Surgical Treatment of Posttraumatic Laterognathia: A Case Report and a Literature Review, Focused on the Effects of a Condylar Fracture on the Face

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Craniomaxillofac Trauma Reconstruction 2018;11:211–218.

Abstract

Keywords

- facial asymmetry
- laterognathia
- orthognathic surgery
- condylar fracture

Facial asymmetry, following early childhood condylar trauma, is a common complaint among patients who seek surgical treatment. G.D.M., a 27-year-old male patient, sought professional help to correct his cosmetic flaw, caused by a condylar fracture when he was 8-years-old. After the proper orthodontic treatment, he underwent a double jaw orthognathic surgery and, 9 months later, a second one to correct the remaining asymmetry. Two years after this second procedure, the patient is still under surveillance and has no complaints.

Bailey et al¹ reported that as many as 35% of patients who sought orthognathic evaluation exhibited asymmetry of the lower third of the face.^{1,2} Severe facial asymmetry can be caused by several factors, including genetic imperfections and environmental influences.^{3,4} Among the latter, the mandibular condyle is one of the most common sites of injury of the facial skeleton, but it is also the most overlooked and least diagnosed trauma site in the head and neck region.^{5,6} The proposed reason for the development of asymmetries is an interference with growth, resulting either from injury to the condylar cartilage or from altered function.⁷ Destruction of the condyle in adults is said to result in more subtle asymmetries, as growth has ceased and the mandible has reached its normal size and form.⁷ Confronted

with this type of malocclusion, the treatment options have been functional therapy, occlusal equilibration, extraction of interfering teeth, prosthodontics, orthodontics, orthognathic surgery, or a combination of these.^{8,9} Normally, the great majority of condylar process fractures are treated with closed reduction.¹⁰ Facial asymmetry due to jaw growth disturbances almost always requires corrective orthognathic surgery.^{10–15}

The purpose of this article is to report an uncommon two-phase surgical treatment of a 27-year-old patient with laterognathia who had a noticeable facial deformity caused by a condylar fracture in his early childhood, which led to a condylar neoformation. When researching the risk of undetected early-age condylar fractures, the PubMed database was used.

received

September 26, 2015

accepted after revision

January 15, 2017

published online

May 18, 2017

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Tel: +1(212) 584-4662.

DOI <https://doi.org/10.1055/s-0037-1601861>
ISSN 1943-3875.

Fig. 1 Preoperative frontal view.

Case Report

G.D.M., a 27-year-old male patient who had a misdiagnosed condylar fracture at the age of 8 years, sought professional help complaining about his visible facial asymmetry (►Figs. 1 and 2). Clinical examination revealed a limitation of mouth opening (around 28 mm), occlusal plane rotation, and a Class I occlusion on both sides, associated with laterognathia (►Figs. 3–5). The patient reported no complaints concerning his mouth opening ability, although he had some difficulty lateralizing the mandible toward the right (where the condyle was normal). Laterality to the left side was preserved. Cone beam computed tomographic (CBCT) scans demonstrated facial asymmetry (►Fig. 6), a deformed left temporomandibular joint (TMJ; ►Fig. 7), hyperplasia of the left coronoid process, and a shortening of the left mandibular ramus (►Fig. 8). The preoperative test results were within the normal limits and the patient was classified as ASA I (American Society of Anesthesiologists). As mouth opening and laterality were preserved, the deformed TMJ could not be labeled as a pseudoarthrosis.

After a proper 2-year orthodontic treatment, surgical planning was made using the CBCT scans uploaded into the Dolphin 3D software (Dolphin Imaging and Management

Fig. 2 Preoperative facial profile view.

Fig. 3 Preoperative intraoral right view.

Fig. 4 Preoperative intraoral frontal view.

Fig. 5 Preoperative intraoral left view.

Fig. 6 Preoperative 3D reconstruction cone beam computed tomographic scan, frontal view.

Fig. 7 Preoperative coronal cone beam computed tomographic scan showing the left deformed condyle.

Systems, Chatsworth, CA), with the aid of the Arnett facial analysis.¹⁶ Regarding surgical planning, the patient did not accept the option of being submitted to a bone distraction, and was informed of the possibility of having more than one orthognathic procedure done. As the condyles were functioning well (except for the lateral shift to the shortened side) and the patient was symptom free, no TMJ prostheses were recommended.

Initially, a surgical advancement of the maxilla, mandible, and symphysis along with maxillary rotation and impaction (to correct the midline of the laterally deviated lower third) were planned. However, due to the large discrepancy in the mandibular angle, it was observed that a total correction would not be possible, as it would lead to the formation of a wide gap, which could cause a pseudoarthrosis in the sagittal split osteotomy (SSO). Thus, the priority was to correct the maxillomandibular deviation, the anteroposterior and vertical discrepancies, while the corrections of the ramus and the

mandibular angle were left for a later surgical intervention, after the proper bone healing at the primary osteotomies.

The first surgery started with the osteotomy of the maxilla, performing the downfracture and compensating the cant deviation, impacting and leveling it with the facial midline as much as possible. Then, a bilateral SSO was made and the mandible advanced as far as possible, to maintain bone contact on the left side, achieving initial asymmetry correction. Additionally, a genioplasty was done, advancing the chin according to the facial planning. The procedure changed the occlusal plane by approximately 12 mm superiorly on the right side (►Figs. 9–12).

Nine months later, a second procedure started with the osteotomies of the mandible, compensating the cant, the yaw, and the facial midline. Furthermore, a minor correction was done in the maxilla to achieve a final Class I occlusion. Another genioplasty was necessary, in a segmented way, to correct the residual transversal discrepancy of the

Fig. 8 Preoperative panoramic X-ray.

Fig. 9 Postoperative 3D cone beam computed tomographic scan, after the first procedure.

Fig. 10 Intermediary intraoral right view.

Fig. 11 Intermediary intraoral frontal view.

Fig. 12 Intermediary intraoral left view.

Fig. 13 Postoperative frontal view after 2 years.

symphysis. A Medpor (Porex Surgical, Inc., College Park, GA) polymer prosthesis was placed on the right zygomatic bone, where the soft tissue was discrepant.

Owing to the telescopic effect and its resultant stability following maxillary repositioning, no plate or positional screws were placed in the left zygomatic buttress, in any of the two procedures. Only intermediary splints were used in both surgeries.

The patient recovered well in both postoperative periods, and his orthodontic finalization took 1 more year. His last follow-up visit was 2 years after the second surgery (►Figs. 13 and 14). The postoperative CT scan performed 2 years later (►Fig. 15) and panoramic X-ray (►Fig. 16) confirmed an adequate segment consolidation and alignment. The patient has no functional or aesthetic complaints, although his mouth opening is still limited (around 31 mm; ►Figs. 17–19). The neurosensory deficit of the inferior alveolar nerves declined over time, but there is still some numbness.

Fig. 14 Postoperative facial profile view after 2 years.

Fig. 15 Postoperative 3D cone beam computed tomographic scan, frontal view after 2 years.

Fig. 16 Postoperative panoramic X-ray after 2 years.

Discussion

A laterally deviated mandible is a condition with many possible causes. In some cases, the cause is very clear, for example, an overt trauma or the existence of other pathognomonic features in a syndrome. Often, however, a simple explanation for such asymmetry is not found and its cause needs to be sought among various conditions, such as those

Fig. 18 Final intraoral frontal view.

described in ▶Table 1. If the mandibular ramus is short and the condyle is distorted, but the ears and adjacent soft tissues are normal, it is probable that the asymmetry is due to early childhood fractures left untreated, causing condylar malformation, even if the previous diagnosis of these fractures or the specific trauma episodes were not reported.¹⁷ This is what probably happened in this case.

Usually, the protected environment that surrounds infants and preschool children partly accounts for their relative immunity to injuries. Falls^{2,15} and vehicular accidents² are a commonplace. Since it is more difficult to clinically examine a toddler, a radiological study is harder to perform in an uncooperative child and the examiner may be distracted from a condylar fracture by more life-threatening head and neck injuries that commonly accompany mandibular trauma in children.^{15,18,19} Often, parents do not consult a physician for what appears to be a laceration or small amount of soft-tissue swelling.^{2,5} The young child does not have the verbal ability to complain of mandibular pain; instead, the child may have nonspecific irritability and anorexia, which are attributed to some other cause.^{15,18,19} Therefore, in cases involving blunt trauma to the chin or mandible, it is important to suspect a possible injury to the condyle since the result of a missed fracture may be serious.^{15,18,19}

Fig. 17 Final intraoral right view.

Fig. 19 Final intraoral left view.

Table 1 Possible causes of laterognathism

	Categories	
	Glenoid fossa malposition due to modification in the cranial base	Condylar abnormalities
Muscular torticollis (especially in the mild form) ²	X	
Previous subcondylar or condylar fractures ^{2,14,17}		X
Delayed fracture treatment or unfavorable outcome from surgery ⁸		X
Forceps birth trauma ³⁰		X
Condylar hyperplasia ²		X
Condylar hypoplasia ²		X
Juvenile condylar arthritis ²		X
Hemifacial microsomia ^{2,17}		X
Deformational posterior plagiocephaly ²	X	
Unilateral coronal craniosynostosis ²	X	

Condylar and subcondylar fractures (excluding the nasal bone) are the most common facial fractures in the pediatric population.^{2,14} The occurrence of posttraumatic malocclusion is reported to range from 1.4% to 13%.^{8,10,11,20,21}

Conservative nonsurgical treatments of condylar fractures in children consist of any or a combination of the following: dietary restriction, maxillomandibular fixation (MMF), guiding elastics, removable functional orthopedic appliance, and acrylic resin split.^{2,5,22} The splint is an acrylic orthopedic functional device worn full time, and which covers the occlusal surfaces of the teeth in the mandible. Its posterior height is gradually increased in the arthritic side on a weekly basis.^{23,24} According to Stoustrup et al,²³ this distraction splint has become a vital orthopedic modality in the treatment of patients with juvenile idiopathic arthritis in one or both TMJ. In a conservative treatment, the functional rehabilitation relies on the remodeling capacity of the joint.

Table 2 Problems related to laterally deviated mandibles

Cosmetic appearance from obvious facial asymmetry ^{2,5}
Anterior open bite ¹²
Distinct difference between centric occlusion and centric relation ¹²
Dorsal dislocation of the mandible ¹²
Shortening of the posterior and lengthening of the anterior facial height ^{11,12}
Altered occlusion ^{2,5,11}
Alterations in the jaw range of motion ^{2,5}
Masticatory muscles hypertonia ¹¹
Inability to generate sufficient bite force ¹¹
Constellation of TMJ disorder symptoms (such as pain and clicking) ^{2,5,11}

Laterally deviated mandibles can pose problems to patients, such as those mentioned in ► **Table 2**.

The correct diagnosis helps decide if orthognathic correction is needed, including timing, technique, and detailed preparation and planning. In addition, it may prevent or minimize lateral mandibular relapse after surgical correction.² For example, if there is no occlusal cant and the mandibular movement to be corrected is 2 mm or less, this asymmetry is considered too small to be concerned about. However, surgeons typically want to correct the bimaxillary central incisor midline, as this is often critiqued postoperatively.^{2,25}

Controversy exists regarding when unilateral or bilateral SSO should be performed. Thus, in cases with asymmetric posttraumatic malocclusion caused by a condylar process fracture, the only surgical option is an osteotomy of the affected side of the mandible.^{8,11,12,26} Other authors postulated that this should be made on both sides.^{8,12,27} We believe that a sole unilateral SSO should only be executed in short-term sequelae (few months), while an older deformity should be treated with bimaxillary surgery.

Regarding the maxillary correction, an open bite can be considered for either an entirely posttraumatic situation or an acquired dentofacial deformity.^{8,10} The first case calls for restoration of ramus height; the latter advocates closure of the anterior open bite with (bi)maxillary surgery.^{8,10}

Besides condylar malformation, patients can present with different TMJ problems such as pain, limited and asymmetric mandibular movement, and noises in the TMJ after conservative treatment of condylar fractures.¹² In a nonfractured TMJ, pain may possibly arise from functional overload (“condylar postfracture syndrome”).¹² Nevertheless, our patient reported no TMJ dysfunction on either side.

Treatment success, however, depends on the severity of the damaged tissue. If condylar translation is restricted, surgical release of the ankylosis or the scar is necessary prior to the orthopedic treatment; otherwise the condyle will not respond

to it.^{3,28} In this case, the slightly limited mouth opening did not compromise the surgical planning nor did it justify another invasive treatment, especially in the TMJ region. If the facial asymmetry develops progressively during orthopedic treatment, surgical reconstruction of the TMJ with a costochondral graft or the remaining ramus tissue might be considered.^{3,29} If the patient has completed growing, skeletal deformities are corrected with a combined surgical–orthodontic treatment or a camouflage orthodontic treatment.^{3,29}

In agreement with Choi et al⁵ and Motta et al,³⁰ the CT scan was paramount for the patient's surgical planning, as it showed the exact anteroposterior and lateromedial dimensions of the deformed TMJ, which were not evident in the panoramic X-ray.

Choi et al⁵ and Hovinga et al²² concluded that the non-surgical treatment of dislocated condylar process fractures in children has satisfactory long-term outcome of jaw function, despite the high frequency of radiologically noted aberrations. Serious growth disturbances are rare, but cannot be predicted based on the type of fracture. Conservative treatment is not only more patient friendly but generally also gives very good results, no worse than that of open reduction.²² Similarly, Becking et al^{8,10} reported that the low prevalence of posttraumatic malocclusion and the good results of orthognathic surgery in correcting it, suggesting that prevention of malocclusion cannot be considered a strong argument for open reduction and fixation of condylar process fractures on a routine basis. Moreover, one might hypothesize that it is the ability of teeth to intrude that allows for the recovery of a good occlusal relationship after a fracture. Therefore, tooth intrusion and the resultant asymmetry should be regarded as a favorable biological adaptation.⁷ Finally, the number of patients requiring orthodontic intervention following mandibular fracture was similar in all four age groups of the study of Demianczuk et al,¹⁵ ranging from 28% to 35% (average: 30.25%). This is similar to the normal (nonfracture) frequency of orthodontic intervention in North America.^{15,31} Thus, fracture of the mandible in children does not lead to an increased incidence of orthodontic intervention.¹⁵

Conclusion

A proper clinical test following a trauma is paramount to avoid late mandibular asymmetry. When properly instituted, the usual nonsurgical treatment in children provides satisfactory results. Nevertheless, the incidence of posttraumatic malocclusion apparently does not increase the amount of orthodontic intervention. Once the laterognathia is installed and the patient is fully grown, proper orthodontic treatment followed by combined orthognathic surgery is the treatment of choice. In some cases, depending on the severity of the case, more than one surgical procedure may be necessary to correct the asymmetry.

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