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Case Report Piezoelectric driven mandibular ridge split technique with immediate implant placement: A case report

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ARTICLE INFO	A B S T R A C T
Article history: Received 29-04-2021 Accepted 31-05-2021 Available online 26-07-2021	Narrow dentoalveolar ridges pose a major challenge for the successful placement of endosseous implants. This case report focuses on a Piezoelectric driven mandibular Ridge Split technique without vertical osteotomy for an immediate implant placement in a narrow alveolar ridge measuring 3.0mm. Materials and Methods: Following anaesthesia, a mucoperiosteal flap was elevated after giving a mid- crestal incision distal to 35 along the entire edentulous ridge. Then, with the help of a micro-saw and horizontal spreaders, an osteotomy site of required diameter was achieved. Finally twist drills were used and implants were placed in the expanded site. Result: Clinically, healing was uneventful with no step defect in the expanded buccal bone and the final occlusion obtained was satisfactory. Conclusion: The Piezo-electric driven Ridge Split technique promises to be a minimally invasive option for horizontal augmentation of narrow alveolar ridges- predictability within a short interval of time and with minimal risk of fracture.
<i>Keywords:</i> Alveolar ridge augmentation Dental implants Mandible Piezoelectric surgery Ridge split	
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1. Introduction

Successful implant therapy always requires sound osseous support. The technique of ridge split or ridge expansion was introduced in the early 1970s for horizontal ridge augmentation while maintaining the periosteal attachment by carefully expanding the cortical plates.¹ This technique had an added advantage of augmentation and implant placement in a single visit. Ridge splitting techniques are useful for managing narrow edentulous ridge (<3.5 mm) for implant placement with predictable outcome.

This case report focuses on a Piezoelectric driven mandibular Ridge Split technique without vertical osteotomy for immediate implant placement, followed by prosthetic rehabilitation of a narrow left posterior edentulous ridge.

2. Case Report

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A female patient aged 38 years reported to the Department of Periodontology and Implant Dentistry with a chief complaint of missing lower left back teeth which were extracted due to decay before two years. She requested fixed prosthesis, preferably implant supported. She was apparently healthy with no systemic illness. Patient had undergone replacement in upper and lower left back teeth region before three years. On clinical examination, an edentulous ridge in the lower left molar region was diagnosed (Siebiert's class I) (Figure 1 - Pre operative). To gain desirable horizontal width, a Ridge Split technique Piezoelectric surgery was planned. The treatment plan was explained to the patient, and a written consent duly obtained.

The site was anesthetized using 2% lignocaine 1:80,000 epinephrine. A mid-crestal incision extending from distal of premolar along the edentuolous region was given. A full thickness mucoperiosteal flaps was reflected on the buccal and lingual aspects to get sufficient access (Figure 2

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- Incision and flap elevation). Initially, a round tip UL 3 was used to mark the osteotomy site on the residual ridge. Horizontal bone osteotomy was then performed in the middle of the ridge using a piezoelectric surgery unit (Guilin Woodpecker Medical US-II LED), starting from 2 mm distal to the premolar (35), and extending posteriorly to the planned distal implant without giving vertical osteotomy at the site (Figure 3 - Piezoelectric assisted horizontal rigde split). Then, a micro-saw US1 & US 2 was used sequentially for the initial osteotomy, which was deepened by a UL4 to the desired depth (Figure 4 -Horizontal rigde split). Osteotomy site was prepared for the implant placement in relation to 36 and 37, a pilot drill of about 2mm initially was placed. Then, Horizontal spreaders (bone expanders kit -AXE Bone Expanders) were inserted in the osteotomy site employing a series of non-cutting bone spreaders of increasing diameters for the gradual densification of the cancellous bone and the expansion of the osteotomy. Bone expanders were inserted in the increasing of orders diameter such as, 2.6mm, 3.0mm, 3.4mm and finally 3.8mm using hand ratchet, sequentially (Figure 5 A&B- Ridge expansion with series of bone spreader). Thus bone expanders were used until a desired ridge expansion of about 6mm, respectively. Finally twist drills were used for preparation of the implant beds and then two implants of dimensions about 4.2mm×11.5mm (NORIS) were placed in the osteotome sites and submerged (Two stage implant) in relation to 36 and 37 (Figures 6 and 7 - Osteotomy after ridge expansion & thread exposure after implant placement in 36,37). On inspection, there was a minimal exposure of implant threads were seen at the site. In order to counteract the exposed threads alloplast graft material (B-OstIN ,Beta tricalcium phosphate) in the remnant spaces between the cortices along with a collagen membrane (ColoGide) above the graft were placed and secured well at the site of implant placement (Figure 8 A&B- Defect site grafted with B-OstIN grafting material & graft secured with cologuide collagen membrane). Finally, the elevated flaps were approximated without tension using 3-0 silk sutures in relation to 36 and 37, respectively (Figure 9 - Sutures placed). The patient was put on antibiotic (Amoxycillin 500mg and Metronidazole 400mg) and analgesic (Zerodol SP) for five days. The site was allowed to heal for a period of four months after which, the second stage surgery was performed to place the healing caps. (Figure 10 - Healing after 4 months). Two weeks later, cement retained porcelain-fused-to-metal crowns were cemented in relation to 36 and 37 with proper occlusion.(Figure 11 A&B- Cement retained porcelainfused-to-metal crowns in relation to 36,37). The patient was on periodic recall visits and proper oral hygiene instructions were given accordingly.



Fig. 1: Pre operative



Fig. 2: Incision and flap elevation



Fig. 3: Piezoelectric assisted horizontal ridge split



Fig. 4: Horizontal ridge split



Fig. 5: Ridge expansion with series of bone spreader



Fig. 9: Sutures placed



Fig. 6: Osteotomy after ridge expansion



Fig. 7: Thread exposure after implant placement in 36,37



Fig. 8: Defect site grafted with B-OstIN grafting material & graft secured with cologuide collagen membrane



Fig. 10: Healing after 4 months



Fig. 11: Cement retained porcelain-fused-to-metal crowns in relation to 36,37

3. Discussion

This is a case report of implant placement in a deficient alveolar ridge of width 3mm. This case was managed by a Ridge Split with the support of Piezoelectric surgery in relation to 36,37. Ridge split creates a 4-wall defect with cortical envelope and thus simulates an extraction socket. Vertical osteotomy was avoided to preserve the vascularity of the ridge. An internal coagulum that forms with the placement of interpositional grafting helps in healing and early woven bone formation. This technique provides excellent protection to the graft from exposure and displacement, while providing vascularization from both the cortices and basal bone by internal perfusion throughout the whole healing process. Also, the usage of piezoelectric surgery for horizontal osteotomy provided a great advantage over the conventional hand mallet. Since the latter has various drawbacks such as uncontrolled force, incidence of fracture and other associated complications.² Thus, in the present case, a Ridge Split technique which is minimally invasive, provided a predictable outcome and allowed reduced treatment duration by reducing the waiting time for the second surgery, less bone heating and also low morbidity to add up on.

Following tooth extraction, the horizontal resorption of bone shows various sequelae in different yet certain patterns. There is accelerated bone loss in the labial wall of the maxilla termed as 'centripetal resorption', while, the lingual wall of mandible tend to resorb faster known as centrifugal resorption.³ Alveolar ridge width deficiency can be due to either cortical or cancellous bone resorption. However, cortical plate deficiency affects the implant survival to a greater extent because subsequently, it can cause implant dehiscence after implant insertion and enhanced bone loss following implant loading.⁴

Alveolar ridge split technique was introduced by Tatum Jr. in 1986 with the aim of increasing the amount of bone in the maxilla.⁵ This was later adopted by Summers in 1994 and 1992. Simion et al. used a longitudinal greenstick fracture in order to extend the socket, performed through osteotomies. In 1994, Scipioni et al. described another variation, whereby a partial thickness flap is created, followed by vertical intraosseous incisions and the simultaneous displacement of the buccal cortical plate, including a portion of cancellous bone, and the implant Placement.¹

Comparing various techniques that were advocated for implant placement in a horizontally deficient ridge, Ridge-Split technique provides several advantages such as predictable ridge expansion of 2–4 mm, optimal graft stability and decreased postoperative graft exposure, lack of donor site morbidity (as with Onlay block grafting), and remarkably allows immediate implant insertion. Simion et al. in 1992, first introduced the ridge split technique to provide implant driven treatment for horizontally resorbed ridges.⁶ Following this, several modifications of the original technique have been proposed. Minimum ridge width required for ridge split is 3–4 mm and an adequate ridge height of >10 mm is required to achieve primary stability during immediate implant placement.

Ridge augmentation in deficient alveolar ridges are achieved by block graft (autogenous or allograft), guided bone regeneration, distraction osteogenesis and alveolar ridge splitting or expansion with predictable outcomes either alone or in combination. Use of an autogenous onlay bone graft, harvested from various sites, is a predictable procedure to reestablish an appropriate alveolar ridge width. However, the disadvantages of this includes donor site morbidity, long healing period of about six months, graft resorption, and a staged approach that necessitate two surgical interventions.⁷ Although GBR is a well documented technique, the long healing time that leads to bone regeneration from 9 to 12 months, and the risk of membrane collapse, exposure, or infection, with incomplete reformation of the bone are the disadvantages of this technique.⁸

Ridge splitting techniques are useful for managing narrow edentulous ridge <3.5 mm for implant placement with predictable outcome. The advantage of this includes, that the expanded defect heals in a similar manner to an extraction socket and simultaneous implant placement, in the space formed after the dislocation of the buccal plate in a labial direction. The limitation of this technique lies in its inability to create bone vertically. Therefore, it is not indicated for the correction of vertical defects.⁹

4. Conclusion

There are very many methods for augmentation of the resorbed alveolar ridge (<3.5mm) prior to implant placement. The most important factor for a very successful ridge split is careful patient selection and accurate alveolar bone evaluation. Piezoelectric surgery assisted Ridge Split technique is a very predictable procedure that can achieve substantial gains in horizontal ridge width of the edentulous posterior mandible without associated morbidity.⁹ This technique while allowing the clinician to augment the implant site, concurrently paves the way for implant placement in a single stage, shortening the healing period drastically. Thus, afore mentioned technique, while satisfying the goals of implant therapy, also provides a fully functional restoration that is in harmony with the existing natural dentition.

5. Conflicts of interest

All authors declare no conflicts of interest pertaining to the stated work.

6. Source of Funding

None.

References

- Elian N, Jalbout Z, Ehrlich B, Classi A, Cho SC, Al-Kahtani F, et al. A Two-Stage Full-Arch Ridge Expansion Technique: Review of the Literature and Clinical Guidelines. *Implant Dent.* 2008;17(1):16–23. doi:10.1097/id.0b013e318166d3a3.
- Belleggia F, Pozzi A, Rocci M, Barlattani A, Gargari M. Piezoelectric surgery in mandibular split crest technique with immediate implant placement: a case report. *Oral Implantol (Rome)*. 2008;1(3-4):116–23.
- Qahash M, Susin C, Polimeni G, Hall J, Wikesjö UME. Bone healing dynamics at buccal peri-implant sites. *Clin Oral Implants Res.* 2008;19(2):166–72. doi:10.1111/j.1600-0501.2007.01428.x.
- Cawood JI, Howell RA. A classification of the edentulous jaws. Int J Oral Maxillofac Surg. 1988;17(4):232–6. doi:10.1016/s0901-5027(88)80047-x.

 Tatum H. Maxillary and sinus implant reconstructions. *Dent Clin North* Am. 1986;30(2):207–29.

 Tolstunov L. Classification of the Alveolar Ridge Width: Implant-Driven Treatment Considerations for the Horizontally Deficient Alveolar Ridges. *J Oral Implantol.* 2014;40(S1):365–70. doi:10.1563/aaid-joi-d-14-00023.

- 7. Boyne PJ, Mikels TE. Restoration of alveolar ridges by intramandibular transposition osseous grafting. *J Oral Surg.* 1968;26(9):569–76.
- Parma-Benfenati S, Tinti C, Albrektsson T, Johansson C. Histologic evaluation of guided vertical ridge augmentation around implants in humans. *Int J Periodontics Restor Dent*. 1999;19(5):424–37.
- Mechery R, Thiruvalluvan N, Sreehari AK. Ridge split and implant placement in deficient alveolar ridge: Case report and an update. *Contemp Clin Dent*. 2015;6(1):94–7. doi:10.4103/0976-237x.149300.

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Cite this article: Indumathi M, Mozhi U A, Sudarsan S, Priya R S. Piezoelectric driven mandibular ridge split technique with immediate implant placement: A case report. *IP Int J Periodontol Implantol* 2021;6(2):126-130.