

# Severe Bone Resorption Following Allogenic Bone Block Augmentation: A Case Report and Review of Literature

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**Introduction:** Allogeneic bone graft has been suggested to be a quite propitious alternative bone substitute to autograft. However, controlled clinical trials with adequate samples, including meticulous bone gain measurements, histological evaluations, and long-term clinical and radiographic assessments of inserted dental implants have not yet been conducted to evaluate the abovementioned assumption. **Case Report:** This case report presents a patient for whom allogeneic bone block grafting with a guided bone regeneration procedure had been performed in order to improve the horizontal dimension of atrophic maxillary edentulous ridge. **Results:** Following an uneventful 8-month healing period, though not obvious clinically, tomography images revealed a great amount of resorption, suggesting the replacement of bone graft with soft tissue. Histologic evaluation revealed no evidence of active bone formation. A mass of connective fibrous tissue was infiltrated with inflammatory cells. In between, the presence of trabecular bony structures with a distribution of empty lacunae was illustrative of graft remnants. **Conclusion:** Application of autogenous bone grafts seems to be a more reliable choice at least for extensive reconstructions.

**Keywords:** Allograft; Alveolar Ridge Augmentation; Bone Regeneration; Guided Bone Regeneration

## Introduction

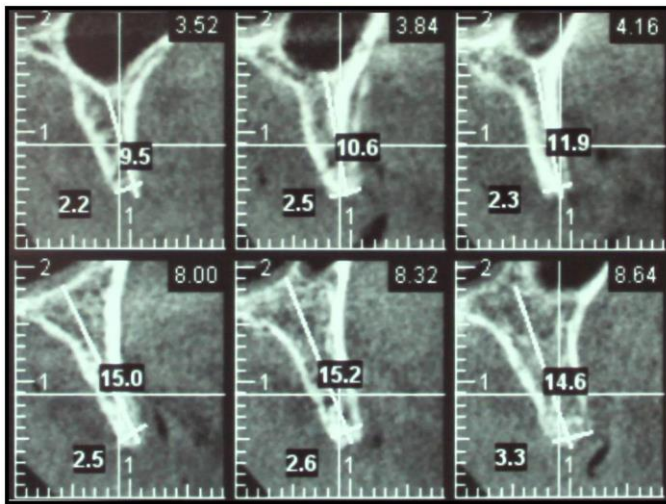
Based upon decades of clinical implant application, a deficient edentulous alveolar ridge has always been a matter of concern. To overcome the lack of sufficient bone in horizontal and/or vertical dimensions, a number of different techniques have been advocated, among which is guided bone regeneration (GBR)(1). GBR had its concept founded on utilizing a barrier membrane over the defect area to create a confined space for osteogenesis, while eliminating the penetration of other tissue types(2). This technique can also benefit from appropriate use of different grafting materials in either particulate or block forms. A range of 2 mm to 7 mm of bone gain have been reported with GBR (3). Difficulties in three-dimensional stability of particulates material with GBR technique in severe horizontal and vertical atrophied jaws make block bone a valuable option in table (4). Nonvascular bone blocks from anterior iliac crest for the defect more than 6 cm and lateral ramus cortical plate found themselves as a workhorse in onlay bone grafting techniques (5). Alloblock introduced to decrease the donor site morbidities hospitalization and cost of treatment for the patients. The range of implant survival and success rates

in ABB was from 73.8% to 100% and 72.8% to 100%, respectively (6). In this article we presented a severe horizontal maxillary deficiency treated with alloblock, but instead of uneventful healing the recipient site showed bone resorption.

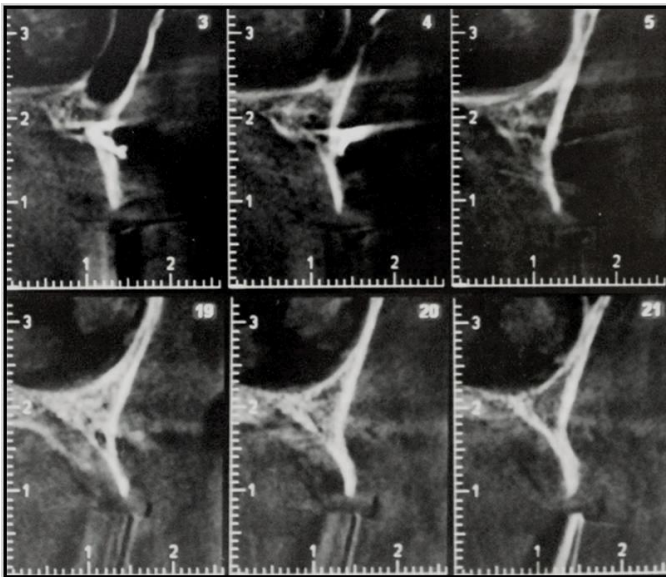
## Report of a Case

### Pre-surgical examination

A fully edentulous 57-year-old female, previously subjected to a maxillary ridge augmentation procedure, was referred to the department of oral and maxillofacial surgery of Shahid Beheshti dentistry school, Tehran, Iran for implant placement. An implant-supported overdenture with four dental implants in the anterior region had been previously treatment planned for the patient. An augmentation procedure had been indicated, based on evaluating the atrophic premaxilla on the pre-surgical cone beam computed tomography scan; on which, lack of alveolar bone volume in horizontal dimension was demonstrated. The alveolar bone width was measured to be 2.1 to 3.6 mm in anterior maxillary region (Figure 1). Horizontal ridge augmentation had been performed using two blocks of allogeneic bone graft (Osteopant Flex, BioTeck, Italy), one on



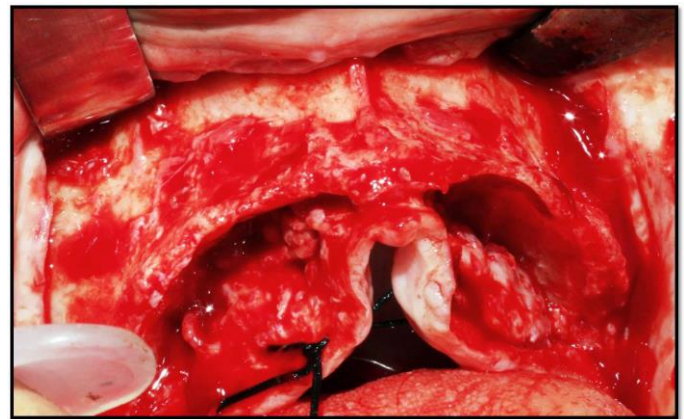
**Figure 1.** Cone beam computed tomography scan demonstrates a lack of alveolar bone volume in horizontal dimension before the GBR procedure



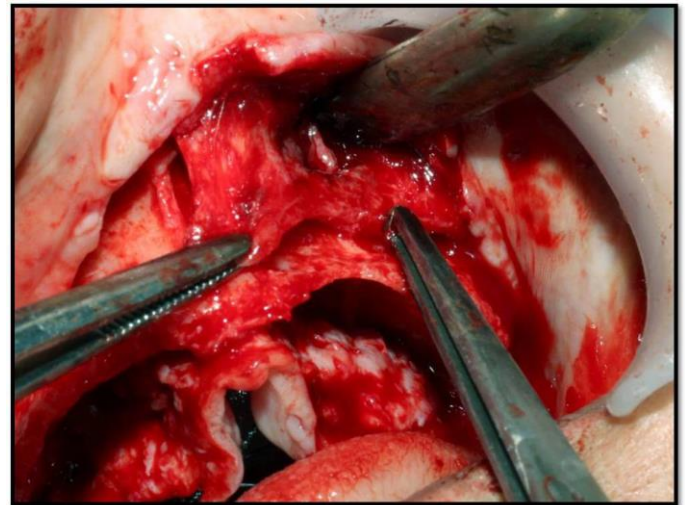
**Figure 2.** Eight months postoperative, bony structure of the ridge is mainly replaced by soft tissue

each side. Stabilization of the grafts was assured by using four titanium bone fixation screws (Jeil Medical, Seoul, Korea, 14 mm length, 1.2 mm diameter). Prior to wound closure, the augmented area had been covered with two layers of resorbable collagen membrane (Biocollagen, BioTeck, Italy). No adverse events were reported during the soft tissue healing period.

At the time of patient's referral (8 months post-operative), on clinical examination, ridge volume seemed to be sufficiently improved. The lining mucosa of the edentulous ridge was of a normal color. No evidence of wound dehiscence or inflammatory exudate could be found. However; assessment of a second



**Figure 3.** Elevation of full-thickness mucoperiosteal flap reveals the atrophied ridge



**Figure 4.** Biopsy specimen taken from the base of the flap

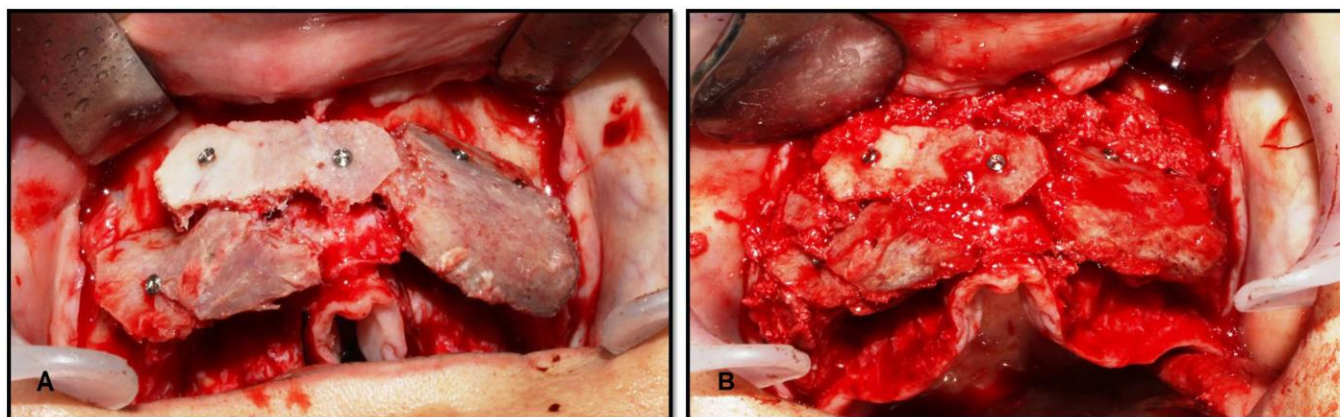
cone beam tomography image revealed that the bony structure of the ridge was mainly replaced by soft tissue; with an approximate residual width of 1 to 2 mm. Guided bone regeneration seemed to have led in vertical and horizontal bone resorption involving the grafted allogeneic bone and the underlying native bone (Figure 2). Based on the mentioned radiographic findings, another ridge augmentation procedure was planned for the patient, this time with autogenous iliac block bone grafts.

### Operative procedure

Onlay bone grafting of the maxilla was performed under general anesthesia. One hour before operation, the patient received 1 mg cefazolin (Darupakhsh, Tehran, Iran), and 8 mg dexamethasone (Darupakhsh, Tehran), intravenously.

Full thickness mucoperiosteal flap was elevated, revealing an extremely atrophied ridge, as well as a significant excess of soft

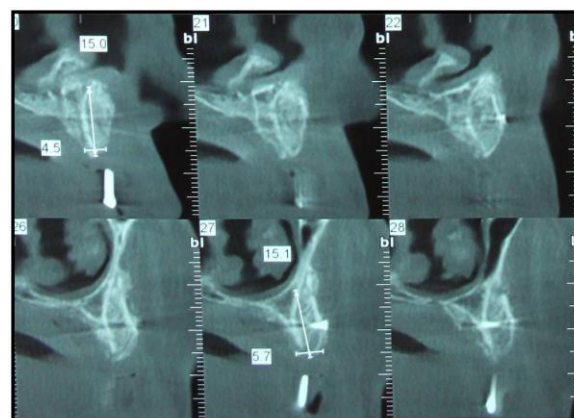




**Figure 5.** A) Bone blocks harvested from the antero-medial part of the iliac crest rigidly stabilized with 3 titanium miniscrews; B) Gaps between autogenous bone blocks and the native bone are filled with particulate iliac bone



**Figure 6.** Four months postoperative, cone beam computed tomography scan demonstrates improvement in ridge width and height



**Figure 7.** A mass of connective fibrous tissue infiltrated with inflammatory cells, with no evidence of active bone formation (hematoxylin and eosin stain, original magnification 40×)

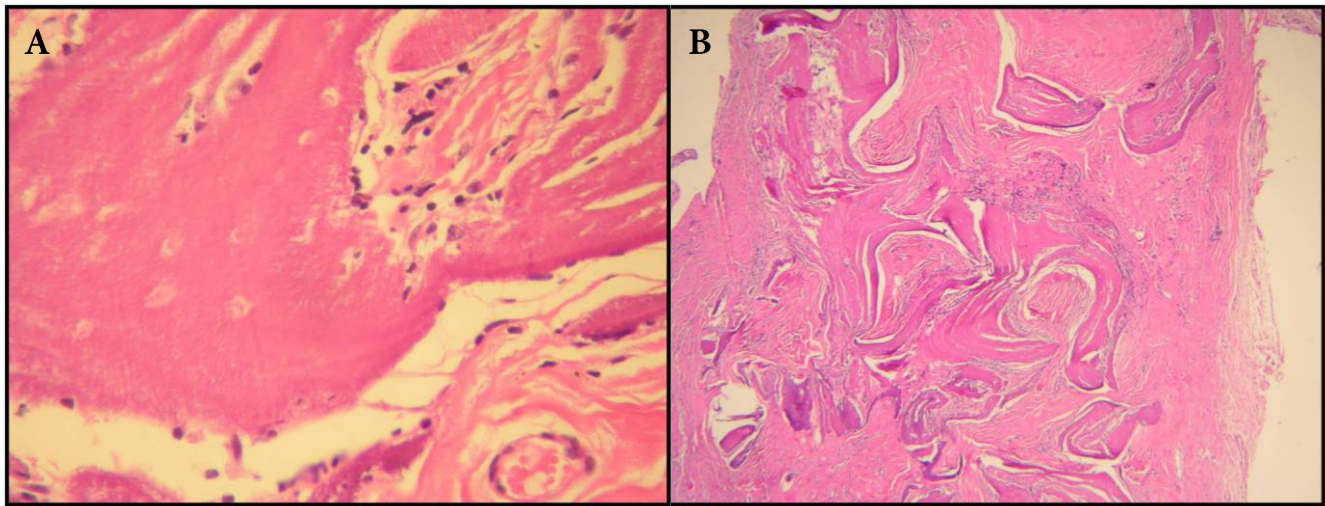
tissue (Figure 3). Collagen membranes were completely resorbed with no remnants remained. Titanium micro-screws were seen to be protruding from the bone and tenting the soft tissue. There was no evidence of bone formation over the atrophic maxilla. The bulk of soft tissue was totally elevated with mucoperiosteal flap and a biopsy specimen was taken from the base of the flap for further histologic evaluation (Figure 4).

Bone blocks harvested from the antero-medial part of the iliac crest were properly recontoured and placed over the atrophic ridge. Autogenous blocks were rigidly stabilized with 3 titanium miniscrews (Jeil Medical, Seoul, Korea, 14 mm length, 1.2 mm diameter). Gaps between autogenous bone blocks and the native bone were filled with particulate iliac bone (Figures. 5A, B). The flap was subsequently sutured in a water-tight manner with 5-0 vicryl (Ethicon Co., Somerville, NJ, USA). The patient received provisional prosthetic restoration one-week postoperative. Soft tissue healing occurred uneventfully, and sutures were removed after two

weeks. Four months following the grafting procedure, tomography images were obtained and assessed. The horizontal dimensions of the ridge were improved up to 5.7 mm and an approximate height of 15 mm was available in most areas (Figure 6).

#### Histologic observations

The obtained specimen was embedded for 24 hours in 10% formalin for fixation and underwent a 7-day treatment with 10% formic acid for decalcification. Subsequently, the specimen was cut into sections 40 micron thick. Sections were stained with hematoxylin and eosin. Histologic evaluation revealed no evidence of active bone formation. A mass of connective fibrous tissue was infiltrated with inflammatory cells (Figure 7). In between, the presence of trabecular bony structures with a distribution of empty lacunae was illustrative of graft remnants (Figure 8).



**Figure 8.** A) Trabecular bony structures with a distribution of empty lacunae illustrates allogeneic graft remnants (hematoxylin and eosin stain, original magnification 200×); B) Fibrous tissue ingrowth with inflammatory PMN infiltration could be seen between nonvital particle of bone allograft (hematoxylin and eosin stain, original magnification 50×)

## Discussion

Recipient site resorption by alloblock grafted bone has been reported here. Lyford *et al* utilized freeze-dried cancellous block graft to increase the width of edentulous ridges. After shaping the block and fixing it with bone screws, the remaining gaps were filled by freeze-dried allograft particulates. The whole grafts were subsequently covered with a barrier membrane. Their results showed a 2-4 mm increase in bone width following a 6-month period. A histologic appraisal of the regenerated bone as well as a follow-up outcome of the inserted implants was not incorporated in this study (7). Petrunaro *et al* treated the defects with allogeneic corticocancellous blocks which were rehydrated with platelet-rich plasma (PRP) and stabilized them with fixation miniscrews. During the reentry surgery, adequate bone was formed for implant placement, though the exact quantitative amount was not reported. Histologic evaluation also demonstrated active bone apposition(8). The histologic interpretation from our specimen showed fibrous remodeling of allografted bone. Keith and colleagues conducted a multicenter prospective study on 73 partially edentulous patients(9). The ridges were measured from 2 to 5 mm in width. Cortico-cancellous block allografts and edentulous ridges were both contoured in order to achieve proper adaptation. The blocks were secured using fixation screws and were covered with a barrier membrane ultimately. Reevaluation of the graft took place after 4 months

concomitant with implant placement and continued for 3 years. According to their results, after 12 months allografts' survival was 93% with 69% showing no resorption at all.

Wallace *et al* reported a case in which both horizontal and vertical augmentations were accomplished using a cancellous freeze-dried block (10). Voids between the graft and the native bone were filled with a mixture of particulate mineralized cortical allograft and PRP, and the reconstructed area was covered with a resorbable membrane. After 5 months of healing period, no graft resorption was noticed. Dental implants were placed successfully and were followed for 21 months with satisfactory results (10). Non-Autogenous bone block can be tolerated well by body according to its high biocompatibility characteristics. The bond strength to the recipient site bone could be strong enough to tolerate dental implant insertion torque (11), but absence of vital osteocyte within the lacuna make the allografted bone as a bio-prosthesis either resorb itself or the recipient site by functional masticatory pressure. In the current case, previous failure with allogeneic bone grafting had resulted in both horizontal and vertical deficiencies, necessitating another ridge augmentation procedure prior to implant placement. Iliac crest bone was opted as the donor site. Ridge width was improved to 5.7 mm, four months postoperatively. The success accomplished with the second bone grafting procedure in this patient, excludes the possible role of unknown endogenous factors that might have been responsible for the previous treatment failure. More



homogenously designed clinical trials might still be necessary in order to introduce the most favorable grafting material as well as the most effective technique for localized or total reconstruction of atrophic alveolar ridges.

## Conclusion

Application of autogenous bone grafts seems to be a more reliable choice at least for extensive reconstructions

Conflict of Interest: 'None declared'.

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