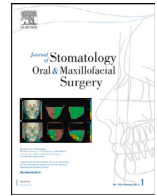




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## Case Report

# Transmucosal posterior segmentation in the context of minimally invasive Le Fort I osteotomy: Technical note

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## ABSTRACT

In patients in which posterior segmentation of the maxilla is planned in the context of a minimally invasive Le Fort I osteotomy, accessing the posterior segmentation may tear the soft tissues, causing the minimally invasive approach to become lost, and tissue vascularization may be jeopardized. A technical note is presented for maintaining the original incision length when posterior osteotomies are required in the context of a minimally invasive Le Fort I osteotomy.

Two vertical incisions are performed at the level of the premolars, a subperiosteal tunnel is made to access the bone with the piezoelectric device, and then an osteotome is used to complete the osteotomy.

It thus may be concluded that this simple and safe additional limited approach can be reproduced in all cases where reaching an anatomical structure in the posterior maxillary region is required in the context of a minimally invasive Le Fort I osteotomy. The described technique offers easy and direct access to the posterior region of the maxilla while maintaining the initial incision length and preserving vascularization through the buccal corridors.

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## 1. Introduction

Maxillary skeletal arch anomalies may require maxillary segmentation (MS) in the context of the management of dentofacial deformities based on orthognathic surgery [1]. Segmentation of the maxilla may be required for maxillary discrepancies in all planes: a) in the axial plane, MS is applied when the correction of transverse deficiencies of up to 6–7 mm is required; otherwise, surgically assisted rapid palatal expansion (SARPE) is performed previously; b) in the coronal plane, MS is advisable for correcting anterior open bite with a pronounced curve of Spee, in which orthodontic leveling might not be stable; and c) in the sagittal plane, MS may be needed to address severe proclined anterior teeth [2].

Although MS has been described as a safe procedure, complications related to segmentation of the maxilla are more likely than those related to a simple Le Fort I osteotomy - the most common problems being periodontal and palatal soft tissue damage and dental injuries [1,3]. Such complications can be minimized through proper root divergence at the segmentation site, well planned and precise osteotomies, gentle subperiosteal dissection, and the use of a piezoelectric saw device which reduces the risk of trauma to adjacent structures [4,5]. Moreover, a minimally invasive Le Fort I approach (from lateral incisor to lateral incisor), as described elsewhere [1],

allows the preservation of vestibular vascularization and ensures integrity of the nasal muscles, thus reducing morbidity [6].

However, when segmentation needs to be performed between canines and first premolars, this limited anterior approach might not be sufficient. The present technical note describes how soft tissue preservation can be achieved when a posterior MS is required in the context of a minimally invasive Le Fort I osteotomy.

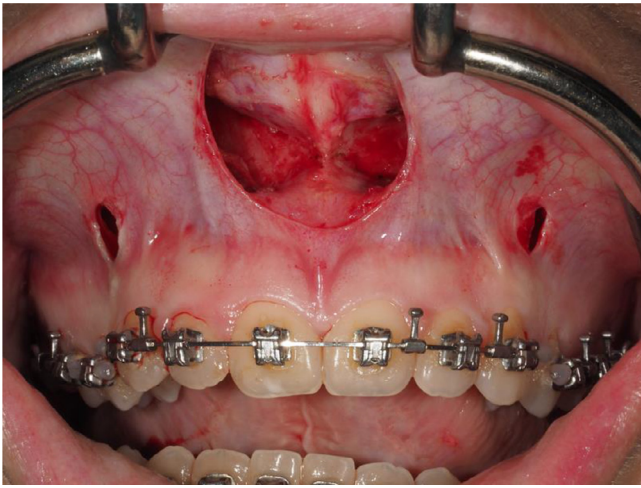
## 2. Technique

Presurgical 3D planning is performed with specific software (Dolphin® 3D Orthognathic Surgery Planning Software Version 11.8, Pentium 4 Processor 3.8 GHz, W/SP5 Windows © XP Professional, 120 GB memory, 2 GB RAM), where divergence between roots in the segmentation area is checked. Intermediate and final surgical splints are printed in-house (TierTime UP Box3D).

Once the minimally invasive approach (from lateral incisor to lateral incisor) and the limited subperiosteal dissection are completed, two short vertical incisions are made in the area between the canine and premolar roots (Fig. 1), followed by a tunnel-shaped subperiosteal dissection of the vertical path for the future segmentation osteotomy. Then, the piezoelectric saw head is introduced through the vertical incision in order to mark the interdental osteotomy (Fig. 2). Next, a Le Fort I osteotomy and maxillary downfracture are carried out using the “twist technique” through the anterior approach [6].

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**Fig. 1.** Design of two short vertical incisions in the area between the canine and premolar roots.



**Fig. 4.** Rigid internal fixation is placed through both approaches: miniplates through the anterior one and the screws through the lateral ones.



**Fig. 2.** Interdental osteotomy through the distal vertical incision with a piezoelectric saw.

Palatal osteotomies are then executed. Then, a chisel is introduced through the vertical incisions to complete division of the interdental segments (Fig. 3). After splint placement for positioning of the maxillary segments, internal fixation is completed (Fig. 4). Finally, a crossed alar cinch with 4–0 polyglactin suture is performed, and the remaining musculature and mucosa are closed in two layers using 5–0 polyglactin continuous suture, with optional V-Y mucosal closure [7].

### 3. Discussion

A minimally invasive approach for Le Fort I osteotomy preserves the maxillary vascular supply through the buccal corridors, thereby minimizing the risk of ischemic events, and improves postoperative tissue healing [6].

When MS is required, such a small incision enables adequate visualization and provides enough room for palatal osteotomy and interdental osteotomies between lateral incisors and canines. However, it may prove inadequate when posterior interdental vertical osteotomies are required, and pulling too much soft tissue with separating instruments located in the buccal sulcus may tear the initially small incision and even lacerate the interdental papilla. Most MS procedures are carried out between lateral incisors and canines [1] - the only indication in our protocol for further posterior segmentation being a steep change of the curve of Spee precisely between the canine and first premolar (which represents only 0.8% of our segmented cases).

Thus, when interdental segmentations farther from the canines are intended, we suggest an additional vertical incision with a subperiosteal tunnel approach immediately above the planned vertical osteotomy. As direct visualization of the osteotomy path is not achieved with this tunneled approach, preoperative diagnosis and virtual planning is mandatory in order to ensure enough room between roots. Otherwise, the roots should be previously diverged through orthodontic treatment. Intraoperatively, the interdental space between roots is felt and checked with a periosteal elevator. Then, the vertical osteotomy must be performed carefully and accurately. For this purpose, the use of an ultrasonic microsaw is advisable, since it minimizes the risk of dental, bone and soft tissue damage [4]. In cases where direct visualization of the osteotomized



**Fig. 3.** Interdental osteotomies are completed with a chisel.

interdental area is advisable, the procedure could be assisted with an endoscope, which can be introduced through the frontal Le Fort I osteotomy approach [2].

On the other hand, this additional access could also be used for other purposes in the posterior maxillary area, extending to the zygomatic process, without the need to enlarge the first incision [8], i.e., posterior segmental osteotomies for transverse or vertical correction.

It thus may be concluded that this simple and safe additional limited approach can be reproduced in all cases where reaching an anatomical structure in the posterior maxillary region is required in the context of a minimally invasive Le Fort I osteotomy. The described technique offers easy and direct access to the posterior region of the maxilla while maintaining the initial incision length and preserving vascularization through the buccal corridors.

### Ethical approval

Not required.

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### Declaration of Competing Interest

None.

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