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"EXPANDING HORIZONS: TRANSFORMING ATROPHIC MANDIBULAR RIDGES WITH IMMEDIATE IMPLANT STRATEGIES: A CASE REPORT"

Dental Science

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ABSTRACT

Aim: To evaluate the effectiveness of the ESSET kit in ridge expansion with immediate implant placement in atrophic posterior mandibular ridges. **Materials And Method:** This case report describes ridge expansion using the ESSET kit (Hiossen® Implant) in a patient with limited alveolar ridge width. Following flap elevation, controlled ridge expansion was performed, and implants were placed immediately. Postoperative outcomes were monitored clinically and Radiographically. **Conclusion:** The ESSET kit enabled minimally invasive ridge expansion with immediate implant placement, achieving primary stability and favorable esthetic and functional outcomes. It offers a predictable and efficient approach for managing narrow ridges in the posterior mandible.

KEYWORDS

Ridge expansion, ESSET kit, knife-edge ridge, immediate implant placement

INTRODUCTION:

In recent years, dental implants have become the preferred solution over other fixed prostheses for replacing missing teeth. They offer a standardized and reliable approach, restoring both partially and fully edentulous regions with consistent long-term success. Their advantages include preserving alveolar bone, improving oral hygiene, and having a minimal impact on adjacent teeth. However, conditions like bone atrophy, periodontal disease, and trauma can cause horizontal alveolar ridge deficiencies, complicating implant placement.[1]

After tooth extraction, the socket remodels rapidly, with bone from the crest resorbed and deposited apically. This occurs fastest in the first two weeks and continues up to six months, causing significant changes in soft tissues and bone.[2] These changes create a hypermobile ridge crest, reduce alveolar bone height, and cause 3D alterations. More bone is resorbed in buccal and lingual areas, leading to knife-edge ridges. Factors affecting resorption degree are systemic conditions, hormones, chewing patterns, and inflammation.[3]

In 1985, Misch and Judy created a classification system for alveolar bone in implant dentistry, based on six resorption patterns by **D.A. Atwood.**[4,5] This study uses their classification, categorizing alveolar ridge defects by 3D morphology, severity, and extent. Defects limited to the bucco-lingual direction with normal ridge height are Class I defects. Those only in the apical-coronal direction are Class II defects. Defects involving both directions, with vertical and horizontal loss, are Class III, causing a reduction in ridge height and width. The severity of the alveolar ridge defect is considered mild (<4 mm), moderate (3-6 mm), or extensive (>6 mm).[6,7]

Long-standing edentulous arches often lead to narrow, knife-edge ridges in the posterior mandible, complicating implant placement. According to Atwood,[8] these knife-edge ridges can be managed using various techniques to augment the ridges and achieve at least 1 mm of bone around the implants. Techniques include bone block grafting, alveolar distraction osteogenesis, onlay grafting, and lateral augmentation, with or without bone regeneration—each with limitations like surgical risks and morbidity. Ridge-widening methods include bone spreading, osteotome technique, and ridge splitting.[9]

This case report describes the outcome of ridge expansion for implant placement in width insufficiency of alveolar ridges using ridge expansion kit (ESSET kit Hiossen® Implant).

Case Report:

A 46-year-old female patient presented to the Department of Periodontology, College of Dental Sciences and Research Centre, Ahmedabad, with a complaint of missing lower right posterior teeth and difficulty in chewing. Her mandibular posterior teeth had been previously extracted due to caries under local anesthesia without complications. The patient was systemically healthy.

Intraoral examination revealed missing teeth (45, 46, 47) and an atrophic ridge covered by thin, healthy, non-inflamed mucosa. After discussing treatment options, the patient opted for a fixed prosthesis to improve masticatory function.

A cone beam computed tomography (CBCT) scan showed inadequate labio-lingual ridge width (<3 mm) in the molar region (Figure 1A), but sufficient cortical and cancellous bone was available for ridge expansion. Immediate implant placement irt 45, and 46 with ridge expansion using the ESSET Kit was planned. Preoperative blood tests were conducted, and informed consent was obtained.

Alginate impressions were recorded, and presurgical diagnostic casts were prepared. Interocclusal distance was assessed on the cast, and the finalized treatment plan was reviewed with the patient.

Surgical Phase:

The patient was prepared for surgery, and a prophylactic antibiotic was administered one hour before the procedure. Local anesthesia (2% lignocaine with 1:80,000 adrenaline) was given via an inferior alveolar nerve block (Figure 1B). After achieving anesthesia, a mid-crestal incision was made using a #15 blade from the distal of the first premolar to the second molar. A full-thickness mucoperiosteal flap was elevated on both labial and lingual aspects (Figure 1C). Two immediate implants were planned in the mandibular posterior region (#45, 46).

For ridge expansion, the Easy Safe Stable Expanding and Tapping (ESSET) Kit was used (Figure 1D). The narrow ridge (2.6 mm) was modified using a crest remover (Ø7.0) at 1,200–1,500 rpm (Figure 1E). A twist drill (Ø1.8 mm) was used to mark the implant sites. Ridge expansion was performed with sequential drills (Ø1.6, 2.2, 2.7 mm) to 11.5 mm depth at 25–30 rpm. Adequate expansion enabled implant placement. After preparation of the implant site (figure 1F), Osstem implants (4.5 × 10 mm and 4.5 × 8.5 mm) were placed (Figure 1G,H).

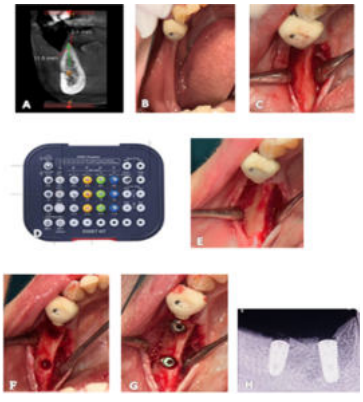

Figure 1: (A,B)- Preoperative CBCT & View, C- Incision & Reflection, D- ESSET Kit, E- Ridge Flattening, F- Osteotomy site irt 46,47 G- Implant placement irt 46,47 H- Postoperative radiograph irt 46,47

After implant placement, the remaining space was grafted with xenograft (ColoCast, Cologenesis) and autogenous bone, then covered with a bioresorbable collagen membrane (PerioCol-GTR, Eucare) (Figures 2A,B). The flap was closed without tension using simple interrupted 4-0 non-absorbable silk sutures (Figure 2C). Postoperative antibiotics, anti-inflammatory, and instructions were given. The patient was recalled after 10 days for suture removal.

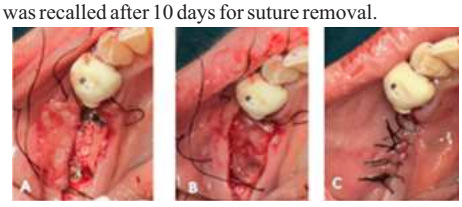

Figure 2: A-Bone grafting irt 45,46. B- Membrane placement irt 45,46 C-Silk sutures are taken

After 3 months, the cover screw was removed and a gingival former was placed. The final prosthesis was delivered at 6 months (Figure 3A). A CBCT after 6 months showed increased ridge width (Figure 3B).

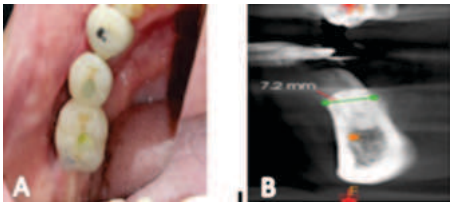

Figure 3: A- Prosthesis delivered, B- Postoperative CBCT

DISCUSSION:

Ridge expansion, first introduced by Hilt Tatum in 1986, addresses alveolar ridge width insufficiency by expanding the two cortical plates of the edentulous ridge. It offers advantages such as simultaneous implant placement, shorter treatment time, and no autologous bone harvesting. However, traditional ridge-splitting techniques can lead to issues like excessive vestibular inclination and labial/buccal bone fractures. Summers (1994) recommended using an osteotome with progressively increasing diameters for implant site preparation.[10,11] **Scipioni et al. (1997)**[12] reported a 98.8% implant survival rate over 5 years using ridge expansion techniques.

A similar study by **Vrushali et al. (2016)**[13] demonstrated horizontal ridge augmentation in the esthetic anterior zone with the ESSET kit, achieving over 3.5 mm in labiolingual width without significant surgical risks or the need for multiple surgeries. Similarly, **Manekar et al. (2022)**[14] reported a 3.2 mm gain in ridge width using motorized ridge expanders in the mandibular posterior sites.

In the present study, a 7.2 mm bone expansion was achieved with simultaneous implant placement. The ESSET kit, developed over 10 years under Dr. B.H. Suh's guidance addresses insufficient horizontal bone volume by utilizing natural stem cells from the expanded bone rather than graft materials. Since 2004, ridge expansion has become integrated into implant placement practices, emphasizing reduced surgical trauma, controlled bone resorption, and periosteal preservation. This study focuses on vertical tension-release osteotomy and a well-controlled expansion technique.

CONCLUSION:

Owing to its advantages over conventional methods, the ESSET kit is one of the most predictable and user-friendly techniques for implant placement in narrow ridges. Ridge splitting in the mandible, which is mainly cortical bone, carries a higher risk of cortical fractures. In contrast, ridge expansion using progressively larger screws reduces this risk, making it a more favorable approach for mandibular implant placement.

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