

New Protocol of Alveolar Distraction: Review of 50 Cases

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Summary

Although the ability of distraction to reconstruct alveolar defects has been shown, achieving predictable and stable results remains a challenge. This paper presents a new protocol that aims to solve commonly encountered problems. Modification of the existing procedure, use of morphogenetic proteins and piezosurgery improves the outcome.

Introduction

Successful rehabilitation of alveolar defects involving loss of teeth, bone, and soft tissue is only achieved after a functioning prosthesis has been completed. The simple enlargement of the alveolus is not enough to declare a deformity corrected. In many cases, distraction provides an adequate quantity of bone but the quality is lacking. Quality deficiencies may present as anatomic or physiologic deficiencies. Commonly employed distraction techniques often result in alveolar contours that have lingual displacement. This anatomic deformity complicates dental implant placement and compromises esthetic restoration. Surgeons have also experienced resorption of the constructed alveolus and difficulty in achieving osseointegration. Despite apparently adequate bone volume, some dental implants fail to achieve or maintain osseointegration. This problem is due to compromise in the quality of the constructed alveolus. Distracting sites that have already undergone reconstruction have increased risk of poor healing. Use of morphogenetic proteins may improve the quality and quantity of the bone filling the regeneration chamber. Simple modifications of the standard technique may prevent many commonly encountered problems.



Fig 1 Ridge deficiency remaining after first distraction.

Materials and Methods

Fifty patients undergoing alveolar distraction were managed with a modified protocol. The following modifications were made to previously described technique: (1) diverging the lateral osteotomies apically, (2) converging the lateral osteotomies lingually (3) filling the regeneration chamber with morphogenetic protein (rhBMP-2), and (4) revising the position of the distraction segment position before consolidation and placing rigid fixation.

All of the patients in this series had vertical deficiency of the alveolar bone (fig 1). An incision is placed in the vestibule and the labial cortex exposed. Soft tissue overlying the crest is not reflected. The two vertical osteotomies are placed such that they diverge apically rather than to converge apically (fig 2, 3). As the vertical osteotomies are extended through the medullary space

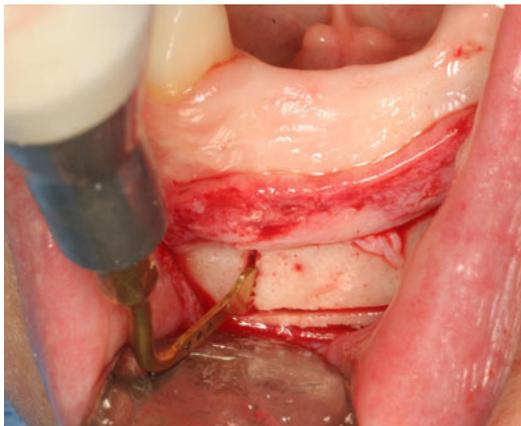


Fig 2 Piezosurgery creates vertical osteotomies with apical divergence.

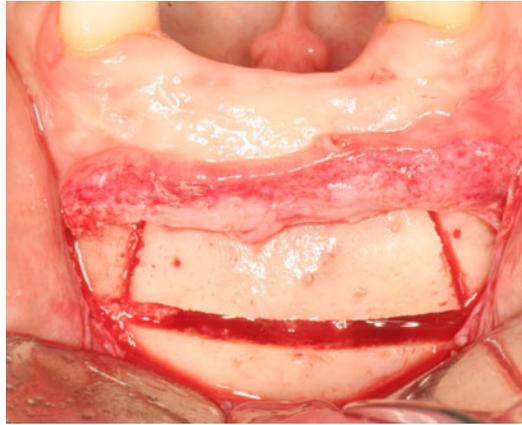


Fig 3 Osteotomy segment with wide base.

and medical cortex, they converge. A non-rigid distraction device, LEAD (Stryker Surgical), is used to transport the segment (fig 4). The shape of the transport segment and adjacent bone forces the segment labially as it is transported vertically. Following a substantial segment transport at the time of osteotomy, the wound is closed and the device left without activation for 7 to 10 days. The distraction device is then activated daily for as many days is necessary to achieve satisfactory transport. At least 3mm of transport beyond the anatomic objective is necessary. The patient is then returned to the clinic for a second procedure. The regeneration chamber and transport segment are exposed. The distraction device is turned in reverse to create mobility of the

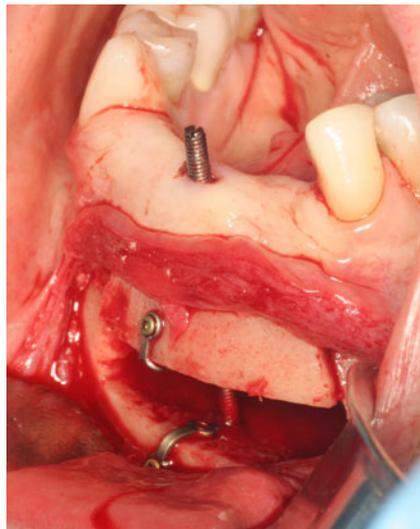


Fig 4 Initial segment transport with anterior displacement.

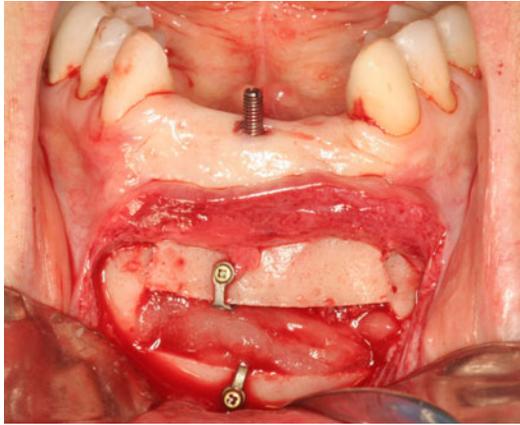


Fig 5 Bone Morphogenetic Protein (rhBMP-2) in place.

pedicle and segment. The segment is luxated into its final position by manual traction and may be fixed with a miniplate. The distraction device may be left in place for greater stability or removed. The regeneration chamber is then filled with a rhBMP-2 (fig 5). The wound is closed and allowed to heal for four months (fig 6). After the healing period, the site is opened for placement of dental implants. In this study, trephine bone cores were obtained for histology.

Results

There was improvement in overall segment position and ability to place esthetic dental implants in all of the cases. Bone biopsies showed highly cellular, viable bone.

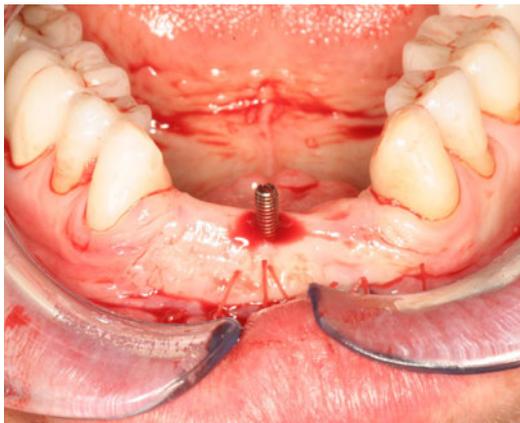


Fig 6 Elevation and protraction of transport segment.

Conclusions

Most alveolar distraction techniques depend on devices to transport segments and maintain the proper vector. The normal lingual trajectory of the labial cortex, position of adjacent teeth and device design often result in segments that become lingually displaced. This situation is difficult to treat with dental implants. Modification of the osteotomy and transport protocol improves the predictability of the distraction process. A geometric undercut is intentionally created by diverging the osteotomy apically. The tapered shape of the segment and osteotomy walls force the segment labially as it is transported vertically. Segment position can be further improved by manual displacement and miniplate fixation. Because of the tapered geometry of the osteotomy, the segment maintains stability throughout the transport and consolidation phases. Proximity of adjacent teeth may limit the opportunity to create a self-retaining transport segment. In this case, as the transport proceeds, the segment may deviate from the desired trajectory. To limit this situation, it is critical that proper instrumentation be used to create the osteotomies. Fine, low impact microsaws or piezosurgery should be used. Excessive kerf of the vertical osteotomies due to incorrect instrumentation results in increased lingual deviation during transport. Despite the most careful technique, this problem is sometimes unavoidable. To correct this situation, the surgeon should perform a revision procedure prior to segment consolidation. Introduction of a microplate after segment correction has been made will avoid results that cannot receive well positioned dental implants. If the anatomic region has been compromised by prior disease or failed surgical treatments, the quality of the transport segment and the regenerate may prevent successful osseointegration. Treatment of the regeneration chamber with rhBMP-2 produces a large volume of viable bone that is available for osseointegration therapy. The combination of modifications improves the quality of the result.

Reference

CHIN M, TOTH BA. Distraction osteogenesis in maxillofacial surgery using internal devices: review of five cases. *J Oral Maxillofacial Surg* 54, 45-53, 1996.