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Immediate Implant Placement With Ridge Split in A Siebert's Class 1 Defect - A Case Report

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Abstract: ***Thin ridges often pose hindrance in oral implant placement. Inadequate width of ridge requires Innovative techniques in placing implants. One of such techniques is ridge splitting technique, Which helps expansion of the ridge with or without fracture of cortical plates. This technique has the advantage of immediate implant loading, in comparison with other ridge widening techniques. This article deals with a case study using the ridge splitting technique .This case report describes the ridge expansion, followed by placement of a dental implant in the left maxillary central area . Ridge expansion was done in relation to # 21and osteotomy was prepared to the required depth. After proper treatment planning endo osseous implant measuring 3.5mm in diameter and 11mm in length was placed. Final crown cementation was done with zirconia crown , 3months after the insertion of implant. The ridge split operating technique and the immediate insertion of the implant resulted in the minimal resorption of the alveolar bone along with max expansion. The patient exhibited no clinical or radiographic complications through 12 months of clinical monitoring after loading. The immediate implant with ridge splitting provided the patient with less number of dental visits and good aesthetics. The sequential surgical, technical, and restorative techniques were blended into one successful protocol, which was demonstrated with this clinical case report.***

Keywords: Immediate Implant, Endo-Osseous Implant, Osseointegration, Ridge Preservation, ridge splitting

1. Introduction

Adequate amount of bone is a essential pre-requisite for implant placement in oral implant therapy. Etiologies such as extraction, trauma, periodontal disease results in decreased bone quantity. Inadequate horizontal bone volume often results in an implant surface exposure and consequent decrease in bone-implant interface leading to implant failure. Seibert[1] has classified the ridge defects as a) Class 1- loss of bucco-lingual width but normal apico-coronal height b) Class 2- loss of apico-coronal height but normal bucco-lingual width c) Class 3- a combination of loss of both height and width of the ridge. Various surgical widening techniques have been described: Guided bone regeneration,[2,3] onlay block bone grafting,[4,5] ridge split technique or ridge expansion[6,7,8] and distraction osteogenesis.[9]

The technique of ridge split or ridge expansion also called as widening technique was first done by Hilt Tatum was introduced in early 1970s for horizontal ridge augmentation while maintaining the periosteal attachment by carefully expanding the cortical plates. This technique had an added advantage of augmentation and implant placement in a single sitting. Ridge splitting techniques are useful for managing narrow edentulous ridge (>3.5 mm) for implant placement with predictable outcome in maxilla than in mandible.[10]

The ridge splitting technique may have an advantage over other ridge augmentation techniques as bone grafting may be done simultaneously during implant placement. The simultaneous implant placement shortens the treatment period in comparison with other techniques.[11]

2. Case Report

A 31-year-old man with a chief complaint of missing anterior teeth #21 reported to the dental outpatient department.(figure 1) clinical examination revealed an edentulous space with defective labial bone.(fig2) On intraoral and extra oral examination , no other abnormality was detected. He was in a good general healthy condition, with no chronic systemic disease or smoking habits. Pre-surgical radiographic evaluation was done with Intraoral periapical radiograph , panoramic radiograph (OPG) and CT scan (fig 3). Clinical and radiographic examination showed that the ideal vertical bone height and inter arch space both favor implant placement. The ridge width of 5 mm was not adequate for implant. It was decided to augment the alveolar crest horizontally. Pre- surgical diagnostic cast were prepared (fig4). Serological analysis was also carried out for appropriate treatment planning which showed no abnormality.

2.1 Procedure

Informed consent of the patient was taken before surgical procedure. The patient evaluation and preparation for implant placement followd the standard protocol for implant procedures. Bone height calculation was done with conventional radiograph; advanced CT scanning was advocated to asses bone density. With 2% lidocaine local anesthesia buccal and palatal infiltration in #21 region was administered , a full thickness flap was raised to expose the defect, and surface of the bone was freed from the surrounding soft tissue and periosteal fibers.(fig 5). In the lateral cortices periosteum was kept intact to ensure blood supply to the underlying bone.

The initial osteotomy was performed on mid-crestal bone using a #15 blade (fig6). Followed by use of expanders in a sequence to widen the buccal plate (fig7). Osteotomy of length 11mm was done with sequential drills to place 3.5 mm diameter implant. The osteotomy was directed to cut the palatal plate and completely avoiding of buccal plate, so that it bisects the ridge crest and separates the cortical plates. The length of the osteotomy along the edentulous span was extend well beyond the planned implant sites, which allowed

a hinging of bony plates at the base of the ridge split osteotomy. An implant of length 11 mm and diameter 3.5 mm was placed using the motor driver at 25rpm (fig 8).The implant was kept away from buccal plate and primary stability was achieved from palatal plate. The implant mount was removed after judging the sub-crestal placement of implant by 1mm (fig 9). 3-0 vicryl sutures placed to achieve primary closure. (fig10).Patient was given adequate post-operative antibiotic and anti-inflammatory cover. Patient was recalled after 48 hours and suture removal was done after 10 days post- implant placement. Temporization was done with acrylic crown and this was bonded with the adjacent tooth with composite (.fig 11)

2.2 Prosthetic Phase

After three months the bonded temporary crown was removed and a gingival former of gingival height 3 mm was placed .(fig 12) impression made using a closed tray technique with polyether(fig13) abutment selection was done using the posterior balance selection tray and an abutment with gingival height (GH) 0.75, 15 degrees, was selected. Abutment was milled as per case requirement. Abutment transfer jig was made in pattern resin.(fig 14) A zirconia coping trial (cercon) prepared on the milled abutment and coping trial was checked for fit, tooth contacts and incisal clearance(fig 15).after thorough evaluation of the trial and approval of the same, shade selection was done for the final zirconia crown. Shade A3 (vita classic shade guide), with cervical staining to replicate the adjacent tooth was selected. A bisque trial of the crown was done. Incisal adjustment was done in centric and protrusive movements. Abutment was tightened with a torque driver at 15N (newton) and the access hole on the abutment was sealed with light cure composite. Cementation of the crown was done (fig 16) with zinc phosphate cement and flossability of contacts were checked. Intra oral peri apical radiographs (IOPA) was taken to check for excess cement and crown fit. The patient was recalled after an interval of 3 weeks, 1 month, 6 months and 1 year. IOPA taken 15 months after implant placement showed stable bone around the implant (fig 17). A yearly recall visit schedule was given to patient.

3. Discussion

The ridge splitting technique allows single implant placement in a narrow crestal ridge. The surgical success and implant survival rate are high in this technique .[12] Though partial thickness flaps are also advocated, full thickness flaps were used to avoid excessive bleeding, resulting in better visualization of the operating sites and better handling of the surgical steps. The partial thickness flap procedure becomes difficult, if there is thin connective tissue, and remaining tissue over the alveolar bone is too thin to protect the bone adequately. [13] Augmentation of deficient alveolar ridges is required in implant treatment plan so as to reduce stress at crestal bone region since; faciopalatal bone is often only 4-6 mm wide at the crest with/without an "hourglass" facial deformity.[14]

Dr. Hilt Tatum 1970s introduced a method of ridge splitting or bone spreading Later, Summers and Scipioni *et al.* in 1994 revived and published articles on edentulous ridge expansion with 98.8% implant survival rate for over 5 years. [15] With the emergence of implant dentistry and introduction of microsaws, piezosaws, and specific ridge split osteotomes this technique has become an integral part of implant dentistry, wherein primarily bone expansion techniques were indicated in regions of division B bone volume and density of D3 or D4. Bone due to its dynamic viscoelastic nature thinner ridges (<3.5 mm) can be expanded with better controlled instrumentation with less risk for fracture, trauma and bone perforations. The softer the trabacular bone quality, the lower the elastic modulus and greater the viscoelastic nature of the ridge. Therefore, the less dense the bone, the easier and more predictable the bone expansion. [16,17] Maxillary crestal osteotomy may be done with BP blade number 15 and with the assistance of the surgical burs. Plate expansion may be done with bone expanders. The possibility of treating only horizontal defects and necessity of spongy bone are the limitations of this technique. The following are the benefits of ridge splitting technique in comparison to other techniques.[18]

1) It allows less invasive procedure of implant placement and avoids donor-site morbidity caused by bone grafting and
2) It also allows primary implant placement and short treatment time. It allows treatment of narrow ridge location within the context of a routine dental office procedure.

Several authors advocated different ridge split technique,[6] in which crestal cut osteotomy is joined to adjacent vertical osteotomy cut on either or on both side followed by creation of greenstick fracture of buccal plate. After the expansion of osteotomy to appropriate size, it is either grafted with bone graft (two step) or implant is placed at same appointment (single step).[7]

Sethi and Kaus have reported more than 97% of success rate in two staged implant placed by osteotome through maxillary expansion in a 5 year study.[8]

The author has successfully taken large ridges in the maxilla 3-4 mm wide and expanded them to 5-6 mm wide. If an increase in width in ridges <3 mm wide is desired, other techniques, such as onlay grafting, GBR augmentation, distraction osteogenesis or nerve repositioning must be used.

4. Figures

Fig 1

Figure1: First visit to Dental Opd

Fig2

Figure2: Edentulous space with defective labial bone

Fig 3

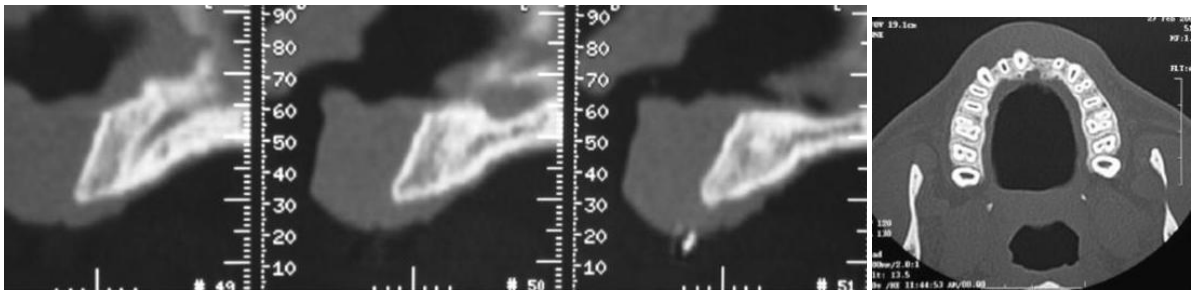

Figure 3: CT Scan images

Fig4

Figure 4: Pre- surgical diagnostic cast

Fig 5

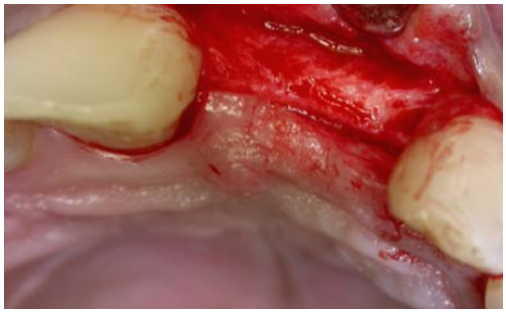

Figure 5: flap raised to expose the defect

Fig6

Figure 6: The initial osteotomy was performed on mid-crestal bone using a #15 blade

Fig7

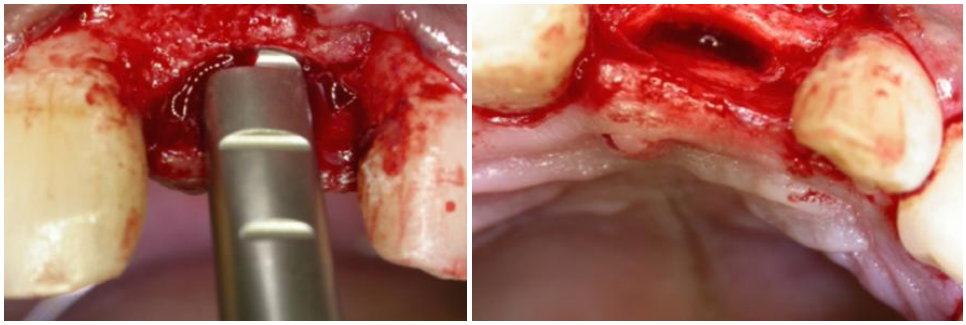

Figure 7: Use of expanders

Fig 8

Figure 8: An implant of length 11 mm and diameter 3.5 mm was placed using the motor driver at 25rpm

Fig 9

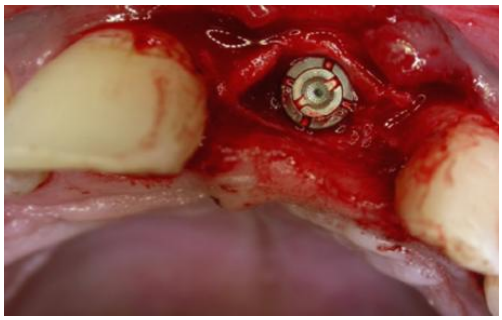

Figure 9: The implant mount was removed after judging the sub-crestal placement of implant by 1mm

Fig 10

Figure 10: vicryl sutures placed

Fig 11

Figure 11: Temporization was done with acrylic crown and this was bonded with the adjacent tooth with composite

Fig 12

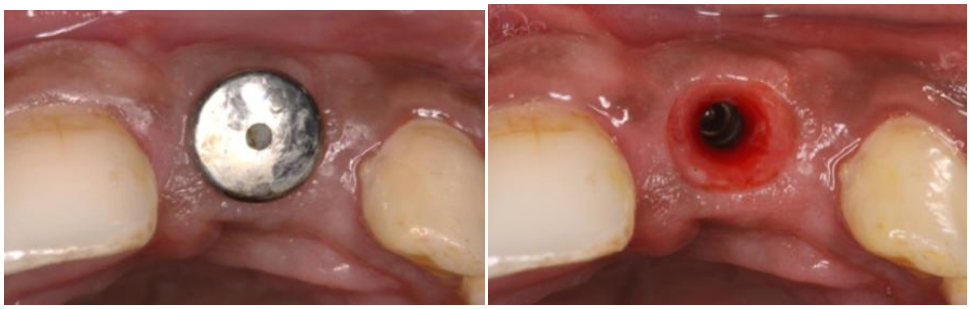

Figure 12: After three months a gingival former of gingival height 3 mm was placed

Fig 13

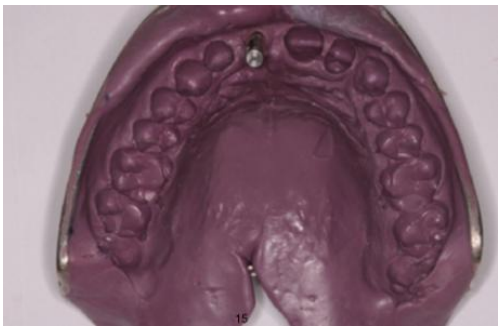

Figure 13: Impression made using a closed tray technique with polyether

Fig 14

Figure 14: Abutment jig was made in pattern resin

Fig 15

Figure 15: A zirconia coping trial (cercon) prepared on the milled abutment

Fig 16

Figure 16: Cementation of the crown

Fig17

Figure 17: IOPA taken 15 months after implant placement

5. Conclusion

The ideal goals of implant dentistry augmentation of deficient alveolar ridges is an important aspect of dental implant therapy with the end goal to provide functional restoration that is in harmony with the adjacent natural dentition as in this case report.

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