

Case Report

# Reconstruction of Severely Atrophic Edentulous Maxilla with Implants Placed in Autogenous Iliac Bone Graft: A Modified Approach

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## Abstract

This clinical report describes a case of maxillary dental rehabilitation using five implants placed simultaneously in three cortico-cancellous iliac bone blocks and rigidly fixed to the residual bone with titanium mini-screws 2-mm in diameter and mini-plates. All “empty spaces” between the bone segments were filled with iliac bone chips harvested from the diploe of iliac bone mixed by Bio-oss. The second surgery was performed 5 months later, when all five implants were integrated, and one cover screw was exposed to oral cavity. Two months after the second surgery, abutments were connected to the implants and loaded with a fixed partial denture.

**Key words:** Dental implant, iliac bone, reconstruction.

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## Introduction

Conventional implant treatment is often not possible in patients with severe atrophied alveolar bone, especially in the maxilla, and it still represents a challenge for the dental rehabilitation of such edentulous patients. Maxillary anatomic structures such as the maxillary sinus, the nasal floor and the nasopalatine canal are among factors that limit the amount of available bone in cases with advanced resorption.<sup>1</sup>

The gold standard for bone reconstruction is the fresh autograft. Among different autologous sources, cancellous bone from the iliac crest has been consid-

ered the reference source due to its enhanced osteogenic properties.<sup>2</sup> Therefore, it has been widely used for major reconstructions in the maxillofacial area.<sup>3,4</sup>

To avoid excessive resorption of the graft, some studies have recommended fixture installation no later than three months, with graft and implant placement done simultaneously if stability of both is guaranteed.<sup>5,6</sup> In this clinical report, a case of maxillary dental rehabilitation is described using five implants placed simultaneously in three cortico-cancellous iliac bone blocks.

## Case Report

A 56-year-old female patient was referred to the Im-

plant Department of Dental School, Hamadan University of Medical Sciences, Iran, for prosthetic rehabilitation using dental implants to improve retention of a dental prosthesis. The patient was in good general health. Maxilla was edentulous and the patient wore a conventional complete denture, which had poor retention and stability.

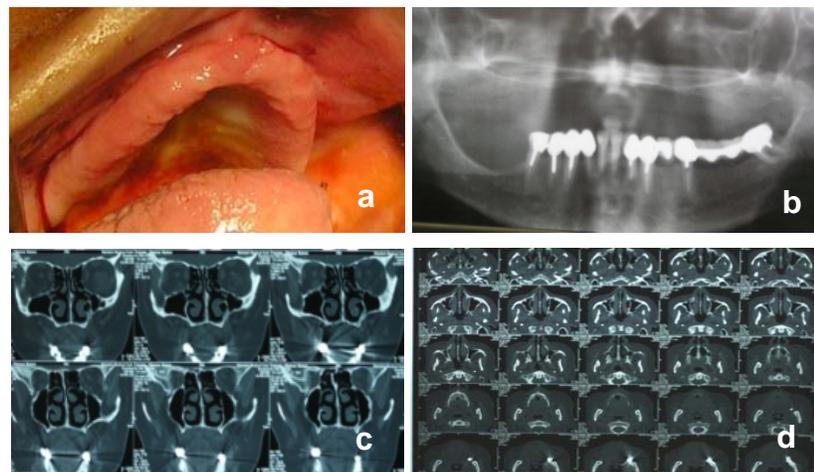
*Preoperative Radiographic Examinations*

The patient was examined radiographically using a panoramic radiograph and CT-scan, which revealed an edentulous maxilla with distinct atrophy of the alveolar bone (Cawood and Howell Class V and VI).<sup>7</sup> The bone height under the nasal floor and the floor of the maxillary sinuses was insufficient for endosseous implant placement (Figure 1).

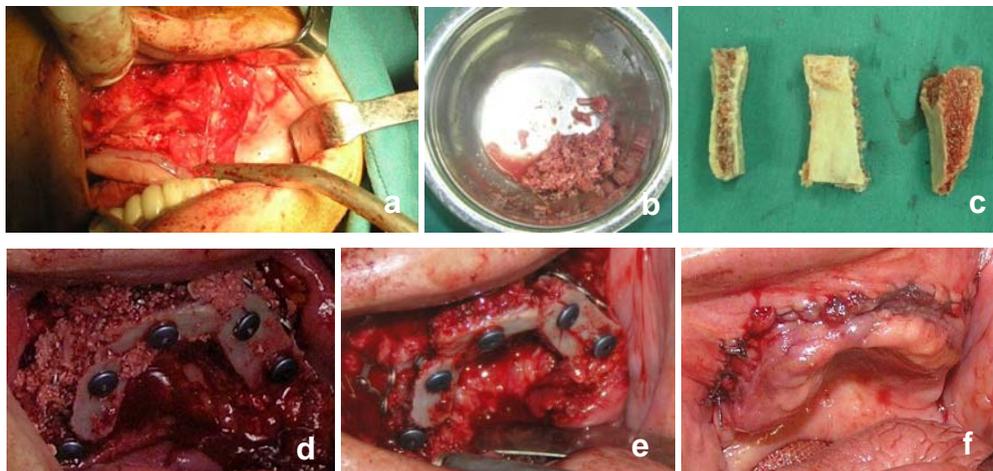
The surgical procedure was performed under general and local anesthesia, and the “trap door technique” was used to achieve the iliac bone blocks. Five

implants (9.5mm height, 4.5mm diameter, SPI, Switzerland) were placed in three cortico-cancellous iliac bone blocks and then rigidly fixed to the residual bone with titanium mini screws 2-mm diameter and mini plates horizontally. The implants had no anchorage of residual bone and all “empty spaces” between the bone segments were filled with iliac bone chips harvested from the diploe of iliac bone mixed by Bio-oss (Geistlich Biomaterials, Wolhusen, Switzerland) (Figure 2).

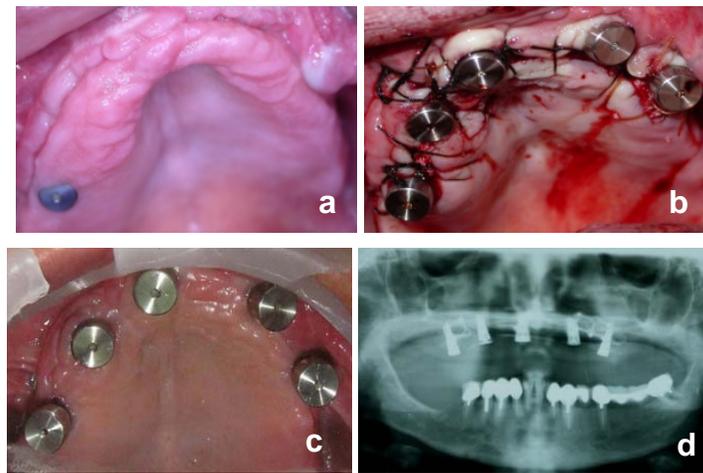
The patient was hospitalized 3 days postoperatively, and given phenoxymethyl penicillin (1 g × 3) for the 7 days following the operation. Vacuum drainage at the donor site was used until the patient was mobilized. Analgesics (paracetamol and nonsteroid anti-inflammatory drugs) were prescribed 7 to 10 days postoperatively. Chlorhexidine mouthwash was prescribed twice daily for 15 days following surgery. The flap sutures were removed 12 days postoperatively.



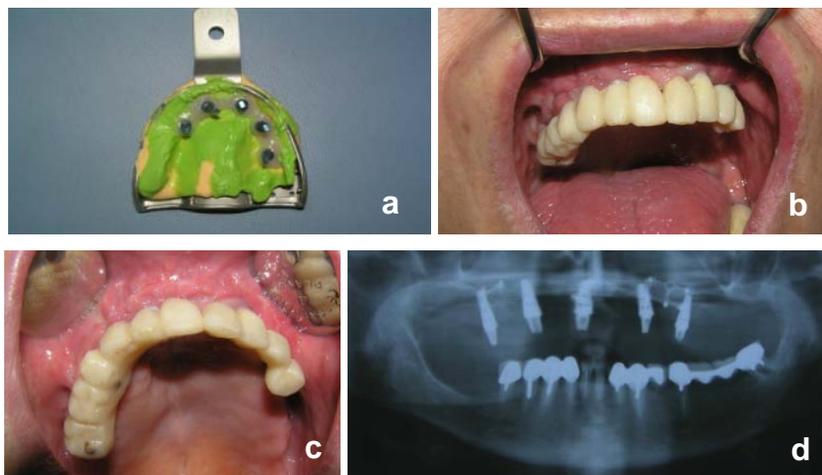
**Figure 1.** Preoperative intraoral view (a); preoperative panoramic radiographic (b) and CT-scan assessments (c,d).



**Figure 2.** First Surgical Procedure. Incision (a); the bone chips with Bio-oss (b); iliac bone graft (c); implants placed in bone graft (d); empty spaces filled with bone chips and Bio-oss (e); sutures in place (f).



**Figure 3.** Maxillary ridge five months after first surgery (a), during the second surgery session for uncovering the implants (b), and two months after second surgery (c). Radiographic appearance at 5 months after first surgery (d).



**Figure 4.** Open tray technique used for impression (a); intraoral view of temporary restoration 12 months after first surgery (b, c); radiographic appearance at 12 months after first surgery (d).

### *Uncovering*

After 5 months all implants had been integrated and one cover screw was exposed to the oral cavity (Figure 3a). Under local anesthesia, all implants were uncovered (apically position technique and rotational pedicle graft) and healing abutment placed on to them. Bio-oss (0.5 mm) was used to treat two threads of two implants which were not covered by bone (Figure 3b). Eight weeks after second surgery (Figure 3c,d), abutments were placed on to the implants and temporary fixed restorations were made for them (Figure 4).

### *Prosthetic Procedures*

The patient was instructed not to wear removable dentures for eight weeks following initial surgery. Thereafter, the patient was supplied with a new denture.

During the healing period after the grafting procedure, the patient was recalled for individual checkups and the denture was relined with a soft tissue relining material or with a permanent relining. The temporary bridge was then used for the additional healing period of approximately 5 months.

### *Follow-up*

One year after implants placement, final bridge was delivered to the patient. Oral hygiene instructions were given to the patient and an individual recall program was set up.

The following clinical parameters were checked: pain, occlusion, prosthesis mobility, and plaque and bleeding indices. Success criteria for implant survival were (1) presence of implant stability, (2) absence of radiolucent zone around the implants, (3) no mucosal

suppuration, and (4) no pain. Extra radiographic examinations were made at baseline, 6 months, and 12 months after first surgery. A radiologist measured the changes in marginal bone height over time (Panoramic and long-cone parallel-technique periapical radiographs). In the 12-month follow-up period, all five implants were stable and had no pain, suppuration, redness or increasing bone loss (Figure 4d). All of the mini-screws and mini-plates were integrated to the cortical bone on the buccal surface of the bony grafts. In order to avoid cutting the screws for removal, all mini-screws but one were left in the site.

### Discussion

Following tooth extraction, and the resulting resorption and atrophy of the edentulous alveolar ridge,<sup>8,9</sup> jaw reconstruction is often necessary.<sup>10</sup> Several techniques have been suggested and evaluated for preservation and reconstruction of alveolar ridge,<sup>11-16</sup> and a variety of bone graft materials and barrier membranes have been suggested to enhance bone formation.<sup>17,18</sup>

Autogenous bone graft is one such technique that bares advantages such as osteogenic potential, form and shape maintenance by using of bone blocks, ability to correct any size or shape deformity, and elimination of the possibility for an immunogenic reaction. The disadvantages of this technique include the need for second surgical intervention, morbidity associated with the donor site, unpredictable bone resorption, longer recovery period, difficulty in managing soft tissue coverage, increased treatment time, and increased risks and side effects.

With the development of implant therapy, new possibilities in the use of bone graft were created and different methods for the combination of augmentation and implant placement were developed.<sup>19-23</sup> Some investigators suggest using short/low diameter implants or titanium reinforced membranes in the severe atrophy cases.<sup>24-27</sup> However, autogenous bone grafts are considered to be the ideal material for the reconstructive procedures.<sup>28</sup> Several donor sites are suggested for the bone graft, but the anterior iliac bone crest is the most commonly used,<sup>29</sup> as a large quantity of bone is required for reconstruction of the atrophic maxilla. In the clinical studies, most of the planned implant positions had to be reconstructed regarding both height and width. The iliac bone can offer large quantities of bone and it is a rather safe donor site.<sup>30</sup> These parameters make the anterior iliac crest the first choice for a grafting site.

Some authors indicate that the one-stage surgery is the most commonly used technique; however, the two-stage technique results in higher survival rates:

79% versus 88%, respectively. One reason for this difference is probably that with two-stage surgery, the revascularization of the bone graft is better and the surgical trauma from placing the implants stimulates an immediate healing response. The two-stage technique also has the advantage that it allows for the correct positioning of the implants. The implant survival rate in the present case, according to the literature concerning the two-stage technique, is comparable with the results after 3 years of loading, 90% versus 88%, respectively. On the other hand, the failure rate of 10% in the present case can be further considered, as the literature concerning implant therapy is gradually shifting from reports of success rates to analysis of complications and identification of risk factors associated with implant failure.<sup>29</sup>

In the previous studies, bone blocks and implants have been used to reconstruct severely atrophied ridges, and thus, some trends of fixtures have always had their primary stability from the alveolar ridge. In the present case the whole length of the implants was placed in the iliac bone blocks which were then fixed to maxilla by means of mini-plates and mini-screws.

Although two threads in two implants were not covered by bone after five months due to bone resorption, one-year follow-up of this case revealed that implants placed in blocks of autogenous iliac bone graft can have predictable results for reconstruction of atrophic maxillary bone. However, additional follow-up is needed to evaluate this method.

### Conclusion

Simultaneous maxillary reconstruction with autogenous iliac bone graft and implants placed in the graft can be a predictable treatment modality in patients with severe atrophied edentulous alveolar ridges.

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