



Distraction Osteogenesis of Anterior Mandibular Ridge Followed by Immediate Implant Placement - A Case Report

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Abstract:

Distraction osteogenesis is a surgical method for reconstructing atrophic alveolar ridge. The insufficient bone thickness of an atrophic mandibular ridge is a common challenge for the implantologists during placement of dental implants. The narrow edentulous alveolar ridge of 4 mm or less requires horizontal augmentation. Patients with severely resorbed edentulous mandible often complain of an ill-fitting lower denture, intolerance to implant-loading, mucosal pain, difficulty eating food, difficulty in speech, loss of soft-tissue support, and altered facial appearance. This case report describes a surgical procedure of widening the atrophic mandibular anterior ridge by means of splitting the crest of an edentulous ridge as thin as 2.5 mm followed by the gradual expansion of the anterior mandibular ridge, followed with simultaneous placement of dental implants within the split ridge. This alveolar ridge-split procedure with gradual bone expansion provides predictable expansion of atrophic ridge, hence eliminating the need for a second surgical site.

Keywords: Bone Screws, Dental Implants, Distraction Osteogenesis, Immediate Implant Placement, Ridge Splitting

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1. Introduction

Narrow maxillary and mandibular alveolar ridges remain a serious challenge for the successful placement of endosseous implants. Failure to replace missing teeth for a prolonged period of time leads to atrophy and resorption of the alveolar ridges thus making it difficult for the placement of implants due to lack of sufficient alveolar ridge height and width. The various surgical techniques that aim to widen the alveolar ridge include lateral augmentation with (1,

2) or without guided bone regeneration (GBR) (3), ridge expansion osteotomy (4, 5) ridge splitting technique with (6, 7) or without (8) interpositional grafting and horizontal distraction osteogenesis (9). Ridge splitting technique causes lateral ridge expansion through longitudinal osteotomy leading to lateral positioning of the existing buccal cortex, thus creating a space between the buccal and lingual cortical plates. The endosseous implant can be placed immediately with or without graft material (10, 11) Thus decreasing the treatment time

significantly and avoiding a second donor site.

2. Case Presentation

A 40-year-old systemically healthy, moderately built and nourished male patient reported to the oral implantology unit of College of Dentistry, Jazan University, Jazan, Saudi Arabia with the chief complaint of an ill-fitting mandibular denture and desired implant placement. Clinical examination revealed atrophic mandibular ridge (Figure-1). Bone quality and quantity were evaluated using cone-beam tomography. It revealed inadequate buccolingual dimensions of the available alveolar bone. (Figure-2)



Figure 1: Preoperative intraoral photograph with narrow alveolar ridge



Figure 2-a, 2b & 2c. Scan Revealed Inadequate Buccolingual Dimension Of Bone.

The scan also revealed that adequate cortical and cancellous bone was present to allow alveolar ridge expansion. Therefore, it was decided to place immediate implants, following the split control expanding technique in relation to mandibular alveolar ridge. The ridge splitting technique is a methodology to increase the alveolar ridge width by splitting the alveolar ridge using a chisel after the formation of a groove at the center of ridge crest using a saw or surgical bur. The ridge expansion technique (RET) is a stepwise technique. It uses screws of gradually increasing width. This sequential expansion allows alveolar bone to expand and hence has a lower risk of cortical bone fracture.

3. Surgical Procedure:

After local anaesthesia was administered, a mid-crestal incision was

made and full-thickness mucoperiosteal flaps were raised on the buccal and lingual surfaces. (Figure-3)



Figure 3: Surgical site with mucoperiosteal flap elevation

The horizontal osteotomy line was marked using a thin separating disk along the narrow crest. (Figure-4)



Figure 4: Separating disc creating a groove for the placement of bone expander.

A wider separating disk (9.50 mm) was then used to deepen the initial osteotomy line. A sequence of expansion drills of increasing width in the edentulous site was used to allow more gradual bone expansion (Figure-5)



Figure 5: Gradual bone expansion



Figure 6: The buccal expansion of the ridge is achieved by splitting the ridge using the bone expander (SplitMaster (Mr. Curette)).



Figure 7: The placement of two expanders in the osteotomy site to expand the full length of edentulous area.



Figure 8: Ridge expanded for Implant placement.



Figure 9: Vertical separator in place



Figure 10: Final Osteotomy and Implant Site Preparation



Figure 11: Osteotomy with final twist drills.



Figure 12: Placement of dental implants

A significant increase was achieved in the alveolar bone dimension, thus enabling the placement of endosseous dental implants successfully. The final twist drills of diameter 2.2 mm×10 mm were inserted in the expanded ridge in relation to mandibular anterior ridge, (Figure11&12)



Figure 13: Guided tissue regeneration membrane placed

The guided tissue regenerative membrane was placed to help in the guided bone regeneration around the dental implant area and the expanded alveolar bone (Figure-13)



Figure 14: Flap closure with sutures



Figure 15: Postoperative panorama showing three implants placed in the anterior mandible

The mucoperiosteal tissue closure was performed over implants using 3-0 nonresorbable suture. Nonsteroidal analgesics, Amoxicillin 500 mg and 0.2% chlorhexidine mouth rinse were then administered for the patient postoperatively. Sutures were removed after 10 days.



Figure 15: Healing caps placed



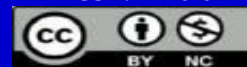
Figure 16: Abutments placed



Figure 17: Intraoral view after delivery of final dental implant-supported ceramic restoration.

4. Discussion:

Ridge splitting with bone expansion is a simple technique to manipulate the residual alveolar ridge to form a receptor site for dental implant fixture placement without removing any bone from the implant site. (12) It is generally referred to in the scientific literature with various terms such as ridge widening, the split crest procedure, and staged ridge splitting. (13) This surgery induces a greenstick fracture utilizing chisels and osteotomes. (14) It used the inherent flexibility of the mandibular bone to mould and adapt the available bone in the narrow alveolar ridge. (12) The procedure expands and forms an adequate implant bed. It offers better bone regeneration as the available bone is autogenous, it protects the periosteum and it resultant bone heals from both the sides. Further osteogenesis wound heals and matures with regeneration faster

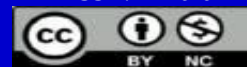


than the guided bone regeneration tissue.(13,15) In case of ridge split procedures the implants can be placed along with bone grafting immediately. However it remains unknown if the bone graft required to be placed in the space generated by ridge splitting and if the grafting improves the overall bone regeneration.(16) Studies have shown that bony gaps of less than 3 mm generated by splitting need not be grafted with bone grafts other than collagen sponges.(17)

The ridge split expansion is an excellent tool in the repository of clinical implantologist. It helps in regaining the alveolar ridge width. The clinician must exercise care and avoid dislodging the bone fragment as it might lead to remodeling resorption. The implants if placed immediately should have primary fixation. A partial thickness mucoperiosteal flap is recommended to retain the blood supply to the alveolar bone.(18)

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