

Chin Wing Osteotomy: An Alternative for Patients with Mandibular Deficiency

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Abstract

The goals of patients seeking orthodontic treatment today are not restricted to the positioning of teeth; they seek improvement of facial contours, passivity in sealing the lips, correction of excessive gingival display and changes in mandibular contours (angle, body and chin). However, orthodontic treatment alone may not be able to provide these major changes desired by the patient. So, even in patients in whom the occlusal relationship has been achieved with good stability with orthodontic treatment, additional intervention may be necessary. Complementation can be accomplished with facial harmonization and other resources. Orthognathic surgery can also be proposed in patients where the final occlusion was established with orthodontic treatment, by changing the occlusion plane and consequently improving aesthetics.

Keywords: Orthognathic Surgery; Occlusion Plane; Orthodontic Treatment

Introduction

For patients in whom the occlusion relationship could be well resolved with conventional orthodontic treatment, that is, the stable occlusal relationship goal was achieved, there is no need for orthognathic surgery. However, for patients who, after the completion of orthodontic treatment, complain of mandibular deficiency and also of eversion of the lower lip and narrowing of the mandibular body, in addition to the mandibular anteroposterior deficiency, we can recommend the chin wing osteotomy. This technique consists of an osteotomy extended to the basilar border of the mandible, below the alveolar nerve to the angle of the mandible. When the chin is advanced forward, this whole segment is advanced and consequently, the body of the mandible is enlarged, improving the mandibular contour.

What is considered attractive may not fall into the “norm” and can vary from culture to culture depending on the historical time and the standard cephalometric and anthropometric references may not be sufficient in these cases. Saponaro G., *et al.* [1] point out that there are some surgical techniques recommended for the lower third of the face in addition to conventional chin surgery, like the V-line or the chin wing osteotomy technique. However, there is no reference system at the moment to define the extent to which a modification of the lower third falls within what is considered beautiful, and everything is left to the patient’s will or the surgeon’s sensitivity. The authors evaluated the angle at the intersection between the two lines connecting the cutaneous gonial angle of each side of the face and the outermost part of the chin on the same side. The authors studied which anthropometric value is considered attractive by the most for what concerns the frontal shape of the lower third of the face. Two hundred two examiners were asked to see pictures of 24 female models and rate them as attractive or nonattractive. The results pointed to the median angle of 89° as the most attractive face. This is a parameter that can be used to guide us in planning the surgery.

According to Pouzoulet, *et al.* [2] the chin is an important element in facial harmony in the anteroposterior, vertical and transverse dimensions, mainly in the influence of the facial balance of the lips and nose. Chin surgery can be performed to correct these changes. However, according to the author, the conventional technique can cause several issues, such as irregularities of the mandibular basilar border, insufficiency of sagittal advancement of the chin and deficiency in the accommodation of soft tissues.

The chin wing technique was described by Triaca in 2010 [3]. It is a chin osteotomy extended to the mandibular angles, considering an osteotomy that involves the mandibular basilar border and deviation of the mental nerve, offering a better harmonic result in the aesthetic and functional aspects.

We observed that this surgical technique provides an advancement of the pogonion (chin) in addition to promoting an enlargement of the mandible body and modification of the position of the mandibular angles, and consequently of the mandibular contours. In the anterior region, it improves bone support for the orbicularis oris muscle of the lower lip, decreasing the eversion of the lip and softening the mentolabial sulcus.

The chin wing technique also improves respiratory function, as the muscles inserted on the mandibular basilar border are pulled anteriorly. It also offers better definition of the mandibular angle, allows correction of the mandibular basilar border in asymmetries, improves soft tissue support in the symphysis region, improves labial incompetence, and avoids the depression in the mandibular basilar border seen in the conventional technique.

In the evaluation of 10 patients with obstructive sleep apnea (OSA) who underwent chin wing osteotomy, Tabrizi, *et al.* [4] concluded that there was an improvement in the signs of OSA and the technique can be considered an option for patients who are not candidates for conventional maxillomandibular advancement.

The technique can be performed unilaterally for the correction of mandibular asymmetries, as Martin, *et al.* [5] demonstrated in 51 cases.

Cortese, *et al.* [6] demonstrated the application of the chin wing osteotomy for Goldenhar's syndrome, significantly improving the patient's aesthetic appearance, without the need for mandibular sagittal splint osteotomy.

As a disadvantage, we can mention the need for greater tissue detachment, requiring broader access to view the mandibular body and angle and greater care in deviating the mental nerve. It also increases the risk of damage to the alveolar nerve. To minimize these disadvantages, virtual planning with a surgical guide for osteotomies and the use of ultrasound (piezosurgery) to cause less trauma to the soft tissues and, eventually, to the lower alveolar nerve, are necessary. Eventually, there is a need for bone graft with rigid fixation in the spaces created in the mandibular body, in addition to rigid fixation (miniplates and/or screws) in the anterior region of the symphysis and on the sides, especially when using grafts, so that we have greater stability. This situation can occur when it is necessary to increase the height of the lower third of the face.

Troulis, *et al.* [7] described that chin wing osteotomy promotes sensory alteration as does the conventional osteotomy and all 15 patients evaluated had sensory return.

Clinical Cases and Discussion

Chin wing osteotomy was performed in 4 patients (2 females and 2 males) who had mandibular anteroposterior deficiency. In one patient, the technique was performed unilaterally, as she had an asymmetry. The technique was performed as described by Triaca [3]; the osteotomy of the mandibular basilar border extended to the mandibular angle. Osteotomies were performed with a piezo surgical blade,

being less traumatic to the soft tissues and the alveolar nerve. The greatest difficulty encountered was to get around the mental nerve and pass through the mandibular body to the angle, since it requires great care to avoid rupture of the nerve in the removal of soft tissues and unfavorable fractures in the posterior segments, since they are narrow (about 5 mm).

Case 1

The patient was a 20-year-old man with Nager syndrome and mandibular anteroposterior and vertical deficiency. He underwent orthognathic surgery (Le Fort I osteotomy for advancement, intraoral inverted 'L' osteotomy for advancement and chin wing osteotomy to increase the lower third of the face). Allogeneic graft (bone bank) was used to stabilize the mandibular segment, as shown in the photos below.



Figure 1: Initial frontal view and profile.

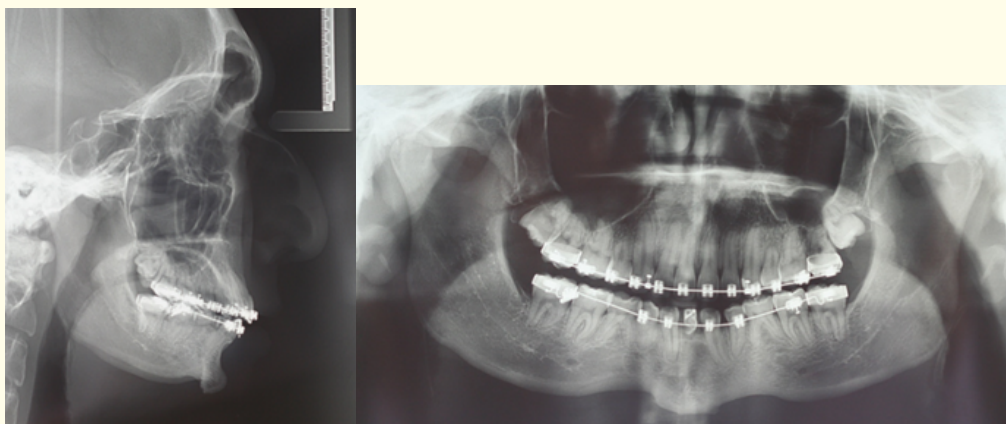


Figure 2: Preoperative profile teloradiography and panoramic radiograph.

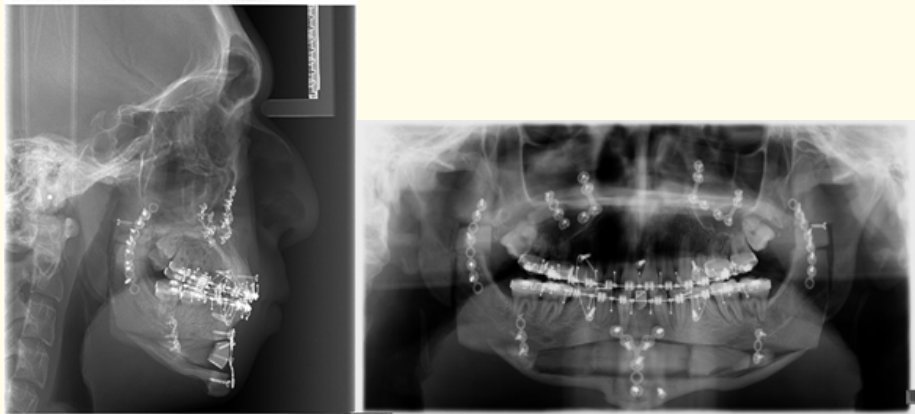


Figure 3: Immediate postoperative profile teleradiography and panoramic radiograph.



Figure 4: Frontal view and profile 5 years postoperatively.

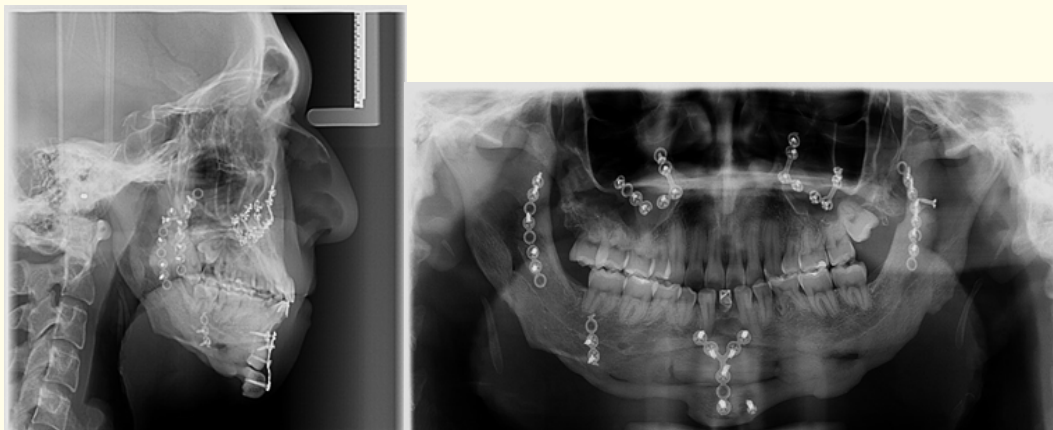


Figure 5: Profile teleradiography and panoramic radiograph 5 years postoperatively.

Case 2

The patient was an 18-year-old man with maxillary vertical excess, anteroposterior deficiency of the lower third of the face, eversion of the lower lip and difficulty in lip sealing. He had compensated occlusion in class I. Le fort I osteotomy was performed for upper replacement and maxillary advancement, and sagittal osteotomy of the mandibular ramus was performed for mandibular advancement. A chin wing osteotomy was performed for enlargement of the mandibular body and advancement of the pogonion, giving passivity to lip sealing.



Figure 6: Preoperative frontal view and profile.



Figure 7: Preoperative profile teleroadiography and panoramic radiograph.

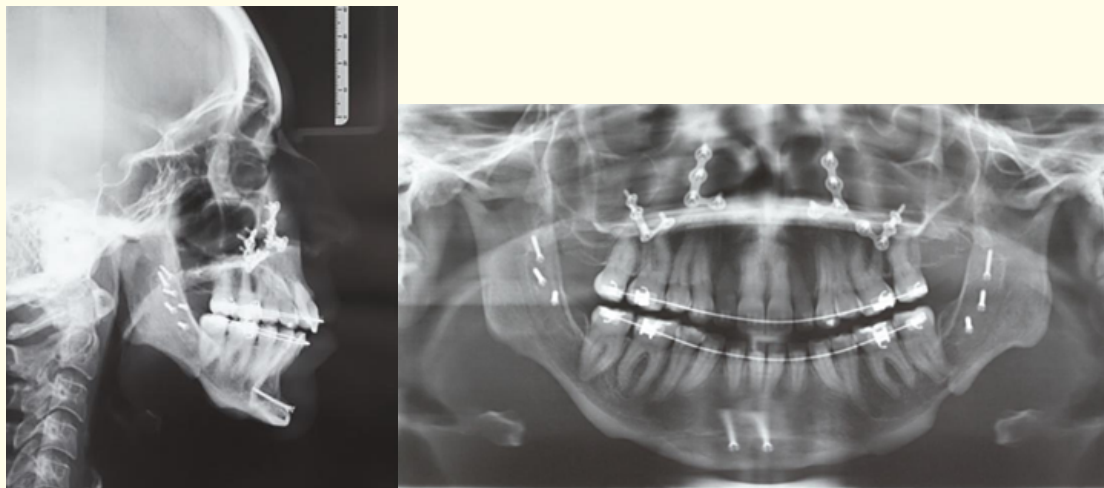


Figure 8: Postoperative profile teloradiography and panoramic radiograph (12 months).



Figure 9: Postoperative frontal view and profile (12 months).

Case 3

The patient was a 35-year-old woman with maxillary vertical excess, mandibular anteroposterior deficiency, eversion of the lower lip and difficulty in lip sealing, which was the patient’s biggest complaint. Chin wing osteotomy was performed for 8 mm advancement of the pogonion.



Figure 10: Preoperative frontal view and profile.



Figure 11: Preoperative profile teloradiography and panoramic radiograph and postoperative computerized tomography scan.



Figure 12: Postoperative frontal view and profile (10 months).

Case 4

The patient was a 28-year-old woman with mandibular anteroposterior deficiency, maxillary vertical excess, difficulty in lip sealing and mandibular and maxillary asymmetry. Le Fort I osteotomy was performed for maxillary impaction and asymmetric advancement. Sagittal osteotomy of the mandibular ramus was performed for advancement and unilateral chin wing osteotomy (right side) was performed to improve mandibular asymmetry.



Figure 13: Preoperative frontal view and profile.



Figure 14: Postoperative computerized tomography scan.



Figure 15: Postoperative frontal view and profile (18 months).

Chin wing osteotomy is a surgical resource that we can use in selected cases, when deficiency of the mandibular body in both the vertical and anteroposterior dimensions is diagnosed, even when the occlusion has been resolved with conventional orthodontic treatment. In addition, Triaca [8] reports the application of the technique also for class III patients. This resource can also assist in facial asymmetries to improve the affected mandibular angle, improving the soft tissue projection in the mandibular angle and body region. Another advantage observed in relation to conventional osteotomy is the absence of the step reported by some patients in the basilar region of the mandible, which in some cases requires filling.

As for the diagnosis for the indication of the chin wing technique, there are few studies on the indications and extensions of movements with precision. Knowledge is based on studies of conventional chin surgery. In Holdaway's postulate, the NB line is drawn; the measured distance from the NB line to the lower incisors should be equal to the distance from the NB line to the pogonion. Another measurement is line A-PO (pogonion): in the final predictive tracing, the buccal surface of the mandibular incisor must be approximately 2 mm anterior to this line. This measurement depends on an adequate inclination of the lower incisors. Another option is the subnasal vertical line: a line is drawn perpendicular to the Frankfurt plane and tangent to the subnasal point, with the distance from that line to the chin being approximately 3 mm, with the chin located posteriorly. Another assessment is the Burstone angle of facial convexity: the reference line is drawn tangent to the soft tissues from the glabella to the subnasal, and the other line is drawn from the subnasal to the soft pogonion. The angle formed should be approximately 11° , according to Pacheco., *et al* [9]. These would be the resources for conventional chin surgery that can guide us. For chin wing osteotomy, Saponaro G., *et al.* [1] suggest as a diagnostic aid the angle at the intersection between the two lines connecting the cutaneous gonial angle of each side of the face and the outermost part of the chin on the same side. The angle considered ideal was 89° . However, we believe that the individualized clinical evaluation of each case, the surgeon's experience and the patient's wishes can help in the decision of movements. For the application of the chin wing technique, we must take these considerations into account, since there are patients who want a narrower jawline and others who want a wider jawline, regardless of sex. Therefore, there is no fixed rule. In virtual planning, there is still a need to improve the visualization and fidelity of soft tissues when handling hard tissue; therefore, it is not a totally reliable form of assessment.

The technique requires wider access than that of traditional chin surgery, so a learning curve is necessary, especially to bypass the mental foramen and perform osteotomy in the mandibular basilar border. Careful assessment of the location of the alveolar nerve in relation to the mandibular basilar border using a tomographic examination is recommended. We can use virtual planning and surgical guides to facilitate the procedure and provide more safety in the chin wing osteotomy. Regarding the need for graft and fixation of the posterior segments of the mandible, it will depend on the type and extent of the movements practiced [10,11].

As for the neurosensory alteration, we did not observe an increase in paresthesia in the reported cases, corroborating the findings of Troulis, *et al* [7].

Final Considerations

The chin wing technique is a tool to assist in the surgical planning of patients who have mainly mandibular anteroposterior deficiency and wish to enlarge the mandibular body, even if the final dental occlusion has already been achieved with orthodontic treatment.

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