Autogenous cortical bone graft harvested from the retromolar area - accidents and complications

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Summary

In this paper we will try to emphasize the possible intraoperatory accidents and complications that can appear in case of taking bone graft from the mandible ramus level. Several cases that acquired harvesting of a large volume graft in order to reconstruct bidimensional the alveolar defect were followed up.
The preoperatory imagistic investigations tried also to evaluate the volume of the graft and the reports with inferior alveolar canal, having used ortopantomography and computerized tomography.
The grafts were harvested using oral saws (NSK) and "fissure" burrs, trying to protect and maintain the integrity of the decollated periosteum. For fixation on the receiving bed titan containing screws (Leibinger) were used and the filling of the empty spaces was made using marrow autogenous bone and mineral bone (Bio-Oss), protected with resorbable membranes.

Keywords: autograft, mandible ramus graft, three-dimensional alveolar crest reconstruction, accidents, complications..

Introduction

Reaching the functional and aesthetic targets in the rehabilitation of maxillary edentulous ridges depends in highly percent on the volume of the alveolar remaining bone [1]. Establishing the treatment plan, the indication for using intraosseous implants, the esthetic result depending on the gingival level are only some of the elements on which the remaining alveolar bone relies on [2]. The time passed from losing teeth, previous treatments and the etiology of missing teeth determinate the volume and the level of osseous atrophy [3].

The reconstruction of the vertical level and width of the alveolar ridge is acquired very often in association of implant therapy [4]. A lot of techniques and materials for alveolar reconstruction have been developed, with advantages and disadvantages for each of them. Of all that, the cortical bone graft applied as onlay or veneer permits the obtaining of the best results [5].

Bone augmentation techniques should be determined by the ideal implant position for prosthetic support [6]. For onlay ridge augmentation, research and clinical experience have shown that alloplastic materials, such as resorbable hydroxyapatite, and allografts, such as demineralized freeze-dried bone, yield poor results [7,8]. For the repair of larger defects, guided bone regeneration techniques require expensive membranes and long healing times [9]. The use of these membranes often results in poorer quality hard tissue [10]. According to Craig Misch, mandibular cortical bone grafts provide very predictable increases in bone volume with a short healing time, and yield a highly dense

osseous architecture for implant placement [11].

The anatomy of the retromolar region and of the mandible angle permits the harvesting of "J" shape autogenous cortical bone, which can be used for reconstruction of horizontal and vertical defects.

Aim of the Paper

In this paper we will try to emphasize the possible intraoperatory accidents and complications that can appear in case of taking bone graft from the mandibular angle level. Several cases that acquired harvesting of a large volume graft in order to reconstruct bidimensional the alveolar defect were followed up.

Material and Method

The preoperatory imagistic investigations also tried to evaluate the volume of the graft and the reports with the inferior alveolar canal, having used ortopantomography and computerized tomography.

The grafts were harvested using oral saws (NSK) and "fissure" burrs, trying to protect and maintain the integrity of the decollated periosteum. For fixation on the receiving bed titan containing screws (Leibinger) were used and the filling of the empty spaces was made using marrow autogenous bone and mineral bone (Bio-Oss), protected with resorbable membranes, the same as the international protocol [12].

Results and Discussion

The autogenous osseous graft for the reconstruction of the alveolar bone in association with endooseous implants was realized for the first time by Branemark et al., at that time harvested from the iliac crest [6]. The osseous reconstruction using osseous autogenous block is nowadays a largely used method, using proximal donor sites as the oral cavity and distal sites, such as calvarium, iliac crest and tibiae.

From these levels, it is possible to harvest different quantities of osseous substance; this is why the harvested site should be chosen in relation with the necessary of osseous volume. Generally, grafts harvested from the mandible ramus or symphysis are preferred due to the proximity of the reconstruction region, surgical access, low morbidity and elimination of hospitalization.

In harvesting the bone graft from the mandible retromolar area, a series of factors should be considered:

- The necessary osseous volume;
- The graft shape and design;
- The report between external bone cortical and alveolar canal;
- The presence or not of the third molar [13].

At the time of preoperatory evaluation, two factors should have priority:

1. The defect
2. The harvesting zone.

This preliminary evaluation has only orientation and approximation value. The clinical evaluation of the osseous defect, decision for grafting, the elective mandibular ramus chosen as donor site, in terms of the level of atrophy, the osseous dimensions offered by the donor site, the appreciation of the osseous quantity needed are done prior to surgery by measuring the results obtained by imagistic investigation such as plane Rx (ortopantomography) (*Figure 1*) or vertical sections for the CT (computer tomography) (*Figure 2*). As plane radiography is effective in providing information only in vertical plane, information that need to be corrected in terms of percentage, the computerized images allow precise, tridimensional, accurate measurements (*Figure 3*).

Figure 1. Before surgery ortopantomography

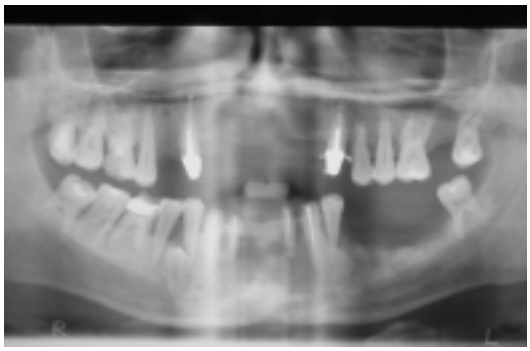
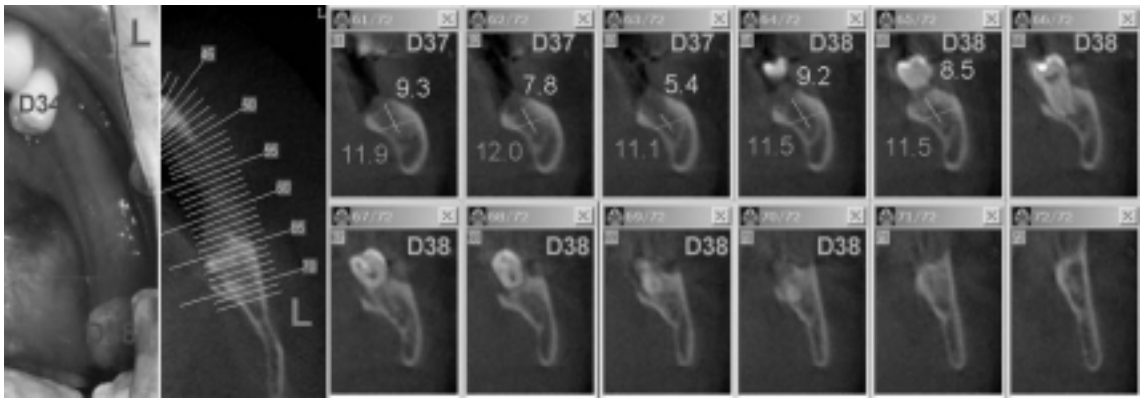


Figure 3. Before surgery 3D CT reconstruction

Figure 2. Before surgery computer-tomography sections



The dimensions of a ramus graft are well suited for increasing the bone width from one to three tooth sites. The thin posterior mandible is a perfect site for using ramus grafts (*Figure 4*) because the donor and the recipient sites are within the same field.

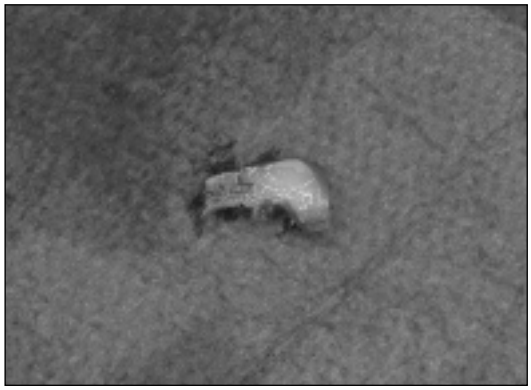
Figure 4. Mandible retromolar autograft harvest

The ramus graft is useful for simultaneous bone harvesting with third molar removal in younger patients with congenitally missing teeth. In addition, this graft can be used as a source for sinus grafting and lateral grafting of the posterior maxilla. When combined with other intraoral donor sites, such as the tuberosity and symphysis, the need for iliac crest grafting can sometimes be eliminated.

The anatomical shape of the alveolar crest in the retromolar region permits harvesting of one cortical bone graft having the detailed surface developed in two almost perpendicular directions as “J” shape (*Figure 5*).

The rotated positioning and fixation of this type of graft on the receptor bed preliminary prepared allows vertical bone augmentation and simultaneously of the width of the alveolar crest.

Figure 5. "J" shaped cortical bone graft harvested from the mandible angle area



From anatomic point of view, the mandible angle region has well represented external cortical bone, bone type I, and allows the harvesting of a large graft, without risk of reducing the resistance of the mandible. By using bone graft from this region it is possible to reconstruct the alveolar crest in one and also in multiple edentulous cases. (*Figure 6*)

Figure 6. Alveolar ridge grafting reconstruction

Cortical bone contains abundant concentrations of bone morphogenic protein for osteoinduction and growth factors that may allow for improved graft incorporation. Studies have shown that block grafts of certain embryologic origin may be responsible for bone healing. Although the majority of bones of the human skeleton are of endochondral origin, mandibular block bone is of a noncartilaginous source (membranous). Research has shown that bone of membranous origin exhibits less resorption than that of endochondral.

Because membranous grafts have been shown to revascularize earlier, a shortened healing time has been applied to grafts harvested from the mandible [14]. Misch considers that the healing time required for ramus bone grafts depends more on the recipient bone [3]. The cortex is porous in the maxilla, and excellent graft incorporation has been found at four months. In the mandible, the cortex is denser; therefore, a slightly longer healing time is given to provide for a solid union. Because implant placement is often at the junction between the host and bone-graft interface, care should be taken during drilling and threading of the osteotomy. The donor site was controlled after surgery also clinically and by imagistic methods: ortopantomography (*Figure 7*) and CT reconstruction (*Figure 8*).

Figure 7. Rx after surgery of the donor site

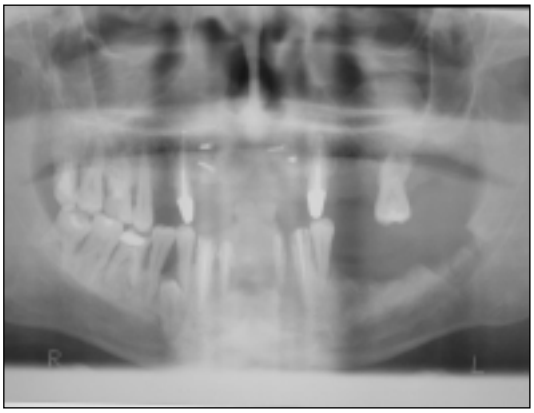


Figure 8. 3D CT reconstruction after surgery of the donor site

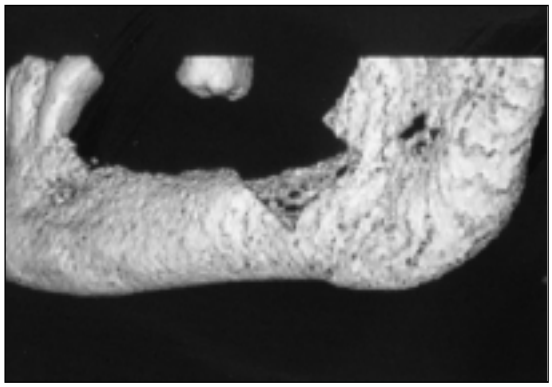
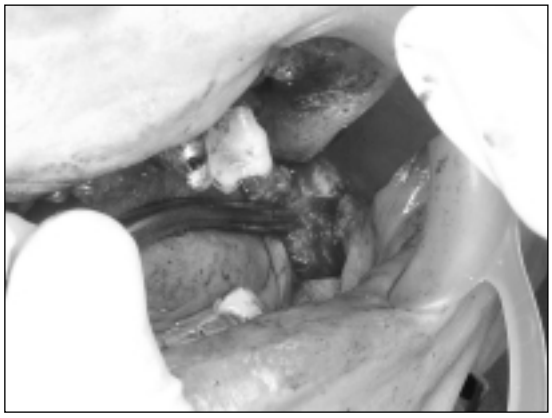


Figure 9. The inferior alveolar nerve and vessels exposed at the donor site



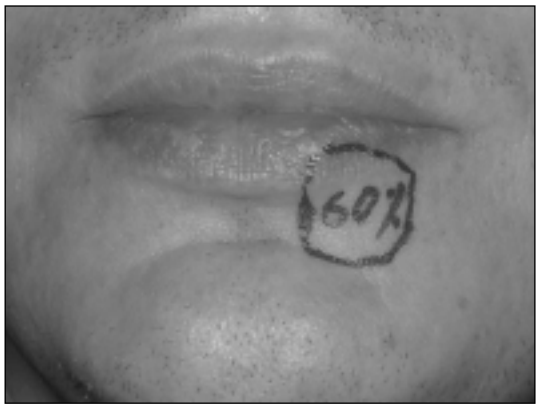
Conclusions

The augmentation of the vertical and horizontal dimensions of the alveolar crest implies as a rule a large piece of graft. The cortical "J" shaped graft, harvested from the retromolar area, fixed on the osseous bed, can repair in both dimensions the osseous defect. Although is considered one procedure that has a small incidence of postoperatory sensitivity alterations, the variable reports between the alveolar canal and the buccal osseous cortical, the dimensions of the donor site, the necessity of a high level of osseous volume, the presence of the third molar on the arch are different factors that can contribute to the opening of the canal (*Figure 9*) and altering its vascular-nervous content.

This can cause abundant bleeding from the site with difficulties in hemostasis and sensitive complications defined in time (*Figure 10, Figure 11*) or permanent on the affected nerve territory. The pain and the local post surgery edema could be significant to the level of donor site, and the alteration of the continuity of the decollated periosteum determine the hematoma diffusion with the apparition of skin echimoses.

Figure 10. The territory of hypoesthesia in the 4th day after surgery

Figure 11. The territory of hypoesthesia in the 43rd day after surgery



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