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Kumari Deepika
MDS (Assistant Professor, Department of Prosthodontics and Crown Bridge, AIIMS-CAPFIMS, Maidan Garhi, New Delhi, India).

Aprajita Verma
MDS (Assistant Professor, Government State Medical College, Kanpur, UP, India).

Shankar Singh
MDS (Medical Officer, Government of Rajasthan, India).

Harshika Gautam
MDS (Assistant Professor, Government State Medical College, Kannauj, UP, India).

Correspondence:
Kumari Deepika
MDS (Assistant Professor, Department of Prosthodontics and Crown Bridge, AIIMS-CAPFIMS, Maidan Ghari, New Delhi, India).

Mandibular Block Graft in Deficient Alveolar Bone as A Superior Treatment Modality for Implant Placement

Kumari Deepika, Aprajita Verma, Shankar Singh, Harshika Gautam

Abstract
Today more focus is becoming on implant surgical procedure rather than prosthetic rehabilitation. The present case reports are about autogenous block grafting. Autogenous block grafting is a highly effective treatment modality in addressing severe atrophic ridges to place dental implant. Autografts are for long considered as the gold standard of grafting materials and are currently the only osteogenic graft that heals into the growing bone through the process of osteogenesis, osteoinduction and osteoconduction. The cortico-cancellous nature of bone harvested from mandible symphysis or ramus site facilitates faster vascular in-growth once the block has been placed, resulting in more rapid integration and less potential resorption during healing. In the literature achievement of adequate bone gain has been seen with mandibular block graft and with minimum morbidity of the donor site. Therefore, in the present case series, the symphysis and ramus block graft were harvested for the horizontal bone augmentation of deficient alveolar ridges to facilitate implant placement in proper position in order to restore adequate esthetic and function. Despite this the lack of adequate pre-prosthetic planning has lead to compromised esthetic and function that is explained here to some extent.

Keywords: Autogenous block graft, symphysis block graft, ramus graft, atrophic ridges.

Introduction
The lack of adequate bone in the anterior maxilla poses major challenges in dentistry to place an implant. Sometimes inadequate bone width in mandibular posterior region is also common occurrence due to alveolar bone resorption after tooth loss. To resolve this problem various techniques available for bone augmentation that include particulate bone grafting technique, guided bone regeneration (GBR), bone ridge split technique and horizontal or vertical alveolar distraction osteogenesis. Autografts, allografts, xenografts or alloplasts can be used for particulate bone augmentation as well as autograft in the form of block graft also.[1]Allografts and alloplasts provide a scaffold that serve as a space-maintenance for osteogenesis, despite this, fresh frozen allografts confer the risk of disease transmission. Therefore, autogenous bone blocks are still considered as the gold standard, especially when large amount of bone volume is required for augmentation.[2] Iliac or calvarial grafts preferred as proposed by various studies but with varying rates of complications, including infection and mobility impairment. Furthermore, remarkable surface resorption of the ililac bone graft has been reported on the recipient alveolar bone in many interventions. On the contrary, intra-oral block grafts seemed to be less inclined to long-term surface resorption, conferring improved survival for the osseointegrated implants.[3]The intra-oral bone graft site includes symphysis, ramus, tuberosity, exostosis and tori. The reasons for their common use are the use of local anesthesia instead of general anesthesia, the relatively short operation time, no need for postoperative hospitalization, less morbidity in the donor site and lower cost. The symphysis and ramal bone grafts are most commonly used among all. Better postoperative patient comfort and low wound dehiscence rate are the reasons for selecting the ramus and symphysis as a donor site.[4] Symphysis comprises of 65% cortical bone and 35% cancellous bone and has more cancellous bone than any other intraoral site and resorption rate is lesser

due to intramembranous bone formation. Various techniques given in the literature to harvest block graft includes Oscillating saw, Trephines, Disc, Fissure bur and chisel and Piezoelectric instruments.[5] In this case series, in one case symphysis region was used for harvesting block graft and in another case ramus region was preferred as a donor site. The block graft was harvested by the use of micromotor bur and chisel.

Case Reports

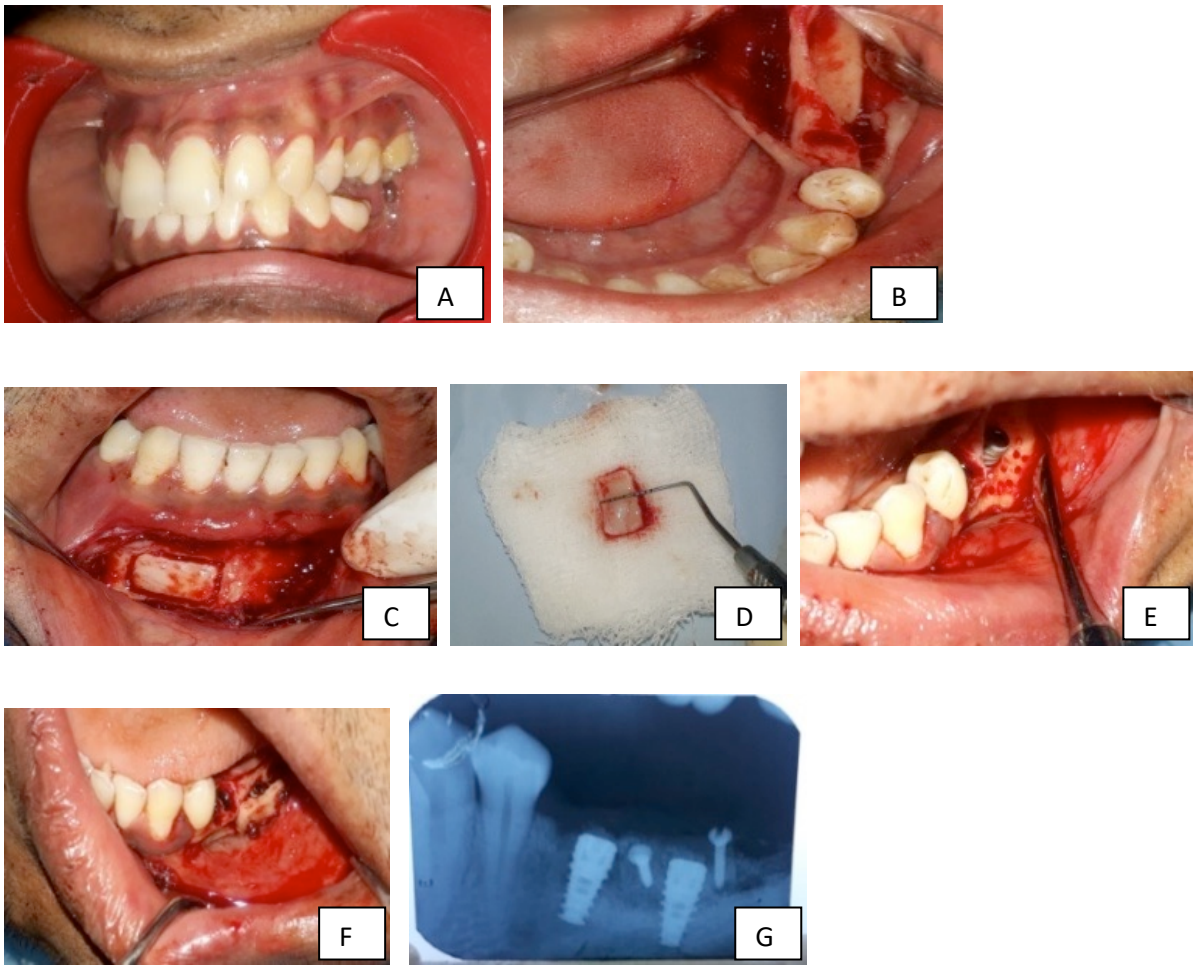

Fig. 1:(A) Retained deciduous 75 and missing permanent 35, 36, 37 (B) Full thickness mucoperiosteal flap was reflected showing deficient bone width at recipient site (C) full thickness flap was reflected to expose the symphysis region at donor site (D) harvested symphysis block graft (E) osteotomy prepared to place implant along with corticotomy (F) block graft screwed in implant position with 2 fixation screws (G) IOPA radiograph examination done.

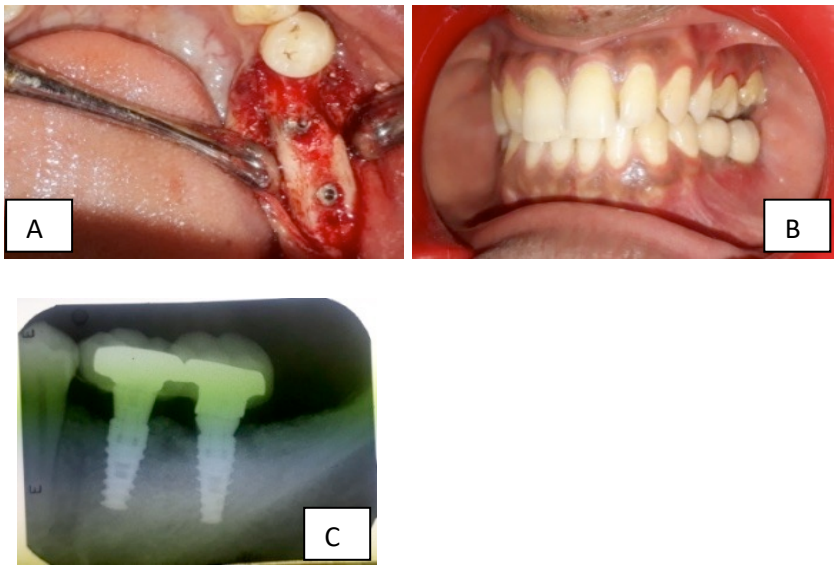

Figure 2 (A) Second stage implant surgery done after 6 months of implant placement (B) Final prosthesis (C) post-op IOPA radiograph examination done.

CASE-2

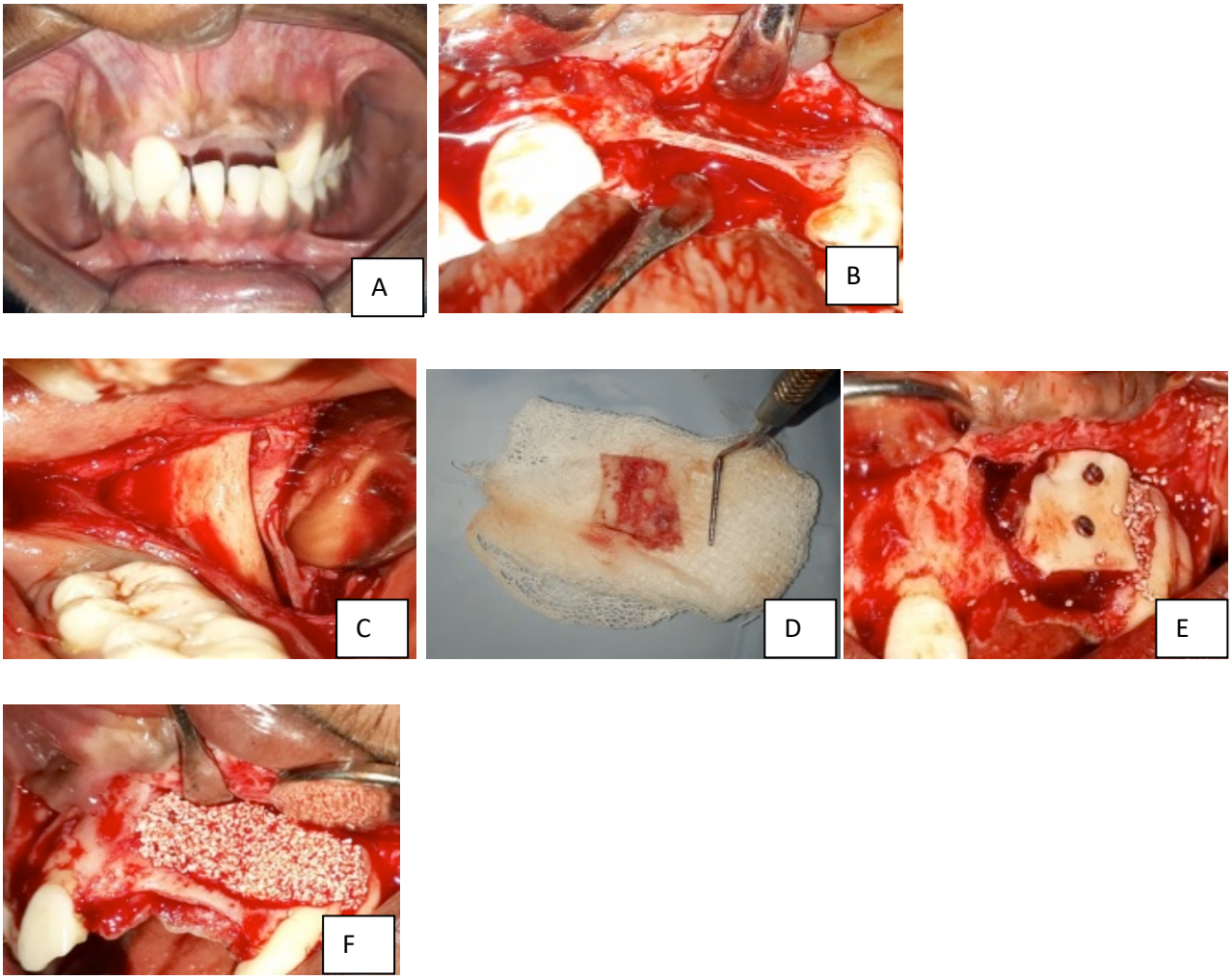

Fig. 1:(A) Intra-oral view showing missing 21 and 22 (Seibert' class III edentulous ridge) (B) available bone width (C) left mandibular ramus exposed (D) harvested ramus bone graft (E) block graft screwed with sandwich cerabone graft (Xenograft) (F) sticky bone graft above block graft placed and flap closed.

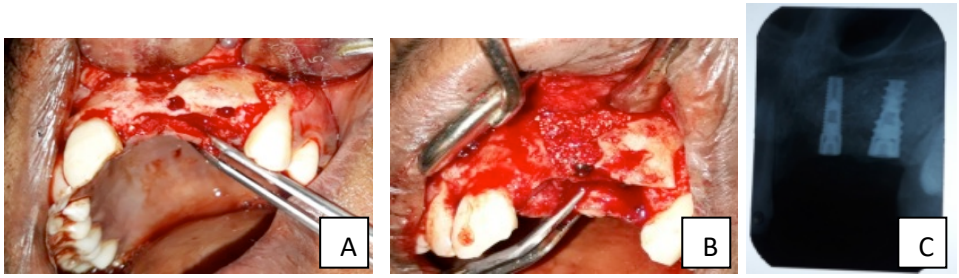

Fig. 2:(A) osteotomy was prepared for placing implant after 6 months (B) sticky bone grafting done in 21 implant site to cover the remaining bone defect (C) IOPA radiograph examination

Fig. 3 (A) Second stage implant surgery done after 4 months of implant placement (B) FP-2 type prosthesis delivered to patient (C) post-op IOPA radiograph examination done.

Case 1- Horizontal ridge augmentation in mandibular posterior region using symphysis block graft along with simultaneous implant placement

A 26-year-old male patient reported to the Department of Prosthodontics with chief complaint of difficulty in chewing from left side. On clinical examination, there were retained deciduous 75 and missing permanent 36, 37 and congenitally missing 35 and 25. 64 –Slice Denta scan images showing deficient residual alveolar ridge width and height in mandibular posterior region for replacing 36 and 37. Available bone was measured in mandibular anterior region for harvesting symphysis block graft. The Full thickness mucoperiosteal flap was raised following the crestal incision and extraction of retained deciduous 75 was done. Available bone height and width was measured using periodontal probe. Vestibular incision was given in mandibular anterior region and full thickness flap was reflected to expose the symphysis region. The superior and inferior osteotomy for the bone block is made using micromotor fissure bur 5mm from the apex of the mandibular anterior teeth and 5mm from the inferior border of the mandible respectively to harvest increased width of bone. The chisel is angled to shear the bone block and graft was harvested. The corticotomy was done at the recipient site for grafting. Harvested symphysis bone block was screwed after placing implant of size 4.2 X 10 mm (ADIN Dental Implant System LTD., Israel) in 36 and 37 regions. The bone block was positioned in implant site with 2 fixation screws and the particulate bone graft was placed in voids between the host bone and the block and rest of the part covered by sticky bone that was formed using Cerabone (Xenograft), A-PRF and I-PRF. The biological resorbable collagen membrane (Periocol) was placed over the graft site. The flap was closed and sutured at both the recipient and donor sites. The donor site was filled with A-PRF and muscle attachment was carefully sutured in one layer and the mucosa closed as a second layer using resorbable sutures. The post-operative IOPA radiograph was examined (**Figure 1)**. The antibiotics, analgesics and anti-inflammatory medication were prescribed to the patient. Clinically, the operated sites showed good wound healing post-operatively after 7 days both at the recipient and donor site. A re-entry was done into the host site after 6 months. Slight bone was removed to expose the implant site and fixation screws used to stabilize the block graft were removed. The cover screw was replaced by healing abutment. The open tray implant level impression making was done using polyvinyl siloxane after 2 weeks of second stage implant surgery. The well-keratinized gingival collar was formed around implant. Implant stability was checked using RFA Osstell mentor that was adequate for loading (mean ISQ values were 85 and 80 in 36 and 37 regions respectively). Prosthetic abutment was placed and abutment screw was secured using Teflon tape and GIC cementation of cement-retained splinted metal ceramic definitive prosthesis was done. Implant protected lingualized occlusion was established and post-op IOPAR examination was done (**Figure 2)**. In the 47 region, there was only slight mesiolingual contact due to the superior position of 27 from occlusal plane that should be corrected before prosthetic rehabilitation.

Case 2- Horizontal ridge augmentation in maxillary anterior region using ramus block graft for implant placement using staged approach

A 22-year-old male patient reported to the Department of Prosthodontics with chief complaint of missing teeth in left upper front region of the jaw. On clinical examination there were missing 21 and 22 -Seibert' class III edentulous ridge. The implant supported fixed prosthesis following ridge augmentation using autogenous block graft was planned and patient consent was taken for the same. For a more precise planning, the defect size and donor site bone were measured and estimated on the Dentasacn. Under aseptic condition and local anaesthesia left mandibular ramus exposed for harvesting bone graft. The harvested ramus bone graft screwed with sandwich cerabone graft (Xenograft) at the recipient site after reflecting full mucoperiosteal flap. The rest of the defect was filled using sticky bone graft (Cerabone and I-PRF), above that resorbable biological collagen membrane placed (Periocol) to secure the graft at place. Flap closed and sutured using non-resorbable black silk sutures (**Figure 1)**. Dentascan images after 6 months of grafting was examined and osteotomy was prepared for placing implant of size 3.3 X 11.5 (Noris Medical-Dental Implant System LTD., Israel) in 21 and 3.75 X 11.5 mm in 22 regions (ADIN Dental Implant System LTD., Israel). The 2 different implant systems were used due to non-availability of the required implant sizes at the time of surgery. The sticky bone graft was placed to cover mild defect mesial to 21. After that pericol resorbable membrane placed and flap sutured both at the recipient site and donor site. IOPA radiograph was examined after implant placement (**Figure 2)**. Post-operatively patient was given antibiotics, analgesics and anti-inflammatory medication. Patient was recalled on every alternate day to check for wound dehiscence and hematoma. Clinically, the operated sites showed good wound healing post-operatively after 10 days. The second stage surgery done after 4 months of implant placement. After soft tissue healing, the open tray implant level impression making done for the fabrication of FP-2 PFM prosthesis. The abutment placed, screw secured with teflon tape and metal ceramic crown cemented over that and post-op IOPA radiograph examined (**Figure 3)**. In this case along with horizontal augmentation, vertical augmentation should also be planned so that FP-1 prosthesis can be dlivered.

Discussion

The presence of inadequate bone makes difficult the ideal placement of endosteal implants. The alveolar bone resorption in the maxillary anterior region is the most common occurrence after tooth loss. In such cases autogenous bone grafting can be used to augment ridge to provide a sufficient amount of bone for implant placement. Using the mandibular symphysis as a donor site offers ease of access, good bone quality for localized repair, a cortico-cancellous block graft morphology, low morbidity, and minimal graft resorption.[11] Only care needed to be taken to kept safe margin from mandibular anterior teeth and lower border of mandible to prevent injury to marginal mandibular nerve. While using ramus as donor site, one of the disadvantages is the risk of the damage to the inferior alveolar nerve or extensive bleeding.[6] Misch has reported that 4 mm thickness of graft can be obtained from this region. When the anatomy of the region is well known and the osteotomy in the buccal cortex is given an inclination to the outside and conducted carefully, the exposure of the

nerve or intensive bleeding are possibilities met rarely.[7] Mandibular bone block grafts give satisfactory results in cases with the lack of teeth up to 4 in maxillary anterior region, and are resistant to resorption, complication rates are lower and healing occurs in a short period of time. In the present case 1, the symphysis block graft was used for bone augmentation in mandibular posterior region and ramus block graft was used for bone augmentation in maxillary anterior region in case 2 as there was less bone in mandibular symphysis region to harvest bone graft. It is clear from the systematic review that autogenous block bone grafts can be applied safely with a low complication rate and satisfactory bone gain in patients when residual crest thickness is <4mm.[8] It has been seen that both symphysal and ramus autogenous bone block transfer (ABBT) procedures were successful for the restoration of a horizontal bone defect in the anterior maxilla. Ramus harvesting may be advisable due to fewer complications. Implants placed in the grafted regions exhibited a high success and survival rate within the one-year follow-up period.[3] In general, the survival rates of implants placed into the autogenous bone block transferred area are between 90.01 and 100 %.[9]Khojasteh and co-workers had found bone gain in an average of 4.3 mm in the anterior maxilla. The gain was found to be less in the mandible, likely due to decreased vascularization of the cortical structure.[10]

In this case series adequate bone gain was obtained to place the implants. Various techniques have been employed to fix the grafted bone which includes plate fixation, mesh, screws and pin. Sometimes wound dehiscence and screw exposure are the complications seen with these techniques.[5]In the present cases, self-tapping titanium screws were used to stabilize the graft and no complication was found. Xenograft was placed around the harvested graft to provide a good contour and to eliminate any dead space between the graft and recipient site. Absorbable collagen membrane was used to cover the graft to prevent the migration of epithelial cells and fibroblasts which could hinder the growth of bone.[11] A-PRF was used to fill the donor site after harvesting bone graft. No complication was found in both the recipient and donor sites. In case 1, titanium screws were removed at the time of stage II and in case 2, at the time of implant placement. Further 4 months of implant placement loading was done. In case 2 due to inadequate bone width in 21 implant site, sticky bone graft was done again using xenograft mixed with I-PRF at the time of implantation. 1 year of implant loading in both the cases no problem was encountered.

Conclusion

Inadequate bone width results in an improper implant position that may compromise the esthetics or function. In such cases bone block graft is a viable treatment option for bone augmentation before placing implant along with pre-prosthetic planning.The results of the present case reports show that the technique of autogenous mandibular bone block grafting is a simple and effective treatment modality for reconstruction of inadequate alveolar bone to place dental implant and also it reduces the total treatment cost.

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