

Vertical Bone Augmentation Using Dental Implant in the Maxillary Anterior Region: A Case Report with Six-Year Follow-Up

Aeklavya Panjali*

Director, New York Implant Institute, Private Practice, USA

***Corresponding Author:** Aeklavya Panjali, Director, New York Implant Institute, Private Practice, USA.

Received: December 27, 2016; **Published:** January 20, 2017

Abstract

Gain height and augment ridges using dental implants in a fairly atraumatic and simple way to restore single edentulous areas with limited bone height, while achieving good bone coverage on exposed threads for along term stability and function.

Keywords: *Dental Implant; Vertical Augmentation; Bone Graft; Tenting; Membrane*

Introduction

Implants have successfully been used to replace single or multiple missing teeth to restore aesthetics, form and function. One of the key factors for successful implant supported prosthesis is good bone quality and quantity. Implants with excellent primary stability provide rigid fixation. For any type of tissue regeneration there are four important factors: (1) Space creation and maintenance, (2) Stability, (3) Angiogenesis and (4) Primary closure -Site development is required in cases where there is loss of vertical height, and a ridge augmentation is typically recommended prior to implant placement. An attempt was made to augment the ridge in vertical as well as horizontal direction using immediately placed dental implant [9].

Case Presentation

As a practicing dentist we are often faced with challenges and clinical situations where conventional treatment is not an option. Based upon the needs and financial constraints of the patients, we often have to modify treatment plans. In this case, we had both financial and time constraints to fulfill the patients needs. Hypothesis in this case was that vertical augmentation could be done with immediate placement utilizing an implant for structural support and stability [9]. A52-year-old male patient presented to the private dental practice with the chief complaint of inability to wear partial denture in maxillary right edentulous area. CBCT revealed a partially impacted right maxillary canine (#6) with missing right maxillary lateral incisor (#7). All posterior teeth posterior to #6 are missing with only the distal part of # 6 erupted (Figure 1). Intraoral examination of the patient revealed that the incisal tip of right canine had approached the cervical 1/3rd of distal aspect of the root of the right central incisor (#8) (Figure 2), and there is recession on disto facial line angle of # 8. The patient was given the option of coronectomy but patient had concerns about the missing # 7 and did not wish to replace existing partial. It was planned to extract # 6 preserving as much facial bone, followed by an implant-supported restoration on # 7.

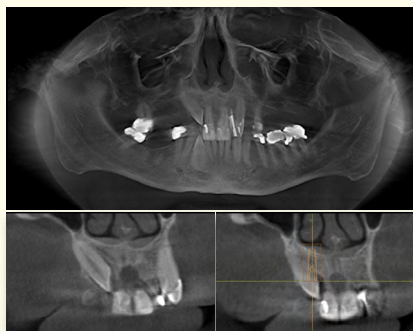


Figure 1



Figure 2

Surgical Protocol

Patient was pre-medicated with four tablets of 500mg amoxicillin an hour before the surgery. 2% lidocaine with 1:100,000 epinephrine (2 corpules) was used to infiltrate the site. To ensure adequate blood supply on closure, a mid crestal and two vertical releasing incisions were given to reflect a freely movable, full thickness flap(including the periosteum) (Figure 3). Due to unfavorable angulation of #6 in relation to #8, #6 was sectioned at the cemento enamel junction (CEJ) and the coronal section was removed (Figure 4). An attempt was made to remove the remaining radicular portion of #6 atraumatically thereby preserving the facial bone. During the extraction the facial cortical plate in relation to #6 fractured while luxating the tooth (Figure 6). The tooth was extracted and the facial plate was preserved for autogenous graft purposes (Figure 5). Area # 7 had a zero wall defect with a vertical bone loss of 9mm from the crest of the planned osteotomy site to cemento enamel junction of #8 (Figure 7).



Figure 3



Figure 4



Figure 5

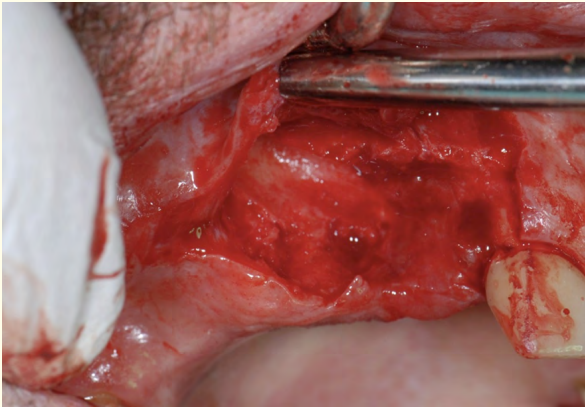


Figure 6

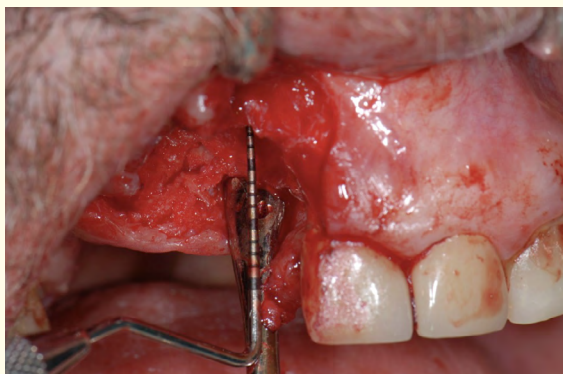


Figure 7

An ANKYLOS (Dentsply) implant 3.5x14 mm was chosen and was planned for 2 mm sub-crestal placement in relation to the CEJ of # 8, with a ANKYLOS standard C straight abutment of 4.5 mm gingival height (Figure 8, 9). Four vials of intravenous blood was drawn from the patient and centrifuged at pre-set factory settings to form platelet rich plasma (PRP) The autogenous bone graft taken from the extraction site was milled to form particulate bone and was lightly packed starting at the crestal area around the implant covering the entire surface of the implant with autogenous cancellous bone. A small amount of PRP was then dispensed over the autogenous graft and the surrounding bone was decorticated. A homogenous mix of allogenic mineralized and demineralized freeze-dried bone (DMFD), with some hydroxyapatite crystals were hydrated with PRP and lightly placed over the implant and built to fill the entire site (Figure 10). The grafted site was over built to allow for shrinkage during healing and consolidation of the graft. A resorbable membrane-Biomend Extend was placed to ensure site was completely covered and isolated from the soft tissue (Figure 11). Tension free primary closure was achieved over the site with horizontal mattress, and interrupted sutures using polyglcolic acid (PGA) 5.0 suture. No provisional restoration was fabricated.

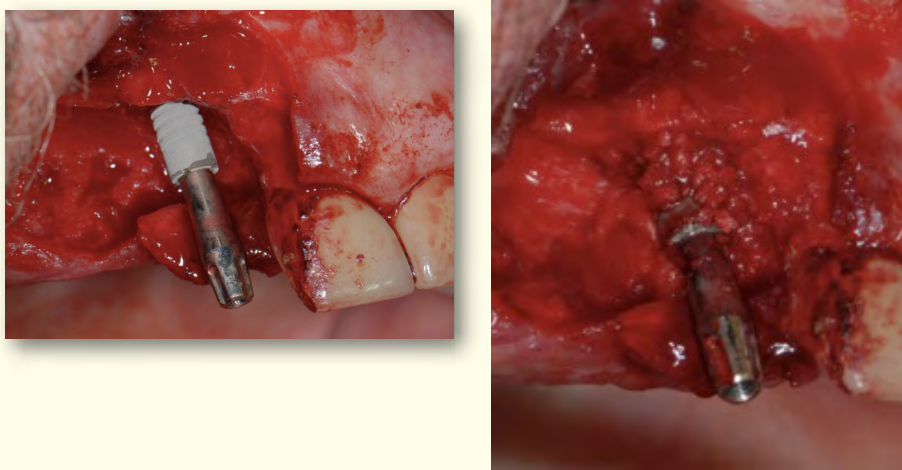


Figure 8

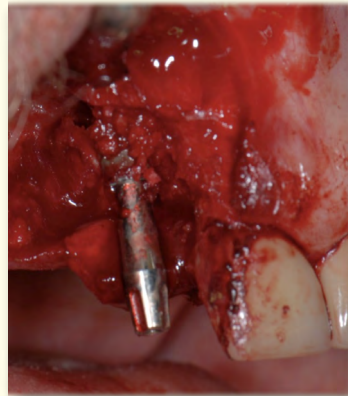


Figure 9



Figure 10



Figure 11

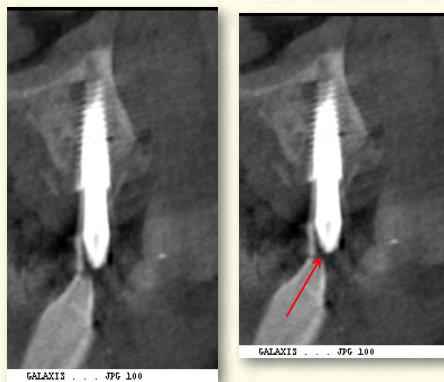


Figure 12



Figure 13

A CBCT/cone beam taken immediately post operative indicated > 6mm of grafted bone facially (Figure 14). The patient was put on a post op recall schedule of one week, four week (Figure 15) followed by a monthly evaluation for eight-month post op. Eight week post operative healing showed health tissue and good healing (Figure 16). Provisional restoration was fabricated at one month after intra oral preparation of the abutment was done and final restoration was seated in 8 months (Figure 17).

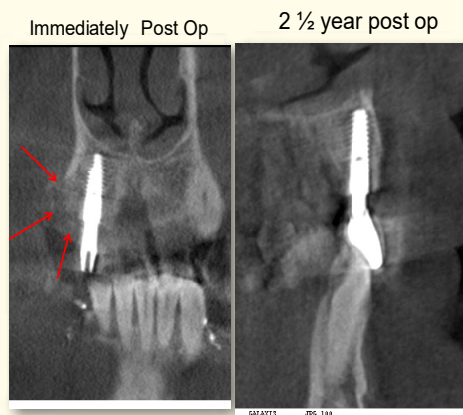


Figure 14



Figure 15

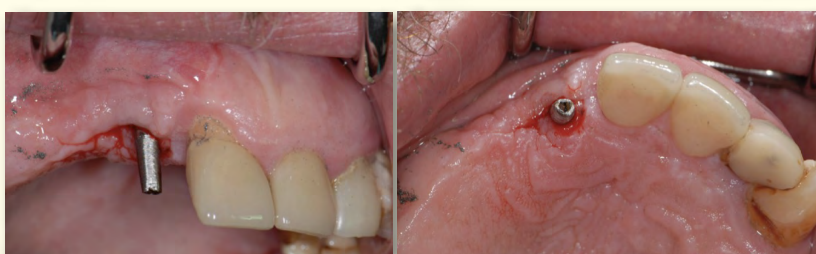


Figure 16



Figure 17

Six years postoperative examination revealed good tissue healing, and stability of the implant supported prosthesis # 7. Recession on #8 was brought to the attention of the patient throughout the duration of treatment and the mesial papilla was adequate. But, patient had an appointment at another provider where scaling was performed traumatically leaving behind a small black triangle (Figure 18). Recommendations were made for root coverage on # 8 ever since the treatment began, however, patient refused any further treatment. A six-year follow up peri-apical (Figure 19, 20) radiograph reveals good bone coverage around the prosthetic platform of the implant. And cone beam revealed facial bone 1.9mm - 2.37mm extending all the way to the prosthetic platform of the implant and 2.3 mm on the palatal bone was maintained (Figure 21).



Figure 18



Figure 19



Figure 20

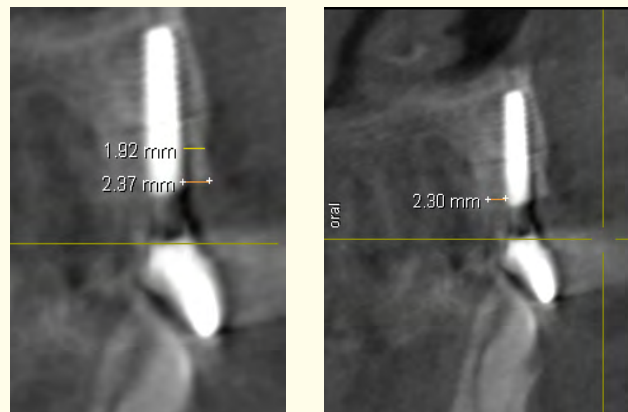


Figure 21

Discussion

The effectiveness of guided bone regeneration (GBR) procedures to promote horizontal and vertical bone regeneration has been well documented [1-9]. Moreover, the stability of regenerated bone and its favorable response under functional loading have been demonstrated [10-13]. Obtaining and maintaining primary closure of the flap during healing is necessary to prevent contamination and infection of the membrane, an event that always compromises the augmentation procedure [14,15].

GBR procedures have evolved greatly over the last 15 years, allowing for predictable implant placement in horizontally and vertically augmented ridges [7-13]. The success of this technique is dependent on strict observation of the surgical protocols. One of the most important factor is to achieve and maintain primary closure of the flaps during the entire healing period. Flap management has to fulfill two main requirements: (1) It must allow for complete and passive coverage of the augmented zone without any residual tension, and (2) it must be safe for the surrounding anatomical structures. Numerous studies have suggested a variety of clinical protocols for the management of soft tissues [16-21].

The goal in this case was to restore #7 area with an implant supported prosthesis. Due to the lack of vertical bone we had the option of either to augment the ridge followed by implant placement in 6-8 months or single visit site development and implant placement with a provisional. Patient's desire to have #7 could only be fulfilled with the second option. Utilizing the implant instead of a screw for "tenting" which will help create and maintain space for graft remodeling and also provide mechanical stability to the grafted site. Thus preventing the need for a second surgery [16]. Flap reflection and achieving a tension free closure over the grafted site was an important factor. Ensuring intact periosteum and collateral blood supply from either side of the graft is equally important to allow for angiogenesis. Another important factor is choosing the implant connection type for such a protocol. It is essential to have a reliable implant to abutment connection for this protocol because an unstable connection can lead to micro-movement and microleakage, therefore, we utilized "one abutment-one time concept" [25-26]. The rigidity of the entire fixture would allow stability to the grafted site and enhance bone remodeling efforts.

Simion., *et al.* [7] applied a model similar to the one used in the present study in their clinical evaluation of implants that were allowed to protrude 4 to 7 mm above the bone crest and supplied with membranes. In 4 of 5 patients they reported uneventful clinical healing around the implants at 9 months. In addition, they had inserted mini screws that were removed from the bone for histologic analyses 9 months after placement in a similar manner of the clinical implant. They reported that soft tissues surrounded the most coronal portions

of these mini screws, but otherwise there was evidence of substantial new bone formation around the previously protruding part of the mini screws. They reported ongoing bone formation but no inflammation or macrophages [7,22-24].

Conclusion

This case report provides proof-of-principle that when space is created and maintained with fair amount of stability provided by an implant, as well as promoting angiogenesis, will result in a desirable bone regeneration. The case also suggests small vertical defects can be managed using implant for "tenting" and vertical augmentation (GBR). In addition, the entire protocol is easy to perform for a desirable result saving time, extensive surgery and avoiding a second surgery. Further clinical trials and research evidence is required to determine whether vertical bone regeneration through this procedure can be a predictable routine procedure.

Disclaimers

The authors have no interest in promoting any products mentioned in the case presentation and do not have financial sponsorship from any organization. The patient was informed prior to documentation of this case and consent was obtained. His details are protected for confidentiality reasons.

Bibliography

1. Dahlin C., et al. "Healing of bone defects by guided tissue regeneration". *Plastic and Reconstructive Surgery* 81.5 (1988): 672-676.
2. Dahlin C., et al. "Generation of new bone around titanium implants using a membrane technique: An experimental study in rabbits". *International Journal of Oral and Maxillofacial Surgery* 4.1 (1989): 19-25.
3. Buser D., et al. "Regeneration and enlargement of jaw bone using guided tissue regeneration". *Clinical Oral Implants Research* 1.1 (1990): 22-32.
4. Nevins M and Mellonig JT. "Enhancement of the damaged edentulous ridge to receive dental implants: A combination of allograft and the Gore-Tex membrane". *International Journal of Periodontics and Restorative Dentistry* 12.2 (1992): 96-111.
5. Buser D., et al. "Localized ridge augmentation using guided bone regeneration. 1. Surgical procedure in the maxilla". *International Journal of Periodontics and Restorative Dentistry* 13.1 (1993): 29-45.
6. Nevins M and Mellonig JT. "The advantages of localized ridge augmentation prior to implant placement: A staged event". *International Journal of Periodontics and Restorative Dentistry* 14.2 (1994): 96-111.
7. Simion M., et al. "Vertical ridge augmentation using a membrane technique associated with osseointegrated implants". *International Journal of Periodontics and Restorative Dentistry* 14.6 (1994): 496-511.
8. Tinti C., et al. "Vertical ridge augmentation: What is the limit?" *International Journal of Periodontics and Restorative Dentistry* 16.3 (1996): 220-229.
9. Simion M., et al. "Vertical ridge augmentation around dental implants using a membrane technique and autogenous bone or allografts in humans". *International Journal of Periodontics and Restorative Dentistry* 18.1 (1998): 8-23.
10. Nevins M., et al. "Implants in regenerated bone: Long-term survival". *International Journal of Periodontics and Restorative Dentistry* 18.1 (1998): 34-45.
11. Simion M., et al. "Long-term evaluation of osseointegrated implants inserted at the time or after vertical ridge augmentation. A retrospective study on 123 implants with 1-5 year follow-up". *Clinical Oral Implants Research* 12.1 (2001): 35-45.

12. Fugazzotto PA. "Success and failure rates of osseointegrated implants in function in regenerated bone for 72 to 133 months". *International Journal of Oral and Maxillofacial Surgery* 20.1 (2005): 77-83.
13. Becktor JP, et al. "Survival analysis of endosseous implants in grafted and nongrafted edentulous maxillae". *International Journal of Oral and Maxillofacial Surgery* 19.1 (2004): 107-115.
14. Simion M, et al. "A comparative study of the effectiveness of e-PTFE membranes with and without early exposure during the healing period". *International Journal of Periodontics and Restorative Dentistry* 14.2 (1994): 166-180.
15. Machtei EE. "The effect of membrane exposure on the outcome of regenerative procedures in humans: A meta-analysis". *Journal of Periodontology* 72.4 (2001): 512-516.
16. Le B., et al. "Screw "tent-pole" grafting technique for reconstruction of large vertical alveolar ridge defects using human mineralized allograft for implant site preparation". *Journal of Oral and Maxillofacial Surgery* 68.2 (2010): 428-435.
17. Tinti C and Parma-Benfenati S. "Coronally positioned palatal sliding flap". *International Journal of Periodontics and Restorative Dentistry* 15.3 (1995): 298-310.
18. Rosenquist B. "A comparison of various methods of soft tissue management following the immediate placement of implants into extraction sockets". *International Journal of Oral and Maxillofacial Surgery* 12.1 (1997): 43-51.
19. Novaes AB Jr and Novaes AB. "Soft tissue management for primary closure in guided bone regeneration: Surgical technique and case report". *International Journal of Oral and Maxillofacial Surgery* 12.1 (1997): 84-87.
20. Fugazzotto PA. "Maintenance of soft tissue closure following guided bone regeneration: Technical considerations and report of 723 cases". *Journal of Periodontology* 70.9 (1999): 1085-1097.
21. Fugazzotto PA. "Maintaining primary closure after guided bone regeneration procedures Introduction of a new flap design and preliminary results". *Journal of Periodontology* 77.8 (2006): 1452-1457.
22. Becker W, et al. "A comparison of e-PTFE membrane alone or in combination with platelet-derived growth factors and insulin-like growth factor-i or demineralized freeze-dried bone in promoting bone formation around immediate extraction socket implants". *Journal of Periodontology* 63.11 (1992): 929-940.
23. Jovanovic SA, et al. "Bone regeneration around titanium dental implants in dehiscence sites: A clinical study". *International Journal of Oral and Maxillofacial Implants* 7.2 (1992): 233-245.
24. Palmer RM, et al. "Healing of implant dehiscence defects with and without expanded polytetrafluoroethylene membranes: A controlled clinical and histological study". *Clinical Oral Implants Research* 5.2 (1994): 98-104.
25. Degidi M, et al. "One abutment at one time: non-removal of an immediate abutment and its effect on bone healing around subcrestal tapered implants". *Clinical Oral Implants Research* 22.11 (2011): 1303-1307.
26. Grandi T, et al. "Immediate positioning of definitive abutments versus repeated abutment replacements in immediately loaded implants: effects on bone healing at the 1-year follow-up of a multicentre randomised controlled trial". *European Journal of Oral Implantology* 5.1 (2012): 9-16.

Volume 7 Issue 3 January 2017

© All rights reserved by Aeklavya Panjali.