

## Horizontal Augmentation of Alveolar Crest with Onlay Graft: A Case Report

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### Abstract

Dental implant is an important material used in aesthetic and functional restoration of missing teeth from past to present. However some conditions must be favorable for this treatment. The main one is that the vertical and horizontal volume of the alveolar crest has sufficient height and width to place the dental implant in the proper position. Although many techniques and materials are used while augmenting alveolar crest deficiencies, autogenous grafts remain the gold standard. In this article, we aimed to present the implant placement and prosthetic restoration step by step after the rehabilitation of an inadequate alveolar crest with a corticocancellous block graft taken from the symphysis region of the mandible in a young female patient who lost her teeth due to the failure of the apical resection treatment to the teeth numbered 11 and 21.

### Case report

## INTRODUCTION

Trauma, caries, periodontal damage, unsuccessful root canal treatment or tooth loss due to various reasons occur. One way to rehabilitate tooth loss aesthetically and functionally is to use dental implants, and there must be sufficient alveolar bone to support the dental implants. Adequate bone volume is one of the critical factors that affect the success of osseointegration and ensure endosseous dental implants successfully remain in the mouth for a long time<sup>1</sup>. Chronic and destructive periodontal diseases are the most frequent loss of teeth as the cause of vertical and horizontal deficiency of the alveolar crest. In addition, factors such as traumatic tooth extraction, prolonged toothlessness, mobile prostheses used by the patient, infection or cyst-like formations in the periapical region, loss of traumatic tooth and deficiency of congenital teeth also cause insufficient alveolar bone volume<sup>2</sup>.

In cases where the alveolar crest is horizontally or vertically insufficient, we see that it is sometimes not possible to place the dental implant at the right angle and at a sufficient length. In these cases, we encounter the concept of bone graft and bone augmentation. The need for alveolar crest augmentation is atrophic crests named class IV and class V according to the Cawood and Howell category<sup>3</sup>. The combined use of autogenous bone grafts with dental implants was first described by Branemark et al. in 1975, and is now accepted in

oral and maxillofacial rehabilitation<sup>4</sup>. Because all the features that should be in a bone graft are found in the autogenous bone graft, it is considered the gold standard and osteoinduction, osteogenesis and osteoconduction properties are expected from the bone graft<sup>5</sup>.

Autogenous block bone grafts can be obtained from various sites, both intraorally and extraorally. Intraoral donor areas are used for crest deficiencies with partial toothless, while extraoral donor areas are used for reconstruction of areas with large bone losses. Extraoral donor sites can be counted as calvaria, tibia, fibula, scapula, ribs, while intraoral donor sites are mandibular symphysis, ramus and retromolar region, maxillary tubers, coronoid process, toruses and zygomatic bones<sup>2</sup>. Access to intraoral donor areas is easier than extraoral areas. Advantages such as the proximity of the recipient and donor regions, shortening the duration of surgery and anesthesia, outpatient treatment, no scar on the skin, minimal discomfort, less morbidity, and local anesthesia can be found in the intraoral region<sup>6</sup>. As a more preferred donor site, the mandible has advantages such as easy access to surgery, good bone quality, minimal postoperative resorption, rapid healing process, and greater biocompatibility with embryology<sup>5</sup>.

It has been shown that the success rates of dental implants made by onlay grafting are between 65% and 91%, and the success rate for grafts and prostheses is above 90%<sup>7</sup>. The dental implant can be placed in the same session as the

block bone graft, or the dental implant can be placed after the block bone graft is expected to heal. A better dental implant location is possible when the block bone graft is expected to heal. Because by allowing the graft to heal and remodel, we facilitate osseointegration of the dental implant while providing better bone formation<sup>2</sup>.

## CASE REPORT

A 24-year-old female patient who was treated with apical resection treatment for teeth 11 and 21 twice and had no systemic disease, applied to the Oral and Maxillofacial Surgery Department of Cumhuriyet University Faculty of Dentistry due to swelling and infection of these teeth. Teeth 11 and 21 were extracted due to mobility in the teeth, widespread radiolucency in orthopantomography, and the patient's refusal to re-apical resection treatment, and it was decided to perform implant treatment later due to acute infection in the region (Figure 1). According to the orthopantomograph and clinical examination, which was taken approximately 1.5 months later, horizontal loss was observed in the alveolar crest. After three-dimensional tomography taken, bone loss was evaluated more accurately (Figure 2a,b). The mandibular symphysis region was chosen as the donor site because of its ease of access, better amount of bone for local repair and corticocancellous structure. Alveolar crest augmentation was planned with block bone graft from the mandibular symphysis region. The procedure was performed under local anesthesia. A periosteal flap was removed in the anterior region of the maxillary region where the grafts would be placed, using a sulcular incision technique. The recipient area was cured. To ensure blood supply, decortication was

performed to the labial region of the alveolar crest. The receiving region has been prepared. To obtain block grafts from donor area, the periosteal flap was removed with the submarginal incision technique between teeth number 33-43. Two block grafts were removed with piezoelectric surgery (Figure 3). The extracted corticocancellous block grafts were placed in the region of teeth 11 and 21 with one titanium screw. The remaining free spaces were supplemented with an allogenic particulate graft (Figure 4a, b). The autogenic block graft and the allogenic particulate graft were covered with a resorbed collagen membrane (Figure 5). The periosteum was stretched using a scalpel to close the wound without tension. The flap was closed primarily using 3-0 silk suture. In order to provide better healing of the donor region, the areas where block grafts were taken were supported with allogenic particulate grafts. And the flap was closed primarily with 3-0 silk suture.

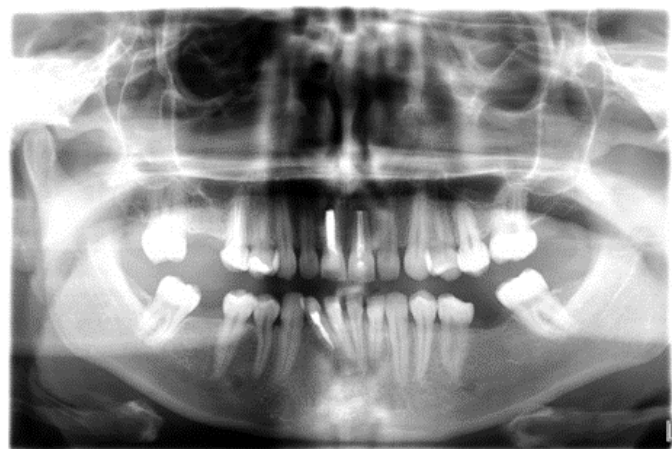


Figure 1: First orthopantomography of the patient

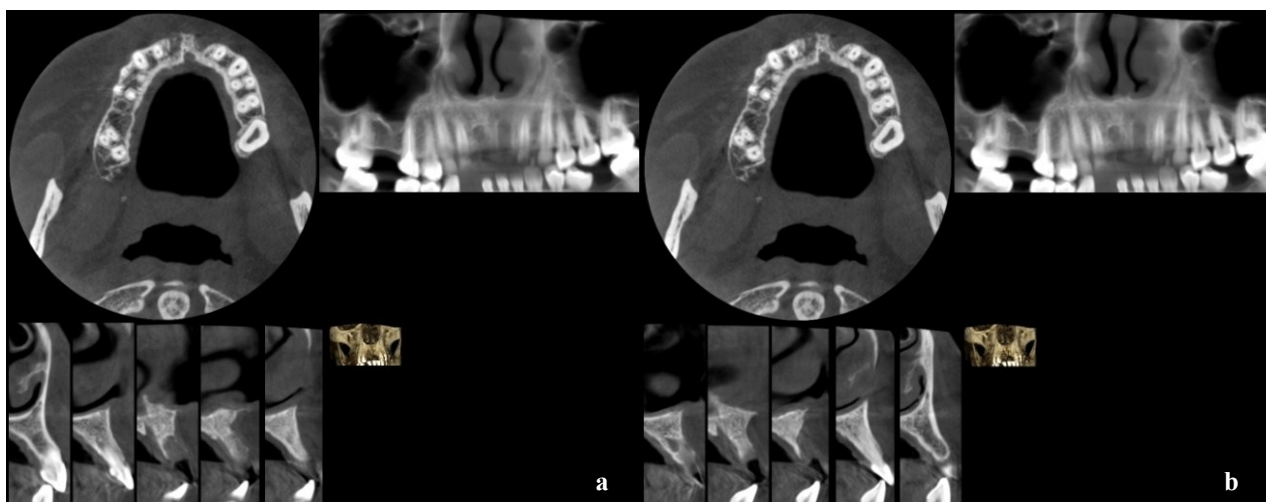
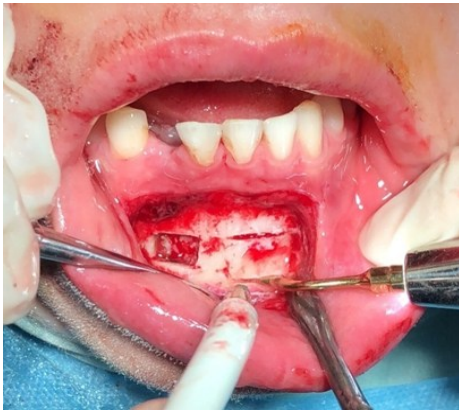
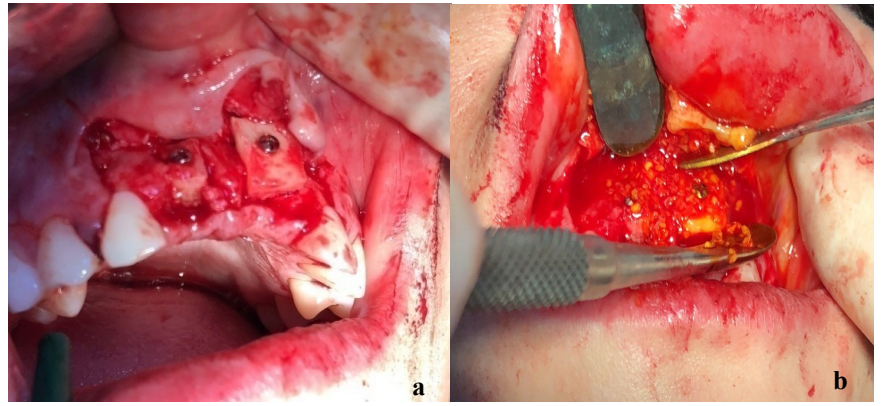


Figure 2. a) Three-dimensional view of tooth region of the maxillary right 1st incisors b) Three-dimensional view of tooth region of the maxillary left 1st incisors

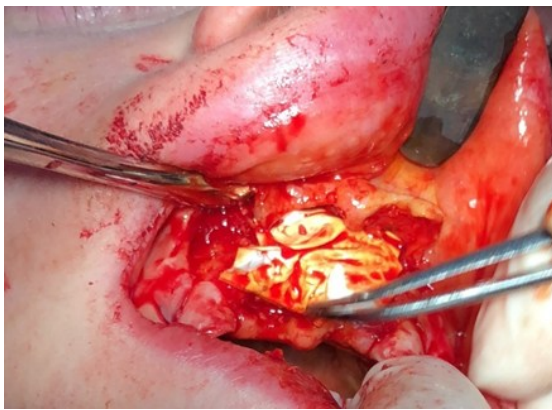




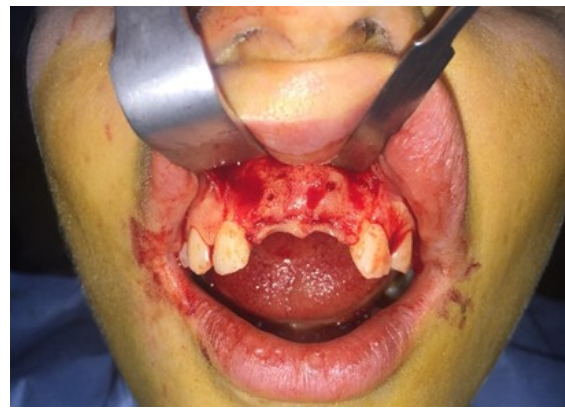
**Figure 3:** Removal of 2 block grafts from the mandible symphysis region using piezo surgery



**Figure 4. a)** Placing the obtained corticocancellous block grafts into the maxillary 1st incisors region with one titanium screw **b)** Supporting the remaining spaces with an allogeneic particulate graft



**Figure 5:** Autogenic block graft and allogeneic particulate graft covering with a resorbed collagen membrane



**Figure 6:** Image of the alveolar crest after 6 months

In the postoperative week, the patient was prescribed amoxicillin+clavulanic acid (Augmentin; GlaxoSmithKline, İstanbul, Turkey), 2x1 metronidazole (Flagyl, Sanofi, İstanbul, Turkey), 2x1 dexketoprofen (Arveles; Menarini International, İstanbul, Turkey), 3x1 0.15% benzylamine HCl + 0.12% chlorhexidine gluconate (Andorex; Pharmactive, İstanbul, Turkey). Sutures were removed ten days after the procedure.

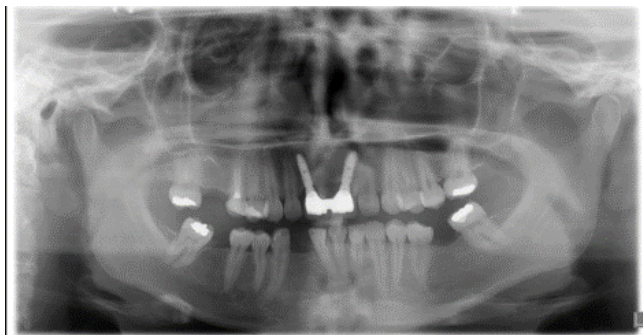
Autogenic block graft and allogeneic particulate graft were expected to heal. Six months later, the recipient area was re-opened to accommodate the dental implants. The horizontal volume of the alveolar crest was considered sufficient to place the dental implant in the proper position (Figure 6). Two dental implants were placed in the areas of teeth 11 and 21 osseointegration was expected for 3 months (Figure 7). After 3 months, the prosthetic restoration was completed by removing the soft tissues on the implants (Figure 8). No resorption was observed on the orthopantomography taken 1 year after the prosthetic rehabilitation was completed (Figure 9).



**Figure 7:** Two dental implants produced by Dentis firm placed in maxillary incisors region



**Figure 8:** Healing cap placed 3 months after implant surgery



**Figure 9:** 1 year after prosthetic rehabilitation

## DISCUSSION

Clinical evaluation and two-dimensional radiographs are inadequate in evaluating alveolar bone sizes. It is very important to use three-dimensional imaging techniques to see both the amount of bone needed by the recipient region and the appropriateness of the donor region before surgery <sup>8</sup>.

The advantage of taking block bone grafts with piezoelectric surgery is that it can protect soft tissues, cause less heat to appear in the bone compared to conventional techniques, and provide safe osteotomies <sup>3</sup>.

Onlay block graft has corticocancellous structure. The cortical part provides support for the graft, while the cancellous part contains a lot of osteoblasts and helps new bone formation. Graft resorption is an important disadvantage in horizontal or vertical augmentation of the alveolar crest. In order to increase the success of this technique, it is necessary to ensure the blood supply of the recipient area by decortication and fix the block bone graft taken to the recipient bed rigidly <sup>9</sup>.

According to comparisons in animal and human studies, intramembranous grafts are more resistant to resorption and tend to maintain volume, while endochondral grafts undergo different degrees of resorption at different time intervals. The mandible body and ramus region, which are among the donor sites where intraoral grafts are taken, show intramembranous features <sup>1</sup>. Selecting the mandibular symphysis region as a donor; It provides opportunities such as easier access to the mandibular ramus, more suitable field of view, short but thicker bone grafts, inducing new bone formation in the recipient region due to being rich in osteoblasts, and being away from the inferior alveolar nerve <sup>10</sup>. In the light of this information in the literature, we chose the mandibular symphysis region in order to obtain auto-graft.

Guided bone regeneration, crest split osteotomy and block grafts are generally used for horizontal augmentation of

the alveolar crest <sup>11</sup>. In this case, we have seen the success of the autogenous block graft again in the horizontal augmentation of the alveolar crest. Requirements for the success of the grafting process are primary closure of soft tissues and no infection in the relevant region. The most common complication in intraoral bone grafting is the opening in the incision line that occurs during the healing period <sup>4</sup>. In this study, no opening was observed in the incision line during the healing process. We think that not observing the opening in the wound area depends on bringing the soft tissues to the ideal volume to close the graft and consequently is of great importance in the healing of our graft. In literature, the rate of temporary paraesthesia occurring in the grafts taken from symphysis is in the range of 10-50%, and in grafts from ramus in the range of 0-5% <sup>1</sup>. It is also important in our study that no paresthesia complaints were observed after the graft taken from the symphysis. We think that this is due to the fact that we carefully performed the incision that goes up from the mental foramen areas and extends across the vestibular sulcus between the lower canine teeth.

Jensen et al. Showed that the combined use of bone grafts and membranes reduces resorption in autogenous bone grafts <sup>12</sup>. In addition, in alveolar crest augmentation, resorption on the graft surface of the autogenous onlay bone graft can be reduced when the grafts are protected by membranes <sup>13,14</sup>. On the contrary, significant crest resorption was observed in autografts that were not protected by membranes <sup>14</sup>. In accordance with the literature, the autogenous graft we placed in the recipient site was supported with an allogeneic graft and was closed with collagen membrane that could be resorbed, and no condition such as graft loss and graft resorption was encountered.

## RESULT

Dental implants are tools that have been used for years to complement the aesthetic and functional deficiencies of the extracted teeth. The alveolar crest volume should be vertical and horizontal enough to put the dental implant in the optimum location in the edentulous region. Intraoral onlay autogenous bone reconstruction of localized alveolar defects is a suitable alternative for horizontal defects. The risk of complications that can result in failure is very low. The reliability and success of block bone grafts taken from intraoral regions has also been proven by studies. In the atrophic alveolar crest, where the

defect is small or partially edentulous, prosthetic rehabilitation can be successfully performed by placing the dental implant in the toothless area using intraoral block bone grafts.

### Conflict of interest

The authors have not reported any conflicts of interest or financial support.

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