assessment methods are either subjective or objective using crude anthropometry. More recently there is interest in using statistical shape modelling as an assessment method. In this paper we compare a traffic light system (red/amber/green=RAG) scored subjective assessment with outcomes generated by 3D geometric morphometric analysis of head shape.

Method

A consecutive series of 26 patients with scaphocephaly who underwent vault remodelling were assessed by five assessors from our craniofacial team. The panel was shown standardised views of pre- and postoperative photos and rated the severity of scaphocephaly based on six components (frontal bossing, bitemporal pinch, posterior bullet, calvarial height, observed cranial index, position of vertex) using a RAG scoring system. Each rating had a numerical conversion value (red=3,amber=2,green=1) and the total sum for each patient pre- and postoperatively was calculated. Same cohort of patients was processed by 3D geometric morphometrics and compared to a control cohort (n=46). Statistical significance was analysed by paired T-test. Procrustes distance between each patient and the estimated mean shape of control cohort was compared. A Spearman rank test was performed to assess correlation.

Results

The average assessor preoperative RAG scoring was 13.36 (±1.56 S.D) and postoperative scoring was 8.99 (±1.16 S.D) which was statistically significant ($p<0.001$). A subset analysis showed a significant reduction in scored severity postoperatively in all assessed components individually ($p<0.05$). The morphometric analysis showed Procrustes distance between postoperative shape and the mean shape was significantly reduced compared to the preoperative shape values indicating the postoperative cranial shape approaching the control cohort data ($p<0.05$). Spearman's rank correlation produced a R-value of 0.56 and 0.76 for preop- and postoperative RAG scoring against the Procrustes distance equivalent hence showed a significant correlation between the two assessment methods ($p<0.05$).

Conclusion

Our study provides assurance and validation between objective 3D morphometric methods and the standard of subjective 2D view assessments for scaphocephaly severity. In both methods, the postoperative images showed a statistically significant difference of improvement towards the control group compared to the preoperative images with significant correlation between both assessment methods

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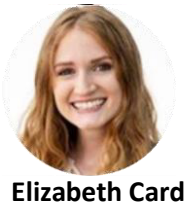
Virtual Surgical Planning (VSP) in Craniofacial Feminization Surgery (FFS): An analysis of complications, operative metrics, and learning curve effects

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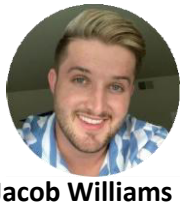
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Abstract

Background

VSP has become an established adjunct in craniomaxillofacial procedures, yet its role in gender-affirming FFS remains incompletely characterized.

Methods

A retrospective review was conducted of 42 consecutive FFS surgeries performed on 34 patients between 2020-2025. Demographic data, surgical details, and outcomes were analyzed to evaluate VSP's impact on complications, operative metrics, and learning curve effects.

Results

A total of 22 individual procedures were performed (median: 5.4/surgery, range: 1-11). VSP was utilized in 73.8% of cases, particularly in complex procedures involving both upper and lower facial thirds (94.1%) and cases with >5 procedures (85.7%). Most surgeries (92.9%) involved bony components, with hairline advancement/brow lift (69.0%), orbital contouring (61.9%), and frontal sinus setback (59.5%) being most common. We observed 4 minor and 6 major complications (requiring in-office or operative intervention), with 9 patients experiencing temporary neuropraxia. Three patients experienced malar implant migration/malposition, and one experienced a posterior table injury with CSF leak.

Multinomial logistic regression identified increased procedure length as a significant predictor of complications and neuropraxia ($p=0.029$) with higher patient age approaching significance ($p=0.058$). VSP use was not independently associated with complications ($p=0.542$). Surgical time was significantly predicted by the number of procedures performed ($p<0.001$), with each adding approximately 30 minutes. Blood loss was significantly associated with procedure duration ($p=0.004$). The probability of surgical time exceeding 4 hours increased progressively with procedure count, crossing 50% threshold at 6 procedures. Normalized for case complexity, VSP cases showed a trend toward greater efficiency (0.0257 vs. 0.0227 procedures/minute, $p=0.344$)–approximately 5.1 minutes saved per procedure, though not statistically significant. VSP utilization over the study period was relatively stable (OR=1.05, $p=0.153$) and there were no learning curve effects of VSP on surgical time (VSP experience interaction OR = 0.87, $p = 0.365$) or complications (VSP experience interaction coefficient = 0.48, $p = 0.821$).

Conclusions

While VSP is preferentially utilized in complex FFS cases, procedure count and duration remain the strongest predictors of surgical outcomes, with each additional procedure significantly increasing operative time and complication risk. VSP demonstrates a trend towards improved efficiency without a learning curve effect in this cohort.

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A Modified Method to Reduce Zygomatic Arch Fracture Precisely with Preauricular Sideburn Incision

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Jianfei Zhang

Abstract

Precise reduction and fixation of zygomatic arch fractures remain a surgical challenge due to anatomical complexity, limited access, and risks of iatrogenic injury. This study introduces a modified minimally invasive technique using a preauricular sideburn incision to achieve accurate reduction and stable fixation of isolated zygomatic arch fractures. The approach provides direct access to the fracture site while minimizing soft tissue disruption and protecting the frontal branch of the facial nerve.A retrospective analysis was conducted on patients treated using this modified approach. Through the sideburn incision, subcutaneous dissection was performed with blunt instruments to avoid nerve injury. A reciprocating saw was used for precise osteotomy of the zygomatic arch. The mobilized bone segment was realigned according to the preoperative 3D surgical plan, and fixation was achieved using a prebent titanium plate through the same incision. Key technical refinements included intraoperative confirmation of arch mobility and bony edge contouring to reduce postoperative palpability.Clinical outcomes demonstrated excellent aesthetic and functional results, with postoperative 3D CT confirming accurate alignment of the zygomatic arch in all cases. The technique allowed for day-surgery discharge, with no reported facial nerve injuries, hematomas, infections, or bone nonunion/malunion. Additionally, all patients achieved satisfactory midfacial contour with reduced lateral projection.This modified method presents several advantages: reduced operative morbidity, minimal scarring, protection of vital neurovascular structures, and improved precision via intraoperative control and rigid fixation. The technique is particularly suitable for patients requiring aesthetic correction or those with traumatic zygomatic arch displacement, offering a reproducible and safe alternative to conventional Gillies or coronal approaches.In conclusion, the preauricular sideburn incision-based zygomatic arch reduction technique represents a refined surgical approach that enhances precision, minimizes complications, and ensures favorable patient-centered outcomes. Further prospective studies with larger cohorts are warranted to validate its long-term efficacy and applicability in broader clinical scenarios.

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Single-Stage Mandibular Curved Ostectomy on Affected Side Combined with Bilateral Outer Cortex Grinding for Correction of Facial Asymmetry: Indications and Outcomes

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Guodong Song

Abstract

Background

Facial asymmetry combined with a prominent mandibular angle is common in the population. Its treatment involves two or three stages of surgeries. Generally, orthognathic surgery is a top priority. However, some patients with no severe occlusion disorders focus on the appearance and could not accept complex therapeutic procedures. This study evaluated the surgical effect of en bloc mandibular angle–body–chin curved ostectomy (MABCCO) combined with traditional mandibular angle curved ostectomy (MACO) and bilateral outer cortex grinding (OCG) to correct facial asymmetry and a prominent mandibular angle.

Methods

From September 2013 to November 2017, a total of 40 patients with facial asymmetry and prominent mandibular angle were chosen for this study. The authors performed single-stage surgery of en bloc MABCCO combined with traditional MACO and bilateral outer cortex grinding to correct facial asymmetry. Patient satisfaction was investigated by questionnaires at 6 months postoperation. The effectiveness was then evaluated through cephalometric radiographs, three-dimensional computed tomography, and preoperative and postoperative standard facial photographs.

Results

The postoperative results of all 40 cases showed that facial asymmetry was effectively corrected without serious complications, and the square face was also significantly improved with a harmonious mandibular contour. There was a statistical difference between the patient's preoperative and postoperative satisfaction scores(p\0.05). The objective esthetic outcomes evaluated by both surgeons and patients were quite satisfactory.

Conclusion

Single-stage surgery of en bloc MABCCO combined with traditional MACO and bilateral OCG was an adaptable option for correction of facial asymmetry and prominent mandibular angle with slight occlusion disorders, which can both largely shorten treatment time and shape a harmonious face.

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A Novel Endoscopic Modified H-Plasty for the Treatment of Sagittal Craniosynostosis

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Abstract

Background

Previous literature has demonstrated improved perioperative outcomes with endoscopic strip craniectomy compared to open cranial vault remodeling for sagittal craniosynostosis. Unfortunately, patients who present after 5-to-6 months of age are generally ineligible for endoscopic treatment. Herein, we describe our experience employing a novel endoscopic modified H-plasty approach for sagittal craniosynostosis for patients who present outside the optimal treatment period for endoscopic treatment.

Methods

Patients who underwent endoscopic strip craniectomy (endo strip) with cranial molding therapy or cranial springs, open H-plasty (open H), and endoscopic H-plasty (endo H) at American Family Children's Hospital from 1999 to 2023 were included. Demographic and perioperative data was collected. Our method involves a 2 cm incision posterior to the bregma and another anterior to the lambda with dissection to the subgaleal plane. An endoscope is used to remove two parasagittal bone strips and the bilateral coronal and lambdoid sutures. The skull is shortened by removal of a small segment of the anterior sagittal strip, which is then secured to the frontal bone. No cranial springs and no postoperative cranial molding therapy are used with the endo H procedure.

Results

A total of 133 patients were included (58 open H, 44 endo strip, 31 endo H). There was no significant difference in age at reconstruction between groups, with the endo H group undergoing surgery at a median of 3.7 (IQR 1.5) months. Operative duration and hospital stay was significantly shorter in the endo strip group compared to both the open H and endo H groups ($p<.05$). Blood loss did not differ between the endo strip and endo H groups ($p=.14$). Three patients in the endo H group (6.8%) underwent minor scar revisions and four patients (9.1%) elected to pursue postoperative helmeting for additional molding, but there were no other complications or secondary cranial vault surgeries associated with this approach.

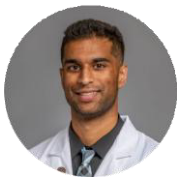
Conclusions

Our endoscopic modified H-plasty approach offers a non-inferior alternative to open cranial vault remodeling that negates the need for a bicoronal incision or adjunct treatment with cranial springs or molding helmets in patients who present outside the window of eligibility for traditional endoscopic strip craniectomy.

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numeriFACE – A novel computational tool to quantify facial paralysis in the pediatric population: a pilot study

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Abstract

Background

The subjective nature of outcomes analysis in facial paralysis makes it challenging to disseminate data accurately and universally about these injuries, especially in the pediatric population. Physicians resort to subjective scales and photographs as there is currently a paucity of reliable and quantitative tools to accurately analyze facial function. Prior methods utilizing Emotrics and eFACE software lack automatic point registration and depth-field characterization. The authors describe the creation and implementation of an open-source, electronic, quantitative facial function tool (numeriFACE), which provides clinicians with patient tailored numerical data and interactive facial mapping for: tracking postoperative outcomes, assessing efficacy of interventions, and universal dissemination of data.

Methods

numeriFACE can be used both prospectively through three-dimensional (3D) patient images or live video as well as retrospectively using two-dimensional images. numeriFACE was used to capture 5 patients' (mean age 11.6 years) extent of facial movement while performing expressions with varying etiologies of facial paralysis. 1,438 points of interest were extracted, and 3D comparison maps were created. Point by point analysis was performed to create 3D deformation maps visualizing and quantifying the changes in commissure excursion (CE), lower lip and upper lip deviation (ULD and LLD).

Results

numeriFACE novelly illustrated depth of change in facial expression as well as registered global changes seen in cases of synkinesis. Focusing on midface symmetry, patients affected (A) and unaffected (UA) sides had changes in CE, ULD and LLD of (7.2mm / 4.8mm) and (2.2mm/1.9mm) and (6.2mm/3.8mm), respectively.

Conclusion

numeriFACE is a novel, reliable, standardized, and patient-specific clinical tool to quantify, monitor and assess facial function and recovery in pediatric facial paralysis patients.

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Epas1 Deficiency Exacerbates Hypoxia-Induced Craniofacial Maldevelopment in Zebrafish: Insights into the Genetic Basis of Hemifacial Microsomia

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Zhifeng Li

Abstract

Background

Hemifacial microsomia (HFM) is a congenital disorder marked by craniofacial asymmetry and mandibular hypoplasia. Hypoxia and genetic factors like epas1 (a hypoxia-inducible transcription factor) are implicated in its pathogenesis, but mechanistic links remain unclear.

Methods

We employed CRISPR-Cas9 to generate epas1a and epas1b single and double knockout (KO) zebrafish models. Embryos were exposed to hypoxia (0.5g/L sodium sulfite) from 6 hours post-fertilization (hpf) to simulate environmental stress. Phenotypic analyses included Alcian Blue staining (cartilage), Alizarin Red staining (bone mineralization), and fluorescence microscopy for vascular development. Gene expression dynamics were assessed via qRT-PCR and RNA sequencing (RNA-seq), with differential expression analysis (DESeq2, $|\log2FC| > 1$, FDR <0.05) and pathway enrichment (GO/KEGG). Experimental groups comprised wild-type (WT) controls, epas1 KO, hypoxia-treated WT, and hypoxia-treated epas1 KO.

Results

Phenotypes: Double epas1 KO caused severe craniofacial defects (50% malformation rate), including microcephaly, reduced jaw length (LJL: 0.45±0.08 mm vs. WT 0.82±0.12 mm, $p<0.001$), and cartilage shortening. Hypoxia exacerbated defects, with combined KO and hypoxia inducing synergistic lethality (70% mortality by 5 dpf).

Gene Expression: RNA-seq identified 524 DEGs in epas1 KO (e.g., wnt9b↓, sox9a↓, col2a1a↓), 1,295 DEGs in hypoxia (e.g., vegfaa↑, hif1an↑), and 1,562 DEGs in combined KO/hypoxia, enriched in apoptosis (casp9↑), FoxO signaling (cdkn1a↑), and MAPK suppression (dusp1/6↑).

Pathway Dysregulation: epas1 deficiency disrupted Wnt/BMP signaling and ECM remodeling, while hypoxia induced metabolic shifts (hk2↑ glycolysis, acaca↓ lipid synthesis).

Functional Defects: Combined KO/hypoxia reduced intersegmental vessel length (58.4±6.2 μm vs. WT 92.3±8.1 μm, $p<0.001$) and bone mineralization (0.15±0.03 mm^2 vs. WT 0.38±0.05 mm^2, $p<0.001$).

Conclusion

Epas1 deficiency synergizes with hypoxia to disrupt craniofacial development via Wnt/BMP pathway dysregulation, ECM defects, and metabolic reprogramming. This zebrafish model recapitulates HFM phenotypes and identifies hypoxia- responsive targets (e.g., VEGF, Wnt agonists) for therapeutic intervention. The study bridges genetic and environmental mechanisms in congenital disorders, offering translational strategies for HFM management.

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The successful use of a minimally invasive temperature-controlled Radio Frequency (RF) device to treat recalcitrant symptomatic hemangiomas in children.

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Abstract

Background

Infantile hemangiomas are common benign vascular tumors of childhood. While many regress without intervention, a subset remains symptomatic, disfiguring, or refractory to standard therapies such as propranolol, corticosteroids, or laser treatment. For these complex cases, we evaluated the use of a minimally invasive, temperature-controlled radio frequency (RF) device as a novel therapeutic approach.

Methods

A retrospective review of 22 pediatric patients with symptomatic or treatment-resistant hemangiomas treated with a Radio Frequency (RF) device delivering targeted thermal energy. Patient ages ranged from 11 months to 17 years (mean: 4.6 years) When appropriate pre-operative ultrasound was obtained. A non-conductive tumescent solution (lactated Ringer's with epinephrine at 1:400,000 dilution) was used for vasoconstriction and thermal insulation. RF energy was applied with the probe placed within the lesion (internal mode) or externally on the surface (external mode) according to device specifications.
Internal tissue temperature approached 60°C and was monitored in real time. Surface temperature was continually monitored using infrared thermography.
Follow-up occurred at 2, 6, and 12 weeks, with ultrasound performed at 12 weeks to assess volume involution and vascular changes. Clinical outcomes were documented via imaging, photographs, and physician assessments.

Results

Of the 22 patients (12 female, 10 male), two patients received both internal and external RF treatments. There were 39 total procedures: 18 internal and 21 external mode. Twelve patients underwent multiple RF procedures (avg 2.4) There was demonstrated marked improvement, including reduced lesion volume, improved skin contour, and decreased vascularity. No significant complications were reported. Ultrasound and photographic data confirmed substantial tissue remodeling, especially in patients previously unresponsive to therapies such as propranolol and pulsed dye laser.

Conclusion

Temperature-controlled RF treatment is a safe, minimally invasive option for recalcitrant pediatric hemangiomas. Ultrasound guidance, precise thermal control, and a standardized protocol support its clinical utility. This approach offers a promising alternative for complex vascular anomalies in children and merits further validation in prospective studies.

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The incidence and risk factors of secondary craniosynostosis

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Songchunyuan Zhang **Chenbin Dong**

Abstract

Objectives

Secondary craniosynostosis was found at radiological iamges in children with non-syndromic craniosynostosis during postoperative follow-up. Secondary craniosynostosis is defined as that initially patent cranial sutures fused after primary correction, which is rarely reported and the mechanism is unclear. Patients with secondary craniosynostosis in a single center was analyzed to report incidence and risk factors.

Methods

The research retrospectively analyzed non-syndromic craniosynostosis in children who underwent operation at the Chlidren's Hospital of Fudan University from January 2015 to February 2023. The inclusion criteria were: 1. Complete and high-quality head CT images before and after operation, 2. The surgery is performed by the same pediatric plastic surgeon, and 3. Imaging follow-up data must be completed for at least 6 months postoperatively. The exclusion criteria are: 1. Children with syndromic craniosynostosis who have a clear genetic diagnosis; 2. Children with a positive family history or related deformities such as syndactyly or hypoplasia of the midface without a clear genetic diagnosis; 3. Clinical data was missing. Routine analysis was performed for general data and univariate and multivariate analysis for preoperative and surgical related variables including initial fused sutures, fingerprints, surgical procedures, evans index, blood loss, etc. to explore risk factors.

Results

A total of 101 children with non-syndromic craniosynostosis were included in this study, all of whom were Asian. The average age of primary operation was(14.63±12.20)months. The average follow-up duration was (17.07±13.37)m. The incidence rate of primary sagittal suture was the highest, 51.49%, and the incidence rate of primary unicoronal suture was the second highest, 18.81%. The incidence of secondary cranisynostosis is 18.81%, and younger children (≤6m) are less likely to develop secondary cranisynostosis. Univariate analysis found that among different primary suture types, secondary cranisynostosis is most likely to occur following after unicoronal craniosynostosis(47.37%), and the differences were significant ($p<0.05$), which was not significant in multivariate regression. Multivariate logistic regression analysis showed that preoperative fingerprints (OR=14.449, 95%CI:2.342-60.235) were a risk factor for secondary craniosynostosis ($p<0.05$).

Conclusion

The long-term imaging follow-up of children with craniosynostosis is of significance for the early diagnosis and monitoring of secondary craniosynostosis.

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Aneural network system based on three-dimensional morphable model for soft-tissue prediction after orthognathic surgery

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Abstract

Objectives

Soft tissue prediction is of great importance for the surgical design and patients' satisfaction in orthognathic surgery. Many previous studies have been conducted on the soft tissue simulation related to bone segments reposition. However, previous methods used either rely on complex simulation models, such as finite element which involves time-consuming computations, or focus on artificial intelligence systems that require large patient databases. Therefore, in the present study, a small-scale neural network utilizing a three-dimensional morphable model (3DMM) was applied for the prediction the 3D facial morphology after orthognathic surgery.

Materials and Methods

A total of 191 patients who underwent double jaw surgery performed by the same senior surgeon were included in the study. 3D facial images were acquired before and 1 year after surgery. Among them, 163 data sets were utilized to train the neural network. The Basel face model (BFM) is utilized as the 3DMM, without requiring a larger patient database for further construction. The proposed simulation methodology has been evaluated on a cohort of 28 patients by comparing the simulation of the soft-tissue with the actual postoperative soft-tissue surface. Error was defined as the RMS between predicted and postoperative surface when they are overlapped with each other. 2mm was set up as the acceptable level. The prediction was considered to be successful when total error was less than 2mm.

Results

The mean error for the entire face measured 1.6 ± 0.4 mm in skeletal class III patients and 0.96 ± 0.15 mm in skeletal class II patients. There were 25 data sets whose total error was less than 2mm, while the other 3 sets were not. The success rate was 89.3%.

Conclusion

The accuracy of a soft-tissue prediction system using neural network system based on 3DMM is clinical feasible.

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Evaluating the Prognostic Role of Total Comminution Score in ZMC Fractures Treated with ORIF: A 4-Year Retrospective Study from Indonesia

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Jane Angela Kalangi



Kristaninta Bangun



Vika Tania

Abstract

Background

Zygomaticomaxillary complex (ZMC) fractures are common facial injuries that can lead to significant functional and aesthetic complications. The severity of fracture comminution may influence surgical outcomes; however, its relationship with postoperative complications remains underexplored. This study aims to evaluate the association between the Total Comminution Score (TCS) and clinical outcomes in patients with ZMC fractures undergoing open reduction and internal fixation (ORIF).

Methods

This retrospective cohort study included patients treated for ZMC fractures at Cipto Mangunkusumo Hospital between 2021 and 2024. The TCS was calculated from preoperative CT scans by scoring comminution at five suture sites and the body of the zygoma. Postoperative complications—including facial, orbital, and reoperation-related outcomes—were analyzed in relation to TCS.

Results

A total of 100 patients (mean age 31.2 ± 13.5 years) with 125 ZMC fractures were included. Facial complications were the most common (41.6%), with malar depression being the most frequent (12.8%). The mean TCS was 4.4 ± 1.47. Univariate analysis revealed a significant association between higher TCS and facial complications ($p = 0.001$), malar depression ($p= 0.010$), ectropion ($p = 0.046$), enophthalmos ($p = 0.013$), and reoperation ($p = 0.028$). After adjusting for demographic and clinical variables, multivariate analysis confirmed that TCS was an independent predictor of facial complications ($p < 0.001$), orbital complications ($p = 0.049$), and reoperation ($p = 0.016$).

Conclusion

The Total Comminution Score is a strong independent predictor of adverse postoperative outcomes in ZMC fracture patients. It holds potential as a practical tool for surgical risk stratification and patient counseling. Early identification of high comminution severity may aid in optimizing treatment planning and improving clinical results.

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The American Society of Craniofacial Surgeons Clinical Practice Guideline for the Surgical Treatment of Craniosynostosis

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Abstract

Background

While significant advancements have been achieved in the surgical management of craniosynostosis in recent years, wide variability in clinical practice persists across perioperative care. This underscores the need for evidence-based guidelines to standardize care and improve patient outcomes. On behalf of the American Society of Craniofacial Surgeons (ASCFS), we aimed to address this need by preparing a comprehensive, evidence-based clinical practice guideline for the surgical treatment of craniosynostosis including considerations for preoperative, operative, and postoperative care.

Methods

Craniofacial centers in the United States were surveyed for the existence and components of their standardized perioperative care protocols for craniosynostosis. Key topics, including analgesia and preoperative imaging, formed the foundation of this guideline. In consultation with a research librarian, literature searches were conducted for each topic on PubMed and Embase. Two reviewers independently screened resulting titles and abstracts and a third-party reviewer resolved any discrepancies. Full-text reviews identified articles for inclusion. Recommendations were developed using an evidence-based consensus approach and graded using the American Society of Plastic Surgeons' evidence and recommendation grading scales.

Results

Recommendations were developed for 23 topics, including antimicrobial prophylaxis, analgesia, steroids, surgical drains, preoperative imaging, postoperative nausea and vomiting, and agents to manage blood loss such as tranexamic acid, epsilon-aminocaproic acid, and fibrinogen. The strength of recommendation to support these components was variable but allows for each institution to implement the aspects of the protocol that are suitable for their practice patterns in an evidence-based manner.

Conclusions

This standardized perioperative clinical care pathway represents a synthesis of the current literature available to guide perioperative care of patients undergoing cranial vault repair for the treatment of craniosynostosis. These recommendations can be applied to most patients, although as with any clinical practice guideline, they should be guided by each patient’s clinical circumstances and individual institutional policies.

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Respiratory outcome of mandibular distraction osteogenesis on obstructive sleep apnea in craniofacial microsomia: A retrospective study

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Lunkun Ma



Wei Liu



Zhiyong Zhang

Abstract

This study aimed to evaluate the effect of mandibular distraction osteogenesis (MDO) on respiratory function in CFM patients with obstructive sleep apnea (OSA) according to polysomnography (PSG). This study retrospectively analyzed patients with CFM who underwent PSG before surgery and after completion of mandible distraction. Patients who met the inclusion criteria were selected. The Pediatric Sleep Questionnaire (PSQ) was used to assess patients' signs and symptoms related to OSA. The obstructive apnea-hypopnea index (OAHI) and lowest oxygen saturation (LSaO2) were imported into SPSS version 26.0. The Wilcoxon signed-rank test was used to assess the differences in PSG before and after MDO. Other data were described using descriptive statistics. A P-value less than 0.05 was consid ered statistically significant.

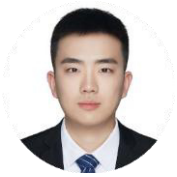
A total of 25 unilateral CFM patients were included in this study. Most patients (72%) had mild OSA; moderate and severe OSA were 12% and 16%, respectively. Snoring (52%) was the most common symptom among these patients. After completion of mandibular distraction, snoring and other OSA-related symptoms were significantly improved. Twelve patients had normalized PSG and the severity of OSA improved significantly in 3 patients. The total effective rate of MDO for OSA was 60%. The statistical results showed that OAHI (P = 0.045) decreased and LSaO2 (P = 0.009) increased significantly compared to preoperative values.

MDO can improve OSA-related symptoms in CFM patients. In addition, respiratory function was improved in most patients after MDO, based on PSG. CFM patients, especially those with OSA, can benefit from MDO.

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Robot-assisted Osteotomy and Reposition System for Craniomaxillofacial Surgery: a preclinical study

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Abstract

Objective

Precision in osteotomy and repositioning is crucial for correcting craniomaxillofacial deformities. This study evaluated an autonomous robot-assisted system with robotic arm tracking and collision detection for craniomaxillofacial surgery.

Methods

The research included model and animal experiments. LeFort I osteotomy, genioplasty, and zygomatic osteotomy were performed on 3D-printed skulls in model experiments. Animal experiments involved mandibular angloplasty and zygomatic osteotomy. The experimental group underwent robot-assisted surgeries, while the control group used 3D-printed surgical guides. Postoperative accuracy was measured by CBCT scans, analyzing distance, angular, and overall errors.

Results

Both groups completed all procedures. The robot system detected and resolved all intraoperative collisions. In model experiments, the robot group's osteotomy precision was 0.78±0.23mm in distance, 0.92±0.23° in angle, and 0.81±0.23mm in overall error, while the reposition accuracy was 0.65±0.13mm in distance, 0.80±0.26° in angle, 0.58±0.07mm in overall error. The corresponding errors in the surgical guides group were 1.28±0.69mm, 2.31±1.28°, 1.33±0.72mm for osteotomy and 0.88±0.29mm, 2.07±1.28°, 0.93±0.18mm for reposition. In animal experiments, the robot group's osteotomy precision reached 0.91±0.43mm in distance, 1.02±0.43° in angle and 1.05±0.39mm in overall error, and the reposition accuracy was 0.95±0.36mm in distance, 1.20±0.56° in angle, 0.95±0.53mm in overall error. The surgical guides group had errors of 2.01±0.81mm, 1.81±0.88°, 2.33±1.02mm for osteotomy and 2.72±0.29mm, 2.35±0.91°, 2.84±1.06mm for reposition. All accuracy metrics showed the robot group had significantly better performance ($P<0.001$).

Conclusion

The robot-assisted osteotomy and repositioning system can autonomously execute precise craniomaxillofacial surgical operations according to preoperative plans and accurately detect intraoperative collisions. Compared with 3D- printed surgical guide-assisted procedures, this system offers higher accuracy, suggesting great potential for enhancing surgical precision and stability in craniomaxillofacial surgeries.

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Surgical Treatment of Mandibular Fractures in the Growing Child Following Traffic Accidents: A 6-Year Experience with Functional and Aesthetic Outcomes

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Thi Ngoc Linh DO **Hong Quan Duong** **Thi Thu Hang Nguyen** **Ngoc Van Tran** **Hong Ha Nguyen**

Abstract

Introduction

Pediatric mandibular fractures pose unique challenges due to ongoing craniofacial growth. Traffic accidents, involving high-energy trauma, are a major cause of these injuries. This study evaluates long-term functional and aesthetic outcomes following pediatric mandibular fractures, based on a 6-year institutional experience.

Methods

A retrospective review was conducted of patients aged 0–18 years treated surgically for mandibular fractures between 2019 and 2024. Data collected included demographics, mechanism of injury, fracture location, fixation type (titanium or resorbable plates). Functional outcomes (occlusion, mandibular mobility, nerve function) and aesthetic outcomes (facial symmetry, scarring) were assessed through clinical follow-up and patient/parent-reported measures, with a minimum follow-up of 12 months. Traffic accidents were identified as the leading cause of injury in 82.5% of cases.

Results

A total of 234 pediatric patients were included. 82.5% sustained fractures due to traffic accidents, predominantly from motorbike accident. The most common fracture sites were the symphysis (44.4%), condyle (36.3%) and parasymphysis (29.1%). 49.1% were multifocal fractures, and 80.3% were associated with other injuries. Open reduction internal fixation was performed in all cases with resorbable fixation employed in 20%. Overall, 97% of patients achieved normal occlusion and full mandibular mobility. Aesthetic outcomes were rated good to excellent by 92.3% of patients and families. Complication rates and overall result in the titanium and resorbable groups were not significantly different ($p = 0.197$ vs 0.409). No significant growth disturbances were noted during long-term follow-up.

Conclusion

Mandibular fractures in growing children, particularly those caused by traffic accidents, can be managed successfully with individualized treatment strategies. Surgical approaches yielded excellent functional and aesthetic outcomes. Both resorbable and non – resorbable fixation offers a safe, effective treatment. Early intervention and careful follow-up are essential to minimize the risk of long-term growth disturbances and optimize facial development.

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CT Images Observation of Physiological Metopic Suture Fusions

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Yuzhu Zhu



Chenbin Dong

Abstract

Objective

The reported timing of physiological metopic suture fused varies, making it challenging to diagnose metopic craniosynostosis in clinical practice. This study aimed to investigate the physiological fused timeline of the metopic suture in infants from CT imaging.

Methods

A retrospective analysis was conducted on infants aged 0-24 months who underwent cranial CT scans at Children’s Hospital of Fudan University from January 2023 to December 2023. Cases with craniosynostosis, hydrocephalus, subdural effusion, cerebral atrophy, or prematurity were excluded. Metopic suture status (non-fused or fused) was assessed using 3D reconstruction or axial bone window imaging.

Results

A total of 966 infants were included (54% male, 46% female). The fused rates of metopic suture were as follows:0-1 month:0% (0/25); 1-2 months: 0% (0/28); 2-3 months: 0% (0/35); 3-4 months:16% (5/32), with partial inferior fused in 13% (4/32); 4-5 months:38% (17/45), with partial inferior fused in 22% (10/45) ; 5-6 months: 49% (27/55), with partial inferior fused in 15% (8/55); 6-7 months:50% (26/52), with partial inferior fused in 12% (6/52) ; 7-8 months: 75% (42/56); 8-9 months: 89% (49/55) ; 9-10 months: 85% (39/46) ; 10-11 months: 98% (47/48); 11-12 months:100% (35/35) ; 12-24 months: 97-100% fused across all age groups.

Conclusion

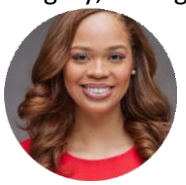
Physiological fusion of metopic suture begins at 3 months of age, and is nearly complete by 12 monthsin most infants.

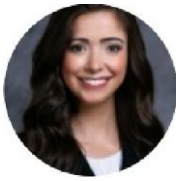
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Evolution Of the Use of Virtual Reality in Surgery: A 1472 - Procedure Experience Over 5 Years

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Abstract

Background

The use of 2D visualization modalities for surgical planning can be difficult for complex surgical cases. Virtual reality (VR) for surgical planning is helpful for understanding 3D relationships and manipulations in 3D space. We aim to discuss the evolution of surgical VR in our institution.

Methods

All surgical procedures involving the use of VR were audited from April 2018 to July 2024 at a single academic practice.

Results

VR was used in 1,472 surgical procedures, with 19 different surgeons at 3 hospitals. Orthognathic surgery made up 37.2% of cases. 50.3% of cases combined planning with 3D printing for guides or models, and, in 41% of procedures, VR was used for visualization alone. There was a decrease in the utilization of VR during the COVID-19 pandemic from 2020 to 2022. Since 2022, the type of procedures utilizing VR has evolved significantly. From 2022 to 2023-2024, there was an increased use for facial trauma (24 to 102 procedures), hardware removals (0 to 34), dental extractions (0 to 36), facial feminization (7 to 34), cranioplasty and craniosynostosis (1 to 26), distraction osteogenesis (1 to 17), dental implants (0 to 6), and orbital implant placement (3 to 9). The fastest growth in procedure types was facial trauma procedures with rapid 3D printing for preoperative or intraoperative plate bending.

Conclusion

The overall number and type of procedures utilizing VR technology has expanded over 5 years, with the most rapid increase in utilization for facial trauma procedures.

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Disparities in Facial Trauma: A Systematic Review and Retrospective Analysis

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Abstract

Background

Facial trauma is extremely common in the United States. Despite its prevalence, the role of sociodemographic factors is often underexplored. In this study, a systematic review and retrospective cohort analysis were performed to examine disparities in facial trauma among adult and pediatric populations.

Methods

A systematic review following PRISMA guidelines was performed, and studies were included if they reported outcomes involving both facial trauma and patient disparities. Disparities were determined by patient demographics, insurance status, socioeconomic status/income. Clinical variables included injury patterns, etiology and clinical outcomes. Retrospective analysis was performed between April 2023 and December 2024 at an urban level 1 trauma center.

Results

The initial review identified 620 articles; 598 were excluded after title/abstract review, and 3 of 22 remaining studies were excluded in full-text review, yielding 19 retrospective studies. Overall, 63% (n=12) focused on adult trauma, and 37% (n=7) on pediatrics. Among adults, 68.4% (n=13) of studies reported racial disparities, with Black males from lower-income backgrounds disproportionately affected by assault and 84.2% (n=16) noted insurance-related disparities, with uninsured patients experiencing higher assault rates. Similarly, our cohort study found blunt assault as the primary adult injury mechanism (n=161, 29.0%), with Black/African American, Hispanic, and Mixed-Race adults, and those with Medicaid, out-of-network, or no insurance, significantly more likely to sustain violent injuries ($p<0.05$). For pediatric patients, the review found Black males more likely to experience assault, while the cohort study identified motor vehicle collisions as the primary mechanism (n=18, 33.3%), with no significant disparities by race/ethnicity, gender, or insurance.

Conclusion

Both the systematic review and cohort study confirm significant demographic and socioeconomic disparities in adult facial trauma, particularly affecting Black/African American, Hispanic, and uninsured or Medicaid-insured patients through higher rates of violent injuries. Pediatric disparities were less evident. These findings advocate for targeted public health interventions to address systemic inequities in facial trauma incidence.

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Skull Base Cephalometrics in Patients with Craniofacial Syndromes – Can You Trust SN to Guide Orthognathic Surgery?

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Benjamin Smith



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Akriti Choudhary



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Malory Alexis



Linping Zhao



Chad Purnell

Abstract

Background

The Sella-Nasion (SN) line is commonly used as a skull base landmark when planning orthognathic surgery. However, patients with craniofacial syndromes may have an abnormal cranial base, with unclear effects on orthognathic surgery planning. The aim of this study is to evaluate differences in cranial base cephalometric measurements when comparing patients with craniofacial syndromes to controls to assess the reliability of cephalometric measurements (CM) for surgical planning.

Methods

A total of 74 patients with high quality CT scans or lateral cephalograms were included: Apert syndrome (AS, n=8), Crouzon syndrome (CS, n=9), Hemifacial Microsomia (HFM, n=10), isolated cleft palate (ICP, n=5), Nager syndrome (NS, n=4), Treacher Collins syndrome (TC, n=8), bilateral cleft lip and palate (BCLP, n=10), unilateral cleft lip and palate (UCLP, n=10), and controls (n=10). CM were analyzed using Mimics and Dolphin software.

Results

The greatest reductions in the anterior cranial base were among TC, NS, and BCLP, decreasing by 54-55% as compared to controls ($p<0.006$). Posterior cranial base lengths decreased greatest in AS, CS, and TC, decreasing by 47-52% ($p<0.006$). Total cranial base lengths decreased greatest in TC, CS, and NS, decreasing by 53-56% ($p<0.006$). Patients with ICP, TC, AS, and HFM demonstrated the greatest reductions in the maxillary lengths, decreasing by 54-59%, while patients decreasing by 45-51% ($p<0.006$). Notable differences in cranial base angles included: Ba-S-N, Ba- SOS-S, and Ba-SOS-N angles. Ba-S-N (cranial base angle on the internal skull side) significantly narrowed by 6.03-21.32° in AS, HFM, NS, UCLP, and TC ($p\leq0.026$). Ba-SOS-S (posterior cranial base angle) significantly widened by 18.05-28.05° in AS, HFM, NS, CS, and TC ($p\leq0.009$). Ba-SOS- N (cranial base angle in facial side) significantly widened by 7.74-13.79° AS and TC ($p\leq0.029$).

Conclusion

Patients with craniofacial syndromes have significant skull base morphometric differences compared to controls without craniofacial syndromes. These findings indicate the cranial base may be unreliable in planning orthognathic surgery for patients with craniofacial syndromes.

Future work is needed to identify a correction factor that can be applied when referencing the cranial base in these diagnoses.

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An Assessment of the Interrater Reliability of Phenotypic Classification of Craniofacial Microsomia by Clinical Photographs

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Abstract

Introduction

Craniofacial microsomia (CFM) is a heterogenous craniofacial anomaly with a poorly understood pathogenesis. The primary aim of this study was to assess the interrater reliability of the Phenotypic Assessment Tool for Craniofacial Microsomia (PAT- CFM) among trainees. The secondary aim was to assess determine if asymmetry and severity scores impact reliability of the assessment.

Methods

A secure database of patients with CFM was developed at a specialty pediatric hospital. Three trainees (one medical student and two plastic surgery residents) completed the global and detailed assessment according to the PAT- CFM. Interrater reliability was calculated using Fleiss kappa (k), strength of agreement was defined as: k <0.20 (poor), 0.21-0.40 (fair), 0.41-0.61 (moderate), 0.61-0.80 (good), and 0.81-1.00 (very good).

Results

In total, 259 patients met criteria for evaluation (519 hemifaces). One hundred (38.5%) patients had bilateral findings. On global assessment, most domains had good (54.5%) agreement among raters. Three domains had very good agreement: ear (k=0.852), smile palsy (k=0.813), and lower lip palsy (k=0.812). For the mandible exam, the extremes of classification (M0=normal or M3=severe deficiency) had greater agreement as compared to other classifications; this was also true for the ear domain. On detail assessment, there was very good agreement on ear canal (k=0.868) and presence of cleft lip (k=0.815). The mean asymmetry score for patients was 5.6 and the mean severity score was 6.1. The patient cohort was then divided into four phenotypic quartiles based on asymmetry/severity score. On global assessment, patients with the most severe phenotype (quartile four) had the greatest reliability among the orbit, mandible, and soft tissue domains and the worse reliability among the normal nerve function and lateral clefting domains.

Conclusion

The PAT-CFM global and detailed assessment can reliably be used by trainees to classify the phenotypic differences in patients with CFM. Domain classifications have greater reliability among the extremes of normal and abnormal, which may reflect the difficulty with objective versus subjective decision making. Patients with the most severe phenotypes have a more reliable analysis of the orbit, mandible and soft tissue and the less reliability among clefting and normal nerve function.

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The correlation between intracranial volume and visual function and cognitive status in the patients with non-syndromic multi-sutural craniosynostoses after FOA plus CVR Surgery

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Bin Yang



Ye-hong Zhong

Abstract

Background and purpose

The Non-syndromic Multiple-sutural Craniosynostoses(NMC) involve more than two sutures prematural synostoses. It is characterized by skull development restriction and intracranial hypertension(ICH), resulting in ophthalmic and cognitive disorders.

Methods

This is a retrospective study of forty-seven (47) consecutive children with NMC who underwent procedures of Fronto-Orbital Advancement(FOA) plus Cranial Vault Remodel (CVR) at PHS from 2014 to 2024 .
Based on DICOM CT data and CMF Proplan and Geomagic softwere , the intracranial volume(ICV) were measured and analyzed pre-operatively and post-operatively as well as follow up 5 years.
By means of Panoramic Ophthalmoscope and Optical Coherence Tomography (OCT) , the retinal nerve fiber layer, optic nerve disk and papilledema were observed and analyzed.
Meanwhile , cognitive outcomes were tested by using Wechsler Intelligence Scale for Children.

Results

The ICV (1260.84 ± 122.08ml)was increased significantly after surgery（P=0.00002）. There were statistically significant differences between the ICV at two weeks after operation and that of five year follow-up (P=0.003).There was no statistically significant difference between the patients ICV (1495±70.32 ml) and the normal peers ICV (1502±41.01ml)（P=0.09） at 5-years follow up.The patients ICV had been expanded and maintained normal level after FOA and CVR surgery . These results showed that the cranial vault and brain grow and develop normally after FOA plus CVR surgery.
The Vision testing results showed that visual acuity of the patients with NMC were improved after FOA plus CVR surgery at 1-year and 5-year follow-up(visual acuity increase 0.4±0.12).
Panoramic ophthalmoscope examination presented that papilledema was alleviated postoperatively at 1-year and 5-years follow-up. The optic disc recovered better postoperatively.
The cognitive testing results indicated that the children with NMC who underwent FOA plus CVR possessed average intellectual ability.

Conclusions

The ICH caused by NMC inevitably results in raised pressure on the optic nerves which pass through the anterior cranial fossa and result in papelliedema and impairment of visual acuity.
Early FOA plus CVR intervention expanded ICV and had the optic nerve decompressed on the skull base , and finally got papilledema alleviating and visual acuity improving, as well as brain growth restriction relieving.

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Comparative study of intraoperative CT and surgical navigation system in the surgical treatment of unilateral zygomatic complex fractures

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Dongyang Ma

Abstract

Objective

To explore the application value of two auxiliary techniques, intraoperative CT (ICT) and surgical navigation systems (CANS), in the treatment of unilateral zygomatic complex (ZMC) fractures.

Methods

Retrospective data analysis of adult patient who underwent surgery with unilateral ZMC fracture in the Department of Oral and Maxillofacial Surgery at the 940th Hospital, from 2018 to 2022. Patients were divided into ICT group, CANS group and Control group（14 were randomly selected in each group）according to the use of intraoperative auxiliary technique. Operative time, intraoperative bleeding volume, the preoperative and postoperative clinical characteristics were recorded in each group. The bilateral zygomatic prominence and width were measured in the corrected axial position of the zygomatic arch, and the difference of prominence and width was calculated. Six bone tissue points were identified and the difference in distance from each of the first 5 points to Nasion point was calculated.

Results

A total of 42 patients were enrolled and the age ranged 18 to 64 years, with the mean age of 34.7. There was a statistically difference in the bilateral zygomatic prominence and width difference value among the three groups ($P < 0.05$), while ICT group and CANS group had smaller prominence and width difference value than the Control group. The differences in distance from each point on the healthy and affected side to Nasion point were statistically different among the three groups ($P > 0.05$). There was also no statistically difference in the chromatographic value of all 6 markers on the healthy and affected side among the three groups ($P > 0.05$), but the average chromatographic values of ICT group and CANS group were smaller than those of Control group. No statistically difference in operative time and intraoperative bleeding volume was found among the three groups ($P < 0.05$), while ICT group and CANS group had longer operative time and more intraoperative bleeding volume than Control group.

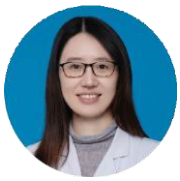
Conclusion

Both ICT and CANS are effective in the surgical treatment of unilateral ZMC fractures compared to traditional method, however there is no significant difference in outcome between the two techniques.

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Characteristics of REM sleep AHI and supine sleep AHI on patients with residual obstructive sleep apnea after maxillomandibular surgeries

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Abstract

Clinical guidelines have showed that maxillomandibular advancement (MMA) is one of the most effective techniques on treating obstructive sleep apnea (OSA), which is comparable to continuous positive airway pressure (CPAP) therapy. The normalization of sleep quality, the apnea-hypopnea index (AHI), and oxyhemoglobin saturation levels is usually regarded as the important objective parameters for resolution of OSA. Polysomnography (PSG) as one of the main sleep studies has been recognized as the gold standard to diagnose and evaluate the severity of OSA, giving us more information about sleep architecture, respiratory parameters and body position changes. In this retrospective study, we summed the patient data on PSG before and after MMA in our center. The detailed sleep architecture and body position changes were also collected. Rapid eye movement (REM) sleep AHI and supine sleep AHI were calculated. Preliminary results showed those residual respiratory events were mainly distributed on REM sleep and supine sleep for those who were successfully treated by MMA with PSG results of post-operative AHI less than 20 times per hour and AHI changes more than 50 percent but did not reach the cure criteria. For those who failed with post-operative AHI more than 30 times per hour, residual respiratory events distributed relatively evenly on both REM sleep and non-rapid eye movement (NREM) sleep. And they tended to have a higher AHI on supine sleep. These results indicate that standard PSG study is essential to provide comprehensive respiratory data on different sleep stages and body positions, thus to better guide surgical planning and evaluate the surgical efficacy.

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Posterior Cranial Vault Expansion in Giant Occipital Encephaloceles: Restoring Intracranial and Posterior Fossa Volume

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Abstract

Purpose

Giant occipital encephaloceles result in the herniation of intracranial tissue through a defect in the occipital region of the calvarium, reducing the posterior cranial fossa volume. This condition leads to an undersized calvarium that cannot adequately house the herniated tissue. As a result, posterior cranial vault expansion during the repair of the encephalocele may be necessary to restore proper intracranial capacity.

Method

A retrospective analysis was conducted on neonates with giant occipital encephaloceles who underwent posterior cranial vault expansion between 2015 and 2025. Pre- and postoperative MRI scans were used to quantify intracranial volume (ICV), posterior fossa volume (PFV), and encephalocele volume. These values were compared to those of age-matched controls. Statistical significance was assessed using a one-sample t-test, with a p-value < 0.05 considered significant.

Results

Four neonates, with a mean gestational age of 37 weeks, were included in the study. The mean encephalocele volume was 186 ± 81.5 cm^3, comprising 84% of the ICV. The mean ICV in the encephalocele group was 232 ± 44.7 cm^3, significantly smaller than the ICV of age-matched controls (341 cm^3, $p<0.05$).1 The mean PFV in affected individuals was 14.1 ± 4.9 cm^3, compared to 41 cm^3 in unaffected controls ($p<0.005$).2 PFV represented only 6.5% of the ICV in these patients. Following posterior cranial vault expansion, the ICV increased by an average of 14% (266 ± 66.4 cm^3).

Conclusions

The herniation of cranial tissue in giant occipital encephaloceles contributes to microcephaly, particularly affecting the posterior cranial fossa. Surgical expansion of the posterior cranial vault at the time of encephalocele repair facilitates the accommodation of the reinternalized cranial tissue. This offers a critical intervention to optimize intracranial volume, ensuring there is adequate intracranial space for normal neurodevelopment.

References

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Spring-Assisted Correction of Unicoronal Craniosynostosis: Technical description and Early Experience

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Abstract

Introduction

Spring-mediated cranioplasty is an established technique for sagittal craniosynostosis but has been less commonly applied to unicoronal craniosynostosis (UCS), which presents unique challenges in restoring anterior cranial symmetry. We present our early experience with a spring-assisted approach for UCS correction, aimed at reducing surgical invasiveness while achieving remodelling of the frontal and orbital asymmetry.

Methods

Five patients with UCS underwent spring-assisted cranioplasty via a unilateral frontal craniotomy. Springs were placed to enable gradual anterior vault expansion over a period of 3–4 months, after which they were removed in a second procedure. In two syndromic patients, this procedure was performed concurrently with spring-assisted posterior vault distraction. No formal morphometric analysis was performed due to limited follow-up.

Results

The procedure was technically feasible in all cases and well tolerated. Initial postoperative assessments suggest improvement in frontal contour and periorbital symmetry, with minimal operative morbidity. Patients undergoing combined unilateral anterior and bilateral posterior spring-assisted distraction tolerated the dual-site intervention without complication.

Conclusions

Spring-assisted correction of UCS appears to be a safe and promising alternative to other techniques for correction of unicoronal craniosynostosis. Our early experience demonstrates technical feasibility and acceptable short-term outcomes, including in patients undergoing simultaneous spring-assisted posterior vault distraction. Ongoing follow-up and quantitative analysis are underway to assess long-term durability and aesthetic outcomes.

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External spring distraction osteogenesis with absorbable plates as external spring fixation points was performed under the guidance of endoscopy to treat premature closure of sagittal cranial sutures in infants and young children.

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Abstract

Objective

To investigate the use of absorbable plates as internal attachment points for external spring traction in the treatment of sagittal craniosynostosis in young infants and indications and advantages of the method.

Methods

For 8 children with sagittal craniosynostosis from 3 months to 6 months, external spring traction was used under the guidance of endoscopy and the distraction point was fixed with an absorbable plate, and 1-0 nylon wire（or 1-0 Steel wire） was used to pull out the scalp, and then the external spring was hung on the distraction. In 8 cases, The two skulls beside the sagittal suture and the two skulls in front of the bilateral lambdoid suture were dissected, and the skull was 2 cm wide andplaced on the external spring fixation. After 3 months of fixation, the nylon thread was cut and the outer spring was removed without anesthesia.

Results

From 2020 to 2023, a total of 8 children with sagittal synostosis were subjected to absorbable plate fixed external spring traction point， and external spring distraction, and the appearance was basically satisfactory for 1 year of follow-up, and the head index returned to normal. Head shape is basically corrected.

Conclusion

The use of absorbable plate as the inner attachment point of external spring distraction is a better way under the guidance of endoscopy to treat sagittal synostosis in infants, it is a minimally invasive treatment, Sagittal synostosis up to 6 months of age can be treated with a parasagittal osteotomy, the edge plus absorbable plate fixed the external spring traction point, and then spring distraction treatment, after 3 months, no anesthesia directly cut the nylon thread, remove the spring, simple operation.12 months follow-up effect is better, safe and reliable. It is a good treatment for sagittal suture closure in young infants.

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Age, Race, and Socioeconomic Factors in Microtia Reconstruction: An Analysis of Over 1000 Surgical Cases from the Pediatric Health Information System Database

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Abstract

Background

Microtia, a congenital difference of the external ear, requires complex, specialized care. Access to care and the influencing factors for microtia reconstruction has not been comprehensively evaluated. This study uses the PHIS database to assess how age, race, and socioeconomic factors (Child Opportunity Index [COI]) influence access for microtia-based reconstruction, regardless of surgical approach, in the United States.

Methods

A retrospective review of the PHIS database was conducted from 2016 to 2024. Patients with a diagnosis of microtia and related procedures were identified. Key variables, including age, race, gender, COI, and surgical outcomes, were statistically analyzed.

Results

The final sample size consisted of 16,885 patients from 35 hospitals, accounting for 1,149 index microtia reconstruction procedures. White patients underwent primary microtia surgery at a younger age than other groups ($p < 0.001$). Patients in high to very high COI areas had surgeries at an earlier age than those in very low to moderate COI areas ($p = 0.042$). Only index procedures for both autologous and alloplastic-based reconstruction were evaluated. No significant association was found between patient characteristics and operative complications or readmissions within 30 days ($p > 0.05$); however, patients with complications were, on average, older ($p = 0.002$). The median surgical length of stay (LOS) for all patients was one day (IQR: 1.0 to 3.0 days). Hispanic and non-Hispanic Asian patients had twice the odds of a longer LOS compared to White and Black patients ($p < 0.05$). Children from low-opportunity areas also had twice the odds of a longer LOS compared to those from very high-opportunity areas (OR 2.02, 95% CI: 1.23–3.31, $p = 0.006$).

Conclusion

Surgical outcomes in microtia repair vary significantly by race, age, and socioeconomic factors, highlighting the need for tailored approaches to address these discrepancies in care for this vulnerable population.

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Multimodal Imaging Fusion for Predicting Postoperative Morphology in Chin Augmentation with Patient-Specific PEEK Prostheses

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Ce Zhang

Abstract

Background

Patient-specific polyetheretherketone (PEEK) prostheses are increasingly utilized in craniomaxillofacial cosmetic and reconstructive surgery. Despite the aesthetic and biomechanical superiority over conventional implants, unpredictable soft tissue remodeling remains a critical barrier to widespread clinical adoption. This study leverages deep learning to establish a predictive model for postoperative outcomes in chin augmentation with PEEK implants.

Methods

A retrospective cohort of 582 patients undergoing patient-specific PEEK chin augmentation (January 2020–December 2024) was analyzed. Multimodal datasets included preoperative high-resolution craniofacial CT (bone morphology: X_1), CT-derived soft tissue reconstruction and standardized pre-operational photographs (soft tissue characteristics: X_2), 3D prosthetic parameters (X_3), and standardized post-operational photographs (Y). Feature extraction and cross-modal registration were performed using spatial transformer networks. A conditional Generative Adversarial Network (cGAN) architecture was implemented to establish an end-to-end mapping Y=F(X1,X2,X3) using the training dataset(n=382), and the model prediction efficiency is verified using the verification dataset(n=200).

Results

The model achieved submillimeter prediction accuracy, demonstrating a mean contour deviation of 1.1±0.4mm ($p<0.001$) between predicted and actual postoperative photographs. Anatomical landmark analysis revealed exceptional precision at pogonion (0.8±0.3mm) and gnathion (0.9±0.2mm), exceeding clinical acceptability thresholds.

Conclusion

This multimodal cGAN framework enables quantitative prediction of soft tissue responses to PEEK chin augmentation with unprecedented spatial resolution (error<1.0mm), overcoming the empirical limitations of conventional surgical simulation. The validated model serves as a precision medicine tool for preoperative virtual planning in alloplastic genioplasty, enhancing predictability in aesthetic craniofacial reconstruction.

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How can the digital technology enhance the multidisciplinary management of cranio-maxillofacial deformities and defects

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Steve GF SHEN

Abstract
The digital technology continues to evolve, offering optimized treatment solutions in the management of craniomaxillofacial deformities or defects. While the multidisciplinary management has been developed from the recognition that failures commonly occurred when various aspects of clinical care were not coordinated, especially for those patients with secondary craniomaxillofacial deformities or defects due to trauma or tumor surgery. The team should meet for regular outpatient joint evaluations, and should consist of an anesthesiologist, a surgeon (plastic and/or oral/maxillofacial), a maxillofacial prosthodontist, an orthodontist, a psychologist, a geneticist, a radiologist, a neurosurgeon, a pediatrician, a speech pathologist, and a nurse and so on. The author emphasizes on how to enhance the multidisciplinary management of craniomaxillofacial deformities and defect with digital technologies.

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Longitudinal outcomes on signs of increased intracranial pressure in metopic synostosis: surgical versus conservative treatment

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Abstract

Background

Current knowledge of outcomes following conservative treatment in patients with metopic synostosis is limited, particularly in comparison to surgical interventions. Evaluating the prevalence of signs of raised intracranial pressure (ICP) in both treatment groups is essential to guide clinical decision-making and improve outcomes. This study aims to compare signs of increased ICP between surgical and conservative treatment in patients with metopic synostosis.

Methods

This study is part of an ongoing prospective cohort. All patients with isolated metopic synostosis presenting to our clinic since 2017 were eligible. Patients underwent annual follow-up, including head circumference measurements and fundoscopy, to monitor for increased ICP. The primary outcome was head circumference standard deviation (SD), analyzed using a linear mixed model. The secondary outcome was the presence of papilledema on fundoscopy.

Results

A total of 216 patients were included: 80 underwent surgery, and 136 received conservative treatment. SD of head circumference increased significantly with age in a non-linear pattern ($p < 0.001$). Female sex was associated with higher SD ($\beta = 0.33$, $p = 0.022$). Surgical treatment was linked to higher SD values ($\beta = 0.40$, $p = 0.016$), but its interaction with age showed a slower growth trajectory compared to conservative treatment ($p = 0.0005$ and $p = 0.015$). Severe initial severity was associated with lower SD ($\beta = –0.36$, $p = 0.046$), while moderate cases were not significantly different. Signs of deflected head growth occurred in three patients (1.4%): two (2.5%) surgical and one (0.7%) conservative. Papilledema was identified in three patients (1.4%): two (2.5%; one pre-operative and one post-operative) surgical and one (0.7%) conservative. One surgical patient had both papilledema and a deflection of the head growth.

Conclusion

Signs of increased intracranial pressure, including deflected head growth and papilledema, were rare in both treatment groups. Although surgical treatment showed a different growth pattern, the low prevalence of raised ICP indicators in both groups supports conservative management as a viable option for selected patients with metopic synostosis.

601

Automatic Segmentation and Virtual Reduction of Unilateral Zygomatic Fractures Based on CNN and ICP Algorithm: A Preliminary Study

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Bimeng Jie


Runqi Liu


Junchen Wang


Yi Zhang


Yang He

Abstract

Background

In the preoperative design of zygomatic fracture reduction and fixation, the segmentation of fracture fragments is complex and time-consuming, and the reduction of fragment requires high - level skills, which urgently need to be optimized.

Methods

A total of 105 CT images of unilateral zygomatic type B fractures were utilized. First, the network combining ConvNeXt semantic segmentation and pyramid pooling was trained with 50 cases of roughly - annotated data to extract the zygomatic and zygomatic arch area. Then, the PP - LiteSeg semantic segmentation network was employed with 30 cases of finely - annotated data to predict fracture lines. After that, fracture fragments were separated through dilation and excision operations. An automatic reduction method based on the iterative closest point (ICP) algorithm was established in the self - developed platform MICsys. Controlled experiments were carried out with 60 cases for reduction and 10 cases for the integrated process, comparing automatic and manual operations.

Results

The overall average root - mean - square surface error (RMSE) of fracture fragments in segmentation was 1.25±0.64mm. The automatic reduction group took 3.06±1.93 seconds on average, much less than the manual group, with a lower RMSE. In the integrated process, the automatic planning group took 88.5±9.1 seconds, significantly less than the manual group, and the RMSEs of the two groups had no significant difference.

Conclusion

The intelligent segmentation and reduction method and automatic preoperative planning process for unilateral zygomatic type B fractures were established and verified. These methods are feasible, with improved efficiency and clinically acceptable accuracy, showing certain clinical application value.

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Effects of Intraoral Endoscopic Navigation-Assisted Condylectomy Combined with Orthognathic Surgery for the Treatment of Condylar Osteochondroma

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Kehan Li


Jingshuang Yu


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Abstract

Background

The authors aimed to analyze the effects of intraoral endoscopic navigation-assisted condylectomy for condylar osteochondroma with simultaneous orthognathic surgery.

Methods

From 2013 to 2020, this retrospective clinical trial enrolled patients diagnosed with condylar osteochondroma who underwent either open condylectomy (OC) or endoscopic navigation-assisted condylectomy (ENAC) combined with orthognathic surgery. Preoperative, immediate postoperative, and one-year follow-up imaging data were collected. Immediate postoperative CT scans were compared with virtual surgical planning (VSP) to assess surgical precision. Evaluations of facial symmetry, occlusal relationship, and complications were conducted during the follow-up visit. Data were analyzed using IBM SPSS Version 27.0.

Results

A total of 58 patients were enrolled, with 20 patients in the OC group and 38 patients in the ENAC group. Both groups achieved ideal facial contour and occlusal relationship. However, the OC group experienced facial nerve symptoms such as temporary paralysis, which resolved within one year postoperatively. No serious complications were observed in the ENAC group.

Additionally, when comparing immediate postoperative CT with VSP, the results showed that the ENAC group exhibited more precise bone repositioning and a closer alignment to the planned surgical outcome.

Conclusions

ENAC with simultaneous orthognathic surgery offers superior surgical precision and fewer postoperative complications compared to conventional surgery. The technique provides satisfactory results in terms of facial symmetry and occlusal relationship while minimizing the risk of facial nerve damage and other severe complications. This study provides valuable insights for clinicians in optimizing treatment plans for condylar osteochondroma and highlights the benefits of utilizing endoscopic navigation in complex maxillofacial surgeries.

605

Preoperative decisional conflict in patients with dentomaxillofacial deformities undergoing orthognathic surgery: a cross-sectional study

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Bixia Wang


Xiangying Hu


Xudong Wang

Abstract

Background

Research has indicated some patients were in a state of uncertainty about plastic surgery decisions, which may lead to anxiety and decisional regret. However, little is known about decisional conflict in preoperation orthognathic surgery amongst Chinese.

Purpose

Decisional conflict refers to the degree to which patients are engaged in and feel comfortable about important clinical decisions. Until now, the concept has received little attention in orthognathic surgery.We investigate the level of decisional conflict in dentomaxillofacial deformities undergoing orthognathic surgery and whether this is influenced by socio-demographics, treatment setting, diagnoses, and other.

Methods

A cross-sectional study of 195 Chinese patients was conducted using the Decisional Conflict Scale, Decisional Expectation Scal, Decisional Self-efficacy Scale and Perceived Social Support Scale.

Results

Patients reported relatively high levels of decisional conflict (mean±SD, 35.35±9.47), decisional expectation (mean±SD, 48.67±4.31), and decision self-efficacy (mean±SD, 69.83±13.53). Analysis revealed a negative association between the different level of education and economic burden with decisional conflict ($p<0.05$). Correlation analysis demonstrated a negative correlation between preoperative decision conflict and decision self-efficacy, while there were positive correlations observed between decision expectation, decision self-efficacy, and social support.

Conclusions

Decisional conflict is prevalent among orthognathic surgery patients and serves as a valuable tool for evaluating the efficacy of clinical decision-making processes. Measuring decisional conflict and knowledge about influencing factors can be used to improve patients'participation in clinical decision making, satisfaction and clinical outcomes.

606

Distraction force promotes the osteogenic differentiation of Gli1+ cells in facial sutures via primary cilia-mediated Hedgehog signaling pathway

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Mengying Jin


Yang An


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Abstract

Background

Trans-sutural distraction osteogenesis (TSDO) involves the application of distraction force to facial sutures to stimulate osteogenesis. Gli1+ cells in the cranial sutures play an important role in bone growth. However, whether Gli1+ cells in facial sutures differentiate into bone under distraction force is unknown.

Methods

4-week-old Gli1ER/Td and C57BL/6 mice were used to establish a TSDO model to explore osteogenesis of zygomaticomaxillary sutures. A Gli1+ cell lineage tracing model was used to observe the distribution of Gli1+ cells and explore the role of Gli1+ cells in facial bone remodeling.

Results

Distraction force promoted bone remodeling during TSDO. Fluorescence and two-photon scanning images revealed the distribution of Gli1+ cells. Under distraction force, Gli1-lineage cells proliferated significantly and co-localized with Runx2+ cells. Hedgehog signaling was upregulated in Gli1+ cells. Inhibition of Hedgehog signaling suppresses the proliferation and osteogenesis of Gli1+ cells induced by distraction force. Subsequently, the stem cell characteristics of Gli1+ cells were identified. Cell-stretching experiments verified that mechanical force promoted the osteogenic differentiation of Gli1+ cells through Hh signaling. Furthermore, immunofluorescence staining and RT-qPCR experiments demonstrated that the primary cilia in Gli1+ cells exhibit Hedgehog-independent mechanosensitivity, which was required for the osteogenic differentiation induced by mechanical force.

Conclusions

Our study indicates that the primary cilia of Gli1+ cells sense mechanical stimuli, mediate Hedgehog signaling activation, and promote the osteogenic differentiation of Gli1+ cells in zygomaticomaxillary sutures.

615

Presence of Emissary Veins in the Glabellar Region in Metopic Craniosynostosis

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Abstract

Background

Emissary veins connect the intra- and extracranial venous circulation, by bridging the dural venous sinuses to the external veins of the skull. Presence and location of emissary veins vary between individuals but are important to consider when performing craniofacial surgery to reduce the risk of large perioperative blood loss. Clinical observations and previous studies have suggested that emissary veins are more frequently present in the glabellar region in patients with metopic synostosis. These veins are thus a potential source of bleeding during cranioplasty.

Aim

This study aims to investigate the presence of emissary veins in the glabellar region in patients with metopic synostosis.

Method

We retrospectively analyzed CT scans regarding presence of emissary veins in the glabellar region of all consecutive patients operated for metopic and sagittal (controls) synostosis between 2020 and 2022 at the Craniofacial Unit at Sahlgrenska University Hospital. Patients with known genetic syndromes or inadequate computed tomography (CT) imaging were excluded.

Results

A total of 86 patients were included, 42 with metopic synostosis and 44 with sagittal synostosis. Age at CT scan (metopic vs sagittal) and age at surgery were evenly distributed between the groups. Emissary veins were found in 88 % of the patients with metopic synostosis and in 11 % of the patients with sagittal synostosis ($p < 0.001$).

Discussion

This study shows that emissary veins in the glabellar region are more frequently present in patients with metopic synostosis compared to controls. This could be the underlying anatomical phenomenon that explains bleeding from glabellar region during cranioplasty for metopic synostosis.

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AI-Driven Surgical Planning and Augmented Reality Navigation for Perpendicular Plate Resection in Asian Cleft Rhinoplasty: A Feasibility Study

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Yang An



Mengying Jin

Abstract

Background

Cleft rhinoplasty in Asian populations poses significant challenges due to complex nasal deformities and anatomical variations. Traditional methods for resecting the perpendicular plate of the ethmoid bone (PPE) rely heavily on surgeon experience, with risks of intraoperative errors. This study evaluates the feasibility of integrating AI-generated surgical pathways and augmented reality (AR) navigation to enhance precision in PPE resection for cleft nasal deformity repair.

Methods

A randomized cohort of patients undergoing nasal reconstruction at Peking University Third Hospital was included. Preoperative CT scans provided DICOM data, which were fused with facial point-cloud data from depth cameras to reconstruct 3D models of the PPE and craniofacial anatomy. Manual annotations of resection boundaries were used to train an AI algorithm for automated surgical pathway generation. An AR headset projected real-time navigation guidance during intraoperative PPE resection. Two groups (with/without AR navigation) were compared, with errors (mm) and time (minutes) recorded for clinical and non-clinical operators.

Results

AI-generated pathways demonstrated high morphological concordance with manual annotations (Dice similarity coefficient: 0.78). AR navigation significantly reduced mean positioning errors: clinical operators achieved a 46.9% reduction ($p<0.05$), while non-clinical operators showed a 53.6% improvement ($p<0.05$). AR navigation increased operative time: clinical operators required 45.1% more time ($p<0.05$), and non-clinical operators needed 50.3% longer ($p<0.05$).

Conclusion

AI-driven planning and AR navigation improve spatial accuracy in PPE resection, particularly benefiting less-experienced operators. While prolonged operative time suggests a learning curve, this technology holds promise for enhancing precision in cleft rhinoplasty.

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Functional synchondrosectomy for syndromic craniosynostoses: a proof of concept

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Abstract

Skull base synchondroses are growth centers implicated in the sagittal growth of the skull and the formation of craniocervical joint. The intrasphenoidal and the sphenooccipital synchondroses are often prematurely obliterated in FGFR-related craniosynostoses. Here we investigated the feasability of the surgical correction of early synchondrosis fusion.

Forty-five patients with Crouzon syndrome were included with available CT-scans < 1 year of age and > 2 serial CT-scans before 10 years of age. The patency of the skull base synchondroses was assessed using innovative morphometric methods. The growth of the skull base was assessed using a parametric geometric model including multimodal inputs such as surgical history, craniocervical joint anatomy, and skull vault shape. The circumferentlail anatomy of the synchondroses was investigated in 5 human cadaver skulls with initial assessment of possible endonasal approaches.

After the establishment of the surgical protocol, a first case was operated with early radiological follow-up. Synchondroses exhibit a variable pattern of post-natal fusion correlated with shape parameters in the craniocervical joint, the position of the midface, and the outline of the skull vault. The anatomy of the skull base indicated taht surgical approaches to the sphenooccipital synchondrosis were reasonably safe, as was confirmed by the first operated case. This report establishes the bases for a new approach in the management of syndromic craniosynostoses, with a focus on the sagittal growth of the skull base.

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Bangkok Earthquake, Double-jaw Orthognathic Surgery During The Devastating Situation

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Sarayuth Dumrongwongsiri

Abstract

Introduction

Orthognathic surgery is a valuable option to correct patient's dentofacial deformity, in both functional and cosmetic aspects. However, the surgery itself is a major operation with potentials for vary complications. Team approach with good collaboration has been emphasised to prevent these risks of complications. So far, in our center, the result of this specific treatment has touched high level of appreciation. Bangkok, Thailand, has never encountered the major earthquake. The disaster has never been prepared by any of our organisations. Unfortunately, the situation happened in the middle of our surgery. This topic is Thailand's first experience to be marked.

Method

We presented a case of an eighteen-year-old woman with a severe class III malocclusion who needs to correct with double-jaw surgery. At the middle of the whole procedure, the earthquake happened unknowingly. Every decision of further management had been improvised and intimately communicated among the surgical stakeholders to safe the patient.

Result

After temporary evacuation, the procedure had eventually finished within hours after the disaster. The patient was in general anesthesized state for the whole period of time without any acknowledgement of the situation. The postoperative recovery was fortunately uneventful.

Conclusion

Orthognathic surgery is a collaboration-demanding treatment. Especially in the unprecedented natural disaster, higher level of communication and cooperation has been proved to maintain the standard of care.

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Application and accuracy of patient-specific implant in the reconstruction of the mandibular ramus by costochondral grafts in patients with hemifacial microsomia: a preliminary study

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Hongpu Wei


Hao Sun


Xudong Wang

Abstract

Background

The precise mandibular reconstruction in patients with hemifacial microsomia (HFM) continues to pose a significant clinical challenge. The utilization of patient-specific implant (PSI) has enabled the possibility of precise mandibular reconstruction. This research aims to investigate the application of PSI in reconstructing the mandibular ramus by costochondral grafts (CCGs) in patients with HFM, as well as to systematically assess the surgical accuracy.

Methods

This retrospective study reviewed the clinical data of patients with Pruzansky type III HFM who received CCGs at Shanghai Ninth People's Hospital between July 2014 and April 2025. In commercial titanium plate group (CTP group), the rib graft was placed in a suitable position in accordance with the bone-supported repositioning guide. Subsequently, the rib graft was fixed by commercial titanium plate. In the PSI group, the rib graft was placed and fixed by PSI at the same time without additional guide plate. All basic information and the computed tomography were collected. The postoperative accuracy of CCGs were evaluated by comparing the surgical plan with the postoperative CT reconstruction.

Results

A total of 49 patients were included in this study, with an average surgical age of 6.75 years. Among them, 8 patients utilized PSI (average age: 6.75 years). The remaining 41 patients utilized CTP (average age: 7.1 years). All patients successfully completed CCGs without complications during and after the surgery. All patients exhibited favorable postoperative recovery with satisfactory wound healing. Postoperative accuracy measurement indicated that the utilization of PSI demonstrated superior surgical precision ($p < 0.05$). In the CTP group, the largest linear root-mean-square deviation (RMSD) between the planned and the postoperative CCG was 4.41 mm in the anteroposterior direction, while the largest angle RMSD was 19.255◦ in the horizontal plane. Whereas, in the PSI group, the largest linear RMSD was 2.72 mm in the anteroposterior direction, the largest angle RMSD was 14.25◦ in the horizontal plane.

Conclusion

This research confirmed that PSI can be successfully applied in CCGs for patients with HFM, achieving favorable surgical outcomes. This approach serves as a reliable method to translate virtual surgical planning into precise intraoperative implementation.

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Temporal Augmentation Effect of Reduction Malarplasty: Application of Our Bracing Technique with Zygomatic Arch Elevation

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Abstract

Background

A broad midface is usually accompanied by temporal depression. Traditional reduction malarplasty may visually improve the temporal depression by the inward reduction of zygomatic arch, but also has a high risk of soft tissue sagging. Our bracing technique has been reported to have an anti- sagging effect and may have a temporal augmentation effect as observed during our long-term clinical practice.

Methods

Data of patients who received reduction malarplasty with our bracing technique from September 2015 to July 2023 were retrospectively collected. The pre-op and post-op CT images of those who met the inclusion criteria were used for three-dimensional reconstruction and measurements of the thickness and volume of the temporal soft tissue as well as the elevation distance of zygomatic arch.

Results

Fifty-eight patients with an average follow-up of 18.4 ± 9.1 months were included. Despite mild thinning of the temporalis muscle after reduction malarplasty, the overall thickness of the temporal soft tissue significantly increased due to the significant thickening of the temporal adipose-fascial layer. There was a 0.5ml-increase in the temporal volume although without statistical difference. No significant correlation was detected between the elevation distance of zygomatic arch and the temporal thickness or volume change.

Conclusions

The bracing technique of reduction malarplasty not only plays an anti-sagging role, but also has a temporal augmentation effect through the superior bracing by the elevation and rigid fixation of the zygomatic arch. It adds brilliance to the traditional technique and can be suggested especially when the patients are disturbed by temporal depression.

Keywords

Reduction malarplasty, Double-bracing technique, Zygomatic arch elevation, Temporal augmentation, Temporal fat pad

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Microtia and Complex Chronic Conditions in the United States: An Analysis of 22,075 Pediatric Patients From the Pediatric Health Information System Database

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Chizoba A. Mosieri


James Antongiovanni


Sierra Willens

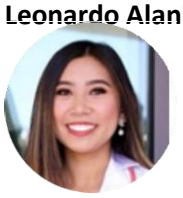

Kevin Blaine


Leonardo Alaniz


Nikhil Shah


Raj Vyas


Miles Pfaff


Cindy Vu

Abstract

Background

The Complex Chronic Conditions (CCC) classification system was developed to identify children with serious, long-standing health problems based on various body systems and disease types. Here, we utilized the Pediatric Health Information System (PHIS) database to investigate the epidemiology of Microtia and its association with CCC and other conditions. Understanding common diagnoses associated with microtia can help guide screening protocols.

Methods

A retrospective review of the PHIS database was conducted between 2015 and 2023. Patients were identified with an initial encounter at a PHIS-registered hospital having an associated ICD-10 diagnosis of Microtia. The database included data from patients across 26 states, their demographics, associated organ system flags, and any CCC.

Results

A total of 20,313 patients were identified as having an initial ICD-10 diagnosis of Microtia. Of these patients, 11,183 cases were male (55.1%), with a significant proportion of cases identified as non-Hispanic white (n=8,089, 41.9%) or Hispanic (n=6,512, 33.8%). Nearly 40% of the population was found to have at least one CCC (n=8,234), with more than two thirds of these patients noted to have two or more CCCs. Cardiovascular issues were the most common associated organ flag (16.9%), followed by gastrointestinal and neurologic conditions (15.2% and 12.3%, respectively).

Conclusions

This study highlights a significant correlation between microtia and CCCs. With 40% of patients diagnosed with microtia also presenting with at least one CCC, these results underscore the need for comprehensive medical assessment and care strategies for this patient population. This study further supports the finding that cardiac conditions appear to affect this population more than other comorbidities, necessitating a re-evaluation of first-line screening modalities for conditions associated with microtia.

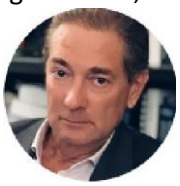
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The Marchac template and growth of the forehead in healthy subjects from birth to the end of craniofacial growth

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Roman Khonsari

Abstract

Introduction

The Marchac template was developed by Dr Daniel Marchac in the 1980's and has since been widely used to select an appropriate forehead in fronto-cranial remodelling for craniosynostosis patients. The template was developed on measurements of skulls from the Musée de l'Homme in Paris, but little is known about the number of subjects, age, sex, and the exact measurement methods. To our knowledge, the calculations to determine the curvature have not been published. The overall perception is that overcorrection of the neo-forehead is needed in fronto-cranial remodelling and that continued growth after surgery will be restricted, resulting in hypotheses that there might be indications for a larger Marchac template.

Methods

CT scans of skulls in healthy subjects aged 0-19 from Necker Hospital, Paris, France were collected, segmented and landmarked. The Marchac template was measured, scanned and converted into STL- and STEP-files. The width, height and curvature of the forehead above a supraorbital rim of 1,5 cm was compared to the template. Mean ages corresponding to the template were calculated and vice versa. Updated Marchac templates were developed based on geometric morphometrics at the end of craniofacial growth and CAD was used to modify the template.

Results

156 subjects were included. The larger Marchac template was 10 cm wide and 5.5 cm in height, the mean ages corresponding to these sizes were 13 years for width and 2-3 months for height. The mean sizes at the end of craniofacial growth were larger than the template; 10.9 ± 8.4 cm for width, 10.4 cm ± 5.6 cm for height. There was a significant size difference between males and females ($p = 0.009$). The discrepancy between the original template and the calculated mean curvature of the forehead was as illustrated and the Marchac template corresponded to a mathematically perfect shape. Suggested potential updates of the Marchac template were as illustrated.

Conclusion

Future studies comparing the original to the updated Marchac template in frontocranial remodelling are needed to evaluate the clinical relevance of identified discrepancies in size and shape.

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Lateral sliding and temporary fixation of Le Fort I Osteotomy assists in intraoral condylar resection

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JIAN CAO


Xudong Wang

Abstract

Background

The treatment of condylar benign tumors often involves condylectomy and orthognathic surgery. Preauricular incisions for condylectomy carry risks of facial scarring and facial nerve injury. The intraoral approach for condylectomy typically requires endoscopic assistance, which has limited visual field and poses risks of severe hemorrhage if improperly performed. For patients undergoing simultaneous orthognathic surgery and intraoral condylectomy, we adopted temporary lateral displacement of the maxilla via Le Fort I osteotomy, significantly expanding the intraoral surgical field for condylectomy and reducing operative time.

Patients and Methods

Five patients with condylar osteochondroma-induced jaw deformities underwent preoperative orthodontic decompensation. The surgical plan included Le Fort I osteotomy to correct the occlusal plane and midline, intraoral condylectomy on the affected side, sagittal split osteotomy (SSO) on the unaffected side, and SSO on the affected side in two cases to adjust the ramus position. Preoperative digital planning was utilized, with 3D-printed titanium plates to eliminate the need for intermediate splints. During osteotomy, 1.5-mm diameter screws were used with cutting guides. After osteotomy completion, bone interferences were removed, and 1.5-mm screws secured the titanium plates to verify repositioning accuracy. The screws above the osteotomy line were then removed, and the maxillary segment was temporarily shifted laterally toward the unaffected side (6–8 mm horizontally) and fixed with two 1.5-mm screws. This created a crossbite on the affected side, markedly improving visualization and operative space for intraoral condylectomy and allowing surface contouring of the new condyle. After condylectomy, the two 1.5-mm screws were removed, the maxilla was repositioned, and fixation was reinforced with 1.85-mm screws. Subsequent procedures included contralateral SSO and mandibular contouring.

Results

All surgeries were completed as planned. Intraoperative visualization for condylectomy was excellent, enabling direct visualization and significantly shorter operative times. Postoperative recovery was uneventful, with stable occlusion, restored jaw morphology, and improved facial aesthetics.

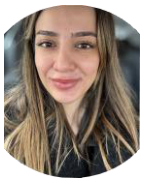
Conclusion

The proposed technique of Le Fort I osteotomy with temporary lateral displacement facilitates intraoral condylectomy in combined orthognathic and condylar resection cases. It avoids additional trauma, reduces technical difficulty and hemorrhage risks, and shortens operative time. However, precise 3D-printed titanium plate technology is essential for its implementation.

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Congenital Arhinia: A Case Report with Ongoing Follow-up 10 Years and Two Additional Patients

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Zeynep Nesil Demirli



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Gökhan Tunçbilek

Abstract

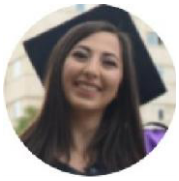
Congenital arhinia, characterized by the complete absence of both external and internal nasal structures, is a remarkably rare craniofacial anomaly with fewer than 50 cases described globally. The etiology remains unclear; mechanisms include aberrant neural crest migration, nasal placode malformation, or epithelial remodeling failure. Most cases are sporadic, though some involve chromosomal abnormalities or pathogenic SMCHD1 mutations. We present a 38-day-old female with isolated congenital arhinia and midface hypoplasia. Imaging showed complete nasal bone and cavity aplasia. After tracheotomy for respiratory distress, she was followed conservatively until age six. A two- stage nasal reconstruction was performed: first, forehead tissue expansion; then, external nose construction using a paramedian forehead flap and costal cartilage grafts. Postoperative recovery was uneventful. After 10 years follow up she continues to be monitored for growth and facial development, with further interventions planned as needed. In addition to this case, two other infants with congenital arhinia are currently under follow- up in our clinic. Due to their young age, surgical intervention has not yet been initiated, and they are being monitored for developmental progression and future reconstruction planning. Medical teams need an integrated approach to treat complete congenital arhinia. CT and MRI scans are used to examine nasal and maxillary structures. Surgical procedures must balance both function and appearance. Reconstructive surgery becomes complex due to the need to address the nasal cavity and external nose either together or in planned stages. The patient's nasal growth patterns play a vital role in long-term treatment planning. Research shows the nose typically grows about 20.9 mm in length from ages 1 to 18. In conclusion, congenital arhinia presents complex challenges that necessitate individualized care. Early stabilization of the airway is essential, while the timing and technique of reconstruction require a multidisciplinary, growth-conscious approach. Ongoing follow-up of additional patients will contribute valuable insights into the evolution and outcomes of surgical strategies. In this article, we will explore the diagnostic criteria, embryological basis, current treatment approaches, and outcomes for patients with congenital arhinia. We aim to provide a comprehensive overview of this rare condition to help improve both clinical understanding and patient care.

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Comparison of the Orbital Volume Changes in 2- vs. 3-point Fixation of Isolated Unilateral Zygomaticomaxillary Complex Fractures

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Abstract

The traditional approach to managing zygomaticomaxillary complex (ZMC) fractures involves open reduction and 3-point fixation at the zygomaticomaxillary buttress, the frontozygomatic suture, and the infraorbital rim. Accompanying orbital floor defects are typically reconstructed using a titanium mesh. However, several studies suggest that 2-point fixation may provide comparable stability, and with the reduction of ZMC, the inferior orbital floor fracture may also be reduced, potentially eliminating the need for orbital floor reconstruction.

This study analyzed CT images of 37 patients (7 female, 30 male) with unilateral isolated ZMC fractures treated surgically between 2016 and 2024. Of these, 22 patients underwent 3-point fixation with orbital floor reconstruction, while 15 were treated with 2-point fixation at the zygomaticomaxillary and frontozygomatic sutures. In the latter group, neither infraorbital rim fixation nor orbital floor reconstruction was performed.

In the 2-point group, mean orbital volumes on the trauma side were 29.04 cm^3 (range, 23.73–33.16) preoperatively and 28.99 cm^3 (range, 23.41–34.3) postoperatively, compared to 28.3 cm^3 (range, 22.06–33.68) on the non-trauma side. In the 3-point group, these values were 29.74 cm^3 (range, 25.24-32.87), 29.59 cm^3 (range, 22.48-33.55), and 29.66 cm^3 (range, 25.02-33.95), respectively. The average postoperative inferior orbital rim position compared to the non-trauma side was 0.08 mm lower in the 2-point group and 0.09 mm lower in the 3-point group. Between the two groups, no statistically significant difference was found for these measurements. CT scans of patients in the 2-point fixation group were assessed for step deformities, and all but one case demonstrated adequate correction. No postoperative complications were observed in the 2-point fixation group, whereas five patients in the 3-point fixation group experienced complications related to inferior orbital rim dissection and mesh placement: three cases required reoperation due to mesh malposition (n=2) and entropion (n=1), two patients developed postoperative diplopia, and one patient experienced permanent infraorbital hypoesthesia.

In conclusion, 2-point fixation at the zygomaticomaxillary and frontozygomatic sutures provides sufficient stabilization and restoration of orbital volume in ZMC fractures, with fewer postoperative complications compared to the traditional 3-point fixation approach, challenging the necessity of routine infraorbital rim fixation and orbital floor reconstruction.

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Personalized Orthognathic Surgical Treatment Strategies for Hemifacial Microsomia Patients

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Abstract

Background

Hemifacial Microsomia (HFM) is a common congenital craniofacial deformity, primarily characterized by facial asymmetry and developmental abnormalities of the maxilla, mandible, ears, and soft tissues. Treatment for this condition relies on multidisciplinary management and personalized treatment plans tailored to different types of deformities and developmental stages. Despite the availability of various treatment methods, determining the optimal strategy for each patient remains a significant challenge in clinical practice.

Methods

This retrospective study analyzed the clinical data of 51 patients (24 males and 27 females) diagnosed with HFM in the department of Oral and Craniomaxillofacial Science of Shanghai Ninth People's Hospital from 2012 to 2024, with an average age of 22.57±4.06 years. Based on Pruzansky/Kaban and OMENS classifications, personalized treatment plans were developed for each patient. The treatment outcomes were evaluated through one-year postoperative follow-up, focusing on facial symmetry and functional recovery.

Results

All patients showed varying degrees of improvement post-treatment. According to the Pruzansky/Kaban classification, 35 patients with type I and IIa underwent early orthodontic treatment and digital orthognathic surgery, resulting in significant facial symmetry. Seven patients with type IIb underwent mandibular distraction osteogenesis followed by orthognathic surgery, successfully restoring mandibular shape and function. Nine type III patients underwent rib grafting for reconstruction, combined with simultaneous orthognathic surgery, significantly improving facial appearance. According to the OMENS classification, 38 patients with soft and hard tissue deficiencies underwent secondary procedures, including fat grafting, prosthesis implantation, and contouring surgeries to further improve facial appearance. One-year follow-up results showed good restoration of facial appearance and function, with stable surgical outcomes. However,

one type III patient experienced graft bone resorption, and another developed an infection.

Conclusion

This study demonstrates that personalized treatment strategies significantly improve both facial appearance and function in patients with HFM. By combining the Pruzansky/Kaban and OMENS classifications and developing individualized comprehensive treatment plans based on these classifications, including orthodontic treatment, digital orthognathic surgery, mandibular distraction osteogenesis, temporomandibular joint reconstruction, and soft and hard tissue repair, favorable clinical outcomes can be achieved, with stable results maintained during long-term follow-up.

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Noninvasive Ventilation via Nasal Mask Aggravates Midface Retrusion in Syndromic Craniosynostosis

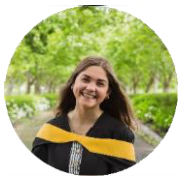
Maxime Taverne[1], Margaux Ntirubuza[1], Aloïs Roussel[1], Yehong Zhong[2], Suzann Beukes[1], Mehran Moazen[3], Roman Hossein Khonsari[4], Brigitte Fauroux[4], Sonia Khirani[4]
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Abstract

Background

Children with craniofacial malformations, such as syndromic craniosynostosis due to FGFR mutations, are at high risk for obstructive sleep apnea syndrome (OSAS). Midface hypoplasia is a well-established contributing factor. When severe OSAS persists despite ENT surgery—or when such interventions are not indicated—frontofacial advancement (FFA) is performed to relieve upper airway obstruction. In the interim, noninvasive ventilation (NIV) via a nasal mask is often necessary. However, prolonged mask use may exacerbate midface retrusion, potentially creating a vicious cycle for both patients and caregivers. This study aimed to identify risk factors for phenotype worsening associated with extended nasal mask use, using geometric and biomechanical methods.

Methods

Nineteen infants under two years old requiring NIV prior to FFA were included. Clinical data (e.g., demographics, genetics, ENT surgeries, age at NIV initiation, duration and adherence) and craniofacial CT scans before NIV and immediately prior to FFA were analyzed. Four risk factors were assessed: treatment duration, age at initiation, initial severity, and mask strap tightness. Craniofacial changes were evaluated through anatomical landmark comparisons on 3D surfaces, and longitudinal data were compared to an age-matched control group not requiring NIV. To assess mechanical impact, typical mask forces were measured using a custom-designed, 3D-printed modular facial benchmark (silicone technology Lynxter S300X) equipped with pressure sensors, simulating patient-specific or parametric morphologies.

Results and Conclusion

Geometric analyses revealed that: (1) longer NIV duration correlated strongly with worsening midface retrusion, significantly altering growth trajectories; (2) earlier initiation (before age 1) led to more rapid deformation; (3) unlike controls, phenotypic changes in the NIV group were independent of initial morphology, implicating the mask's influence. Biomechanical tests showed that: (1) pressure distribution patterns influenced deformation levels; (2) specific features (e.g., small nasal ridge, pronounced frontal bossing) increased risk; (3) variable strap tension produced significant pressure differences, highlighting the need for caregiver and parents training. These findings offer novel quantitative insights into mask-related complications and provide thresholds to inform clinical decision-making between early FFA and prolonged NIV. They also lay the groundwork for a prospective study aimed at evaluating the benefits and drawbacks of early FFA versus prolonged NIV.

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Cranioplasty for Sweeney-Cox Syndrome: Japan's First Report and Surgical Insight

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Joceline Theda Kadarman



Nobuyuki Mitsukawa

Abstract

Background

Sweeney-Cox syndrome, an autosomal dominant syndrome characterized by congenital craniofacial bone abnormalities, was first reported by Kim Sharon et al. in 2017. This sporadic syndrome, caused by mutations in the TWIST1 gene, led to multiple abnormalities such as hypertelorism, short columella, hypoplastic alae nasi, and auricular hypoplasia. Generally, Sweeney-Cox syndrome patients also exhibited developmental delay. We reported the first cranioplasty performed in Japan to treat a Sweeney-Cox syndrome patient with premature skull fusion, underscoring the importance of genetic testing in diagnosing and treating such conditions.

Methods

Our study consisted of one male patient born at 41 weeks and 0 days of gestation with no maternal or prenatal abnormalities. This patient was referred to our department at 8 weeks of age with suspicion of Crouzon's syndrome due to multiple anomalies, including a peculiar facial appearance caused by premature fusion of the coronal sutures. There is no family history related to syndromic craniosynostosis in this patient. However, after a thorough examination and genetic testing, this patient was diagnosed with Sweeney-Cox syndrome at 34 weeks of age. At that time, this case was the third case in the world and the first Sweeney-Cox syndrome case diagnosed in Japan. We performed posterior cranial vault distraction (PCVD) to correct the craniosynostosis at 26 weeks old. Subsequently, we performed another surgery, a fronto- orbital distraction (FOA), at 1 year and 6 months of age to further achieve the desirable cranial volume expansion.

Results

The postoperative course was excellent, with significant cranial volume expansion. The child's head morphology is now normal, and his motor development is almost normal, with only a slight delay in mental development. This successful outcome provides reassurance and underscores the potential of our approach in treating Sweeney-Cox syndrome.

Conclusions

We successfully performed PCVD and FOA in a patient with Sweeney-Cox syndrome, resulting in marked cranial volume expansion, normal head morphology, and close-to-normal motoric development.

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Clinical application of novel statistical shape modelling methods in outcome assessment in endoscopic-assisted strip craniectomy for trigonocephaly

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Ajay Sinha


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Abstract

Background: Endoscopic-assisted strip craniectomy combined with postoperative custom-made helmet therapy (EASC + HT) provides a promising and safe minimally invasive treatment for infants with severe metopic synostosis. However, quantitative examination of cranial shape changes over time remains a challenge, potentially hindering our understanding of mechanisms underlying post-operative development and the assessment of surgical outcomes.

Method: Pre- and post-operative 3D photography at different time points from 10 patients diagnosed with trigonocephaly were acquired using 3D photogrammetry. We propose a computational method for capturing shape variations between trigonocephaly group and control set, sampled from 3D Headspace dataset. Anatomical landmarks are anatomically identified from 3D photography of each sample based on 2D landmarking with non-rigid registration technique, which assists in calculating cephalometric measurements and establishing dense correspondence points. Subsequently, statistical models of shape and mean curvature are constructed by performing principal component analysis and variations in shapes and curvatures are compared between the groups over time. Additionally, we utilised four machine learning methods to classify the trigonocephaly group based on mean curvature features.

Result: We achieved automated landmark placement for both the control set and the patient group, with larger errors observed at the preaurale and tragion landmarks. Mean curvatures at each correspondence combined with support vector machines distinguished pre- and post-operative cranial shapes from the control set with an accuracy rate exceeding 99.00%. Variations in shape and mean curvature indicated that trigonocephaly exhibits a pronounced and narrowing mid-forehead with inward contraction of lateral regions above the superciliary arches and increased bilateral width. Additionally, our results demonstrated that significant post-operative shape changes occurred in the central mid-forehead, characterized by relatively outward broadening in the lateral regions with flattening and shrinkage in the central area, approaching the normative shape of control set over time.

Conclusion: Our computational framework presents constructs statistical models of shape and mean curvature from 3D photography, providing insights into quantifiable improvements and growth in cranial shape. By incorporating elements of geometric morphometric analysis, automation and machine learning, our method enables the evaluation of surgical treatments and the diagnosis of trigonocephaly and craniosynostosis more generally.

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The incidence of subsequent high intracranial pressure in patients undergoing early, open, and wide strip craniectomy for sagittal synostosis

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Abstract

Objective

Secondary bone closure following single suture cranio-synostosis (SSCS) correction has been previously reported. However, the incidence of such secondary closure, which leads to increased intracranial pressure, following strip craniectomy for sagittal synostosis (SS) has not been systematically described. The possibility of secondary closure must be taken into account when determining the optimal long-term follow-up regimen after the procedure. Secondary closure leading to high intracranial pressure (ICP) may cause silent papilledema, optic atrophy, and even blindness. In this study, we investigated the long-term follow-up of children who underwent early, open, and wide strip craniectomy for sagittal synostosis. We analyzed the incidence of secondary closure that led to increased intracranial pressure and the subsequent need for surgical or medical intervention.

Methods

This is a single-center, retrospective, observational study with a follow-up of 2 to 25 years (Av=9.1y, SD±6.2y). The study cohort included 286 children who underwent strip craniectomy for SS at the age of 2-4 months.

Results

Three of 286 developed papilledema with documented increased intracranial pressure (formal ICP monitoring for 3 days). Two of them required cranial vault expansion at the age of 1.8 and 1.9 years. The third monitoring for 3 days). Two of them required cranial vault expansion at the age of 1.8 and 1.9 years. The third patient was diagnosed with papilledema and borderline high values of ICP at the age of 2.8 years. He was treated with acetazolamide, resulting in persistent normalization of his fundoscopic exam, even after the acetazolamide treatment was stopped (8 mounts).

Conclusions

This study verifies that the incidence of secondary closure is very low following early, open, and wide strip

craniectomy for SS. However, careful clinical and ophthalmological follow-up is advised during the first few years following surgery.

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Robotic-Assisted Cleft Lip Repair: Feasibility and Insights from a Pilot Study Using a Novel 3D-printed Cleft Model

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Hannah BROWN


Leticia Lenki


Andrew Wilmer


Luz Diaz


Jack Stubbs


Rajendra Sawh-Martinez

Abstract

Background
Microsurgical robotic platforms offer enhanced precision, tremor elimination, and motion scaling, which may translate to improved outcomes in cleft lip (CL) repair, where surgical fields are often less than 10 × 10 mm. Traditional repairs carry risks of scar widening, shortened lip height, asymmetry, and persistent nasal deformity. This pilot study investigates the feasibility, benefits, and limitations of robotic-assisted CL repair using a novel 3D-printed unilateral cleft model.

Methods
Robotic-assisted cleft lip repairs were performed using the Symani Surgical System (MMI) with 7×–12× motion scaling, employing a modified Fisher technique. Manual repairs served as controls. Procedural steps included orbicularis oris dissection, muscle approximation, and dermal closure. Feasibility was assessed qualitatively (success/failure). A paired two-tailed t-test evaluated time differences between robotic and manual approaches for each procedural step.

Results
Successful orbicularis-dermis dissection was achieved in 66% of robotic trials and 100% of manual trials. All robotic repairs achieved muscle approximation using 5-0 sutures. Dermal and cutaneous closure required finer sutures robotically (6-0 Vicryl, 8-0 Prolene) and were successfully completed in all trials. Mean operative times for robotic vs. manual techniques were: dermal suturing (9 vs. 5 minutes), orbicularis dissection (7.3 vs. 2.5 minutes), and muscle approximation (8 vs. 2 minutes). Total robotic repair time was approximately twice that of manual repair.

Discussion
This study demonstrates the technical feasibility of robotic-assisted CL repair employing a 3D printed cleft model. Robotic platforms enabled fine suture handling and layered closure but were limited by slower performance, likely due to motion scaling. Nonetheless, the ability to perform high-precision repairs using smaller sutures may translate to reduced tissue trauma and improved aesthetic outcomes in future clinical applications.

Conclusion
While feasible, future studies are needed to establish a higher level of evidence and a better understanding of robotic-assisted cleft lip repairs by directly comparing the surgical outcomes of robotic-assisted and conventional cleft lip repair.

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A Multi-center Randomized Clinical Trial Validating the Accuracy of Patient-Specific Implants versus CAD/CAM Splints in Orthognathic Surgery

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Xinxi Wang



Biao Li



Xudong Wang

Abstract

Background

Patient-specific implants (PSIs) have demonstrated comparable or superior effectiveness in orthognathic surgery when compared to computer-aided design/computer-aided manufacturing (CAD/CAM) surgical guides. However, there are variations in accuracy among studies from different institutions. A multicenter randomized controlled trial (RCT) is needed to eliminate the influence of institutional differences in experience and methodology on accuracy and potential bias. This randomized controlled trial aimed to compare the accuracy of maxillary repositioning between PSI and CAD/ CAM guides, while also evaluating the consistency and stability of results across different medical centers.

Methods

A total of 77 patients requiring orthognathic surgery from three medical centers were randomly assigned to either the PSI group or the CAD/CAM surgical guide group for maxillary repositioning. The effectiveness was evaluated by comparing the virtual preoperative plan to the actual postoperative outcomes. The primary outcome measure was the centroid position discrepancy of the maxilla, with additional assessments of the stability of the centroid position discrepancies across medical centers. Other translational and angular discrepancies were also compared.

Results

A total of 38 patients in the PSI group and 39 patients in the splint group were analyzed. The overall maxillary position discrepancy was 1.02 ± 0.33 mm in the PSI group and 1.79 ± 0.41 mm in the splint group, with a significant between-group difference ($p < 0.001$). The centroid position discrepancies across three centers were as follows: No.9: 1.00 ± 0.26 mm vs. 1.72 ± 0.23 mm, Tongji: 1.07 ± 0.44 mm vs. 1.63 ± 0.45 mm, and Fudan: 1.07 ± 0.29 mm vs. 2.01 ± 0.26 mm. The differences between the PSI and splint groups were significant at all centers ($p < 0.05$). No significant between-center differences were observed within either the PSI or splint group. Additionally, the PSI group showed 0.97±0.56 degrees orientation discrepancy in pitch, while the splint group was1.63 ± 0.60 degrees.

Conclusion

PSI technology demonstrates high reliability and consistency across different medical centers and surgeons, significantly outperforming conventional splint methods.

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Early Endoscopic Strip Craniectomy with Posterior Vault Distraction Osteogenesis for Complex Craniosynostosis: A Comprehensive Approach

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Rajendra Sawh-Martinez


Rose Meltzer


William Cobb


Leticia Lenkiu

Abstract

Introduction

Complex craniosynostosis, defined by premature fusion of multiple cranial sutures, may result in elevated intracranial pressure, abnormal cranial morphology, and neurodevelopmental delay. Early surgical intervention is associated with improved outcomes; however, controversy remains over the optimal timing and modality—particularly between early endoscopic strip craniectomy (ESC) and later open cranial vault remodeling. This study evaluates a combined surgical approach—early ESC (by 3 months of age) followed by posterior vault distraction osteogenesis (PVDO)—compared to patients undergoing either procedure in isolation.

Methods

A retrospective review was conducted of patients with complex craniosynostosis treated at a single institution. Four patients underwent ESC before 3 months of age (including one prior to 1 month), followed by staged PVDO. Outcomes were compared to a control cohort of four patients who received PVDO alone and 12 patients who underwent ESC alone. Data analyzed included syndromic status, initial cranial severity, surgical timing and sequence, complication rates, and morphometric outcomes (e.g., cephalic index, cranial volume, turricephaly index, and head circumference).

Results

The combined ESC + PVDO cohort demonstrated complication rates and morphometric improvements comparable to both PVDO-only and ESC-only groups, as well as outcomes reported in the literature. Notably, early ESC did not preclude successful staged PVDO, and sequential intervention was well tolerated. No major complications occurred in the combined group, and operative goals related to cranial shape and volume were achieved across all cohorts.

Conclusions

This study supports the feasibility and safety of a comprehensive surgical strategy combining early endoscopic release with later posterior vault expansion in infants with complex craniosynostosis. ESC can be performed as early as one month of age without compromising future interventions. This dual-modality approach may offer a flexible, staged solution for addressing functional, developmental and aesthetic concerns in complex craniosynostosis. Ongoing longitudinal follow-up will be essential to assess neurodevelopmental outcomes and long-term cranial growth.

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Impact of One-Piece Fronto-Orbital Distraction Osteogenesis on Orbital Morphology and Strabismus Development in Unilateral Craniosynostosis

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Hojin Park


Jong-Woo Choi


Young-Shin Ra

Abstract

Background

Unicoronal craniosynostosis (UCS) disrupts normal orbital development, resulting in asymmetric bony morphology that has been implicated in various ophthalmologic dysfunctions, most notably strabismus. This study aims to quantitatively evaluate orbital dysmorphology in individuals with UCS, elucidate its developmental changes following fronto-orbital distraction osteogenesis (FODO), and analyze the characteristics of postoperative new-onset strabismus.

Materials & Methods

A total of 19 patients with UCS who underwent FODO between May 2008 and November 2020 were included in this retrospective analysis. Ophthalmologic records and pre- and postoperative computed tomographic scans were reviewed. Seven orbital parameters, including orbital width, height, volume, and four directional angles (vertical angle [VA], horizontal angle [HA], superolateral angle [SLA], and superomedial angle [SMA]), were quantitatively measured. Comparisons were performed between the ipsilateral and contralateral orbits in UCS patients, and with those of age-matched control subjects.

Results

The SLA and VA of the ipsilateral orbit, as well as the SMA of the contralateral orbit, were significantly more obtuse in patients with UCS compared to age-matched controls. Following FODO, the ipsilateral SLA significantly decreased from 69.2 ± 5.4 degrees to 59.1 ± 4.2 degrees (P = 0.001), while the contralateral SMA decreased from 64.8 ± 5.8 degrees to 60.2 ± 6.0 degrees (P = 0.003). Among the 17 patients without preoperative strabismus, four developed new-onset strabismus during postoperative follow- up. The most common type was horizontal strabismus involving the ipsilateral eye, presenting as either exotropia (n = 2) or esotropia (n = 1). One patient developed combined vertical and horizontal strabismus. Logistic regression analysis revealed a significant association between the interorbital SMA difference and the development of postoperative strabismus (odds ratio = 1.39; P = 0.041).

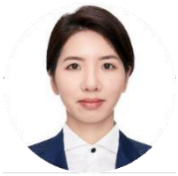
Conclusions

Although patients with UCS are diagnosed based on unilateral coronal suture fusion, orbital dysmorphology is bilateral in nature. Both orbital roofs exhibit characteristic distortion, typically with superior displacement toward the fused suture. These abnormalities can be partially corrected through FODO. While strabismus remains a common finding postoperatively, FODO appears to be a viable approach with a potentially lower risk of strabismus. In particular, residual asymmetry of the superomedial orbital roof may be associated with the development of horizontal strabismus.

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Minimally invasive intra-oral condylectomy combimed simultaneous orthognathic surgery for secondary laterognathia of Condylar Osteochondroma : A retrospective study of 83 cases

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Yu Jing



Wang Xudong

Abstract

Background

Condylar osteochondroma (OC) frequently induces complex craniofacial deformities characterized by progressive laterognathia and asymmetry. This study investigates the outcomes of a minimally invasive intraoral endoscopic-assisted approach for simultaneous condylectomy and orthognathic reconstruction compared to conventional extraoral techniques.

Methods

In this retrospective cohort study, 83 consecutive patients with OC-related deformities underwent single-stage condylectomy with orthognathic correction between October 2006 and December 2023. The cohort comprised 63 patients treated via intraoral endoscopic-assisted approach (study group) and 20 via traditional extraoral approach (control group). Outcome measures included: 1) occlusal functional recovery;2) three-dimensional symmetry improvement (quantified by CT image);and3) complication profiles.

Results

Both approaches demonstrated significant postoperative improvement in mandibular symmetry ($p<0.01$, intergroup $p=0.56$).Comparable functional outcomes were achieved (mean maximal interincisal opening ≥37mm in both groups).No significant differences in operative duration ($p=0.09$) or intraoperative blood loss ($p=0.13$).Complication profiles differed:1)1 case of ramus ischemic necrosis ,and1 recurrence (spiny-surface giant OC) in the intraoral group;2)2 transient facial nerve palsies and 1 Frey's syndrome (5%). The ollow-up period at least 2 years.

Conclusions

The endoscopic intraoral approach provides equivalent functional and aesthetic outcomes to conventional methods while reducing extraoral morbidity. Based on our 20-year experience, we propose these evidence-based protocols:

Approach selection: Intraoral endoscopic for tumors (<4cm) without spiny surfaces, and extraoral for giant (>4cm) or spiny lesions;

Technical considerationsm1: a) Minimum 1cm condylar resection for intraoral access; b) Sequential surgical protocol follow "maxilla-condyle-mandible-contour" to ensure jaw stability;

Risk mitigation: Careful soft tissue preservation to prevent ischemic complications when bilateral mandibular sagittal split osteotomy and contouring on affected side are required.

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Deep learning for automated ventricle segmentation in craniosynostosis: overcoming small datasets and anatomical variability

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Roman Khonsari


Irene Mathijssen

Abstract

Background

Accurate brain ventricle segmentation and volume calculation are essential for studying and monitoring brain development, including hydrocephalus, in children with craniosynostosis. Currently, this is not routinely performed due to the substantial effort and expertise required. Deep learning methods allow for automated segmentation but often underperform with small datasets, while conventional segmentation tools like FreeSurfer struggle with anatomical variability as seen in craniosynostosis. Therefore, a new automated pipeline for ventricle volume calculation is crucial.

Methods

At the core of the pipeline is a nnUNet-based deep learning model. 282 T1-weighted MRI scans from Crouzon and Muenke patients aged 0-23 years were divided into training (90%, n=255) and testing (10%, n=27) datasets. Initially, the nnUNet was trained on 10 manually segmented MRI-scans (model A), after which the remaining scans from the training dataset were segmented using model A. Review of these segmentations identified 24 requiring manual adjustment, while 221 were accepted without modification. The network was retrained with the 10 manual and the 24 corrected segmentations (model B), and with the full training dataset consisting of the 10 manual, 24 corrected, and 221 accepted segmentations (model C). Performance was evaluated on the test set using Dice Similarity Coefficient (DSC) scores. Model comparisons, and comparisons with FreeSurfer were made using paired two-sided t-tests.

Results

Total ventricle volumes in the test set ranged between 8-570 ml (mean ± SD: 82 ± 129 ml), reflecting high variability. All models significantly outperformed FreeSurfer (DSC = 0.884), with progressive improvements from Model A (0.966) to B (0.975) and C (0.985), all $p < 0.05$. Model C was further validated on additional craniosynostosis subtypes (Apert, Trigonocephaly), normal controls, and an independent external dataset from Necker hospital, confirming clinical applicability. Clinical cases will be presented.

Discussion

Our results show that incorporating expert-reviewed adjustments and accepted segmentations into deep learning training enhances performance with limited annotated data and improves robustness to anatomical variability compared to FreeSurfer. The resulting pipeline offers a precise and efficient tool for ventricle volume calculation. Next steps include integration of the pipeline into clinical practice to support research, treatment, and long-term monitoring that will aid clinical decision making.

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Building Distant Metastasis Models for HNSCC Using Machine Learning Techniques

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Changping Ma

Abstract

Background

Accurate risk assessment of distant metastasis of head and neck squamous cell carcinoma (HNSCC) is important for developing personalized treatment and prognosis. This study explores risk factors for distant metastasis of HNSCC and establishes a predictive model using machine learning methods.

Materials and Methods

We designed a retrospective cross-sectional study with a cohort from the SEER database (affiliated with the National Cancer Institute). 31,060 cases were included by our inclusion criteria. We constructed four machine learning models—Logistic Regression, Decision Tree, XGBoost, and Neural Network—to predict the risk of distant metastasis in HNSCC patients and compared the performance of the four models. Accuracy, precision, recall, and F1-score were used to evaluate the performance of the model. The evaluation ability and clinical practicability of the model were verified by comparing the area under the curve and the receiver operating characteristic curve.

Results

The receiver operating characteristic of the four models ranged from 0.681 to 0.847. The average accuracy of all algorithms was 77%, and XGBoost had the highest accuracy of 85.119 %. Among the four models, XGBoost and Logistic Regression had the highest precision, both with a precision greater than 79. The Neural Network had the highest recall and F1-score. Decision Tree had the lowest accuracy and recall. Among the four models, the area under the curve of Decision Tree was the lowest, at 0.690, whereas that of XGBoost was the highest, at 0.846. Overall, XGBoost had the best predictive effect.

Conclusion

XGBoost had the highest classification accuracy, so this machine learning method could be used to predict distant metastasis of HNSCC. The application of machine learning algorithms can stratify patients with HNSCC, which is conducive to the development of personalized treatment plans.

Clinical Relevance

The findings have significant implications for clinical management. The superior predictive performance of XGBoost, as demonstrated by its high precision and area under the Decision Curve, suggests that this machine learning algorithm could be effectively integrated into clinical practice to predict distant metastasis in HMSCC patients, with potential to enhance accuracy of prognostic assessments, thereby facilitating more informed treatment planning and personalized care.

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Self-Providing Flaps for Reconstructing the Defects after Resection of Maxillofacial Giant Benign Tumors

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Abstract
Benign tumors in the maxillofacial region are often asymptomatic, leading patients to seek medical consultation typically when the tumor reaches a substantial size. In the context of managing large benign tumors in the maxillofacial region, the affected area typically exhibits an increase in skin area and soft tissue volume when compared to the contralateral side. Consequently, surgeons often need to resect the excess soft tissue, including both cutaneous and subcutaneous layers, resulting in reduced skin area and soft tissue volume, thereby restoring the facial contour to a normal state. Conventionally, surgeons have resorted to the use of free tissue flaps to eliminate dead space and to achieve closure of wounds. Nevertheless, free tissue flaps require the creation of an additional surgical field and may result in functional problems of donor site. In response to these challenges, we have introduced an innovative approach that utilizes the soft tissue expanded by the tumor itself as an adjacent flap for wound closure and the reconstruction of mucosal defects following its transposition into the oral cavity.

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Management of the Apert Hand: The Boston Children's Experience

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Abstract

Purpose

Management of the Apert hand brings a unique set of complexities. We present our Boston Children's Hospital experience which utilizes a two-surgeon, patient-tailored, and multi-stage approach that balances function and aesthetics through the creation of a five-digit hand.

Methods

We reviewed the records of patients with Apert syndrome who presented to our institution for surgical correction of the hand by the authors (BIL, AHT) between January 2010 - January 2025. Patients who underwent initial hand correction elsewhere or by another surgeon were excluded. Records were reviewed for demographics, presentation, operative details, and postoperative outcomes.

Results

Fifty-one patients (102 hands) were included in analyses, with roughly half of the series being female (51%) and two-thirds identifying as white (63%). The majority of patients were non-Hispanic (82%) and traveled domestically for care (90%). The distribution of Upton Type included: Type I (41%), Type II (22%), and Type III (37%). Median ages at initial presentation and staged syndactyly release were 7 and 12 months, respectively. Median follow-up time was 38 months. By the time of analyses, 80% of the cohort completed all staged syndactyly releases, of which all achieved bilateral five- digit hands. The most common length of stay was 1 day.

Discussion

We report one of the largest series to date of patients with Apert syndrome who underwent surgical correction of the hand. Regardless of Upton Type, favorable outcomes and a five-digit hand were achieved in patients using a variety of multi-staged, pre-planned procedures tailored to the individual patient. Of note is our three-stage approach in the management of the Type III hand, which first converts the central three digits into a single plane allowing for subsequent syndactyly releases and the creation of a five-digit hand. The lower abdomen was the primary graft donor site for all Upton Types. In addition to syndactyly release, later adjunct procedures were performed to improve function and cosmesis: central coalition osteotomy (Upton Type III), osteotomy or distraction lengthening to straighten or lengthen the thumb, phalangeal augmentation, and correction of angular deformities. Our findings demonstrate that routine amputations are unnecessary and should be avoided regardless of Upton Type.

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Key Technologies for the Treatment of Maxillofacial Trauma

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Xiangdong Qi

Abstract

Craniomaxillofacial (CMF) trauma, primarily caused by traffic accidents (44.7%), falls (21.9%), and violence (21.3%), predominantly affects individuals aged 21–40, with injuries concentrated in the mid- (50.3%) and lower-face (46.2%). Management challenges include rapid hemorrhage, airway compromise, infection risks, and functional/aesthetic sequelae. Early assessment prioritizes ABC (airway, breathing, circulation) stabilization, systematic trauma evaluation, and imaging-guided fracture identification. Military-derived protocols emphasize rapid hemorrhage control, airway security, and fixation within critical timeframes (e.g., 6–12h for definitive repair). Definitive repair adheres to principles of anatomical bone restoration (rigid fixation with titanium plates), vascularized bone grafts for large defects, and soft-tissue reconstruction using local, regional, or free flaps (e.g., radial forearm, fibula). Advanced technologies, including 3D reconstruction, surgical navigation, and patient- specific guides, enhance precision in fracture reduction and implant placement. A case series (263 patients) demonstrated 94.7% satisfaction, reduced operative time, and minimized reoperations. Future directions integrate augmented reality, electromagnetic navigation, and robotics to address challenges like bone fragmentation and intraoperative spatial constraints. These innovations aim to optimize functional and aesthetic outcomes, underscoring the evolving synergy of precision medicine and multidisciplinary care in CMF trauma management.

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Computer-assisted Soft Tissue Three-dimensional measurement and reconstruction apply to correct the Orbital Floor Fractures

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Jinchao Yu



Xinhai Ye

Abstract

Introduction

Orbital floor fractures are common injuries of the midface. The clinical appearance, ophthalmological examination, and CT scans are currently key factors in determining surgical intervention for orbital floor fractures. There is still much debate as to the optimal time and operative indications. This study evaluated the positive predictive operative indications of orbital floor fractures management based on the three-dimensional measurement and reconstruction.

Methods

The patients who underwent surgical correction of orbital floor fractures between Jan 2019 and Dec 2024 at Department of Facial Plastic and Reconstructive Surgery, Eye & ENT Hospital of Fudan University were identified. A retrospective review of three-dimensional measurement of preoperative and postoperative CT scans and surgical data was performed to evaluate the defect size, displaced tissue volume and sectional area, and extraocular muscle displacement. Correlations between the surgical intervention and parameters of CT three-dimensional measurement and reconstruction were performed.

Results

Thirty-three patients (19 males and 14 females) were admitted in the study. The average age was 36.2 years. The fracture defect size resulted from three-dimensional measurement demonstrates high correlation with intraoperative findings. The presence of diplopia and eye movement limitation was associated with the defect size, displaced tissue volume, and extraocular muscle displacement. The enophthalmos was associated with the defect size and displaced tissue volume. The preoperative and postoperative CT three-dimensional measurement results showed statistical improvements in displaced tissue volume, and extraocular muscle displacement postoperatively.

Conclusion

Computer-assisted soft tissue three-dimensional measurement and reconstruction from CT scans is an accessible, easy and objective technique to evaluate the range and severity of orbital floor fractures and to identify patients necessitating surgical intervention.

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Craniofacial Feminization and Masculinization Surgery: Three-Year Single Surgeon Experience

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Gerhard S. Mundinger, M.D., M.B.A.

Abstract

Introduction

Facial feminization and masculinization surgery encompasses a varied and extensive group of surgical procedures. This presentation reports a single surgeon experience with facial masculinization and feminization, highlighting craniofacial skeletal techniques that effectively modify the femininity and masculinity of faces as illustrated through case examples.

Methods

Patients undergoing facial feminization surgery (FFS) or facial masculinization surgery (FMS) were retrospectively evaluated and categorized based on region of facial surgery as follows: upper face (forehead and superior orbits), middle face (nose and cheeks), lower face (mandible), and neck. Procedure combinations, staging, and complications were also evaluated.

Results

Over a 3-year period, 194 patients underwent a total of 248 FFS or FMS procedures. Of these, 241 (97.2%) were FFS procedures, and 7 (2.8%) were FMS procedures. For FFS procedures, forehead/superior orbital reduction with brow lifting was most commonly performed (n=170, 68.5%), followed by rhinoplasty (n=130, 52.4%), reduction genioplasty (n=120, 48.4%), mandibular angle reduction (n=98, 39.5%), thyroid cartilage reduction (n=90, 36.3%), hairline advancement (n=54, 21.8%), and malar augmentation (n=51, 20.6%). 10.9% of patients had simultaneous procedures in all four facial regions, while 20.2% of patients had procedures in one facial region. 6.9% of patients had soft tissue only procedures (i.e. facelift, necklift, and/or neck liposuction). 9.3% of FFS cases presented primarily for revision surgery, while only 0.8% of cases required revision. 1.6% (n= 4) of FFS patients had complications, including cellulitis, neck hematoma, intraoral dehiscence, and oral abscess. 11.3% (n=22) of FFS patients required staged procedures to complete feminization, either due to the extensive nature of facial procedures, or desires for combining facial procedures with additional body procedures. FMS primarily included mandibular angle and/or chin augmentation (71.4%). The remaining 2 FMS patients underwent ancillary procedures, including hair transplantation and neck liposuction.

Conclusions

Extensive structural facial feminization surgery can be safely performed in a single stage, typically involving reduction of the forehead, mandible, and thyroid cartilage along with malar augmentation, lip volumizing, and rhinoplasty. Skin envelope procedures generally follow structural procedures once a feminized facial structure is obtained. Facial masculinization surgery is increasing in incidence.

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Timing and Outcomes of Cleft Palate Repair in Patients with Pierre-Robin Sequence

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Abstract

Background

Cleft palate occurs in 60-90% of patients with Pierre-Robin sequence (PRS). Interventions needed to manage and protect the airway, such as mandibular distraction osteogenesis, may delay palate repair and affect the rate of postoperative complications. The objective of this study is to compare the timing of palate repair and rate of postoperative complications between those with PRS and a cohort of patients with isolated cleft palate.

Methods

Retrospective analysis of 63 patients with PRS who underwent palate repair at Texas Children's Hospital from January 2014 to December 2024 was conducted. Variables analyzed included age at palate repair, oronasal fistula occurrence, and rate of velopharyngeal insufficiency. Regression analyses were performed to compare outcomes between patients with PRS and 63 patients with isolated cleft palate, controlling for gender, race, ethnicity, Veau classification, and gestational age.

Results

Of the 63 patients with PRS, 87.3% were White (N=55), 44.4% were Hispanic (N=28), and 52.4% were female (N=33). Veau 2 was the most common palate classification (N=56, 88.9%), and 30.2% (N=19) of patients had a known genetic syndrome. Mandibular distraction was performed in 63.5% (N=40) of patients, and average age at distraction was 1.7 months (range: 0.2 - 14.0). Average age at primary palate repair for patients with PRS and isolated cleft palate was 18 months (range: 9.9, 90) and 13 months (range: 9.6, 29.8), respectively (p-value: 0.014). The rate of oronasal fistula in patients with PRS was 4.8% (N=3) versus 3.2% (N=2) in patients with isolated cleft palate (p-value: 0.887), and the rate of velopharyngeal insufficiency was 14.3% (N=9) and 12.7% (N=8), respectively (p-value: 0.908). Average length of follow-up was 30 months for PRS patients and 22 months for isolated cleft palate patients.

Conclusion

Although primary cleft palate repair was delayed in patients with PRS compared to those with isolated cleft palate, other outcomes—such as rates of velopharyngeal insufficiency and oronasal fistula—were not adversely affected. Further studies with larger patient populations are needed to confirm these findings. Overall, patients with PRS may continue to benefit from early operative airway management and delayed cleft palate repair without increased risk of postoperative complications.

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Two Decades of Institutional Experience in Posterior Vault Distraction Osteogenesis: A Review of Patient Demographics and Surgical Outcomes

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Abstract

Background

Posterior vault distraction osteogenesis (PVDO) involves an osteotomy of the posterior cranial vault and application of distractors to achieve controlled volumetric expansion. It has been demonstrated to effectively enhance intracranial volume and promote expansion of the posterior cranial fossa. However, data on its outcomes is limited. In this study, we present demographic data and surgical outcomes in patients who underwent PVDO over two decades at our institution.

Methods

A retrospective review of patients with craniosynostosis who underwent PVDO for treatment of syndromic and multisuture craniosynostosis at a tertiary children's hospital from 2003 to 2024 was performed. Demographic information, perioperative, intraoperative, and postoperative outcomes, and distraction distance was analyzed. Data was analyzed using descriptive statistics.

Results

A total of 27 patients underwent PVDO between 2003 and 2024 at our institution, 16 (59.5%) of whom were male. Mean age at presentation was 3.6 ±5.0 months. The majority of patients (n=22, 81.5%) who underwent PVDO had a diagnosed craniosynostosis syndrome, including Apert (n=9, 40.9%), Pfeiffer (n=5, 19.2%), Crouzon (n=3, 13.6%), Saethre-Chotzen (n=2, 9.0%), Muenke (n=2, 9.0%), Carpenter (n=1, 4.5%), and Gomez- Lopez-Hernandez Syndrome (n=1, 4.5%). All patients had multisuture craniosynostosis, and among these, 23 (85.2%) had bicoronal, 9 had lambdoid (33.3%), 7 had sagittal (25.9%), 2 had metopic involvement (7.4%), and 2 had squamosal suture involvement (7.4%). Mean distraction distance was 31.7 mm±6.6 mm. There were no hardware failures or severe complications, such as death, cranial necrosis, or intracranial infection. Five patients who underwent PVDO of patients did not undergo subsequent FOA (18.5%).

Conclusion

Our two-decade experience with PVDO contributes to the literature that PVDO is safe and effective modality to achieve expansion in syndromic craniosynostosis. PVDO can effectively expand the posterior cranial fossa and help relieve cerebellar tonsillar herniation in craniosynostosis patients with concurrent Chiari I malformations. Even in cases with no signs of Chiari malformation, PVDO is effective in expanding the posterior calvarium in preparation for second stage FOA and calvarial vault remodeling to lower the turricephaly and advance the fronto-orbital complex. Our data also provides support that PVDO may be associated with a reduced rate of secondary FOAs.

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NELL-1–Enhanced In Vivo Bioreactors Harness Iliac Marrow-Derived Signals for Bone Regeneration: A Novel Approach for Craniofacial Reconstruction.

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Monica Maria Illescas Ralda



Han-Tsung Liao

Abstract

Introduction

Craniofacial reconstruction of complex defects remains challenging. This study evaluates the use of in vivo bioreactors targeting the iliac medullary space with specific growth factors to stimulate osteogenesis. Among these, Nell-1 is a promising osteoinductive molecule with craniofacial specificity and a more favorable safety profile, due to its reduced adipogenesis and inflammatory response. By enabling the controlled formation of bone in defined volumes and geometries, this strategy mitigates the unpredictability often encountered with traditional graft materials.

Methods

Bioreactor chambers containing collagen matrix supplemented with platelet lysate (PL), BMP-2, or NELL-1 were fixed over the iliac crest in rabbits (n = 8 per group), their open face positioned directly over cortical perforations exposing the medullary space. After 12 weeks, bone formed was harvested and used to reconstruct 6 mm calvarial defects. CT scans were performed at Weeks 1, 6, and 12 for both bioreactor and defect sites. Samples were analyzed by histomorphometry, micro-CT, and histological staining (H&E, Masson's trichrome).

Results

NELL-1 demonstrated superior performance compared to BMP-2 and PL across all parameters. In the iliac bioreactor samples, the PL group exhibited the weakest osteogenic response, with 62.5% of samples showing no detectable bone formation. The BMP-2 group showed moderate bone formation but was associated with inflammation in 37.5% of specimens (3/8). The NELL-1 group achieved the highest BA/TA ratio (24.12% ± 5.81), followed by BMP-2 (11.32% ± 5.81) and PL (4.99% ± 6.87), with a near-significant trend (Kruskal-Wallis $\chi^2(2) = 5.945$, $p = 0.051$). Micro-CT confirmed this tendency in BV/TV values. At Week 1 post-reconstruction, NELL-1-treated defects showed significantly greater BV/TV and defect closure compared to Control ($p = 0.013$ and $p = 0.022$). No significant differences were observed in BS/BV. Histologically, NELL-1 induced robust bone formation with normocellular marrow spaces and minimal inflammation, while BMP-2 showed disorganized trabeculae and excess adipose tissue. PL-treated samples were largely fibrous with minimal mineralization.

Conclusion

These findings highlight the potential of growth factor-loaded bioreactors with medullary activation to promote bone regeneration. NELL-1 shows strong promise as a potent osteoinductive factor for autologous graft generation in craniofacial reconstruction.

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An Innovative Technique in Symmetrical and Aesthetical Optimization for Severe Mandibular Asymmetrical Deformity secondary to Condylar Osteochondroma: Side-Switch Autogenous Inferior Marginal Bone Graft.

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Jingshuang Yu


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Abstract

Objective

In patients with mandibular asymmetry deformities secondary to condylar osteochondroma, the affected side exhibits an "elongated, narrow mandibular body," the unaffected side a "shortened, widened flip," and the chin a "twisted asymmetry," resulting in compromised facial symmetry and aesthetics. This study proposes a surgical design integrating symmetry restoration and aesthetic optimization while evaluating its clinical efficacy.

Methods

Three patients underwent preoperative planning via ProPlan CMF:
Tumor delineation: Multiplane imaging defined tumor boundaries with safety margins.
Bimaxillary repositioning: LeFort I + SSRO established occlusion, aligning the occlusal plane, dental midline, and condylar position, facial profile.
Condylar resection: Excess tissue trimmed to maintain ≥2 mm joint space with residual part of condyle.
Asymmetry analysis: Residual imbalance from vertical ramus/body overgrowth, chin deviation, and reduced lower facial height.
Genioplasty: Symmetric osteotomy corrected chin rotation/deviation.
Contour refinement: Mirror-based resection of the affected inferior margin risked inferior alveolar nerve injury. A "balanced partitioning" strategy preserved half the excess bone near the mental foramen on the affected side. The harvested bone segment was rotated and transplanted to the contralateral inferior margin to address the "short-wide flip" deformity.（Side-Switch Autogenous Inferior Marginal Bone Graft）
Symmetry validation: Mirroring confirmed balanced contours.
Surgery included navigation-guided endoscopic tumor resection and guide-assisted osteotomies. Chin deviation, rotation, and mandibular asymmetry indices (Go, MF, Sg) were measured, with graft survival assessed.

Results

The operations and healing were uneventful and the patients showed no signs of recurrence or temporomandibular joint ankylosis during the follow-up. Facial symmetry was greatly improved right after the surgery in the chin deviation (from 5.8mm to 1.8 mm), chin rotation(from 9.3° to 4.5°, $P<0.01$) and the asymmetry index of three mandibular landmarks (Go, MF and Sg). Graft survival rate by volume reached 75%. Both mandibular contours achieved satisfying aesthetic expectations. It also showed a stable result after 12 to 18 months follow-up.

Conclusion

The side-switch autogenous inferior marginal bone grafting technique effectively optimizes mandibular symmetry and aesthetics in severe deviation deformities secondary to condylar osteochondroma. This method demonstrates clinical feasibility and merits broader application and further investigation.

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Predictors of Postoperative Complications Following Craniosynostosis Surgery: Evidence from 8,108 Operations

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Abstract

Background

Postoperative complications following craniosynostosis (CS) surgery significantly impact patient outcomes. Identifying predictors of these complications is essential for improving perioperative management and patient care. However, prior studies have often been limited by small sample sizes. This study represents the largest retrospective analysis of CS surgery to date.

Methods

The Epic Cosmos database (Verona, WI) was queried for patients diagnosed with craniosynostosis who underwent surgery between January 2017 and March 2025. Time-to-event Cox regression models were used to identify predictors of six major postoperative complications occurring within 365 days of surgery: cerebrospinal fluid (CSF) leak, hardware malfunction, hemorrhage, seizures, surgical site infection (SSI), and wound dehiscence (WD). Predictors included neurological, cardiopulmonary, and genetic comorbidities (trisomy and sex chromosome disorders), inpatient length of stay, reoperation status, age at surgery, and multi-suture involvement.

Results

We identified 8,108 craniosynostosis surgeries performed on 6,809 patients. Postoperative complications occurred in 852 cases (10.5%) within 365 days, with the most common being hardware malfunction (2.3%), CSF leak (1.9%), and wound dehiscence (1.9%). One death (0.01%) was recorded. Neurological comorbidities significantly increased risk for post operative seizures (HR=4.05), CSF leaks (HR=2.81), and hardware malfunction (HR=2.10) (all $p<0.001$). Reoperation was associated with higher risk of CSF leaks (HR=3.02, $p<0.001$) and wound dehiscence (HR=2.04, $p=0.001$). Multi-suture CS, compared to non-syndromic cases, increased risk for seizures (HR=1.70), hemorrhage (HR=1.51), CSF leaks (HR=1.42), and SSI (HR=1.46) (all $p<0.05$). Older age at surgery predicted greater risk of hardware malfunction (HR=1.06) and seizures (HR=1.07) (both $p<0.001$), while longer inpatient stays increased risk for hardware issues (HR=1.03, $p=0.005$) and SSI (HR=1.03, $p<0.001$). Genetic comorbidities were linked to higher risk of seizures (HR=2.19, $p=0.044$), SSI (HR=2.06, $p<0.001$), and wound dehiscence (HR=2.80, $p<0.001$).

Conclusions

Overall, CS surgeries can be safely performed with a low overall complication rate. However, neurological and genetic comorbidities, reoperation, multi- suture CS, longer inpatient stay, and older age at operation are associated with increased risks for postoperative complications. These results provide valuable insights for perioperative risk assessment, guiding clinical decision-making to optimize patient outcomes following CS surgery.

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Augmentation of Midfacial Volume with Concurrent Bone Grafting in Orthognathic Surgery: A 3D Quantitative Study

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Zhulin Xue


Zili Li


Xiaojing Liu

Abstract

Background

Patients with dentofacial deformities increasingly demand enhanced aesthetic outcomes following orthognathic surgery, yet conventional techniques often fail to adequately address midfacial contour deficiencies. This study aimed to quantitatively evaluate three-dimensional (3D) volumetric changes and aesthetic improvements in the midface following concurrent bone grafting during orthognathic surgery.

Methods

A clinical trial was conducted involving 30 skeletal Class III patients who underwent orthognathic surgery with intraoperative midfacial bone grafting. Assessments were performed preoperatively and postoperatively at 3 months, 6 months, and beyond, utilizing standardized photographs, 3D facial scans, and patient satisfaction surveys.

Results

In all 30 patients, 3D quantitative analysis demonstrated significant increases in midfacial volume at 3 and 6 months postoperatively. Subjective aesthetic scores correlated closely with objective 3D imaging results.

Conclusion

The findings suggest that adjunctive midfacial bone grafting during orthognathic surgery effectively enhances midface aesthetics and improves patient satisfaction. This study proposes a novel clinical approach to address the aesthetic challenge of midfacial volume deficiency following orthognathic surgery.

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Evaluating Long Term Neurocognitive Outcomes of Surgical Intervention for Sagittal Synostosis: Cranial Vault Remodeling vs Spring Assisted Surgery

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Abstract

Purpose

Previous studies indicated that patients with sagittal synostosis who underwent cranial vault remodeling (CVR) had higher intelligence than those receiving endoscopic surgery or spring-assisted surgery (SAS). However, geographic separation of study cohorts raises concerns about the validity of these findings. This study aims to compare neurocognitive outcomes in sagittal synostosis patients undergoing CVR or SAS, better controlling for demographic and geographic differences.

Methods

We conducted a cross-sectional study comparing neurocognitive outcomes in patients with nonsyndromic sagittal synostosis treated with CVR or SAS. Demographic, clinical, and socioeconomic data were collected. Neurocognitive outcomes were measured using the Wechsler Abbreviated Scale of Intelligence–Second Edition (WASI-II) and the NIH Toolbox Cognition Battery. Multivariate analyses adjusted for potential confounders including sex, age at surgery, ethnicity, and maternal education.

Results

Fifty-seven patients were included (CVR: n=21, SAS: n=36). Mean age at surgery was significantly lower in the SAS group (4.1 vs 13.2 months; $p<0.001$). The groups were otherwise demographically comparable, although children in the SAS group were more likely to live with both biological parents ($p=0.041$). No significant differences were observed in unadjusted or adjusted cognitive scores, including Full-Scale IQ (CVR: 100.4, SAS: 102.1; $p=0.747$), NIH Toolbox Total Composite, or individual domain scores. Maternal education was the only independent predictor significantly associated with improved cognitive performance across both assessments (WASI-II $p < .0001$; NIH toolbox $p < .001$), consistent with neurocognitive literature for the general population.

Conclusion

In this geographically controlled cohort, long-term neurocognitive outcomes did not differ significantly between patients undergoing CVR or SAS. These findings challenge prior reports suggesting cognitive superiority of CVR and highlight the importance of accounting for demographic and environmental variables—especially maternal education. Both CVR and SAS remain viable surgical options without evidence of long-term neurocognitive disadvantage.

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Soft Tissue Symmetry and Skeletal Remodeling Following Mandibular Distraction Osteogenesis in Hemifacial Microsomia: A 13-Year Retrospective Study

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Weidong Jiang



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Abstract

Hemifacial microsomia (HFM) commonly presents with soft tissue underdevelopment, skeletal deficiencies, and associated functional impairments on the affected side of the face. Mandibular distraction osteogenesis (MDO) has been proven effective in correcting skeletal deformities in HFM patients; however, comprehensive evaluations of soft tissue changes and long-term skeletal stability remain limited. This retrospective study analyzed 67 patients with HFM (35 males and 32 females) who underwent unilateral mandibular distraction at Shanghai Ninth People's Hospital, Shanghai Jiao Tong University School of Medicine, between January 2012 and June 2024. Pre- and postoperative assessments included three-dimensional computed tomography (3D-CT) imaging to evaluate skeletal changes and standardized clinical photography to assess soft tissue improvements. The results demonstrated significant improvements in mandibular height, maxillary canting, chin deviation, lip commissure inclination, and clinical mandibular asymmetry after MDO (all $p < 0.05$).

During the follow-up period, mandibular height ratios and maxillary canting remained stable ($p > 0.05$), indicating good long-term skeletal stability. Radiographic analysis revealed a progressive increase in bone density and volume on the affected mandibular side, evolving from "underfilled" to "filled" and "overfilled" morphology. Notably, the bone mass in the region between the pogonion and zygomatic buttress (PO–NB) increased substantially, with partial correction of ramus height deficiency. In terms of soft tissue, postoperative improvements in mandibular contour and facial midline symmetry were significant ($p < 0.05$), and 3D reconstruction confirmed increased soft tissue thickness. In conclusion, MDO provides effective and durable correction of skeletal deformities in HFM patients, accompanied by marked improvements in soft tissue appearance. This approach contributes to enhanced facial symmetry and demonstrates favorable long-term clinical outcomes.

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Assessing Visual Attention in Orthognathic Surgery Training Using Eye- Tracking Technology

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Kai Liu



Xinxi Wang



Xudong Wang

Abstract

Purpose

This study aimed to compare visual attention patterns between novices and expert surgeons in orthognathic procedures, and to provide empirical evidence for developing optimized surgical training strategies.

Methods

Using eye-tracking technology, we monitored the visual attention distribution of novice and expert participants while they observed orthognathic surgery videos. The percentage of fixation duration on defined areas of interest (surgical targets, primary surgeon's instruments, and assistant's instruments) during different surgical phases was analyzed. Between-group comparisons were performed using repeated-measures factorial ANOVA.

Results

Across all surgical phases, novices demonstrated significantly longer fixation durations on surgical targets compared to experts ($p<0.05$). During critical procedures including maxillary segment separation in Le Fort I osteotomy and mandibular splitting in bilateral sagittal split osteotomy, novices also showed greater visual attention to the primary surgeon's instruments than experts ($p<0.05$).

Conclusions

The findings suggest novices require substantial cognitive resources to process surgical targets throughout orthognathic procedures, particularly focusing on the primary surgeon's instruments during bone separation phases. Targeted training emphasizing these elements may help reduce cognitive load and accelerate surgical skill acquisition.

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A Rare Case Report : Unilateral Squamous Synostosis with an Interparietal Bone

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Suryaning Rasyidah



Indri Lakhsmi Putri



Alexandria Stephanie Suparman



Eveline Keiza

Abstract

Introduction

Craniosynostosis is a rare condition (1:2000–2500 live births), with squamosal synostosis being an atypical form (<1% of cases). An interparietal bone, resulting from incomplete fusion of ossification centers, occurs in 0.4–8.33% of individuals and can appear in various forms and shapes depending on the failure of fusion of ossification centers. We present a rare case of unilateral squamous synostosis with an interparietal bone and developmental delay.

Case Description

A 14-month-old preterm low-birth-weight infant was being referred by a pediatrician and presented with asymmetrical head shape, global developmental delay, inability to walk, speech delay, and a history of recurrent sleep-related seizures. Physical exam showed normal head circumference and cephalic index, with no abnormalities detected via ophthalmologic, otolaryngologic, or EEG evaluations. CT imaging revealed a fused right squamosal suture, interparietal bone, digital impressions in the right temporoparietal, ventriculomegaly, and arachnoid space narrowing due to suspicion of increased intracranial pressure. Surgical intervention using a coronal approach was performed, followed by suturectomy and removal of the interparietal bone.

Result

Postoperative follow-up showed no sign of complication. A CT imaging will be planned 6 months post-op along with routine developmental progress tracking.

Conclusion

A squamous synostosis with interparietal bone is one of the rare forms of craniosynostosis. A decision made in the need or the time of surgery depends on the presence of symptoms or signs, which vary based on suture involvement and fusion severity, and is decided with a multidisciplinary approach. The goal of surgery is to provide optimal space allowing brain expansion for better growth and development, preventing raised intracranial pressure or abnormal vein drainage and postoperative improvements in both function and aesthetics.

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Reconstruction of Orbital Floor Defect with Free Flaps after Maxillectomy: Experience From a Tertiary Hospital in Indonesia

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Regina Putri Apriza



Kristaninta Bangun

Abstract

Background

Despite the tremendous evolution throughout the years, there are fewer reports of orbital floor reconstructions in maxillectomy than mandibular reconstructions. This study aims to assess the results of orbital floor reconstruction following maxillectomy using free flaps.

Methods

This case series study was performed at a Tertiary Hospital (Cipto Mangunkusumo Hospital) in Jakarta, Indonesia. Data was collected for 1 year (October 2023 until October 2024). Patients underwent free flap reconstruction of the orbital floor after maxillectomy are included in this study

Results

Three patients had bony reconstruction with free fibular flap, and 1 had soft tissue reconstruction (radial forearm free flap) combined with bone graft, 1 patient use orbital mesh. Eye movement and visual acuity was normal in all of the patients. There were no abnormal globe position or diplopia found. Esthetic satisfaction was also good in all of the patients.

Conclusion

Following a thorough maxillectomy, orbital floor reconstruction has produced good results with free tissue transfer. An excellent functional and aesthetic result was obtained. A larger study with sufficient power and an equal number of patients in each group would be required to ascertain whether our data supports a bone orbital restoration. The most popular option when considering a bone repair is still the free fibula flap.

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Quantifying the role of synchondroses in craniofacial growth: insights from an FGFR3 mouse model

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Abstract

The growth dynamics of the skull base are a critical determinant of overall craniofacial architecture. While synchondroses mediate this growth process via endochondral ossification, their specific contributions and regulatory mechanisms remain incompletely characterized. Synchondroseal activity is regulated by both intrinsic genetic factors, notably members of the Fibroblast Growth Factor Receptor (FGFR) family, and extrinsic biomechanical forces, such as those exerted by the expanding brain. Dysregulation of these processes, particularly involving FGFR pathways, can lead to significant craniofacial malformations like those seen in achondroplasia or syndromic craniosynostoses like Crouzon syndrome.

This study aims to clarify the fundamental roles of skull base synchondroses in normal and pathological craniofacial development, focusing on FGFR3-related signaling, and their ontogeny. The goal being to inform the development of novel therapeutic strategies for congenital and acquired craniofacial deformities.

This study compares wild-type (WT) mice alongside an established FGFR3Y367C mutant mouse model of achondroplasia across key prenatal and postnatal developmental stages. The research program encompasses three specific aims:

Using an experimentally validated framework we show that changes in synchondroses activity and changes in skull base morphology are correlated over the course of skull base morphogenesis. This work paves the way for potential new surgical treatments to rescue skull base growth in malformative pathologies.

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Grey matter development in patients with metopic craniosynostosis.

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Marie-Lise van Veelen



Henry Vrooman



Irene Mathijssen

Abstract

Background: Metopic synostosis (MS) patients have an increased risk of neurodevelopmental disorders, despite minimal risk of intracranial hypertension. While premature suture fusion and the resulting mechanical constraint have been proposed as contributing factors, emerging evidence indicates that intrinsic brain malformations may repre-sent the primary underlying pathology. Cortical thickness (CT), cortical volume (CV), and cortical surface area (CSA) alterations have been implicated in neurodevelopmental disorders, yet their role in MS remains unclear. This study investigates whether these cortical parameters are altered in MS patients compared to healthy controls.

Methods: T1-weighted MRI scans from preoperative MS patients and age-matched controls were processed using the Infant FreeSurfer pipeline to quantify CT, CV, CSA and total intracranial volume (TIV). Linear regression models, adjusted for age, sex, and TIV were used to compare global CT, CV, CSA between groups, with secondary analyses assessing lobe-specific CT, CV and CSA.

Results: 66 MS patients and 32 controls (median age at MRI 8.56 months [IQR 4.90] and 12.36 months [IQR 9.68], respectively) were included. No significant differences were found in global CT ($p=0.329$), total CV ($p=0.084$) and total CSA ($p=0.443$) in patients compared to controls. CT and CSA demonstrated a nonlinear association with age ($p<0.001$). TIV strongly predicted CV ($R^2=84.25\%$, $p<0.001$). Lobar analyses showed reduced temporal CT and CV ($\beta = -0.2047$, $p = 0.045$ and $\beta = -8.510$, $p = 0.0452$) and parietal lobe CT ($\beta = -0.0141$, $p = 0.043$) in controls, with a significant negative association for parietal lobe CT at early stages of life. No significant differences were observed in the lobar analysis of CSA.

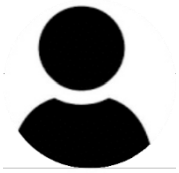
Conclusion: MS patients exhibit preserved global CT, CV and CSA, with no evidence of gross morphological constraints. However, lobe-specific variations suggest intrinsic neurodevelopmental mechanisms may underlie associated cognitive impairments. These findings shift the focus from mechanical deformation to fundamental brain development pathways in MS patients.

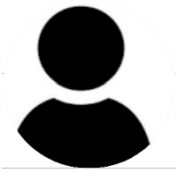
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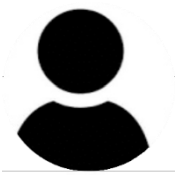
Facial Feminization Surgery: Lessons learned from first 2000 cases and from Human and Artificial Intelligence studies.

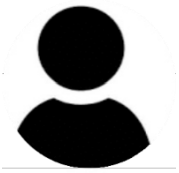
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James Bradley


Kuldeep Singh


Jackie Albert


Joshua Choe


Meghan Miller

Abstract

Introduction

Facial Feminization Surgery (FFS) with facial feature modification has emerged as an important aspect of social gender confirmation for the trans-women; however, we are still learning by asking some of the following questions: Which facial region is most important? Should procedures be staged or all at once? How should different types of mandibular contouring and orthognathic surgery be utilized? How should soft tissue laxity be dealt with depending on age? Is osseous virtual planning or 3D morphing with the patient valuable? We used human and artificial intelligence to answer these questions as they relate to our cases.

Methods

For outcome analysis, we used 4 neural networks (AI which have been trained to recognize facial images to assess gender) and crowd sourcing public opinion for gender typing (n>1000; varied based on study); FACE-Q surveys were used to measure patient-reported facial aesthetic outcome, and PROMIS surveys were used to assess psychosocial outcomes (Anxiety, Depression, Fatigue, Meaning and Purpose).

Results

I: The outcome of 12 different individual FFS procedures (eg. osseous genioplasty vs rhinoplasty) or regions (eg. Forehead vs chin) showed that all or the nasofrontal region (frontal sinus setback/rhinoplasty) were the most important region to modify (data to be shown); II. All-in-one surgery had benefits over staged approach with respect to time of procedure, cost, and outcome (complications, patient satisfaction-data to be shown); III.Mandibular contouring (inferior border resection, angle reduction, Double jaw surgery with CCW occlusal plane rotation) is dependent on patient anatomy and preferences (data to be shown). IV. Osseous virtual planning improves efficiency and accuracy (based on CT volumetric comparison-data to be shown); V. 3D morphing with patient improves perceived outcomes and reduces revision rate.

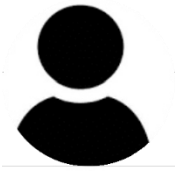
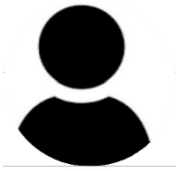
Conclusion

For FFS feature change we are learning from as we do a larger volume of cases and as we continue with objective research to improve planning, operative techniques, and perioperative care.

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Evaluation of Airway Management Techniques in Complex Craniomaxillofacial Fracture Surgery: Retromolar, Submental, and Tracheostomy Intubation Approaches

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Wenbin Zhang **Jianfei Zhang**

Abstract

Background

Complex craniomaxillofacial fractures often involve concomitant nasal and skull base fractures, precluding nasotracheal intubation. Conventional orotracheal intubation obstructs the surgical field and hinders occlusal relationship restoration, making airway management a significant challenge. This study evaluates the efficacy of retromolar, submental, and tracheostomy intubation in such cases.

Methods

A retrospective analysis was conducted on 68 patients with severe craniomaxillofacial fractures who could not undergo nasotracheal or standard orotracheal intubation. Intubation approaches included retromolar (n=26), submental diversion (n=32), and tracheostomy (n=10).

Results

All surgeries were completed successfully. In the retromolar group, two patients required the extraction of buccally impacted maxillary molars before intubation. In the submental group, two cases exhibited transient intraoperative increases in airway pressure, with no significant complications; one patient developed a postoperative submental skin infection, which resolved with antibiotics. In the tracheostomy group, two patients reported neck scarring.

Conclusions

For complex craniomaxillofacial fractures with contraindications to nasal intubation, retromolar intubation is feasible if sufficient molar space exists. If retromolar access is inadequate, submental diversion serves as a viable alternative. Tracheostomy remains optimal for patients requiring prolonged ventilatory support.

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Neurological Outcomes in Patients with Unilateral Coronal Craniosynostosis: A Matched Cohort Study

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Yizhuo Shen

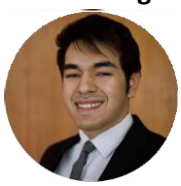

Samira Glaeser-Khan


Chi Ya Yang

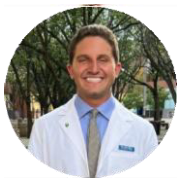

Omar Allam


Paula Flores Perez


Melanie Vassallo


Andrew Salib


Victoria Kong


Jake Moscarelli


David Colen


Michael Alperovich

Abstract

Background

Non-syndromic unilateral coronal craniosynostosis leads to asymmetric craniofacial development, including anterior plagiocephaly and orbital asymmetry. It is associated with ocular anomalies and abnormal neurodevelopment; however, prior studies have been limited by small sample sizes. This study utilizes the largest cohort to date to examine the associations between unilateral coronal craniosynostosis and neurological as well as visual complications.

Methods

A matched retrospective cohort study was conducted using the Epic Cosmos database (Verona, WI) from January 2017 to March 2025. Patients with unilateral coronal craniosynostosis (n=1,474) were matched 1:1 to pediatric controls without craniosynostosis by age, sex, race, and ethnicity. Outcomes assessed included amblyopia, strabismus, hemianopia, cortical blindness, diplopia, unspecified visual field defects, Chiari malformation, and balance disorders. Odds ratios (OR), risk differences (RD), and risk ratios (RR) were estimated using logistic and Poisson regression models, with standard errors clustered by matched pair.

Results

A total of 1,474 patients were diagnosed with unilateral coronal craniosynostosis, with an average age of 1.34 years (SD: 1.50). Of these, 614 patients (41.7%) underwent craniosynostosis surgery at an average age of 0.83 years (SD: 0.84). Compared to matched controls, patients exhibited significantly higher rates of amblyopia (risk difference [RD] = 17.2%), Chiari malformation (RD = 0.5%), strabismus (RD = 19.8%), diplopia (RD = 0.2%), unspecified visual field defects (RD = 0.1%), and balance disorders (RD = 0.1%), all with $p < 0.001$. Surgical intervention was associated with increased odds of amblyopia (odds ratio [OR] = 1.86, $p < 0.001$) and strabismus (OR = 1.70, $p < 0.001$)**Conclusions**

These results show that children with unilateral coronal craniosynostosis have an elevated risk of multiple neurological and vision disorders, which underscores the need for comprehensive and early ophthalmologic and neurologic evaluations to prevent exacerbation of other cognitive and developmental effects associated with craniosynostosis.

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Patient and Family Perspectives on Tissue Engineering in Microtia Reconstruction

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Abstract

Introduction

Tissue engineering (TE) involves the application of biomaterials, cells, and growth factors to restore or replace deficient tissues. With this advancement, understanding the patient perspective is crucial for effectively integrating TE into surgical practice and guide future TE-based innovations.

Aims

This study aims to evaluate the perspectives of patients and guardians levels of awareness, comprehension, and interest in TE, along with concerns related to the adoption of tissue-engineered solutions.

Methods

A survey and educational material were distributed to microtia patients. Survey responses were analyzed comparing demographic factors, degrees of TE awareness, barriers to reconstruction, and hesitations amongst patients. Surveyors were assessed on a likert scale and comparative analysis with two sample t-testing was used to observe trends in responses.

Results

A total of 40 surveys were recorded. White patients indicated greater familiarity with TE (3.00 v. 2.13, $p<0.05$). Following the introduction of TE educational material, more than half of the respondents (n = 26/40) expressed an interest in TE as a reconstructive option. Families who indicated cost serves a role in their willingness to choose TE have a greater understanding of TE (2.59 vs. 1.67, $p<0.05$). Families who indicated a willingness to travel for TE were more comfortable with technology in surgery and TE approaches (3.92 vs. 3.00 and 3.87 vs. 3.20; $p<0.05$ and $p<0.05$). Those who indicated trust TE are interested in learning more about TE and are more interested in TE reconstruction (4.01 vs. 3.00 and 3.90 vs. 2.50; $p <0.05$ and $p<0.01$).

Conclusion

TE is an unfamiliar concept for most microtia patients, however, most expressed interest in learning more. Cost, culture, travel, and trust in TE serve an important role in patient willingness to choose TE reconstructive options.

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Outcome of Cranial Defects After Surgical Correction of Syndromic Craniosynostosis

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Yueqing Wang



Chenbin Dong

Abstract

Objective

Investigation of Healing Outcomes in Cranial Defects Following Cranial Vault Remodeling for Syndromic Craniosynostosis in Pediatric Patients

Methods

A retrospective analysis was conducted on syndromic craniosynostosis patients undergoing surgical treatment in our Department of Plastic Surgery from January 2015 to December 2020. Postoperative thin-slice CT scans (slice thickness: 0.625 mm) at 1 month and 3 years were analyzed. Using the PACS system, cranial defect dimensions (length, width, and area) were measured under standard MPR windows. Inclusion criteria: 1. Diagnosis of syndromic craniosynostosis; 2. Fronto-orbital advancement with cranial vault remodeling. Exclusion criteria: 1. Prior posterior cranial vault distraction osteogenesis; 2. Incomplete postoperative CT data.

Results

Sixteen patients with syndromic craniosynostosis met the inclusion criteria (12 males, 4 females). The mean cranial vault defect area at 1 month postoperatively was 11.23 ± 3.52 cm^2, with left and right temporal defects measuring 4.34 ± 1.21 cm^2 and 5.56 ± 1.67 cm^2, respectively. At 3 years postoperatively, the cranial vault defect area decreased to 2.89 ± 1.02 cm^2, while the left and right temporal defects further reduced to 0.98 ± 0.21 cm^2 and 1.04 ± 0.18 cm^2, respectively.

Conclusion

Pediatric patients with syndromic craniosynostosis may exhibit incomplete osteogenesis following cranial vault remodeling, with a higher propensity for residual defects in the cranial vault compared to the temporal regions.

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Optimal Diagnostic and Treatment Practices for Facial Dysostosis Syndromes: A Clinical Consensus Statement Among European Experts

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Victor L. van Roey



Willemijn F.E. Irvine



Sarah L. Versnel

Abstract

Background

Facial dysostosis syndromes (FDS, i.e., Treacher Collins, Nager, and Miller syndromes) are rare congenital conditions impacting facial development, often leading to diverse craniofacial abnormalities. This study addresses the scarcity of evidence on these syndromes about optimal diagnostic and treatment practices.

Methods

To overcome this scarcity, European experts from ERN CRANIO collaborated to develop a clinical consensus statement through the Delphi consensus method. A systematic search of Embase, MEDLINE/PubMed, Cochrane, and Web of Science databases was conducted until February 2023. The quality of evidence was evaluated using various tools depending on the study design. Statements were subsequently formed based on literature and expert opinion, followed by a Delphi process with expert health care providers and patient representatives. In total, ninety-two clinicians from 13 ERN- CRANIO centres and three patient representatives rated each statement on a 9-point Likert scale; consensus required a mean ≥ 7.0 with ≤1 outlier.

Results

Over 3 voting rounds, consensus was achieved on 92 (46.9%), 58 (59.2%), and 19 (70.4%) statements, respectively. These statements cover the topics of (1) general care; (2) craniofacial reconstruction; (3) the eyes and lacrimal system; (4) upper airway management; (5) genetics; (6) hearing; (7) speech; (8) growth, feeding, and swallowing; (9) dental treatment and orthodontics; (10) extracranial anomalies; and (11) psychology and cognition. Priority research gaps were identified in orbito-zygomatic reconstruction techniques, decannulation criteria, feeding and swallowing management, PROM validation, and mitigation of neurodevelopmental risks.

Conclusions

The current clinical consensus statement provides the first Europe-wide framework for optimal diagnostic and treatment practices and identifies key research opportunities for FDS. This consensus statement represents a significant advancement in FDS care, underlining the commitment of health care professionals to improve the understanding and management of these rare syndromes in Europe.

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Ethnicity-Based Differences in Psychosocial Outcomes in Hispanic and Non-Hispanic Patients With Cleft Lip and Palate

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Nikhil Shah


Andreina Gonzalez


Van Hoang


Omotayo Arowojolu


Douglas Olson


Sharon Vargas


Olga Guijon


Roza Mahdiyar


Touran Zadeh


Miles Pfaff


Raj Vyas


Cindy Vu

Abstract

Background

Cleft lip and palate (CL/CP) are congenital disorders affecting individuals of all races, especially Asian, Native American, and Hispanic populations. These conditions can cause medical complications like feeding and speech issues, as well as significant psychosocial effects. The Patient-Reported Outcomes Measurement Information System (PROMIS) evaluates emotional health across diverse groups. While studies indicate CL/CP patients may face cognitive and emotional challenges, there is a lack of research comparing psychosocial outcomes between Hispanic and non-Hispanic patients. This study aims to fill that gap.

Methods

Participants were recruited from a tertiary care children's hospital for this cross-sectional study. Inclusion criteria involved patients who had undergone or were being evaluated for surgical treatment. Psychosocial outcomes, including family and peer relationships, anger, anxiety, depression, and stress levels, were assessed using PROMIS self- report forms on a Likert scale. T-tests were conducted to analyze differences between Hispanic and non-Hispanic participants.

Results

A total of 704 patients, aged 5 to 21 years, participated in the study, including 128 diagnosed with CL/CP. Among them, data were collected from 85 Hispanic and 43 non- Hispanic patients with CL/CP. Comparisons of psychosocial outcomes showed no significant differences between the groups in family relationships ($M=4.45$, $p=0.29$), peer relationships ($M=3.88$, $p=0.37$), anger ($M=2.24$, $p=0.82$), anxiety ($M=2.12$, $p=0.68$), depression ($M=1.81$, $p=0.5$), or stress ($M=2.05$, $p=0.97$), despite adequate statistical power.

Conclusions

No significant differences were found in psychosocial outcomes between Hispanic and non-Hispanic patients with CL/CP regarding family relationships, anger, anxiety, depression, and stress. This finding is particularly notable considering the importance of the family unit in Latino culture, suggesting a need for further research in this area.

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Three-Dimensional Computed Tomographic Analysis of Mandibular Deformity in Children with Type IIA Craniofacial Microsomia Based on Skeletal Subunits

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Lei Li


Zhiyong Zhang

Abstract

Objective:
This study aimed to analyze the morphological characteristics of mandibular skeletal subunits in patients with type IIA craniofacial microsomia (CFM) using three-dimensional computed tomography (3D-CT), with a focus on identifying underdeveloped skeletal regions for targeted treatment. A secondary objective was to compare mandibular structures across different age groups to assess growth potential relevant to treatment planning.

Materials and Methods:
The study included 55 patients (aged 6–17 years) diagnosed with type IIA CFM and 55 sex- and age-matched non-CFM controls. Three-dimensional reconstructions of craniofacial CT scans were used to define anatomical landmarks. The mandible was segmented into skeletal subunits, and linear and angular measurements were performed.

Results:
The 110 participants were stratified into four groups based on condition (CFM vs. non-CFM) and age (6–11 years vs. 12–17 years). CFM patients exhibited the greatest asymmetry in the condylar unit, with more pronounced asymmetry in the mandibular ramus than in the body. Significant differences were observed in all measured parameters between age groups, except for the mandibular symphysis unit. Control groups demonstrated consistent mandibular symmetry across age groups. Additionally, no age-related progression in mandibular asymmetry indices was detected.

Conclusion:
Our findings indicate that mandibular deformity in CFM primarily affects the condylar unit, with significant multi-regional asymmetry. However, no evidence suggests that asymmetry in any specific region progresses with age.

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Associations Between FGFR-Mutations and Clinical Presentation in Crouzon-Pfeiffer Syndrome

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Abstract

Background

Crouzon-Pfeiffer syndrome is caused by mutations in FGFR1, FGFR2, or FGFR3 and shows significant phenotypic variability. The extent to which specific pathogenic variants drive distinct clinical subtypes remains unclear, limiting precision in counseling and prognosis. Using the largest cohort to date, this study investigates genotype- phenotype associations and functional outcomes in Crouzon-Pfeiffer syndrome.

Method

This multicenter cohort study across eight European craniofacial centers (2004– 2024) included patients with genetically confirmed Crouzon-Pfeiffer syndrome. Clinical data included the presence of severe obstructive sleep apnea (OSA) and airway management, hydrocephalus treatment, presence and type of other major anomalies (EUROCAT classification), and educational level.

Results

a total of 353 patients were included. Eighty-three distinct pathogenic variants were identified, with 81 located in FGFR2 with hotspots at codons 290 (5 variants, 17 patients) and 342 (7 variants, 105 patients). Severe OSA requiring intervention was seen in 174 patients across 36 mutations. Tracheostomy was needed in 17 mutations, with Cys342Ser (86%, 25/29), Cys342Arg (85%, 23/27), and Ala391Glu (84%, 16/19) showing the highest tracheostomy rates. Hydrocephalus affected 98 patients (37 mutations), with 29 variants requiring VP shunting. A wide range of major congenital anomalies was presented. Cys342Arg showed the highest rates of hearing loss (56%, 15/27) and globe luxation (33%, 9/27), while Cys342Ser was associated with elbow/knee contractures (38%, 11/29). Thirty-four mutations showed no major anomalies. Special education placement was highest for Cys342Arg (23%, 14/27), followed by Cys278Phe (8%, 5/28).

Conclusion

These findings show that specific FGFR mutations, particularly cysteine substitutions at codon 342, are strongly associated with severe functional complications, while 34 variants carry lower burden. By mapping mutation-specific clinical phenotypes and outcomes, this study refines prognostic accuracy and enhances risk-based (pre)natal counseling in Crouzon- Pfeiffer syndrome.

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Maxillofacial Fractures in Pediatric Patients: Orbital Trauma & The Biomechanical Link to Cervical Spine Injuries

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Abstract

Background:

Maxillofacial fractures in adults are known to carry risk for concomitant cervical spine injuries (CSI), but pediatric-specific risks remain less defined. This study evaluates mechanisms, fracture patterns, and associated CSI in pediatric facial trauma across two decades.

Methods:

A retrospective review was conducted of patients under 18 with CT–confirmed maxillofacial fractures secondary to blunt trauma, treated at a tertiary children's hospital from 2002–2024. Syndromic patients were excluded. Patients were stratified into age groups (newborn 0–1 years, infant 1–4, child 4–12, adolescent 12–19) and by mechanism (fall, motor vehicle accident [MVA], assault, other). CSI incidence was compared across fracture categories (orbit, mandible, maxilla, other) using Chi-squared or Fisher's exact tests, with subgroup analyses by age and mechanism.

Results:

A total of 402 patients met inclusion criteria. Overall CSI incidence was 2.2% (n=9). CSI occurred in 3.3% of orbital fractures (6/180), 6.3% of mandibular (3/48), and 1.4% of "other" fractures (1/74); no CSIs were seen in maxillary fractures (0/100). Compared head-to-head, mandibular fractures carried a greater CSI risk than maxillary (6.3% vs 0%, p=0.033); all other comparisons were nonsignificant. By age strata, infants demonstrated the highest CSI rates, particularly with mandibular fractures (33.3% vs orbit 6.2% vs maxilla/other 0%, p=0.057). Mechanism-specific analysis revealed that infants with falls (χ^2=8.97, p=0.030) and infants with MVAs (χ^2=6.00, p=0.050) had significant mandibular fracture associations with CSI. In adolescents, orbital fractures trended toward higher CSI risk (4.2% vs 0.9%), though nonsignificant (p=1.56). Surgical intervention was most frequent in orbital fractures compared to other fracture types (39.3% vs 24.4%, p=0.001).

Conclusions:

In pediatric facial trauma, mandibular fractures carried the greatest CSI risk, particularly in infants after falls and MVAs. Orbital fractures demonstrated elevated but nonsignificant CSI risk across age groups. These findings may

reflect unique biomechanical features of pediatric anatomy, including a proportionally larger upper-to-lower facial ratio facilitating force transmission to the cervical spine. Careful cervical spine evaluation is warranted in pediatric trauma patients.

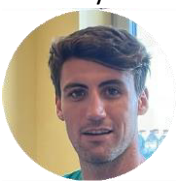
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Airway, Growth, and Function: A Longitudinal Study of Early Mandibular Distraction Osteogenesis in Pierre Robin Sequence

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Mattia Moretti **Fabio Mazzoleni** **Alejandro J. Piza Moragues** **Giorgio Novelli** **Maria C. Meazzini**

Abstract

Introduction

Pierre Robin Sequence (PRS) is a congenital condition marked by mandibular hypoplasia, glossoptosis, and upper airway obstruction (UAO), occurring either in isolation or within syndromic contexts. When conservative measures such as prone positioning and airway adjuncts prove insufficient, surgical intervention becomes necessary. Mandibular Distraction Osteogenesis (MDO) has emerged as the treatment of choice, offering rapid resolution of airway compromise. This study evaluates the long-term skeletal, functional, and dental outcomes following early MDO, focusing on mandibular growth patterns and the incidence of postoperative and developmental complications.

Materials and Methods

A retrospective analysis was conducted on a cohort of 21 patients presenting with severe mandibular hypoplasia, including 11 cases of isolated Pierre Robin Sequence (PRS) and 10 cases associated with syndromic forms. All patients underwent MDO before six months of age. Lateral skull radiographs were systematically obtained at three time points: preoperatively, immediately following the completion of distraction, and during extended follow-up. To ensure consistency across radiographic assessments, internal calibration was performed using either the distractor length or, when applicable, the diameter of the endotracheal tube as reference standards. Cephalometric analyses were employed to quantify mandibular elongation, evaluate the stability of skeletal changes over time, and assess potential relapse.

Results

The mean age at the time of surgery was 54.2 ± 47 days, with a mean follow-up duration of 6.37 ± 2 years. The average mandibular elongation achieved was 25.28 ± 13.4 mm, with stable maintenance over the observation period. Mild phenotypic relapse was noted exclusively in syndromic PRS cases, likely reflecting intrinsic growth disturbances; isolated PRS patients exhibited harmonious mandibular growth thereafter. No sensory deficits or impairments in lip mobility were recorded. Dental evaluation revealed minimal anomalies, with only two cases of isolated premolar and molar agenesis, unrelated to the surgical procedure. Importantly, no patient reported aesthetic concerns related to the scars.

Conclusions

MDO, when performed in early infancy and guided by thorough preoperative planning — including radiological imaging and, in select cases, stereolithographic modeling — offers a durable and safe solution for airway management in PRS patients. The procedure ensures stable skeletal correction, preserves functional integrity, and minimizes long-term complications.

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Functional Airway and Feeding Outcomes Following Mandibular Distraction Osteogenesis in Pediatric Pierre Robin Sequence Patients

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Abstract

Background

Pierre Robin Sequence (PRS) presents with micrognathia, glossoptosis, and upper airway obstruction, leading to feeding and respiratory difficulties. Mandibular distraction osteogenesis (MDO) improves signs of airway obstruction, yet the relationship between anatomic and physiologic improvement remains underexplored. This study evaluates the impact of MDO on airway patency, feeding, and respiratory support.

Methods

A retrospective review included 31 PRS patients who underwent MDO (2021-2024) at a tertiary pediatric hospital. Inclusion criteria required pre/postoperative direct laryngoscopy (DL) and polysomnography (PSG). Data included demographics, comorbidities, feeding modality, PSG metrics, oxygen requirements, intubation history, and distraction length. Wilcoxon signed-rank and McNemar's tests evaluated differences; Pearson correlation assessed distraction length and DL grade improvement.

Results

Median age at osteotomy was 3.5 months [IQR 2.1–12.1], with an average follow up period of 26.3 months [range: 1-68 months]. Most had comorbidities: pulmonary (67.7%), CNS (64.5%), or cardiac (38.7%); 45.2% were syndromic. Postoperative PSG (mean: 2.18 months, range: 1-14 months post-MDO) showed significant respiratory improvement: median AHI decreased from 33.1 [95% CI: 15.2, 56.6] to 5.8 [95% CI: 3.0, 9.6] ($p<0.001$) and oxygen nadir improved from 82.5% [95% CI: 73.2, 86.8] to 89.5% [95% CI: 84.2, 91.0] ($p=0.02$). Combined oral/enteral feeds increased (35.5% to 64.5%) and enteral-only feeds decreased (25.8% to 19.4%) ($p=0.025$). The proportion of patients with Grade 4 laryngoscopic findings decreased from N=11 (40.7%) preoperatively to N=1 (3.8%) postoperatively, while Grade 1 findings increased from N=2 (7.4%) to N=14 (53.8%). A moderate negative correlation ($r = –0.43$) was found between distraction length and DL grade, with greater distraction correlating with DL grade improvement, though influenced by outliers. No significant correlation was found between DL grades and PSG parameters pre- or postoperatively. Preoperative and postoperative drug induced sleep endoscopy (DISE) scores were reviewed, but sample size (N=8) was insufficient for meaningful analysis

Conclusion

Anatomic and physiologic measures of OSA, as well as feeding, improved after MDO in patients with PRS. Greater distraction length may support airway improvement. While DL offers valuable insight into anatomic changes, correlation with functional outcomes remains unclear. These findings emphasize the need for individualized care and multimodal assessment strategies.

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Machine Learning to Aid Craniofacial Surgery Preoperative Planning

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Abstract

Craniosynostosis is a condition in which an infant's cranial sutures prematurely fuse, often requiring surgery to correct cranial anatomy. Surgical planning uses computed tomography (CT) to create images of the skulls. Ionising radiation emitted during these scans increases the risk of malignancy, particularly in infants. This study explores the feasibility of predicting internal skull geometry from external, radiation-free head scans. Fifty CT scans of subjects affected by sagittal craniosynostosis (age range 2 days – 7.6 months) were used to build both a skull and head statistical shape model.

Principal Component Analysis (PCA) identified the most significant modes of variation. Several machine learning models were developed and tested to predict the first three skull modes using the first three head modes, including LASSO, Linear Regression, Ridge Regression, and Support Vector Regression (SVR). The models were trained and optimised using Bayesian hyperparameter tuning and cross-validation. LASSO achieved the best performance for Mode 1, LASSO and Linear Regression produced comparable results for Mode 2, while SVR performed well for Mode 3. Using the predicted modes, 10 unseen skulls were reconstructed from the relative head models, achieving an average mean reconstruction error of approximately 2mm. These results suggest that skull prediction based on radiation-free external head scans is both feasible and accurate, while also highlighting the need for larger datasets and automated preprocessing to improve reliability and scalability for clinical use.

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Beyond Osteotomies: Transforming Midfacial Advancement with Enhanced Sutural Protraction

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Mattia Moretti



Federica Corradi



Luca Autelitano



Valeria M. Augusta Battista



Gabriele Canzi



Giorgio Novelli



Maria Costanza Meazzini

Abstract

Introduction

Midface hypoplasia constitutes a common diagnostic finding, presenting both as part of complex craniofacial syndromes and as an isolated dentoskeletal dysmorphism. Managing this deformity during skeletal growth presents significant therapeutic challenges, as surgical interventions are prone to high relapse rates, while orthodontic and orthopedic approaches exhibit variable efficacy in ensuring durable midfacial advancement.

Materials and Methods

The Meazzini-Mazzoleni Enhanced Sutural Protraction (MMESP) protocol was assessed as an orthopedic-orthodontic solution for the correction of severe midfacial hypoplasia. A series of ten patients, with and without associated craniofacial anomalies, were managed at two ERN CRANIO centers: Fondazione IRCCS San Gerardo dei Tintori and ASST Santi Paolo e Carlo – Ospedale San Paolo. Inclusion was guided by the degree of circummaxillary suture maturation. Treatment entailed an initial phase of sutural activation, achieved via either palatal expansion or a modified Alternate Rapid Maxillary Expansion and Constriction (Alt-RAMEC) protocol. Midface advancement was then performed using a rigid external distractor anchored either skeletally or dentally, obviating the need for osteotomies. Stabilization following distraction was secured through temporary anchorage devices, intraoral elastics, or protraction face masks.

Results

Quantitative evaluation of treatment efficacy was performed through serial lateral cephalometric radiographs and computed tomography (CT) scans acquired pre-treatment, post-intervention, and at 12 months of follow-up. Superimposition of cephalometric tracings demonstrated a substantial and stable anterior displacement of the midface, with a mean advancement of 15.68 mm at A point, achieving complete correction of the skeletal deficiency. Three- dimensional CT reconstructions further substantiated these findings, delineating a displacement pattern mirroring the trajectory of a Le Fort III osteotomy, characterized by a cranio-caudal gradient with maximal forward projection at the level of the maxillary alveolar process. Additionally, tensile stresses applied along the circummaxillary sutures correlated with evidence of bone apposition, indicative of a biologically favorable skeletal remodeling response to orthopedic protraction forces.

Conclusions

These results validate the MMESP protocol as a highly effective orthopedic approach for the management of severe midfacial hypoplasia in the growing patient population. By capitalizing on the inherent plasticity of craniofacial sutures, this method offers a robust alternative to traditional surgical interventions, achieving excellent functional and morphological outcomes.

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Evaluation of pharynx in isolated cleft palate and Pierre-Robin syndrome with cleft palate

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Baihui Liu

Abstract

Objective

To investigate the difference between the three-dimensional structure cavity in patient with c isolated cleft palate and Pierre-Robin syndrome (PRS) with cleft palate.

Methods

Retrospective measurements of high need ratio (NR), velopharyngeal gap, soft palate length and long velopharyngeal depth (VPD) were taken from lateral and anteroposterior (AP) cephalometric radiographs of isolated cleft palate and PRS with cleft palate.

Results

A total of 29 isolated cleft palate and 30 PRS patients with cleft palate were included. The velopharyngeal gap, soft palate length and VPD of cleft palate were higher than those in PRS group. But there is no statistically significant difference of the NR values between the two groups (P=0.136).

Conclusion

NR and long VPD were contributing factors to velopharyngeal insufficiency (VPI) occurrence. The higher VPD in isolated cleft palate patients compared to PRS may reflect age-related assessment variability. However, the two groups show no significant difference in NR values, suggesting comparable velopharyngeal insufficiency between PRS and isolated cleft palate patients.

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Shape and Cranial Volume Maintenance after Fronto-Orbital Advancement for Metopic Synostosis

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Dorsa Toghani



Ezgi Mercan



Craig Birgfeld



Amy Lee



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Richard Hopper



Srinivas Susarla

Abstract

Background

The aim of this study was to quantify cranial volume and bandeau shape and measure the effect of fronto-orbital advancement (FOA) on 2-year morphometric outcomes in metopic craniosynostosis (MCS).

Methods

A retrospective chart review was conducted to identify patients who underwent FOA for metopic synostosis and a control cohort of age-matched patients with no craniofacial abnormalities was included. Cephalometric measurements and cranial vault volumes were calculated. Using axial vectors, a circularity measure was developed to evaluate the contour at the level of bandeau. The advancement distances were recorded near both zygomaticofrontal sutures and nasion on postoperative CTs. Bivariate and multiple linear regression analyses were completed.

Results

CTs at three timepoints for 88 patients with MCS, 84 CTs for control and 74 CTs for 2-yr control cohorts were included. Mean age at FOA was 10.7 months. MCS cohort had significantly lower preoperative circularity score than controls. After FOA, the circularity of MCS group increased but relapsed slightly at 2-year follow-up. At 2-year follow-up MCS group still had higher circularity scores than matched control cohort, indicating rounder forehead shape. In linear regression models, preoperative circularity was a significant predictor of 2-year circularity ($p=0.02$), while advancement distance and age were not ($p=0.60$, $p=0.88$). Advancement distance was negatively correlated with preoperative circularity ($rho=-0.33$, $p=0.004$). Total cranial volume was comparable between MCS and controls at all three timepoints. MCS had significantly smaller anterior vaults ($p<0.001$) and larger middle vaults ($p=0.03$) compared to controls. Anterior vault volume in MCS increased with FOA and total cranial volume was higher than controls. At 2-year follow-up, anterior vault in MCS cohort was again significantly smaller than controls ($p<0.001$) with middle vault compensating with larger volumes ($p=0.02$).

Conclusions

FOA is effective in normalizing cranial shape and volume in metopic synostosis with favorable morphometric outcomes at 2-year follow-up. Cranial shape improved from preop to postop and was comparable to controls at 2-year despite some relapse. The magnitude of bandeau remodeling negatively correlated with preoperative severity, where more severe trigonocephaly indicated further advancement and reshaping of the bandeau. Multi-variable regression revealed that preoperative severity was predictive of 2-year shape.

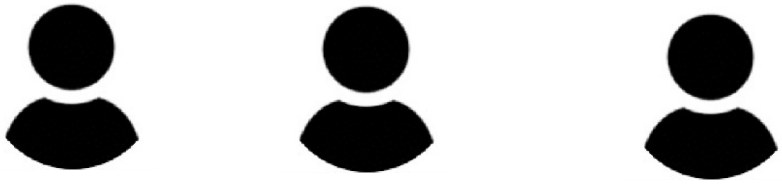
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Improving surgical outcomes in Craniofacial surgery by means of biofidelic 3D printed digital materials replicating paediatric skull cranial bone mechanics.

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Luke Smith **Sara Ajami** **Silvia Schievano** **Juling Ong**



David Dunaway **Noor ul Owase Jeelani** **Alessandro Borghi**

Abstract

This project focuses on developing a “bio-fidelic” 3D-printed material capable of replicating the mechanical behaviour of the infant skull during cranial distraction procedures, specifically for the treatment of scaphocephaly. Currently, pre-operative planning for such procedures is largely based on surgeon experience and clinical observation, lacking a standardized, mechanical testing platform. Previous research from the group has shown that the biomechanical properties of cranial bones significantly influence both short- and long-term surgical outcomes. These viscoelastic responses can be numerically predicted, laying the foundation for a more data-driven approach to surgical planning.

To replicate infant cranial bone mechanics, several materials—Vero Yellow, Rigur, Digital ABS Plus, and Durus—were 3D printed into dumbbell and rectangular shapes and tested for tensile and flexural properties following ASTM standards. However, their bending stiffness (1.01–1.85 GPa) was much higher than that of natural infant bone (average 546.7±380 MPa). To bridge this gap, two strategies were tested: (1) using digital materials combining rigid (Vero White) and flexible (Tango Plus) components, and (2) implementing lattice structures to reduce stiffness. Among tested configurations, lattice-structured samples most closely matched bone stiffness, with only an 8%±41% deviation, compared to up to 181% in solid samples.

Using preoperative 3D scans from eight male infants (average age 5.1±0.4 months) treated at GOSH with spring distractors, skull phantoms were created in two configurations: solid Vero White (VW) as control and lattice-based (LATT) as test models. Simulated surgeries with spring insertion were performed on these phantoms. Post-surgical spring openings were measured, showing that LATT phantoms (32.3±3.3 cm) were significantly closer to in-surgery measurements (35.0±2.6 cm) than VW phantoms (29.2±3.1 cm, $p = 0.0078$). Similarly, the cranial index (CI) in LATT phantoms (73.1%±2.7%) more accurately represented surgical outcomes than VW models, although the statistical difference with real surgical values was not significant due to data variability.

In summary, lattice-structured 3D printed skull phantoms successfully replicate the mechanical behaviour of infant skulls during cranial distraction. This innovation provides a powerful platform for accurate, personalized surgical planning and has potential applications in other cranio-maxillofacial procedures.

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Lambdoid Craniosynostosis and Neurological Risk: Findings from the Largest Matched Cohort Study

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Abstract

Background

Lambdoid craniosynostosis is a rare cranial deformity caused by premature fusion of the lambdoid suture, potentially restricting growth of adjacent brain regions, particularly the cerebellum and occipital lobe. While it is theorized to impair neurological functions such as vision and balance, definitive evidence linking lambdoid craniosynostosis to specific neurological outcomes remains limited. This study aimed to investigate associations between lambdoid craniosynostosis and neurological complications, including visual deficits, Chiari malformation, and balance issues, in the largest cohort study to date.

Methods

We conducted a matched retrospective cohort study using the TriNetX database, which included electronic medical records from 100 healthcare organizations. Patients diagnosed with lambdoid craniosynostosis (n=136) were matched 1:1 to pediatric controls without craniosynostosis by age, sex, race, and ethnicity. Outcomes included amblyopia, strabismus, hemianopia, cortical blindness, diplopia, unspecified visual field defects, Chiari malformation, and balance issues. The risk difference (RD) was reported for every outcome of interest.

Results

Compared to controls, patients with lambdoid craniosynostosis had significantly higher rates of: Chiari malformation (7.4% vs. 0%; RD=14.2, $p<0.001$) and Amblyopia (7.4% vs. 0%; RD = 7.4% $p<0.001$). There were no occurrences of diplopia, hemianopia, cortical blindness, or balance issues in either cohort.

Conclusions

Lambdoid craniosynostosis significantly increases the risk of Chiari malformation and amblyopia. Vigilant screening for these conditions is critical to enable timely intervention and optimize patient outcomes.

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Optimizing Free Tissue Transfer for Pediatric Scalp Reconstruction: A Systematic Review and Meta-Analysis of Donor Site Selection

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Abstract

Background

Microvascular free tissue transfer is the gold standard for extensive scalp reconstruction but poses unique challenges in pediatric patients due to limited donor site availability, small-caliber vessels, and concerns over growth- related morbidity. This systematic review evaluates outcomes of pediatric free flap scalp reconstruction to identify optimal donor site selection.

Methods

A systematic review was conducted to identify studies reporting on free flap scalp reconstruction in patients aged 0–17 years. Scalp replantations and pedicled flaps were excluded. Extracted data included demographics, flap type, defect etiology and size, and postoperative outcomes. Statistical analyses compared complication rates among flap types.

Results

Overall, 34 studies encompassing 105 patients met inclusion criteria. Most defects resulted from trauma or burns (73.3%), followed by malignancy (14.3%), infection (7.6%), and congenital anomalies (4.8%). The anterolateral thigh (ALT, 53.3%) and latissimus dorsi (LD, 26.7%) flaps were most commonly employed. ALT flaps were preferred in younger children, while LD flaps predominated in older children ($p<0.001$). Overall flap survival was 96.2%, with 19% of patients experiencing complications, 60% of which were minor. ALT flaps had fewer overall complications than other flap types (7.1% vs. 20-50%, respectively; $p=0.0015$) but demonstrated higher flap-related complication rates compared to LD flaps (100% vs. 70%; $p<0.001$).

Conclusion

Free flap scalp reconstruction in children is safe and effective, with a high flap survival. ALT and LD flaps are reliable options, though ALT may offer superior outcomes with lower complication rates. Individualized flap selection based on age and defect characteristics is critical to optimizing success in this anatomically and physiologically distinct population.

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Breed-Specific Risk Factors and Clinical Outcomes in Pediatric Head and Neck Dog Bite Injuries: A 14-year Retrospective Analysis

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Abstract

Background

Dog bites are a significant cause of pediatric injuries, leading to severe physical and psychological consequences. This study analyzes breed-specific injury patterns, management, and outcomes in dog bite cases over 14 years at a Level I pediatric trauma center.

Methods

A retrospective review of pediatric dog bite injuries that presented to the emergency department (ED) from 2010 to 2024 was conducted. Demographics, injury characteristics, breed, patient-dog relationship, management, and outcomes were assessed. Descriptive and statistical analyses were performed.

Results

A total of 430 pediatric patients (median age: 8.1 years, 61.3% male, 62.3% Black) were included, with 188 (43.7%) sustaining head and neck injuries. The most common sites were the lips (26.6%), cheek (20.3%), and complex multi-site injuries (32.3%). Head and neck injuries had the highest escalation of care, with 61.2% of cases requiring primary closure or greater intervention ($p<0.001$). Soft tissue loss and avulsion were significantly more common in this region compared to other sites ($p<0.001$), and ocular injuries frequently required specialist consultation and OR repair ($p<0.001$). Breed was identified in 38.6% of 430 cases; Pit bulls (N=75, 17.4%) were most frequently implicated followed by German Shepherds (N=13, 3.0%), Rottweilers (N=7, 1.6%) and Huskies (N=7, 1.6%). Among identified breeds, head and neck injuries were most common, occurring in 85.7% of Husky, 61.5% of German Shepherd, and 28.0% of Pit Bull bites ($p<0.001$). Considering all cases of identified breeds, Pit bulls were linked to higher number of soft tissue loss (N=17, $p=0.001$), avulsion (N=15, $p<0.001$), and fractures (N=5, $p=0.002$), and were the only breed linked to keloid formation (2.7%).Across the full cohort, patients managed by specialists had higher OR returns (7.4% vs. 0% for ED-managed, $p<0.001$) and longer hospital stays ($p<0.001$), likely reflecting the more severe nature of these injuries; infection and scar outcomes did not significantly differ.

Conclusion

Head and neck dog bites represent the most severe anatomical site in pediatric patients, requiring significant escalation of care. Specific breeds demonstrate a higher propensity for complex craniofacial injuries. These findings underscore the need for early specialist involvement, multidisciplinary management, and targeted prevention efforts with heightened vigilance for high-risk breeds.

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Postoperative Strabismus Rates in Unicoronal Synostosis: Distraction versus Remodeling

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Abstract

Background

Unicoronal synostosis (UCS) is frequently associated with ophthalmologic disorders, including strabismus, astigmatism, and amblyopia. Traditional fronto-orbital advancement remodeling (FOAR) has shown limited effectiveness in correcting orbital asymmetry and is associated with a high prevalence of ophthalmologic comorbidities. Fronto-orbital distraction (FOD) has emerged as a less invasive alternative with promising outcomes; however, comparative studies assessing ophthalmologic effects remain limited. This study examines the incidence of strabismus, astigmatism, and amblyopia following FOD and FOAR to determine which procedure is associated with lower ophthalmologic morbidity.

Methods

A retrospective analysis was conducted on 45 children with isolated UCS who underwent either FOD or FOAR. Ophthalmologic records and medical charts were reviewed, and statistical comparisons were performed using Fisher's exact test and Mann-Whitney U test, with a significance threshold set at $p < 0.05$.

Results

Sixteen patients treated with FOD and 29 treated with FOAR were included. The groups were comparable in age at surgery, gender distribution, laterality, and age at ophthalmologic examination. In the FOD group, 3 patients (18.8%) had strabismus and 1 patient (6.3%) had amblyopia, compared to 12 patients (41.4%) and 7 patients (24.1%), respectively, in the FOAR group. No significant differences were found in the rates of strabismus, astigmatism, or amblyopia between groups. However, odds ratios indicated a lower likelihood of strabismus (OR = 0.34) and amblyopia (OR = 0.22) following FOD, corresponding to approximately 66% and 78% reduced odds, respectively. Refraction variables (spherical and cylindrical) also showed no significant differences between groups.

Conclusions

The lower odds of strabismus and amblyopia following FOD suggest a potential trend toward reduced ophthalmologic morbidity, although no statistically significant differences were observed in the rates of strabismus, astigmatism, or amblyopia between the FOD and FOAR groups. These findings indicate that FOD may offer advantages over FOAR in minimizing ophthalmologic complications in patients with UCS. Further research with a larger sample size, currently being gathered by our group, is needed to validate these results and clarify possible comparative benefits of FOD.

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Examining Sociodemographic Disparities in Diagnostic Delays and Surgical Management of Non-syndromic Craniosynostosis: A 10-Year Review

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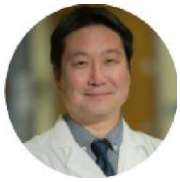

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Abstract

Background

Socioeconomic status (SES) and non-White race have been associated with delayed surgery and more invasive procedures in craniosynostosis. While attention to sociodemographic (SD) factors in craniosynostosis care has increased, literature on their impact on diagnostic delays, complications, and hospital stay remains limited. This study investigates the impact of SD factors on surgical management and outcomes in non-syndromic craniosynostosis, focusing on delays in diagnosis and intervention.

Methods

We conducted a retrospective review of patients undergoing craniosynostosis surgery from 2013 to 2023 at a pediatric tertiary hospital. Patients with syndromes or prior surgery were excluded. Demographic, diagnostic, surgical, and outcome data were collected. SES was assessed using the Area Deprivation Index (ADI). Primary outcomes included SD factors, type of surgery, age at diagnosis, age at first specialty appointment, and age at surgery. Secondary outcomes were postoperative complications and hospital stay. Statistical analyses included Mann-Whitney-U and Chi-squared/Fisher's Exact tests.

Results

Among 373 patients, the majority were male (66.0%), White (48.8%), English-speaking (86.1%), and privately insured (78.6%). Most patients resided in areas of low socioeconomic disadvantage based on ADI (74.1%). Patients undergoing open procedures (OP) were older at specialty appointments (6.6 vs. 1.9 months, $p<0.001$), diagnosis (8.1 vs. 2.2 months, $p<0.001$), and surgery (11.4 vs. 2.9 months, $p<0.001$). OP was more common among Black (56.9% vs. 32.0% White, $p<0.001$), Hispanic (60.0% vs. 42.4%, $p=0.030$), non-English speakers (61.5% vs. 41.1%, $p=0.007$), interpreter users (59.6% vs. 41.4%, $p=0.016$), and publicly insured patients (55.7% vs. 40.9%, $p=0.022$). Patients from areas of greater deprivation (ADI) had longer hospital stay (3.0 vs. 1.0 days, $p = 0.005$) and were more likely to require additional procedures (15.4% vs. 2.6%, $p = 0.047$). Complication rates did not significantly differ across SD groups.

Conclusion

Patients from lower SES, particularly Hispanic/Latinos, Black/African Americans and publicly insured, experience longer referral delays to specialists, leading to later age at surgery and higher likelihood of undergoing open procedures. These delays likely cause patients to miss the window for minimally invasive treatments, and they may be attributed to SD barriers, such as limited access to care, language barriers, or disparities in healthcare navigation.

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Impact of State Legislation on Regional Availability of Facial Feminization Surgeons in the United States of America

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Abstract

Background

Access to gender-affirming surgery (GAS) in the United State (US) has undergone significant changes in recent decades, largely influenced by evolving policies. One of the primary barriers to care remains a shortage of qualified providers, with notable geographic differences. This study explores the current geographic disparity of surgeons offering facial feminization surgery (FFS) in the US, with a focus on the impact of state legislation.

Methods

Surgeons performing FFS in 2023 were identified using five databases, with practice locations recorded. State and transgender population data were obtained from the U.S. Census Bureau and the Williams Institute. Surgeon density per 10,000 transgender individuals was calculated by state. Isochrone API software mapped counties within a two-hour drive of each surgeon. States were categorized by GAS-related legislation to assess surgeon availability by legal environment. Z tests assessed differences between groups. Analysis was conducted with Prism v10.4.0 (GraphPad, San Diego, CA).

Results

Surgeon density ranged from 0 to 23.3 per 10,000 transgender individuals, with 12 states having none. County-level access showed 68.5% of counties had no surgeons; 16.4% (520) had access to 1-3, 4.5% (143) to 4-5, and 10.6% (329) to 6 or more. In total, 31.6% of U.S. counties, representing 64.8% of the population, had access to at least one FFS surgeon. States with protective laws had an average of 3.03 surgeons per 10,000 transgender individuals, compared to 1.79 in neutral, 1.47 in restrictive, and 3.22 in shield law states. Most surgeons who practice FFS are located near population clusters, with increased availability in the Northeastern, Southeastern and Western US as opposed to Southwertern and Midwestern US, where availability is limited.

Conclusion

While most of the U.S. population has access to at least one FFS surgeon, access is limited outside urban centers, especially in the Midwestern and Central US regions where there are fewer urban clusters. States with restrictive GAS laws have lower surgeon density, while those with protective laws show higher availability. The combination of restrictive legislation and dispersed urban centers in Central and Midwestern states contributes to reduced access for transgender individuals in these areas.

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Gender Affirming Facial Surgery Improves Patient Satisfaction and Relieves Gender Dysphoria: A GENDER-Q and Gender Preoccupation and Stability Questionnaire Study

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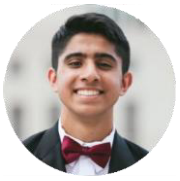

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Abstract

Background

Gender Affirming Facial Surgery (GAFS) alleviates gender dysphoria by aligning facial features with gender identity. Both bony and soft tissues may be addressed to render patients more attractive, with historical emphasis on refining the upper facial thirds. This study assessed the effects of FFS with the Gender Preoccupation and Stability Questionnaire (GPSQ) and the GENDER-Q-- a novel patient-reported outcome measure (PROM), evaluating the aesthetic, functional, and psychosocial effects of gender-affirming procedures and treatments specifically in the transgender population.

Methods

This study included 69 surveyed patients who either completed or were scheduled to undergo GAFS at a large academic medical center. Lower GPSQ and higher GENDER-Q scores reflect a positive outcome. Pre- and post-operative outcomes were compared using paired and unpaired t-tests. Spearman's correlation coefficients assessed relationships between the parameters assessed.

Results

GPSQ scores decreased significantly (-7.13 ± 1.61, $p < 0.001$). Significant improvements in post-operative GENDER-Q scores were observed across facial features, with the upper face (47.07 ± 5.60, $p<0.001$), nose (45.83 ± 6.83, $p<0.001$) and jaw (39.87 ± 6.47, $p<0.001$) showing greatest gains. Pre- to post-operative changes of dysphoria, as measured by the GENDER-Q, was associated with overall face ($r = 0.62$, $p < 0.001$), upper face ($r = 0.64$, $p < 0.001$), and chin ($r = 0.51$, $p =0.08$) score improvement. Furthermore, increase in overall facial satisfaction positively correlated with all facial features, strongest with upper face ($r=0.654$, $p<0.001$), nose ($r=0.586$, $p=0.002$), and chin ($r=0.618$, $p=0.001$).

Conclusion

This study is the first to evaluate GAFS using the GPSQ and the GENDER-Q, a novel population-specific PROM evaluating outcomes after gender affirming surgery. These validated measures show that GAFS improves facial satisfaction and alleviates gender dysphoria. Furthermore, our study suggests that patient outcomes are not beholden to individual facial subunits, and rather are the result of improved facial harmony based on patient-specific needs. An individualized patient-specific approach to FFS improves gender congruence and satisfaction while alleviating gender dysphoria.

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Quantification of Skeletal Paranasal Asymmetry in Patients with Unilateral Cleft Lip and Palate

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Abstract

Introduction

Patients with unilateral cleft lip and palate (UCLP) often exhibit asymmetric paranasal flatness of soft tissues. Despite clinical recognition of this asymmetry, skeletal paranasal asymmetry remains poorly quantified. Measuring skeletal landmark asymmetries can aid in planning surgical maxillary yaw corrections that simultaneously enhance paranasal symmetry and maxillary dental midline position.

Aims

This study aims to quantify skeletal paranasal asymmetry in patients with UCLP and establish a standardized method for measuring this asymmetry.

Methods

Skeletally mature patients with complete UCLP who were orthodontically prepared for orthognathic surgery between 2014 and 2023 were included in this study. Pre-surgical CBCTs were analyzed using Dolphin 3D. Anterior-posterior discrepancies between affected and unaffected sides were measured at the most lateral point of piriform aperture (PA) and 15 mm lateral to PA (15PA). A one-sample t-Test was conducted.

Results

Analysis of 30 patients (mean age 18-8 years, 13 female, 17 male, 20 left-sided, 10 right-sided) was completed. On the affected side, PA and 15PA were positioned 3.8 mm ($p < .05$) and 2.4 mm ($p < .05$) more posteriorly, respectively.

Conclusions

These results highlight the importance of assessing skeletal paranasal asymmetry during the pre-treatment stage, as pre-surgical orthodontics should maintain a maxillary midline deviation toward the affected side when yaw correction is indicated. This approach facilitates simultaneous correction of piriform projection and midline alignment during surgery and may reduce the need for secondary procedures, such as malar implants or fat injections, which add cost and morbidity. This study confirms the presence of skeletal paranasal asymmetry in patients with UCLP and establishes a standardized method for measuring this asymmetry using CBCT-based skeletal landmarks.

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A combined Machine Learning and Finite Element Modelling tool for the preclinical planning of Spring Cranioplasty

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Abstract

Background

Finite Element Analysis (FEA) has been effective in predicting surgical outcomes of spring- assisted cranioplasty (SAC) and posterior vault expansion (SAPVE), but lacks real-time capabilities. To address this, we developed a novel tool that integrates Machine Learning (ML) with FEA to allow real-time surgical predictions for SAC and SAPVE procedures.

Methods

Thirty SAC patients (aged 3.8 to 9.4 months) and forty-nine SAPVE patients (mean age 2.2 ± 1.6 years) were included. Preoperative CT scans were used to reconstruct skull geometries. A series of surgical scenarios were simulated by varying osteotomy configurations and spring placements, generating synthetic outcome datasets for both SAC (2356 cases) and SAPVE (716 cases). Statistical Shape Modelling (SSM) was applied independently to pre- and postoperative head shapes. For SAC, a multi-output support vector regression (SVR) model was trained using preoperative SSM shape modes and surgical parameters to predict postoperative modes. For SAPVE, a hybrid approach incorporating Random Forest and support vector regression was used. Model performance was evaluated using Mean Squared Error (MSE), Mean Absolute Error (MAE), and R^2 metrics.

Results

The ML models accurately predicted postoperative head shape modes for both SAC (MSE = 0.04; MAE = 0.12) and SAPVE (MSE = 1.25; MAE = 0.86). Prediction times were reduced from several hours (using traditional FEA) to a few seconds.

Conclusion

This ML-enhanced FEM approach offers real-time prediction of surgical outcomes, representing a major step toward intraoperative decision support. Prospective validation will be carried out using 3D pre- and postoperative photography.

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Developing Craniofacial Surgery in Vietnam – Raising the Floor and the Ceiling

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Abstract

Introduction

Vietnam (VN), a lower- middle-income country, has historically relied on visiting surgeons to perform complicated CF procedures due to underdeveloped CF surgical training. Nuoy Reconstructive International utilizes a strategy of clinical engagement, education development, and research infrastructure with a 20-year surgical partnership at Vietnam National Children's Hospital. Partnership has recently expanded to several other hospitals in the country. Here, we review the literature on previous CF engagements in VN and discuss the experience and evolution of Nuoy in building craniofacial expertise in VN.

Methods

A PubMed literature review was conducted with "VN craniofacial reconstruction; VN craniosynostosis; limitations in global craniofacial reconstruction; middle income countries craniosynostosis; and Southeast Asia craniosynostosis" as search terms. Next, a retrospective review of data from Nuoy from 2001-2025 regarding craniofacial procedures was performed to evaluate the types of craniofacial procedures that were conducted.

Results

Seven articles were identified. Types of engagements included short-term missions (2 articles), research (1), demographic projects (2), and visiting educational programs (2). There were complete records identified from Nuoy from 2018-2025. During this span, Nuoy and VN surgeons together performed 254 complex craniofacial procedures including 51 intracranial procedures, 29 mid-face distractions, and 174 other craniofacial surgeries including microtia repair, microsurgery, vascular malformations, and more. Hands-on didactic conferences included an American Society of Maxillofacial Surgeons (ASMS) basic course, a Microsurgery Course, a Cranial Springs workshop, a difficult airway course, and monthly orthognathic surgical education conferences. Additionally, 11 peer-reviewed scientific articles have been written collaboratively.

Conclusion

Craniofacial surgery has made tremendous strides in Vietnam. Previous engagements have focused on short-term solutions or institutional visitation. By developing local experience and knowledge through regular cadences with long-term partnership focused on shared clinical responsibility, education, and research, a model is proposed to raise both access to care (floor) and state-of-the art treatment and execution (ceiling). We propose this model as a potential solution to global limitations in CF surgeons, decreasing barriers to treatment.

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Evaluating long-term outcomes of fronto-orbital advancement in metopic synostosis: insights from 3D photogrammetry

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Abstract

Background

Current literature on long-term surgical outcomes in patients with metopic synostosis shows significant heterogeneity, a limited and variable follow-up duration, and variations in outcome measures, resulting in the lack of clear data on post-surgical outcomes in late adolescence. The primary objective of this study was to objectively evaluate the long-term outcomes at skeletal maturity following fronto-orbital advancement (FOA) in patients with metopic synostosis.

Methods

All consecutive patients with isolated metopic synostosis who underwent FOA at Sophia Children's Hospital between 2003-2008 were included. Their data was retrospectively reviewed. Head shape analysis was performed on all available 3D images of patients with metopic synostosis at their last follow-up appointment. CranioRate was used to determine pre-operative severity.

Results

The total cohort consists of 107 patients, who underwent FOA at the median age of 11 months [IQR 9-12]. Head shape analysis on available 3D images (n = 48) at the age of 17 years showed that patients exhibit notable differences in forehead shape compared to healthy controls, characterized by frontal retrusion and temporal depressions. At late adolescence, 3.7% of patients with metopic synostosis who underwent FOA opted for a secondary recontouring procedure using PMMA. No significant difference were observed in age at primary surgery, sex, and pre-operative severity between those who underwent secondary recontouring and those who did not.

Conclusion

At the age of 17 years, patients with metopic synostosis following FOA have evident temporal depressions and frontal retrusion. Initial severity had minimal effect on these deformities.

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Relationship Between Mandibular Morphology and Jaw-Closing Muscle Development In Robin Sequence Versus a Healthy Age-Matched Population

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Abstract

Mandibular growth is determined both by genetic factors and by mechanical loading from the masseter, temporalis, and other masticatory muscles. While mandibular morphology in Robin Sequence (RS) is known to differ from unaffected individuals, little is known regarding corresponding masticatory muscle morphology in this condition. Understanding these muscle-bone relationships may offer insights into functional outcomes such as feeding and chewing. A multi-center retrospective study was conducted. All patients with isolated RS (iRS) who had high quality pre-operative computed tomography (CT) scans between the ages of 0-12months were included. A pre-existing normative dataset was used as a control group. Three-dimensional objects were generated for the mandible and jaw closing muscles including the temporalis, masseter and medial pterygoid. Mandibular shape was captured using 21 validated landmarks, followed by General Procrustes superimposition on landmark coordinates. Principal Component Analysis was used to analyse the mandibular shape variation. Muscle symmetry and associations between mandibular shape, mandibular size and muscle volumes were tested using Wilcoxon signed-rank tests, rank sum tests, bivariate regressions and ANOVA.

A total of 28 patients (mean age 4.13, median 2.9months, 54%female) were included. The control group consisted of 17 infants (mean age 4.34, median 4.01months, 41%female).

Mandibular length was a significant predictor of mandibular shape in controls (R^2=0.68,$F(16,1)$=33.7,p=2.68e-5) and significant but less pronounced for iRS patients (R^2=0.23,$F(26,1)$=7.91,p=9.24e-3). There was a greater morphological disparity for shape in iRS vs control with larger allometric effects for the control group. In controls, mandibular size impacted the volume of the temporalis (R^2=0.73,$F(1,16)$=43.13,p=6.48e-6), masseter (R^2=0.78,$F(1,16)$=57.04,p=1.16e-6) and medial pterygoid muscles (R^2=0.78, $F(1,16)$=56.92,p=1.18e-6). In iRS patients, mandibular size impacted the volume of the temporalis (R^2=0.65,$F(1,26)$=48.01,p=2.34e-7), masseter (R^2=0.68,$F(1,26)$=56.29,p=5.77e-8) and medial pterygoid muscles (R^2=0.74,$F(1,26)$=75.09, p=3.83e-9). There were no significant differences in the absolute muscular volume between the groups.

This study showed that mandibular size predicts muscle volume across groups, although allometric effects were less pronounced in iRS. These findings provide a basis for future work correlating morphological data with functional outcomes such as feeding and chewing function.

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Development of a generative deep learning algorithm to guide craniofacial defective or malformed bone correction

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Abstract

Objective

The present study aims to develop a deep learning (DL) algorithm which can semi-automatically reconstruct craniofacial bone defects or malformed parts in patients at end of growth, to be used as an aid in the virtual surgical planning of the correction and possibly in the design and production of patient-specific implants.

Materials and methods

We selected 950 partial and complete CT scans of the craniofacial region from adult patients not presenting bone defects or anomalies. CT scans were segmented to obtain cranial and mandibular meshes. The position-normalized meshes were then subdivided into training and test subgroups with a relative numerosity of 9:1. Meshes belonging to the training group underwent a random defect simulation, sized coherently with a surgical resection. The selected model architecture is based on implicit surface completion methods. We then applied the obtained algorithm on the test subgroup aiming to a preliminary validation. After that, the algorithm was applied on CT-derived models of 40 patients undergoing surgery for jaw malformations; after virtual removal of upper and lower jaw, teeth-bearing segments were then reconstructed by the neural network. The generated models were qualitatively and quantitatively evaluated by experienced surgeons as well as with a simplified 3D cephalometric analysis.

Results

The algorithm test output was qualitatively evaluated for defect reconstruction quality by region. A remarkable reconstruction quality was achieved for most macroscopic areas of the cranium and mandible. Quantitatively, the average error on the test subset, computed as distance, in the reconstructed region was 1.6 mm (st. dev. 0.5mm), and was below 3mm in 93% of cases. Subsequently, the models generated for the correction of jaw deformities were evaluated as satisfactory overall, even though they failed to provide accurate detail of the teeth. Considering the cephalometric evaluation, skeletal profiles were generally reconstructed with good accuracy, and intermaxillary relationship as well as symmetry were satisfactory.

Conclusion

The deep learning algorithm proved promising in providing surgeons with a further guide for the planning and design of craniofacial correction and reconstructions. Further enlargement of the CT dataset is needed, and a complete clinical validation should be performed before a full clinical implementation.

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A modified surgical correction for trigonocephaly: long-term evaluation

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Amir Elbarbary


Hazem Mostafa

Abstract

Premature closure of the metopic suture or trigonocephaly denotes a triangular shape of the forehead & supraorbital ridges along with frontotemporal narrowing & hypotelorbitism. Techniques managing trigonocephaly are based on Tessier's & Marchac's techniques of forehead along with supraorbital bar advancements and remodeling. Despite several refinements, reestablishment of normal aesthetic units of the frontal & especially the temporal areas remain quite challenging, and patients tend to present with stigma of bi-temporal narrowing & therefore is not-uncommon that they undergo secondary procedures including touch-ups. This study sought to evaluate over long term a modification in the surgical technique of cases presenting with moderate to severe degrees of trigonocephaly. In principle, the synostotic suture was excised down to frontonasal suture then the forehead craniotomy performed to the coronal suture boundaries, without including it, was turned 180 degrees & contoured to achieve a more natural forehead height & curvature. The supraorbital bandeau was re-contoured using closing and opening wedge osteotomies to straighten the midline and achieve advancement laterally while matching curvature to the new forehead. Barrel-Stave osteotomies were performed bilaterally on the temporal bones & further extended into lateral aspects of the parietal bones to correct the bi-temporal narrowing & avoid any contour irregularities close to the anterior hairline. Thirty six males & fourteen females with age ranging between six months & three years underwent this modification by the same craniofacial team at Ain-Shams University, Cairo-Egypt. All patients underwent in-depth clinical evaluation including anthropometric craniofacial measurements prior to surgery. Preoperative ophthalmologic evaluation & genetic counseling were conducted routinely. The surgical outcomes were evaluated according to the Whitaker classification. With up to twelve years of follow-up, this technique achieved normalization of both the frontal & temporal areas with negligible complications reported. Results were considered good to excellent (category I and II) according to the Whitaker classification with those operated above age of two years falling in the latter category. Surgical procedure averaged three hours & hospitalization ranged between four to six days including one day of intermediate care. In conclusion, reestablishment of normal aesthetic units of the forehead & the temporal areas in trigonocephalic patients is attainable by combining temporal barrel-stave osteotomies to fronto-orbital & forehead re-contouring procedure.

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Transient Panfacial Nerve Palsy After Mandibular Distraction Hardware Removal

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Aidan O'Shea



Catharine Garland



Daniel Cho

Abstract

Background

Panfacial nerve palsy is a rare and rather unexpected complication following mandibular distraction osteogenesis (MDO) hardware removal. Despite the anatomic distance between distraction devices and the main facial nerve trunk, transient global facial nerve dysfunction may occur. We present a case series demonstrating recovery in all patients, highlighting an important and reassuring clinical course for surgeons who may encounter this phenomenon.

Methods

We reviewed the records of three patients who developed panfacial nerve palsy following internal mandibular distractor removal, noting the trajectory of recovery and any diagnostic or therapeutic interventions performed. **Results**

Case 1: A 3-month-old male with Marshall-Smith syndrome was observed to have a right-sided facial nerve palsy following hardware removal. Of note, he did have an episode of a milder facial nerve palsy during the activation phase that resolved spontaneously. A stroke-protocol MRI did not reveal any concerning intracranial findings that would explain the patient's presentation. The patient was treated with an initial pulse of steroids, eye protection, and observation. Nerve function had significantly improved by two months postoperatively.

Case 2: A 3-year-old female with Lennox-Gastaut syndrome experienced a left-sided facial nerve palsy after hardware removal that initially improved with a pulse of steroids but recurred following a urinary tract infection. Her nerve function returned to baseline by 18 months postoperatively.

Case 3: A 6-month-old male with Pierre Robin sequence and an unnamed genetic syndrome experienced left-sided facial nerve palsy after a revision MDO procedure. Electromyography was performed which demonstrated complete denervation of the frontalis muscle and partial denervation of the mentalis muscle. The patient was treated conservatively with observation, and nerve function was noted to have recovered by 10 months postoperatively.

Conclusions

Transient panfacial nerve palsy was observed in three patients after MDO hardware removal. In all patients, facial nerve function improved with conservative interventions or observation only. All patients had rare genetic syndromes, and we hypothesize that abnormal anatomy or neurologic manifestations of their disease may have made them more vulnerable to neuropraxic injury during manipulation of tissue intraoperatively. A multi-institution study may help better characterize risk factors and prognosis for this phenomenon.

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Progressive Palatopharyngoplasty: An Institutional Algorithm proposal for Tension-Free Closure and Optimal Velopharyngeal Function in Cleft Palate Repair.

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Abstract

Introduction

Cleft palate (CP) is among the most common congenital maxillofacial malformations, with a prevalence of 0.33 per 1,000 live births. Oronasal fistulae (ONF) and velopharyngeal insufficiency (VPI) are major postoperative complications affecting speech, feeding, and breathing. The optimal surgical approach for tension–free palatal closure remains debated.

Aims

To compare ONF and VPI rates between two surgical protocols for CP repair implemented at Hospital General Dr. Manuel Gea Gonzalez.

Methods

A comparative study was conducted on CP patients who underwent surgery between June 2000 and February 2025. Two groups were analyzed: 2,747 patients treated before 2015 by one surgical team and 829 treated after 2015 by another team. Postoperative complications were recorded, and ONF and VPI rates were calculated. Logistic regression was used for statistical analysis.

Results

A total of 3,741 patients were analyzed (2,130 males, 1,540 females), with a mean age of 9.48 years (range: 0.2&ndash60). Logistic regression confirmed a significant decrease in postoperative sequelae after 2015, VPI and ONF, whose odds were reduced (p≤ 0.05).

Conclusions

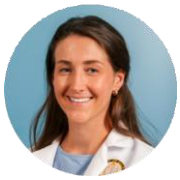
The revised 2015 surgical protocol significantly reduced postoperative complications in CP repair, such as VPI and ONF; its incidence has declined, indicating improved palatal closure and muscular reconstruction. These findings support the protocols effectiveness in enhancing functional outcomes for CP patients.

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Living with Facio-auriculo-vertebral Spectrum: A 20 Year Single Institution Experience

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Abstract

Introduction

Clinical presentations of facio-auriculo-vertebral (FAV) spectrum vary significantly, and management requires a multidisciplinary approach. This study presents our experience at a single institution treating a large cohort of patients with FAV over 20 years, reporting on patient demographic variables, phenotypes, and the associated burden of care.

Methods

A retrospective review of patients with FAV who presented to a single institution multidisciplinary Craniofacial group for care between November 2002 and May 2023 was conducted. Demographic data, age at presentation, birth history, and medical comorbidities were collected. Documentation of physical exams, radiographic imaging and photographs were used to grade patients using the OMENS scoring system. Statistical analysis included the use of Spearman rank correlations to examine relationships between OMENS component grades and burden of care.

Results

Two hundred thirty patients were reviewed, and after exclusion for insufficient documentation, 163 patients remained. Our population was equally divided between male and female, and most patients identified their race as white and ethnicity as Hispanic. Almost half of the patients (n=81) had medical comorbidities involving at least one other organ system. 135 cases were unilateral and 28 were bilateral. Median age at presentation was 203 days. Mean duration of follow up was 7.8 years (SD=6.2) and mean age at last follow up was 10.6 years (SD=6.7). The most frequent manifestation of FAV in our cohort was microtia (n=126). 45% of cases were graded with a mandibular score of M0 and 58% of cases were graded with a soft tissue score of S0. On average, patients underwent 2.0 craniofacial surgeries (SD=2.8). Severity of both mandibular hypoplasia (ρ=0.35, p=0.005) and microtia (ρ=0.32, p=0.01) significantly correlated with increased surgical burden in patients followed through adolescence (>13 years old).

Conclusions

Our findings suggest the presence of milder phenotypes on the FAV spectrum, with lower mandibular and soft tissue scores in our cohort than have previously been reported in other large studies. Our goal with this study is to characterize a large, diverse cohort of patients with FAV and their experiences with the diagnosis to continue to improve their care through education and shared decision-making, using a multidisciplinary approach.

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Perioperative Antibiotic Use in Cleft Lip and Palate Repair: A Systematic Review

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Taylor Schumann


Michael Gedestad


Benjamin Massenburg

Abstract

Background

Orofacial clefts are the most common craniofacial birth defect, and lead to significant functional and aesthetic challenges for affected patients. Early surgical intervention is the mainstay of treatment for restoring proper feeding, speech, and psychological wellbeing. Reduction of complications is paramount, with particular attention to rates of infection, fistula formation, and dehiscence. Numerous studies have investigated the impact of perioperative antibiotics on these complications; however the data remain variable and there is no clear consensus on optimal management.

Objective

This systematic review evaluates the effect of perioperative antibiotics on cleft lip and palate repair with respect to complication rates.

Methods

Medline, Embase, EBM, and Web of Science databases were searched from 1995 to 2025 for publications that evaluated perioperative management of antibiotics in cleft lip and palate repair. Inclusion criteria were studies involving antibiotic use in cleft lip repair, palatoplasty, and/or alveolar bone grafting. Studies not explicitly addressing treatment outcomes, studies without a comparator group, and studies in languages other than English were excluded.

Results

Ten publications met inclusion criteria based on study design, quality, and applicability. Six studies reported outcomes following palatoplasty, two studies reported combined outcomes for both cleft lip and palate repair, and two studies reported outcomes following alveolar bone grafting. The results show high variability in the management of perioperative antibiotics and the reporting of complications, but overall no additional benefit of prophylactic or prolonged antibiotic use in the context of complication prevention. In cleft lip repair, the overall rate of infection was 4.1% (N=3 of 72), and there was no additional benefit of prolonged post-operative antibiotics. In palatoplasty, the overall rate of fistula was 7.6% (N=238 of 3131), and there was no additional benefit of prolonged post-operative antibiotics. In alveolar bone grafting, the overall rate of graft loss was 4.3% (N=8 of 185), and there was no additional benefit of prolonged post-operative antibiotics.

Conclusion

The current body of literature on perioperative antibiotic use in orofacial cleft surgery does not reveal a significant benefit in terms of preventing infection, fistula formation, and dehiscence. Future well-controlled comparative studies are needed to further evaluate this relationship.

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The Birmingham Algorithm for Calvarial Expansion

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Abstract

Introduction

The nuances of decision making when embarking on the surgical management of a craniofacial patient are complex. Addressing volumetric change, anatomical differences and craniofacial aesthetics all need to be considered in the context of a longitudinal approach to account for growth and development. Factors affecting the choice between differing calvarial expansion techniques include age of patient, pathology, if the patient has syndromic or non-syndromic synostosis, clinical or radiological suspicion of raised intracranial pressure, previous interventions, the chances of needing further surgery, anatomical factors and other medical conditions. We present the Birmingham algorithm for calvarial expansion in the management of craniosynostosis, which is used as a framework for surgical decision making during multidisciplinary team planning in our supra-regional centre.

Methods

By performing a retrospective review of all transcranial procedures aimed at achieving remodelling or expansion between January 2010 – May 2024 (n = 1114), we reviewed our surgical strategy, thereby formalising our practice. For endoscopic suturectomy procedures (n = 21), outcomes were reviewed and bench marked nationally. Volumetric measurements were calculated for fixed calvarial augmentation cases (n =30).

Results

Procedures were subdivided into passive (487), fixed (518) and dynamic (109) expansions. Evolution of techniques, including refinement, innovation and adoption, combined with patient outcomes have resulted in changes to specialist practice over time. Volumetric expansion in the fixed augmentations group (19-23% volume increase) was found to be comparable to volumetric changes reported with distraction techniques, supporting the use of fixed augmentation as an alternative method of expansion.

Conclusion

The Birmingham Algorithm for Calvarial Expansion is a multidisciplinary team framework for surgical management of patients with syndromic and non-syndromic craniosynostosis, that can be adopted as a tool for surgical decision making.

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Prospective Analysis of Polysomnographic EARN Factors to Identify Infants with Robin Sequence Failing Conservative Airway Management

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Abstract

Background

While conservative therapy may be the first-line approach in most infants with Robin sequence (RS), some require a surgical airway procedure to manage severe upper airway obstruction (UAO). Since 2020, previously published polysomnographic (PSG) EARN factors have been prospectively used at our institution to identify these patients and avoid prolonged and ultimately failed attempts at conservative airway measures. This study assessed the diagnostic accuracy of the EARN factors to predict failure of conservative airway management in RS.

Methods

A retrospective review was conducted of infants ≤12 months with RS and PSG-confirmed UAO from January 2020 through February 2025. Infants meeting at least one EARN factor criterion were classified as EARN+. Clinical outcomes were reviewed.

Results

Forty-three infants with RS were reviewed (mean follow-up 27.2 months). Of these patients, 65.1% (n=28, mean follow-up 29.4 months) had a PSG study that met EARN+ criteria; 34.9% (n=15, mean follow-up 22.6 months) had an EARN- PSG. Of the EARN+ patients, 82.1% (n=23) underwent a surgical airway procedure. MDO was the most common airway intervention (n=19), and 94.7% (n=18) patients demonstrated significant objective and/or clinical improvement in UAO postoperatively. 17.9% (n=5) of EARN+ patients did not undergo surgery. The families of four of these patients refused surgery, while in one case, the plastic surgery team was not consulted for MDO despite evidence of tongue-based obstruction and severe OSA found on PSG. Of the EARN- patients, 86.7% (n=13) were managed conservatively; due to improvement in clinical signs of UAO, only 23.1% (n=3) of these patients underwent a repeat PSG, all of which showed either stable or improved mild OSA. Two EARN- patients eventually failed conservative management, were readmitted to the hospital due to worsening respiratory status, and underwent MDO.

Conclusion

Our interim analysis suggests that in most infants with RS, the EARN criteria can correctly classify UAO into conservative airway vs. surgical airway groups. Nevertheless, careful, individualized assessment and intervention is necessary in patients with UAO and RS.

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Comparative Outcomes of Cancellous Bone Allograft Versus Autologous Bone in Cranial Vault Remodeling for Craniosynostosis

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Mark R Proctor


John G Meara

Abstract

Background

Cranial Vault Remodeling (CVR) for craniosynostosis expands the intracranial space to alleviate elevated pressure and accommodate brain growth, often leaving bony voids that require reconstruction. While autologous bone is traditionally used, it is sometimes insufficient or not attainable. In such cases, we use cancellous bone allograft as an alternative. Allografts are widely used in orthopedic and craniofacial surgery due to their safety profile, elimination of donor site morbidity, and potential to reduce operative time and blood loss. Although well established in cranioplasty, their role in CVR remains underexplored. This study compares outcomes in patients undergoing CVR using autologous bone versus cancellous bone allograft.

Methods

A retrospective review was conducted on infants diagnosed with craniosynostosis who underwent CVR between 01/2021 and 02/2023 at Boston Children's Hospital. Patient demographics, operative details, and postoperative outcomes were gathered from medical records. Patients were grouped based on graft type—cancellous allograft or autologous bone—for comparison.

Results

Eighty-three patients were included with a mean operative age of 3.20 ± 2.47 years and a mean postoperative follow-up of 12.1 ± 10.8 months. Minor wound healing concerns, such as incisional erythema or crusting, occurred in four allograft patients and three autologous patients. One patient in the allograft group experienced localized wound dehiscence, unrelated to the graft site, requiring hardware removal. Postoperative infections occurred in one allograft recipient (managed with antibiotics) and two autologous recipients, both requiring operative intervention and antibiotics. There were no significant differences between groups in operative time (p=0.484), transfusion need (p=0.793), transfused volume (p=0.793), or length of stay (p=0.857). Similarly, the incidence of wound healing issues (p=0.284), infection (p=1.00), graft extrusion (p=1.00), and revisionary procedures (p=0.2483) did not differ. Among 17 patients with postoperative CT imaging, satisfactory bone healing was observed in both autologous (n=9) and allogenic (n=8) groups.

Conclusion

This analysis suggests that cancellous bone allograft is a safe and viable alternative to autologous bone in CVR for craniosynostosis. Long-term follow-up and imaging will be essential to confirm sustained safety and graft integration.

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Age at surgery for frontal encephalocele influences the final morphology of the nasofrontal area. Long-term follow-up

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Nivaldo Alonso **Hamilton Matushita** **Cristiano Tonello** **Chaline Matushita**

Abstract

A frontonasal encephalocele is a rare congenital neural tube defect where brain tissue and meninges protrude through a defect in the skull. Frontonasal encephalocele can be classified as nasofrontal, nasoethmoidal, and naso-orbital depending on where it occurs. It is an embryological defect characterized by failure of the anterior neuropore during neural tube development around the 3rd to 4th week of gestation. Clinical features show a visible mass, which can be associated with hyperteleorbitism and a long or broad nose, with an abnormal eyebrow. The age of its correction is significant in avoiding CSF leakage and nasoorbital distortion. Between 2000 and 2024, we saw 47 patients with encephalocels, among those 28 were fronto-nasal, 02 fronto-ethmoidal, 16 transsphenoidal, and 01 occipitoparietal. Of those frontonasal and fronto-ethmoidal (30), 15 patients had more than 7 years of follow-up. The patient's age, defect size, eye position, and nasal morphology were evaluated through CT scan and long-term follow-up. Patients operated on until 9 months did not have changes in nasal size or eyebrow position; the size of the defect did not change the outcome. Tessier Cleft 1/13 was found in 03 patients, 02 with fronto-ethmoidal encephalocele and 01 with fronto-orbital-nasal. Nasal elongation and eyebrow malposition were found in patients operated on at over 9 months of age. For defect sizes smaller than 3 cm2, no intracranial access was necessary.

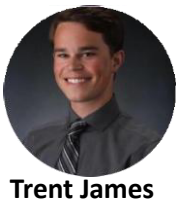
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Orthodontic outcomes following ABG: Can the use of specific pre and post-operative imaging modalities improve intra-operative approaches and lead to optimal subsequent dental treatment plans?

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Kiersten Woodyard deBrito


Scott Rapp


Trent James

Abstract

Background

75% of cleft patients have alveolar defects impairing alignment and support of permanent dental structures. Cancellous bone reconstruction remains the gold standard, with many centers utilizing allograft with growth factors for primary ABG. Success is defined as arch stability, ability to move or descend teeth into the segment, and the ability to house an implant. Currently, peri-operative planning is limited with quantification of alveolar clefts and the amount/type of graft necessary to obtain sufficient bony bridging across. We examine the use of Cone-Beam Computed Tomography (CBCT) and 3-Dimensional (3D) segmentation for volumetric quantification to reduce orthodontic limitations following ABG.

Methods

From 2018, a retrospective review demonstrates 68 patients who underwent CBCT imaging studies for pre-operative planning. 40% (n=28) of patients had a bilateral defects. Pt demographics, post-operative data and imaging were collected. ITK-Snap neuroimaging software was used, obtaining measurements of volume and widths of alveolar clefts pre- and post-operatively at 6 months.

Results

Of the 68 patients, 66 demonstrate measurable post-operative bony bridging. 33 pre-operative CBCT studies were available for 3D segmentation with 21 primary ABGs and 12 were conducted for secondary grafting due to primary failure. 11 post-operative studies had enough residual cleft volume to undergo 3D segmentation, 9 of which had measurable bony bridging. For post-operative 3D segmentations of successful ABG, original cleft width averaged 5.35mm, cleft residual volume averaged 559.1mm3, and bony bridging height averaged 6.06mm. Original cleft width in patients who required revision was significantly higher compared to those who did not (8.02mm vs. 5.35mm, p=0.011). A comparison between the residual volume of clefts which required revision and those that did not require revision approached statistical significance (980.2mm3 vs. 559.1 mm3, p=0.058).

Conclusions

Results from 3D analysis indicate width of cleft may be more influential in ABG success compared to overall cleft volume. Continued analysis will include measurement of bone graft density (allograft & autograft) compared to native arch bone with correlation of dental reconstructive options. Results may impact amount of graft required, type of graft utilized, with a goal to lead to more predictable dental restoration outcomes regarding substitutions, bridges, and implant capabilities.

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Craniosynostosis Management in the Synostosis Registry Group: Baseline data and Early Outcomes

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Kamlesh Patel


Gary Skolnick


Jennifer Strahle

Abstract

Background

Observational studies in patients with craniosynostosis have typically been confined to single-center settings, leading to limited sample sizes and constrained findings. Establishing a collaborative multi-center research network is crucial to accelerating research and evaluating treatment responses more comprehensively. Our project seeks to address these limitations by creating a multi-center cohort to assess treatment outcomes for patients with craniosynostosis. In this abstract, the authors share their initial experiences and describe practice patterns to generate hypothesis for future research.

Methods

In 2017, the Synostosis Research Group (SynRG) was established as a multicenter, multidisciplinary collaborative network to study craniosynostosis. Since its inception, the network has expanded from 5 to 11 centers. The team of investigators comprises pediatric neurosurgeons, craniofacial plastic surgeons, and neuropsychologists. All patients presenting to a SynRG center with a clinical diagnosis of craniosynostosis are prospectively enrolled in the study, including nonoperative patients. More recently, SynRG added the collection and storage of standard of care CT and MR imaging to its protocols. The data extracted from the prospectively maintained SynRG registry includes baseline parameters, surgical adjuncts and techniques, complications prior to discharge, and indications for reoperation.

Results

The registry currently includes data on 1,214 patients from 9 active sites, with 214 patients enrolled in 2024. Additionally, 2 sites are in the regulatory process of joining. A total of 154 standard-of-care imaging scans, including CT and MRI, have been uploaded. Among operative patients with single suture synostosis (n=884), 446 were treated with strip craniectomy followed by postoperative helmeting, 16 with spring-assisted cranioplasty, and 320 with calvarial vault remodeling. For those with multisuture synostosis (n=213), 37 were treated with strip craniectomy followed by postoperative helmeting, 2 with spring-assisted cranioplasty, and 134 with calvarial vault remodeling. The total complication rate was 2.5%, and 5 patients required unintended reoperation.

Conclusion

SynRG is well-positioned to advance the field through its collaborative research network. Future goals include continuing to expand the number of participating sites, prospectively tracking craniofacial growth, and assessing neurocognitive and social development.

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Ocular hypertelorism correction: soft tissue and bone results, ocular impairment, and complications.

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Cristiano Tonello


Isabella Paula


Michele Brandão


Luciano Machado


Nivaldo Alonso

Abstract

Introduction

Ocular hypertelorism correction is a complex procedure that allows the medialization of the orbits. Different diagnoses are identified, and aesthetic results could be achieved, but partial success and complications are frequent.

Objective

The objective was to evaluate a sample of ocular hypertelorism patients who underwent surgical correction, define the diagnosis, and compare the measurements of the orbits' distances pre- and post-operatively. Orbital relapse and complications were evaluated.

Methods

Sixteen patients who underwent surgical correction between 2020 and 2024 were evaluated. The interpupillary, nasal pupillary, internal intercanthal, and external intercanthal distances pre- and post-operatively, beyond the hypertelorism index, were measured using standard pictures for soft tissue result evaluation. The medial orbital wall was evaluated using CT scans pre- and postoperatively. The angulation of the optical nerve and orbital relapse at at least six months' follow-up were evaluated. The diagnosis, time of surgery, and surgical complication rate, including infection, eye or visual damage, were evaluated.

Results

Ten male patients had frontonasal dysplasia, which was the most frequent syndromic diagnosis, while four patients showed 0-14 Tessier Cleft, two of them with transsphenoidal encephalocele. The median age at the moment of the surgery was 15 years old. Six patients underwent facial bipartition, and ten patients underwent Tessier Box Osteotomy.

The average medial orbital wall bone at the pre-operative was 41,7 millimeters and the post-operative was 22,3 millimeters. The residual telecanthus was observed in 90% of the patients. The increased angulation of the anterior portion of the optical nerve was observed.

The total of the patients developed diplopia immediately after the procedure, with natural remission until two months after the surgery. One patient showed palate damage and needed palate repair after the facial bipartition. One showed alveolar necrosis of the central incisor, and another developed infection and partial absorption of the frontal bone.

Results

Ocular hypertelorism correction allows orbital mobilization, leading to a satisfactory aesthetic outcome. The measurement of the bone distances usually doesn’t reflect the soft tissue results. Residual telecanthus was observed in almost all of this sample. Facial bipartition presents more frequently, with more severe complications and compromised optical nerve angulation.

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Long Term Nerve Function Outcomes of Transverse-Curved Ramus Osteotomy in Mandibular Distraction Osteogenesis: A Retrospective Case Series

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Abstract

Introduction

Mandibular hypoplasia, often seen in congenital diagnoses such as Pierre Robin Sequence, can lead to airway obstruction, malocclusion, and facial asymmetry. Mandibular distraction osteogenesis (MDO) is a surgical technique used to alleviate these issues and is traditionally performed using a linear body or ramus osteotomy. However, these osteotomies may present complications, including injury to neurovascular structures. The transverse-curved osteotomy (TCO) may offer an approach that limits injury to neurovascular structures in MDO. This retrospective case series evaluates the nerve complication rates of patients undergoing mandibular distraction using the TCO technique.

Methods

Retrospective chart reviews were conducted for patients who underwent MDO performed by a single surgeon between 2015 and 2024. The inclusion criteria were patients who completed the full course of MDO, including the TCO procedure, the activation phase, and the removal of the distractor devices after bone consolidation. Patients who did not complete the full process were excluded from the study. Data collected included demographic information, operative details, distraction parameters, length of follow-up, and nerve complications. Primary outcomes included occurrence of any nerve injury. Descriptive statistics were used to evaluate the clinical outcomes of the TCO technique.

Results

Twenty-three patients who completed mandibular distraction using the TCO technique for obstructive micrognathia were analyzed in this study. The average age at the start of the distraction process was 15.58 months (Range: 9 days – 15 years), with an average length of follow-up of 32.81 months. Of these patients, two patients had temporary facial nerve palsy before distractor device removal, resolving within 54.5 days (Range: 33–76 days). In terms of long-term nerve function, there were no patient- or parent-reported facial nerve injuries or injuries to sensation. Seven patients had formal facial nerve examinations, with all patients having preserved motor capability. Three patients had formal examination of lip sensation, all of whom had preserved sensation to touch and temperature.

Conclusion

The transverse-curved osteotomy for MDO is a reliable and effective method for addressing mandibular hypoplasia, minimizing complications to neurovascular structures, although explicit nerve examinations and additional long-term follow-up data are necessary to continue the study of this technique's outcomes.

823

From Helmet to Outcome: Machine Learning Prediction of Cranial Remodeling in 6,694 Infants

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Jay G Berry


Krystof Stanek


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Abstract

Background

Families of infants diagnosed with Deformational Plagiocephaly (DP) and/or Brachycephaly (DB) often consider cranial orthosis therapy to improve head shape asymmetry. To support clinical decision-making and family counseling, we developed a predictive model to estimate treatment outcomes—specifically changes in Cranial Vault Asymmetry Index (CVAI) and Cranial Index (CI)—in infants undergoing helmet therapy.

Methods

We conducted a retrospective study of 6,694 infants treated for DP and/or DB across cranial orthosis clinics in nine U.S. states between 04/01/2012 and 10/31/2022. Serial measurements of CVAI and CI were analyzed from therapy initiation through completion. Using patient age and treatment duration as input features, we employed the Extreme Gradient Boosting (XGBoost) machine learning algorithm to forecast CVAI and CI at the end of therapy.

Results

The median age at therapy initiation was 6 months (IQR: 5–8). Of the cohort, 36.5% (n=2,446) had isolated DP, 9.0% (n=600) isolated DB, and 54.5% (n=3,648) had both. Initial median CVAI and CI were 7.6% (IQR: 6.2–9.4%) and 95.0% (IQR: 92.6–98.5%), respectively. The XGBoost model demonstrated strong predictive performance, accounting for 79.4% of the variance in final CVAI (R^2 = 0.794, MAE = 0.756) and 86.4% of the variance in final CI (R^2 = 0.864, MAE = 0.936).

Conclusion

Leveraging a large multisite dataset, we created a validated machine learning model capable of predicting treatment outcomes in infants undergoing cranial orthosis therapy. This tool offers potential to enhance individualized counseling, improve caregiver expectations, and guide treatment planning in the management of DP and DB.

825

Evaluating Morphometric Changes in Bicoronal Craniosynostosis Patients Following Endoscopic Strip Craniectomy

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Izza Sattar


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Abstract

Introduction

Bicoronal craniosynostosis is a condition characterized by the premature fusion of both coronal sutures, leading to significant cranial deformities, including brachycephaly and increased intracranial pressure. Endoscopic strip craniectomy (ESC) surgery releases fused sutures in craniosynostosis patients. While the clinical and aesthetic benefit of this surgery is well-delineated, the morphometric changes that occur are not well-studied. The present study aims to bridge this gap in the literature.

Hypothesis

We hypothesize that ESC will increase anterior, posterior, and total intracranial volumes, validating its effectiveness in treating bicoronal craniosynostosis.

Methods

A retrospective review of pediatric patients diagnosed with bicoronal craniosynostosis who underwent ESC between 2017 and 2022 was conducted. Pre- and post-operative cranial measurements including the sella to nasion distance, cranial length, cranial width, anterior, middle, and posterior cranial heights, frontal bossing angle, and intracranial volumes were obtained from 3D CT imaging using 3D Slicer software. This data was analyzed using the Wilson signed rank test.

Results

A total of 6 patients (2 males; 4 female; average age 2.17) met inclusion criteria. Surgery improved total intracranial volumes by an average of 158.130 ± 162.4 cm3 ($p=0.013247$). A mean volumetric gain of 127.22 ± 158.86 cm3($p=0.002957$) occurred in the posterior vault versus of 30.94 ± 34.89 ($p>0.05$) in the anterior vault. There were no significant statistical differences observed between patients in terms of the sella to nasion distance, frontal bossing angle, and anterior, middle, and posterior cranial heights.

Conclusions

ESC increases intracranial volume in bicoronal craniosynostosis patients. The most significant increases were observed in the posterior vault, which is important for restoring head shape and mitigating the risk of increased intracranial pressure in this patient population. Future research will compare morphometric outcomes between different surgical approaches, such as cranial vault repair versus ESC.

826

Safety Profile of Feminizing Facial Gender Affirming Surgery in Single vs. Multiple Stages

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Abstract

Background

Facial gender-affirming surgery (FGAS) often includes procedures on the upper face (frontal contouring, hairline, brows), midface (nose, cheeks), and lower face (mandibular contouring). Procedures may be performed in single or multiple stages. Single stage surgery requires longer anesthetic time, operative time, and potentially increased perioperative risks. We seek to compare the safety profile of procedures performed in a single stage vs. multiple stages.

Methods

We conducted a retrospective study of patients who underwent both upper and lower face feminizing FGAS between 2018-2024. We collected data on procedures performed, number of stages, total operative time (incision to closure), total blood loss, and postoperative outcomes. Group 1 (G1) underwent single-stage FGAS including both the upper and lower face, with or without rhinoplasty. Group 2 (G2) underwent two-stage surgery in which upper face and lower face were done separately, with or without rhinoplasty.

Results

G1 included 22 patients (mean age 32.8 years), and G2 included 36 patients (mean age 31.6 years), with a mean interval of 8.4 months between stages. Simultaneous rhinoplasty was more common in G2 (G1 22.7% vs G2 66.7%). Among patients with a simultaneous rhinoplasty, total operative time was significantly shorter in G1 (G1 464.4±41.7 vs G2 550.0±78.3 min, $p<0.0001$). Without rhinoplasty, total operative time did not significantly differ (G1 401.1±77.9 vs G2 376.8 ± 59.2 min, $p=0.18$). Total blood loss was comparable between the groups (G1 216.1±151.9 vs G2 199.0±90.7 mL, $p=0.59$), and no patient required a blood transfusion. Rates of postoperative nausea and vomiting were similar (G1 27.3% vs G2 31.9%, $p=0.67$). Patients were equally likely to experience an unplanned hospital admission across their surgical treatment (G1 13.6% vs G2 13.9%, $p=0.97$). One patient in G1 experienced a pulmonary embolism. No infections occurred in G1, while one patient in G2 required operative mandibular abscess washout and six received antibiotics for minor surgical site infections.

Conclusions

Single-stage FGAS appears to offer a similar safety profile to a staged approach, with similar complication rates and operative times. Larger studies are needed to better understand factors influencing outcomes as well as preferences in this surgical population.

829

Moving the Craniofacial team forward: The role of animated surgical videos in Craniofacial surgical education

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Natasha Wielogórska



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Abstract

Introduction

Craniofacial surgery is a super-specialised discipline within the scope of neurosurgery, plastic surgery and maxillofacial surgery. Small patient group, rare disease profile, complex patients, high risk surgeries, multidisciplinary surgery (often involving multiple surgeons), centralisation and senior-lead operating contribute to the multi-factorial challenge of training in these surgeries. Craniofacial surgery is an essential part of each parent speciality syllabus, creating an educational need that is not limited to trainees. Surgical-step videos are of increasingly recognised value. Animations demonstrate superiority over conventional literary resources and are widely used for surgical education. In comparison to real-life surgical footage, animations allow widespread sharing, do not require the complexities of consent, and may be favoured by those unaccustomed to surgical images.

Methods

Using a digital drawing device (Ipad, Apple pen) the operative steps were drawn for four core craniofacial operations:
Endoscopic Assisted Sagittal Suturectomy
Total Calvarial Vault Remodelling
Fronto-Orbital Advancement and Remodelling
Posterior Calvarial Distraction
Digital images were spliced to create an animation series using a video editing program (VN). An audio file was superimposed explaining the surgical steps including relevant anatomy, instrumentation and key manoeuvres (Trainee File). A further version was developed targeting the wider craniofacial team with a focus on explaining the surgical process with less emphasis on technique (Craniofacial Team File). Finally, a patient/parent educational version was made (Parent File), with input from a parent support group (Cranio Dads). By producing three versions of the same animation, we have developed a resource series that can meet the different educational needs of the department.

Results

We have produced grouped animations targeting four core procedures in Craniofacial surgery. As animations, these are widely accessible and provide learning opportunities for all interested parties, increasing educational impact. A validated Digital Animation Survey tool was used to assess trainee response to the Trainee Files for each of the four procedures. Operative videos were scored highly for stimulation, learning and clarity.

Conclusion

Surgical animations can 'bring to life' complex procedures for the learner. By producing animated videos that target different learner groups, we can aid understanding across the wider Craniofacial team, whilst supporting patients and families.

831

Application of Aesthetic-Oriented Treatment Concepts in Orthognathic Surgery for Correction of Skeletal Maxillary Protrusion

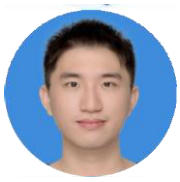
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Abstract

Objective

To explore the application of aesthetic-oriented treatment concepts in orthognathic surgery for correction of skeletal maxillary protrusion.

Methods

A total of 65 patients with skeletal protrusion of maxilla who received orthognathic surgery in Stomatology Hospital, Southern Medical University from January 2009 to December 2023 were selected. Inclusion criteria: (a) diagnosis of skeletal maxillary protrusion; (b) basically well-aligned dentiton with good occlusion; (c) no intention for orthodontic treatment; (d) no temporomandibular joint disorders or psychological conditions. Aesthetic concepts—including facial symmetry, the golden ratio, static tooth exposure and smile line in frontal view; nasolabial angle, mentolabial sulcus, E- line in lateral view; the axial inclination of the maxillary anterior teeth in intraoral view— guided all surgical designs. Five patients treated before December 2016 underwent traditional model surgery for surgical design, whereas 60 patients treated after 2017 received digitally assisted planning. The surgical procedure consisted of simultaneous Le Fort I osteotomy with maxillary rotation and superior repositioning or setback, bilateral sagittal split ramus osteotomy (BSSRO), and genioplasty, which collectively improved facial aesthetics by modifying the spatial relationships among the maxilla, mandible, and chin without altering dentition alignment and occlusion. Postoperatively, intermaxillary elastic traction was applied for 3 to 5 weeks. Subsequent to complete discontinuation of traction, no patients required supplemental orthodontic intervention. Results: With a minimum 12-month follow-up, all 65 patients maintained stable postoperative occlusion. The facial profiles were successfully corrected from convex to straight type with harmonized proportions and improved symmetry. The patients exhibited proper tooth exposure and parallel smile arcs with 1 to 2 mm gingival display. Conclusion: Strict adherence to surgical indications enables orthognathic convexity, balancing facial proportions, and refining smile aesthetics, while preserving dentition alignment and occlusion—demonstrating reliable esthetic improvement without orthodontic treatment.

Key words

skeletal jaw deformity; maxillary protrusion; orthognathic surgery; aesthetics

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The Power of Partnership: Complex Pediatric Microsurgical Head and Neck Reconstruction

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Abstract

Background

Pediatric head and neck reconstruction demands a highly coordinated, multidisciplinary approach tailored to children's unique anatomical and developmental needs. This study evaluates the surgical techniques, perioperative protocols, and clinical outcomes achieved through a collaborative operative model led by a dedicated two-surgeon team. Emphasizing consistency, partnership, and shared decision-making, this model integrates surgical precision with longitudinal care, offering a framework for optimizing complex pediatric reconstruction within a tertiary care setting.

Methods

A retrospective review of pediatric patients undergoing head and neck reconstruction was conducted from February 2022 to April 2025. Patient demographics, history, reconstructive approaches, perioperative data, and complications were analyzed.

Results

Eighteen patients from 1-19 years (average 9) underwent 19 free flaps for reconstruction after oncological resection (63%), trauma (26%), and cranial surgical complication (5.2%); the defects involved the scalp/skull (31.5%), midface (26.3%), and lower face (42.1%). Lateral thigh-based flaps were most common (47.3%), followed by fibula (26.3%) and subscapular system (26.3%). Flap failure rate was 5.2%, caused by intraoperative thrombosis. Other complications included surgical site infection (10.5%), hematoma (5.2%), and return to the operating room for exploration (10.5%). Despite attempts to extubate the patients in the operating room, 63.1% were kept intubated in the ICU postoperatively, and the average stay was 12 days, primarily due to underlying medical or social conditions. No significant differences were observed in length of hospital stay, ICU stay, or postoperative complications between age groups (under and over 9 years).

Conclusion

Complex microsurgical pediatric head and neck reconstruction can be performed safely with favorable outcomes when supported by a consistent and experienced surgical team. Consistency in operative and postoperative care is essential, especially for pediatric patients, as differences in sedation needs and body composition affect recovery processes. Despite these physiological differences across age groups, children and adolescents demonstrate comparable surgical outcomes, including rates of flap survival and complication profiles. Our team has worked on implementing standardized ICU protocols focused on early extubation and optimized fluid management, contributing to shortened hospital stays and enhanced recovery. Also, though technically demanding in younger patients, microsurgery remains a critical tool in achieving optimal reconstructive.

839

Spatial and Temporal Control of Bone Regeneration Using Decellularized Amniotic Membrane with BMP2-Encapsulated Bone-based Nanoparticles: An Alternative Strategy for Orofacial Cleft Composite Repair

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Bo Wang


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Abstract

Background/Purpose

Orofacial clefting imposes a substantial longitudinal surgical burden, underscoring the need for better alternatives to traditional treatments such as autologous bone grafting. Our laboratory's prior work has highlighted various regenerative engineering strategies utilizing decellularized amniotic membrane (DAM) and novel bone-based nanoparticles (BPs), including cleft palate repair, long bone healing, and in-situ monitoring using Near-Infrared fluorescence imaging. In this study, we investigated whether DAM and BMP2-encapsulated BPs can effectively repair a non-healing alveolar cleft defect in a small animal model. We hypothesize that these DAM/BMP2 BPs will promote soft tissue and bone healing and that their sustained release will correspond with healing as monitored by non-ionizing fluorescence imaging.

Methods

BPs were fabricated using established protocols and loaded with either indocyanine green dye (ICG) or Cy7-labelled BMP2 peptide to enable in-situ monitoring capability. Human Amniotic Membrane was decellularized and demineralized using previously published methods. Non-healing maxillary alveolar defects were created in 8-week-old rats and assigned to one of three groups: 1) untreated, 2) ICG/BPs + DAM, or 3) Cy7BMP2/BPs + DAM. For treated groups, DAM and BPs were layered into the defect site, followed by soft tissue closure. NIR imaging was performed intermittently over 10 weeks. Following euthanasia, skulls were evaluated for bone regeneration via gross and microCT analysis.

Results

Over 10 weeks, we observed strong NIR imaging capabilities in both ICG/BPs and Cy7BMP2/BPs, allowing precise measurement of their degradation within bone defects. The imaging provided insights into the biodistribution and degradation of the peptides post-implantation. Quantitative analysis revealed significant differences in degradation rates between the BP variations, suggesting that BMP2 peptide may influence BP degradation. Ex vivo examination confirmed that the combination of DAM and BPs effectively stimulated tissue regeneration, with the Cy7BMP2/BP + DAM group showing more substantial bone growth.

Conclusion

These results highlight the promising potential of using DAM and BPs as an alternative grafting strategy for composite alveolar cleft defect repair. The ability to non-invasively monitor the spatial and temporal release of BMP2 from within the BPs using a non-ionizing radiation-based imaging technique highlights their versatility to be both a strong therapeutic and diagnostic imaging tool.

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Craniofacial Reconstruction Using Bone-Based Nanoparticles; A Promising Translational Technique

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Abstract

Background/Purpose

Autologous bone grafting in the immature craniofacial skeleton continues to be a challenge across a spectrum of disease processes. Our laboratory's work has demonstrated the feasibility of using bone-based nanoparticles (BPs) for applications in the craniofacial skeleton. BPs with encapsulated indocyanine green dye (ICG/BPs) can be used as a bone-grafting material with in-situ monitoring using non-ionizing Near-Infrared fluorescence imaging (NIR). In this study, we explored whether ICG/BPs could be a substitute for repairing non-healing calvarial bone defects in a small animal model. We hypothesized that ICG/BPs allow for sustained calvarial bone healing that can be spatially and temporally controlled and inversely correlated with real-time fluorescence imaging.

Methods

ICG/BPs were synthesized using established methods, and bone morphogenetic protein 2 (BMP2) peptide was additionally encapsulated, creating ICG/BMP2/BPs. The regenerative efficacy and NIR monitoring capabilities were tested in vivo using 8-week-old rats with bilateral non-healing calvarial defects. The defects were divided into two groups: one side untreated, the other treated with ICG/BPs or ICG/BMP2/BPs, and NIR imaging was conducted intermittently over 10 weeks to assess material degradation. Post-euthanasia, skulls were analyzed for osteogenic capacity and bone growth grossly and with CT imaging.

Results

Over 10 weeks, we found robust NIR imaging capability of both the ICG/BPs and ICG/BMP2/BPs, allowing for accurate measurement and quantification of material degradation. We observed that the ICG/BPs degrade more rapidly compared to the ICG/BMP2/BPs, having lost all fluorescence by days 35 and 56, respectively. Ex vivo analysis of the bone tissues indicated the ICG/BPs were effective at stimulating bone growth when compared to a non-treated defect. However, the addition of BMP2 improved the therapeutic efficacy of the BPs, showing near-complete bone regeneration.

Conclusion

This study highlights the potential of the BPs as a regenerative approach to bone grafting in the immature craniofacial skeleton. The BPs were associated with bone regeneration that can be tracked in real time using non-ionizing fluorescence-based imaging. Their functionality includes robust imaging capabilities for in vivo monitoring that inversely correlate with bone healing, spatial and temporal control of tissue regeneration, and effective bone-stimulating capabilities.

849

Overcoming Depth-Perception Limitations in Augmented Reality-Guided Craniotomies with a Tool-Tracked Workflow

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Abstract

Our collaborative research team has developed and evaluated an Augmented Reality (AR) navigation platform designed to overcome key limitations of current optical see-through head- mounted displays (HMDs)—specifically, depth-perception errors from vergence-accommodation conflict and occlusion handling. These limitations present acute challenges in craniofacial and neurosurgical procedures where sub-millimeter precision is required, particularly near critical structures such as venous sinuses.

Building on prior work where our AR system was used in over 200 surgeries—including a recent craniofacial series (n = 17) showing reduced blood loss and iatrogenic injury via improved venous sinus visualization—we introduce and validate a novel workflow that combines surface-tracing registration with tool-tracked AR guidance for precision burr-hole drilling and craniotomy planning.

In this study, 12 users (2 faculty neurosurgeons, 6 residents, 2 medical students, 2 engineers) each performed 12 pre-planned burr-hole placements on 3D-printed skull phantoms. Registration and marking were performed using a stylus embedded with an infrared fiducial array and tracked by the Time-of-Flight sensor on the Microsoft HoloLens 2. Surface-tracing registration was completed in under 90 seconds (RMSE = 1.02–1.59 mm), and the same stylus was then used to mark burr-hole targets with real-time visual feedback—error rings and directional arrows—overlaid in the user's field of view.

The system achieved a median entry-point error of 2.3 mm (IQR 1.2 mm) and a median marking time of 13 seconds (IQR 9.8 s). The total registration-plus-marking time remained under 2 minutes. On a 5-point Likert scale, 4 of 10 participants agreed and 6 strongly agreed that the AR system improved marking precision over current workflows. This AR platform was then applied to a series of craniofacial cases at UC Davis and the University of Oklahoma.

By enabling fast, accurate registration and tool-tracked guidance without external hardware, this platform addresses critical AR limitations while preserving the benefits of a hands-free, co- registered surgical field.

POSTER

15
Application of low-cost virtual surgical planning softwares and 3d printing in le fort ii osteotomy for cleft orthognathic patient: a case report

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Quang Dong

Abstract

Computer assisted surgery has become the standard in Cranio-Maxillofacial surgery. This digital approach allows clinicians not only to assess patients' anatomy more accurately before the operation but also to design surgical guides and patient-specific implants. In complicated cases involved vital structures such as the skull base or the crucial blood vessels, virtual planning, can really help not only the novice surgeons but also the experienced ones to perform the case with highest level of safety. Nevertheless, in order to utilize this advanced technology, surgeons or their institutions often need to purchase expensive softwares from vendors with restricted functions. Although using these specific tools brings convenience and ease of use to the clinicians as well as technical support from the service provider, the financial burden is quite a significant issue for medical practitioners from developing countries. Fortunately, there are quite a few open- source softwares which can offer surgeons the same functions although they are not surgery-specific. In this poster, the author present a case-report of applying low-cost virtual surgical planning softwares and 3D printing technology in Le Fort II osteotomy for a cleft orthognathic patient with hypoplasia of nasomaxillary complex. The patient suffered from hypoplasia of the nasomaxillary complex due to cleft lip and palate. The Dicom data of the patient was used to reconstruct the virtual 3D skull. After that, the virtual osteotomies of the Le Fort II, Le Fort I and the Bilateral sagittal split osteotomy were made. Based on the movements, the cutting guides, which helped avoid the skull base, with pre-drilled holes and positioning guides were designed. The holes in the cutting guides were the same holes in the positioning guides. A final splint for the occlusion was also created. Finally, all the design files were sent to a local 3D printing laboratory to manufacture. In the OR, with the aid of the cutting guide and positioning guide, the Le Fort I osteotomy was performed first, after that the Le Fort II osteotomy was done with the bicoronal approach and the subtarsal approach. Finally, the bilateral sagittal split osteotomy was carried out with the final splint.

25
Outcomes of Tongue Reduction Surgery in Beckwith-Wiedemann Syndrome

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Abstract

Introduction:
Macroglossia is a frequent clinical feature of Beckwith-Wiedemann syndrome (BWS), a congenital overgrowth disorder. Macroglossia can lead to abnormal breathing, feeding, speech, and dentoskeletal development. Partial glossectomy is a common intervention aimed at reducing these abnormalities. The optimal timing of partial glossectomy remains controversial due to the potential need for secondary surgery and the ongoing growth of the tongue in early childhood. **Materials/Methods:**
Following PRISMA-ScR and PRISMA-S reporting standards, this comprehensive review included English language studies of patients with Beckwith-Wiedemann syndrome who underwent partial glossectomy. Data were extracted, including patient age, clinical outcomes and follow-up. Study evidence levels were categorized based on a recognized hierarchy, and bias was assessed using the MINORS criteria.
Results:
Early tongue reduction surgery (<24 months) was associated with a lower incidence of class 3 occlusion and anterior open bite compared to later surgery. Improvements in speech intelligibility, tongue mobility, and breathing outcomes, including a reduction in obstructive sleep apnea, were observed, especially in early surgical groups. Feeding and drooling outcomes improved across both early and late surgical interventions, though no direct comparisons were made between the two. Overall, tongue reduction surgery demonstrated benefits in functional outcomes, while dentoskeletal improvements remained variable.
Conclusion:
While there is a lack of consensus to the optimal age for the procedure, overall tongue reduction surgery in BWS appears to have functional benefits, including in speech, feeding and breathing. Dentoskeletal outcomes are more variable. Variability in macroglossia severity, surgical technique, and surgeon experience may account for differences in
reported outcomes across studies.

40
Craniofacial and upper airway morphological features in severe obese adults with obstructive sleep apnea: insights from cephalometric and polysomnographic Analysis

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Liang Xia


Wenwen Yu

Abstract

Introduction and Aims: Craniofacial and upper airway development are closely associated with obstructive sleep apnea (OSA). This study aimed to analyze craniofacial and upper airway characteristics in adults with severe obesity and OSA to better understand the disease.

Methods: 94severely obese patients (BMI≥35) underwent polysomnography (PSG) and lateral cephalograms to assess craniofacial and upper airway morphology. Cephalometric and airway measurements were analyzed combined with PSG findings to evaluate craniofacial and airway features in severe OSA patients.

Results: The study included 50 males and 44 females, with a mean age of 33.05 years and an average apnea-hypopnea index (AHI) of 52.22. Males had significantly higher AHI, neck circumference, waist circumference, and arousal index, along with lower average and minimal oxygen saturation levels compared to females. Cephalometric analysis showed that
males had greater mandibular ramus length and Sella-to-condyle vertical distance. Cross-correlation analysis indicated
Sella-Nasion line
with BMI, neck circumference, and waist circumference. Hyoid bone position was linked to tongue volume, Y-axis angle, pharyngeal airway space, facial height, and lip length. Tongue volume correlated with mandibular ramus length, upper anterior tooth angle, and upper lip length. Snoring index was associated with pharyngeal airway space and tongue height, while pharyngeal airway space width was related to oxygen saturation levels.

Conclusion: Severe obese individuals, particularly males, experience more severe OSA symptoms. A complex interplay exists between OSA, craniofacial morphology, and airway structure.

Clinical Relevance: Craniofacial and dental features are consistent in severe obese OSA patients, suggesting that obesity-related fat accumulation has a greater impact on respiratory function than skeletal structure or dental alignment.

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A modified Millard method for repairing micro Tessier IV cleft

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Dandan Wu

Abstract

Background: Tessier IV facial cleft is a rare congenital facial deformity. The double Z - cross flap is a commonly used for repairing Tessier IV cleft lip. However, the morphology of the philtral ridge and the structure of the cupid's bow are unclear, and the scars are obvious. We present a case demonstrating a modified Millard technique for repairing micro Tessier IV facial clefts.
Materials and Methods: A 2-year-old boy with micro Tessier IV cleft was admitted to the hospital. Surgical repair was performed using a modified Millard method to reconstruct the philtral ridge and the cupid's bow.
Results: After 1-year follow-up, the appearance was good, with philtral ridge and peak locating at the natural position, minimal scars and mild mild facial deformities.
Conclusions:
The modified Millard method is a feasible option for repairing micro Tessier IV cleft. Compared to the traditional double Z - cross flap methods, it can achieve good results in reconstructing the natural position of the philtrum ridge and peak and minimal scars.
Conclusion:
NCPs may account for 60–70% of congenital anomalies, exceeding historical estimates. Craniofacial involvement drives PRS demand, emphasizing the need for defect-specific surgical pathways and interdisciplinary collaboration to optimize outcomes globally.

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Redefining Mandibular Sub-units: The "ABC" Classification and Surgical Strategies for Lower Face Contouring

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Xiaoshuang Guo

Abstract

Background:
In east Asia, lower face contouring surgeries including reduction mandibuloplasty and genioplasty are the most popular aesthetic craniofacial surgeries. Conventional selection of surgical strategies mainly relied on the visual judgment of the mandibular angle, without overall assessment of the mandibular sub-units. Furthermore, only a few studies offered quantitative assessment of the mandibular shape.

Methods:
From 2010 to 2021, 1241 patients diagnosed with square faces and received customized lower face contouring surgeries by the senior author were reviewed and analyzed to propose an "ABC" classification system for facilitating surgical planning.

Results:
Among them, 998 (80.42%) received bilateral mandible reshaping, 155 (12.49%) underwent bilateral mandible reshaping combined with genioplasty, and 88 (7.09%) received asymmetric mandible reshaping. A modified classification system composed of three critical parameters (height, morphology/thickness, divergence) in three aesthetic zones (mandibular angle, mandibular body, chin) was proposed based on quantitative summarization of the CT database and the senior author's 12-year experience. The way to facilitate surgical planning with this classification was demonstrated.

Conclusions:
This modified classification system ushered in a decision-making process that prioritized several critical measurements and proposed an operative planning form. It can also be integrated into the three-dimensional virtual surgical plan.

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Predictors of Surgical Management and Outcomes in Patients with Pierre Robin Sequence: A 21-Year Study

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Viraj Govani



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Jesse Goldstein

Abstract

Pierre Robin Sequence (PRS) is a complex craniofacial anomaly characterized by micrognathia, glossoptosis, and airway obstruction, often requiring surgical intervention to address feeding and respiratory challenges. While PRS has traditionally been categorized as either isolated or syndromic, the overlap in phenotypic severity and associated anomalies complicates classification. This study evaluates the surgical management of PRS patients over a 21-year period, focusing on treatment patterns, perioperative outcomes, and long-term morbidity.

A retrospective review of 292 patients diagnosed with PRS from 2002 to 2023 was conducted, analyzing demographics, surgical history, comorbidities, and clinical outcomes. Statistical analyses included t-tests for continuous variables, χ^2 tests for categorical variables, and logistic regression to identify predictors of surgical intervention.

Mandibular distraction osteogenesis (MDO) was performed in 36.21% of patients, with an average time to surgery of 24.7 days. Palatoplasty was required in 37.33% of cases, and myringotomy with tube placement was the most common procedure (87.97%). Airway management was a significant concern, with 27.00% of patients requiring intubation at birth and 85.65% admitted to the NICU for respiratory support. Patients undergoing MDO had significantly higher rates of neonatal intensive care admission (92.8% vs. 81.4%, $p=0.032$) and were more likely to require tracheostomy (14.6% vs. 2.9%, $p<0.001$). Long-term complications included persistent obstructive sleep apnea (37.33%), speech/language delay (63.41%), and gastroesophageal reflux disease (39.04%). Genetic factors were found to influence surgical indications and clinical outcomes, as patients with pathogenic variants exhibited a greater need for invasive airway surgeries and had higher rates of comorbid developmental delay ($p=0.001$).These findings highlight the need for an integrated approach to PRS management, incorporating both early surgical intervention and a thorough clinical and genetic evaluation. A spectrum-based classification may better predict surgical needs and improve personalized treatment strategies, optimizing long-term functional outcomes. Future research should focus on refining predictive models for airway intervention and understanding the impact of genetic findings on surgical decision-making.

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8 year follow-up for a devastating hemifacial electrical burn: reconstruction of a lower eyelid ectropion and peri-oral contractures

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Chuan Han Ang



Catherine TH Lee



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Abstract

Modern multi-disciplinary care has led to increased survival after devastating burn injuries. Increased survival with severe burns leads to more complex reconstructive challenges presenting for correction. Deep tissue damage from high voltage electrical injury causes extensive underlying muscle damage and vascular injuries. In the pediatric population, resultant abnormal balance in the facial musculature leads to contraction-induced skeletal and dental growth deformities. We describe the reconstruction of a severe hemiface electrical burn with a focus on lower eyelid ectropion and oral commissure contracture, and complementary orthodontic treatment.

A 40-year-old Chinese gentleman suffered a left cheek electrical burn 30 years ago. He previously underwent a failed thoracodorsal artery perforator flap with multiple skin grafts in another hospital. He presents with severe left hemiface scarring from the orbits down to the neck. This was complicated by left eyelid ectropion, retraction of left oral commissure, teeth displacement and extensive involvement of alveolar bone, reduced jaw opening and loss of left pinna. He underwent pre-surgical orthodontic preparation and multiple reconstructive surgeries over a period of 2 years and 3 months. Data regarding the surgical and orthodontic treatment, symptom improvement, aesthetic outcomes and length of follow-up were collected.

To avoid extensive resection and reconstructive for the patient, non-conventional orthodontics was attempted pre- operatively for the patient, before he underwent an anterolateral thigh free flap reconstruction of the left cheek scar with tensor fascia lata to shape the new oral commissure in 2018. Subsequently, he underwent left facial flap debulking, left ectropion repair with lateral tarsal strip and lateral canthoplasty. Lastly, he underwent further left facial flap debulking, commissuroplasty, and multiple z-plasty. After 8 years follow-up, he has no more ectropion recurrence, excellent occlusion without trismus, and satisfactory aesthetic outcomes.

Surgeons need to design operations that release intrinsic and extrinsic contractures, and balance both dynamic and aesthetic concerns, in order to achieve long-lasting ideal outcomes in facial burn reconstruction. Other than reconstructing the soft tissue deficit in the cheek, a tarsal strip and canthoplasty will provide additional support for the eyelid. For the commissure, a fascial sling and commissuroplasty will facilitate adequate mouth closure with complementary orthodontic treatment.

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Patient-specific Dynamic Reference Frame for Navigation-guided Surgery in Mandible: A Novel Noninvasive Method

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Lai Jiang


Jinyang Wu


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Abstract

Computer-assisted navigation has proved to be a useful tool in oral and craniomaxillofacial surgery, but there is a steep learning curve in mandibular navigation surgery, which limits its wide applications. This article introduces a non-invasive, convenient and accurate navigation method for mandibular surgery and evaluates its effectiveness. A modified patient- specific dynamic reference frame (DRF) was designed and manufactured based on the patient' s dental cast of lower jaw, which combined the navigation technology with 3D printing. During the operation, the patient-specific DRF was fixed o the lower dentition, and the pair-point registration could be completed automatically by pointing the fiducials in the rame via navigation probe. The mandibular surgery was performed under the guidance of navigation. Preoperative registration and intraoperative navigation were successfully achieved in this patient. Navigation-guided surgery in andible was completed uneventfully. The postoperative image superimposition of the simulative virtual model and the actual model proved that good surgical outcome was achieved, errors between them were less than 2 mm. In conclusion, Patient-specific DRF is convenient, effective and flexible, combining navigation technology with 3D printing, which may simplify the procedure of navigation-guided surgery in mandible and make computer-assisted navigation easy to be used in clinics.

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Engineering dual active sites and defect structure in nanozymes to reprogramme jawbone microenvironment for osteoradionecrosis therapy

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Yuli Wang


Yifei Du


Hua Yuan


Zheng Cheng

Abstract

Various radiation-induced tissue injuries are associated with reactive oxygen and nitrogen species (RONS) overproduction. we used Fe doping in VOx (Fe-VO_x) nanozymes with multienzyme activities for osteoradionecrosis of the jaw (ORNJ) treatment via RONS scavenging. Fe doping could induce structure reconstruction of nanozymes with abundant defect production, including Fe substitution and oxygen vacancies (OVs), which markedly increased multiple enzyme-mimicking activity. Catalase (CAT), superoxide dismutase (SOD), and glutathione peroxidase (GPx) enzyme-like performance of Fe-VO_x could effectively reprogramme jawbone microenvironment to restore mitochondrial dysfunction.

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Single-Cell Transcriptomics Unveils the Regulatory Landscape of Osteogenesis in Maxillary Prominence Development

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Abstract

Objective:

During the embryonic development of vertebrates, neural crest-derived mesenchymal cells within the maxillary prominences undergo precisely coordinated proliferation and differentiation to give rise to bone and teeth. The transcriptional regulatory network in this process has not been well elucidated. This investigation defines expression patterns of key osteogenic marker genes that are differentially expressed between different developmental timepoints and reveals transcriptional regulation map of osteogenesis in maxillary prominence development by single-cell RNA- sequencing (scRNA-seq) technologies .

Methods:

The standards for single-cell data analysis mainly include the following steps and considerations: processing of sequencing raw data;obtain expression matrix;compare the barcode to distinguish the gene expression matrix of each cell;data quality control;cell filtration;dimensionality reduction and clustering;find maker genes for cell clusters;cell type annotation;result display and analysis.

Results:

1、Annotated based on single-cell sequencing results of maxillary process combined with marker genes including mesenchymal cells, epithelial cells, endothelial cells, neuronal cells, and osteoblasts, exhibiting high cellular heterogeneity;2、To reveal how neural crest-
derived mesenchymal cells differentiate into bone or cartilage tissue, mesenchymal cells at each developmental stage were selected for further analysis. These subpopulations of mesenchymal cells were identified based on the distinct transcriptomic features of different subcohorte；3、Mesenchymal cells arranged along the pseudotime track showed a bifurcated differentiation pattern. Mesenchymal cells expressing Msx1 preferentially developed to the fate of osteoblasts, while mesenchymal cells expressing Barx1 preferentially developed to the fate of perimyocytes.

Conclusion:

We identified the developmental trajectories of maxillary process mesenchymal progenitor cells at the single-cell level, and further revealed the differentiation pathways of mesenchymal progenitor cells. Maxillary process mesenchymal cells differentiate into a variety of cell types, including osteochondrocytes, muscle bundle cells, and fibroblasts. Studies focused on key transcriptional regulatory maps of osteogenesis, with the discovery of osteogenic lineage-specific transcription factors through integrated single-cell transcriptomes at different stages, such as Msx1, Msx2, Dlx1, Dlx2, and Phox2a specify the osteogenic fate of the mesenchymal population.

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Visible-light-responsive TiO2-x coating for deep cleaning of craniomaxillofacial implants

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Xudong Wang

Abstract

Objectives:

Titanium (Ti) implants are widely used in trauma and orthognathic fields. However, maxillofacial implants often face the risk of microbial contamination after implantation. Infection may lead to peri-implant inflammation and even implant loss. Effective and thorough decontamination of contaminated implant surfaces is beneficial to the treatment of peri-implant inflammation. However, traditional decontamination methods are difficult to completely remove the organic residues. Titanium dioxide (TiO_2) has photocatalytic activity and can catalyze the decomposition of almost all organic matter. Our group has previously prepared a unique TiO_{2-x} coating on Ti substrate using an innovative process based on plasma electrolytic oxidation (PEO), which has visible light-responsive photocatalytic activity. On this basis, its photocatalytic cleaning efficiency and changes in surface properties were further explored.

Methods:

TiO_{2-x} coatings were prepared on the surface of titanium substrates by 180V plasma electrolysis, annealing at 600℃, and grinding and polishing. SEM, AFM, EDX mapping and other testing methods were used for characterization. The biological properties of the coatings were evaluated by L929 cells. After the traditional mechanical decontamination method, the surface was cleaned by visible light irradiation. The changes of surface morphology, contact angles, and organic residues were compared.

Results:

The coating was about 1μm in thickness, mainly contained Ti, O and C elements. Compared with pure titanium, TiO_{2-x} has similar biocompatibility towards L929 cells. However, there is no significant difference in the osseointegration level between 1 month and 3 months after implantation in minipig jaw. This coating could effectively degrade organic residues of Porphyromonas gingivalis (P.g.) with visible light irradiation. The contact Angle test results showed that the contact Angle of TiO_{2-x} surface decreased and the hydrophilicity increased after the photocatalytic decontamination treatment.

Conclusion:

The TiO_{2-x} coating had excellent surface mechanical properties, good visible light response photocatalytic activity, and biocompatibility. It is expected to be used as a novel surface coating for craniomaxillofacial implants to deeply clean bacterial residues when the implants are infected by microorganisms, and to provide a new solution for improving the treatment effect of craniomaxillofacial peri-implant inflammation.

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The Role of the Anterior Nasal Spine in Predicting Soft Tissue Changes Post-Le Fort I Osteotomy

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Kehan Li

Abstract

Background:
This study investigates the relationship between alterations in maxillary hard tissue landmarks and nasolabial soft tissue points following Le Fort I osteotomy in patients with skeletal Class II and Class III malocclusion. The aim is to evaluate whether the anterior nasal spine (ANS) can serve as a reliable indicator for predicting soft tissue movements.

Methods:
A retrospective analysis was conducted on patients who underwent Le Fort I osteotomy from 2017 to 2022. Three maxillary hard tissue landmarks and twelve soft tissue points located on the nose and lips were measured. Pearson's correlation coefficient was used to determine the relationship between hard and soft tissue changes along both sagittal and vertical directions. Ratios with significant correlation were calculated.

Results:
The study included 219 patients. In skeletal Class III malocclusion, a strong and widespread correlation was observed between the movement of the ANS and the A point in both sagittal and vertical directions with nasolabial soft tissue changes. Conversely, in skeletal Class II malocclusion, these correlations were weaker. Notably, the correlation diminished as the distance from the ANS increased.

Conclusion:
This study demonstrates that, in comparison to Class II malocclusion, Class III malocclusion exhibits a stronger connection between the movement of the ANS and soft tissue alterations, especially in the sagittal plane. The findings suggest that the anterior nasal spine may serve as an important factor in predicting post-surgical nasolabial soft tissue morphology, particularly in Class III patients.

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Sociodemographic factors associated with late presentation in nonsyndromic sagittal synostosis

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Davinder Singh


Trey Watmore


Nicole Kurnik


Alma Jukic

Abstract

ABSTRACT

Objective: Our objective is to determine which sociodemographic factors may influence the time of presentation of craniosynostosis, which can impact whether less invasive procedures are performed.
Design: Retrospective cohort study.
Setting: Tertiary Pediatric Care Hospital.
Patients, Participants: All patients with nonsyndromic sagittal synostosis who underwent surgery at a tertiary pediatric hospital from 1/1/2007-2/1/2024 were eligible for inclusion.
Interventions: Comparing demographic variables between those undergoing early and late craniosynostosis repair.
Main Outcome Measure(s): Demographic variables, Social Vulnerability Index (SVI) and Area Deprivation Index (ADI), median household income, education rate, and employment rates.
Results: 77.5% (n=234) of patients underwent minimally invasive repair. 22.5% (n=68) underwent open cranial vault remodeling. Age at consultation differed significantly between those undergoing early repair compared to late repair (0.18years v. 1.01 years, $p < 0.0001$). Patients undergoing late repair were more likely to be Hispanic (42.6% v. 24.4%, p 0.0378), on public insurance (66.2% v. 45.3%, $p = 0.0079$), have lower parental education rates (24.78% vs. 31.64%, $p = 0.0019$), and lower median household income ($65,657 vs. $75,281, $p = 0.0226$). Interestingly, ADI scores and SVI scores did not significantly differ between groups
Conclusions: Patients who presented later for treatment of nonsyndromic sagittal synostosis had lower median household income, were more likely to be Hispanic, had lower parental education rates, and were more likely to be on public insurance compared to those who received early treatment.

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Gas Metabolite Patterns to Identify Oral Squamous Cell Carcinoma

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Chao Peng



Guoran Li



Minyi Ren



Le Yang

Abstract

Oral squamous cell carcinoma (OSCC) is a common yet severely malignant tumor without obvious clinical symptoms in the early stage. Non-invasive early screening is an important treatment goal in OSCC management. However, data on its ability to perform this are lacking. We performed a diagnostic study to evaluate whether a portable “PEN3” equipped with 10 metal oxide sensors (eNose) could identify OSCC patients. We detected the gas-drawing sample using the eNose with a pathological diagnosis of OSCC patients (n = 98) and non-OSCC participants (n = 76). To analyze eNose signals, we adopted five different machine learning classification models and compared their performance. Among them, artificial neural network (ANN) has the highest accuracy of 86.15% to distinguish OSCC. Random forest (RF) has the highest sensitivity of 92.89% and the highest negative predictive value of 89.23% to discriminate. Our study showed that gas-drawing analysis using eNose could accurately identify OSCC patients, indicating OSCC might have specific volatile organic compounds patterns including alcohol, aldehydes, ketones, alkane, and organic sulfides.

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5-Year Institutional Experience Implementing Spring-Assisted Cranioplasty

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Colton Fernstrum


Samantha Morin


Laura Humphries


Ian Hoppe

Abstract

Background/ Purpose: Spring-assisted cranioplasty (SAC) is a minimally invasive technique for cranial expansion in patients with craniosynostosis. This study aims to describe the implementation of spring-assisted cranioplasty at the authors' institution which had not offered this surgical treatment option prior and shed light on its indications, patient selection process, patient demographics and overall results.
Methods: A retrospective cohort study of patients who underwent SAC for the treatment of single and multi-suture craniosynostosis was performed at a single institution over a 5-year period. Demographic data, perioperative outcomes, spring selection, and complications were described.
Results: 43 patients underwent SAC procedures for treatment of various forms of craniosynostosis. The male-to-female ratio was a little greater than 3:1 (34 males, 9 females). 84% of the cohort (n=36) were diagnosed with single-suture craniosynostosis, in which only 1 patient was syndromic. Approximately 78% of the patients with single-suture craniosynostosis were diagnosed with sagittal craniosynostosis (n=28). The remaining 22% were diagnosed with metopic (n=5) or lambdoid (n=3) craniosynostosis. 16% of the cohort (n=7) were diagnosed with multi-suture craniosynostosis and 2 patients had underlying syndromes; one with Muenke Syndrome with bilateral coronal, lambdoid, andsquamosal involvement and the other with PHACES syndrome with bicoronal sutures affected. The average age of the patients at insertion of the cranial springs was 3.79 months and springs were left in for an average of 89 days. On average, 3 springs were used per case with an average exertion of 26.13 N. Three patients presented with concern for early infection and all were successfully managed with antibiotics.
Conclusions: Cranial springs offer a minimally invasive option for cranial vault remodeling in patients with a diverse range of craniosynostosis.

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Impact of Surgical Incision on Palatal Tissue Microcirculation in Cleft Palate Repair: A Prospective Observational Study

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Abstract

Introduction:
Cleft palate repair involves intricate surgical techniques aimed at restoring the function of the palate. One of the critical factors influencing the outcome of these surgeries is the preservation of tissue microcirculation. While various incision techniques are employed, the impact of incision type on palatal tissue oxygenation remains underexplored. This study focuses on understanding how different surgical incision outlines—medial versus lateral—affect the microcirculation of palatal tissues during cleft palate repair.

Aims:
The primary objective of this study is to quantify the effect of different surgical incisions on regional tissue oxygen saturation (StO2%) in the palatal tissues during cleft palate repair. We hypothesize that a medial incision outline leads to superior preservation of microcirculation and better restoration of tissue oxygenation postoperatively compared to lateral incisions (von Langenbeck palatoplatsty).

Methods:
This prospective observational cohort study includes consecutive patients undergoing cleft lip and palate repair at a single cleft center from 2020-2025. Patients are divided into two groups based on the type of incision used: medial and lateral. A non-invasive optical spectroscopy-based flat light probe is employed to measure localized microvascular oxygenation (StO2%) in both the soft and hard palate before and after surgery. As a control, StO2% is also measured in patients without palatal clefts to establish baseline perfusion levels. Secondary outcomes include wound healing status (Pittsburgh classification), complications (CLASSIC and Clavien-Dindo systems), and the effect of incision type on StO2% changes depending on cleft type.

Results:
The results indicate that the medial incision significantly preserves palatal microcirculation, as evidenced by a higher postoperative StO2% compared to lateral incisions. The difference in tissue oxygenation was especially prominent on the non-cleft side in unilateral cleft palate cases, suggesting that incision outline plays a crucial role in regional tissue perfusion. No increase in surgical complications was observed with the medial approach.

Conclusion:
Medial incisions in cleft palate repair significantly improve the preservation and restoration of palatal microcirculation
compared to lateral incisions. Optimizing incision strategies can enhance tissue viability, promote better wound healing, and reduce postoperative complications, ultimately leading to improved functional and aesthetic outcomes in cleft repair surgeries.

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Pierre Robin Sequence - Initial management of upper airway obstruction: A 50 patient cohort study and review of literature

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Benito K Benitez

Abstract

Introduction:

Pierre Robin Sequence (PRS) is characterized by micrognathia, glossoptosis, upper airway obstruction, and feeding difficulties, often associated with cleft palate. Airway management in PRS patients is crucial, with both invasive and non-invasive treatment approaches available. However, preferences among clinicians vary. This study reviews the treatment options for airway management in PRS patients, based on a retrospective cohort from a center with over 20 years of experience, and examines regimens derived from the literature.

Methods:

This retrospective cohort study includes PRS patients with cleft palate treated at our center from birth to 6 years of age between 1999 and 2024. A literature review was also conducted using search terms related to Pierre Robin, airway, and cleft. Data collected included mode of birth, treatment course, and interventions. The primary outcome was morbidity and mortality during initial airway management, while secondary outcomes included the need for mandibular distraction or tracheostomy.

Results:

The cohort consisted of 50 children (31 females, 62%). In patients with airway obstruction who could not tolerate a supine position, a pre-epiglottic baton plate was the primary airway management strategy. All patients received feeding counseling by a speech-language pathologist or lactation consultant to facilitate oral feeding within the first 2 months. Tongue-lip adhesion was never performed. Persistent upper airway obstruction occurred in one patient, who required mandibular distraction at 10 months of age. However, all other patients with non-syndromic PRS experienced spontaneous resolution of airway obstruction after 4 to 6 months of pre-epiglottic baton plate therapy. A literature review of 693 articles identified 76 relevant studies, which reinforced the efficacy of the pre-epiglottic baton plate. Mandibular distraction was less frequently performed than in other treatment regimens reported in the literature, which highlighted the need for more randomized controlled trials and polysomnography as an evidence-based outcome measure.

Conclusion:

Our center’s 20-year experience confirms that the pre-epiglottic baton plate is an effective treatment for upper airway obstruction in PRS patients with cleft palate. Simplifying and standardizing its fabrication and handling may improve its clinical dissemination. Airway management in PRS should be performed by experienced centers and tailored to each patient’s needs.

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Spring-assisted occipital expansion in syndromic craniosynostosis: the difference between an occipital or cranial hinge

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Marjolein Dremmen



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Jochem Spoor

Abstract

Aim: From 2010 to 2016 we performed spring-assisted occipital expansion (OE) in patients with syndromic craniosynostosis with the bony hinge positioned low on the occiput. We then change the position of the bony hinge to the vertex with the goal to further reduce the occurrence of intracranial hypertension (ICH).

Methods: A total 46 patients were included: 18 patients underwent an OE with occipital hinge and 28 patients with a cranial hinge. The outcome of treatment of both cohorts were compared regarding complications, degree of ossification of the distracted area, and occurrence of ICH.

Results: The OE-occipital hinge group comprised of 8 patients with Crouzon syndrome, 8 Apert syndrome and 2 multisuture synostosis; in the OE-cranial hinge group these numbers are 16, 6, and 6 resp. Complications rate was low in both groups. Ossification was more complete in the OE-cranial hinge. Twelve patients with OE-cranial hinge (43%) required additional treatment for ICH versus eight (44%) with OE-occipital hinge. Treatment was a VP insertion for hydrocephalus in respectively 5 and 1 patient. Out of the 20 patients with additional treatment, 16 patients had Crouzon syndrome.

In seven OE-cranial hinge procedures and eleven OE-occipital procedures, the osteotomy was above the torcula. In seven of these 18 procedures (39%, 2/7 and 5/11 resp) required additional treatment for ICH. In the remaining 21 OE-cranial hinge procedures and 7 OE-occipital procedures with the osteotomy above the torcula, this number was twelve (43%, 9/21 and 3/7 resp).

Conclusion: There does not appear to be a benefit regarding complications, ossification of occurrence of ICH with respect to positioning the hinge in OE. Also, the level of osteotomy related to the torcula does not seem to be a determining factor.

The main predictor for developing ICH following OE could be the genetic defect causing Crouzon syndrome.

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An Unprecedented Complication in Pharyngeal Flap Surgery: Cerebrospinal Fluid Leakage

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Abstract

Velopharyngeal insufficiency (VPI) arises from inadequate closure of the velopharyngeal unit and is primarily treated through surgical intervention, most commonly with pharyngeal flap (PF). Although PF is considered the gold standard for VPI correction, recent studies have raised safety concerns due to significant complication rates. One reason for these complications is the elevation of the flap above the prevertebral fascia, close to the clivus and internal carotid artery.

Considering this anatomical proximity and its potential risks, we present a case of an 18-year-old female with midline craniofacial anomalies and a history of cleft palate repair, referred to our center for VPI. Nasometric analysis and fiberoptic nasopharyngoscopy revealed a wide velopharyngeal gap. PF surgery was planned to improve speech. The surgery involved elevating a superiorly based PF above the prevertebral fascia. In this patient with midline anomalies, tissue planes were complex and indistinct. During donor site closure, a pulsatile and colorless cerebrospinal fluid (CSF) leak was observed, likely due to microdefects in the disrupted and poorly defined fascia. The leak was successfully controlled using purse-string sutures. On postoperative day one, the patient developed high fever and severe headache. Paranasal sinus computed tomography (CT) and magnetic resonance (MR) cisternography revealed multiple midline cranial anomalies, including clival defects and pneumocephalus, consistent with prior CSF leakage, although no active leak was detected.

Due to the intraoral route and CSF exposure, empirical antibiotics were started, and the patient completed a 14-day course without complications. At six-month follow-up, neurological status was normal, and speech had significantly improved.

As a result, in patients with isolated cleft palate and syndromic features, where midline anomalies may be present, preoperative evaluation with paranasal sinus CT or MR cisternography prior to PF surgery may help prevent complications such as CSF leakage. In the event of CSF leakage, immediate and meticulous closure of the donor site using appropriate suture techniques, along with extended antibiotic therapy in symptomatic patients, appears to be an effective management strategy. To the best of our knowledge, this is the first study to report the rare complication of CSF leakage, which has not been previously documented.

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From Blueprint to Implementation: A Comprehensive Approach for the European Cleft Registry, a collaborative path forwards

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Abstract

Background

Cleft treatment protocols remain inconsistent across centers within and between countries, complicating meaningful comparisons of treatment outcomes. The European Reference Network for Rare Craniofacial Anomalies and Ear-Nose-Throat disorders (ERN-CRANIO) aims to improve the care of patients with rare craniofacial conditions, including cleft lip and/or palate (CL/P), on an international level. To address this issue, a European-wide CL/P dataset and registry was developed, enabling the standardization of treatment endpoints and outcome measures for international comparison and benchmarking.

Methods

A systematic review was first conducted to establish a scientific foundation for the registry by analyzing 24 previous cleft lip and palate registry initiatives. This review used thematic analysis and narrative synthesis to identify key themes necessary for the successful development of the registry. Following this, a set of questionnaires and semi-structured interviews were administered to determine the most effective structure for the registry. The initial dataset was created from an analysis of existing CL/P initiatives and refined through consensus meetings with cleft specialists.

Results

The review identified 21 distinct headings, including both quantitative and qualitative data, with 14 key themes visualized in a guidance framework. A total of 87 cleft specialists from 16 European countries participated in the development of the registry. Consensus was reached on a “Level 1” dataset, comprising mandatory clinical and patient-reported outcome measures, and a “Level 2” dataset, which includes additional outcome measures. Two dashboards were also created for the dissemination of data, enabling ongoing monitoring and analysis. Collaboration with other international cleft initiatives outside Europe was set up to enhance future linkage. By the end of 2024, the Level 1 registry was launched in the first cleft centers.

Conclusion

The successful development of the European CL/P dataset and registry marks a significant step forward in addressing disparities in resources, specialist expertise, and regulatory differences across European countries. This initiative is set to improve patient care and outcomes for CL/P patients throughout Europe. The study provides valuable insights for other international initiatives aiming to establish similar registries, supporting the goal of more standardized, data-driven cleft care on a pan-European scale.

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Polarized M2 macrophages induced by mechanical stretching modulate bone regeneration of the craniofacial suture for midfacial hypoplasia treatment

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Abstract

The underlying mechanism of the trans-sutural distraction osteogenesis (TSDO) technique as an effective treatment that improves the symptoms of midfacial hypoplasia syndromes is not clearly understood. Increasing findings in the orthopedics field indicate that macrophages are mechanically sensitive and their phenotypes can respond to mechanical cues. However, how macrophages respond to mechanical stretching and consequently influence osteoblast differentiation of suture-derived stem cells (SuSCs) remains unclear, particularly during the TSDO process. In the resent study, we established a TSDO rat model to determine whether and how macrophages were polarized in response to stretching and consequently affected bone regeneration of the suture frontal edge. Notably, after performing mmunofluorescence, RNA-sequencing, and micro-computed tomography, it was demonstrated that macrophages are first recruited by various chemokine factors and polarized to the M2 phenotype upon optimal stretching. The latter in turn regulates SuSCs activity and facilitates bone regeneration in sutures. Moreover, when the activated M2 macrophages were suppressed by pharmacological manipulation, new bone micro-architecture could rarely be detected under mechanical stretching and the expansion of the sutures was clear. Additionally, macrophages achieved M2 polarization in response to the optimal mechanical stretching (10%, 0.5 Hz) and strongly facilitated SuSCs osteogenic differentiation and human umbilical vein endothelial cell angiogenesis using an indirect co-culture system in vitro. Collectively, this study revealed the mechanical stimulation-immune response-bone regeneration axis and clarified at least in part how sutures achieve bone regeneration in response to mechanical force.

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Robot-assisted Augmented Reality Navigation for Osteotomy and Personalized Guide-plate in Mandibular Reconstruction: A Preclinical Study

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Xing Li



Long Shao



Xiaojun Wang



Tao Zhang

Abstract

Background: This study aimed to evaluate the accuracy of osteotomies performed using a self-developed Robot-assisted Augmented Reality Osteotomy Navigation System (RARONS) in cadaveric trials. Additionally, this study also assessed the precision of a mandibular reconstruction technique utilizing personalized pseudo-titanium plates and positioning guide-plates. The objective is to develop a reliable method for fibular and mandibular osteotomies as well as mandibular reconstruction.

Methods: This study developed RARONS and subsequently constructed a virtual surgical plan using imaging data. An evaluation framework was then established to assess the precision of osteotomy and reconstruction, quantifying osteotomy errors in terms of length, angle, and volume, as well as mandibular reconstruction errors in terms of width, height, anteroposterior diameter, and symmetry. This cadaveric study investigated the impact of pedicle factors on osteotomy accuracy during the experimental phase. Using Augmented Reality technology, surgeons were able to intuitively perform procedures during the robot-assisted osteotomy process based on the virtual plan. Furthermore, this study analyzed the influence of pedicle factors on mandibular reconstruction accuracy and compared the precision of traditional freehand reconstruction methods with that of personalized surgical guide-plate-based reconstruction methods.

Results: In the osteotomy experiments, the Non-Flap Fibula group demonstrated greater accuracy than the Free Flap Fibula group, with mean errors in osteotomy length, angle, and volume recorded as 1.44 ± 1.87 mm, 10.49 ± 4.28°, and 8.78 ± 4.32%, respectively. Similarly, the mandibular osteotomy experiment yielded clinically acceptable errors in osteotomy length, with mean errors in length, angle, and volume reported as 1.75 ± 1.32 mm, 6.32 ± 2.71°, and 10.61 ± 5.29%, respectively. In the reconstruction experiments, the personalized surgical guide-plate reconstruction group exhibited superior accuracy in width, anteroposterior diameter, and symmetry compared to the traditional freehand reconstruction group. Moreover, the presence of a pedicled fibula did not significantly impact the error rate in mandibular reconstruction.

Conclusions: This study highlights the potential of RARONS in enhancing surgical accuracy. Furthermore, the integration of personalized pseudo-titanium plates and positioning guide-plate technology facilitates precise mandibular reconstruction. This advancement lays the foundation for incorporating digital osteotomy navigation systems and personalized surgical guide-plate technology into maxillofacial surgery.

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Treatment of Maxillary Retrusion via Lefort I Osteotomy Combined with Distraction Osteogenesis in Patients with Cleft Lip and Palate: a Retrospective Cohort study

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Abstract

Background: Postoperative maxillary retrusion following cleft lip and palate (CLP) surgery represents a significant challenge in secondary reconstruction. The combination of LeFort I osteotomy with distraction osteogenesis (LeFort I-DO) has emerged as an increasingly favored approach due to its capacity for bone volume reconstruction and synchronized soft tissue adaptation. Nevertheless, systematic evaluations regarding the long-term stability and influencing factors post-surgery remain insufficient. In this study, we aimed to evaluate the outcomes and influencing factors of LeFort I-DO for the treatment of maxillary hypoplasia secondary to CLP.

Methods: A retrospective study of 64 CLP patients with maxillary hypoplasia treated with LeFort I-DO between January 2017 and December 2022 was conducted. Preoperative and postoperative (1 year) 3D-CT measurements, surgical parameters, complications, and follow-up data were analyzed. Univariate and multivariate logistic regression analyses were used to explore factors associated with postoperative stability.

Results: A total of 64 patients (mean age: 12.4±2.1 years; mean follow-up: 23.2±6.3 months) were included. Postoperative SNA angle significantly improved from 72.3°±3.2° to 83.3°±2.8° ($P<0.01$), maintaining at 82.1°±3.1° at 1-year follow-up. Occlusal plane angle, maxillary plane angle, and airway volume were significantly improved ($P<0.05$). The relapse rate (SNA reduction≥2°) was 17.4%. Multivariate analysis identified CLP type (OR=0.38, P=0.012), oblique distraction (OR=0.43, P=0.022), and slower distraction rate (0.5 mm/d, OR=0.36, P=0.009) as protective factors for postoperative stability.

Conclusions: LeFort I-DO is effective in correcting maxillary hypoplasia in CLP patients. Adjustments in distraction direction and rate improve long-term outcomes and stability, supporting its clinical application.

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Revisiting the Ousterhout Forehead Feminization Classification System: CT Characterization of Frontal Sinus Anatomy and Surgical Decision- Making

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Abstract

Purpose

Facial feminization surgery (FFS) often includes forehead procedures, such as forehead setback and/or contouring. The original Ousterhout classification used lateral cephalograms to define frontal sinus anatomy into 4 types for forehead surgical planning. References to these types are commonly used by the literature, patients, and surgeons when planning FFS. Since the original publication in 1987, no study has used CT scan to validate these, nor determine frequency and correlation with surgical procedure. This study investigates whether specific CT measurements support Ousterhout's frontal sinus types, their distribution, and correlation with forehead surgical technique.

Methods

We conducted a retrospective chart review of FFS patients from 2018–2024 within a large integrated healthcare system. Collected data included CT scan measurements and forehead procedure performed. Axial, coronal, and sagittal CT views were used to measure frontal sinus characteristics relevant to Ousterhout types. Two independent reviewers (AA and ID) assigned each patient an Ousterhout classification based on measurements. Chi-square test of independence evaluated associations between classification and surgical procedure. One-Way ANOVA assessed differences in CT measurements across Ousterhout types.

Results

155 patient charts were reviewed. One-Way ANOVA revealed statistically significant differences between Ousterhout types in left anterior table thickness, left depth ($p < 0.001$), left projection ($p < 0.001$), right anterior table thickness ($p < 0.001$), right depth ($p < 0.001$), right projection ($p = 0.002$), height ($p < 0.001$), and width ($p < 0.001$). Distribution by type was: 18% type 1 (vs. 9% original), 7% type 2 (vs. 8%), 40% type 3 (vs. 82%), no type 4, and 34% unclassified. Most type 3 patients underwent setback, while most type 1 and 2 patients had contouring only. Chi-square test showed significant association ($p < 0.001$) between classification and procedure performed.

Conclusion

CT measurements validate significant anatomical differences between Ousterhout types, particularly anterior table thickness, projection, depth, height, and width. Surgical procedures align with type assignments, affirming the classification's clinical relevance. Frequencies differ from original estimates, and 34% of patients did not fit any type, suggesting limitations. These findings support expanding contouring-only approaches in patients previously considered for setback, enhancing surgical planning and patient counseling.

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Application of Digital Surgical Techniques of Trauma-Induced Occlusal Disorder

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峰 邱

Abstract

Profile:
This case tentatively applied digital surgical techniques to overcome the limitations of anatomical reduction and achieved functional occlusal reconstruction for the purpose of patient's comfort. It provides a feasible solution for traumatic occlusal disorders caused by severe maxillofacial trauma.

Case report：
Information: Male, 33 years old. Open bite after trauma for 3 days.
Examination: Facial symmetry is noted, with limited mouth opening and an anterior open bite. CT scan shows a right premolar sagittal fracture and a left condylar neck fracture.
Diagnosis: Multiple mandibular fractures.
Treatment procedure: **Preoperative Digital Workflow** (**a.** Computer-assisted virtual occlusal analysis; **b.** 3D anatomical model-guided reconstruction; **c.** 3D surgical guide fabrication.) **Intraoperative Precision Execution** (**d.** Place the surgical guide in position; **e.** Guided fracture fixation.) **Postoperative Occlusal Stabilization** (**f.** Intermaxillary traction with a rubber band).

Discussion：
The patient's bilateral condylar asymmetry suggests that pre-injury occlusion achieved functional balance via temporomandibular joint adaptation, not an ideal anatomical state. The reduction effect of traditional surgical methods is affected by many factors such as surgical field, swelling and bleeding in the surgical area. Our surgical goal prioritized functional occlusion over forced anatomical reduction, aligning with the 'physiological reduction' concept. Digital surgical planning realizes the prediction of occlusal reconstruction through three key techniques: First, computer-assisted virtual surgical planning (VSP) can accurately simulate fracture reduction preoperatively using high-resolution CT data and quantitatively analyze occlusal relationship and condylar spatial orientation. Secondly, the 3D printed patient-specific surgical guide converts virtual data into entities with sub-millimeter accuracy. Finally, the biomechanical optimization of the mandibular movement is ensured by the dynamic occlusion evaluation of the virtual jaw joint. Through virtual simulation and 3D-printed surgical guides, digital surgery can predict and design the reduction position of fracture segment in advance, achieve the purpose of restoring ideal occlusion and condylar position.

Conclusion：
Digital surgical technology pursues the coordination of anatomical reality and physiological needs by combining biological adaptation principles with precision engineering. Offers a feasible solution for traumatic occlusal disorders through the integration of preoperative virtual planning and intraoperative navigation.

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Hypoxia-Induced HUVEC-Derived Exosome-Functionalized Hydrogel for Promoting Skin Defect Repair

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Abstract

Objective

Chronic skin defects in the maxillofacial region present a significant clinical challenge, often resulting from trauma, infection, or vascular insufficiency, leading to impaired tissue repair and functional compromise. Hypoxic exosomes have emerged as a promising therapeutic strategy to enhance angiogenesis and tissue regeneration in such defects. This study aims to investigate the regenerative potential of hypoxia-induced exosomes derived from human umbilical vein endothelial cells (HUVECs), encapsulated in Gelatin Methacryloyl (GelMA) hydrogels, for the treatment of chronic maxillofacial skin wounds.

Methods

HUVECs were cultured under hypoxic conditions (1% O_2) to generate hypoxia-induced exosomes (Hp-Exo), which were subsequently isolated and characterized. MicroRNA sequencing was performed to compare the miRNA profiles of Hp-Exo and normoxic HUVEC-derived exosomes. In vitro assays assessed the effects of Hp-Exo on endothelial cell viability, migration, and angiogenic tube formation. For in vivo evaluation, full-thickness skin defects were created in a murine maxillofacial wound model. Wound closure, tissue regeneration, and neovascularization were analyzed over 7-14 days using macroscopic observation, histology, and immunofluorescence staining.

Results

Hypoxic conditioning significantly enriched HUVEC-derived exosomes with miR-519-5p, which enhanced endothelial cell proliferation, migration, and angiogenic potential in vitro. GelMA hydrogels loaded with Hp-Exo promoted robust angiogenesis and accelerated wound healing in the maxillofacial defect model, demonstrating improved re-epithelialization, collagen deposition, and microvascular density compared to controls.

Conclusion

Hypoxia-primed exosomes exhibit enhanced pro-angiogenic and regenerative properties, making them a promising therapeutic tool for chronic maxillofacial skin defects. The combination of Hp-Exo with GelMA hydrogels provides a synergistic strategy to support vascularization and tissue repair in challenging wound environments. These findings highlight the potential of exosome-based therapies in craniofacial soft tissue engineering and regenerative medicine.

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One Piece milled PEEK (polyetheretherketone) PSI for inferomedial blow- out fractures

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Dong Yeon Kim

Abstract

Background

Inferomedial blow-out fractures often require complex surgical reconstruction to restore the 3D structure of the orbital wall. While titanium implants are commonly used, they present challenges like difficult intraoperative modifications and poor radiolucency. Polyetheretherketone (PEEK) has emerged as a promising alternative due to its radiolucency, biocompatibility, and ability to be milled into thin patient-specific implants (PSIs). This study evaluates the use of one-piece milled PEEK implants in the reconstruction of inferomedial blow-out fractures.

Materials and Methods

A total of 22 patients with inferomedial blow-out fractures underwent surgical reconstruction with one-piece milled PEEK implants. Preoperative CAD-based planning, using mirrored images of the unaffected side, ensured optimal implant shaping. Implants were milled to 0.7 mm thickness for precise anatomical reconstruction. Intraoperative navigation confirmed correct implant positioning, and postoperative CT scans were used to compare results with preoperative designs. Clinical outcomes were assessed based on functional recovery, aesthetics, and patient satisfaction.

Results

With a mean follow-up of 9 months, one patient developed a delayed seroma requiring implant removal, but no significant complications occurred in the remaining patients. Functional recovery, including eye movement and diplopia correction, was satisfactory, and aesthetic outcomes were comparable to other materials. Patients expressed higher satisfaction due to preoperative 3D design confirmation and clear postoperative results, with most surgeries performed via a transconjunctival approach, minimizing scarring.

Conclusion

One-piece milled PEEK implants provide a viable alternative for the reconstruction of inferomedial blow-out fractures, offering advantages in radiolucency, anatomical precision, and reduced scarring. Further studies are needed to confirm the long-term safety and efficacy of PEEK in orbital reconstructions.

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A combination of anterior maxillary osteotomy (AMO) and mandibular anterior segmental subapical osteotomy (MASSO) with or without genioplasty for bimaxillary protrusion correction

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Abstract

The conventional treatment for bimaxillary protrusion involves orthodontic therapy with the extraction of four first premolars followed by retroclination of the anterior teeth and jaw segments. However, in adult patients, achieving significant posterior movement of the anterior dentoalveolar complex through orthodontics alone is often challenging due to biomechanical limitations, leaving many patients dissatisfied with residual lip protrusion post-treatment. This study evaluates the efficacy of combined anterior maxillary osteotomy (AMO) and mandibular anterior segmental subapical osteotomy (MASSO), supplemented by orthodontics, in addressing this condition. A total of 33 patients (median age: 27.6 years) underwent the procedure, utilizing a modified Wassmund technique with a supplemental hard palate sagittal incision to optimize maxillary osteotomy. Concurrent genioplasty was performed in select cases based on post-AMO/MASSO chin morphology. Pre- and postoperative cephalometric analyses were conducted using specialized software, with statistical significance (SPSS 14.0) set at $p < 0.05$. All patients achieved primary healing with no major complications. Key outcomes included: SNA (−1.18° ± 0.38°) and SNB (−1.59° ± 0.38°) reductions, SND increase (+2.45° ± 0.4°), A-NP (−1.87 ± 0.28 mm) and B-NP (−1.93 ± 0.39 mm) retractions, Pog-NP advancement (+1.99 ± 0.45 mm), Improved lip position (UL-E: −3.41 ± 0.95 mm; LL-E: −3.24 ± 0.39 mm), Enhanced Z-angle (+8.14° ± 0.25°). Patient satisfaction was high (31/33), with two cases reporting mild residual lip fullness. The findings demonstrate that AMO-MASSO combined therapy is an effective approach for correcting bimaxillary protrusion, offering predictable skeletal and aesthetic outcomes.

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Cetuximab with dalpicilib in patients with HPV-negative, anti-PD-1 resistant R/M HNSCC

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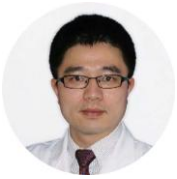
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Guoxin Ren



Jingzhou Hu

Abstract

Background: HPV-negative HNSCC is characterized by the hyperactivation of CDK4/6 pathway. As immunotherapy increasingly emerges as the first-line treatment for HNSCC, resistance to anti-PD-1 agents has become a pivotal challenge. We conducted this phase II study to evaluate the efficacy and safety of dalpiciclib, a CDK4/6 inhibitor, combined with cetuximab in patients with anti-PD-1-resistant, HPV-negative HNSCC.

Methods: The patients diagnosed with p16-negative recurrent or metastatic HNSCC resistant to the first-line anti-PD-1 therapy, who had not previously treated with cetuximab, were enrolled in this study. Patients received oral dalpiciclib 150 mg once daily for 21 consecutive days, and intravenous cetuximab (400 mg/m^2 on day 1 of the first cycle followed by 250 mg/m^2 once per week) in 28-day cycles. The primary endpoint was objective response rate (ORR). Secondary endpoints included safety, progression free survival (PFS), and overall survival (OS). A Simon's two-stage design was used, the study would be terminated if 1 or fewer responses were observed among the 14 patients enrolled in the first stage. If the first stage was fulfilled, further 12 patients would be enrolled.

Results: In the final analysis, 28 patients who met the inclusion criteria were enrolled, with a median age of 58.0 years (range 30-75 years). Of 28 evaluable patients, 3 patients experienced disease progression, 6 had stable disease and 19 achieved PR. The ORR and DCR were 67.9% (95% CI, 0.49-0.82) and 89.3% (95% CI, 0.72-0.97), respectively. By the cutoff date (Dec 31th, 2024), 9 patients remained on treatment. With a median follow-up of 7.34 months, the median PFS was 5.3 months (95% CI, 1.33-9.27), and the median OS was 17.0 months. Treatment-related adverse events (TRAEs) occurred in 100.0% of patients, mainly grade 1-2. The most common TRAEs were neutrophil count decreased (25/28, 89.3%), white blood cell decreased (25/28, 89.3%), and acneiform rash (16/28, 57.1%). Grade 3 TRAEs included neutrophil count decreased (9/28, 32.1%) and white blood cell count (9/28, 32.1%). No grade 4/5 TRAEs were reported.

Conclusions: Our data suggests that dalpiciclib combined with cetuximab was well-tolerated and demonstrated potentially favorable efficacy in patients with anti-PD-1-resistant, HPV-negative HNSCC.

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Single-cell RNA sequencing reveals mitochondrial dysfunction in microtia chondrocytes

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Abstract

Microtia, a congenital malformation characterized by underdeveloped or absent external ears, affects approximately 1 in 5,000 to 10,000 live births globally, resulting in auditory impairments and significant psychosocial challenges for affected individuals. Despite its clinical importance, the cellular and molecular mechanisms driving microtia remain poorly understood, particularly the role of chondrocyte dysfunction in auricular cartilage development. This study employed single-cell RNA sequencing to investigate mitochondrial dysfunction in chondrocytes from cartilage samples of patients with unilateral, non-syndromic microtia compared to healthy controls, utilizing the 10x Genomics platform. Comprehensive bioinformatic analyses, including cell type identification, trajectory analysis, and weighted gene co-expression network analysis, were performed to uncover cellular and molecular abnormalities. Mitochondrial function was further evaluated through reactive oxygen species (ROS) levels, mitochondrial membrane potential, and transmission electron microscopy.

Results demonstrated that microtia chondrocytes exhibited significantly lower mitochondrial function scores, elevated ROS production, reduced membrane potential, and altered mitochondrial morphology compared to controls. Trajectory analysis revealed disrupted and disorganized differentiation patterns in microtia chondrocytes, indicating impaired cartilage formation critical for normal auricular development. Gene co-expression network analysis identified key hub genes,

including SDHA, SIRT1, and PGC1A, which showed reduced expression in microtia and are closely linked to mitochondrial function and cellular energy metabolism. These findings confirm mitochondrial dysfunction as a central contributor to microtia pathogenesis, with increased ROS levels and defective differentiation disrupting the normal development of auricular cartilage. The elevated ROS may induce oxidative stress, further impairing chondrocyte function and cartilage integrity. By elucidating these molecular mechanisms, this study provides critical insights into microtia's etiology and highlights potential therapeutic targets, such as interventions to restore mitochondrial function and redox balance, to enhance chondrocyte performance and promote normal cartilage development. These findings pave the way for future regenerative medicine strategies, potentially improving clinical outcomes for individuals with microtia and advancing our understanding of congenital cartilage disorders.

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Common Craniosynostosis Syndromes: when is midface advancement surgery required?

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Abstract

Introduction: Patients with syndromic craniosynostosis usually undergo multiple different craniofacial surgeries throughout their lifetime as part of their multidisciplinary management. Severe maxillary hypoplasia and retrusion is generally a feature of these syndromes, with phenotypic variation. Midface advancement surgery can be required in some of these patients to address psychological, physiological and/or functional concerns such as upper airway obstruction, difficulty with mastication or lack of eye protection.

Aims: The aims of this study were to determine the proportion of patients with each craniosynostosis syndrome that underwent midfacial advancement surgery as part of their craniofacial management. To explore reasons why surgery was, or was not, indicated to enable clinicians to better educate families regarding the likelihood of needing midface surgery.

Methods: A retrospective cohort study was undertaken at the Supra-Regional Craniofacial Unit, Alder Hey Children's Hospital, Liverpool, UK. All patients with a diagnosis of Apert, Crouzon, Pfeiffer, Saethre-Chotzen and Muenke syndrome >9 years old were identified from the departmental database. The clinical records were assessed to determine if a midfacial advancement procedure had been performed, or reasons for not performing surgery.

Results: After application of inclusion and exclusion criteria 143 cases were included in the final analysis; Apert (n=34), Crouzon (n=47), Muenke (n=23), Saethre-Chotzen (n=24), Pfeiffer (n=14). 40% (n=58) of patients underwent a midface advancement procedure comprising monobloc +/- bipartition (n=10) or Le Fort III +/- bipartition (n=48). The average age at the time of surgery was 11 years old. Proportionally by syndrome mid-face advancement was performed in; 73% Apert (n=25), 57% Crouzon (n=57%), 36% Pfeiffer (n=5), 4% (n=1) Saethre-Chotzen Syndrome. No patients with Muenke Syndrome underwent mid-facial advancement. Of the patients who didn't undergo midfacial advancement this was not clinically indicated in 77% (n=63), the patient or family declined in 22% (n=18) and 1% had medical contraindications (n=1).

Conclusions: Parents of patients with Saethre-Chotzen or Muenke Syndrome can be counselled from an early stage that mid-face advancement surgery is unlikely to be required as part of their surgical management. Midface advancement is generally indicated in patients with the other common craniosynostosis syndromes; however, a proportion of patients will still decline.

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Novel 3D printed model for visualisation of impacted and supernumerary teeth in complex multidisciplinary cases

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Abstract

Introduction: Multiple impacted or supernumerary teeth, often due to syndromic conditions such as in cleidocranial dysostosis, craniosynostosis syndromes or facial clefts can pose a complex challenge for oral and maxillofacial surgeons and orthodontists. Multidisciplinary treatment planning in the presence of multiple impacted teeth and supernumeraries, in close proximity to each other, can be complex and time consuming. Accurate identification of supernumerary teeth to be removed is essential to prevent incorrect extraction. 3D imaging such as CT and cone beam CT (CBCT) have greatly improved localisation, however there are limitations. Identification can be particularly challenging where multiple teeth are overlying one another, not only on imaging, but also when trying to visualise in a bloody surgical field.

Aims: The aim was to develop a transparent 3D printed model to be able to visualise unerupted impacted and supernumerary teeth to aid in treatment planning and communication.

Methods: Selected CT or CBCT scans of patients with multiple impacted or supernumerary teeth were used to construct virtual 3D models. The teeth were digitally segmented and individually grouped and colour coded before printing. Different hard structures were printed using different resins; erupted and impacted teeth in white, supernumerary teeth in red and the supporting bone in clear.

Results: Four patients were identified as benefitting from 3D printed models as part of their treatment planning phase. Three patients had a diagnosis of cleidocranial dysostosis and one had Apert syndrome with impacted canines. An initial proof of concept model was successfully printed using the methodology above before being further refined. Transparent bone allowed for visualisation of the supernumerary and impacted teeth through the model, in their accurate clinical
orientation. Accurate localisation of the unerupted teeth using the 3D printed model informed the surgical treatment plan in each case and allowed accurate localisation intra-operatively.

Conclusions: 3D printing is an indispensable development for assisting in visualisation of the position of impacted teeth and accurate localisation of supernumeraries. 3D models are an important communication tool for clinicians involved in MDT patient care, as well as an educational aid for patients and families when consenting to treatment.

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Digital Design and 3D Printing Technology-Assisted Treatment of a Patient with Mandibular Asymmetry: A Case Report

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Lifeng Li



Xiaoyi Hu

Abstract

Mandibular asymmetry is one of the most common facial deformities, affecting both aesthetics and oral-maxillofacial function, and may even impact patients' mental health. Depending on the severity of the malocclusion, treatment options include orthodontic therapy, surgical intervention, or combined orthodontic-orthognathic approaches. Given the variety and inconsistency in classification methods for mandibular asymmetry, personalized surgical plans tailored to individual cases are necessary to achieve both facial harmony and structural stability. Currently, under the collaboration of orthodontists, 3D simulation technology is used for preoperative analysis, fabrication of occlusal splints and surgical osteotomy guides, and the development of patient-specific surgical plans. This, combined with precise intraoperative procedures, significantly reduces surgical trauma and leads to favorable clinical outcomes. Against this background, our department treated a case of mandibular asymmetry using 3D simulation technology.

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‘FACE ME’: The Impact and Value of an Arts-Based Project about the Patient-Parent-Clinician Relationship in European Reference Network CRANIO

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Hester M van de Bovenkamp

Abstract

Background: A good patient-clinician relationship is an important aspect of quality of care according to patients living with a rare congenital craniofacial condition and their parents. Despite efforts, the challenging question remains how to improve this relationship.

Objective: We describe the value and impact of using arts-based methods as a catalyst for bringing the two ‘worlds’ of patients and their parents and that of clinicians together.

Methods: FACE ME, developed by two visual artists, consisted of reorganizing the house of a surgeon with a group of patients (n=3), surgeons (n=3), and a parent (n=1) resulting in two artworks. The following data

were analysed using reflexive thematic analysis: the film recording the process, photos of the artworks (i.e. end-results of two reorganisations), conversations and reflections of the project group involved, and survey results of respondents who watched the film and photos.
Results: Four intertwined themes describe the impact and value of FACE ME: 1) *Importance of* e*xchanging trust,* 2) *Seeing each other as a person,* 3) *Imagine standing in each other's shoes,* and 4) *Working as a team.* These themes identified represent both perspectives and their similarities in expectations of a good relationship, and findings were supported by the views of the project group and the audience watching the film.
Conclusion: FACE ME crossed the boundaries of clinicians, patients, and their parents, and created a better mutual understanding. This arts-based project started a different conversation, and reflection, changed mindsets,and provoked actions towards a better relationship.

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The comparative study of lateral profile measured by 3dMD FaceSystem and lateral cephalogram

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PIAO WANG



RENJI CHEN

Abstract

Objective

To evaluate the lateral profile using lateral cephalogram and 3dMD FaceSystem and to investigate the difference of these two measurements.

Methods

A total of 37 volunteers with normal face profile took 3dMD photograph and lateral cephalogram. The line distance, ratio and angle of the face profile were measured. The data of these two methods were compared and analyzed.

Results

The line distance of Sn-Gn', Sn-Sto, Sto-Gn', 0-meridian to Sn and 0-meridian to Pog', the ratio of Sn-Sto/Sto-Gn', Sto-Gn'/Sto-Gn' and the angle of N'-Sn-Pog' had no significant differences, but the angle of N'-Prn-Pog', Cm-SnLs and N'-Sn hadsignificant differences between the two methods($P < 0.05$).

Conclusion

Compared with the measurement of lateral cephalogram, the 3dMD measurement can describe the soft tissue shape better, but some of the landmarks in the lateral cephalogram cannot be used in the 3dMD measurement.

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Correlation Study of Ramus-Preserving Mandibular Angle Osteotomy and Lower Facial Soft Tissue Sagging: A Retrospective Analysis of 104 Cases

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Zhang Yichi

Abstract

Objective:
This study investigates the impact of ramus-sparing mandibular angle ostectomy on mandibular contour morphology and lower facial soft tissue laxity.

Methods:
A total of 104 patients who underwent surgery at Shanghai Ninth People's Hospital affiliated with Shanghai Jiao Tong University School of Medicine between January 2018 and December 2023 were included. Comprehensive three- dimensional facial data acquisition using 3DMD imaging systems and computed tomography scans were performed preoperatively and at 6-month follow-up. Quantitative assessments included: 1) comparative analysis of hard and soft tissue ramus heights, 2) Merz aesthetic scale evaluation, and 3) cervical-mental angle measurements.

Results:
No statistically significant differences were observed in ramus height measurements between osseous and soft tissue components ($p>0.05$), demonstrating proportional soft tissue adaptation to skeletal reduction (mean bone resection: 17.1±4.5 mm vs soft tissue change: 15.9±4.3 mm). Both Merz scale assessments (preoperative: 1.94 vs postoperative: 1.79) and cervical-mental angles (preoperative: 114.62° vs postoperative: 111.52°) showed no statistically significant differences at 6-month follow-up ($p>0.05$).

Conclusion:
The ramus-sparing mandibular angle ostectomy effectively contours the mandible without inducing significant lower facial soft tissue relaxation in short-term evaluation, demonstrating its clinical reliability for facial aesthetic surgery.

Keywords： Mandibular Angle Osteotomy；Lower Facial； Soft Tissue Sagging；Retrospective Analysis

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Nursing care of a patient undergoing carotid artery reconstruction for secondary malignant tumour of the neck

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Zhuang Panpan


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Abstract
Carotid artery invasion is one of the most difficult problems in the surgical management of advanced head and neck malignant tumours, and such patients are difficult to treat and have a poor prognosis. Although carotid artery vascular resection and reconstruction can completely remove the tumour and improve the postoperative survival rate of patients, carotid artery ligation and resection can lead to complications such as cerebral ischemia, arterial rupture and bleeding, and arterial thrombosis, which can be fatal in severe cases. Therefore, accurate assessment of the status of cerebral collateral circulation, careful design and implementation of surgical methods, and careful care during the perioperative period can reduce the occurrence of complications, promote the early recovery of patients, and improve their quality of life. This study summarises the nursing experience of one case of a patient with carcinoma of the floor of the mouth with a secondary malignant tumour of the neck undergoing right radical cervical lymph node dissection, unilateral + right carotid artery partial resection accompanied by common carotid - internal carotid artery autologous vascular bypass grafting (right saphenous vein reconstruction), with the aim of providing a reference for clinical care. Nursing points include: positional braking; close observation of neurological signs, strict monitoring and control of blood pressure, anticoagulation therapy to prevent cerebral ischemia, vascular embolism, arterial rupture and other complications; tracheotomy, drain tube care; nutritional support intervention; rehabilitation exercise guidance; targeted psychological care, etc. After careful treatment and care by the health care team, the patient's condition was stable for 17 d after the operation, and was discharged from the hospital successfully.

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Cleft Lip Repair Associated with a Rare Postoperative Infection Serratia Marcescens: A Rare Case Report

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Amina Al-Yaqqobi



Sheikhan Al-Hashmi



Ruqaya Al-Abri



Fatma Al-Habsi

Abstract

Cleft lip deformity is the most common birth defect, characterized by failure of the union of the medial nasal process and maxillary prominence. The variable range of cleft lip could be unilateral or bilateral, complete or incomplete, cleft lip with or without cleft palate. Diagnosis of cleft lip is typically through clinical examination. Surgical repair is the ultimate management of cleft lips, which restores their normal appearance. Repairing a cleft lip could be associated with certain complications, including infection, dehiscence, notching, and post-op hypertrophic scarring. Nevertheless, the infection can occur with any surgical procedure, but infection with Serratia marcescens in a cleft lip procedure is uncommon typically. In this paper, we present a rare case report of a 5-month-old female patient with Serratia Marcescens infection post-cleft lip repair.

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A prediction model for the occurrence of second primary cancer in oral squamous cell carcinoma patients receiving surgery

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Abstract

Background

This study aims to develop a predictive model for second primary cancer (SPC) in post- operative oral squamous cell carcinoma (OSCC) patients.

Methods

A retrospective analysis was conducted on the clinical data of 714 OSCC patients admitted to our institution. Patients were randomly assigned to modeling and validation cohorts in a 7:3 ratio. Independent risk factors for postoperative SPC were identified through univariate and multivariate logistic regression analyses, and a Nomogram-based prediction model was constructed. The performance of the Nomogram was assessed using receiver operating characteristic curve (ROC), area under the curve (AUC), calibration curve and decision curve.

Results

The results identified smoking history, alcohol consumption, tumor differentiation, TNM stage, T stage, N stage, and prior radiotherapy as independent risk factors for the development of SPC following OSCC surgery. The nomogram-based prediction model, incorporating these variables, demonstrated robust discriminatory power and calibration in both the training and validation cohorts, with AUC values of 0.77 and 0.72, respectively. The calibration curve closely aligned with the standard curve, confirmed a strong concordance between predicted probabilities and actual outcomes. Moreover, decision curve analysis (DCA) indicated high clinical utility of the model.

Conclusion

The prediction model constructed in this study provides a scientific basis for screening high-risk populations of OSCC patients for postoperative SPC and timely clinical intervention.

Keywords

Oral squamous cell carcinoma, Secondary primary cancer, Prediction model, Nomogram

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Study on the Correlation between the Immunosuppressive Effect of Radiotherapy and Second Primary Cancer in Patients with oral squamous cell carcinoma receiving surgery

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Abstract

Objective

Radiotherapy is known to reshape the tumor immune microenvironment, often leading to immunosuppression. This study seeks to investigate the underlying relationship and potential mechanisms linking the immunosuppressive effects of radiotherapy to the emergence of second primary cancer (SPC) in oral cancer. We aim to achieve this by analyzing the association between immunosuppression-related markers after radiotherapy and oral cancer-associated SPC, thereby laying a foundation for early clinical intervention and further mechanistic investigations.

Methods

We performed a retrospective analysis on clinical data from patients diagnosed with both oral cancer-related SPC and those with solitary oral cancer. The study included clinical samples of primary oral squamous cell carcinoma (p-OSCC) and second primary oral squamous cell carcinoma (s-OSCC) that developed after radiotherapy. Additionally, self-matched samples from patients with first primary oral squamous cell carcinoma (f-OSCC) and s-OSCC, with or without a history of radiotherapy, were examined. Immunohistochemistry was employed to observe differences in the expression of immunosuppressive factors, specifically T cell immunoglobulin and mucin domain-3 (TIM-3) and indoleamine 2,3-dioxygenase (IDO), to elucidate the regulatory impact of radiotherapy on the immune microenvironment.

Results

Our findings reveal a significant increase in the expression of both IDO and TIM-3 in s-OSCC tissues that developed after radiotherapy compared to p-OSCC tissues. This suggests that radiotherapy may contribute to an immunosuppressive microenvironment by upregulating these factors, potentially promoting the occurrence of SPC.

Conclusion Our study indicates that radiotherapy may be implicated in the onset and progression of SPC by inducing an immunosuppressive state. By elucidating the possible intrinsic link between the immunosuppressive effects of radiotherapy and the emergence of SPC, our research offers a fresh perspective and a theoretical groundwork for a deeper understanding of the mechanisms underlying SPC development after OSCC surgery.

Keywords oral cancer; second primary cancer; radiotherapy; immunosuppression

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Digitally artificial temporomandibular joint replacement for bilateral traumatic temporomandibular joint bony ankylosis: A case report

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Abstract

Background

Temporomandibular joint (TMJ) bony ankylosis severely impacts mouth opening, orofacial growth, airway space, and overall quality of life.Artificial TMJ replacement is recognized as one of the most effective treatment modalities for adult patients with TMJ ankylosis. This case report describes the digital management of bilateral traumatic TMJ bony ankylosis through artificial joint replacement.

Case presentation

A 48 year old female patient presented with a chief complaint of complete limitation of mouth opening with 36-year history. Clinically, the patient revealed severema ndibular retrognathism and obstructive sleep apnea(OSA) due to mandibular dysplasia, multiple residual roots, defective crowns, and poor prostheses in her oral cavity. 3D-computed tomography findings revealed bilateral mandibular ramus hypoplasia along with bilateral TMJ bony ankylosis. Moreover, the narrowest segment of the upper airway measured less than 4 mm. Then, a digital surgical plan for bilateral artificial TMJ replacement should be designed and a digital surgical guide should be made before surgery. Intraoperatively, a surgical navigation system and surgical guide were utilized to enhance surgical precision and efficiency.Postoperatively, the mentum was moved forward by 1cm, and the narrowest distance of the upper airway was over 8mm. The patient was instructed to perform daily mouth-opening exercises.. After six-month follow-up, the exceeded 35mm mouth opening was maintained, and there was no detachment or loosening of the prostheses and screws. The patient was very satisfied with the treatment effect with no complications and planned to achieve the occlusal rehabilitation.

Conclusion

Digitally artificial temporomandibular joint replacement represents a viable and effective treatment strategy for adult patients with traumatic TMJ bony ankylosis, potentially yielding favorable functional and aesthetic outcomes.

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A Single Institution's Experience with Posterior Vault Distraction Osteogenesis in a Low Resource Environment

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Abstract

Background:

The goal of posterior vault distraction osteogenesis (PVDO) for patients with craniosynostosis is to increase intracranial volume in order to prevent intracranial hypertension and improve head shape. The process of distraction osteogenesis can be more complex when patients have minimal access to healthcare resources. The average complication rate reported in the literature is 30%, with cerebrospinal fluid leak and wound infections being the most common. The purpose of this study is to describe a single institution's experience with patients undergoing PVDO, many of whom face significant barriers to accessing healthcare.

Methods:

A retrospective analysis was performed of patients undergoing PVDO from 2014-2023 at a single institution. Data collection included demographics, social vulnerability index (SVI), cranial sutures involved, intraoperative details, and post-operative complications. Descriptive statistical analyses were used to compare variables of interest.

Results:

There was a total of 20 patients, including 9 females (45%) and 11 males (55%). The mean U.S. SVI was 0.73. Patients with a syndromic diagnosis made up 50% of the patient population (n=10). The median age at the time of surgery was 8.5 months (range of 3 months to 6 years). Patients with multi-suture craniosynostosis represented 85% of the patient cohort (n=17), with the coronal suture being the most commonly involved (n=13; 65%). Six patients (30%) developed postoperative infections and 1 of those patients required a return to the operating room for washout. Eight patients (40%) underwent multiple cranial vault surgeries.

Conclusions:

This analysis describes clinical outcomes of a vulnerable patient population undergoing PVDO. The average SVI highlights a lack of convenient access to healthcare, and thus a higher risk for non-compliance and adverse outcomes. Despite facing socioeconomic barriers, the studied patients had similar complication rates to those reported in the literature.

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Diagnosis specific webinars for patients and caregivers

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Jacoba Kats



Elin Weissbach

Abstract

Diagnosis-specific webinars for patients and caregivers

Background and aim

For patients and caregivers, it can be difficult to find the right information about rare diseases, such as craniofacial anomalies. Scientific papers about these diseases are not accessible to patients. Our goal is to provide patients with evidence-based information in patient-friendly language.

Method

In this study, nurse specialists (NS) identified the information needs of parents of children and young adults with craniofacial diagnoses during routine phone calls and in-person consultations. The information needed was then grouped per diagnosis. Depending on the topic(s), the NS selected the most suitable members of the craniofacial care and/or research team to prepare a presentation that aligns with the identified information need. In addition, a few patients or parents were asked to share their personal treatment journeys.

Families were invited by e-mail and through the team's social media channels. Presentations took place on Microsoft Teams, after which attendees had the opportunity to ask questions and had to complete an online evaluation survey. All presentations were also recorded and published on the team's YouTube channel.

Results

Over the past three years, six evening webinars have been organised, each lasting two hours. Topics included sleep apnea in Apert syndrome; treatment of Crouzon and Pfeiffer syndrome; treatment of Treacher Collins syndrome; development of the craniofacial microsomia guideline; treatment options for scaphocephaly (in collaboration with Radboud UMC); and the comparative effectiveness of conservative management versus craniofacial surgery in trigonocephaly.

Evaluations of the webinars showed high satisfaction among both patients and presenters, and recordings uploaded to the team's YouTube channel continue to attract frequent views.

Conclusion

Online webinars that bring together clinicians, researchers, and patients and/or their parents to share their expertise and experience are highly appreciated by families. These sessions can help to inform families on aspects of their treatment and translate current research findings and care developments into practical guidance.

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Long-term health-related quality of life and satisfaction following fronto-orbital advancement in non-syndromic metopic synostosis: FACE-Q Craniofacial Module and SCAR-Q

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Abstract

Background:
Although one of the primary goals of fronto-orbital advancement (FOA) in metopic synostosis is improving esthetic outcomes, patient perspectives are infrequently reported and often involve non-validated outcomes. Patient-reported outcome measures (PROMs), including the FACE-Q and SCAR-Q, are rigorously developed questionnaires, supporting validated and standardized outcome collection. The aim of this study is to used validated PROMs to report health-related quality of life and satisfaction in metopic synostosis following FOA and compare this to normative data.

Method:
The FACE-Q Craniofacial Module and SCAR-Q were sent to patients with non-syndromic metopic synostosis who underwent fronto-orbital advancement and born between 2003-2008. FACE-Q scales were compared to data from a Dutch normative population.

Results:
56 patients completed the questionnaire at the median age of 18 years (57% response rate). Among all scales, scores on the forehead and head shape scales were lowest. A higher pre-operative severity results in a significantly lower score on the head shape scale (b = -4.56, p = 0.042). In addition, compared to the basic level of education, patients with an advanced level of education had significantly better scores on the symptom scale of the SCAR-Q (b = 26.83, p =0.024). Patients scored significantly higher on head shape (p = 0.008), appearance distress (p<0.001), psychological functioning (p<0.001), school functioning (p<0.001), and social functioning (p<0.001) compared to normative data.

Conclusion:
Long-term HRQoL and scar satisfaction is good in metopic synostosis following FOA and not below normative data. Forehead appearance and head shape received the lowest scores among the assessed scales. Greater pre-perative severity was associated with significantly lower head shape scores.

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Endoscopic-Assisted Forehead Augmentation with Polyetheretherketone (PEEK) Patient-Specific Implant (PSI) for Aesthetic Considerations

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Kaili Yan


Chongxu Qiao


Guoping Wu

Abstract

Background

Forehead contouring and augmentation have become popular aesthetic procedures to improve facial features among Asians in recent years. Polyetheretherketone (PEEK) has the potential for customized processing and has been employed as a reliable substitute for other alloplastic material. However, the use of PEEK patient-specific implant （PSI） in the craniomaxillofacial contouring surgery for aesthetic considerations is not well documented in the existing studies.

Methods

The PEEK PSIs were fabricated using virtual surgical planning(VSP) and computer-aided manufacturing(CAM) for each patient, preoperatively. The implant pockets were dissected in the subperiosteal plane and PEEK PSIs were placed in their designed position and fixed assisted by endoscopy via small incision within hairline. All patients were asked to complete the FACE-Q questionnaire before and 6 months after operation. Pre and postoperative demographics, photographs, and other clinical data of the patients were collected and analyzed.

Results

11 patients underwent forehead augmentation were enrolled in this study. All procedures were completed successfully with the help of endoscope. The average patient age was 30.63±2.54 years. The mean thickness and size of PEEK PSI were 4.44±1.77mm and 38.43±22.66, respectively. The mean operative time was 83.00±29.44 min, and the mean postoperative follow-up period was 11.00±6.50 (ranged from 6 to 24) months. No implant exposure, extrusion or removal were reported. FACE-Q scores of the patients in satisfaction with the forehead increased from 47.64±7.15 to 78.81±6.35, postoperatively ($P < 0.001$).

Conclusions

Using CAD/CAM technique, PEEK PSIs can be prefabricated to achieve accurate remodeling of the frontal contour with good esthetic outcomes. The endoscope provides direct and magnified vision, which allow easy access to the supraorbital rim and lateral edge of the eyebrow arch and confirming the position of the implants without damaging nerves and vessels. Endoscopic assisted forehead augmentation with PEEK PSI is safe and effective. Although PEEK is expensive, it is still worthy of clinical promotion.

craniosynostosis; half (n=4) underwent PVDO, and half (n=4) underwent PVR. 1 patient (12.5%) had a post-operative complication (distractor infection), with no long-term sequelae. 100% (n=8) had resolution of clinical symptoms at first follow-up, and 85.7% (n=6/7) at last follow-up. 50.0% (n=4) of patients had improvement and 50.0% (n=4) had a stable presentation of CM on post-operative imaging. While most patients with radiologic improvement of their CM were in the PVDO group compared to PVR (75% (n=3/4), vs. 25% (n=1/4), p=0.49), this study was underpowered to detect a significant difference between techniques.

Conclusions:

Posterior vault expansion with extradural Chiari decompression in patients with concomitant suspected increased ICP and craniosynostosis appears safe and relatively effective at extended follow-up. Additional study of its long-term effects, patient selection, and comparison of PVDO vs PVR is warranted.

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Differential Relapse Patterns in Asymmetric vs Symmetric Mandibular Prognathism: A 3D Comparative Analysis of BSSRO Outcomes

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Abstract

Background

Bilateral sagittal split ramus osteotomy (BSSRO) is the gold-standardtreatment for mandibular prognathism correction. While effective, postoperative relapse remains a concern, particularly in asymmetric cases. This study compares three-dimensional movement patterns during surgical correction and postoperative relapse between asymmetric and symmetric Class III malocclusion patients undergoing BSSRO.

Methods

We conducted a retrospective cohort study of class III malocclusion patients treated with BSSRO between January 2018 and December 2023. Patients were stratified intosymmetric (SG) and asymmetric (AG) groups based on mental deviation. CBCT datasets were obtained preoperatively (T0), immediately postoperatively (T1), and at least 6 monthspostoperatively (T2). Three-dimensional analysis quantified translational and rotational changes in distal and proximal segments during surgical
correction (T0-T1) and relapse (T1-T2). Intergroup comparisons were performed using two-sample t-tests.

Results

Intraoperatively, AG demonstrated significantly greater leftward displacement of the distal segment (P=0.001), and rightward movement of the left proximal segment (P=0.044). Rotational analysis revealed increased clockwise yaw in AG's distal segment (P=0.009) and clockwise roll in the left proximal segment (P=0.021).Postoperatively, AG exhibited significant leftward relapse in both proximal segments (left: P<0.001; right: P=0.027), while counterclockwise yaw in the distal segment (P=0.020). Notably, the deviated left proximal segment demonstrated counterclockwise rolling tendency (P=0.050) during follow-up. Conclusions Asymmetric and symmetric mandibles exhibit fundamentally different relapse patterns following BSSRO, involving distinct translational and rotational movements across all segments. These findings highlight the need for differential treatment planning and postoperative management in asymmetric cases. Further prospective multi-center studies with extended follow-up are needed to validate these observations.

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Endoscopic-Assisted Mandibular Angle Revision Using Patient-Specific PEEK Implants: Surgical Accuracy and Aesthetic Outcomes in Over- Resected Mandibles

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Miao Junyan


Yan Shunchao


Wu Guoping

Abstract

Background

Mandibular angle osteotomy (MAO) is a popular procedure to improve facial aesthetics, however, over-resection of the mandibular angle can lead to both functional and aesthetic challenges. Polyetheretherketone (PEEK) implants offer biocompatibility, durability, and customization potential, making them valuable for achieving precise and predictable results. This study examines the efficacy of PEEK patient-specific implants (PSIs) in endoscopic-assisted mandibular angle revision (MAR) surgery, assessing improvements in surgical accuracy and aesthetic outcomes.

Methods

We retrospectively analyzed 24 patients (39 mandibles) who underwent MAR from January 2019 to December 2023. Preoperative and postoperative CBCT scans were collected for virtual surgical plan and clinical outcome evaluation.

EEK PSIs were designed, prefabricated and modified by both surgeon and engineer based on the anatomical characteristics of the mandible and the aesthetic requirement. Surgical accuracy was measured by comparing planned and achieved PSI positions using root mean square error (RMSE) and maximum deviation (MaxD). Patient satisfaction was assessed using the FACE-Q questionnaires, administered preoperatively and at least six months postoperatively. Correlations between PSI fitting accuracy (RMSE, MaxD) and FACE-Q score changes was performed Results 24 patients underwent MAR and fully recovered within 3 months. The average RMSE between planned and actual PSI positions ranged from 0.1166 to 0.3149 mm, with 96% of implants showing deviation of less than 0.3 mm. FACE-Q scores for lower facial appearance and psychological well-being improved significantly, form 42.50 ± 5.28 to 56.08 ± 4.58 and 61.50±4.31 to 70.58 ± 6.46, respectively. A strong negative correlation was observed between implant fit accuracy (RMSE, MaxD) and FACE-Q score improvements related to appearance.

Conclusions Endoscopic-assisted MAR with PEEK PSIs offers precise correction and significant aesthetic improvements for patients with over-resected mandibles. This technique demonstrated high surgical accuracy and favorable patient-reported outcomes. Future studies on a larger scale are recommended to validate these findings.

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Beyond Soft Tissue Sagging: Craniofacial Skeletal Resorption Emerges as the Key Architect of Age-Related Facial Transformation

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Ziying Guo


Jianjian Lu

Abstract

Facial aging represents a multifactorial process involving dynamic interactions between skeletal structures and overlying soft tissues. This review critically examines the underrecognized yet critical role of craniofacial bone remodeling in driving age-related facial changes, integrating recent advances in 3D imaging and computational analysis to elucidate spatial, sexual, and ethnic heterogeneity in skeletal aging patterns. Sex-specific frontal bone remodeling occurs, with males exhibiting progressive thickness reduction and females showing mild augmentation, accompanied by anterior-inferior displacement in both sexes. Orbital expansion through superior/ medial resorption predominates across ethnicities, though longitudinal data reveal paradoxical orbital volume reduction inEast Asian women. Notably, East Asian populations demonstrate delayed periorbital skeletal changes compared to Caucasians, potentially contributing to their perceived slower aging phenotype. Midface aging manifests through maxillary clockwise rotation, zygomatic retrusion, and pyriform widening, creating characteristic concavities. Nasal bones undergo progressive shortening with associated soft tissue ptosis. Mandibular changes show striking sexual dimorphism: postmenopausal women experience accelerated gonion posterior displacement, while dentition status emerges as a stronger predictor of mandibular morphology than chronological age. Emerging evidence challenges traditional soft tissue-centric models, positioning skeletal resorption as a primary driver of facial volume loss and ptosis. Current interventions achieving ≤34% improvement in age-related changes underscore the clinical imperative for dual-modality approaches combining skeletal augmentation (porous polyethylene implants, bioresorbable scaffolds) with soft tissue repositioning. Deep learning-assisted CT analysis now enables precise quantification of millimeter-level bone loss patterns, revolutionizing treatment planning.

Urgent priorities include multicenter longitudinal studies across ethnic cohorts to decode genetic/environmental modifiers of skeletal aging, and randomized trials comparing bone-based versus soft tissue rejuvenation outcomes. This synthesis advocates for a paradigm shift in facial rejuvenation strategies, emphasizing early skeletal intervention to counteract the concertina effect. Cross-disciplinary collaboration between craniofacial surgeons, radiologists, and aesthetic surgeons will be essential for establishing evidence-based, personalized paradigms.

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Six1 regulates mandibular osteogenic differentiation by regulating Bmp4

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Abstract

Congenital craniomaxillofacial deformities account for one third of all malformations, and the etiology research is of great importance and necessity. The transcription factor Six1 plays an important role in both human and mouse development. Mutation of Six1 causes abnormalities in craniomaxillofacial skeletal development.

In this study, we constructed a Six1 knockout ($Six1^{-/-}$) mouse model and found that $Six1^{-/-}$ mice exhibited craniomaxillofacial abnormalities. Quantitative analysis showed that the mandibular length of Six1 knockout mice was significantly smaller than that of wild type mice. Subsequently, we generated a mouse model with conditional knockout of Six1 in craniofacial neural crest cells and found a short mandible phenotype similar to that of full Six1 knockout mice. RNA-seq analysis showed that the down-regulated genes in the knockout mice were enriched in osteogenesis. In addition, we constructed a Six1-knockdown cell line, and found that the osteogenic ability of Six1-knockdown cells was decreased.

We found that the down-regulated genes in the knockdown group were also enriched in osteogenic function, and the down-regulation of BMP4 and other osteogenesis-related genes was verified. By using CUT&Tag assay, we confirmed that SIX1 could bind to the promoters of Bmp4, Fgfr2 and other genes to regulate their transcription.We also identified a region distal to the BMP4 gene that binds SIX1 and H3K27Ac, which we defined as an enhancer. By designing dCas9 targets to block this enhancer sequence, we measured Bmp4 RNA expression levels and found that Bmp4 expression was decreased after the enhancer was blocked. This sequence is a functional enhancer and plays a role in regulating Bmp4 expression.

In summary, we demonstrate that Six1 plays a key role in the regulation of osteogenic differentiation during embryonic mandibular development and describe the gene regulatory network in which Six1 participates in mandibular development.

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Condylar-Ramus Index Predicts Postoperative Condylar Stability in Mandibular Setback Surgery: A 3D Morphometric Analysis

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Abstract

Background

Bilateral sagittal split ramus osteotomy (BSSRO) is the standard treatment for correcting mandibular prognathism and restoring facial symmetry in asymmetric cases. While postoperative condylar displacement is common, the relationship between preoperative condylar morphology and relapse patterns remains poorly understood. This study investigates whether condylar volumetric parameters can predict postoperative condylar stability following BSSRO.

Methods

We conducted a retrospective cohort study of class III asymmetry patients undergoing BSSRO between January 2018 and December 2023. Three-dimensional CBCT datasets were collected at three time points: preoperative (T0), immediate postoperative (T1), and≥6-month follow-up (T2). At T0, mandibular condylar and ramus were segmented in Mimics 26.0, and the condyle-ramus index (CRI: the ratio of condylar and ramus volume) was calculated. Quantitative assessment of the condylar displacement was quantified for both surgical correction (T0-T1) and relapse phase (T1-T2), including three-dimensional translational and rotational changes. Additionally, correlation analyses between volumetric parameters and the relapse magnitude were evaluated.

Results

A total of 20 patients (40 condyles) with asymmetric prognathism were included. The mean condylar and ramus volume are 1127.8±241.4 $mm^3$and 8793.6±1444.9 mm^3, respectively. Compared with intraoperative outcome, during relapse phase, condylar segment exhibited more significant anteroposterior displacement (P=0.002) and rotational $_{relapse(Roll:P}$ < 0.001; Yaw: P=0.004). Key correlation included: during T0-T1, ramus volume negatively correlated with transverse displacement distance (r=-0.345, P = 0.029); during T1-T2, larger condylar volume was associated with reduced vertical relapse (r=-0.381, P=0.015), while higher CRI predicted less roll rotation (r=-0.406, P=0.009).

Conclusions

Condylar volume and CRI are potential predictors of postoperative condylar stability. Both translational and rotational relapse are influenced by preoperative condylar morphology, highlighting the need for patient-specific surgical planning in asymmetric cases. Further multi-center studies with extended follow-up are recommended to validate these findings.

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Treatment of osteocutaneous fistula after mandible reconstruction with free fibula flap following ameloblastoma resection in pediatric patient: a case report

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Nurardhilah Vityadewi



Mufida Muzakkie



Soewardjo Soewardjo

Abstract

Ameloblastoma is a rare but aggressive odontogenic tumor in pediatric patients, requiring meticulous management due to ongoing facial growth and distinct bone physiology. This study presents a case of a 10-year-old girl with ameloblastoma of the right mandible who underwent hemimandibulectomy followed by immediate reconstruction using a free fibula flap.

Despite initial surgical success, the patient developed an osteocutaneous fistula three weeks postoperatively, necessitating multiple surgical interventions, including granuloma excision, debridement, and eventual plate removal. Generally, one of the common complications of mandibular reconstruction with free fibula flaps is orocutaneous fistula, often resulting from salivary contamination. However, in this case, we describe an unusual presentation in a pediatric patient, where the fistula originated directly from the reconstructed bone plating site to the skin, without intraoral involvement. Management strategies range from conservative wound care to surgical debridement, with plate removal being necessary in chronic, non-healing cases. Six months after reconstructive surgery, the patient demonstrated satisfactory mandibular healing, optimal mouth opening, and restoration of masticatory function. This case highlights the challenges of managing ameloblastoma in a pediatric patient and emphasizes the importance of proper intervention for post-reconstruction complications. Free fibula flap reconstruction remains the gold standard for mandibular defects in pediatric patients, providing favorable long-term functional and aesthetic outcomes despite potential postoperative complications.

Keywords: Ameloblastoma; Mandible reconstruction; Free fibula flap; Osteocutaneous fistula; Orocutaneous fistula

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Influence of suture closure extent on cranial morphology in Apert and Crouzon syndromes

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Abstract

Introduction

Craniosynostoses are congenital conditions characterized by the premature fusion of cranial and facial sutures, leading to neurodevelopmental and functional impairments. Syndromic forms, such as Crouzon (CS) and Apert (AS) syndromes, present distinct cranial anomalies affecting skull growth and intracranial volume. While these deformities are well described clinically, systematic quantitative comparisons remain limited. This study analyzes skull morphology in unoperated CS and AS patients using advanced three-dimensional (3D) imaging to provide insights into cranial development and clinical implications.

Methods

We analyzed high-resolution CT scans (slice thickness < 1.25 mm) from patients treated at Hôpital Necker Enfants Malades (2008-2024). The study included 289 age-matched controls (2 days-18.6 years, mean: 4.21 years) and 72 unoperated syndromic patients (51 CS, 29 days-15 years, mean: 2.77 years; 21 AS, 24 days-16.1 years, mean: 2.42
years). Cranial vault segmentation was performed using 3D Slicer, followed by rigid alignment using the Iterative Closest Point algorithm in CloudCompare. Non-rigid registration with Faceform's Wrap module generated standardized meshes, from which semilandmarks were extracted for morphometric analysis. A Partial Least Squares regression adjusted for age effects before Principal Component Analysis (PCA). Group differences were assessed using MANOVA and ANOVA, followed by Dunn's post-hoc tests ($p < 0.05$). Morphological variations were visualized using heat maps.

Results

Age-adjusted analyses confirmed significant morphological differences. While CS patients showed high variability, AS patients exhibited a significantly enlarged posterior cranial fossa (PC1, $p < 0.05$). Subgroup analysis within CS revealed that pansynostosis patients and those with open sutures displayed no significant differences from controls. However, patients with bicoronal or scaphocephaly patterns exhibited distinct morphological alterations. Heat maps highlighted key areas of variation, particularly in anterior and posterior cranial fossae.

Conclusion

This study quantitatively assesses cranial morphology in syndromic craniosynostoses, revealing distinct deformation patterns in AS and heterogeneity within CS. These findings may aid surgical planning. Future research should explore links between cranial morphology, genetic factors, and neurodevelopmental outcomes.

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Evaluating Surgical Accuracy in Bimaxillary Surgery: A Systematic Review and Meta-Analysis of Mandible-First versus Maxilla-First Approaches

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Abstract

Background

Mandible-first surgery (MdFS) has gained attention as an alternative to the traditional maxilla-first surgery (MxFS) in bimaxillary procedures. Given the distinct sequence of operations between these approaches, evaluating the clinical advantages of MdFS compared to MxFS is crucial for optimizing surgical decision-making. This systematic review and meta-analysis examined intraoperative achievability and postoperative stability between the two surgical sequences. **Methods**

A thorough literature search was performed using PubMed, Embase, Web of Science, and MEDLINE, covering articles published from 2013 to 2023. Included studies were retrospective, prospective, and randomized trials that compared the accuracy and/or stability of MdFS with MxFS. Mean discrepancies and standard deviations for each landmark at different time points were abstracted to assess accuracy and stability. Additionally, frequencies of diagnostic abnormalities and surgical plans were recorded to identify any potential differences between the two approaches.

Results

A total of 11 studies encompassing 712 patients met the inclusion criteria. Skeletal class II deformities were more frequently diagnosed in subjects of the MdFS group, while skeletal class III deformities were more common in cases where MxFS was planned. The analysis suggested that MdFS might reduce accuracy in the sagittal dimension (CI, 0.05 to 0.74) but offered greater achievability in the vertical direction (CI, - 0.47 to - 0.07). Additionally, MdFS was associated with a relatively posterior (CI, - 1.18 to - 0.60) and inferior (CI, - 0.64 to - 0.07) positioning of the maxillomandibular complex. Neither the maxilla nor the mandible showed significant differences in placement when a pitch, roll or yaw was planned using MdFS or MxFS. Long-term skeletal stability investigation of MdFS versus MxFS suggested no difference in postoperative relapse between the two groups.

Conclusion

In summary, despite certain limitations, the present study suggests that MdFS and MxFS result in similar clinical outcomes in terms of accuracy and long-term stability. Further prospective studies with larger sample sizes and standardized measurement methods are needed to confirm these findings and provide more definitive guidance for surgeons.

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Biplanar X-Rays to CT Images Using Two-Stage Diffusion Model

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Abstract

In medical imaging, high-precision 3D mandibular reconstruction typically relies on the segmentation and reconstruction of head CT images. However, conventional CT scanning involves substantial radiation exposure (approximately equivalent to 13 months of natural background radiation), which raises potential health risks and limits its widespread clinical use. In contrast, lateral cephalometric radiography delivers significantly lower radiation doses but only provides 2D projection data. Therefore, reconstructing high-quality 3D CT images from low-dose anteroposterior and lateral X-rays presents a research challenge with both clinical significance and technical complexity. This study proposes a novel two-stage diffusion model framework for cross-modal medical image synthesis. The first stage employs a style-transfer diffusion model to mitigate the domain gap between real X-rays and simulated projections, while the second stage achieves high-fidelity 3D CT reconstruction through multi-view projection fusion. To enhance computational efficiency, we incorporate variational autoencoders (VAE) for feature compression of medical images. To verify the effectiveness of our algorithm, we performed experiments on public, clinical private, and external datasets. The clinical private datasets were collected from Shanghai Ninth People's Hospital, including both paired and unpaired datasets of anteroposterior-lateral radiographs and head CT images. The dataset consisted of 1,082 patients for training and 120 patients for testing. For the public dataset, the LIDC-IDRI dataset includes 1,018 chest CT scans, and we randomly selected 916 CT scans for training, using the remaining 102 scans for testing. Experiments on multiple datasets show that our method performs exceptionally well in single-view reconstruction tasks: AP view PSNR 32.94/SSIM 0.8080, lateral view PSNR 33.45/SSIM 0.8197. Dual-view joint reconstruction further improves performance to PSNR 35.11/SSIM 0.8654. In perceptual quality metrics, our approach outperforms existing state-of-the-art methods (FID 3.873, LPIPS 0.0665). Downstream task validation shows that the synthesized CT images demonstrate significant clinical potential in mandibular tissue segmentation and reconstruction.

We trained nnunet for segmentation validation on the ToothFairy2 dataset and an ROI-based CNN network for landmark localization validation on the MMLD dataset. The final experimental results indicate that our generated CT images achieved the best performance.

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Analysis Factors Influencing Postoperative Infection Following Mandibular Distraction Osteogenesis for Pierre-Robin Syndrome

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Abstract

Objective

This study aims to investigate the occurrence of postoperative infections in patients with Pierre-Robin Syndrome (PRS) following mandibular distraction osteogenesis (MDO) and to analyze the related factors

Methods

A total of 150 PRS patients who underwent MDO at our hospital between 2020 and 2025 were included in this study, with 75 males and 75 females, aged 0–2 years.

Retrospective analysis of patient data was conducted, and tables were created to analyze factors including gestational age, birth weight, delivery method, age at admission, weight at admission, intraoperative blood loss, operation duration, length of hospital stay, distraction duration, ICU admission, intubation duration, postoperative fever, signs of surgical site infection (redness, swelling, exudation, pus, or granulation), nosocomial or community-acquired infections, presence of pathogenic bacteria, and postoperative medication use.The incidence of surgical site infections was calculated, and multivariate analysis was performed

Results

Among the 150 PRS patients who underwent MDO, 6 patients developed postoperative infections, and 2 patients experienced wound dehiscence following infection. The infection rate was 14%. The main causes of postoperative infections included improper intraoperative techniques and inadequate postoperative home care.

Conclusion

The incidence of postoperative infections in PRS patients following MDO is relatively high.

By optimizing preoperative assessment, intraoperative techniques, postoperative management, evaluation of the patient's overall condition, and rational use of antibiotics, the risk of postoperative infections can be effectively reduced.

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Post-Traumatic Necrosis of the Maxilla and Palate: A Rare Case Report

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Lobredia Zarasade

Abstract

INTRODUCTIONS AND OBJECTIVES:
Necrosis of the maxilla following traumatic fracture is rarely reported. In our center, there are 200-250 cases of maxillofacial fracture every year, and we have never encountered necrotic maxilla before. Osteonecrosis of the maxilla occurs when the vascularity is compromised. The vascular supply to the maxilla is derived from the descending palatine artery and the internal maxillary artery. This article aims to emphasize the importance of closely monitoring and management of the patients suffering from maxillofacial trauma, as it can lead to osteonecrosis of the facial bone and result in permanent impairment.

METHODS:
A case report of a boy with necrosis of the left maxilla following a traumatic incident. Some clinical features, surgical digital planning and treatment modalities would be presented.

RESULTS:
A 9-year-old boy presented with necrosis in the palatal area of the left maxilla 4 days after injury. He was referred after undergone debridement and fracture reposition by local surgeon. In the time of debridement procedure, it was found of almost left hemimaxilla necrosis. We performed necrotomy and closed the palatal defect with advancement buccal flap. Five months later, we conducted reconstruction of the facial bone with iliac bone grafting for the maxilla, zygoma, and inferior orbital rim, along with a buccal flap for the palatal mucosa. Additionally, we created a 3D model for maxillary bone measurement. The results were favourable, and the bone graft demonstrated viability.

CONCLUSIONS:
Midface trauma can lead to fractures of the maxilla and palate; such injuries require proper management because they can result in osteonecrosis of these areas. Although these complications are rare, they should be taken seriously, as they can cause significant morbidity for the patient and may necessitate extensive surgical procedures to correct the resulting defects.

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Delayed Reconstruction of a Complex Midfacial Fracture: A Case of Neglected Orbitozygomaticmaxillary Fractures

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Abstract

Background:
Neglected facial fractures can lead to significant functional and aesthetic complications. We reporting a case of a neglected orbitozygomaticmaxillary fractures in a 42-year-old female.

Case Presentation:
The patient presented with left facial pain, nasal obstruction, left eyelid ptosis, tearing, and visual disturbances for 9 months following a motor vehicle collision. Initial management in a resource-constrained hospital was limited to soft tissue repair and nasal repositioning. Physical examination revealed left malar depression, nasal deviation, left enophthalmos, dystopia, and diplopia. Patient had normal occlusion and a dental fracture at I2 maxilla dextra. Ophthalmologic examination on left eye showed significant restriction of eye movement, reduced visual acuity (1/300 OS) with slight ptosis and mydriatic pupil suggesting damaged ophthalmic nerve.

Management and Outcome:
The patient underwent comprehensive craniofacial reconstruction. Surgical procedures included open reduction and internal fixation (ORIF) of the frontozygomatic complex, inferior orbital rim, and lateral maxillary buttress; orbital floor and medial wall exploration with orbital mesh placement to correct orbital volume loss; and septonasoplasty with nasal bone repositioning. A combined transcaruncular and transconjunctival approach was utilized to access the orbital region, aiming to minimize postoperative scarring. Preoperative preparation involved 3-D imaging, ophthalmologic evaluation and anesthetic optimization.
Postoperative recovery was uneventful, with noted improvement in facial symmetry and ocular function.

Conclusion:
This case highlights the importance of early and appropriate management of midfacial fractures to prevent long-term complications. Surgical reconstruction in neglected cases requires a comprehensive, multidisciplinary approach to restore both function and aesthetics.

Keywords:
Neglected facial fracture, Blow-out fracture, ZMC fracture, Delayed fracture management

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Application of optical coherence tomography in early detection of oral cancer

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Abstract

Background: The existing examination methods for oral cancer mainly rely on tissue biopsy. However, on the one hand, tissue biopsy is an invasive operation. On the other hand, patients undergoing tissue biopsy are generally advanced patients. Currently, there is a lack of effective early screening methods for oral cancer.

Objective: To explore whether polarization sensitive optical coherence tomography (PS-OCT) can effectively distinguish early oral cancer from dysplasia.

Materials and Methods: thirty K14-EGFP-miR-211-GFP transgenic mice were induced using drinking water supplemented with 4-nitroquinoline-1 oxide. Then, PS-OCT was used to detect 30 mouse, and the results were compared with histopathology.

Results: A total of 8 normal mice, 12 mice with mucosal hyperplasia, 11 mice with mucosal dysplasia, and 4 mice with early oral cancer were obtained. The sensitivity, specificity, positive predictive value and negative predictive value of PS-OCT for detecting abnormal hyperplasia and early cancer were 100.00%, 95.00%, 93.75% and 100.00% respectively.

Conclusion: PS-OCT, as a non-invasive, real-time imaging method, can effectively distinguish dysplasia from early cancer, and is expected to be used as a new method for early screening of oral cancer.

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Experimental Study of the Human-Machine Collaborative Augmented Reality Navigation System (HMARS) in Precision Reconstruction of Mandibular Defects

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Abstract

Background:

Mandibular defect reconstruction poses significant challenges for surgeons. Traditional free fibula flap transplantation suffers from substantial osteotomy errors and insufficient postoperative functional compensation. This study proposes a Human-Machine Collaborative Augmented Reality-Based Mandibular Reconstruction Surgical Navigation System (HMARS), integrating robot-assisted guided osteotomy (RAO) and augmented reality-guided reconstruction (ARR). By leveraging high-precision dynamic registration and real-time visual feedback, HMARS aims to achieve precise and minimally invasive mandibular defect reconstruction.

Methods:

This study included 9 sets of mandibular-fibular specimens and 2 sets of intact cadaver head-leg specimens. HMARS was used to perform robot-guided osteotomy and AR- navigated reconstruction. The Super4PCS registration algorithm dynamically aligned preoperative plans with intraoperative scenarios, and a Rotating Calipers-based Compensation (RCC) method was proposed to optimize AR fusion errors. Quantitative evaluations included Target Registration Error (TRE), AR fusion accuracy, and osteotomy/reconstruction precision.

Results:

The optical navigation TRE was approximately 0.5 mm. AR fusion errors decreased from 2.23±0.54 mm to 1.08±0.43 mm after RCC optimization ($P<0.05$). Osteotomy precision analysis revealed fibular length errors of 1.65±1.66 mm, osteotomy surface center point
distance errors of 1.57±0.87 mm, and osteotomy surface angle errors of 2.24±1.40°. Mandibular reconstruction absolute fusion error was 1.50±0.48 mm, with key anatomical landmark errors <5 mm.

Conclusion:

The HMARS system achieves high-precision mandibular reconstruction and intraoperative dynamic error correction through human-machine collaboration. Its innovation lies in integrating the stability of optical navigation with the interactivity of AR, addressing issues of "static planning" in traditional guides and AR registration drift.

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FRONTO-ORBITAL ADVANCEMENT (FOA) FOLLOWED BY TOTAL CRANIAL VAULT REMODELING (CVR) IN SEVERE APERT SYNDROME WITH PAN-SYNOSTOSIS: A CASE REPORT

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Rizqi Shabrina Lestari



Indri Lakshmi Putri

Abstract

Background: Apert syndrome is a syndromic craniosynostosis with a risk of raised intracranial pressure (ICP), which develops in 45-83% of patients, with 50% experiencing it within the first year of life. This syndrome is characterized by craniosynostosis, proptosis, midface hypoplasia, and symmetric syndactyly of both hands and feet. For patients with Apert syndrome, surgical intervention is recommended around the age of 6 to 9 months, or earlier if evidence of increased ICP is present. The initial cranial vault expansion recommended in Apert syndrome is occipital expansion. Here, we present a case of severe Apert Syndrome with pan-synostosis that underwent fronto-orbital advancement followed by total cranial vault remodeling (CVR) within six months.

Case Reports:

A one-month-old female patient was diagnosed with Apert syndrome. Clinical examination showed turricephaly, ocular proptosis, frontal bossing, occasional lagophthalmos, and symmetrical syndactyly in both hands and feet. A head CT scan showed bilateral coronal and squamous synostosis accompanied by partial lambdoid synostosis, harlequin sign, copper beaten skull, bilateral shallow orbits, maxilla hypoplasia, left temporal lobe hypoplasia, septum pellucidum agenesis and non-communicating hydrocephalus. At the age of 6 months, craniotomy and fronto-orbital advancement (FOA) were performed and at the age of 1-year-old, a craniotomy and total cranial vault remodeling (CVR) were performed.

Results:

At 3-months follow-up, there was an improvement in the shape of the head, and there were no complaints from the patient's parents. The parents noted that the patient's contact and response were better than before the operation. Furthermore, there was observed improvement in the patient's growth and development.

Conclusion:

Operative procedures for Apert Syndrome must involve multidisciplinary team and customized for each patient according to their clinical, functional and radiological findings, also aesthetic appearance.

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Effect of Distraction Osteogenesis on Velopharyngeal Complex in Patients with Maxillary Hypoplasia

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Abstract

Background

Maxillary distraction osteogenesis (MDO) has gained clinical acceptance as a minimally invasive solution for maxillary hypoplasia, offering accelerated recovery and sustained therapeutic effects. While its skeletal outcomes are well-documented, the procedure's impact on velopharyngeal dynamics, particularly pharyngeal depth (PD), soft palate length (SPL), and oropharyngeal volume (OPV), remains underexplored. These parameters critically influence velopharyngeal closure during deglutition and phonation, necessitating rigorous evaluation of their postoperative alterations.

Objective

To quantify morphological changes in the velopharyngeal complex following MDO and establish correlations between maxillary advancement distance and PD/SPL/OPV modifications.

Methods

A retrospective study enrolled 20 MDO patients (mean age 16.4±2.1 years). All patients underwent lateral cephalometric radiography and 3D CT scans before and after the distraction procedure. Imaging data were used to measure and analyze changes in pharyngeal depth (PD), soft palate length (SPL), and oropharyngeal volume (OPV), and to calculate the distraction distance. Paired t-tests were used to compare the changes in these parameters before and after distraction(α=0.05), and Pearson correlation analysis was used to study the correlation between distraction distance and changes in these parameters, with a significance level set at $p<0.05$.

Results

After distraction, the pharyngeal depth of the patients increased significantly ($p<0.05$), with an average increase of 3.2 ± 0.8 mm. There was no significant change in the length of the soft palate, with no statistically significant difference before and after distraction. The oropharyngeal volume increased significantly ($p<0.05$), with an average increase of 15.4± 4.2 mm^3. The distraction distance was positively correlated with changes in pharyngeal depth (r=0.65, $p<0.05$) and oropharyngeal volume (r=0.58, $p<0.05$), but not with changes in soft palate length (r=0.12, $p>0.05$).

Conclusion

MDO induces predictable volumetric expansion of the oropharyngeal space proportional to maxillary advancement, without compromising soft palate integrity. It suggests that MDO may have an impact on the patient's velopharyngeal closure function. These findings support MDO's functional preservation advantages while providing quantitative guidelines for surgical planning, while the changes of velopharyngeal function before and after surgery should be further studied.

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A Patient-Specific Characterisation And Simulation Of Posterior Vault Distraction In Crouzon Syndrome

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Abstract

Background:
Crouzon syndrome involves early fusion of cranial joints, that restricts the brain growth, leading to skull deformities. Posterior vault distraction (PVD) is used to expand the skull and increase the intracranial volume (ICV). The aim of this study was to characterize PVD in an individual with sequential head computed tomography (CT) data and to develop a validated finite element (FE) model of PVD.

Methods:
CT head scans at five time points (pre-PVD and at 254, 261 and 268 days) were analyzed to characterize (a) osteotomy gap at several points, (b) ICV, and (c) overall skull morphology. A FE model was developed based on the preoperative CT, simulating PVD by applying displacements at clinical distraction sites. A series of sensitivity analyses were carried out to the choice of elastic moduli of the ICV and osteotomies (that were identified to considerably impact the prediction of the FE model). In silico osteotomy widening and overall skull shape were compared to the clinical CT measurements.

Results:
CT analysis showed non-uniform distraction, with actual displacements across the osteotomy gap differing from the 1 mm/day distraction induced at the anatomical site that distraction was clinically fixed. Model were sensitive to the considered variable. The best agreement to clinical data (1.29% error) was achieved with a Young's modulus of 0.5 MPa for intracranial contents and 0.1 MPa for osteotomies.

Conclusion:
The validated model developed in this study provides the foundation for further studies to advance clinical management of syndromic craniosynostosis, with future validation in larger cohorts being needed.

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Scalp Tissue Expansion in Delayed Cranioplasty: Case series in a pediatric population at a tertiary-level hospital in Cali, Colombia.

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Abstract

Background:
Delayed cranioplasty after decompressive craniectomy for traumatic brain injury presents significant reconstructive challenges, particularly in pediatric patients with large cranial defects, scalp contraction, or a history of complications such as infection or implant loss. Scalp tissue expansion has emerged as a valuable tool to optimize soft tissue conditions before definitive cranial reconstruction.

Objectives:
To report a case series of pediatric patients managed at a tertiary care center in southwestern Colombia, who underwent tissue expansion for the reconstruction of large scalp defects in delayed cranioplasty secondary to decompressive craniectomies following traumatic cranial injuries.

Methods:
We conducted a descriptive case series including four pediatric patients treated at a tertiary care institution in Cali, Colombia. Patients had previously undergone decompressive craniectomy due to traumatic brain injury and subsequently presented with extensive scalp defects. A staged surgical approach was implemented, involving initial tissue expansion followed by delayed cranioplasty for definitive scalp reconstruction. Data were collected retrospectively from medical records and included patient demographics, clinical history, surgical technique, duration of expansion, complications, and outcomes. All procedures were performed by the same surgical team following institutional protocols.

Results:
Tissue expansion was particularly beneficial in pediatric patients with large cranial defects, contracted scalp due to previous surgeries or infections, and high aesthetic demands. It enabled tension-free closure using vascularized, hair-bearing tissue. However, the technique carries a higher risk of complications such as infection, device exposure, and neurologic symptoms associated with the “syndrome of the trephined.” Identified risk factors for poor outcomes include: pediatric patients under 7 years of age, use of multiple expanders, expansion volumes exceeding 300 cc, immunosuppressive therapies, and prior surgical site infections. Despite these risks, the integration of scalp expansion significantly improved surgical planning and outcomes in selected patients.

Conclusions:
Scalp tissue expansion is a safe and effective adjunct in delayed cranioplasty when used in appropriately selected patients. It provides durable, aesthetic, and tension-free coverage for cranial implants, especially in complex cases. A multidisciplinary approach between neurosurgeons and plastic surgeons is key to minimizing complications and achieving optimal reconstructive results.

Keywords:
Scalp expansion, delayed cranioplasty, cranial reconstruction, neuroplastic surgery, surgical complications, scalp contracture

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Paediatric Patient Blood Management for Craniofacial Surgery

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Abstract

Blood loss is a recognised complication of craniofacial surgery, and perioperative blood transfusion is associated with dose-dependent increases in mortality (Goobie et al, 2016). Holistic paediatric patient blood management (PBM) is emerging as a preferred strategy to optimise perioperative 'blood health' (Goobie et al, 2025). We audited transfusion rates in major craniofacial surgery at our institution in order to gather baseline data of current practices, and then implemented a bundle of PBM strategies aimed at reducing transfusion requirements.

We performed a retrospective audit of blood transfusion for craniofacial surgical cases between January 2024 and March 2025. We included spring assisted cranioplasty, endoscopic strip craniectomy, vault reconstruction and fronto-facial
remodelling cases. We implemented an evidence based bundle of PBM strategies including administration of tranexamic acid bolus plus infusion, protocolised temperature control and restrictive transfusion thresholds. We used run charts to determine if transfusion rates were reduced.

335 craniofacial procedures were performed at our institution between audited dates. 153 cases met the inclusion criteria. 35% of patients required red blood cell transfusion. The highest transfusion rate was observed in posterior vault cases (40%), followed by advancement and remodelling procedures (26%). The lowest transfusion rate (2%) was seen in patients undergoing parasagittal osteotomies with spring-assisted correction.

Tranexamic acid 10-15mg/kg was administered in 82% of cases. Preoperative anaemia (Hb <110 g/L) was present in 30% of patients. 45% of transfusions occurred when Hb ranged between 80–89 g/L, while 37% occurred at an Hb of 79 g/L or lower (range 55–79 g/L). Median transfusion volumes for posterior vault cases were 10 mL/kg and calvarial remodelling cases 13.5 mL/kg.

Our baseline data suggest current practices limit transfusion needs despite low starting Hb, with a one-third transfusion rate comparing favourably to published literature. Nonetheless, this presents an opportunity for improvement. A formal PBM quality improvement initiative commencing in June 2025 will aim to reduce transfusion rates further, targeting a goal of 25% in major craniofacial procedures through refined protocols and early anaemia management. Further data will be collected and reported to assess the impact of these interventions.

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A CASE REPORT OF MAXILLOFACIAL FRACTURE AND MULTIPLE INJURY ON PREGNANCY WOMEN

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Lilyana Ulfa Wulandari



Siti Isya Wahdini

Abstract

Introduction :

Pregnancy adds complexity to managing trauma, especially in facial bone fractures. Physiological changes during pregnancy require careful consideration to minimize risks to both mother and fetus. Specialized surgical techniques are needed for maxillofacial trauma to protect vital structures.

A 24-year-old women in the 3rd trimester of pregnant, transferred to our hospital after 24 hour ago experience car accident hit by bus. Patient sit on the back of the car driver and the car driver was sudden died. She experienced syncope about 2 hours at the location of the accident and do not remember anything about the accident. She just realizes when she woke up on the first hospitals, she is complaining about the pain on the face and the limbs. Other symptoms like nausea or vomitus, blurry visions, headache, shortness of breath, abdominal pain are denied.

Methods:

A team that consist of multi-disciplinary was built due to the complex of this cases, team consist of Plastic reconstruction surgeon, orthopedic surgeon, anesthesiologist, obstetric and gynecologist, and radiologists to manage the patient.

Result:

The Ob-gyn team consider not to terminate the baby because of that condition anesthesiologist give us limited time to operate. In this case we decide to operate only the symphysis and conserved the fracture of condyles. The orthopedic surgeon chose to external fixation with the skin traction for the femur fracture. With great of multidisciplinary team work, the patient is successfully managed with minimum complication. Two weeks after the surgery the patient reported terminate the pregnancy by caesarian section in the other Hospital on her town.

Conclusion:

Treatment aims for proper alignment and stability to prevent complications on the special condition like pregnancy.

Keywords:

Mandibular fracture, occlusion, facial trauma, pregnancy

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The "Surgeon's View": Advancing Cleft Palate Analysis Through Intraoperative MRI, 3D Segmentation, and Augmented Reality

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Leticia Lenkiu



Andrew Willmer



Hannah Brown



Jamie Perry



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Abstract

Background:

Anatomic variability in levator veli palatini (LVP) insertion presents challenges in cleft palate repair that may underlie the high fistula and velopharyngeal incompetence (VPI) rates. Traditional MRI planes (oblique coronal, midsagittal) do not reflect the surgeon's perspective, limiting their intraoperative surgical planning utility. We introduce a novel "surgeon's view" imaging plane, integrated with 3D segmentation and augmented reality (AR), to improve real-time surgical visualization and planning.

Methods:

Patients underwent preoperative intraoperative MRI (7-minute acquisition) at the time of surgical intervention. DICOM datasets were imported into segmentation software (NOVARAD VisAR), where standard planes and a new "surgeon's view"—an axial cross-section orthogonal to the oblique coronal plane—were generated. The LVP was manually segmented using the "surgeon's view," and 3D models were generated. A mesh overlay was applied to an isosurface rendering of the patients, and the final models were displayed as an augmented reality hologram (Microsoft Hololens).

Results:

The "surgeon's view" reliably enabled identification and segmentation of the LVP, validated by cross-plane landmark comparison. Manual segmentation and 3D model generation were completed within 5 minutes during patient preparation. This plane mirrored surgical positioning, allowing intuitive assessment of LVP morphology. AR holograms provided dynamic visualization aligned to the patient's anatomy, enhancing intraoperative orientation.

Discussion:

Integration of real-time MRI, 3D modeling, and AR offers a transformative advance for surgical planning, education, and patient-specific cleft reconstruction. This study introduces a novel MRI-based approach that mirrors the surgeon's intraoperative perspective, offering practical advantages for surgical planning. By enabling real-time visualization of abnormal LVP insertion points, this technique provides critical anatomical insights and redefines cleft palate imaging. Furthermore, when paired with 3D segmentation and AR, it holds promise for improving both surgical precision and education, offering a detailed, immersive representation of cleft palate anatomy for trainees and experienced surgeons alike.

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Aesthetic Lateral Canthoplasty: a Gray Line Split Approach

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Aiguo Xie

Abstract

Background:
Many women in Asian countries chase larger and brighter eyes, but to most Asian people only double eye plasty and epicanthoplasty is not enough. As a result, aesthetic lateral canthoplasty, another procedure to lengthen the palpebral fissure, is becoming more and more popular. However, the current procedure of aesthetic lateral canthoplasty has many potential complications, restricting the wide application of this procedure.

Methods:
Here, the authors developed a minimally invasive method through gray line split and canthopexy to achieve lateral canthoplasty. Eighty-seven patients from February 2013 to January 2016 were included and had the procedure. The lengthen of the palpebral fissure was measured and photographs were also taken before the surgery and in the follow-up periods. Besides, the complications related to this procedure were also investigated.

Results:
The authors have performed aesthetic lateral canthoplasty in 87 patients, almost all of the follow-up patients have satisfactory results with a lengthen of palpebral fissure ranging from 2.3 to 4.2 mm. Through the long-term follow-up the authors found the lengthen of the palpebral fissure is stable. No serious complications like lacrimal system fistula or hypertrophic scars emerged except 1 patient with conjunctival exposure.

Conclusions:
Through this gray line split method, the authors can acquire larger and brighter eyes without serious complications. The authors think that this is a good method and worthy of promotion.

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Midterm assessment of Mandibular Distraction Osteogenesis in Hemifacial Microsomia

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Jinchao Yu

Abstract

Introduction:
Mandible distraction osteogenesis (MDO) has widely accepted to reconstruct the mandible in Hemifacial microsomia (HFM) . There is controversy on correcting hemifacial microsomia with distraction osteogenesis in children. Although the clinical results of that were very good in early period of postoperation, but they were unstable and recurrent easily. In the study, we report the midterm assessment of cases with HFM managed with MDO.

Methods:
The patients who underwent MDO for correcting unilateral HFM between Apr 2020 and Mar 2023 at Department of Facial Plastic and Reconstructive Surgery, Eye & ENT Hospital of Fudan University were identified. The preoperative and postoperative Likert Scale and CT scans data was performed to evaluate the architectural and aesthetic
parameters.

Results:
Eighteen patients (13 males and 5 females) were admitted in the study that they are classified as type IIa for 11, IIb for 6, and III for 1 based on the Pruzansky-Kaban classification. The bony regeneration of them were excellent after the distractors were removed following 2-3 months of consolidation. There were not any severe complications such as tooth and tooth germ damage, inferior alveolar nerve dysfunction, and facial nerve paralysis. The average age at MDO was 7.5 years and the follow-up range time was 2-4 years. Overall results showed significant improvement of Likert Scale and bone three-dimensional measurement from CT scans. The 17 patients of type IIa and IIb have significant improvement in the mandibular ramus length, and there was no recurrent compared to the healthy side in the follow-up period.

Conclusion:
The treatment of hemifacial microsomia remains a challenge. Our data demonstrates good midterm outcomes of patients with HFM managed with MDO. However, the long-term effect of mandibular morphology for these patients will be kept dogging in the future .

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Combined Transverse Incision and Pouch Incision for the Correction of Medial Epicanthus

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Abstract

Background:
The epicanthal fold is a distinct characteristic of the upper eyelid in many Asians. To achieve satisfactory results, epicanthoplasty is usually performed with double eyelid plasty and blepharoptosis. Although many surgical procedures have been reported for the elimination of epicanthal folds, such as recurrence, copious designs, conspicuous scar, and unnatural palpebral contours are challenges to the surgeon and also make patients worried.

Methods:
From June 2010 to June 2015, epicanthoplasty was performed for 236 Chinese female patients using transverse incision combined with pouch incision. The transverse straight incision was performed in new inner canthus to the original eanthal corner point, after the original inner canthus corner point was reached, the oblique parallel incision was performed along the lower eyelid, so that full subcutaneous separation was obtained on the upper and lower incision, the malpositioned isomerous orbicular muscle and thickened tissue were released and excised, so that the epicanthus skin was naturally restored, and finally the incision was sutured without tension. The extent of postoperative scarring and improvement of the epicanthal fold were evaluated after surgery. The medial canthal distance was measured preoperatively and 12 months postoperatively.

Results:
The average intercanthal distance decreased significantly from a mean of 41.68 （+-） 2.57mm preoperatively to 37.14 （+-） 1.94mm 12 months postoperatively ($P<0.05$, paired t-test). And all patients were satisfied with the excellent aesthetic results in terms of an open medial canthus without definite recurrence, hypertrophic scarring, and other complications during the 12-month follow-up period.

Conclusion:
Epicanthoplasty with transverse incision and pouch incision is a simple and effective method for elimination epicanthal folds, resulting in a pleasant visualization, inconspicuous scar. However, its long-term effects require further study.

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Risk factors of surgical site infection and flap failure in maxillofacial defect reconstruction with free flap: a retrospective cohort study

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Gaowei Zhang

Abstract

Objectives

This study aimed to identify the potential risk factors of surgical site infection (SSI) and flap failure in maxillofacial free flap transplantation.

Materials and Methods

In this retrospective cohort study, the relationship between potential factors and SSI or flap failure were analyzed via univariate and multivariate regression.

Results

985 cases were finally included in the analysis. The incidence of SSI was 4.4% (43/985). Cephalosporin (RR 0.061; P<0.001) and piperacillin (RR 0.007; P<0.001), compared to levofloxacin, decreased the SSI risk significantly. Younger age (RR 0.972; P=0.031), intraoperative blood loss (RR 1.003; P=0.001, every additional 1ml), previous radiotherapy history (RR 17.122; P<0.001), pathological stage IV (RR 5.719; P=0.005), and use of vascularized bony flap (RR 0.345; P=0.050) were potential risk factors of SSI. The incidence of flap failure was 4.8% (47/985). Smoking history (RR 2.576; P=0.003), use of latissimus dorsi myocutaneous flap (RR 3.276; P=0.045), and surgical site infection (RR 8.242; P<0.001) were independent risk factors.

Conclusion

Younger age, intraoperative blood loss, previous radiotherapy, pathological stage IV, use of vascularized bony flap, and levofloxacin use were considered independent factors of SSI. And smoking history, use of latissimus dorsi myocutaneous flap, and surgical site infection were considered risk factors of flap failure.

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Progressive Overgrowth of Costochondral Graft in a Hemifacial Microsomia: A Rare and Severe Case Report

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Carolus Aldo Windura


Lobredia Zarasade

Abstract

INTRODUCTIONS AND OBJECTIVES:
Hemifacial microsomia treatment often involves bone grafting and soft tissue augmentation to restore facial symmetry. Costochondral grafts (CCGs) have been widely used for temporomandibular joint (TMJ) reconstruction in children with hemifacial microsomia (HFM) and other mandibular deficiencies. While all grafts demonstrated growth potential, the growth pattern of CCGs was found to be highly unpredictable, ranging from excessive growth to suboptimal or no growth.
This article is to describe the common complication of CCG, which is overgrowth, that can lead to significant morbidities which need several procedures to correct.
METHODS:
A case report of one hemifacial microsomia patient with progressive costochondral graft overgrowth. Eight years followed up of the clinical conditions and operations from bone graft procedure to date .
RESULTS:
A nine year old boy underwent ramus correction for left hemifacial microsomia with costochondral graft.. Despite initial correction, the graft demonstrated excessive and asymmetric growth, continuing beyond skeletal maturity and resulting in significant facial asymmetry.. By the age of 17, clinical and radiographic assessments revealed a 2.5 cm discrepancy between the left and right mandibular ramus lengths, with a 34.5° deviation of the mandible toward the right side. Surgical history includes two major corrective procedures with presurgical digital planning. The first surgery involved vertical ramus subsigmoid osteotomy (VRSO), right coronoidectomy, and excision of the left costochondral graft. Persistent asymmetry and functional impairment necessitated a second surgery comprising Le Fort I osteotomy and augmentation osseous genioplasty. Additionally, other complications arose from mechanical failure of the reconstruction plate and ankylosis of the contralateral TMJ.
CONCLUSIONS:
The severity of deformity and complications of CCG in pediatric patients underscore the need for close longitudinal follow-up. Although considered a favorable graft material for its growth potential, the unpredictability of CCG behavior in growing individuals can lead to significant morbidity. Individualized surgical planning and multidisciplinary management are important in addressing both functional and aesthetic outcomes in complex craniofacial reconstruction. Corrective osteotomy for overgrowth CCG should be postponed after the completion of growth.

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Surgical and Clinical Outcomes of Temporomandibular Joint Ankylosis: A Systematic Review

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Abstract

Background:

Temporomandibular joint (TMJ) ankylosis causes severe restriction in mouth opening, affecting speech, nutrition, appearance, and oral hygiene. While various treatment techniques have been reported, the relationship between surgical options and patient outcomes remains poorly defined. This systematic review assesses current literature on surgical treatment of TMJ ankylosis to develop a predictive relationship between intervention and outcomes.

Methods:

PubMed, Embase, and Web of Science were searched for this PRISMA-compliant review. A total of 1597 studies were identified. Inclusion criteria encompassed English-language studies from January 1994 to December 2024 with surgery-specific outcomes, exclusively pediatric or adult data, reported pre- and postoperative maximal interincisal opening (MIO), physiotherapy protocol, and ≥1-year follow-up. After screening, 52 studies met inclusion. Exclusion criteria included unavailable full text, non-human subjects, non-TMJ diseases, or lack of surgery-specific outcomes. Data extracted included demographics, surgery type, MIO, physiotherapy, complications, and follow-up. Outcomes assessed were re-ankylosis, facial nerve injury, infection, and MIO change.

Results:

Of 52 studies, 30 focused on pediatric and 22 on adult patients (n=926; 591 pediatric, 335 adult). In pediatric patients, mean preoperative MIO was 6.85mm, improving to 32.41mm postoperatively. Most common procedures were gap arthroplasty with interposition grafts (28.6%), gap arthroplasty (26%), gap arthroplasty with costochondral and interposition grafts (21.5%), and gap arthroplasty with costochondral grafts (21.3%). Greatest MIO improvement occurred with gap arthroplasty with costochondral and interposition grafts (6.14mm to 32.72mm); smallest with interposition grafts alone (6.26mm to 31.38mm). Complication rate was 15.9%; re-ankylosis was 6.9%. Facial nerve injury occurred in 26 patients; infection in 10. In adults, preoperative MIO was 8.58mm, improving to 32.83mm. Most common procedures were gap arthroplasty with interposition grafts (39.4%), gap arthroplasty (24.5%), and TMJ replacement (21.2%). Greatest MIO improvement was with gap arthroplasty with costochondral and interposition grafts (8.18mm to 37.3mm); smallest in TMJ replacement (9.08mm to 24.62mm). Complication rate was 13.7%, with re-ankylosis at 0.89%. Noncompliance with physiotherapy was a key factor in re-ankylosis and reduced MIO.

Conclusions:

TMJ ankylosis treatment remains challenging due to recurrence, complications, and limited data. On average, 32mm of postoperative MIO can be expected. Emphasizing physiotherapy is critical to improving outcomes and reducing re-ankylosis.

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Considerations on Infection in Craniofacial Surgery

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Abstract

【Objective】Intracranial infection is a serious complication in craniofacial surgery, often necessitating bone flap removal and resulting in significant morbidity. Despite its severity, few studies have investigated management strategies for such infections. This study retrospectively reviews cases of postoperative intracranial infection at our institution to elucidate their clinical features and therapeutic approaches. 【Methods】We conducted a retrospective review of patients who developed postoperative intracranial infections following craniosynostosis surgery at Kanazawa Medical University. Cases involving only superficial infections confined to the skin and subcutaneous tissues were excluded from the analysis.

【Results】Case 1: A 4-year-old boy underwent fronto-orbital advancement for atypical cranial deformity due to premature fusion of the left squamosal suture. On postoperative day 4, left periorbital erythema and swelling were noted, indicating intracranial infection. Management included antibiotic therapy, three debridement procedures under general anesthesia, repositioning of the bone flap, closure of the epidural space, and continuous irrigation, ultimately leading to infection resolution. Case 2: An 8-year-old boy with Crouzon syndrome underwent monobloc distraction osteogenesis. Two weeks postoperatively, periorbital erythema and fluctuance developed. Treatment with debridement, antibiotic therapy, and continuous irrigation successfully controlled the infection. Case 3: A 9-year-old boy with Apert syndrome underwent facial bipartition distraction osteogenesis. On postoperative day 5, periorbital erythema and fluctuance were observed. Following antibiotic administration, debridement, and continuous irrigation, the infection was successfully resolved.

【Discussion】

The causative pathogens were identified as multidrug-resistant streptococci and mixed anaerobic bacteria, both presumed to originate from the nasal cavity. Therefore, prophylactic antibiotic regimens should include agents with anaerobic coverage rather than relying solely on first-generation cephalosporins typically used for targeting skin flora. In procedures where communication between the nasal cavity and intracranial space is present or anticipated, meticulous separation using a pericranial flap is critical. Moreover, distraction osteogenesis techniques are recommended to minimize epidural dead space. For established infections, continuous irrigation in combination with appropriate antimicrobial therapy proved effective in achieving infection control without sacrificing devascularized bone.

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Association between Craniofacial Microsomia Severity and Patient Reported Outcomes: A Pilot Study using FACE-Q and PROMIS Measures

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Abstract

Background:

Craniofacial Microsomia (CFM) is one of the most phenotypically heterogenous craniofacial diagnoses. The Phenotypic Assessment Tool for Craniofacial Microsomia (PAT-CFM) offers a comprehensive and standardized approach to clinician-assessed phenotyping. The primary aim of this study was to evaluate whether clinician PAT-CFM assessments correlate with patient-reported outcomes (PROs) to better understand how clinical phenotype translates to patient satisfaction and quality of life.

Methods:

Patients with CFM were prospectively enrolled and completed PROs at initial clinic visit, preoperatively, postoperatively, and at 1- and 2-year follow up visits using both the FACE-Q and PROMIS global health surveys. Two-dimensional clinical photographs were independently scored by a clinician using the PAT-CFM. Patients were assigned severity and asymmetry scores based on the International Consortium for Health Outcomes Measurement (ICHOM) system. Associations between PAT-CFM-derived scores and PROs were assessed using Spearman's correlation.

Results:

Thirty-two patients were included (mean asymmetry score of 5.26 ±3.41; mean severity score 5.77±3.34, range 0-16 points). At the initial visit, 13 (40.1%) patients completed FACE-Q and 18 (56.2%) patients completed PROMIS pediatric or proxy global health surveys. Spearman's correlation showed no significant association between severity scores and any FACE-Q domain including appearance distress, satisfaction with facial appearance, eyes, jaw, or teeth or functional domains such as breathing, eating and movement. Similarly, no association was observed between severity scores and pooled PROMIS Global Health T-scores. Trends were noted toward lower patient satisfaction with appearance (eyes, jaw, teeth) and decreased functional outcomes (breathing, movement) with increasing severity, although these associations did not reach statistical significance, likely due to sample size limitations.

Conclusions:

Preliminary findings suggest that greater phenotypic severity in CFM may be associated with lower patient-reported satisfaction and perceived global health at initial evaluation, although statistical significance was not reached. Ongoing efforts to expand the patient cohort, increase longitudinal PRO collection across multiple pre- and postoperative timepoints, and improve survey completion rates will be critical for more robust evaluation of the relationship between clinical phenotype and PROs in craniofacial microsomia.

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Effect of PDGF-BB on osteoblastic cells and human umbilical vein endothelial cells pretreated by alendronate

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Wang Rihui



huang li

Abstract

Systemic Bisphosphonates (BPs) such as zoledronates and alendronates administration can contribute to a severe complication—Bisphosphonates related osteonecrosis of jaw (BRONJ). Recently, BPs were fund that it can suppress the coupling of osteogenesis and angiogenesis by inhibiting the preosteoclasts-derived platelet derived growth factor-BB (PDGF-BB) secretion.

And treatment with exogenous PDGF-BBincreased CD31hiEmcnhi vessel number and stimulates bone formation in OVX mice. So, we hypothesized that exogenous PDGF-BB might reverse the function of BPs suppress the coupling of osteogenesis and angiogenesis in vivo study. Here, we found that alendronate inhibited HUVECs proliferation and migration can be reversed by PDGF-BB. Meanwhile, angiogenic function of HUVECs and secretion of VEGF of OBs pretreated by alendronate also improved when culturing with PDGF-BB. Western blot assay showed that the expression of FGF-2, VEGF in ECs improved when culturing with PDGF-BB compared to the control group. Our study may partly contribute to offering a new way to treat or prevent BRONJ.

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Application of 3D printed personalized PEEK prosthesis material in repairing severe facial soft and hard tissue deformities after radiotherapy

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Xiao Zhang


Yanshan Liu

Abstract

Exploring the use of 3D printed personalized PEEK materials in repairing severe facial tissue deformities caused by radiotherapy for malignant tumors of the paranasal sinuses, providing clinical ideas for precise repair of maxillofacial deformities.

Method and Results:

Preoperative completion of three-dimensional CT scan and photography of the patient's facial features. Based on the patient's condition, two options were provided: ① Personalized Peek material implantation for reconstruction of the maxilla, orbital floor, and nasal dorsum; ② Personalized Peek material implantation for reconstruction of maxilla, orbital floor, and secondary nasal repair. After multidisciplinary MDT consultation and communication with the patient before surgery, the second option was ultimately chosen.

During the operation, a digital guide plate was made before the operation to complete the repair of the surgical area defect. After the operation, a three-dimensional CT scan of the brain was performed to evaluate the patient's healing condition; Use Mimics software to analyze the changes in facial soft and hard tissue symmetry before and after surgery in patients.

The patient's postoperative follow-up showed good recovery of the maxillofacial appearance, with basic symmetry on both sides; Improvement of postoperative diplopia symptoms; Mimics software analysis of three-dimensional CT data of the brain showed good alignment of the prosthetic material, without absorption or displacement. The symmetry of the patient's facial soft and hard tissues improved significantly after surgery compared to before surgery.

Conclusion:

1. This case adopts personalized PEEK prosthesis material designed digitally, which has many advantages in terms of morphology, function, secondary trauma and other complications.
2. Digitally designed personalized PEEK prosthesis materials have been used to repair maxillary bone defects, resulting in good recovery of the maxillofacial appearance and providing clinical practice for precise repair of maxillary bone defects.

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Digital Technology-Assisted Craniofacial Deformity Reconstruction in a Case of Crouzon Syndrome

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Jianping Huang



Canyang Jiang



Yan Jiang



Zunhao Tan



Lisong Lin



Li Huang

Abstract

Background

Crouzon syndrome is a rare genetic craniosynostosis disorder caused by FGFR2 mutations, characterized by premature cranial suture fusion, midfacial hypoplasia, and proptosis. It often leads to increased intracranial pressure and functional impairments, requiring multidisciplinary surgical management.

Case presentation

This case report describes the application of digital technology-assisted surgical planning in the staged craniofacial reconstruction of a 2-year-old female patient with Crouzon syndrome. The patient presented withprogressive bilateral exophthalmos, midfacial hypoplasia, craniosynostosis, and signs of intracranial hypertension. Imaging studies confirmed scaphocephaly, maxillary retrusion, and incomplete eyelid closure, with narrowing of the anterior cranial base and orbital region. A two-stage surgical approach was undertaken. Stage I involved monobloc advancement cranioplasty, which effectively relieved intracranial hypertension and expanded the cranial vault, facilitating normal cognitive development. Postoperative imaging at one and three months demonstrated favorable morphological outcomes. Stage II comprised Le Fort III osteotomy with craniofacial distraction osteogenesis to address midfacial deficiency and occlusal anomalies. A five-month postoperative CT scan confirmed satisfactory bone healing and structural improvement.

Conclusion

This case illustrates the utility of digital surgical planning in enhancing the precision and outcomes of complex craniofacial reconstructions. The integration of advanced imaging and three-dimensional modeling facilitated individualized treatment strategies, leading to improved functional and aesthetic results in a pediatric patient with syndromic craniosynostosis.

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Hierarchical micro/nano-structured topographies regulating osteogenesis of BMSCs through the SEMA7A/ITGB1/FAK/ERK signaling pathway

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Jinkai Zhang


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Xudong Wang

Abstract
3D-printed personalized Ti implants are promising for the restoration of segmental craniomaxillofacial bone defects. Previously, submicron-scale pits and nanotubes were fabricated on 3D-printed Ti surfaces, obtaining ierarchical micro/nano-structured topographies. This topographical surface was verified to significantly improve the osteogenic performance of 3D- printed Ti implant, which is essential for its clinical application. In this study, to explore the underlying mechanisms, RNA-seq was performed and the results revealed that Semaphorin 7A (Sema7A) might be involved in surface topography-regulated osteogenesis. After validating the differently expressed levels of Sema7A and its receptors, Integrin β1 (ITGB1) and Plexin C1 (PLXNC1), co-immunoprecipitation experiment was performed to determine its receptor- binding affinity. The results suggested SEMA7A predominantly bound with ITGB1, therefore it's assumed that Sema7A participated in the surface topography-regulated osteogenesis of BMSCs through the well-documented ITGB1/FAK/ERK signaling pathway. To verify this hypothesis, lentivirus and mall interfering RNA (siRNA) were designed to up/down-regulate the expression of Sema7A. And positive correlation between the activation level of FAK/ERK pathway, as well as the osteogenic phenotype of BSMCs, and the expression level of Sema7A were observed. In summary, this study revealed a potential molecular mechanism participating in surface topography-regulated osteogenesis, which is instructive for surface design of implants for bone restoration.

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Endoscope-Assisted Vestibular Approach for Surgical Correction of Hemifacial Microsomia Via Mandibular Distraction Osteogenesis: A Case Report

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Xiaoyi Hu

Abstract

Introduction:

Hemifacial microsomia (HFM) presents significant challenges in craniofacial surgery due to its complex three-dimensional deformities. Traditional approaches often require extensive external incisions, resulting in visible scarring.

This case report presents an innovative minimally invasive technique utilizing an endoscope-assisted intraoral approach for the surgical correction of HFM.

Methods:

A 9-year-old male presented with left-sided hemifacial microsomia (Pruzansky-Kaban Type IIa). The surgical procedure was performed entirely through an intraoral approach with endoscopic assistance. The mandibular ramus and body were accessed through a vestibular incision. Endoscopic visualization facilitated precise osteotomy placement, bone grafting, and fixation while minimizing soft tissue disruption. Three-dimensional surgical planning and custom surgical guides were utilized to achieve precise skeletal cutting.

Results:

The patient demonstrated satisfactory facial symmetry at 12-month follow-up. Postoperative CT scans confirmed appropriate positioning of the reconstructed mandible. The vestibular approach resulted in less external scarring (transbuccal incision, less than 5mm), and the patient reported minimal postoperative discomfort. Recovery time was notably shortened compared to traditional approaches. Objective measurements showed improvement in ramus height and mandibular body length, achieving 92% symmetry with the unaffected side.

Conclusion:

This case demonstrates the feasibility and advantages of an endoscope-assisted vestibular approach for HFM correction. The technique offers excellent visualization while minimizing external scarring and surgical morbidity. This approach may represent a valuable alternative to traditional surgical methods for selected cases of hemifacial microsomia.

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Combined Orthodontic and Orthognathic Treatment of a Skeletal Class III Malocclusion with Facial Asymmetry

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Zunhao Tan


Canyang Jiang


Jianping Huang


Yan Jiang


Lisong Lin


Li Huang

Abstract

Background:
Skeletal Class III malocclusion accompanied by mandibular deviation is a complex dentofacial deformity that significantly affects facial aesthetics and occlusal function. It is often caused by disproportionate maxillomandibular growth and requires a combination of orthodontic and orthognathic treatment for functional and esthetic correction.

Case Presentation:
This case report describes a 20-year-old female patient presenting with a skeletal Class III malocclusion and mandibular deviation to the left. Clinical examination revealed a concave facial profile, midline deviation, and anterior crossbite. Cephalometric analysis confirmed maxillary retrusion, mandibular prognathism, and lateral deviation of the mandible. A two-phase treatment approach was adopted: pre-surgical orthodontics to decompensate the dentition, followed by bilateral sagittal split osteotomy (BSSO) and Le Fort I osteotomy with asymmetric mandibular setback and maxillary advancement. Post-treatment results demonstrated improved facial symmetry, corrected dental midlines, and a stable Class I occlusion.

Conclusion:
This case highlights the effectiveness of combined orthodontic and orthognathic treatment in correcting skeletal Class III malocclusion with mandibular asymmetry. Individualized surgical planning and coordinated interdisciplinary care are essential for achieving optimal functional and aesthetic outcomes.

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PAOO-Assisted Orthodontics for Correcting Post-Orthognathic Bone Segment Displacement: A Case Report

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Qinfeng Ding



Xudong Wang

Abstract

Background

Segmental instability following multi-piece orthognathic surgery presents significant clinical challenges. A 35-year-old patient with bimaxillary protrusion underwent maxillary LeFort I osteotomy with anterior segmental setback and mandibular BSSRO combined with anterior segmental setback and genioplasty. At 3 months postoperatively, the patient developed right-sided vertical open bite (5mm) and horizontal crossbite (-2.5mm), resulting in significant masticatory dysfunction. Conventional orthodontic approaches proved ineffective due to mature bony healing and segmental rigidity.

Methods

A comprehensive PAOO protocol was implemented:

Surgical Phase: Selective piezocision corticotomies at the displaced right posterior maxillary and mandibular segments. Labial/buccal decortication to enhance regional acceleratory phenomenon (RAP).

Orthodontic Phase: Intrusive mechanics (40g force) with TADs for open bite correction. Coordinated archwire sequencing (0.019×0.025" SS). Asymmetric elastics (4.5oz, 1/4) for crossbite correction.

Biological Rationale: The RAP effect (peak activity at 3-6 weeks) enabled rapid segmental repositioning by temporarily reducing cortical bone resistance.

Results

4 weeks post-PAOO: 70% open bite reduction (1.5mm residual) and complete crossbite correction achieved.

12 weeks: Stable right molar occlusion with 2mm overbite; CBCT confirmed bony bridging at corticotomy sites; Improved facial symmetry (3D photogrammetry showed 85% asymmetry reduction).

6-month follow-up: Maintained functional occlusion with no relapse.

Conclusion

This case demonstrates: PAOO's effectiveness in managing post-surgical segmental displacement in mature patients (≥35 years). The technique's capacity to overcome limitations of conventional orthodontics in late-presenting cases (≥3 months post-op). Critical window for intervention: 2-4 months post-orthognathic surgery when RAP response remains optimal.PAOO represents a biologically sound alternative to revision surgery for specific post-orthognathic complications, particularly in cases involving combined maxillary and mandibular segmental procedures.

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Psychosocial Challenges and Mental Health Outcomes in Individuals with Microtia

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Abstract

Background/Purpose

Microtia—a congenital deformity characterized by an underdeveloped or absent external ear—can profoundly affect the psychosocial well-being of those impacted. While surgical interventions have improved aesthetic outcomes, the mental health implications of living with a visible facial defect remain underexplored.

The Patient-Reported Outcomes Measurement Information System (PROMIS) is a validated tool that provides insights into the emotional health of children with craniofacial conditions. This study leverages PROMIS instruments to understand the mental health landscape for individuals with microtia, aiming to inform holistic, patient-centered care that addresses both physical and psychological needs.

Methods

Patients diagnosed with microtia (ICD-10 code Q17.2) who underwent or were evaluated for surgical treatment at a tertiary children's hospital completed PROMIS assessments to evaluate psychosocial outcomes, including family and peer relationships, anger, anxiety, depression, and stress using a Likert-scale format. A t-test analysis compared psychosocial outcomes between patients with microtia, control groups, and those with other craniofacial(CF) anomalies.

Results

A total of 82 microtia patients had undergone ear reconstruction surgery and were included in our analysis. Compared to controls, patients with microtia showed no significant differences in family and peer relationships or anger. However, patients with microtia reported significantly higher levels of anxiety, depression, and stress ($M = 1.94$, $SD = 0.70$ vs. $M = 2.21$, $SD = 0.89$, $p = 0.047$; $M = 1.62$, $SD = 0.69$ vs. $M = 1.96$, $SD = 0.89$, $p = 0.017$; $M = 1.91$, $SD = 0.75$ vs. $M = 2.14$, $SD = 0.89$, $p = 0.033$, respectively). Additionally, lower family relationship ratings approached significance in patients with microtia compared to those with other craniofacial anomalies ($M = 4.12$, $SD = 0.88$ vs. $M = 4.38$, $SD = 0.61$, $p = 0.058$). No significant differences in anger, anxiety, depression, or stress were found between patients with microtia and other craniofacial anomaly groups.

Conclusions

This study highlights the psychosocial challenges faced by microtia patients, such as elevated depression and weaker family and peer relationships compared to patients without CF anomalies. Insights from PROMIS assessments can guide integrated care to help improve the overall well-being in microtia patients.

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Evidence-Based Summary of Breastfeeding Practices for Children with Cleft Lip and Palate

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Xiangying Hu


Xudong Wang

Abstract

Objective:
To systematically retrieve, critically evaluate, and summarize the highest-quality evidence regarding breastfeeding for children with cleft lip and palate, thereby providing a robust foundation for clinical practice.

Method:
Based on the "6S" pyramid evidence model, a systematic search was conducted across websites and databases to identify literature on breastfeeding in children with cleft lip and palate. The search timeframe extended from the inception of each database to January 2025. Researchers trained in systematic evidence-based nursing assessed the methodological quality of the included studies, extracted relevant data, and synthesized the evidence.

Result:
A total of 10 studies were included, comprising 3 guidelines, 2 meta-analyses, 4 systematic reviews, and 1 evidence summary. These covered four key areas: feeding assessment, feeding tools, feeding posture, and feeding guidance.

Conclusion:
The evidence summarized in this study is both scientifically rigorous and practically applicable, offering a reliable basis for healthcare professionals and caregivers to conduct health education on breastfeeding for children with cleft lip and palate.

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Orthognathic Surgery of Goldenhar Syndrome Patient with Absent Bilateral Mental Foramina

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Jaewoo Kim


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Abstract
Goldenhar syndrome (GS), also known as oculo-auriculo-vertebral spectrum (OAVS), is a congenital condition affecting the craniofacial region and vertebrae. This report details a 21-year-old Korean female with GS, characterized by the absence of bilateral mental foramina, who underwent two-jaw orthognathic surgery with genioplasty to address mandibular hypoplasia, asymmetry, and severe anterior open bite. Preoperative CT revealed hypoplasia of the right maxilla and left mandible, and absent bilateral mental foramina which were confirmed intraoperatively. The surgical procedure was successfully completed, with meticulous dissection. Postoperative recovery was uneventful, with gradual improvement in bilateral chin hypesthesia likely caused by traction, achieving full sensory recovery within six months. A systematic review of GS cases involving absent mental foramen identified nine articles among 5,605 search results, highlighting the rarity of this anomaly. This case underscores the importance of detailed preoperative anatomical evaluation in GS patients undergoing orthognathic surgery to ensure optimal outcomes.

Conclusions
For pediatric patients experiencing craniofacial trauma, patients under the age of 5 have a higher incidence of NAT than patients aged 5 and over, with a greater injury severity score, ICU admissions, and mortality. Defining this cohort will help guide treatment and evaluation of these patients on admission.

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Rapid and Ultrasensitive Detection of Staphylococcus aureus by a One-Pot System Integrating Pyrococcus furiosus Argonaute with Loop- Mediated Isothermal Amplification

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Abstract

Abstract: *Staphylococcus aureus* (*S. aureus*) is one of the most common pathogens associated with oral and maxillofacial space infections (OMSI), significantly impairing patients' quality of life and posing substantial public health risks. Traditional detection methods are usually time-consuming and operationally complex, which limits their applicability for rapid on-site detection. This study introduces a novel, ultrasensitive nucleic acid detection system combining loop-mediated isothermal amplification (LAMP) with *Pyrococcus furiosus* Argonaute (*Pf*Ago) in a one-pot strategy. The combination of LAMP and *Pf*Ago not only improves specificity and sensitivity but also effectively reduces the risk of aerosol contamination and false positives. The system detects the *nuc* gene of *S. aureus*, enabling rapid detection within 50 minutes with a limit of detection (LOD) of 10^0 Colony Forming Units (CFU)/mL for bacterial solutions and 10^{-5} ng/μL for plasmids. This system exhibited exceptional specificity by effectively differentiating *S. aureus* from other common OSMI bacteria, and was successfully applied to samples from animal OMSI infection models. This innovative one-pot system offers a rapid, reliable, and effective solution for *S. aureus* detection, with potential applications in human health and public safety.

Keywords: *Staphylococcus aureus*; *Pyrococcus furiosus* Argonaute; Loop-mediated isothermal amplification (LAMP); nucleic acid detection

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Workflow Optimization for Final Occlusion Design in Segmental Orthognathic Surgery

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Anqi Gao


Dongming He


Xudong Wang

Abstract

Background:
Precise final occlusion is essential for orthognathic surgery success. Traditional model surgery is widely used but remains manual and subjective. While digital planning is established for unsegmental cases, segmental cases lack standardized protocols and objective validation. Considering the frequent use of segmentation, this study presents a four-step virtual occlusion workflow for both case types. Its clinical accuracy and feasibility are evaluated using the ABO-OGS and stability tests, aiming to improve planning efficiency and provide a reliable, reproducible approach to occlusion setup

Methods:
This ethically approved study at Shanghai Ninth People's Hospital involved 50 adult patients with skeletal malocclusion, who underwent bimaxillary surgery and over two years of follow-up. CT imaging and plaster models were collected preoperatively. All patients received both conventional (model surgery) and virtual occlusion using ProPlan CMF software. A four-step digital protocol was developed to sequentially adjust segmented jaws, focusing on midline alignment, overjet, overbite, and contact points.
Movements involved translations and rotations across all axes, with key adjustments in anterior, mandibular, posterior, and maxillary regions. Occlusion quality and stability were evaluated through ABO-OGS scores and penetration depth, aiming to establish a more efficient and reproducible digital planning method

Results:
This study compared conventional occlusion (CO) and virtual occlusion (VO) in 50 bimaxillary surgery patients. All models were 3D-printed using the same resin and blindly evaluated via ABO-OGS and stability tests. The intra-examiner reliability was excellent (ICC = 0.990; range, 0.993–0.984). In unsegmental cases, VO showed significantly better total scores (p=0.012), overjet (p=0.018), and occlusal relationships (p=0.021). In segmental cases, only overjet differed significantly (p=0.045). CO models showed slightly higher stability, but the difference was not significant (p>0.05). VO demonstrated clinical feasibility with high precision and reproducibility

Conclusion:
Virtual planning in orthognathic surgery improves accuracy and efficiency by allowing precise occlusion establishment before surgery. Unlike model surgery, virtual planning offers real-time feedback, flexibility, and visualization. It applies to both segmental and unsegmental cases, enhancing predictability and reducing manual labor. While automated protocols need development, virtual occlusion is a promising replacement for model surgery

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Correction of the Constricted Nasal Sill using the Perialar Petal Flap

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Abstract

Introduction

Nasal sill constriction may result from over-reduction or scarring of the nasal sill, resulting in asymmetry of the nostrils and nasal base. Correcting this deformity is a challenge, often compounded by a shortened lip height on the affected side, paucity of local tissue and scarring around the nasal base. These factors render it difficult to achieve a satisfactory result. We describe a novel technique of correcting nasal sill constriction using a perialar transposition flap, while simultaneously achieving repositioning of the displaced alar base.

Methods

The alar base is mobilised via a perialar incision and transposed to its ideal position. A petal-shaped inferiorly-based flap is elevated from excess skin underlying the new alar position. The nasal sill scar is incised and the flap is transposed medially to lengthen the nasal sill. The donor site is closed primarily with a well-concealed scar within the alar-cheek junction.

This technique was used to correct severe nasal sill constriction in 3 patients and was performed in conjunction with lip scar revision.

Results / Discussion

All patients healed without complications and achieved improvement in nasal sill width and symmetry. There were no cases of flap necrosis.

The perialar petal flap allows strategic rearrangement of the perialar tissue and transfers healthy tissue from an area of redundancy to achieve effective lengthening of the scarred nasal sill. This corrects nasal sill constriction and repositions the alar base with an inconspicuous donor site scar.

Conclusion

The perialar petal flap is an effective and safe technique for correcting the constricted nasal sill, repositioning the alar base and improving nasal symmetry.

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Analysis of Salivary Microbiota Changes During Oral Carcinogenesis Based on 16S rDNA Sequencing

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Abstract
Background:
Oral potentially malignant disorders (OPMDs) are critical precancerous stages of oral squamous cell carcinoma (OSCC), and early identification is essential for improving OSCC prognosis. Although the salivary microbiome has garnered attention as a non-invasive biomarker, the microbial succession patterns across the health–OPMD–OSCC spectrum and their clinical implications have not been systematically elucidated.
Methods:
This study established three cohorts (29 healthy controls, 10 OPMDs cases, and 11 OSCC patients). High-throughput sequencing of the 16S rDNA V3–V4 region was used to characterize salivary microbial composition. LEfSe analysis was applied to identify differentially abundant genera between groups.
Results:
Microbial succession showed clear disease stage-specific characteristics throughout the progression from health to OSCC. *Haemophilus* exhibited the highest relative abundance in healthy individuals and declined significantly as the disease advanced ($p < 0.05$). In contrast, *Peptostreptococcus* was specifically enriched in the OSCC group. *Pseudomonas*
demonstrated a transitional increase in the OPMDs group, with significantly higher levels compared to both the healthy and OSCC groups ($p < 0.05$). Additionally, *Peptococcus* and *Johnsonella* were found to increase synergistically in OSCC patients, both differing significantly from the healthy group ($p < 0.05$). These findings highlight a progressive microbial shift associated with oral carcinogenesis.
Conclusion:
The study reveals a stage-specific evolution of the salivary microbiome during oral carcinogenesis, characterized by a “probiotic decline – opportunistic pathogen increase” trend. The inverse shifts in *Haemophilus* and *Peptostreptococcus*, along with the co-proliferation of *Peptococcus* and *Johnsonella*, offer a novel microbial biomarker combination for early OSCC screening and malignant transformation risk prediction in OPMDs.
Keywords:
Salivary microbiome; Oral potentially malignant disorders; Oral squamous cell carcinoma; 16S rDNA sequencing; Biomarkers

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Sandwich technique for alveolar bone grafting: efficiency and complications

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Xuefei Pang



Ming Cai

Abstract

Background:
Alveolar cleft causes oronasal communication, nasal floor collapse, and dental anomalies, significantly impairing physiological functions such as mastication and speech. This study aimed to evaluate the short-term osteogenic effects of the sandwich technique versus iliac cancellous bone (ICB) grafting in secondary alveolar cleft repair.

Methods:
Forty patients with secondary alveolar clefts were enrolled and randomly assigned to either the experimental group (sandwich technique) or the control group (ICB). The sandwich technique involved using intraoral autogenous mandibular cortical bone to reconstruct the nasal floor and buccal alveolar layer, leveraging its superior mechanical strength. A mixture of platelet-rich fibrin (PRF) and xenogenic bone granules was packed between the cortical layers to restore cancellous bone volume. The control group underwent conventional ICB grafting. Clinical and radiographic assessments were performed preoperatively, immediately postoperatively, and at 1, 3, 6, 12, 18, and 24 months postoperatively. Bone resorption rates were measured at 6 months.

Results:
The sandwich group had significantly lower bone resorption (38.43 ± 14.67%) compared to the ICB group (56.43 ± 19.32%) ($p = 0.007$). The overall complication rate was 7.5% (3 cases), including one mucosal dehiscence and one absorbable plate fragment expulsion in the sandwich group, and one graft necrosis in the ICB group.

Conclusion:
The minimally invasive sandwich technique demonstrates superior bone preservation and clinical efficacy in alveolar cleft reconstruction compared to traditional ICB grafting.

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Simultaneous orthognathic surgery and mandibular vascularized reconstruction (SOM) for adult type III hemifacial microsomia

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JIAN CAO


Xudong Wang

Abstract

Objective:
The adult Pruzansky-Kaban type III hemifacial microsomia presents with severe facial asymmetry with absent or rudimentary mandibular ramus and condyle, pronounced chin deviation toward the affected side. The treatment should include concomitant orthognathic surgery and mandibular ramus reconstruction on the affected side. Here we report the use of free fibular flap to reconstruct the ramus with the simultaneous orthognathic surgery to correct the type III hemifacial microsomia.

Patient and Methods:
A joint consultation was arranged including the orthodontics, orthognathic and maxillofacial reconstruction surgeon. Preoperative orthodontics was performed for decompensation. The virtual surgical planning was performed using ProPlan CMF 2.1 software (Materialise, Leuven, Belgium). During the surgery, the Le Fort I osteotomy was performed and the maxilla was repositioned to adjust the upper teeth midline, correct the cant of the occlusal plane, and alter the sagittal protrusion and vertical excess. Second, the mandibular sagittal split ramus osteotomy (MSSO) of the unaffected ramus was performed. Third, the final occlusion was registered to reposition the distal segment of the mandible. Fourth, the margin of the remaining mandible was trimmed. Fifth, the segmented fibula was repositioned on the defect site and the free end of the fibula was designed to maintain a 5-mm space with the fossa.

Results:
All cases had satisfied treatment results. The success rate of fibula flap transplantation was 100%. The mouth opening and occlusal relationship returned to normal after surgery, and the facial profile was significantly improved.

Conclusion:
The concomitant orthognathic and microsurgery could be carried out safely and effectively. Digital technology has made these treatments clinically reliable.

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Perioperative Nursing of Condylar Osteochondroma Supported by Digital Surgery and Microsurgery

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Ting Liu


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Jing-shuang Yu


Wen-jun Zhou

Abstract

Objective:
To summarize the key points of perioperative nursing for different surgical procedures of condylar osteochondroma in the context of the development of digital surgery and microsurgery, aiming to improve patients' pain experience and enhance the rehabilitation effect.

Methods:
A total of 219 cases of condylar osteochondroma treated in our department were retrospectively collected. The key points of perioperative nursing were summarized, including providing personalized psychological and pain nursing, strengthening postoperative follow - up, focusing on monitoring the effects of postoperative physical therapy for temporomandibular joint and mandibular muscle strength training, and ensuring adequate functional exercises. The key points of perioperative nursing for patients at different stages and with different surgical procedures were summarized to improve patients' pain experience and inpatient satisfaction.

Results:
A total of 219 cases were selected, with an average age of (31.00±9.12) years. All patients were discharged smoothly. After 3 months of postoperative follow - up, the effects of combined postoperative physical therapy for temporomandibular joint and mandibular muscle strength training were evaluated. The patients' postoperative wounds and oral and maxillofacial functions recovered well, with no complications.

Conclusion:
Digital surgery and microsurgery technologies have improved the clinical treatment efficacy. Strengthening the follow - up and monitoring of postoperative rehabilitation effects according to different surgical methods can effectively improve the quality of postoperative rehabilitation, accelerate the rehabilitation process of patients, and increase inpatient satisfaction.

Keywords: Condylar chondroma; Digital and microsurgery; Perioperative nursing

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Initial Research on WNT7A Driving Perineural Invasion in Head and Neck Squamous Cell Carcinoma via the FZD7/STAT3 Signaling Pathway

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Abstract

Background and Objective:
Numerous studies have shown that metastasis in head and neck squamous cell carcinoma (HNSCC) significantly affects prognosis, with perineural invasion (PNI) being a critical mode of metastasis closely associated with a shortened 5- year disease-free survival rate. Although clinical research has focused on its prognostic value, the molecular regulatory mechanisms remain unclear. This study focuses on the role of WNT7A in PNI, aiming to elucidate its molecular network regulating tumor-neuron invasion.
Materials and Methods:
Clinical HNSCC samples with nerve invasion were collected to analyze the correlation between WNT7A expression and PNI. An in vitro co-culture model was constructed using head and neck squamous cancer cell lines, dorsal root ganglia (DRG) from C57BL/6J mice, and neuronal-like cells. A patient-derived xenograft (PDX) model was established to verify the in vivo effects. Protein-protein interaction assays and pathway analyses were performed to explore the molecular mechanisms.
Results:
1) WNT7A expression levels were positively correlated with PNI in clinical HNSCC samples; 2) In vitro experiments demonstrated that WNT7A enhanced the interaction between tumor cells and DRG neurons, promoting tumor cell migration and epithelial-mesenchymal transition (EMT); 3) WNT7A likely activates axon guidance signaling pathways, facilitating the extension of neuronal synaptic structures and infiltration of surrounding matrices; 4) Mechanistic studies revealed that WNT7A binds to the FZD7 receptor, activating the STAT3 signaling pathway, and upregulates the expression of neuropeptide genes CALCRL and GLDC in neurogenic cell models; 5) Neuropeptide genes CALCRL and GLDC promote tumor cell invasion and proliferation and facilitate the elongation of neuronal protrusions by tumors, establishing the prerequisites for PNI development.
Conclusion:
This study reveals that WNT7A promotes PNI in HNSCC through the following mechanisms: 1) Binding to the FZD7 receptor to activate the STAT3 signaling pathway, enhancing tumor cell migration and epithelial-mesenchymal transition; 2) Upregulating the expression of neuropeptide genes CALCRL and GLDC in neurogenic cells, promoting tumor-neuron interactions. These findings lay the foundation for further exploration of the molecular mechanisms underlying PNI in HNSCC.

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Perioperative Nursing Care of Patients Undergoing "Simultaneous Orthognathic and Micro-surgery (SOM)" During the Same Period

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Abstract

Objective:
To explore the perioperative nursing care of the "Simultaneous Orthognathic and Micro-surgery (SOM)" technique, with an emphasis on measures such as perioperative airway care, oral cavity cleaning, nutritional support, observation and care of the flap, functional exercises, and guidance on elastic band traction, so as to improve the quality of nursing care, prevent or reduce the occurrence of complications, and enhance the surgical efficacy.

Methods:
Summarize the perioperative nursing experience of 15 patients who underwent "Maxillary Lefort I Osteotomy + Mandibular Bilateral Sagittal Split Ramus Osteotomy (BSSRO) + Fibula Myocutaneous Flap Transfer and Reconstruction + Tracheotomy" in our hospital. Pay attention to health assessment and guidance, as well as the confirmation and disinfection of the occlusal splint. For patients undergoing SOM surgery simultaneously, provide personalized nursing care, including airway care, observation and care of the flap, oral cavity cleaning (irrigation + brushing), pipeline care, nutritional support, position management, functional exercises, etc.

Results:
A total of 15 patients' data were collected, among which 8 (53.33%) were male, with an average age of (31.8 ± 11.1) years. The simultaneous surgery achieved good curative effects. The nursing measures were in place and effective, which improved the quality of nursing care, guided patients in self-care, effectively promoted the postoperative rehabilitation of patients. All patients were discharged smoothly without the occurrence of complications.

Conclusion:
Mastering the key points of perioperative nursing care for SOM proficiently, strengthening personalized nursing care during the perioperative period, and improving patients' compliance with self-care are conducive to improving the quality of nursing care and patients' rehabilitation, enhancing the surgical efficacy, and reducing complications.

Keywords: Simultaneous Orthognathic and Micro-surgery (SOM); Perioperative Nursing Care; Retrospective Analysis

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Frontal -nose-orbital bone osteotomy for the treatment of Orbital Hypertelorism

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Weimin Shen

Abstract

Objective

The orbital hypertelorism is accompanied by deformities of the frontal bone, orbit and nose. Simply correcting the interorbital distance cannot achieve a complete cure. Therefore, it is necessary to correct the deformities of the frontal bone, orbit and nose together.

Methods

Underwent comprehensive plastic surgery on the frontal bone, orbital and nose for 48 children with orbital hypertelorism from 12 months to 8 years old. 48 patients including 21 males and 27 females had orbital hypertelorism, and the interorbital distance (IOD) was 3.9 to 5.2 cm. Vision, olfactory sense, and intel ligence were normal; inner canthal distance was 4.5 to 7.7 cm. 48 patients were combined with nasal double-tip deformity. Three dimensional CT (3D-CT) examination showed that the IOD was 3.5 to 5.0 cm. There were no extra craniofacial defects. All the cases underwent frontal bone flap rotationoplasty, orbital distance reduction and advancement, and rhinoplasty.

Results

From 2021 to 2024, a total of 48 children with orbital hypertelorism were underwent frontal bone flap rotationoplasty, orbital distance reduction and advancement, and rhinoplasty. After one year of follow-up, the appearance was satisfactory. The orbital distance was corrected, and the nasal shape and naso-frontal Angle were basically normal

Conclusion

frontal bone flap rotationoplasty, orbital distance reduction and advancement, and rhinoplasty is a good treatment for children's orbital hypertelorism.

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Changes of Facial Attentional Bias to Menton Deviation of Orthognathic Patients: An Eye-Tracking Study

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Xinxi Wang



Kai Liu



Xudong Wang

Abstract

Purpose:

This study aimed to quantify the impact of menton deviation on facial visual attention in orthognathic patients, and to examine the special visual pattern of orthognathic patients .

Methods:

The visual scanning paths of 260 participants were recorded using an eye-tracking device while they viewed images of both normal faces and faces with varying degrees of menton deviation. The fixation duration (FD) and first fixation time (FFT) on specified areas of interest (AOI) were compared.

Results:

Group I exhibited a significantly longer fixation duration (FD) on the lower face compared to Group II when observing a normal face ($P < 0.05$). A menton deviation of 3° resulted in a significantly longer FD and earlier first fixation time (FFT) for both groups ($P < 0.05$). As the severity of menton deviation increased, this trend became more pronounced, with a noticeable decrease in visual attention to the eyes and nose (decreased FD, delayed FFT).

Conclusions:

Orthognathic patients exhibited significantly higher visual attention to the non-deviated menton. A menton deviation of 3° significantly increases visual attention toward the lower face in both orthognathic patients and individuals without facial deformities. As the degree of deviation increases, this effect becomes more pronounced, with concurrent reductions in visual focus on the eyes and nose.

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Autologous bone powder mixed with Hydroxyapatite and tri-calcium phosphate for cranioplasty defects.

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Dr Rakesh Kain



Dr Sagnika Ukil

Abstract

Use of Autologous bone graft in Craniofacial surgery is proffered choice to fill the defect and reconstruction. when craniofacial surgery performed for craniosynostosis or craniofacial cleft many a time it resulted in to shortage of bone to fill the defect or to bridge the defect. Similarly re-do surgical procedures requires large amount of bone graft. to overcome this problem, we started using bone dust powder obtained at the time of craniotomy and burr hole creation and this is mixed with Hydroxyapatite and tri calcium phosphate powder to increase the amount of bone. this was used directly over the cranial defects or wrapped in surgicel and kept at the site of defect. Total 33 patients were incorporated in study. Postoperatively we obtained repeat CT scan after 6 months to see the condition of defect and consolidation of bone mixed with Hydroxyapatite and Tricalcium phosphate. Post operatively helmet was given to protect the displacement of bony segments and direct brain injury In 5 Patients bone scan was done to see vascularization of mixed bone.in observation it was found that 30(90.9%) shown bone consolidation,3(9.1%) had resorption, 7(21.2%) had cellulitis and some discharge but none required removal or debridement. In 90.9% of cases the bony gap was not palpable clinically.

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Perioperative Nursing Care of Patients Undergoing "Simultaneous Orthognathic and Micro-surgery (SOM)" During the Same Period

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Jiali Zheng


Yi Zhu


Hao Sun


Ting Liu

Abstract

Objective:
To explore the methods of perioperative nursing care for children after mandibular distraction surgery. Pay attention to the nursing guidance of the distractor and nutritional support during the perioperative period of children to improve the quality of nursing care and patient satisfaction.

Methods:
Summarize the key points of perioperative nursing care for 129 children who underwent "mandibular distraction osteogenesis" in the Department of Oral and Craniofacial Surgery, Shanghai Ninth People's Hospital Affiliated to Shanghai Jiao Tong University School of Medicine. These key points include preoperative health guidance, postoperative body position placement, airway observation, feeding guidance, pain management, and guiding parents to master the nursing key points of the extension rod of the distractor after surgery.

Results:
The average age of the included patients in this study was (9.02 ± 3.12) years old. Targeted nursing measures were implemented for all the included children. All the children were discharged smoothly. There was no displacement or detachment of the distractor found, no wound infection occurred, and no children had adverse complications such as nutritional disorders, and the distractors were removed as scheduled.

Conclusion:
For children undergoing mandibular distraction osteogenesis, it is necessary to strengthen the evaluation of parents' caregiving ability, especially focusing on the guidance of distractor nursing. After surgery, children may be affected by wound pain, which may influence their eating. Therefore, it is necessary to strengthen the evaluation and nutritional support to prevent the risk of nutritional disorders in children, and further improve the quality of nursing service and patient satisfaction.

Key words: Mandibular distraction osteogenesis; Perioperative nursing care; Retrospective analysis

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Global, regional, and national burden of orofacial clefts, 1990-2021: an analysis of data from the global burden of disease study 2021

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Weikun Qi


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Abstract

Background:

Orofacial clefts (OFCs) represent the most prevalent congenital malformations globally. We aim to characterize disease burden of OFCs across regions and countries, analyze temporal trends from 1990 to 2021, examine relationship with Socio-demographic Index (SDI), explore gender disparities and predict future epidemiological patterns.

Methods:

Utilizing GBD 2021 database for 204 countries/regions, we analyzed age-standardized metrics including disability-adjusted life years (DALYs), prevalence, mortality, incidence, using tools like DisMod-MR 2.1 for Bayesian meta-regression. SDI, calculated from educational attainment, per capita income, and fertility rates (range 0-1), stratified nations into quintiles. Statistical analyses included SDI-burden correlations and future projections using Bayesian age-period-cohort (BAPC) modeling, implemented through R software.

Results:

In 2021, there are a total of 4124006.8 cases of OFCs worldwide, with an age-standardized prevalence rate (ASPR) of 53.4 per 100,000 (95% UI: 43–64). The age-standardized incidence rate (ASIR) was 3.0 per 100,000 (95% UI: 2.2–3.9), while age-standardized deaths rate (ASDR) of 0 per 100,000 (95% UI: 0–0.1). Additionally, age-standardized DALYs rate was 5.8 per 100,000 (95% UI: 3.5–9.8). Regionally, low- to middle-SDI regions demonstrated the highest ASPR and ASIR, whereas low-SDI areas showed the most severe ASDR and DALY rates. In contrast, high-SDI regions consistently exhibited the lowest burden across all metrics. At the subregional level, South Asia recorded the greatest ASPR, while Central Asia had the peak ASIR. Oceania displayed the highest ASDR and DALY rates. Country-specific analysis identified Palestine with the maximum ASPR, Kazakhstan with the highest ASIR, Papua New Guinea with the greatest ASDR, and Afghanistan with the most elevated DALY rates.

Conclusion:

The global OFCs burden demonstrated consistent decline from 1990-2021, with persistent male predominance. Regional disparities correlate strongly with SDI, particularly affecting Central Asia, South Asia, and Africa populations.

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Development of a Classification Framework for Temporomandibular Joint Disc Deformities in Hemifacial Microsomia

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Abstract

Background:

Hemifacial microsomia (HFM) is the second most prevalent congenital craniofacial anomaly, characterized by a heterogeneous spectrum of structural deformities. The OMENS system, and its subsequent refinement as OMENS+, have served as standardized diagnostic frameworks for HFM by capturing skeletal, auricular, soft tissue, and nerve involvement. However, the role of temporomandibular joint (TMJ) disc pathology in HFM remains underexplored and is not yet integrated into existing classification systems.

Methods:

This retrospective study analyzed magnetic resonance imaging (MRI) data of 110 HFM patients to assess TMJ disc morphology. A novel four-tier classification system was developed:D0: Normal disc morphology;D1: Dysmorphic disc with sufficient length to cover the (reconstructed) condyle;D2: Dysmorphic disc with insufficient coverage of the (reconstructed) condyle;D3: Absence of a discernible disc.Correlations between TMJ disc types and OMENS+ components were statistically evaluated.

Results:

The TMJ disc classification demonstrated significant positive correlations with multiple OMENS+ domains: mandibular deformity ($p < 0.01$), auricular deformity ($p < 0.05$), soft tissue deficiency ($p < 0.01$), and facial clefting ($p < 0.01$). These findings suggest that TMJ disc malformations are developmentally aligned with other craniofacial structures affected in HFM.

Conclusions:

Our findings support the inclusion of TMJ disc pathology as a diagnostic parameter in HFM evaluation. We propose an extension of the existing OMENS+ framework to OMENS+D, providing a more comprehensive assessment of the craniofacial phenotype. This refinement reflects the shared embryological origin and coordinated dysmorphogenesis of the mandible, ear, soft tissues, and TMJ disc in HFM patients.

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Impact of Reverse Trendelenburg Position on Perioperative Management in Office-Based Orthognathic Surgery

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Akira KANEYAMA



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Abstract

Background

Orthognathic surgery is frequently associated with significant blood loss—a serious concern in ambulatory centers that lack on-site transfusion or intensive-care capability. Although deliberate hypotension curbs arterial hemorrhage, dependable methods for diffuse venous oozing remain scarce. In Asian aesthetic practice—particularly among Japanese patients pursuing a kogao ("small-face") profile—Le Fort I osteotomy is typically performed with posterior rather than anterior maxillary repositioning, bringing the pterygoid venous plexus into the operative field and heightening the risk of venous bleeding. Because cephalic venous pressure declines as the head is elevated, we evaluated whether a modest reverse Trendelenburg (RT) position could lower blood loss without compromising hemodynamic stability.

Methods

Between February 2023 and February 2024, 62 consecutive adults (mean age 27.3 ± 5.0 yr; 56 women, 6 men) underwent combined Le Fort I and bilateral sagittal split ramus osteotomy at Tokyo Cosmetic Surgery and CONTOUR CLINIC TOKYO. General anesthesia incorporated induced hypotension, targeting a mean arterial pressure of ≈50 mm Hg during bone cutting. Thirty-one patients were managed supine (controls) and 31 in a surgeon-adjustable 5–8° RT maintained from induction to closure. All patients were observed overnight under light sedation with the head elevated 20°.

The primary outcome was estimated blood loss (EBL).

Results

Overall mean EBL was 201.5 ± 131.2 mL. RT positioning reduced EBL to 155.4 ± 107.0 mL versus 247.6 ± 138.5 mL in controls (p = 0.004), a 37 % relative reduction. Only 3 of 31 RT patients compared with 9 of 31 controls lost >300 mL (risk ratio 0.33; 95 % CI 0.10–0.97). Enhanced visualization shortened the median operative time by 18 min. No venous air embolism, neuropraxia, visual disturbance, or airway compromise occurred, and every patient was discharged as scheduled on postoperative day 1.

Conclusion

Maintaining a 5–8° reverse Trendelenburg tilt throughout orthognathic surgery—followed by overnight head elevation—reduces venous bleeding and enhances the safety of office-based maxillofacial surgery without adverse effects. Routine use of this maneuver could widen safety margins where critical-care resources are limited; randomized trials are warranted to corroborate these findings.

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Midfacial Distraction Osteogenesis in Down Syndrome: Treatment Experience and Surgical Considerations

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Joceline Theda Kadarman


Nobuyuki Mitsukawa

Abstract

Background:
Down syndrome is the most common chromosomal abnormality worldwide. Patients with Down syndrome usually have unique characteristics, including a round, flat face, epicanthal fold, up-slanting palpebral fissures, flat nasal bridge, ligament laxity, joint hypermobility, malocclusion, and tracheomalacia. As a consequence of Down syndrome's physical characteristics, such as midfacial hypoplasia, relative macroglossia, weakened respiratory muscles caused by muscle hypotonia, short neck, and a tendency to obesity, patients with Down syndrome can suffer from respiratory disorders like obstructive sleep apnea (OSA). We reported a case of a Down syndrome patient with OSA due to midfacial hypoplasia in which we performed Le Fort II distraction osteogenesis (DO) surgery.

Methods:
Our study consisted of one 2-year-old boy who was diagnosed with Down syndrome from birth based on genetic testing and clinical appearances. We observed common traits of Down syndrome in this patient. As the patient grew, facial deformity caused by midfacial hypoplasia and class III malocclusion became more obvious. He also developed respiratory disorders, precisely OSA. In addition, this patient had a history of tracheomalacia without any tracheostomy procedure performed before. Therefore, we performed Le Fort II DO surgery using a halo-type external distraction device. This patient's upper airway volume was analyzed by comparing preoperative and postoperative thin-layer CT images reconstructed using 3D analysis software (ProPlan CMF ver.3)

Results:
Maxilla was distracted by 23 millimeters, including overcorrection due to some considerations. Immediately after the surgery, tracheomalacia during infancy reoccurred, and this patient required temporary tracheostomy, which was weaned off one year after the Le Fort II DO surgery. Preoperative upper airway volume was 230.38 mm^3, and postoperative upper airway volume was 4446.22 mm^3, which shows significant improvement.

Conclusion:
Regardless of the good results, Down syndrome patients usually have weakened respiratory muscles, so we should carefully consider the indication for this procedure and take caution to ensure the safety of the patient.

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3D-Printed Individual Titanium Plates in Orthognathic Surgery for Skeletal Class II Malocclusion: A Retrospective Comparative Study

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Jiashu Yan



Xudong Wang

Abstract

Purpose:

This research systematically compared the clinical performance of 3D printed Individual Titanium Plates versus traditional mandibular-first in orthognathic surgery for skeletal Class II malocclusion patients, including those with and without condylar pathology.

Methods:

We identified 53 skeletal Class II malocclusion patients who underwent bimaxillary surgery at our institution between March 2018 and August 2022 and divided them into two groups: Titanium Plates and traditional mandibular-first, with further condylar abnormality subgroup analysis. Using ProPlan CMF 2.1, we measured virtual plans against postoperative and follow-up jaw/condylar positions, then compared surgical accuracy, stability, and condylar resorption between groups using SPSS ($p<0.05$ significant).

Results:

Among 53 patients:

1. Accuracy: The Individual Titanium Plates group demonstrated significantly smaller positioning errors in both the maxilla (1.28 ± 0.98 mm vs. 2.50 ± 1.61 mm) and mandible (1.51 ± 0.90 mm vs. 2.83 ± 1.29 mm) compared to the traditional mandibular-first group ($p < 0.05$). This advantage was more pronounced in patients with condylar abnormalities.
2. Stability: No significant difference was observed in long-term maxillary stability between groups ($p > 0.05$). However, in patients with condylar abnormalities, the Individual Titanium Plates group exhibited significantly less mandibular deviation (1.07 ± 1.60 mm) compared to the traditional mandibular-first group (−2.08 ± 1.49 mm, $p < 0.05$).
3. Condylar Resorption: The Individual Titanium Plates group showed significantly lower long-term condylar resorption rates (6.4 ± 5.5%) than the traditional mandibular-first group (13.1 ± 12.0%, $p < 0.05$). The protective effect of Individual Titanium Plates against condylar resorption was particularly evident in patients with pre-existing condylar abnormalities.

Conclusion:

The Individual Titanium Plates demonstrated superior effectiveness over conventional mandibular-first approaches in skeletal Class II malocclusion correction, particularly for cases involving condylar abnormalities. This method is an ideal way to achieve accurate surgical positioning, reduce postoperative condylar absorption, and improve stability.

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Association of ventricular volume with cortical thickness, surface area and volume in syndromic craniosynostosis

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Abstract

Background

Children with syndromic craniosynostosis are at increased risk for decreased cognitive function, which has been linked to changes in cortical thickness (CT) and cortical surface area (CSA). Ventricular enlargement is also common in syndromic craniosynostosis, raising the question of whether ventricular size may influence cortical morphology. This study investigates the association between ventricular volume and regional CT, CSA, and cortical volume (CV) in syndromic craniosynostosis.

Methods

241 T1-weighted MRI scans from syndromic craniosynostosis patients were available, including Apert (n = 61), Crouzon (n = 133) and Muenke (n = 47) syndromes. Regional CT, CSA and CV were derived from FreeSurfer, subjects aged ≤ 2 years were processed using Infant FreeSurfer, to ensure age-appropriate segmentation. Total ventricle volume was calculated using an in-house deep-learning segmentation model. Associations of ventricular volume with regional CT, CSA and CV were assessed using a linear mixed model, controlling for age, sex, total intracranial volume and repeated measurements. Bonferroni correction was applied for multiple testing.

Results

Preliminary results show that larger ventricular volume was associated with increased CT in several regions, including the left frontal, left occipital, right parietal, and right frontal cortices (all $p < 0.05$). Conversely, in the left cingulate region larger ventricular volume was associated with decreased CT ($p < 0.05$). Additionally, larger ventricular volume was associated with reduced CSA in several regions, particularly in the left parietal, left frontal, left temporal, right parietal, right frontal, right temporal, and right occipital cortices (all $p < 0.05$). While in the left cingulate region larger ventricular volume was associated with increased CSA ($p < 0.05$). No significant associations were observed between ventricular volume and CV.

Discussion

In children with syndromic craniosynostosis, increased ventricular volume was associated with increased CT and reduced CSA across several cortical regions. Previous research shows that increased CT might be caused by an overestimation of CT by Infant FreeSurfer. Whether the association between ventricular enlargement and reduced CSA is causal or driven by other underlying factors, such as genetics, should be further researched. Additionally, further research is needed to determine whether these cortical changes underlie the increased risk of cognitive impairment observed in this population.

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Introduction of Digital-Assisted Multidisciplinary Treatment in the Functional and Morphological Reconstruction of Naso-Orbital-Ethmoid Fractures

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Xiaofeng Xu


Shilei Zhang

Abstract

This study summarizes the process of digital-assisted multidisciplinary treatment (MDT) of naso-orbital-ethmoid (NOE) fractures and evaluates the treatment outcomes. From October 2018 to December 2020, 39 patients with NOE fractures were treated in our department, 21 of whom were diagnosed and treated by a multidisciplinary team. After preoperative multidisciplinary discussions and personalized virtual surgical planning, they received MDT with the assistance of a surgical navigation system. The other 18 patients received traditional single-disciplinary treatment, that is, no preoperative multidisciplinary discussions. Oral and maxil-lofacial surgeons performed surgical design and digitally-assisted surgery alone. After the operation, treatment outcomes were evaluated in terms of aesthetic appearance and function. The duration of preoperative preparation and postoperative aesthetic outcomes were not significantly different in patients who received single-disciplinary treatment and MDT ($P > 0.05$). However, postoperative functional outcomes were significantly better in patients who received MDT ($P < 0.05$). Furthermore, no significant complications were found. Digital-assisted MDT has a high application value in repair and appearance reconstruction, especially restoring functionality after NOE fracture; thus, it should be promoted in clinical practice.

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Clinical Efficacy of 3D-Printed Osteotomy Guides in Anterior Maxillary Distraction Osteogenesis for Cleft Lip and Palate-Associated Hypoplasia

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Teng Wan



Xudong Wang

Abstract

Objective:
To evaluate the therapeutic outcomes of anterior maxillary distraction osteogenesis (AMDO) in correcting sagittal maxillary hypoplasia secondary to cleft lip and palate (CLP) and to assess the accuracy of 3D-printed tooth-borne surgical guides for osteotomy.

Methods:
Twelve CLP patients undergoing AMDO were included. Virtual surgical planning was performed on 3D-reconstructed maxillary models, and customized 3D-printed guides were fabricated. Lateral cephalometric analyses were conducted preoperatively (T0), post-consolidation (T1), and six months post-consolidation (T2). Postoperative CT data were superimposed on preoperative models to quantify osteotomy accuracy using root-mean-square deviation (RMSD).

Results:
All procedures were completed without major complications. Significant improvements were observed in SNA (T0: 82.1°±3.5° vs. T1: 85.7°±2.8°, $p<0.01$) and overjet (T0: -3.2±1.8 mm vs. T1: 2.1±1.5 mm, $p<0.001$), which remained stable at T2. ANB, facial convexity, and palatal length showed nonsignificant changes. SNB remained stable throughout follow-up. The osteotomy guide demonstrated high precision, with sagittal linear RMSD of 0.90 mm and angular deviation of 5.07°.

Conclusion:
AMDO effectively addresses sagittal maxillary hypoplasia in CLP patients. The integration of 3D-printed surgical guides enhances procedural accuracy, simplifies surgical execution, and reduces complication risks, offering a reliable solution for complex craniofacial reconstruction

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Harmonizing Craniosynostosis Care: European Guideline collaborative development within ERN CRANIO

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Lauren Clement



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Abstract

Background:
There is a growing need for harmonized, evidence-based care pathways for patients with rare and complex craniofacial conditions across Europe. For that reason, a European guideline for the treatment and management of craniosynostosis is being developed under the leadership of the European Reference Network for Craniofacial Anomalies (ERN CRANIO). Given the emergence of new evidence and evolving clinical insights, an update of existing recommendations is warranted. The revised guideline, expected by the end of 2025, aims to standardize clinical practice across member states and improve patient outcomes. It will be the basis of multiple care pathways and strengthen team coordination from diagnosis through follow-up. This poster outlines the collaborative, consensus-based methodology used to develop the guideline.
Methods:
The process followed the Dutch Medical Specialist Guidelines 2.0 and AGREE II framework. A multidisciplinary working group comprising of experts from ERN CRANIO full member centers conducted a bottleneck analysis to identify key topics for revision. A systematic literature review was conducted across Medline, Embase, Cochrane Libraries, with evidence appraised using GRADE and EBRO methods by independent reviewers. The working group and patient representatives were actively involved per structured feedback rounds and monthly focus groups. Clinical questions reflected scenarios faced by multidisciplinary teams. Draft recommendations underwent wide consultation among professional societies and patient organizations.
Results:
Of 2,513 articles on craniosynostosis published between 2018 and 2025, 416 were retained after screening. New evidence was discussed in consensus meetings with chapter thematic subgroups and informed the updated recommendations. The updates emphasize team-based care coordination and patient input shaped priorities related to continuity of care. The methodology enabled structured formulation of clinical questions, standardized evidence appraisal, and reaching consensus among European experts. The collaborative methodology supported development of multidisciplinary, evidence-based guidance tailored to the European healthcare context.
Conclusion:
This project demonstrates the feasibility and value of a structured, transparent, and inclusive approach to craniosynostosis guideline development within ERN CRANIO. It offers a replicable model for future international efforts in rare and complex conditions, emphasizing team coordination, supporting harmonized care, improved decision-making, and consistent standards across borders.

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Protocal of navigation-guided removal of foreign bodies in oral and craniomaxillofacial area

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Abstract

Introduction:
Many patients have foreign bodies in their wounds after oral and craniomaxillofacial trauma, and the complex anatomy makes their removal both difficult and risky. This paper aims to standardize the procedure of navigation-assisted removal of foreign bodies in oral and craniomaxillofacial areas.

Case description:
48 patients with foreign bodies in the oral and craniomaxillofacial area were included in this study. The protocol was as follows: Preoperatively, computed tomography (CT) scan was performed on all patients. Digital subtraction angiography (DSA) or computed tomography angiography (CTA) was necessary to be used if foreign bodies closed the important veins, while for non-metallic foreign bodies which were located within complex soft tissue structures, magnetic resonance imaging (MRI) was considered for further evaluation. Surgery was scheduled about 3 weeks after entry of the foreign body. Intraoperatively, minimally invasive incision and surgical exploration pathway were designed closest to the foreign body. The navigation system Accu-Navi A (UEG Co, Shanghai, China) was used for virtual surgical planning and intraoperative navigation. Postoperatively, foreign bodies in 48 cases were removed successfully in a minimally invasive manner without any complications, and follow-up at 3 to 6 months showed satisfaction for all patients.

Discussion:
This study summarizes the experience in the removal of oral and craniomaxillofacial foreign bodies. The scheduled surgery time should be set for at least three weeks post-injury, when the foreign body's position was considered to be stable. CT scans are routinely considered for evaluation, and DSA, CTA, or MRI can be used depending on the location and characteristics of the foreign body. Intraoperatively, surgeons should continuously check the procedures following the preplanned navigation approach to achieve a minimally invasive outcome. Postoperative imaging is required to confirm the complete removal of the foreign body and the surgical outcome.

Conclusion:
In this study, a detailed protocol for the navigation-guided removal of foreign bodies in the oral and craniomaxillofacial area was established. Surgical navigation technology is a reliable option for the removal of foreign bodies in oral and craniomaxillofacial area.

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New technique of precise repair and reconstruction of comminuted fracture of mandible

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shilei zhang

Abstract

Objective:
To explore the application value of reverse engineering personalized guide plate in the precise reconstruction of complex mandibular comminuted fractures, and try to compare its advantages and disadvantages with traditional repair methods in the process of mandibular defect repair.

Method:
From 2020 to 2023, our team used reverse engineering personalized guides to reconstruct and repair 11 patients with mandibular comminuted fractures of various causes, including 9 males and 2 females. On the three-dimensional printed mandibular models after reduction, pre-bent reconstruction titanium plates were placed. Three-dimensional images of the mandible, titanium plate, and titanium screws were reconstructed using CT scans. Surface-to-surface registration technology was employed to reconstruct the original mandibular bone surface, creating a guide plate with the spatial positions of the reconstructed titanium plate and screw holes. During surgery, the guide plate was used to reduce and determine the fixation position of the reconstructed titanium plate, achieving precise reconstruction of the mandibular comminuted fracture.

Results:
The surgical precision was higher than that of traditional repair methods, and the operation time was significantly shortened. Two patients had secondary debridement due to infection after surgery, while the rest of the patients recovered well. After 6-24 months follow-up, the occlusion relationship and facial shape were well restored, and the patients were highly satisfied.

conclusion:
The personalized guide plate made by reverse engineering technology can effectively assist the precise reconstruction of comminuted mandibular fracture, and has certain promotion value.

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Distraction Osteogenesis Combined with Orthodontic Treatment for Complex Dentofacial Deformities in Cleft Lip and Palate

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Yanfei Zhu



Min Zhu

Abstract

【Background】Patients with CLP typically exhibit severe skeletal maxillary hypoplasia, which presents unique therapeutic challenges. Unlike conventional craniofacial deformities, secondary dentofacial deformities in CLP patients require more complex multidisciplinary intervention. This case report presents a treatment approach combining external distraction osteogenesis with orthodontic therapy for addressing these challenging secondary deformities in CLP.

【Case Description】 A 16-year-old male patient with a history of surgically repaired right unilateral cleft lip and palate presented with a chief complaint of anterior crossbite. Clinical examination revealed postoperative cleft scar, skeletal maxillary deficiency, 6 mm anterior crossbite, and severe dental crowding. The treatment protocol involved anterior maxillary distraction osteogenesis (AMDO) using rigid external distraction to simultaneously correct skeletal deficiency and create space for dental alignment, followed by orthodontic treatment to establish functional occlusion. Post-treatment evaluation demonstrated significant improvement in facial profile, crossbite correction, and enhanced dentofacial harmony.

【Discussion】CLP patients present unique surgical challenges due to palatal scar tissue restriction, which limits maxillary advancement in conventional orthognathic surgery and increases risks of relapse and secondary velopharyngeal insufficiency. While distraction osteogenesis offers following advantages: (1) achieving predictable and stable maxillary advancement; (2) producing concomitant soft tissue expansion that maintains velopharyngeal function; and (3) generating additional arch length to resolve dental crowding without premolar extraction. This approach addresses skeletal, dentoalveolar, and soft tissue deficiencies in cleft-related dentofacial deformities.

【Conclusion】Distraction osteogenesis combined with orthodontic treatment represents an effective and stable therapeutic approach for managing secondary complex dentofacial deformities in CLP patients.

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Decorin attenuates hypertrophic scar fibrosis via TGFβ/Smad Signaling

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Jiangtao Cui



Xiaoyi Hu

Abstract

The management of hypertrophic scar (HS), characterized by excessive collagen production, involves various non-surgical and surgical interventions. Yet, the absence of a well-defined molecular mechanism governing hypertrophic scar has led to less-than-ideal results in clinical anti-fibrotic treatments. Therefore, our study focuses on investigating the role of decorin (DCN) and its regulatory role in the TGF-β/Smad signaling pathway in the development of hypertrophic scar. In our research, we observed a decrease in DCN expression within hypertrophic scar tissue and its derived cells (HSFc) compared to normal tissue. Then, the inhibitory function of DCN of collagen synthesis were confirmed in Fc and HSFc via detections of fibrosis markers such as COL-1 and COL-3 after overexpress and knockdown of DCN. Moreover, functional assessments revealed that DCN suppresses the proliferation, migration, and invasion of HSFc. We discovered that DCN significantly inhibits the TGF-β1/Smad3 pathway by suppressing TGF-β1 expression, as well as the formation and phosphorylation of Smad3. This finding suggests that DCN regulates the synthesis of collagen-based extracellular matrix and fibrosis through the TGF-β1/Smad3 pathway.

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Functional Outcomes Following Open vs. Closed Treatment of Intracapsular Condylar Head Fractures: A 10-Year Retrospective Cohort Study

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Monica Maria Illescas Ralda



Han-Tsung Liao

Abstract

Introduction: Treatment strategies for intracapsular condylar fractures (ICFs) remain a topic of debate, as high-quality evidence supporting a standardized, evidence-based approach is lacking, particularly in relation to long-term functional outcomes and complication rates. This study compares long-term functional outcomes of open reduction and internal fixation (ORIF) versus closed reduction (CR) in the management of unilateral and bilateral ICFs.

Methods: This 10-year retrospective cohort study included 62 patients with 93 ICFs treated at Chang Gung Memorial Hospital, Linkou Branch, between May 2007 and August 2017. All surgeries were performed by a single senior surgeon.

Patients with extracapsular fractures were excluded. Fractures were classified according to He's system, and outcomes were assessed based on maximal mouth opening (MMO) at 1, 3, 6, and 12 months postoperatively. Associated complications, including malocclusion, trismus, and temporomandibular joint (TMJ) pathology, were recorded. Univariate and multivariate logistic regression analyses were used to identify risk factors for trismus.

Results: Of the 93 ICFs, 50% were unilateral and 50% bilateral. He's classification revealed 48% type A, 14% type B, 5% type C, 22% type M, and 11% non-displaced fractures. MMO at 6 months was significantly greater in unilateral cases (37 mm) than bilateral (33 mm). ORIF resulted in significantly better MMO recovery at 3 months compared to CR. Logistic regression identified CR as an independent risk factor for trismus (univariate OR: 4.92, p = 0.01; multivariate OR: 4.76, p =0.027). Malocclusion occurred in 5 patients per group, and one patient in the CR group developed TMJ osteoarthritis. No facial nerve injury was observed in the ORIF group.

Conclusion: ORIF provided superior early functional recovery in ICFs compared to CR and is associated with a significantly lower risk of trismus. Bilateral fractures demonstrate reduced MMO recovery compared to unilateral fractures.

fractures to optimize long-term function and minimize complications.

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Differences in Psychosocial Outcomes Between Age and Gender in Pediatric Patients with Malocclusion

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Abstract

Introduction: Malocclusion, a condition where the upper and lower teeth are misaligned when the jaws close, is influenced by both genetics and environment. It can adversely affect mental health and life quality, especially in adolescents, females, and those with severe cases. It has been associated with higher rates of anxiety, depression, social withdrawal, bullying, and academic struggles. This research investigates how malocclusion impacts psychosocial factors—such as relationships, well-being, and mental health—across genders and different age groups.

Methods: This cross-sectional study included patients aged 5–21 with malocclusion, recruited from a craniofacial clinic, and a control group of children without craniofacial conditions. Participants were either undergoing or being evaluated for surgical treatment. Those with neurological or psychiatric disorders or who couldn't complete surveys were excluded. The PROMIS self-report tool was used to assess psychosocial outcomes, including emotional and social health factors. Patients self-reported their experiences using a Likert scale. Age groups were categorized as child, preteen, teen, and adult. Statistical analysis included Welch's t-test for gender comparisons and a 4-way ANOVA for age-based analysis.

Results: The study analyzed 286 patients with malocclusion, categorized into adults, teenagers, preteens, and children. Of these, 235 reported their sex at birth. Teenagers and adults showed the highest family relationship scores. Preteens had the highest anger scores, while children had the highest anxiety levels. Gender analysis revealed that females reported significantly higher levels of depression and psychological stress compared to males. However, no notable gender differences were found in scores related to family relationships, peer interactions, anger, or anxiety. These findings highlight age- and gender-specific psychosocial patterns among individuals with malocclusion.
Conclusion: Younger children with malocclusion experience higher levels of anxiety, while preteens exhibit increased anger, underscoring the need for targeted psychosocial support. In contrast, teenagers reported better outcomes in family relationships. These findings highlight the importance of age-specific approaches in addressing the psychosocial impact of malocclusion and improving patient care.

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A Comparison of Outcomes by Surgical Technique for Treatment of Lambdoid Craniosynostosis

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Abstract

Background:
Surgical correction of craniosynostosis of the lambdoid suture involves open cranial vault remodeling (CVR), endoscopic suturectomy with molding helmet therapy, and more recently, suturectomy with spring-assisted cranioplasty. Currently, there is a paucity of literature comparing these techniques. In this study, we present outcomes of patients with lambdoid craniosynostosis who underwent surgical intervention at a level one pediatric institution.

Methods:
Retrospective analysis of 26 patients surgically treated for lambdoid craniosynostosis from January 2011 to February 2025 was conducted. Patients with bilateral lambdoid craniosynostosis and those with ≥ 3 affected sutures were excluded.

Results:
Isolated lambdoid craniosynostosis (77%) was the most common presentation, and all patients were non-syndromic; 65% underwent CVR (N=17), 23% underwent suturectomy with helmet therapy (N=6), and 12% (N=3) underwent suturectomy with springs. For CVR, median operative time was 340 minutes, 29% experienced postoperative complications (e.g. postoperative anemia requiring transfusion, unintentional drain removal, respiratory distress, and right bundle branch block), and no patients required additional surgery; however, cosmetic results were suboptimal with only mild improvements in asymmetry. For suturectomy with helmet therapy, median operative time was 259 minutes, 67% experienced postoperative complications (e.g. postoperative anemia requiring transfusion, respiratory distress, coronal ridging secondary to helmet therapy, and cranial asymmetry requiring operative intervention), and 33% required secondary CVR due to refusion of sutures or residual head deformity. Suturectomy with springs had the lowest median operative time at 207 minutes, no patients experienced complications nor required unplanned surgery, and significant improvement in occipital flattening was seen.

Conclusion:
While CVR is the current standard of care for craniosynostosis, cosmetic results are modest at best. Suturectomy with helmet therapy holds less risk but postoperative improvement is limited and reoperation rates high. Suturectomy with springs shows promise with good cosmetic results and low risk of endoscopic surgery.

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A 5-Year-Plus Multidisciplinary Approach for a LEOPARD Syndrome Patient with Severe Dentofacial Deformity: Orthodontic-Orthognathic Treatment and Oral Health Management

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Xiaotao Xing



Xudong Wang

Abstract

Background：

LEOPARD syndrome, a rare disease caused by PTPN11 or RAF1 mutations, is characterized by lentigines, cardiac anomalies (e.g., hypertrophic cardiomyopathy). With fewer than 200 cases reported globally as of 2008 and an estimated incidence <1/100,000, the concurrent dentofacial deformities (e.g., maxillomandibular discrepancy) in LS remain poorly characterized. Therefore, a comprehensive treatment plan for dentofacial deformities and oral management is required for LEOPARD patients.

Object:

This study details the multidisciplinary management of a genetically confirmed LS patient with severe dentofacial deformity, aiming to establish evidence-based approaches for addressing dentofacial anomalies and associated oral complications in this population.

Case reports:

A 16-year-old male with genetically confirmed LS presented with severe dentofacial deformity, including maxillary hypoplasia, mandibular hyperplasia, and macroglossia. Multidisciplinary evaluation integrating systemic and maxillofacial assessments guided a staged treatment protocol: (1) macroglossia reduction; (2) pre-surgical orthodontics; (3) bimaxillary orthognathic surgery; and (4) postoperative refinement. At 5-year follow-up, stable skeletal-occlusal outcomes were achieved, with maintained tongue volume, harmonious facial profile, and functional occlusion. Concurrent management of supernumerary teeth, caries, and periodontal disease ensured sustained oral health.

Conclusion:

LS patients with dentofacial deformities demand precise diagnosis and integrated oral-maxillofacial rehabilitation. Despite the predominance of craniofacial skeletal anomalies (e.g., mandibular prognathism), dentofacial complications (e.g., malocclusion) exhibit lower reported incidence, likely due to underdiagnosis or phenotypic heterogeneity. Systematic dental evaluations within multidisciplinary frameworks are critical to enable early intervention and mitigate dentoalveolar morbidity.

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Le Fort III Distraction Osteogenesis: Two Decades in Review

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Fabio Mazzoleni


Giorgio Novelli


Maria Costanza Meazzini

Abstract

Introduction:

Craniofacial synostosis is characterized by marked midfacial retrusion and prominent exorbitism, traditionally managed with a Le Fort III osteotomy. Conventional surgical approaches, combining osteotomy, bone grafting, and rigid fixation, generally achieve moderate advancements, typically between 8 and 14omm. However, in cases requiring more extensive skeletal repositioning — advancements exceeding 15omm — distraction osteogenesis has become the preferred technique, offering superior mobilization of the midfacial complex. The objective of this study is to assess the long-term stability of midfacial advancements obtained through distraction osteogenesis in patients affected by craniofacial synostosis. Through the analysis of a substantial cohort with prolonged follow-up, we seek to deliver critical insights into the long-term stability of surgical outcomes, the growth dynamics, and the morphological evolution of the midface.

Materials and Methods:

A retrospective review was conducted on 86 patients who underwent Le Fort III osteotomy at a reference craniofacial center. Among them, 47 patients treated with distraction osteogenesis were included in the study cohort. Comprehensive cephalometric evaluations were performed preoperatively, immediately postoperatively, and at multiple follow-up intervals, with some cases exceeding ten years of observation. The degree of skeletal advancement and its maintenance over time were systematically analyzed. Additionally, high-resolution computed tomography (CT) imaging was utilized to assess bone healing quality and the ossification patterns at the osteotomy sites.

Results:

Postoperative outcomes demonstrated excellent skeletal stability, corroborated by CT evidence of robust and homogeneous ossification. In growing patients, however, longitudinal follow-up revealed minor resorptive changes localized to the zygomatic-temporal and subspinal regions, accompanied by a modest recurrence of exorbitism. These changes are attributed to the lack of sutural growth and remodeling, which limits postoperative orbital expansion and sagittal midfacial development.

Conclusions:

Le Fort III osteotomy combined with distraction osteogenesis consistently achieves stable and durable midfacial advancement. While the risk of class III relapse remains minimal, surgeons must anticipate physiological remodeling phenomena and consider strategic overcorrection to optimize long-term outcomes in growing patients.

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Nitrate promotes the survival of diabetic skin flaps by enhancing autophagy via the AMPK signaling pathway

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Mozi Li

Abstract

Random skin flap is commonly used for the repair of craniofacial defects. However, ischemic necrosis is frequently detected postoperatively, which severely affects patients' prognosis and quality of life, especially for those with diabetes.

Although nitrate has been found to protect against the development of ischemic diseases, its effects on ischemic injury in diabetic skin flaps remains to be thoroughly explored. This study investigated the effects of nitrate on the survival of diabetic skin flaps and the associated mechanisms. A dorsal skin flap model was established in high-fat diet and streptozotocin-induced diabetic rats to investigate the protective effects of nitrate on ischemic injury in vivo. Additionally, human umbilical vein endothelial cells (HUVECs) were cultured under high-glucose and palmitate conditions to assess the regulatory role of nitrate on endothelial function in vitro. To further explore the underlying mechanism, pharmacological inhibition models were applied using Compound C (an AMPK inhibitor) and 3-Methyladenine (3-MA, an autophagy inhibitor) to validate the involvement of the AMPK-autophagy signaling pathway in nitrate-mediated protection. The results showed that nitrate increased blood perfusion in diabetic skin flaps and decreased the area of ischemic necrosis. It also promoted angiogenesis, reduced apoptosis and oxidative stress, while upregulating autophagy levels in the ischemic regions. These protective effects were reversed by 3-MA, indicating that autophagy mediated the protective effects of nitrate on diabetic flaps. RNA-seq analysis revealed that nitrate activated the AMPK signaling pathway in diabetic skin flaps. Inhibition of the AMPK phosphorylation by Compound C reduced autophagy levels and reversed the protective effects. In conclusion, this study demonstrates that nitrate can promote the survival of diabetic skin flaps by improving angiogenesis, inhibiting apoptosis, and reducing oxidative stress. These beneficial effects are mediated by the enhancement of autophagy via the AMPK signaling pathway.

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Rib Autograft vs. Porous Polyethylene Implant Outcomes in Microtia Reconstruction: A Meta-Analysis and Systematic Review

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Sofia Finestone


Liara S. Ortiz-Ocasio


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Abstract

Background: Auricular reconstruction for microtia typically involves autologous rib cartilage graft (ARCG) or porous polyethylene (PPE) implants. While ARCG is considered the gold standard, PPE has shown success with reduced donor site morbidity. This meta-analysis compares outcomes between ARCG and PPE implants.
Methods: A systematic search of literature published from 2000 to 2023 identified 3,463 studies. Cohorts and large case series comparing ARCG to PPE were included, while systematic reviews, case reports, and studies on only one technique were excluded. Data on infection and necrosis rates, graft loss, framework exposure, number of redo procedures, aesthetic outcomes, and patient satisfaction were extracted. Meta-analysis was performed to calculate pooled effect size difference in microtia reconstruction outcome rates using a random-effects model.
Results: Eleven studies met inclusion criteria, accounting for 3,816 patients. Follow-up ranged from 30 days to 11 years for ARCG and 30 days to 6 years for PPE. Meta-analysis revealed a higher pooled infection rate difference for PPE of 3.18% (95% CI: -2.00, 8.36%; 8 studies, 647/2254 PPE/ARCG patients). PPE also had a higher pooled redo operation rate difference of 4.88% compared to ARCG (95% CI: -3.45, 13.20%; 5 studies, 226/640 PPE/ARCG patients). Framework exposure rate difference was 6.97% higher in PPE (95% CI: 0.07, 13.86%; 8 studies, 690/1767 PPE/ARCG patients).
Moderate to significant between studies heterogeneity was found (I^2 = 39 - 68%). Most studies identified no significant difference in aesthetic outcomes, though one study reported better ear definition, shape, and size with PPE, and greater color match with ARCG. Two studies analyzed satisfaction and concluded contradictory results. A 300-patient cohort showed significantly higher patient satisfaction at 1-year follow-up with ARCG (95.3%) compared to PPE (82.7%). In contrast, a smaller study reported 47.1% of ARCG patients as satisfied compared to 90.0% of PPE patients. No significant differences in quality of life were observed.
Conclusion:
Meta-analysis results suggest that PPE implants may be associated with higher rates of infection, framework exposure, and redo procedures compared to ARCG. However, poor study quality and result heterogeneity demonstrate the need for additional research comparing these techniques.

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Evolution of Craniofacial Symmetry after Fronto-Orbital Advancement with Rigid Fixation in Unilateral Coronal Synostosis: A Retrospective Cohort Analysis

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Fabio Mazzoleni



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Abstract

Introduction:

Unilateral coronal synostosis (UCS) affects approximately 1 in 10,000 births and accounts for 15–20% of single-suture craniosynostosis cases. It may occur in isolation or as part of Muenke syndrome, often leading to asymmetry of the fronto-orbital region, nasal deviation, zygomatic dystopia, and facial twisting. Although controversy persists regarding associated functional deficits, including neurocognitive development, vision, and head posture, studies suggest a low incidence of intracranial hypertension and minimal neurodevelopmental impact. Facial asymmetry, however, significantly affects psychosocial well-being. Surgical correction aims to restore fronto-orbital morphology and promote symmetrical facial growth. Fronto-orbital remodeling with overcorrection and rigid fixation remains essential to prevent phenotype recurrence. Various techniques have evolved, yet long-term outcomes continue to emphasize the need for precise and individualized surgical planning.

Materials and Methods:

A retrospective analysis was conducted on 54 patients with hemicoronal synostosis who underwent standardized cranioplasty with rigid fixation. Preoperative, immediate postoperative, and annual follow-up photographs were obtained, maintaining consistent head positioning and projection. A photogrammetric analysis was performed to quantify cranial contour changes: the anterior hemispheres of the skull were traced, divided into two equal parts, and their areas compared. Angular measurements were calculated based on the intersection between the interpupillary line and a vertical glabellar reference line. The mean photographic follow-up was 6.8 years, with a range from 1 to 14 years.

Results:

The mean advancement achieved on the affected side measured 18 mm, with a range of 16 to 23 mm. Preoperatively, the cranial area on the involved hemisphere demonstrated an average increase of 14.6% ± 2.4%. Photogrammetric angular assessments corroborated the successful restoration of frontal vault symmetry and consistently documented a progressive improvement in facial symmetry throughout the follow-up period.

Conclusions:

Fronto-orbital advancement with rigid fixation provided stable correction of anterior plagiocephaly, supporting harmonious and symmetrical facial growth in the long term. Photogrammetric analysis proved to be a reliable tool for quantitatively validating surgical outcomes and monitoring progressive facial remodeling.

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Intracranial Hypertension and Effect of Surgery on Cerebral Blood Flow in Syndromic Craniosynostosis: an Arterial Spin Labeling Study

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Abstract

Background: Children with syndromic craniosynostosis (sCS) are at risk of developing intracranial hypertension (ICH). ICH has the potential to impede cerebral blood flow (CBF) due to the generation of compartmental pressure. This study investigates the impact of ICH on CBF in sCS patients and assess changes in CBF subsequent to craniofacial vault expansion procedures using arterial spin labeling (ASL) MRI.

Method: Patients with syndromic craniosynostosis (Apert, Crouzon-Pfeiffer, Muenke, Saethre-Chotzen, and ERF syndromes) who underwent arterial spin labeling (ASL) MRI were included. ICH status was assessed within ±3 months of MRI. Risk factors for ICH, including papilledema, obstructive sleep apnea, occipitofrontal circumference curve deflection and lateral ventricle volume were extracted from medical records and imaging. CBF was quantified using an in-house Hammers atlas-based segmentation pipeline. Longitudinal pre- to post-operative CBF changes were evaluated in patients with available scans.

Results: Analysis of 213 scans from 148 sCS patients (78 males, 70 females; mean age 6y 4mo, range 4mo-21y) revealed no significant CBF difference between those with and without signs of ICH (92.7±32.4 vs 76.5±27.4 mL/100g/min, p=0.15). A mild inverse relationship between lateral ventricle volume and CBF was observed, suggesting ventriculomegaly may relate to lower perfusion (β=−0.08 mL/100g/min per mL ventricle volume, p=0.08). Longitudinal analysis revealed that age difference between scans was the only significant predictor of postoperative CBFchanges (β=−11.37 mL/100g/min per year, p<0.05), with older children showing reduced perfusion gains. No significant effects of sex, syndrome or surgical approach were observed.

Conclusions: No significant ICH-CBF associations were found, however ventriculomegaly trends and age-dependent perfusion declines highlight multifactorial hemodynamic regulation in sCS. Our findings indicate that surgery may support CBF normalization, but variability in follow-up timing limits interpretation.

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Ten Steps to Enhance Aesthetic and Reconstructive Outcomes in Unilateral Cleft Lip Repair with the Millard Technique

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Abstract

Introduction:

The Millard technique is widely used for repairing unilateral cleft lips. However, standardized application may lead to suboptimal results in some cases. This study proposes modifications to the traditional Millard technique improving aesthetic and functional outcomes based on clinical experience and patient satisfaction.

Aims:

To evaluate the effectiveness of modifications to the Millard technique and analyze patient&ndashreported outcomes on aesthetics, symmetry, and satisfaction after surgery In the School of Plastic Surgery, General Hospital Dr. Manuel Gea González

Methods:

A retrospective review was conducted, including patients who underwent unilateral cleft lip repair using a modified Millard technique by the principal author. Modifications included elongation of the C flap, circular configuration of the A flap, nasal dissection with transfictal sutures, multi&ndashlayered orbicularis muscle release, closure of the nasal floor in two layers, and the use of botulinum toxin and infraorbital nerve block pre and/or postoperatively. Patient satisfaction was assessed through a structured survey evaluating nasal appearance, lip symmetry, scar aesthetics, facial appearance, pain perception, and overall satisfaction.

Results:

Out of 317 patients, 91.6% had unilateral cleft lips, and 87% underwent surgery between 3 to 12 months of age. Postoperative satisfaction was high, with 82.1% reporting being very satisfied with facial aesthetics, 75.8% with lip symmetry, and 71.6% with scar appearance. Pain levels were moderate, with 18% reporting a score of 5 on a 10&ndashpoint scale. Overall, 94.4% of patients reported improved self&ndashesteem after surgery, and 78% were very satisfied with their ability to eat comfortably, while 40.4% reported being very satisfied with their speech.

Conclusions:

The proposed modifications to the Millard technique improve postoperative outcomes by enhancing symmetry, reducing scar visibility, and improving patient satisfaction. These findings suggest that tailored adjustments in cleft lip repair can achieve superior long-term results.

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RHINOPLASTY AND SEPTAL PERFORATION REPAIR FOR SADDLE NOSE DEFORMITY IN A PATIENT WITH PROPYLTHIOURACIL-INDUCED VASCULITIS AND GRAVES' DISEASE

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Inggrid Asali



Alki Andana

Abstract

Introduction:

The combined approach of rhinoplasty and septal perforation repair is a complex and technically demanding surgical procedure, with only a limited number of studies documenting its outcomes. This study aims to evaluate the long-term surgical results of rhinoplasty with concurrent septal perforation repair in rare PTU Induced Vasculitis case.

Case Presentation:

We present the case of a 25-year-old woman with septal perforation and positive anti-neutrophil cytoplasmic antibody (ANCA). She had been diagnosed with Graves' disease and had been on propylthiouracil (PTU) treatment for 12 months. A biopsy of the nasal septum showed an infiltration of inflammatory cells, with no signs of malignancy or granulomatous changes. Considering the use of PTU, the severity of the nasal lesion, and the positive ANCA results, the patient was diagnosed with drug-induced ANCA-associated vasculitis (AAV) and was subsequently treated with prednisolone and methotrexate after discontinuing PTU. While PTU is recognized as a trigger for drug-induced AAV, the occurrence of nasal septal perforation as a manifestation of this condition is rarely reported. We Performed a combined open rhinoplasty approach and septal perforation repair to correct the saddle nose deformity. 3 months post-operative results showed aesthetically acceptable nasal contour and Improved airway function. Our results show that septal perforation repair could be safely combined with rhinoplasty at the same time and that some of the cartilage technique manoeuvres used could even facilitate the process of septal perforation repair.

Conclusion

Rhinoplasty and septal perforation repair each come with their own technical challenges, but an experienced surgeon can perform both procedures simultaneously while maintaining successful aesthetic and functional outcomes

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Clinical features of Van der Woude Syndrome in three-generation Indonesian family

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Shania Priza Adelia



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Abstract

INTRODUCTION & OBJECTIVES:
Van der Woude syndrome (VWS) is the most common clefting syndrome, characterized by lower lip pits and cleft lip/palate. This syndrome occurs in roughly 1% to 3% of patients with lip and palatal clefts. It exhibits autosomal dominant inheritance with variable expressivity and has approximately 90% penetrance. This autosomal dominant syndrome is caused by a defect in *IRF6* on chromosome 1. Clinical presentations characterized by two labial pits or elevations in the lower lip considered pathognomonic to the syndrome. Pits are usually bilateral and symmetrically placed, although an asymmetrical pit or single central pit may occur. Roughly 33% of patients with van der Woude syndrome have pits without clefting, 33% have pits with cleft lip and palate, and 33% have lip pits with isolated cleft palate or submucous cleft palate. This article describes the variability of clinical appearance of VWS in three-generation of Indonesian family.

METHODS :
Case reports of Van der Woude Syndrome in Indonesian family affecting three-generation. Some clinical features, and treatments were reported.

RESULTS :
Five members of the a family affected VWS with different clinical appearance. The first generation was female (F1) with bilateral cleft lip and palate with bilateral lip pits. The second generation affected all her 2 children female (F2) and male (M2) with manifestation both had bilateral cleft lip and palate and bilateral pits. The third generation affected in 2 girls, one (F3.2) with unilateral cleft lip and palate with bilateral lower pits, she is the daughter of M2. The other girl (F3.1) is daughter of F2 with manifestation only lower pits without CLP. All members underwent cleft repair procedures and pits excision, except F3.1.

CONCLUSIONS:
VWS affects all offspring with different clinical manifestations in this family. This is consistent with an autosomal dominant gene with strong penetrance. Genetic counseling in Van der Woude syndrome affected families is important, because a high percentage of descendants can have some kind of clefting.

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Enhancing Global Surgical Capacity Through Simulation-Based Training: Insights from the First South African Comprehensive Cleft Care Workshop

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Abstract

Introduction:

Cleft lip and palate (CLP) are among the most common congenital anomalies globally, often requiring specialized multidisciplinary care. In resource-limited settings, barriers such as limited surgical training, inadequate infrastructure, and workforce shortages hinder timely cleft care delivery. The Comprehensive Cleft Care Workshop (CCCW), established in 2018, offers a replicable, evidence-based global health education model. In October 2024, the first South African CCCW was held in Capetown with a focus on addressing cleft care challenges across the African continent.The two-day event featured expert-led lectures, live surgical demonstration, and two hands-on surgical simulation workshops: Unilateral complete cleft lip repair and buccal flap techniques for cleft palate closure.

Methods:

Participants completed pre- and post-simulation surveys capturing demographics, prior cleft and simulation experience, and procedural confidence. Satisfaction with the educational experience was assessed using a modified version of the validated Student Evaluation of Educational Quality (SEEQ) survey. Procedural confidence was measured using a modified validated tool graded on a 5-point Likert scale. Descriptive statistics and analysis were generated for all collected data.

Results:

Forty participants completed all surveys. The majority were plastic surgeons (60%), followed by oral and maxillofacial surgeons (22.5%), general surgeons (12.5%), and nurses (5%). Participants averaged 6.0 years in practice, with representation from nine countries, primarily South Africa (n=20). Most had prior cleft care experience (87.5%), but only 32.5% had prior simulation exposure. Participant satisfaction was consistently high. Attendees rated the sessions as intellectually stimulating (Score=4.22/5), valuable (4.40/5), and educationally impactful (4.30/5). Trainer performance received top marks for enthusiasm (4.58/5), clarity (4.20/5), and engagement (4.28/5). Participants strongly agreed that simulation training would improve their competence (4.10/5), performance (4.18/5), and patient outcomes (4.32/5). Procedural confidence increased significantly from a mean of 20.4 pre-simulation to 21.93 post-simulation (p-value =0.049). All (100%) would recommend simulation-based training and would attend similar future workshops. **Conclusion:**

Simulation-based cleft care workshops represent a reproducible and effective model for developing surgical capacity in underserved regions. These programs are well received by participants and offer unique training in cleft surgery. Continued collaboration among global cleft care leaders is essential to expand educational initiatives and reduce disparities.

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Increased Referral Volume to a Multidisciplinary Craniosynostosis Clinic Following a Coordinated Educational and Outreach Initiative for Referring Providers

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Abstract

Background:
Recent research into disparities in craniosynostosis care has revealed barriers to accessing high quality craniofacial care that impact outcomes. Many challenges exist in connecting patients with concerning head shape differences to craniofacial teams: most primary care providers (PCPs) have never had formal training in evaluating head shape differences and many have never seen a child with craniosynostosis. To improve access to our multidisciplinary craniosynostosis clinic, an outreach program was developed and implemented to educate community PCPs about craniosynostosis and provide information about our team.

Methods:
In coordination with our institution's provider relations team, a coordinated outreach effort to area PCPs was implemented over a 10-month period. A craniofacial surgeon provided training on the diagnosis and treatment of craniosynostosis as well as information on placing appropriate referrals, and an informational flyer about the multidisciplinary clinic was given to all providers. A retrospective analysis of patients evaluated at our multidisciplinary craniosynostosis clinic at a tertiary children's hospital was performed for the three calendar years before the outreach effort as well as the most recent 12 months.

Results:
Outreach efforts consisted of one recorded educational lecture for a large tertiary healthcare system, five in-person Grand Rounds lectures at community hospitals, six introductory meetings at department meetings, and strategic visits to primary care practices. In the three years preceding the outreach efforts, an average of 75 new patients per year were seen in consultation in the multidisciplinary craniosynostosis clinic with 21.9% of referrals being diagnosed with craniosynostosis. In the most recent 12 months following completion of the outreach efforts, 123 new patients were seen in the clinic with a diagnosis rate of 21.1%. This represents a 65% increase in referral volume without an increase in non-craniosynostosis referrals to the dedicated craniosynostosis clinic resulting from our outreach efforts.

Conclusions:
Many PCPs struggle with identifying children with craniosynostosis and making efficient referrals to dedicated craniofacial surgery teams. With targeted outreach efforts by established craniofacial teams, access to high quality craniofacial care can be enhanced by improving awareness of craniofacial teams, increasing diagnostic confidence, and facilitating communication between referral providers and surgeons.

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Sand Dollar and Staves Technique for Treatment of Unilateral Lambdoid Craniosynostosis: A Comparative Pilot Study

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Abstract
Introduction: Unilateral lambdoid craniosynostosis (ULS) is a rare craniosynostosis variant characterized by premature fusion of one lambdoid suture. Switch cranioplasty (SC) is the standard surgical approach for ULS treatment, though postoperative outcomes are frequently suboptimal. The Sand-Dollar and Staves technique (SDS) is a novel method utilizing virtual surgical planning to correct parietal bossing after suturectomy. This pilot study compares operative metrics and aesthetic outcomes between SC and SDS.
Methods: A retrospective chart review identified ULS patients treated with SC and SDS. Variables included patient age at surgery, follow-up duration, operative time, estimated blood loss, complications, and length of stay. Pre- and postoperative photographs were evaluated by two panels, one consisting of craniofacial surgeons and the other consisting of nonclinical medical staff, to grade aesthetic outcomes.
Results: Eighteen patients underwent surgical correction of ULS (5 with SC, 13 with SDS) with a median age of 11 months at surgery. Comparing SC and SDS, no differences were observed in median operative time (188 vs. 208 minutes, p=0.99), estimated blood loss (170 mL vs. 103 mL, p=0.34), or postoperative length of stay (4 vs. 3 days, p=0.99). No complications were observed.
Seventeen patients (4 SC, 13 SDS) had postoperative images, and 15 (3 SC, 12 SDS) had both pre- and postoperative images. Following surgery, 50% and 56% of responses rated head shape as slightly abnormal for SDS and SC, respectively. Very abnormal head shapes were reported in 6% of SC and 5% of SDS cases. Comparing pre- and postoperative images, 22% of SDS and 8% of SC responses indicated significant cranial morphology improvement; and nonclinical personnel reported no significant improvement in morphology after SC.
Conclusion: SDS is a safe and feasible technique for surgical management of ULS. While neither approach demonstrated a significant effect on facial scoliosis, the results suggest that both SC and SDS may yield improved outcomes with procedural refinement. The lack of perceived head shape improvement with SC among nonclinical evaluators highlights the potential value of the SDS technique as an alternative approach. Larger studies with expanded sample sizes and reviewer panels are needed for validation.

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Condylar Hyperplasia : A Rare Case Report and Literature Review

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Abstract

INTRODUCTIONS AND OBJECTIVES:
Condylar hyperplasia (CH) is an uncommon pathological condition characterized by excessive growth of the mandibular condyle. It was first documented by Adams in 1836. Typically presenting unilaterally, CH is most commonly associated with progressive facial asymmetry. Additional clinical features frequently include occlusal discrepancies, deviation of the chin, and discomfort in the temporomandibular joint (TMJ). The condition is generally considered self-limiting, with onset often occurring during puberty and gradual progression over time; in some cases, it may not be diagnosed until the patient reaches 25 to 30 years of age.
RESULTS:
We report two cases of unilateral condylar hyperplasia in 24- and 25 year old male and female in our hospital. Two patient presented with a complaint of rightward deviation of the lower jaw that has been progressively worsening over the past 10 years. The condition is accompanied by a clicking sensation and audible sounds during mouth opening. The patient reported a history of trauma 10 years ago, in which they fell while playing on a swing and struck their chin against a pile of roof tiles. Following the incident, the patient experienced swelling and pain localized to the left side of the mandible. The first patient treated conservative only with orthodontist, and the second patient treated with surgery.
DISCUSSION:
The diagnosis of Condylar hyperplasia is essentially clinical; there are supporting studies that determine the activity and morphology of the condyle affected. Without a doubt, computerized tomography (CT) has contributed to establishing the pathology and condylar morphology but the nuclear medicine studies have helped in determining the active growth of the condyle.
CONCLUSIONS:
In our case the probable cause was trauma during childhood. CT and SPECT have contributed largely in determining the time of surgery. Surgical correction with proper planning and timing of treatment yields good functional and aesthetic outcome.

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Outcomes in Endoscopic Strip Craniectomy Before Three Months of Age for Nonsyndromic Craniosynostosis

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Abstract

Introduction

The recommended timing for endoscopic-strip craniectomy (ESC) for non-syndromic craniosynostosis is 3–6 months; however, the optimal timing to improve perioperative morbidity, craniometrics, and longitudinal neurologic outcomes remains unknown.

Methods

A retrospective review identified non-syndromic craniosynostosis patients treated with ESC and helmeting at Stanford (2014–2021), stratified by surgery age <3 or >3 months. Demographic, perioperative, craniometric, and longitudinal outcome measures were collected. Craniometrics were extrapolated from Digital Surface Imaging® at the time of helmeting, with specific attention to cephalic index (CI), medial-lateral (ML) growth, and cranial vault symmetry.

Results

Fifty-nine patients were identified, divided into surgery <3 months (n=35) and >3 months (n=24). There were no significant differences between the groups in perioperative variables, including estimated blood loss (EBL), intraoperative and postoperative transfusion requirements, or tranexamic acid (TXA) usage. The <3-month group had significantly reduced operative times (108 vs 128 minutes; p=0.044), and a strong correlation was observed between younger surgical age and shorter operative time across the cohort (R=0.49; p<0.001). Mean follow-up was 5.2 years post-operatively. The <3-month cohort exhibited lower rates of future anisometropia (0% vs 16.7%; p=0.023); after adjusting for influential variables, anisometropia was strongly associated with older age at surgery (OR > 100; p<0.001), metopic suture involvement (OR 12.0; p=0.035), and male sex (OR 1.45; p=0.033). Developmental, motor, and speech delays were less frequent in the <3- month cohort, though not statistically significant. Helmet scans revealed greater cranial reshaping in the <3-month group, including significant cephalic index changes (0.77 to 0.80; p=0.017) and greater medial-lateral (ML) growth (18.6 vs 13.1 mm, p=0.009), particularly in sagittal synostoses. These changes occurred more rapidly per month in <3-month patients, including faster rates of ML growth (1.9 vs 1.4 mm/month;

p=0.01) and CI improvement (0.002 vs -0.001 mm/month; p=0.037), again reflected in sagittal patients.

Conclusion

ESC before three months of age is safe and associated with shorter operative times, improved cranial reshaping, and a lower risk of anisometropia. Earlier intervention may enhance both short-term cranial metrics and long-term functional outcomes in non-syndromic craniosynostosis patients.

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Patient Satisfaction Following Secondary Rhinoplasty Using Teostrut and Diced Costal Cartilage in Cleft Lip and Palate: A Serial Case Report

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Kristaninta Bangun



Rininta Cristabella

Abstract

Background

Secondary cleft rhinoplasty poses significant reconstructive challenges due to complex nasal deformities and high patient expectations. Achieving both aesthetic and functional improvements is essential in this population.

Objective

To assess patient satisfaction following secondary rhinoplasty using a combination of Teostrut (columellar strut graft) and diced costal cartilage in patients with cleft lip and palate (CLP).

Methods

A cross-sectional survey was conducted among 31 CLP patients who underwent secondary rhinoplasty at a the Cleft and Craniofacial Center, Ciptomangunkusumo Hospital, Faculty of Medicine, Universitas Indonesia . Fifteen of thirty-one eligible patients have completed the survey, yielding a response rate of 48%. We use the Byrne Questionnaire to evaluate satisfaction across aesthetic and functional domains. The questionnaire included both subjective impressions and quantitative scoring (scale: 0–10). Median and interquartile ranges (IQR) were calculated for satisfaction scores.

Results

The nasal ala was the most common preoperative concern (50%), followed by the columella (28.6%). 93,3% expressed overall satisfaction with the surgical outcomes. Postoperatively, 40% reported the greatest improvement in the nasal ala, and 33.3% in the columella. Most patients preferred the frontal view post-surgery (46.7%), while 26.7% favored both front and side views. More than half (53.3%) were willing to undergo the procedure again. Quantitatively, the median satisfaction score for nasal improvement was 8.0 (IQR: 1.5), and for scar appearance was 8.0 (IQR: 2.0). No major complications or dorsal warping were observed. All respondents reported improvement in nasal breathing.

Conclusion

Secondary rhinoplasty using Teostrut and diced costal cartilage is associated with high patient satisfaction and functional improvement. It offers a reliable reconstructive option for achieving aesthetic and respiratory goals in CLP patients.

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Demographic and Clinical Variables Remain Poor Predictors of the Need for Postoperative Transfusion among Patients Undergoing Surgical Repair of Nonsyndromic Craniosynostosis

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Abstract

Introduction

Craniofacial reconstruction for nonsyndromic craniosynostosis is often performed before one year of age, a period in which patients are particularly vulnerable to complications from substantial blood loss. This study therefore sought to identify variables that might be associated with need for postoperative transfusion for risk stratification.

Methods

Nonsyndromic craniosynostosis patients with >24 months of follow-up who underwent surgical repair from January 2006 to December 2021 at a stand-alone children's hospital were retrospectively reviewed. All known or suspected syndromic patients were excluded. Patients were stratified by record of postoperative packed red blood cell (pRBC) transfusion or lack thereof. All statistical analyses were performed in SPSS.

Results

163 patients met criteria for inclusion (67% male, 67% self-identified White). Of these, 54% had sagittal, 15% coronal, 18% metopic, 6% lambdoid, and 7% multi-suture craniosynostosis. The average age of initial surgery was 9.5 ± 12 months. 36% underwent endoscopic strip craniectomy and 64% open remodeling. 39 patients (24%) received a postoperative transfusion (median volume 100 [68.8-135.5] mL). Open rather than endoscopic surgery (OR 3.76, $p < 0.001$), receiving an intraoperative transfusion (OR 5.75, $p < 0.001$), and receiving intraoperative tranexamic acid (TXA) (OR 2.49, $p = 0.009$) significantly increased the odds of postoperative transfusion. Conversely, sagittal synostosis compared to other types significantly decreased the odds (OR 0.37, $p = 0.011$). Only the trend for surgery type persisted when controlled for relevant covariates. Patients who received a transfusion were also younger at surgery (4.63 vs. 6.62 months, $p = 0.026$) and had shorter operative times (138 vs. 188 minutes, $p = 0.003$), on average. Notably, reported estimated blood loss (EBL) was not significantly associated with need for postoperative transfusion. Controlling for all demographic variables, the only significant variable in the best-fitting model (unadjusted R2 0.477) of postoperative transfusion volume per kilogram was the postoperative hemoglobin value ($\beta = 0.223$, $p = 0.039$).

Conclusions

Open surgery, younger age, and lower weight were associated with need for post-operative transfusion, corroborating previous findings. Among patients who received a postoperative transfusion, postoperative hemoglobin was significantly positively associated with postoperative transfusion volume per kilogram, suggesting a tendency towards overly aggressive postoperative transfusion.