An innovative approach for maxillary mobilization: Technique and a case report

Abstract

The BlairCleftPalateElevator (BCPE)wasinitiallydevelopedattheCraniofacialAnomaliesRehabilitationHospitalinBauru ,Brazil1995. Orthognathicsurgeryisatypeofsurgerywhichinvolvescorrection ofjawandfacialirregularities to avoid problems (speaking,chewing,breathing,andaesthetics). 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 symmetryandfunction.Traditionally,surgeonshaveusedRoweforcepsorTessiermobilizerfo rmaxillarymobilization.The purpose of paper isto describe maxillary mobilization usingBCPE instrument in orthognathic surgery in detail and demonstrate the use of BCPE in maxillary mobilization asanewandinnovative technique in orthognathicsurgery. Themethodproved to be highly efficient and can be used in patients without cleft palate, and it is atrustedtechniqueinmaxillarymobilizationfororthognathicsurgery.

Keywords:LeFortOsteotomy;OrthognathicSurgery;Maxilla.

Introduction

ConventionalsurgicalproceduresformaxillaryadvancementofteninvolveaLeFortIco mpleteosteotomywithpterygomaxillarydisjunction,septaldisjunction, and careful medial sinus wall separation followed by an intraoperativedownfracturetoachievethecompletemobilizationofthemaxilla[1,2].Effectivem obilization enables passive repositioning of the maxilla, reducing the incidenceofmuscularforcesandinstabilityofthefixationsystem.

Mobilization ofthe maxilla to the new position is often difficult,especiallywhensignificantmaxillaryadvancesareplanned.Traditionally,surgeonsh aveusedRoweforcepsorTessiermobilizerfformaxillarymobilization;

thismaneuvermustbeperformedcarefully,astheuseofinappropriateinstrumentsor applicationofinadvertentforcemayresultinseriouscomplications,suchasfracture,dentalavulsion,vascularinjuries,palatinefibro mucosacompression,maxillarynecrosis,andinsomecases,maxillaryavulsion[3,4,5].

Thus,wepresentatechniqueinwhichaninstrument,notinitiallydesignated forthispurpose,butwithminormodification,isusedasanauxiliarytoolinmaxillarymobilization ,especiallyincasesofsignificantadvancements,using BCPE in maxillary mobilization in orthognathic surgery does not damagethemaxillarymucosa either.

The present work was carried out in model – 12254 – Nacional Ossos, complete skullwith all the teeth, the osteotomies in a patient were madewith surgical drills nº 701, andthereleaseofmaxilla,usingtheBCPEinstrument.

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

Case Presentation

The surgical procedure was performed under general anesthesia with nasotrachealintubation. Upon entry in theoral cavity, the buccal soft tissue ofthe maxilla wasinfiltratedwith1%lidocainewith1:100,000epinephrine.

Ahorizontalincisionwasmadeapproximately5mmabovethemucogingivaljunction of the premolar region, and the mucoperiosteal flap wasraised. Le Fort Iosteotomy is commonly used, including pterygomaxillary and septal disjunction,andcarefully separating the zygomaticomaxillary and nasomaxillary pillars.Once the osteotomies werecompleted, the down fracture wasperformed with support of the thumb,index,andmiddlefingersonthelabialmucosaofthesuperiorincisors.

In rare cases, when there is no lower mobilization, a Smith spreader is placedbilaterallywithitsactivetipintheosteotomyinthenasomaxillarybuttress to finish the maxillary mobilization.

With the maxilla mobilized inferiorly, bone spicules of the lateral nasal walls wereremoved using osteotomes to avoid perforating the nasal mucosaduringthemaxillaryanterolateralmobilization.

Complete mobilization of the maxilla was obtained with BCPEmodified by the author. Its modification consists of establishing a right angle between the rod and the tip (Figure 1) and creating grooves in the inner partofthis active tip (Figure1). The grooved surface promotes a more excellent friction zone with theposteriorboneofthemaxilla,increasingstabilityandminimizingtheriskofslippingandlaceration of the softtissue.

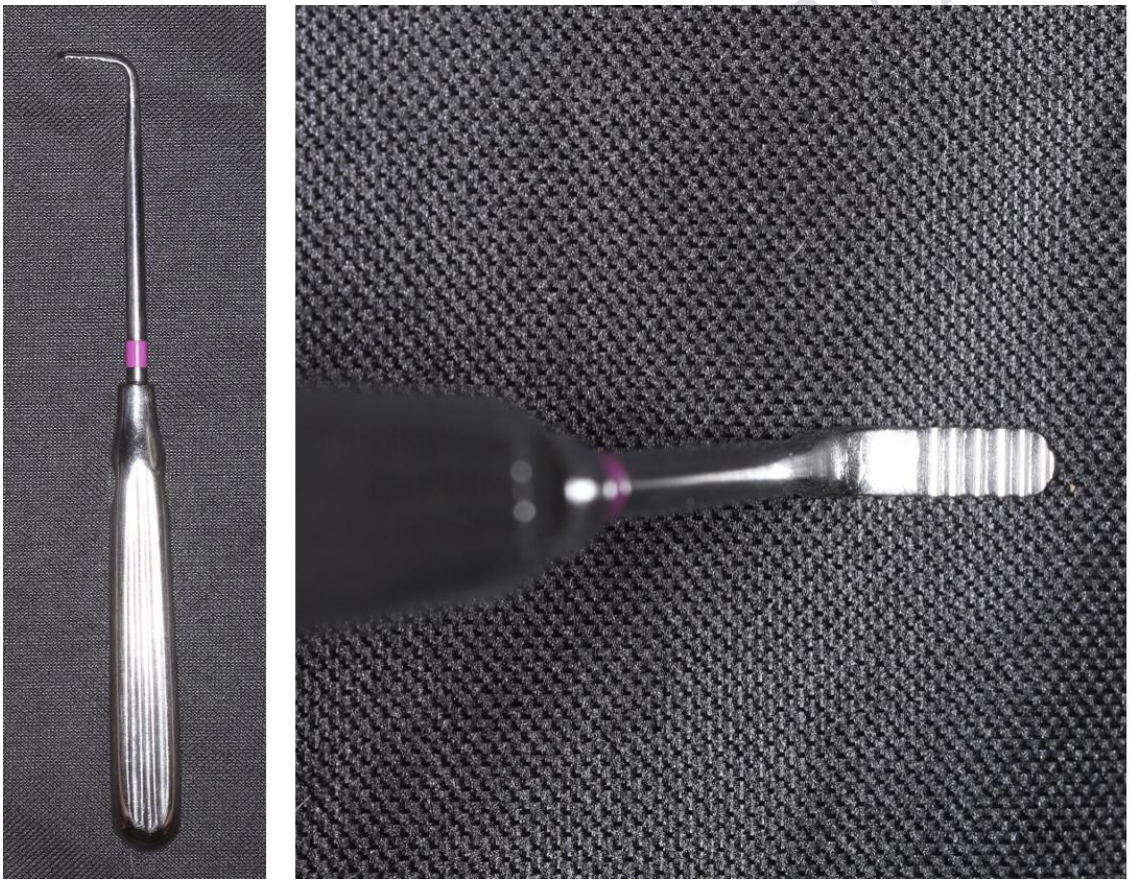

Figure 1: BCPE with a right angle between the rod and the tip. BCPE active point.

Theactivetipoftheinstrumentwaspositionedintheregionbetweenthepterygoidplates and the maxillary tuberosity, with the handle and the rod accompanying by thecurvatureofthe maxilla,precedingthefollowingmaneuvers:

1. The instrument was held firmly, so that the forearm was opposedtotheactivetipandtheelbow,supportedlaterallywiththesurgeon'schesttomobilizethemaxilla bilaterally;

2. With the opposite hand, passing behind the patient's head, the anterior partofthemaxillawas held in ’the labial and palatal region of the opposite side;

3. Theauxiliarysurgeonwas locatedbehind the patient's head to firm the sides of the skull and avoid the mobility of the complex head/neck. Thus, the displacement of themaxillaisapendulummovementofthesurgeon'sbody,notrequiringtheapplicationofa bigforce;

4. The maxilla was moved in the anterolateral direction, that is, towards the left and anterior, on thesamesidewheretheinstrument tipissupported(Figure2).

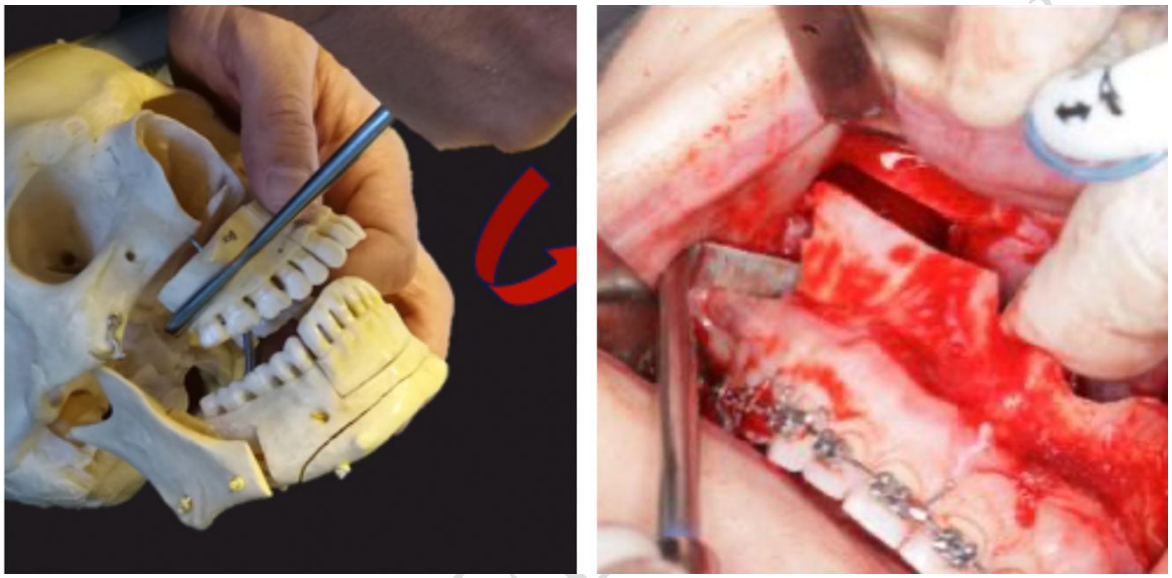

Figure 2. Movement of the maxilla in anterolateral direction (left side).

5. For left-hand mobilization, the instrument was handled the same way as previouslydescribedbut with the active tip pointing in the same direction as the forearm.Themaxilla was movedcarefullyinthedirectionofthesurgeon(Figure3);

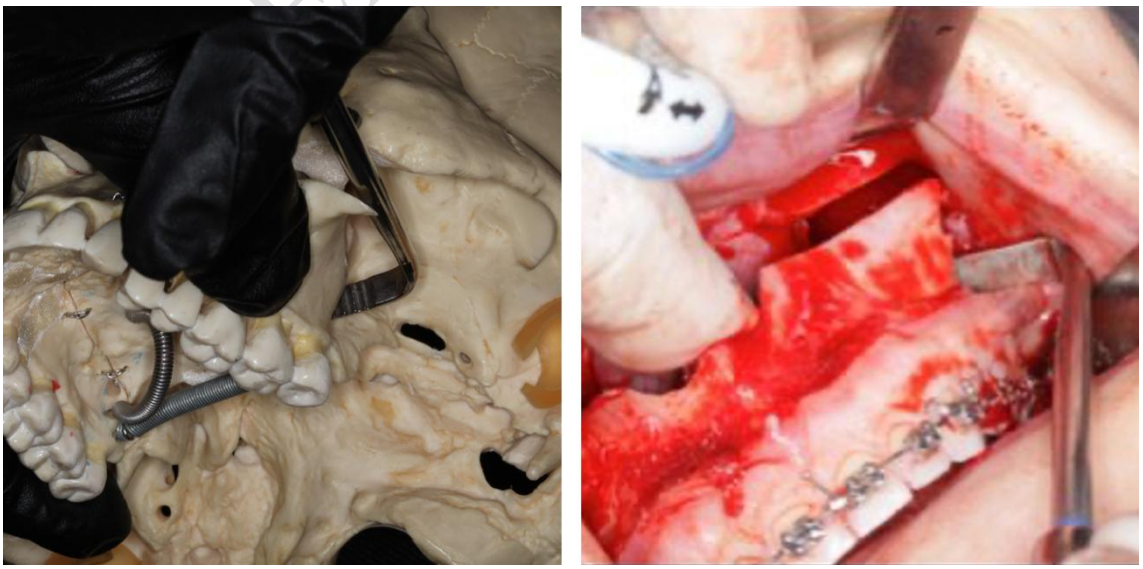

Figure 3. Movement of the maxilla in the anterolateral direction (right side).

6. The bone segment was maneuvered bilaterally until it has been thoroughlymobilized;

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.

Discussion

There are benefits of this new technique. By correctly applying thissimplified method, we can reduce the direct risk of trauma, as well as the risk ofcompromisingmaxillarymucosairrigation,whichoccurswhenusingRowe forceps. We are causing lacerations through the dynamic movements of the Tessier mobilizers. Themobilizationprocessisstraightforwardandcontrolled,involvinganchoringtheinstrument in the posterior region of the maxilla, significantly reducingthe surgical time. Unlike the excessive force required by forceps Rowe, this proposedtechniquerequireslessforce,which,whenusedtogetherwiththesurgeonbody, arm, and forearm (attached to the body), provides greater control over themovement. When properly applied, this technique can achieve substantial maxillary advances in a single movement. Furthermore, the instrumentation is simple,allowingformoreefficientuseofspaceinthesurgicalbox.

Although we did not findany 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 compromisedmaxillary vascularization. Assuming that these complications can be disastrous for thepatient,thesurgeonmustbeawareofthecorrectpositioningoftheinstrumentandtheapplicationofmovementstomobilizethemaxilla,asdescribed.

We have used this technique routinely for more than 15 years withoutadverse results in Brazilian hospitals.

LeFortIosteotomyformaxillaryadvancementisastandardand safe procedure in orthognathic surgery. Combined with down fracture, mobilization, and repositioning, it can be used to correct three-dimensional maxillary deformity[6] surgically.Thedegreeofdifficultyinreaching the point of down fracture and the process of down fracture itselfmay underpin the likelihood of direct or indirect neurovascular damage.

UntowardfracturesmaybepropagatedfromaLeFortIprocedure,mainlyresultingfrompteryg

omaxillarydysfunctionandmaxillarydown fracture.Suchfracture patternshavebeenextensivelyassessedinradiological,cadaveric,anddryskullstudies[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 beresponsibleforsignificantneurovascularmorbidity[10].

Furthermore,oneoftheleadinglatecomplicationsassociatedwiththisprocedure is unexpected relapse, which may cause malocclusion, and in some cases,requiresurgicalreintervention[11,12].Completebonemobilization,withouttension,preservationofthetissueviabilityduringtheincisions/osteotomies,andpropersynthesisareessential forachievingstabilityinorthognathicsurgeries[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 upperjaw). Few studies have addressed this issue, and very few techniques havebeendescribedtosupportmobilizationoftheupperjawaftercompletingLeFortI osteotomy[15,17,18].

Revascularization and bone healing occur after Le Fort I osteotomy. One of the most common methods used to mobilize the maxilla is by means ofRowe 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 bythe 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 palatalfibro mucosaandpromotevascularizationimpairmentofthemaxilla.A slip of theinstrument during handling may result in inadvertent fracture of anterior teeth or maxilla[16].

Another related technique is using Tessier mobilizers to facilitate the releaseof all bone contacts and gently stretch the posterior maxillary soft tissues until thenecessaryadvancementisachieved[17].However,itsactivetipislongandserrated,associated with an extensive and curved rod, which requires a more significant force applied by thesurgeon,facilitatingtheslideoftheinstrumentandinjurytoadjacenttissues.

Conclusion

The modified BCPE promoted a controlled mobilization with low bonefracture risk and lesser force by the surgeon. In addition, a simple instrument was used to perform this method, which, when adequately adapted and applied, doesnot traumatize the soft tissues of the nasal floor, palate, or anterior teeth and promotes passiverepositioningofthemaxilla,aspreviouslyplanned.

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