

Vertical Alveolar Augmentation Using Autogenous Bone From The Iliac Ala - Description Of Two Cases

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Abstract

Implant placement is the standard treatment for tooth loss in patients with completed bone development. The use of implants in some cases is difficult and sometimes impossible due to the lack of adequate bone volume. An adequate amount of bone tissue determines the correct prosthetic position of the implant, resulting in a favorable aesthetic result and minimizing complications.

The authors of the study will present clinical observations on two cases of augmentation of maxillary and mandibular bone defects using the Khoury method. It is one of the methods of reconstructing large bone defects after extensive resection procedures. The autobone is most often used in large defects of the facial bones.

The article describes two cases of reconstruction of a bone defect with an autogenous graft from the iliac ala. The bone destruction was caused by a tumor of the jaw, and in the second case by an extensive cyst of the mandibular body.

Results: The augmentation procedures were followed by good clinical results and the 5 -year follow-up showed no significant bone atrophy.

Conclusions:

1. The Khoury method is currently the best technique for reconstructing bone tissue in width and height.
2. The best material for bone reconstruction is autogenous grafts which are usually obtained from the retromolar area and the mandibular symphysis area.
3. In large mandibular bone reconstructions, grafts from the iliac ala prepared according to the Khoury technique can be used.

Keywords: augmentation, Khoury method, autogenous grafts, implantation,

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I. Introduction

Implant placement is the standard treatment for tooth loss in patients with completed bone development. According to Schropp et al., within a year after tooth extraction, there is a loss of about 50% of the bone in the vestibulo-lingual dimension. [1]

The use of implants in some cases is difficult and sometimes impossible due to the lack of adequate bone volume. By this we mean the lack of a horizontal dimension, or the width of the alveolar process, as well as the lack of a vertical dimension, or the height of the alveolar process. The degrees of bone resorption are clearly described by the Cawood-Howell classification [2]. An adequate amount of bone tissue determines the correct prosthetic position of the implant, which results in a favorable aesthetic result and minimizes complications.

Reconstructive procedures in the maxilla and mandible are an important scope of treatment not only in extensive oncologic surgeries, but also during the reconstruction of bone after the extraction of cysts or benign tumors [3]

Vertical bone augmentation is one of the most difficult and unpredictable procedures in implant surgery.

II. Case Descriptions

Case 1 description

A 21-year-old female patient was admitted to the Outpatient clinic of maxillofacial surgery, Specialist Hospital in Radom due to bone loss in the anterior aspect of the jaw and loosening of teeth 11,12,13,14 [Figs. 1 and 2]



Fig 1. Clinical image of a patient with SOT before planned reconstruction - buccal view.



Fig. 2 Clinical picture of a patient with SOT before planned reconstruction - palatal view.

Radiological examinations revealed massive bone atrophy of the maxilla on the right side suggestive of periodontal disease. [Fig. 3]



Fig.3 X-ray photo suggestive of periodontal disease

Laboratory tests showed no abnormalities. Dislodged teeth 11,12,13,14 were removed, with granulomatous lesions at the apexes. [Fig. 4]

The material was taken for histopathological examination which yielded the diagnosis (Number 17448-9/18): "In the submitted material, numerous islands and nests of well-differentiated nonkeratinized squamous epithelium, without features of atypia and mitotic activity, laying in a perivascular parenchyma with the presence of mediocre chronic inflammatory infiltrates. The image may be consistent with Squamousodontogenic Tumor. Features of eosinophilic granuloma are not found". It was decided to observe the post-extraction site to rule out possible recurrence.



Fig. 4 Tooth with SOT tumor mass removed.

After 6 months, a very large bone loss was found in the class V jaw of Cawood-Howell classification. [Figs. 5,6] A decision was made to perform vertical alveolar augmentation using autogenous bone from the iliac ala.



Fig. 5 Complete wound healing. Status after 6 months.



Fig.6 3D image of bone defect in the jaw.

Under general anesthesia with nasal intubation, a bone reconstruction procedure was performed in the jaw. A mucoperiosteal flap was incised and dehisced and mobilized in torque to the area of teeth 24;25. [Figure 7]

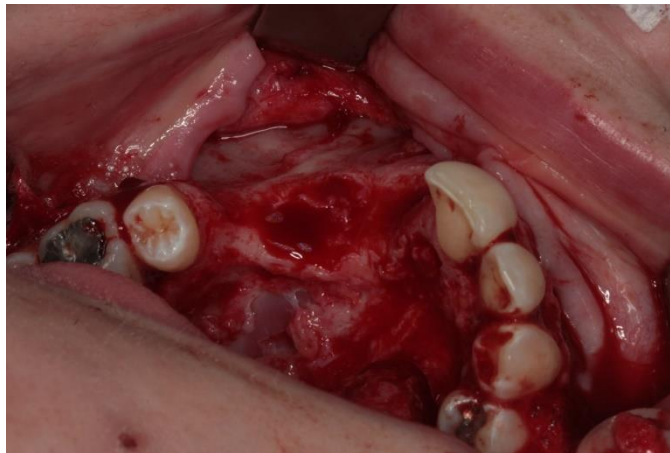


Fig. 7 A visualized recipient site after flap dehiscence.

Subsequently, a monocortical block was obtained from the right iliac ala and a skin graft was harvested.

Subsequently, cortical plaques were prepared according to Khoury technique using surgical disks. The cancellated bone was fragmented. The resulting cortical plate matrices were matched and fixated on the atrophied part of the jaw with titanium screws. [Fig. 8] Shredded cancellated bone was inserted into the space between the lamellae. The wound was treated with two layers, creating the first layer from Bichat's fat pad. The mucosal layer of the base of the flap was then released to minimize tension and a free skin graft from the hip area was sewn in. [Fig. 9]

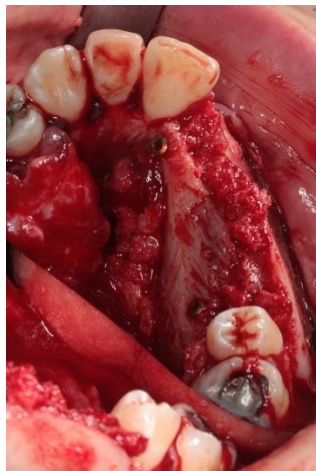


Fig. 8 Fixed bone lamellae along with fragmented cancellated bone

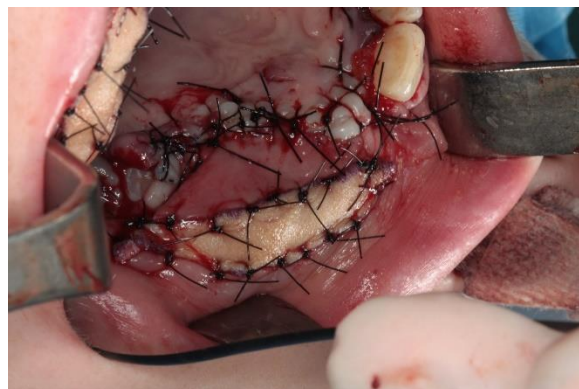


Fig. 9 The final stage of the procedure with the sutured skin extracted from the hip.



Fig. 10 Tenth day after surgery. Healing normal.

The patient was observed until the wound healed. After 6 months, implants were placed and prosthetic restoration was performed. [Figs. 11,12]

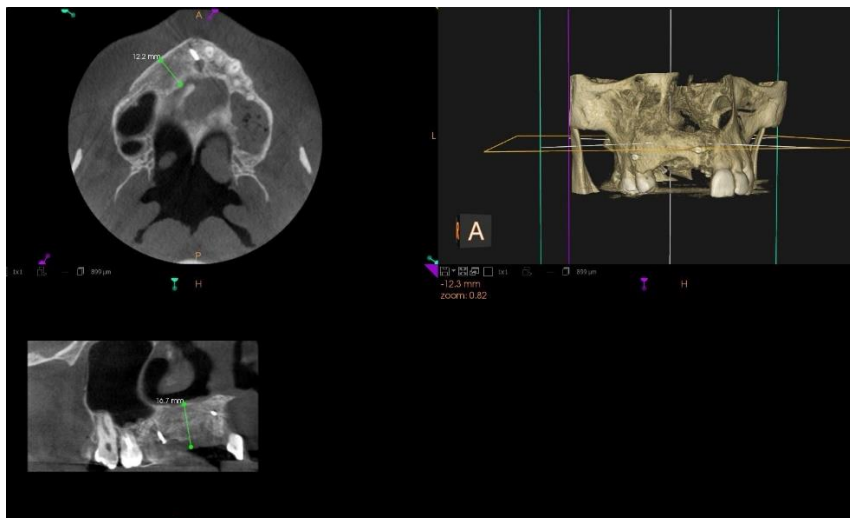


Fig.11 CBCT after about 6 months.

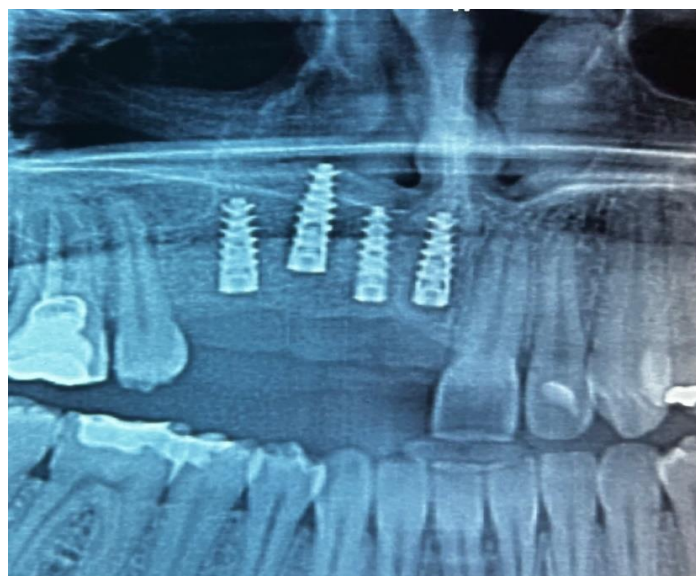


Fig. 12 Status after placement of 4 implants six months after augmentation.

SOT is a benign tumor with slow mostly asymptomatic growth. The lesions are usually accompanied only by increased tooth mobility with a deepened periodontal pocket without purulent exudate[4;5]. There is no excessive expansion of the alveolar process, paresthesia in the surrounding nerves or gingival distension. Excision of the lesion and curettage of adjacent teeth are among the basic procedures for treating such lesions. More extensive lesions especially localized in the maxilla or the recurrent form should be subjected to more aggressive intervention, tooth extraction with excavation of the lesion or partial resection of the jaw along with adjacent teeth is recommended. [6;7]

Based on clinical signs, SOT can be differentiated from peripheral giant cell lesion, fibro-osteal lesion, localized severe periodontitis, squamous cell tumor, vitreous tumor, lateral periodontal cyst and root cyst.[8;9]

SOT can occur in both the maxilla and mandible. In the jaw, most cases are described as occurring in the anterior-medial segment. [9]

Case 2 description

a 40-year-old patient who underwent surgery at Specialist Hospital in Radom for a mandibular cyst presented for reconstruction of the mandibular bone on the right side about two years after surgery. Bone atrophy made implant-supported prosthetic work impossible. [Fig. 13]



Fig. 13 Clinical image of the patient before the planned bone augmentation procedure.

Decisions were made to perform vertical bone augmentation using autogenous bone from the iliac ala. He was qualified for reconstruction with an autogenous graft from the iliac ala due to the extent of defect of classes V and VI of Cawood-Howell classification. Before the surgery, a comprehensive diagnostic imaging CBCT was performed. [Fig. 14]



Fig.14 Bone defect in the mandible.

The procedure was performed under general anesthesia with intubation through the nose. Bone blocks were taken from the iliac ala on the left side and cortical blocks were prepared according to Khoury's technique, using surgical discs.

The cancellated bone was fragmented. The resulting cortical lamina matrices were matched and fixated on the atrophied mandibular alveolar process with titanium screws. Shredded cancellated bone was inserted into the space between the lamellae [Fig. 15] The wound was sutured using a free skin graft taken from the hip. After about 6 months, a follow-up CBCT was performed. [Fig.16]

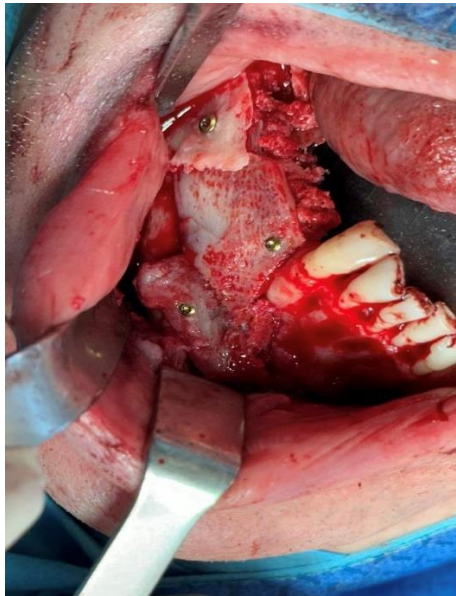


Figure 15 Intraoperative image after fixation of cortical lamellae along with cancellated bone.

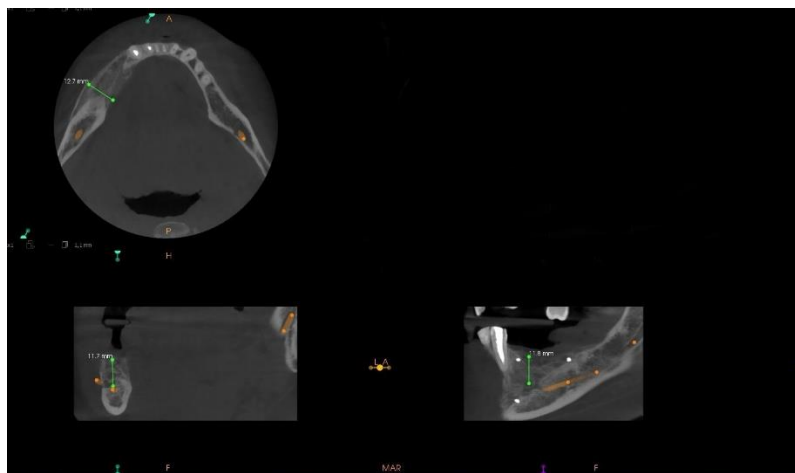


Fig.16 CBCT after 6 months.

III. Discussion:

Three-dimensional defects were most often treated with distraction, GBR or bone block techniques. Autogenous bone blocks met all the requirements associated with the type of graft, but the large number of complications associated with this method and, above all, the difficulties in vascularizing the bone block despite its good stability decided to abandon this technique. [10] The search began for a method that would allow bone to be reconstructed in height while creating histologically sound tissue. The work of Misch and Khoury led to the development of the onlay grafting technique which involves the creation of thin bone lamina to provide a scaffold for the bone defect, stabilized with screws, and cancellated bone tissue was inserted into the center of the scaffold in combination with bone substitute materials. A major advantage of the Khoury technique is that does not use exogenous materials that can trigger host immune responses.[10] During therapeutic management, it is important to remember the 3 phases of treatment. The first is bone reconstruction in width, length and height. The iliac ala is used because of its good affinity in segmental bone defects and because of the cancellated nature of the bone with high ease of anastomosis. [11] Free grafts from iliac ala the have good

affinity in isolated segmental mandibular defects in patients with retained dentition. The limitation is the length of the bone restoration (max. 14cm). The second stage is soft tissue reconstruction within the oral cavity. The final stage is implantoprosthesis. [12] This technique, which reproduces the natural structure of the bone, allows, on the one hand, proper stabilization of the graft, delays resorption, prevents soft tissue penetration into the center of the defect, and at the same time allows strong revascularization of the fine bone between the onlays.

Autogenous bone, due to its osteogenic, osteoconductive and osteoinductive nature, is the best material for vertical alveolar reconstruction. In this regard, autogenous bone grafts have been considered the gold standard in alveolar augmentation, as they contain osteogenic cells, collagen and a number of signaling molecules, such as bone morphogenic proteins which enable the formation of new bone without immune rejection. [13] There are also negative factors associated with this procedure, such as the prevalence of recipient sites, increased treatment time and even hospitalization (in the case of the iliac crest), increased operating time and increased resorption rate. Consideration of autogenous bone grafting as the best method should also depend on selected criteria, such as the site and volume of augmentation, the degree of bone remodeling and resorption.

In cases of smaller bone reconstructions, the recipient site may be the mandibular symphysis region or a ramus of mandible. Sometimes, however, due to the extent of the planned reconstruction, a graft from the iliac ala should be considered. Kalchthaler et al. demonstrated that a greater volume gain of bone can be achieved with the split bone block method than with a full block. [14] Cancellated bone, together with mesenchymal cells in the graft, gradually transforms into host bone. It is a predictable process. [14,15]

Autogenous bone grafting still remains the gold standard. In the case of a large bone defect in the maxilla or mandible, reconstruction with bone blocks taken, for example, from the iliac ala, rib or fibula is recommended. Graft harvesting from these sites should also be considered in cases of high risk of paralysis of the inferior alveolar nerve in planned procedures to obtain autogenous grafts from the branchiomandibular. [1]

IV. Conclusions:

1. The Khoury method is currently the best technique for reconstructing bone tissue in width and height.
2. Autogenous bone grafts, which are usually obtained from the sinusoidal region and the mandibular symphysis region, are the most suitable material for bone reconstruction.
3. In large mandibular bone reconstructions, grafts from the iliac ala prepared according to the Khoury technique can be used.

Ethics approval and consent to participate
Not applicable.

Data availability
All data generated and/or analyzed during this study is included in this published article.

Consent for publication
Not applicable.

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