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Case Report

Deficient Maxillary Anterior Ridge Augmentation by Ramus Block for Implant: A Case File Representing a Predictable Approach

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Abstract

This case file represents severely deficient maxillary anterior alveolar ridge being only 1.2 mm of bone width and implant site requires a hard tissue base foundation. To fulfill this requirement, mandibular ramus block bone is used to improve bone width. After 6 months of the graft surgery, 6.8 mm gain in bone width was observed, implant was placed and till now it was fighting fit in terms of function and aesthetics.

Keywords: *Autogenous Bone Graft; Horizontal Ridge Augmentation; Mandibular Ramus*

Introduction

Success of the implant directly depends on the bone availability and density [1]. Availability of the bond in the anterior region of maxilla for implant placement is posses a great challenge. There are various bone graft options available for the surgeons, including auto graft, allograft either of a cortical or cancellous, alloplast, and xenograft [2] to rebuild and repair these osseous defects, but autogenous bone graft is considered the "gold standard" [3]. Iliac crest is frequently used in major jaw reconstruction but it has disadvantages of high cost, alteration of ambulation site, and need for general anesthesia and hospitalization. The reported incidence of donor site complications after iliac crest bone grafting amount and densities from 2% to 39% [8,9]. Research show that intraoral harvested membranous graft (symphysis, mandibular ramus) shows a lesser amount of resorption than endochondral bone graft (iliac crest) [10] and having advantages of close proximity of donor and recipient sites, convenient surgical access, decrease donor site morbidity, and less expensive [11]. With these advantages and the necessary of small amount of bone in these situations, like augmentation of smaller region, the use of intraoral block bone graft is gaining popularity to increase the width and height of bone as a part of implant site development. This case report presented here bone augmentation in anterior maxilla was augmented using mandibular ramus block graft.

Case Report

A 36 year old male patient presented to the Post graduate department of Periodontology, Chandra Dental College and Hospital with chief complains of missing left central and lateral incisor since 2 years probably with implant. A CBCT is advised to know the height, width, and density of bone at the proposed implant site. CBCT reveals that there is only 1.2 mm bone width but adequate ridge height at the implant site was insufficient and necessitate for horizontal bone augmentation (Figure 1 and 2). The patient was given a detailed explanation pertaining to the present state, alternative treatment plans and the proposed treatment plan, and informed consent was obtained. A staged treatment procedure was planned to reduce potential complications, such as wound dehiscence and block graft fracture.

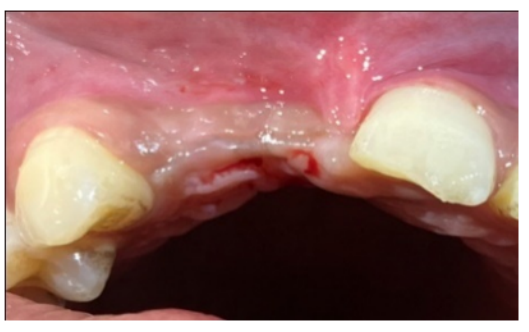

Figure 1: *Pre-operative view.*

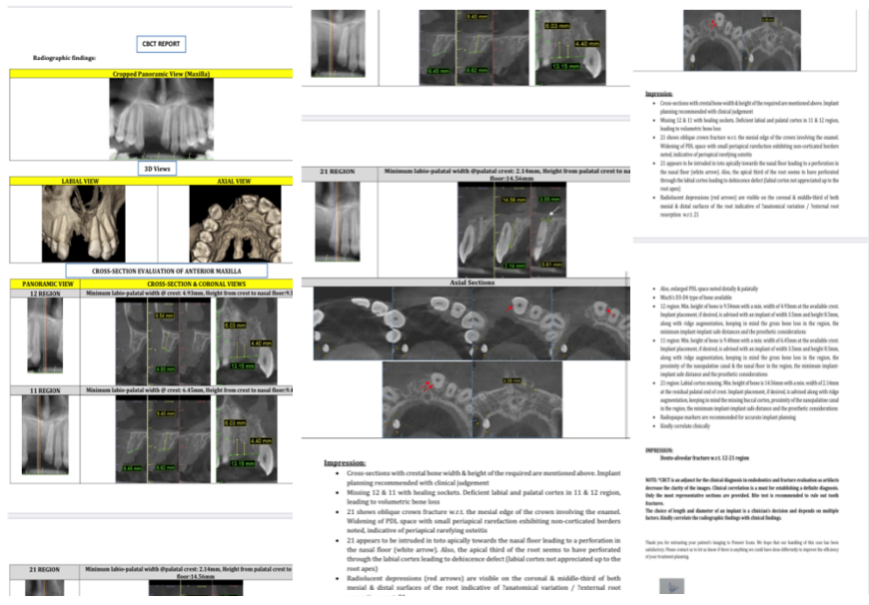

Figure 2: *CBCT reports revealing with intact buccal and palatal cortical plate.*

Stages of treatment:

- Stage I: Augmentation with block bone
- Stage II: Surgery 5 months later
- Stage III: Surgery 2 months post since stage II.

Donor site evaluation and mandibular ramus block graft harvest

The surgical procedure was performed under local anesthesia (2% lidocaine containing 1:1,00,000 epinephrine). A full thickness incision is given extending from extending ramus running anteriorly to the first molar, where an oblique releasing incision is given to the depth of the vestibule (Figure 3-5). A full thickness mucoperiosteal flap is reflected to permit visualization of the external oblique ridge, buccal shelf, lateral ramus. The ramus donor site is lateral to the molar (buccal shelf region) and extending up to the ascending ramus. A superior osteotomy is created approximately 45 mm medial to the external oblique ridge with the help of 702L straight fissure bur. It begins opposite to the distal half of the mandibular first molar or opposite to the second molar and continues posteriorly in the ascending ramus. The length of this osteotomy depends on the graft size. The vertical osteotomies begin at each end of the superior bone cut and continue inferiorly approximately 10 to 12 mm. All osteotomies just penetrate only through buccal cortex into marrow. Finally, a 0.8 mm round bur is used to create a groove that connects the inferior aspect of each vertical osteotomy. The graft is then harvested using bone spreader or chisel that is malleted along the superior osteotomy (Figure 6-12). The block graft is stored in normal saline.

Figure 3: *Pre-operative view.*

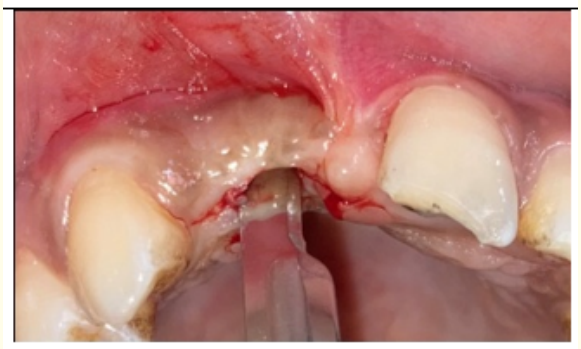

Figure 4: *Surgery.*

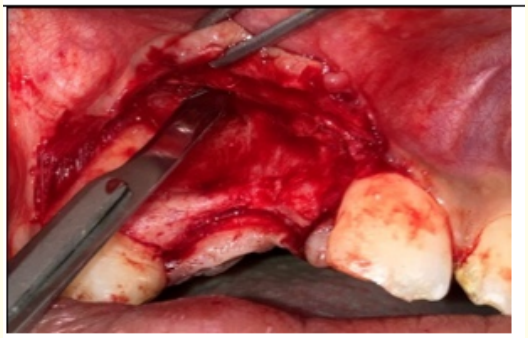

Figure 5: *Exposure of bone.*

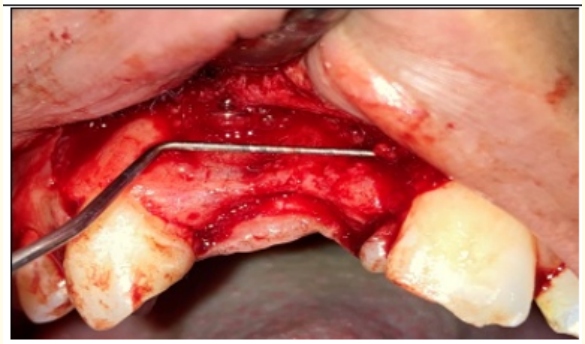

Figure 6: *Measuring of bone dimension.*

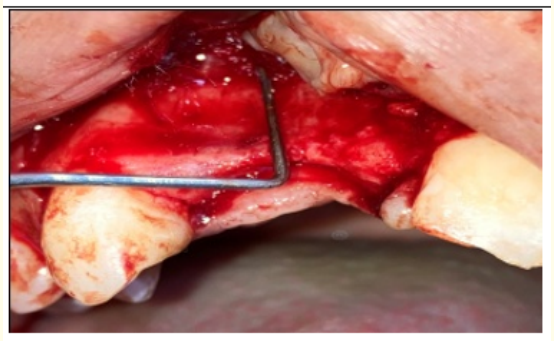

Figure 7: *Measuring of bone dimension.*

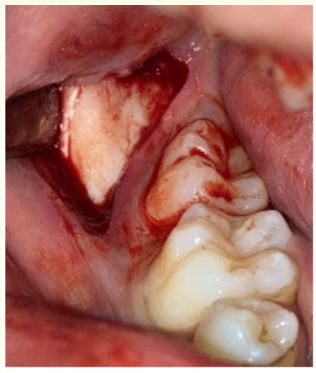

Figure 8: *Graft donor site ramus bone.*

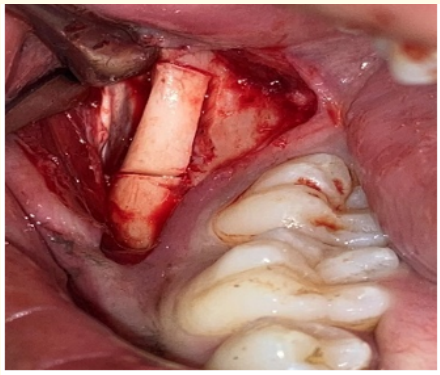

Figure 9: *Graft donor site ramus bone cutted.*

Figure 10: *Ramus bone cutted.*

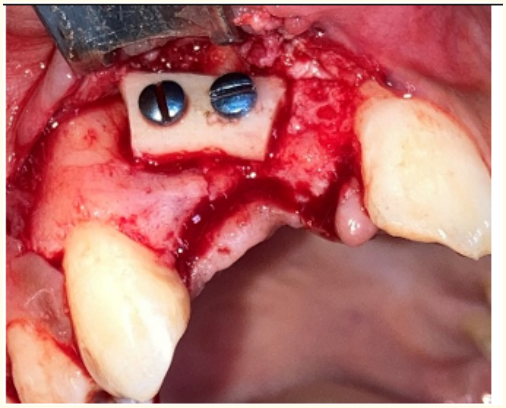

Figure 11: *Ramus bone placed in bone defect.*

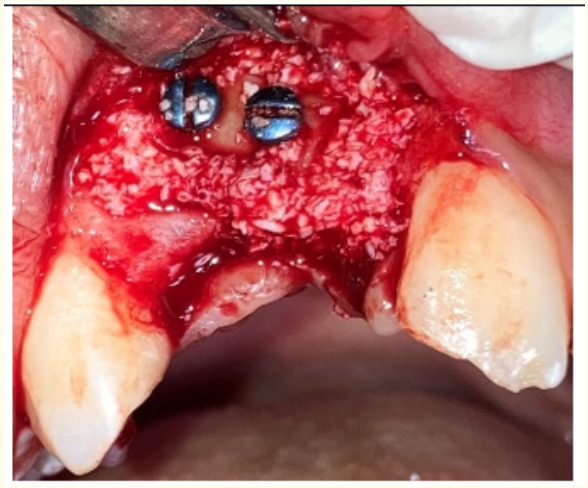

Figure 12: *Bone graft granules placed.*

Recipient site preparation

A midcrestal incision with bilateral oblique releasing incision is given in maxillary anterior region on the implant site and full thickness mucoperiosteal flap is elevated. The recipient site is perforated with 0.8 mm round bur to penetrate underlying marrow (Figure 13). This preparation provides access for trabecular bone blood vessels to the graft and accelerates revascularization. Surgical trauma also accelerates regional acceleratory phenomenon which results 2 - 10 times faster healing. Block graft is fixed to the recipient site with 2.5 mm diameter titanium selftap screws (Figure 14 and 15). Two screws are placed to prevent microrotation of the graft which can result in compromised healing. Uneven area between the block graft and recipient site is filled with bovine bone graft (xenograft) graft material (Biooss, Geistlich Pharmaceuticals, Wolhauson, Switzerland). If a large amount of particulate graft is used, a collagen membrane is needed; otherwise, no membrane is necessary for expected block grafting (Figure 16-19).

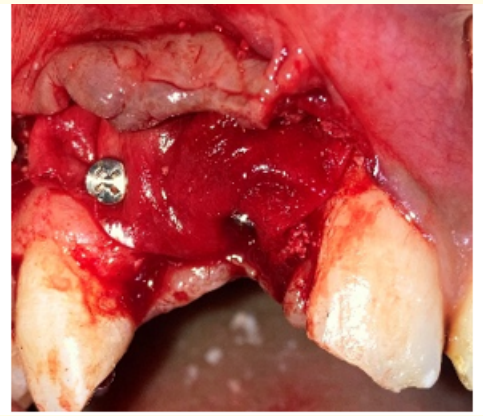

Figure 13: *Regenerative membrane placed.*

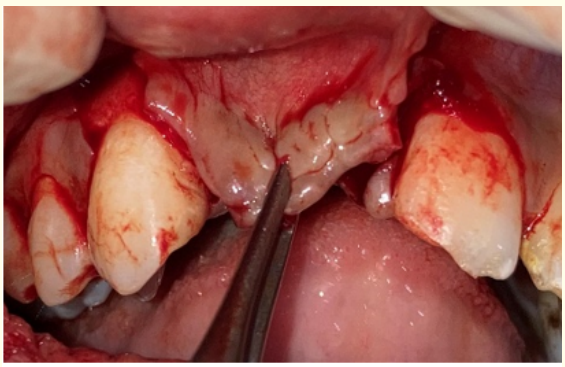

Figure 14: *Flap closure.*

Figure 15: *IOPA after block placed.*

Figure 16: *Surgical reopening after 6 months.*

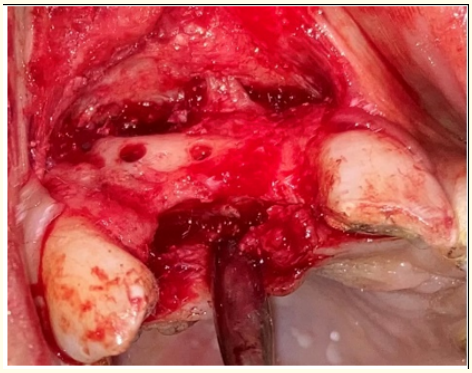

Figure 17: *Surgical reopening after 6 months screw removed.*

Figure 18: *Implant placed.*

Figure 19: *Suturing.*

Implant placement and prosthesis

Five months after the graft surgery, on evaluation, 6.8 mm increase in bone width is noticed (Figure 4). A full thickness mucoperiosteal flap is elevated and both titanium selftap screws are removed. A 3.3 × 13 mm length implant in 12 regions and 3.3 × 11 mm length implant in 11 region (Dentium NR line implant, Korean system) is placed with sequential drilling. Two months after second stage surgery, periapical radiographs were taken which showed successful osseointegration. The trial of Zirconium crown was made; occlusion was corrected and cemented onto the implant. Follow-up was done at 6, 12, and 18 months later and seen that implant was fighting fit in terms of function and aesthetics (Figure 20-25).

Discussion

A lot of controversies exists concerning the transplantation of live bone and its ability to survive [10,12]. The ideal bone graft should be: (1) Osteoinductive and conductive; (2) biomechanically stable; (3) disease free; and (4) contain minimal antigenic factors. All these features are found in autograft bone. The disadvantages of autografts incorporate the need for a separate incision for harvesting, increased operational time, and possibility of donor site complications [13]. The present clinical case report illustrates autogenous block

Figure 20: *RVG after placement.*

Figure 21: *After 4 months of placement.*

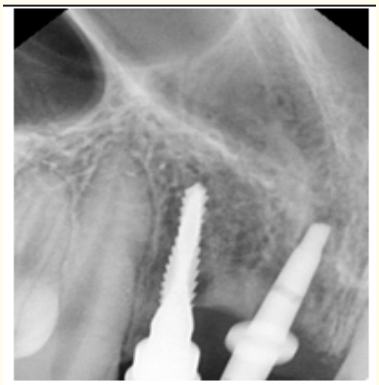

Figure 22: *RVG after 4 months of placement revealing peri- implant bone adaptation.*

Figure 23: *Abudment placement.*

Figure 24: *Post-operative view after final prosthesis.*

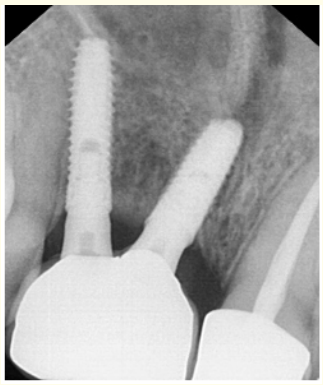

Figure 25: *Post-Operative IOPA after 6 months of implant.*

bone technique to create sufficient bone volume to allow consistent implant placement. Mandibular ramus block bone is used because post-operative morbidity associated with bone harvesting from the mandibular ramus is 0 - 5% in comparison with chin amount and density from 10% to 50% [14,16]. It has fewer complications such as less cosmetic concern, no gingival recession, less wound dehiscence, less sensory disturbance, and less discomfort. Block graft harvested from mandibular ramus can be used for predictable bone augmentation up to 3,4 mm in horizontal and vertical dimensions. The amount and density of this cortical graft thickness is 4.5 mm with most sites providing 34 mm. The density of the graft is D1 and up to three to four tooth edentulous sites can be grafted [17] which are almost similar to bone harvested from symphysis.

Bone augmentation can also be performed using bone spreading or ridge splitting technique while it is a predictable procedure but it has a mechanical limitation in cases having ridge width less than 3 mm. In this case, it was not possible to split the cortices because the bone width existing at implant site is only 1.2 mm [18].

GBR can also be used to augment deficient ridge width but it is difficult to maintain the required space beneath the barrier membrane without the support of bony wall throughout the healing period. Despite the success, complications such as soft tissue dehiscence with membrane exposure and infection impair the outcome of therapy [19].

Conclusion

Successful bone regeneration requires substitution of graft material with autogenous bone. The overall morbidity of mandibular ramus block graft is minimal and it serves as a good alternative for ridge augmentation and always considered as gold standard.

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