

Alveolar Ridge Augmentation using Autogenous Block Bone Grafts Harvested from Mandibular Ramus to Facilitate Implant Placement: A Case Report

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Abstract

With increased awareness on dental implants, more and more patients are presenting to dental practitioners requesting for fixed solutions to their dilemmas. The placement of endosteal implants requires adequate bone volume for successful osseointegration. When the morphology of the bone does not allow proper implant placement, there are various bone augmentation procedures which aids in reconstruction of the residual alveolar ridge for ideal implant placement. The mandibular ramus can act as an excellent source of autogenous bone for augmentation of alveolar ridge deficiencies. This article describes a case report of localized alveolar ridge augmentation using block bone autografts harvested from the mandibular ramus prior to implant placement.

Keywords: Autogenous bone grafts, Block bone grafts, Dental implants, Mandibular ramus, Ridge augmentation

INTRODUCTION

Successful implant surgery is not merely the achievement of successful osseointegration, but rather the establishment of an ideal foundation for implant-supported prosthetic restorations.¹ A major contraindication for dental implant placement is inadequate bone volume. Osseous defects may occur as a result of trauma, prolonged edentulism, congenital anomalies, periodontal disease and infection.² There are minimum dimensions that the remaining alveolar ridge must possess for implants to be placed. Based on clinical experience, the minimum dimensions in the maxilla to insert a dental implant are an alveolar ridge width of 5 mm and a bone height of 10 mm.³ When these dimensions are not available, it will be necessary to augment the size of the alveolar ridge prior to implant placement using various grafting procedures. Without grafting, the implants may have to be placed in anatomically unfavorable positions or may have adverse angulations. These compromises can lead to unesthetic restorations, mechanical overload and ultimately failure of

the implant. Various bone grafting techniques are available for reconstruction of alveolar deficiencies which include autografts, allografts and xenografts.² The success rates of grafted bone have been excellent to moderate but have varied more than for conventional implant treatment.⁴ Among them, autografts have excellent osteoinductive properties and hence they are considered the gold standard in bone augmentation procedures.⁵ This article presents a case report of localized alveolar ridge augmentation using block bone autografts harvested from the mandibular ramus prior to implant placement.

CASE REPORT

An eighteen year old female patient reported to the Department of Prosthodontics, Govt. Dental College, Trivandrum with the chief complaint of missing upper front tooth (Figure 1). She had lost her tooth in an accident 1 year back and was wearing a removable partial denture. All the treatment options were explained to her and she opted for implant supported restorations on 21 and 22.

On clinical evaluation, the gingival biotype was thick with adequate width of attached gingiva and favorable arch position. The clinical and radiological (panoramic and periapical) examinations revealed that the alveolar ridge height was normal, but there was a lack of alveolar ridge width. Labio-palatal atrophy of the edentulous alveolar ridge made it intricate to place implants on 21, 22 region. Hence it was decided to augment the alveolar crest horizontally. The mandibular ramus area was selected as the donor site for bone augmentation.

Pre-operative radiographs and diagnostic casts were prepared (Figure 2). The patient was healthy and had no systemic contraindications for intraoral surgery and implant placement. Surgical procedures were carried out as an outpatient procedure under local anaesthesia (2% lignocaine hydrochloride with epinephrine 1:2,00,000). A full thickness muco-periosteal flap was raised to expose and visualize the size of the defect, and the surface of the bone was released from the remaining muscle and periosteal fibers (Figure 3). Next, the bucco-palatal width and height of the

alveolar bone were measured. The alveolar bone height was more than 10 mm. However, the width of the alveolar bone was about 4.1mm. After the extent of bone loss was outlined at the recipient site, we proceeded with the donor site exposure. A surgical marking pen was used to outline area of the vestibular incision at the ramus region. A full-thickness mucoperiosteal incision was made distal to the most posterior tooth in the right mandible continuing to the retromolar pad and ascending ramus. An oblique releasing incision to the depth of the vestibule was given. Three complete osteotomies and one bone groove was prepared using a 702L straight fissure bur before the graft harvest (Figure 4). The order of the osteotomies proceeded as superior cut, followed by anterior, posterior, and the inferior cut. Exposure of the recipient site and the donor site permitted direct measurement of the bony defect and available bone at the donor site. The bone block was carefully loosened and lifted from the donor bed using conventionally designed instruments. Before placing the autogenous graft,



Figure 1: Pre-operative intra oral view

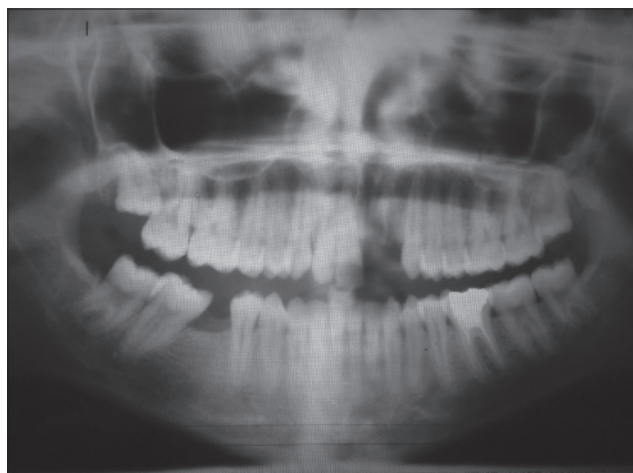


Figure 2: Pre-operative Oral Pantamogram

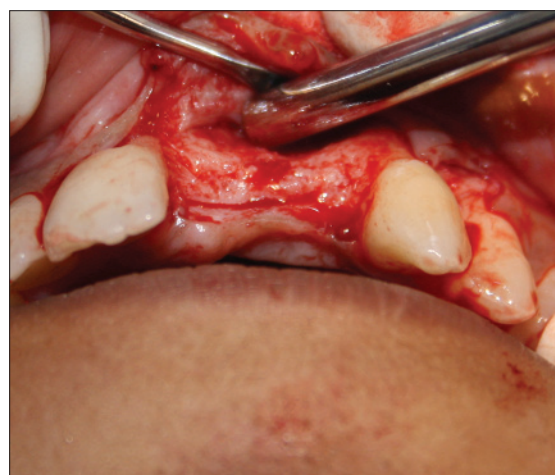


Figure 3: Muco-periosteal flap raised to expose the bone at the recipient site



Figure 4: Muco-periosteal flap raised to expose the bone at the donor site

recipient site was prepared for predictable incorporation of block grafts.⁶ The preparation involved decortication and perforation into underlying bone marrow which accelerated revascularization of the graft. The block graft obtained from ramus was also prepared to allow intimate contact with the recipient site to facilitate graft incorporation. Titanium screws of 1.5 mm diameter and 6 mm length were used to stabilize the graft onto the recipient area⁴ (Figure 5). A pilot hole was drilled through the graft onto the recipient site and enlarged to allow the placement of a titanium fixation screw without resistance. After fixing the autogenous block bone graft onto the recipient area with a titanium screw, small gaps at the edges of the autogenous bone graft were filled with hydroxyapatite bone grafting material. The graft material was stabilized with an absorbable collagen membrane for guided bone regeneration. Finally the periosteum of the mucoperiosteal flap was relieved at its base to mobilize the flap and allowed to cover the bone graft without any tension. The patient was placed on analgesics, antibiotics, and an antimicrobial mouthrinse for 1 week. Temporisation were done using a customized fixed composite bridge for esthetics and to aid in adequate graft stability.

The postoperative clinical and radiographic examination showed an increase in the width of alveolar ridge at

the grafted site (Figure 6). The site was re-entered after 6 months for removal of the fixation screw and placement of the implants (Figure 7). Under local anesthesia, a mucoperiosteal flap was raised to expose the recipient area. 3.3×13 mm implants (Adin) were planned for 21 and 22 regions. It was seen that there was minimal resorption around the screw and the width of the alveolar bone was measured as 6.8 mm. The screw stabilizing the graft was removed with a screw holder and two implants of size 3.3×13 mm dimensions were placed in a conventional manner (Figure 8). Cortical perforation caused by the stabilization screw was filled with hydroxyapatite bone grafting material and the graft material was stabilized with an absorbable collagen membrane for guided tissue regeneration. Four months after the second stage surgery, periapical radiographs showed that osseointegration had been completed successfully (Figure 9). During the prosthetic phase, healing abutments were placed to achieve an esthetic soft tissue emergence profile. After stabilization of gingival tissues, implant level impressions were made using open tray impression copings and a master cast was

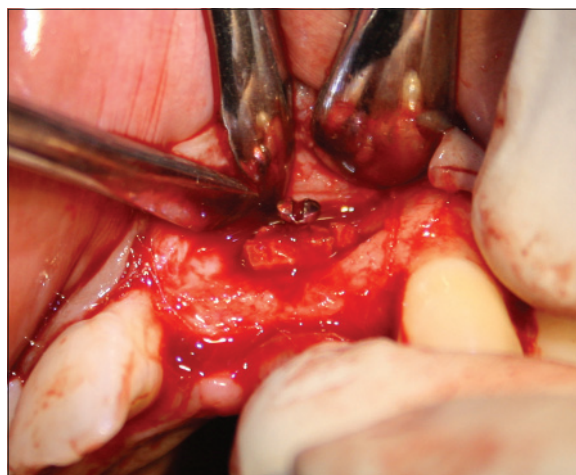


Figure 5: Ramus graft stabilized using titanium screws

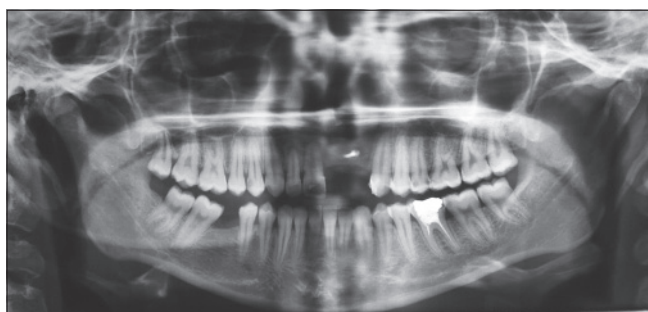


Figure 6: Post-operative oral pantamogram showing titanium screw stabilizing the graft

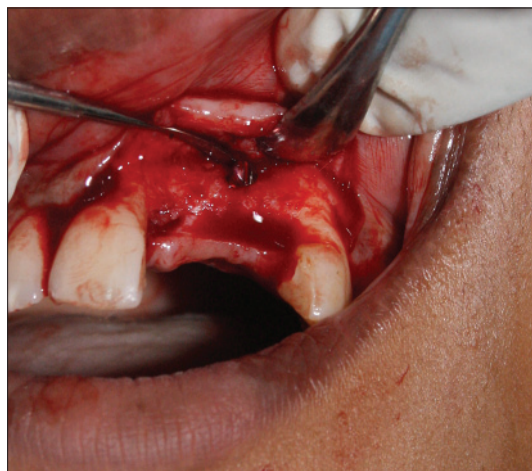


Figure 7: The recipient site re-entered after 6 months

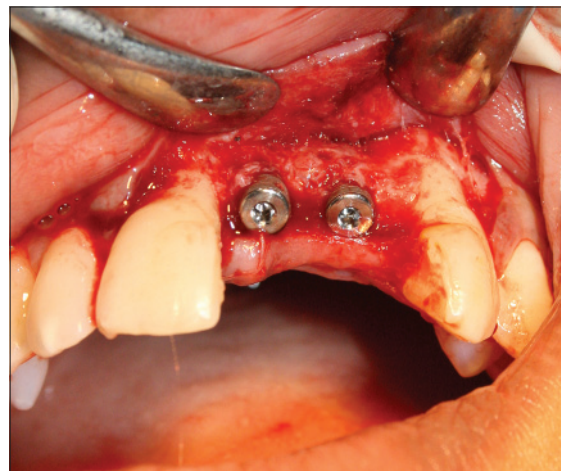


Figure 8: Placement of implant fixtures

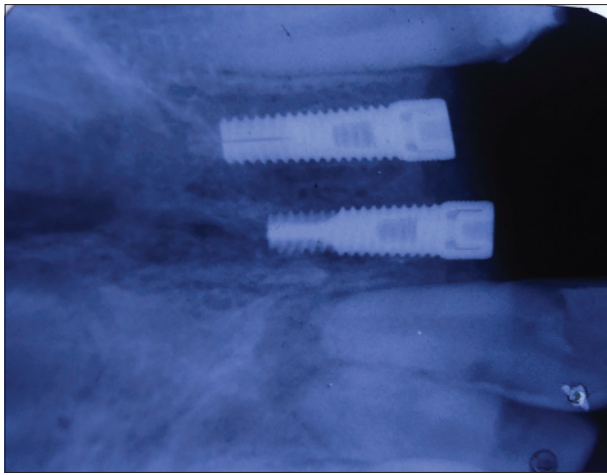


Figure 9: IOPA

fabricated with implant body analogues. The casts were mounted on an articulator. The abutment preparation was done and the implant crowns were manufactured. The metal porcelain crowns were finished and cemented on to the implants using glass ionomer cement (GC Fugl CEM, GC Corporation, Tokyo, Japan) (Figure 10). Finally, a thorough inspection was performed to ensure that the peri-implant sulcus was free of remaining cement particles hence prevent any foreign body reactions.

DISCUSSION

Esthetic and functional compromises in implant restorations can be prevented by ridge augmentation procedures which results in enhanced emergence profile for an implant supported restoration. A thorough clinical and radiological examination should be done in order to diagnose the exact quantity of bone loss and accordingly plan for various bone augmentation procedures. Autogenous bone grafts are recommended in bone augmentations prior to implant placement because of their osteogenic potential.⁷ Intramembranous autogenous osseous grafts including the mandibular ramus, mandibular symphysis, angle of mandible, maxillary tuberosity and intraoral exostoses, are the “gold standard” for improving intraoral osseous volume to facilitate placement of implants.⁸ Alveolar defects can be restored by autologous grafting techniques including corticocancellous blocks, compressed particulate cancellous bone and marrow, and cortical grafts. Block grafts are associated with minimal resorption and do not usually require the use of an overlying membrane unless the dimensions of the graft are inadequate. Block grafts take longer to integrate than cancellous bone grafts. When a block graft is used, a staged surgical approach is recommended as opposed to placing the implants in conjunction with the graft.⁹ The mandibular ramus is a useful, cortical graft that provides primarily dense



Figure 10: Post operative extra oral view

cortical bone and high concentration of promoter proteins (eg, bone morphogenetic proteins). In addition, the mandibular ramus donor site is associated with fewer postoperative complications, in comparison to the symphysis region.^{6,10-13} Hence they can be successfully used for alveolar ridge augmentation prior to implant placement.

CONCLUSION

This article presents a case of alveolar ridge augmentation in a partially edentulous patient prior to implant placement, using autogenous bone grafts harvested from the mandibular ramus and firmly secured to the recipient site with osteosynthesis screws. The clinical indication for the case described was the lack of sufficient alveolar bone quantity, a situation that could interfere with the esthetics and functional loading of implants. The mandibular ramus block bone grafts gives predictable outcome within a short healing time and provides ideal sites for endosseous implant placement.

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