



# **An Innovative Approach for Maxillary Mobilization: Technique and a Case Report**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. Author WCO wrote the manuscript, conducted the surgical procedure of the clinical case and collected the data. Author AJLP wrote the manuscript and did literature searches. Author MOCDL wrote the first draft of the manuscript. Author RGT managed the literature searches. Author CRPJ Managed the literature searches and collected the data. All authors read and approved the final manuscript.*

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**Case Report**

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## **ABSTRACT**

The Blair Cleft Palate Elevator (BCPE) was initially developed at the Craniofacial Anomalies Rehabilitation Hospital in Bauru, Brazil 1995. Orthognathic surgery is a type of surgery which involves correction of jaw and facial irregularities to avoid problems (speaking, chewing, breathing,

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and aesthetics). One of the most critical steps in this surgery is the maxillary mobilization, which involves moving the upper jaw into a new position to improve facial symmetry and function. Traditionally, surgeons have used Rowe forceps or Tessier mobilizer for maxillary mobilization. The purpose of paper is to describe maxillary mobilization using BCPE instrument in orthognathic surgery in detail and demonstrate the use of BCPE in maxillary mobilization as a new and innovative technique in orthognathic surgery. The method proved to be highly efficient and can be used in patients without cleft palate, and it is a trusted technique in maxillary mobilization for orthognathic surgery.

*Keywords: Le fort osteotomy; orthognathic surgery; maxilla.*

## 1. INTRODUCTION

Conventional surgical procedures for maxillary advancement often involve a Le Fort I complete osteotomy with pterygomaxillary disjunction, septal disjunction, and careful medial sinus wall separation followed by an intraoperative down fracture to achieve the complete mobilization of the maxilla [1,2]. Effective mobilization enables passive repositioning of the maxilla, reducing the incidence of muscular forces and instability of the fixation system.

Mobilization of the maxilla to the new position is often difficult, especially when significant maxillary advances are planned. Traditionally, surgeons have used Rowe forceps or Tessier mobilizer for maxillary mobilization; this maneuver must be performed carefully, as the use of inappropriate instruments or application of inadvertent force may result in serious complications, such as fracture, dental avulsion, vascular injuries, palatine fibro mucosa

compression, maxillary necrosis, and in some cases, maxillary avulsion [3,4,5].

Thus, we present a technique in which an instrument, not initially designated for this purpose, but with minor modification, is used as an auxiliary tool in maxillary mobilization, especially in cases of significant advancements, using BCPE in maxillary mobilization in orthognathic surgery does not damage the maxillary mucosa either.

The present work was carried out in model – 12254 – Nacional Ossos, complete skull with all the teeth, the osteotomies in a patient were made with surgical drills nº 701, and the release of maxilla, using the BCPE instrument.

The purpose of this paper is to describe maxillary mobilization using BCPE instrument (Fig. 1) in orthognathic surgery in detail and demonstrate its use as a new and innovative technique.



**Fig. 1. BCPE with a right angle between the rod and the tip. BCPE active point**

## 2. CASE PRESENTATION

The surgical procedure was performed under general anesthesia with nasotracheal intubation. Upon entry in the oral cavity, the buccal soft tissue of the maxilla was infiltrated with 1% lidocaine with 1:100,000 epinephrine.

A horizontal incision was made approximately 5mm above the mucogingival junction of the premolar region, and the mucoperiosteal flap was raised. Le Fort I osteotomy is commonly used, including pterygomaxillary and septal disjunction, and carefully separating the zygomaticomaxillary and nasomaxillary pillars. Once the osteotomies were completed, the down fracture was performed with support of the thumb, index, and middle fingers on the labial mucosa of the superior incisors. In rare cases, when there is no lower mobilization, a Smith spreader is placed bilaterally with its active tip in the osteotomy in the nasomaxillary buttress to finish the maxillary mobilization.

With the maxilla mobilized inferiorly, bone spicules of the lateral nasal walls were removed using osteotomes to avoid perforating the nasal mucosa during the maxillary anterolateral mobilization.

Complete mobilization of the maxilla was obtained with BCPE modified by the author. Its modification consists of establishing a right angle between the rod and the tip (Fig. 1) and creating grooves in the inner part of this active tip (Fig. 1). The grooved surface promotes a more excellent friction zone with the posterior bone of the maxilla, increasing stability and minimizing the risk of slipping and laceration of the soft tissue.

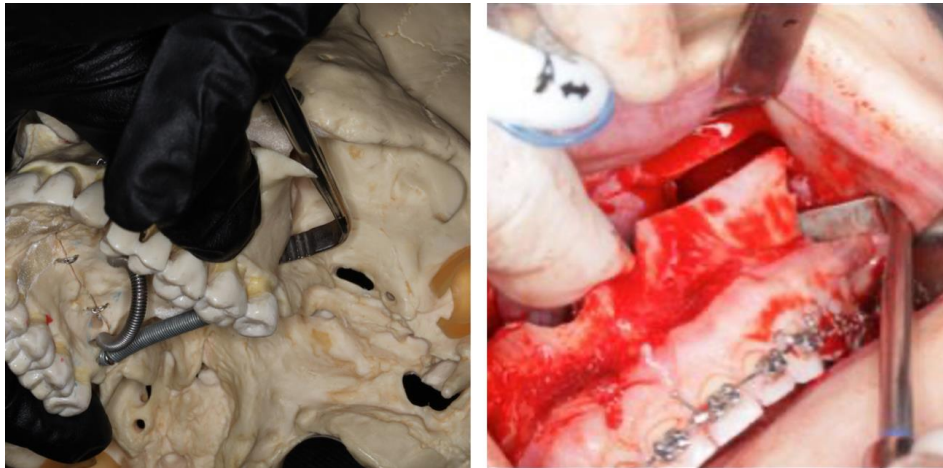
The active tip of the instrument was positioned in the region between the pterygoid plates and the

maxillary tuberosity, with the handle and the rod accompanying by the curvature of the maxilla, preceding the following maneuvers:

1. The instrument was held firmly, so that the forearm was opposed to the active tip and the elbow, supported laterally with the surgeon's chest to mobilize the maxilla bilaterally;
2. With the opposite hand, passing behind the patient's head, the anterior part of the maxilla was held in the labial and palatal region of the opposite side;
3. The auxiliary surgeon was located behind the patient's head to firm the sides of the skull and avoid the mobility of the complex head/neck. Thus, the displacement of the maxilla is a pendulum movement of the surgeon's body, not requiring the application of a big force;
4. The maxilla was moved in the anterolateral direction, that is, towards the left and anterior, on the same side where the instrument tip is supported (Fig. 2).
5. For left-hand mobilization, the instrument was handled the same way as previously described but with the active tip pointing in the same direction as the forearm. The maxilla was moved carefully in the direction of the surgeon (Fig. 3);
6. The bone segment was maneuvered bilaterally until it has been thoroughly mobilized;
7. At the end of the mobilization, it was observed that the maxilla and the maxilla teeth were passively in the lower dental arch. If the occlusion was not wholly passive, even with overcorrection, the mobilization was repeated. Thus, the advancement of the maxilla can exceed 15 mm relatively easily.



**Fig. 2. Movement of the maxilla in anterolateral direction (left side)**



**Fig. 3. Movement of the maxilla in the anterolateral direction (right side)**

### 3. DISCUSSION

There are benefits of this new technique. By correctly applying this simplified method, we can reduce the direct risk of trauma, as well as the risk of compromising maxillary mucosa irrigation, which occurs when using Rowe forceps. We are causing lacerations through the dynamic movements of the Tessier mobilizers. The mobilization process is straightforward and controlled, involving anchoring the instrument in the posterior region of the maxilla, significantly reducing the surgical time. Unlike the excessive force required by forceps Rowe, this proposed technique requires less force, which, when used together with the surgeon body, arm, and forearm (attached to the body), provides greater control over the movement. When properly applied, this technique can achieve substantial maxillary advances in a single movement. Furthermore, the instrumentation is simple, allowing for more efficient use of space in the surgical box.

Although we did not find any complications in using this method, there may be potential risks due to the incorrect application of the force vector, resulting in the sliding of the instrument and soft tissue lesions with compromised maxillary vascularization. Assuming that these complications can be disastrous for the patient, the surgeon must be aware of the correct positioning of the instrument and the application of movements to mobilize the maxilla, as described.

We have used this technique routinely for more than 15 years without adverse results in Brazilian hospitals.

Le Fort I osteotomy for maxillary advancement is a standard and safe procedure in orthognathic surgery. Combined with down fracture, mobilization, and repositioning, it can be used to correct three-dimensional maxillary deformity [6] surgically. The degree of difficulty in reaching the point of down fracture and the process of down fracture itself may underpin the likelihood of direct or indirect neurovascular damage. Untoward fractures may be propagated from a Le Fort I procedure, mainly resulting from pterygomaxillary dysfunction and maxillary down fracture. Such fracture patterns have been extensively assessed in radiological, cadaveric, and dry skull studies [7,8,9].

The development of unwanted fractures involving the pterygoid plates (exceptionally high level), or fine fissure fractures may extend to contiguous osseous structures. Those unfavorable fractures that extend to the pterygopalatine fossa, skull base (foramina), and orbit may be responsible for significant neurovascular morbidity [10].

Furthermore, one of the leading late complications associated with this procedure is unexpected relapse, which may cause malocclusion, and in some cases, require surgical reintervention [11,12] Complete bone mobilization, without tension, preservation of the tissue viability during the incisions/osteotomies, and proper synthesis are essential for achieving stability in orthognathic surgeries [13,14].

Despite the procedural simplicity of Le Fort I osteotomy, there is considerable mobilization of the maxilla (advancement) (>10 mm advancement in the sagittal plane of the upper jaw). Few studies have addressed this issue, and



very few techniques have been described to support mobilization of the upper jaw after completing Le Fort I osteotomy [15,16,17,18]

Revascularization and bone healing occur after Le Fort I osteotomy. One of the most common methods used to mobilize the maxilla is by means of Rowe forceps, which enables significant amount of force to mobilize the maxilla through movements up and down to the sides. Thus, it is possible to reposition the maxilla. Still, with support by the action mechanism of the Rowe forceps, the descending palatine vessels can be ruptured, and there may be serious complications, such as oronasal fistula and trauma to the oral, nasal, or palatal mucosa. Fracture of the alveolar bone or palate, disruption of the palatal blood supply, or damage to the dentoalveolar and adjacent structures [19].

Rowe maxillary forceps can be used for this purpose. However, the application of this instrument may cause compression or injury of the palatal fibro mucosa and promote vascularization impairment of the maxilla. A slip of the instrument during handling may result in inadvertent fracture of anterior teeth or maxilla [16].

Another related technique is using Tessier mobilizers to facilitate the release of all bone contacts and gently stretch the posterior maxillary soft tissues until the necessary advancement is achieved [17]. However, its active tip is long and serrated, associated with an extensive and curved rod, which requires a more significant force applied by the surgeon, facilitating the slide of the instrument and injury to adjacent tissues.

#### 4. CONCLUSION

The modified BCPE promoted a controlled mobilization with low bone fracture risk and lesser force by the surgeon. In addition, a simple instrument was used to perform this method, which, when adequately adapted and applied, does not traumatize the soft tissues of the nasal floor, palate, or anterior teeth and promotes passive repositioning of the maxilla, as previously planned.

#### CONSENT

It is not applicable.

#### ETHICAL APPROVAL

It is not applicable.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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