

# W-Shaped Osteotomy to Avoid Paranasal Deformity After Standard Le Fort I in Orthognathic Surgery

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## L'ostéotomie en W pour éviter une anomalie paranasale après une intervention de Le Fort I en chirurgie orthognathique

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### Abstract

When occlusal alterations are not accompanied by paranasal deficiencies, mobilization of the maxilla via Le Fort I osteotomy should be made with a different design. In this preliminary report, a W-shaped osteotomy that doesn't change the position of the maxillary bone surrounding the pyriform aperture was presented for the first time. Advantages and indications of this new procedure are discussed.

### Résumé

Lorsque les altérations occlusales ne sont pas accompagnées d'anomalies paranasales, la mobilisation du maxillaire par l'ostéotomie de LeFort I devrait être conçue différemment. Le présent rapport préliminaire décrit une ostéotomie en W qui ne modifie pas la position de l'os maxillaire entourant l'orifice piriforme. Les avantages et les indications de cette nouvelle intervention sont exposés.

### Keywords

osteotomy, Le Fort I, orthognathic surgery, W-shaped, UT angle

### Introduction

Orthognathic surgery is performed to correct dentoskeletal deformities and to provide functional enhancement in mastication, breathing, and speech. Furthermore, the patient's facial appearance and harmony can be improved significantly as a result of surgery. Several studies have described the optimal dentofacial profile and suitable methods for obtaining facial harmony by means of orthognathic surgery.<sup>1,2</sup>

In relation to Le Fort I osteotomy, a common movement is based on an anterior and inferior displacement of the anterior nasal spine of the maxillary bone. This condition determines soft tissue changes in the nasolabial region.<sup>3-5</sup> In particular, Le Fort I osteotomy with large maxillary advancement (more than 4-5 mm) may lead to an excessive advancement of the anterior nasal spine with a substantial increase in the nasolabial angle and a significant decrease in the UT angle (the angle between

the Frankfurt plane and the line that goes from the lateral chandon to the tip of the nose).<sup>6</sup> This change is indeed solely acceptable in case of little advancement of the maxilla and/or in case of the nasal tip drooping.

When Le Fort I osteotomy is performed, common soft tissue changes in the nasolabial region are nasal tip upturning, widening and flattening of the alar bases of the nose, and flattening

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and thinning of the upper lip.<sup>3-5</sup> In many cases, it is possible to counteract the widening and flattening of the alar base of the nose by cinch suture and the flattening and thinning of the upper lip by V-Y closure; these procedures are inadequate to prevent nasal tip upturning.

The purpose of this study was to present a modification of the conventional Le Fort I osteotomy by the introduction of a W-shaped osteotomy in which the anterior nasal spine is separated from the osteotomized alveolar process in order to prevent the above-mentioned alterations of the nasolabial region and to enhance the aesthetic result.

## Surgical Technique

Under general anaesthesia with nasal endotracheal intubation, the patient is draped with the infraorbital and malar areas left exposed. An intraoral maxillary vestibular incision is extended from the canine to the contralateral canine area. A full-thickness mucoperiosteal flap is elevated and extended posteriorly over the zygomatic process of the maxilla by tunnelization exposing the infraorbital nerve and the pterygomaxillary junction bilaterally; the pyriform rim, the floor of the nose, and the anterior nasal spine are then exposed. A long “toed-out” retractor is placed subperiosteally in the pterygomaxillary space. The maxilla is separated from the pterygoid process with an osteotome. The conventional osteotomy through the lateral sinus wall and the canine fossa is then performed by piezosurgery utilizing the MT1-10 tip. Furthermore, 4 oblique osteotomies are performed from the lateral side of the pyriform aperture to the contralateral side to design a W-shaped osteotomy approximately 10 mm above the bony nasal floor; the isolated bony segment includes the anterior nasal spine. The nasal septum is not detached from the anterior nasal spine, besides this downfracture is performed in the traditional way. The maxilla was freed and mobilized until passive anterior movement into the prefabricated interocclusal splint is accomplished. The anterior nasal spine and the osseous septum are not anteriorly displaced despite the 7 mm advancement of the maxilla. The maxillo-mandibular fixation is completed, and the maxilla is stabilized in the achieved position using bone plates in the infrazygomatic and canine region bilaterally. The subnasal W-shaped bony segment is also fixed in its original position by titanium plate and screws (Figure 1).

## Results

According to our experience, by using this technique, we have noticed a better aesthetic outcome in relation to the nasal tip position and nasolabial angle compared to results obtained in similar cases when the traditional Le Fort I osteotomy was performed (Figure 2).

The degree of tip rotation was objectively measured by UT angle before surgery and 3 weeks after surgery: no modification was registered, compared to our cases of traditional Le



**Figure 1.** W-shaped osteotomy.



**Figure 2.** Presurgical patient's lateral view: surgical maxillary advancement: 7 mm/postoperative patient's lateral view 3 weeks after surgery.

Fort I osteotomy in which about 7 mm of advancement corresponds to about 5° of UT angle decrease.

Preoperative and 3 weeks after surgery, the patient's frontal view objectively demonstrated that alar base widening is minimized (Figure 3).

No complications have been observed.

## Discussion

Mommaerts et al<sup>7</sup> presented a subspinal variation in the Le Fort I osteotomy in order to reduce the widening and flattening of the alar base of the nose as a consequence of such maxillary osteotomy.

In this study, the postoperative increase in the interalar rim width was analysed in 2 groups of patients: the control group consisted of 30 patients treated by conventional osteotomy, absorbable alar cinch suture, and V-Y closure, and the experimental one consisted of 16 patients treated by subspinal Le Fort I osteotomy without alar cinch suture or V-Y closure. The end follow-up time in the study was at 15 months postoperatively, and 31 patients returned for this late follow-up appointment (19 of the control group and 12 of the experimental one); the interalar rim width resulted to be smaller in the subspinal osteotomy group: at 6-month follow-up, the difference was 1.92 mm, and at 15-month follow-up, measurement slightly decreased at 1.31 mm. The authors observed that the flaring of the alar base did not depend on the skeletal movements but on the detachment of the nasolabial muscles. In their technique, the nasal spine was



**Figure 3.** Patient's frontal view before surgery/patient's frontal view 3 weeks after surgery.

separated from the maxilla by a 1-cm-wide osteotome and left free. Since the introduction of this subspinal osteotomy, 4 patients developed nasal septal deviation: in 3 cases, the deviation disappeared when edema resolved, after 1 to 2 months. In 1 patient, a submucosal septum resection was performed 3 weeks postoperatively.

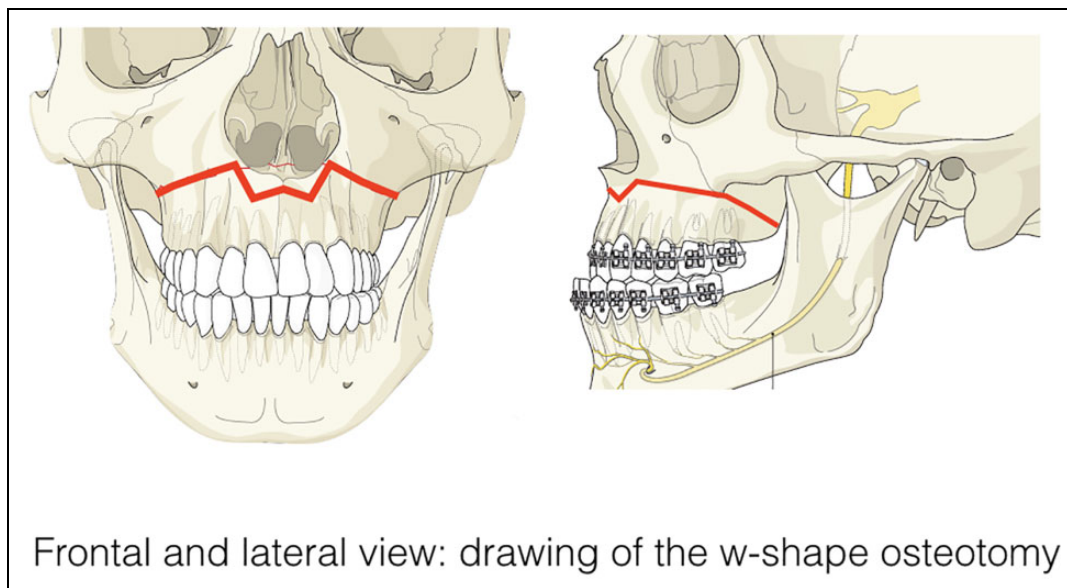
We wanted to use a similar modified Le Fort I osteotomy in order to contain the changes of the nasal tip<sup>5</sup> in case of great maxillary advancement especially when the patient shows a pleasant and harmonious paranasal region.

We believe that is mandatory to perform the synthesis of the subspinal segment by rigid fixation to avoid the post-operative complications of nasal septum deviation (Figure 4). We prefer to draw a W-shaped osteotomy in order to have a reference point in the correct 3-D reposition of the osteotomized segment. Due to the technique's intrinsic preservation of the septum, this technique cannot be used when a significant cranial impaction of the maxilla is needed (more than 2 mm of cranial impaction).

When planning orthognathic surgery, it is essential to contemplate the possible effects of the skeletal manipulation not only on the soft tissues that overlie maxilla and mandible but also on other structures that play a significant role in the overall aesthetic balance of the face, such as the nose.

In maxillary surgery, traditional Le Fort I osteotomy results in significant nasal and labial changes.<sup>8,9</sup> The aesthetic outcome of the nose after surgical treatment is for the patients equally important to the maxillomandibular improvements. This underlines the importance of correct planning of the maxillary advancement considering the UT of the future nasal tip.

Performing traditional Le Fort I osteotomy, the UT angle decreases by 0.6° to 0.8° each millimetre of maxillary advancement.<sup>6</sup> This might result in an unpleasant outcome in case of preoperative harmonious nasal tip. When performing the



**Figure 4.** Diagrammatic representation of the technique.



**Figure 5.** UT angle before surgery/UT angle 3 weeks after surgery.

W-shaped osteotomy, we could objectively show a preservation of the UT angle and consequently of the nasal tip rotation, which is extremely important when the preoperative nasal profile should be maintained (Figure 5).

Furthermore, the UT angle is essential for the evaluation of nasal tip rotation and projection in the surgical procedure that includes modification of mandible, as orthognathic surgery: In this case, it would be not possible to analyse landmark points of profile as nasofacial angle.

The W-shaped osteotomy is a safe surgical technique in Le Fort I-type osteotomy, very useful to avoid nasal tip deformity when large maxillary advancement is required and/or when the presurgical condition of the paranasal region and nasal tip is harmonious. Besides, by using this technique, it is possible to perform as large maxillary advancements as the conventional Le Fort I osteotomy allows as the maxillary ventral movement follows the lateral maxillary osteotomy lines just like in the traditional Le Fort I osteotomy.

#### Authors' Note

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional

and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.


#### Declaration of Conflicting Interests

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