Split Ridge Technique for Dental Implant Placement in the Esthetic Zone: A Case Report

Hana Gadalla1* and Bassam M Kinaia2

1Clinical Assistant Professor, Division of Graduate Periodontics, University of Detroit Mercy School of Dentistry, Detroit, MI, USA
2Director and Associate Professor, Division of Graduate Periodontics, University of Detroit Mercy School of Dentistry, Detroit, MI, USA

*Corresponding Author: Hana Gadalla, Clinical Assistant Professor, Division of Graduate Periodontics, University of Detroit Mercy School of Dentistry, Detroit, MI, USA.

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Abstract

Background: Alveolar ridge deficiency is a common occurrence post extraction. Multiple surgical techniques are used to rebuild the alveolar ridge for proper implant placement including the concept of guided tissue regeneration before or at time of implant placement. Split ridge procedure is a technique that is used to increase the width of narrow ridge with simultaneous implant placement with high success rates (98 - 100%).

Case Report: A 44 year old female presented with missing teeth No. 8, 9 due to trauma for more than 1 year. Upon examination, patient had a thick biotype with horizontal ridge deficiency where implant placement with simultaneous bone grafting was indicated. Clinically, there was approximately 5 - 6 mm of ridge width and 4.74 mm bone width as confirmed by the CBCT. Split ridge procedure was performed using piezosurgery, along with bone expanders and placement of two dental implants combined with bone grafting. Patient follow up for 1 year after implant placement.

Results: The bone expansion was successful. The bone width gain was approximately 3 mm, which provided an adequate width to accommodate the dental implants. The two implants were inserted without complication and the primary stability was achieved at 35 ncm. The two implants were successfully loaded. WES and PES scored were used to objectively examine the soft tissue around implants.

Conclusion: The present case demonstrates the effectiveness of split ridge in increase the width of deficient ridge with simultaneous implant placement.

Keywords: Split Ridge Technique; Dental Implant; Esthetic Zone

Introduction

Dental implants are a common treatment for replacement of natural teeth with predictable esthetic results [1,2]. After tooth loss, alveolar ridge resorption occurs resulting in esthetic and functional challenges [3-5]. Average alveolar ridge resorption of 1.5 - 2.0 mm vertically and 40 - 60% horizontally have been reported [6,7]. Such changes, especially in the esthetic zone can be difficult to correct and is dependent on the degree of alveolar ridge deficiency. In an attempt to compensate for such deficiency, a multidisciplinary approach including ridge augmentation and restorative technique is often required [8-10].

Several guided bone regeneration techniques have been used to rebuild the deficient ridge [11,12]. In order to increase the bone width, height and improve bone quality including guided bone regeneration [13], only ridge bone grafting [11]. However, these procedures revealed several disadvantages, including the necessity of second surgical site [14], graft materials resorption [15,16], delayed implant
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placement 3 - 6 months of healing [17], membrane exposure [18]. These complication may lead to increase the duration and cost of treatment [16]. Split ridge technique represented as less invasive alternative approach to treat deficient ridge in bucco-lingual dimension with simultaneous implant placement in short treatment duration [19]. It allows reliable expansion of atrophic ridges, which helps placing implant inside the alveolar bone housing with adequate blood supply with success rate (89 - 100%) [20]. Aim of this case report to present case was treated with ridge split technique with simultaneous implant placement in esthetic zone with 1 year follow up.

Methods

Split Ridge Technique is a viable option with horizontal defects ranged from 3 - 5 mm and no need for vertical augmentation. It's preferred to perform split ridge for narrow ridges minimum of 3 mm. The 3 mm bone will have at least 1 mm of trabecular bone between the two cortical plates [21]. That will ensure housing the implant with good surrounding blood supply [20]. There has been a preference of split ridge in maxillary teeth rather than mandibular teeth because of bone quality. Maxillary bone is softer than mandibular Bone. The use of osteotome in split ridge may improve the bone quality around implant and achieve primary stability [22].

Case Presentation

A 44 year old female with medical history of asthma and bipolar disorder controlled with medications presented with a history of trauma in the anterior region. Teeth No. 8, 9 and 25 were extracted a year ago. Clinical and radiographic examinations revealed a thick biotype with horizontal ridge deficiency (Figure 1). Treatment plan included implant placement with simultaneous bone grafting via ridge split and patient consented to treatment. Radiographically, there was approximately 4 - 5 mm bone width at the crest and 6 - 8 mm at the apex as confirmed by the Cone Beam Computed Tomography (CBCT) (Figure 2).

The patient rinsed with a 0.12% chlorhexidine (Hi-Tech Pharmacal Co., Inc. Amityville, NY, USA) solution for a minute pre-surgically. Local anesthesia was administrated using 2% lidocaine with 1:100,000 epinephrine (Empi, Inc., St. Paul, MN). Para-crestal and vertical incisions were performed No. 7 mesial to 10 mesial with full thickness flap reflection facially and palatally (Figure 3). Using a surgical guide, osteotomy sites were marked and split ridge using piezosurgery was initiated via one crestal cut and two vertical cuts through cortical bone (Figure 4). Ridge split was further enlarged using bone expanders until facial and palatal plats were separated (Figure 5). Osteotomy was performed using sequential drilling under copious saline irrigation and two dental implants (3.7 x 10 mm) (Tapered Screw-Vent®, Zimmer Dental Inc., Carlsbad, CA) were placed at 30Ncm (Figure 6). The expanded ridge was augmented using particulate freeze-dried cancellous bone allograft and a resorbable collagen membrane (Puros and Biomend Extend, Zimmer Dental, Carlsbad, CA) (Figure 7). The flap was approximated for primary closure and the patient was followed up at 1, 2, 4 weeks (Figure 8). The implants were surgical exposed at 4 months maintaining adequate keratinized facially (Figure 9) and allowed to heal for 4 more weeks (Figure 10).
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**Figure 5**

**Figure 6**

**Figure 7**
Restorative treatment

At 5 months, a screw-retained provisional was fabricated using auto-polymerizing acrylic resin material to develop the soft tissue profile (Figure 11). The final crown was delivered after 6 months (Figure 12). The follow-ups at 12 months (Figure 13) demonstrated adequate soft tissue volume with a good esthetic outcome.

Figure 11

Figure 12
The pink esthetic score (PES) [23] and white esthetic score index (WES) [24] were applied in order to objectively evaluate the soft tissue around implant and implant restoration at restoration delivery (Baseline) and at 1 year follow up (Table 1 and 2).

Table 1: Summary results of the preoperative and 12-months follow up for the Pink Esthetic Scores (PES) and White Esthetic Scores (WES).

<table>
<thead>
<tr>
<th>Site</th>
<th>Mesial Papilla</th>
<th>Distal Papilla</th>
<th>Curvature of facial mucosa</th>
<th>Level of Facial Mucosa</th>
<th>Root convexity, Soft tissue color and Texture</th>
<th>Total PES</th>
<th>Tooth form</th>
<th>Tooth volume/Outline</th>
<th>Color (Hue/Value)</th>
<th>Surface Texture</th>
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Table 2: Summary results of the Mean Pink Esthetic Scores (PES) and White Esthetic Scores (WES) at 12 months follow up.

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Results

The bone expansion was successful. The bone width gain was approximately 3 mm, which provided an adequate width to accommodate the dental implants. The two implants were inserted without complication and the primary stability was achieved at 35 ncm. The two implants were successfully loaded.

Discussion

The present case report examined the amount of increase of labiolingual width of a narrow ridge with simultaneous implant placement following split ridge procedure in anterior maxilla. This technique allows dental implant placement in areas involving insufficient bone width by moving the labial external cortical plate labially [25]. There are many advantages to this procedure. First, it eliminates the need for second surgical site to harvest the bone graft like intra-oral or Extra-oral site, therefore reduced the patient morbidity [14]. Also, Chiapasco 2009 reported that it allows reliable expansion of atrophic ridges that permit immediate implant placement an inside alveolar bony housing with adequate blood supply and High success rates (98 - 100%) [20]. Also, this technique is more suitable in maxilla rather than mandible because of thinner cortical plates and softer medullary bone [26].

Conclusion

This case demonstrates the effectiveness of split ridge in increase the width of deficient ridge with simultaneous implant placement.

Bibliography


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