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Case Report

Enhanced fixation techniques in orthognathic surgery for improved nasal aesthetics

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1. Introduction

Current concepts in modern orthognathic surgery prioritize not only the restoration of masticatory and respiratory functions for patients with dentofacial deformities but also the enhancement of facial aesthetics and harmony. Achieving these goals necessitates the careful prediction of soft tissue changes, which is essential for accurate diagnosis and surgical planning, particularly in the nasolabial region, a crucial area for facial aesthetics [1].

The minimally invasive surgical technique, as described by Hunter, is characterized as a discipline that encompasses surgical procedures executed "in a new way" to minimize the complications commonly associated with conventional surgical treatments, increasing surgical efficiency and decreasing surgical trauma. A key principle of this technique is the preservation of soft tissues through the use of smaller incisions and reduced mucoperiosteal detachment, which helps to decrease postoperative edema and mitigate aesthetic and functional deficits in muscle compared to traditional methods [2,3].

Changes in the nasolabial area that occur following Le Fort I osteotomy are believed to arise from multiple contributing factors. Notably, the detachment of muscles during the buccal incision and the management of the anterior nasal spine (ANS) significantly influence the alterations in nasolabial anatomy. The extent of subperiosteal dissection and flap elevation can also impact soft tissue modifications in this area, as well as the degree of bone movement, which may lead to interalar rim width (IRW) [1–3].

Traditional maxillary access typically results in the detachment of various muscle insertions surrounding the alar base. The literature suggests that the transection of the perioral and perinasal muscles without subsequent re-approximation is a leading cause of postoperative aesthetic changes in the nasolabial region, including widening of the alar wing and base, nasal tip bulging, and thinning of the upper lip [5]. To manage or mitigate these changes that can result in less favorable aesthetic outcomes, various surgical techniques have been proposed, including subspinous osteotomy, alar cinch, V-Y suturing, anterior nasal spine reduction, nasal floor

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reduction, caudal septum adjustment, and various nasal tip corrections [3,4].

To address the IRW following orthognathic surgery, a subspinal Le Fort 1-type osteotomy technique has been proposed. This technique expands upon the Le Fort I osteotomy to incorporate the anterior ANS while minimizing tissue detachment. The authors observed that, although the technique led to an improvement in postoperative IRW, nasal septal deviation was noted in four patients within the study group, potentially attributed to the absence of septal fixation [4].

While the maxillofacial region is a primary focus during the planning of an orthognathic surgery procedure, it is essential to recognize that the nose, malar-midface, and jawline also play significant roles in overall facial aesthetics. Achieving an aesthetically pleasing outcome necessitates a careful balance among these three key facial landmarks [5].

The goal of this study is to present an innovative approach for stabilizing the anterior nasal spine, aiming to enhance its support and, consequently, achieve improved aesthetic results in postoperative outcomes following orthognathic surgery.

2. Technical note

This case report has been prepared in accordance with ethical committee guidelines from Edmundo Vasconcelos Hospital (number: 82049424.5.0000.0090), and documented consent from the patient has been obtained.

Following the principle of minimally invasive technique for Le Fort 1 osteotomy [2], a slight curvilinear incision using monopolar electrosurgical unit was made from the right to the left lateral incisor to access the maxilla. Subsequently, a meticulous mucoperiosteal dissection was conducted through the nasolabial muscles and the periosteum until the bone using a #15 scalpel, at the level of the nasal base. A minimal subperiosteal degloving was performed along the outer part of the right lateral nasal wall, and a subperiosteal tunneling was created in order to expose each hemi-maxilla (Fig. 1).

A modified subspinal Le Fort 1 osteotomy was made using a Piezosurgery® (Mectron s.p.a – Carasco - Italy), ensuring a 5 mm bone perimeter from the piriform aperture to enhance the stabilization of fixation in this area (Fig. 2). The corticotomy was finalized in the posterior area with the aid of a micro saw (W&H Group - Bürmoos, Austria). Afterward, the traditional down fracture and pterygomaxillary disjunction were proceeded and all bone interferences that were deemed necessary.

The final splint was securely placed, followed by the maxillomandibular fixation in centric relation (ensuring condylar stability). The maxilla was repositioned in alignment with the three-dimensional virtual planning, moving 2 mm anteriorly, along with the anterior nasal spine. This approach ensured that the nasal base and projection were preserved, meeting the patient's aesthetic expectations.

The standard maxilla fixation was carried out with a 1.5 mm osteosynthesis system. A Lindorf shape plate (Traumec, Rio Claro, Brazil) was chosen for the paranasal bone area. The selected plate should be appropriately contoured on its lateral sections to accommodate the desired movement of the anterior nasal spine, and it should ultimately be secured with monocortical screws. In addition, two "L" shaped plates (Traumec, Rio Claro, Brazil) were positioned in the zygomatic buttress on both the left and right sides (Fig. 3).

Following the final repositioning and rigid fixation of the maxilla, extensive saline solution rinsing was conducted. A double-layer closure of the wound was then implemented, starting with paranasal cross-sutures to secure the nasolabial muscles in the deep layer, followed by continuous suturing to close the mucosal layer. A computed tomography scan was performed immediately after the surgery, and demonstrated very stable fixation and occlusion (Fig. 4).

Class III elastics were applied to the right side to align the dental midline and ensure proper dental contacts, thereby establishing an Angle Class I canine relationship.

The patient received thorough instructions on post-operative care, progressing without complications. A prescription for Amoxicillin 400 mg/5ml, to be administered at a dosage of 10 ml every 12 hours for 7 days, and Ketorolac 10 mg every 8 hours for 3 days was provided. Furthermore, the patient was advised to adhere to a soft diet for the next 15 days and to maintain strict oral hygiene.

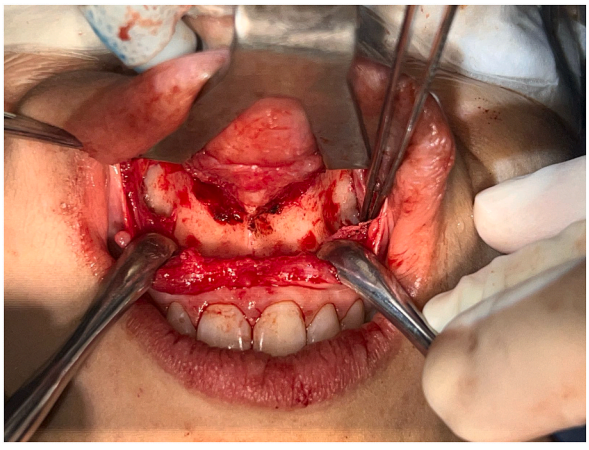

Fig. 1. Minimally invasive approach to the maxilla.

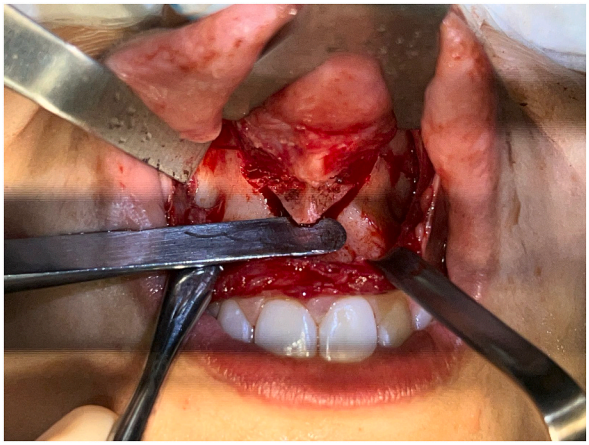

Fig. 2. Subspinal Le Fort 1 osteotomy.

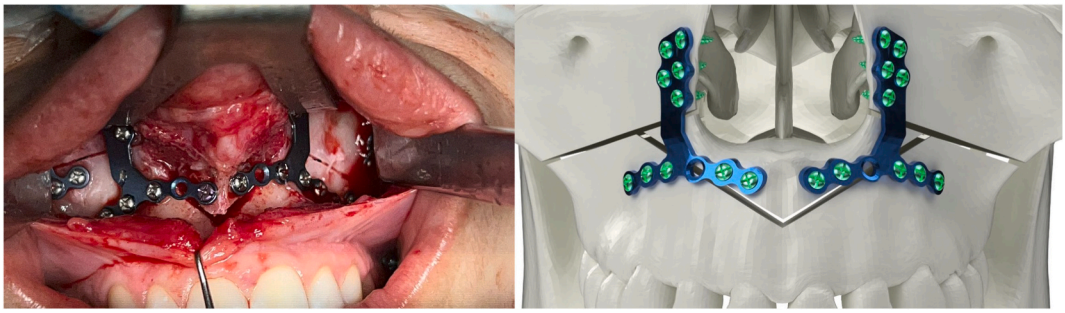

Fig. 3. Modified fixation of the maxilla utilizing Lindorf and L-shaped plates.

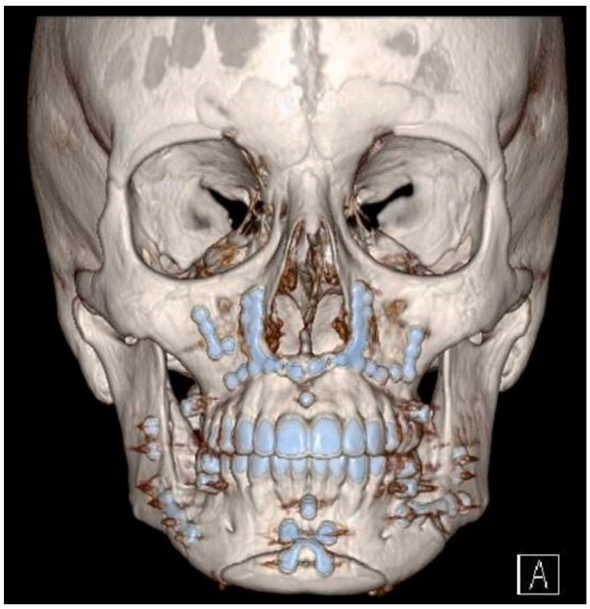

Fig. 4. Computed tomography indicates successful stabilization of the osteotomy and a stable occlusion.

The patient has progressed favorably and without complications up to the present date (one year follow-up). It is possible to observe aesthetic enhancements in the facial and nasal profile, as well as improved nasal airflow (Figs. 5 and 6).

3. Discussion

Le Fort 1 maxillary osteotomy is a recognized treatment modality to address severe anterior-posterior and transverse occlusal discrepancies. However, this technique can have a considerable aesthetic impact on nasolabial region [6–9]. Aesthetic impact may occur due to multiple factors, including elevation of the periosteum, muscles and ligaments that stabilize the alar region with the anterior surface of the maxilla and management of the anterior nasal spine, both of which contribute to the anatomical changes observed in this region. Even with accurate hard tissue surgical planning, predicting 3D nasolabial soft tissue changes can be difficult [10].

The traditional Le Fort I osteotomy, it is recommend to make an incision and perform dissection at the insertion points of several muscles, including the transverse part of the nasal muscle, the levator labii superioris, the levator labii superioris alaeque nasi, the zygomaticus muscles, the oblique fibers of the orbicularis oris, the myrtiform muscle, and the incisal muscle. In contrast, the surgical approach using modified subspinal Le Fort 1 osteotomy, looks impacts only the transverse part of the nasal and myrtiform muscles [5].

The maxillary movements have significant effects in the upper lip and nose regions. There seems to be a significant correlation between the degree of muscular involvement resulting from transection or detachment from its origin and the contours and dynamics of the facial structure. Additionally, the upper lip and subnasal projections significantly increase post-surgically (proportion hard/soft tissue 2:1 and 3.2:1, respectively) [10].

The anterior nasal spine plays a significant aesthetic role in supporting the columella and nasal tip, while maintaining the naso-labial angle. The relocation and stabilization of the anterior nasal spine during orthognathic surgery can pose challenges, as there is currently no established protocol for its fixation. While a single wire has been proposed for anchoring the anterior nasal spine along the midline [11], our technique prioritizes a more robust fixation approach utilizing plates and screws to enhance the stability of the anterior nasal spine, providing space for septal straightening and avoid septum deviation.

Mommaerts et al. [4] were the first to describe the subspinal Le Fort 1 osteotomy technique. The authors conducted a comparative analysis of the IRW in patients undergoing orthognathic surgery, (maxillary advancement and impaction movements) utilizing both conventional Le Fort 1 osteotomy and subspinal Le Fort 1-type osteotomy.

In that study, patients who underwent subspinal osteotomy did not receive V-Y sutures or alar cinch for muscle release. The results revealed a statistically significant difference between the two groups at the 6-month follow-up, with the conventional osteotomy group showing an IRW increase of 1.04 mm, while the subspinal osteotomy group exhibited an IRW decrease of 2.27 mm. Additionally, there was no significant difference noted between the impaction and advancement groups. It is important to mention that four patients experienced nasal septal deviation, as the septa were not stabilized during the surgical procedure [4].

In our case study, a the modified subspinal Le Fort 1 osteotomy was performed. The patient expressed a desire for increased projection of the nasal apex. Therefore, an overband was positioned on the plate to address this concern. To enhance stability in the lower portion of the anterior nasal spine during fixation, a Sverzut chisel was utilized to apply gentle superoanterior traction, aiming to achieve a modest advancement of the nasal spine. Therefore, we can decrease the probability of nasal septal deviation after the surgery.

The technique outlined in this discussion offers a viable alternative for cases lacking stabilization of the anterior nasal spine with the potential for unsatisfactory nasal aesthetic outcomes. It is anticipated that this fixation will provide enhanced support for the tissues and muscles within the nasolabial area.

4. Conclusion

The technique for stabilizing the anterior nasal spine does not present a high learning curve, nor does it generate additional costs or increased surgical time. The study highlights the necessity for more extensive and standardized research to validate these findings, while also emphasizing the significance of the ANS position in enhancing nasal aesthetics over the long term.

CRediT authorship contribution statement

Flávio Fidêncio de Lima: Writing – review & editing, Writing – original draft, Methodology, Data curation, Conceptualization. **Maria Carolina de Sousa Melo:** Investigation, Conceptualization. **Thamyryz Rafaela Almeida Simões:** Writing – review & editing. **David Fischer:** Writing – review & editing, Validation, Supervision. **Luiz Carlos Magno Filho:** Writing – review & editing, Validation, Supervision, Conceptualization.

Authorship

Flavio Fidêncio de Lima, Maria Carolina de Sousa Melo and Luiz Carlos Magno Filho: conception and design of the study and acquisition of data.

Luiz Carlos Magno Filho, Thamyryz Rafaela Almeida Simões and David Fischer: revising it critically for important intellectual content.

Flavio Fidêncio de Lima, Luiz Carlos Magno Filho and David Fischer: final approval of the version to be submitted.

Fig. 5. One year follow-up: front view, showing improvements in nasal aesthetics.

Fig. 6. One-year follow-up: lateral view demonstrating improvements in posterior-anterior nasal projection and soft tissue stability.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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