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Horizontal Ridge Augmentation in a Siebert class 1defect with Simultaneous Implant Placement -A case report

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ABSTRACT:
Horizontal alveolar ridge defects especially in the maxillary aesthetic zone are devastating for the patient and a dilemma for the clinician. Dental implants are a game-changer in the field of dentistry and play a pivotal role in restoring the function and aesthetics in the patients. In this case report, alveolar ridge expansion with motorized ridge expanders along with Guided bone regeneration and simultaneous implant placement was done. This article highlights a procedure which is minimally invasive, predictable and affords long-term tissue stability as compared to the conventional surgical techniques which may require a second surgical donor site for bone harvesting and a longer time for bone consolidation before implant placement.

Keywords: Ridge expansion, Guided bone regeneration, Alveolar ridge augmentation

Key Message
Bone expansion with motorized threaders/expanders is predictable, time-saving and with lesser morbidity as compared to the conventional ridge augmentation procedures for Siebert's class 1 maxillary alveolar ridge defects.

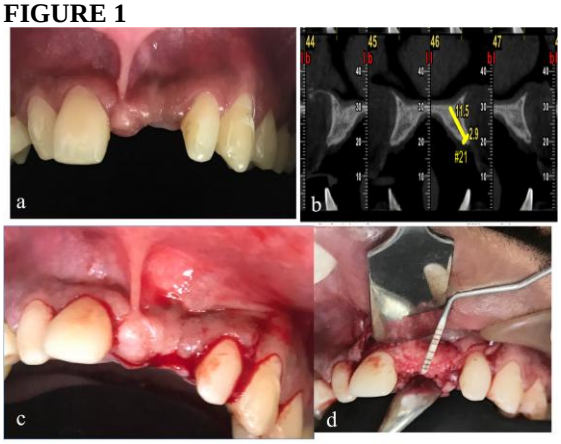
I. INTRODUCTION

Rehabilitation of alveolar ridge defects in the edentulous areas can be a daunting task for the treating clinician and may be attributed to trauma, denture wear andperiodontitis.[1] Management of such ridge defects especially in the aesthetic zone are challenging, and can be done with lateral augmentation, guided bone regeneration (GBR), bone-expansion (bone-splitting) techniques or a combination of these techniques.[2] Horizontal ridge augmentation by ridge split or ridge expansion procedures were introduced in the early 1970s and entails careful expansion of the cortical plates without compromising the periosteal attachment. It has more predictable results in maxilla than in the mandible and is ideally used for managing narrow edentulous ridges for implant placement.[3]

II. CASE HISTORY

A 28-year-old male reported to the outpatient department of Government dental college and hospital,Mumbai with the chief complaint of missing maxillary left central incisor (tooth # 21) due to trauma two years ago which led to the tooth evulsion. **(Figure 1a)**

FIGURE 1



Pre-operative assessment and Proposed treatment plan

The Labio-palatal width of the maxillary arch in tooth # 21 region as evaluated by Cone Beam Computed Tomography (CBCT) (Planmeca Promax Mid; Helsinki, Finland) was 2.9 mm from the ridge crest with the available ridge height of 11.5 mm. **(Figure 1b)** The width of the alveolar ridge increased apically and adequate amount of cortical and cancellous bone was available for the ridge expansion procedure. It was decided to do an alveoloplasty of one mm so as to have a plateau of bone for the implant osteotomy site. What was noteworthy was the thick gingival phenotype and the position of the interdental papilla. **(Figure 1a**) Because of the apical and palatal resorption of the alveolar ridge, the morphometrics of the incisive canal was altered and the incisive foramen was located near the alveolar ridge area. This progressive centripetal bone loss pattern of the

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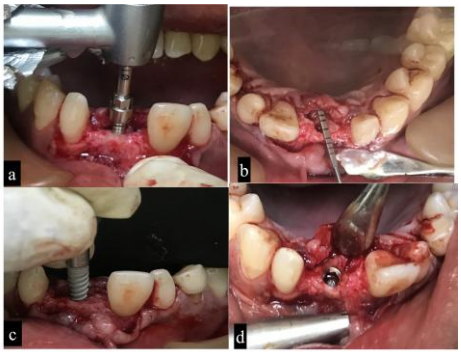
labial alveolar bone gave an illusion that the papilla has moved forward .

SURGICAL PHASE

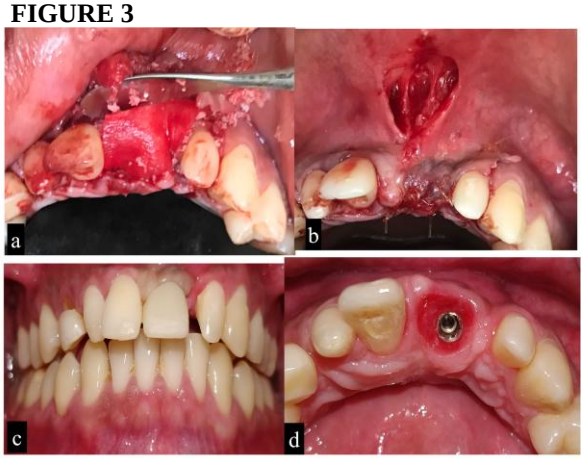
After taking an informed consent of the patient before the surgical procedure, standard protocols for implant placement were followed.After administering local anaesthesia(2% Lignocaine hydrochloride with adrenaline bitartrate, XICAINE®, ICPA Health Products Ltd, Mumbai, India) a mid-crestal incision was made and a full-thickness muco-periosteal flap was reflected exposing the residual alveolar bone (approximately three mm) at the site of implant placement.**(Figure 1c)**An oblique vertical releasing incisions extending beyond the mucogingival junction was given along the disto-buccal line angle of maxillary left lateral incisor (tooth # 22). (**Figure 1d)** The incision was given around the incisive papilla to avoid splitting the nasopalatine canal vessels. Site preparation began with the use of a tip drill followed by the two mm pilot drill (Adin Dental Implant Systems, Israel) at a speed of 1100 rpm up to the desired depth. Once adequate depth was attained, a series of threaded motorized expanders (RS kit, Dentium, Seoul, Korea) with progressively increasing diameter (1.4mm, 2mm,2.6mm) at 50rpm were used to gradually expand the site horizontally. (**Figure 2a).**

FIGURE 2



The ridge expanders gradually expand and simultaneously condense bone with minimal trauma in a step-wise manner; the alveolar crest after bone expansion was approximately 6mm labio-palatally. (**Figure 2b).** Finally, an implant of 3.5x 10 mm diameter (Adin® Touareg™ S, Israel) was placed (**Figure 2c)** with 1.5 mm of available alveolar bone present buccally and palatally after the implant placement. (**Figure 2d)** After decortication, guided bone regeneration was achieved with 1 cc of 0.25–1 mm particulate size, highly porous, and organic porcine xenograft (MinerOss XP, Biohorizons, USA) and a 15 mm × 20 mm bioresorbable Type 1bovine collagen membrane (Mem-Lok Biohorizons, USA). **(Figure 3a)**

FIGURE 3



A periosteal releasing incision was given and the flap was repositioned and sutured with a 4-0 synthetic absorbable monofilament surgical suture (Monosyn®). A frenectomy was done with complete excision of the frenum attachment to the underlying alveolar process **(Figure 3b)** and sutures were given.

Prosthetic Phase

At the second stage surgery for uncovering the implant after 3 months, a high collar gingival former (Adin® RS healing abutment Ø3×5 mm length) was left in place. A chair side highly polished and contoured screw- retained provisional crown was fabricated on the temporary abutment (UNP Temporary Abutment, Adin® Touareg™ S) with Bis -Acrylate composite resin. (Luxatemp DMG Germany)**(Figure 3c)**After eight weeks of provisionalization the desired sculpted peri-implant soft tissue contour was achieved**. (Figure 3d)** The cylindrical implant impression coping(NP Open tray transfer, Adin Dental Implant systems LTD; Israel) was contoured with light-cure composite resin (Tetric Evoflow, Ivoclar Vivadent, Lichtenstein) to correctly reproduce the emergence profile of the natural teeth.After Impression coping jig-verification trial was done, (**Figure 4a**) a screw -retained Porcelain fused -to -metal (PFM)crown was fabricated as the final prosthesis.**(Figure 4 b, c, d)** The post-operative CBCT after two years showed that there was sound cortico-cancellous bone labial and palatal to the implant suggesting good incorporation of graft material in alveolar bone. **(Figure 4 e)**

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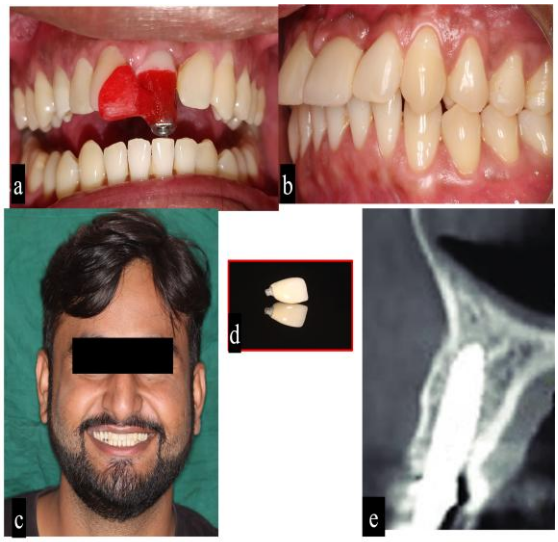
FIGURE 4



III. DISCUSSION:

From the morphologic standpoint, Siebert et al in 1983 had classified alveolar ridge defects as Class 1 (Bucco-lingual loss of tissue contour with a normal Apico-coronal height, Class II defect (Apico-coronal loss of tissue with normal buccolingual contour) and Class III defect (A combination of buccolingual and apicocoronal loss).[4]It was in the 1970s that Dr. Hilt Tatum had introduced a method of ridge splitting or bone spreading with specific instruments and osteotomes for implant placement in atrophic ridges.[3]The osteotome technique was introduced by Summers et al in 1994 and consists of a series of bone condensing instruments which simultaneously condensed the bone apically along with the expansion of the edentulous ridge without additional removal of bone.[5]There has been a paradigm shift from the conventional devices to the modern devices used for ridge expansion, which include motorized ridge expanders, piezo surgery and ultrasound bone surgery.[6]Recently, Osseo - densification with the Densah burs was introduced by Huwais which takes advantage of the visco-elastic properties to preserve and compact bone.[7] A retrospective study by Tang et al (2016) had suggested that implant placement with ridge expansion alone or in combination with GBR is a safe and effective treatment option for management of alveolar ridge deficiency. [8] Some studies found that survival rate of implants by this method was 86% and 97%. [9,10]

IV. CONCLUSIONS

Placements of implants in a narrow ridge are challenging especially in the maxillary anterior aesthetic zone and are successfully managed with ridge-splitting/expansion techniques. The key to the success of this surgical augmentative technique was attributed to the minimally invasive approach and a predictable choice of the surgical procedure which in turn led to long-term tissue stability.

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Acknowledgement: -NONE

LEGENDS

Figure 1a: -Partially edentulous span in tooth # 21 region. Thick gingival phenotype with a prominent incisive papilla.
Figure-1b: - CBCT of tooth # 21 region indicated 2.9 mm of bone from the ridge crest with the available ridge height of 11.5 mm.
Figure 1c: -A mid-crestal incision with an oblique vertical releasing incisions extending beyond the mucogingival junction was given along the disto-buccal line angle of tooth # 22
Figure 1d: -A full -thickness mucoperiosteal flap was reflected exposing the residual alveolar bone at the site of implant placement (approximately 3mm).
Figure 2a: -Threaded motorized expanders with progressively increasing diameter were used to gradually expand the site horizontally.
Figure 2b: -Labio-palatal measurement after sequential ridge expansion was approximately 6mm.
Figure2c**:** -An implant of 3.5x 10 mm diameter (Adin® Touareg^{TM} S, Israel) was placed.
Figure 2d: **-** Approximately 1.5 mm of available alveolar bone was present buccally and palatally after the implant placement.
Figure 3a: -GBR was done with Porcine xenograft (MinerOss XP, Biohorizons, USA) and a 15 mm × 20 mm bioresorbable Type 1bovine collagen membrane (Mem-Lok Biohorizons, USA)
Figure 3b: -A frenectomy was done with complete excision of the frenum attachment to the underlying alveolar processand sutures were given.
Figure 3c: -A highly polished and contoured screw- retained provisional crown fabricated on the temporary abutment.
Figure 3d: -After eight weeks of provisionalization the desired sculptedperi-implant soft tissue contour
Figure 4a: -Impression coping jig-verification trial.
Figure 4b, c, d: -The final prosthesis of a screw -retained Porcelain fused to metal crown
Figure 4e**: -** A 2-year post -operative CBCT shows that there was sound cortico-cancellous bone labial and palatal to the implant.