A Modified Technique for Placing Prebent Plates during a Le Fort I Osteotomy: A Technical Note

Marwa Ragaey, DDS, MS¹ Joseph Van Sickels, DDS¹

¹ Department of Oral and Maxillofacial Surgery, University of Kentucky, Lexington, Kentucky

Address for correspondence Marwa Ragaey, DDS, MS, Department of Oral and Maxillofacial Surgery, University of Kentucky, 800 Rose Street, Lexington, KY 40506 (e-mail: marwa_ragaey@hotmail.com).

Craniomaxillofac Trauma Reconstruction 2016;9:297–298

Abstract

Prebent plates have gained popularity in recent years as a fixation appliance for large maxillary advancements. They are larger than standard plates used for maxillary procedures and appear to give greater stability. Due to their size and configuration, they have the potential to be more palpable than standard plates, possibly causing discomfort following placement. With a simple “box” osteotomy of the maxilla at the site of placement and a minor modification of the plate, the plate is less palpable and better tolerated by the patient.

Keywords

- Le Fort I
- prebent plates
- plate removal

The stability of maxillary advancements has been studied using many different fixation modalities.^{1–4} Modifications in these fixation appliances have been evolving for the past three decades since rigid fixation became the routine practice. Prebent plates are one of the most recent modifications in the plate technology designed specifically for maxillary advancements.^{5,6} They have a larger and thicker design than traditional plates and appear to give more stability.⁶ Prebent plates have two right angles with different lengths to accommodate the amount of advancement of the maxilla (► Fig. 1).

However, because of their configuration and length, they can sometimes be palpated at both the infraorbital rim and at the piriform fossa when placed. Over the past 6 years, the senior author (J.V.S.) has been doing a simple modification of the maxillary osteotomy in Class III maxillary advancement cases. By making a simple box in the bone near the piriform fossa, it facilitates plate placement and makes the right angle of the plate less prominent. It also lowers the placement of the upper arm of the plate away from the infraorbital rim while the lower arm engages the maxilla closer to the apices of the teeth.

Surgical Technique

Le Fort I osteotomy is performed as described by Van Sickels et al.² The maxilla is then repositioned following mobilization and placed in intermaxillary fixation as dictated by an

occlusal wafer. Interferences that prevent the maxilla from being placed at the preferred vertical position are removed. An appropriate width prebent plate is initially placed in the proposed site at the piriform fossa. Where the right angle of the plate touches the advanced maxillary wall, the site is marked with a thin fissure bur. A small “box” is cut into the site moving the point of contact with the horizontal portion of the plate approximately 2 to 3 mm inferior (► Fig. 2a). The most superior hole of the upper limb of the plate is removed. At least two screws are placed in the inferior limb of the plate when it is placed in its new position. The maxillomandibular complex is rotated on the condylar axis with the plate attached to it until the desired vertical position has been achieved again. The three superior screws are placed and the remaining screws are placed in the inferior limb of the plate (► Fig. 2b).

In our practice, fixation of the maxilla is accomplished with two prebent plates used in the region of the piriform aperture bilaterally and two 2-mm solid straight miniplates at the maxillary buttresses. Any voids greater than 4 mm are filled with a bone substitute.

Discussion

Prebent plates are the ultimate modification of plating systems for use with maxillary osteotomies.⁶ Their advantages include reduction in bending which decreases operative time

received

March 8, 2016

accepted after revision

May 15, 2016

published online

August 23, 2016

Copyright © 2016 by Thieme Medical Publishers, Inc., 333 Seventh Avenue, New York, NY 10001, USA.
Tel: +1(212) 584-4662.

DOI <http://dx.doi.org/10.1055/s-0036-1592092>.
ISSN 1943-3875.

Fig. 1 Two different sizes of prebent plates.

Fig. 2 (a) A notch (small box) prior to placement of the plate. (b) Prebent plate in place—three superior screws, posterior plate on the buttress.

and lessens any potential compromise to the integral strength of the plates. They come in different length which can estimate the amount of movement of the maxilla. The thicker, 90-degree angle prebent enables them to resist vertical and horizontal load and probably decreases relapse. In a bio-

mechanical study, Araujo and his colleagues concluded that prebent plates provide the best resistance to displacement and permanent deformation when compared with three other systems.⁷ The larger configuration and adaptation of prebent plates leads to a larger contact surface, thereby more uniformly distributing forces locally. The larger contact surface and cross-sectional areas, plus the number of fixation screws, may also explain the higher resistance to vertical and horizontal loading.⁷ In 2016, Ragaey et al showed that prebent plates in combination with L plates are a more stable method of fixation for maxillary advancements in skeletal Class III patients.⁸

A disadvantage of these plates is that they are larger and more rigid which without any modifications might make them more palpable.⁵ With this simple modification, these plates can be easily placed. While we have removed a few of the plates that were placed in the past 6 years, there does not seem to have been a marked increase compared with the removal of standard plates. A study of the percentage and causes of prebent plate removal is being currently conducted in our institute.

Conclusion

Notching the bone of the maxilla (small box) allows the prebent plates to fit well and appears to decrease the incidence of postoperative discomfort and the need for a second surgery to remove these plates, due to their subsequent palpability.

References

- 1 Bothur S, Blomqvist JE, Isaksson S. Stability of Le Fort I osteotomy with advancement: a comparison of single maxillary surgery and a two-jaw procedure. *J Oral Maxillofac Surg* 1998;56(9):1029–1033, discussion 1033–1034
- 2 Van Sickels JE, Jeter TD, Aragon SB. Rigid fixation of maxillary osteotomies: a preliminary report and technique article. *Oral Surg Oral Med Oral Pathol* 1985;60(3):262–265
- 3 Proffit WR, Turvey TA, Phillips C. The hierarchy of stability and predictability in orthognathic surgery with rigid fixation: an update and extension. *Head Face Med* 2007;3:21
- 4 Bell WH, Jacobs JD, Quejada JG. Simultaneous repositioning of the maxilla, mandible, and chin. Treatment planning and analysis of soft tissues. *Am J Orthod* 1986;89(1):28–50
- 5 Lye KW, Waite PD, Wang D, Sittitavornwong S. Predictability of prebent advancement plates for use in maxillomandibular advancement surgery. *J Oral Maxillofac Surg* 2008;66(8):1625–1629
- 6 Coskunes FM, Kan B, Mutlu I, Cilasun U, Celik T. Evaluation of prebent miniplates in fixation of Le Fort I advancement osteotomy with the finite element method. *J Craniomaxillofac Surg* 2015; 43(8):1505–1510
- 7 Araujo MM, Waite PD, Lemons JE. Strength analysis of Le Fort I osteotomy fixation: titanium versus resorbable plates. *J Oral Maxillofac Surg* 2001;59(9):1034–1039, discussion 1039–1040
- 8 Ragaey M, Fan L, Burchett W, Van Sickels J. Stability of maxillary advancements using a combination of prebent and conventional plates for fixation. In: *The 11th Annual CCTS Spring Conference*. Lexington, KY; 2016