

Surgical expansion of the alveolar ridge with immediate implant installation

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Abstract

Introduction: After tooth loss, the alveolar process undergoes gradual atrophy, making rehabilitation with dental implants impossible, in extreme cases. **Objective:** To report a clinical case of immediate implant placement in atrophic edentulous maxilla, after application of the alveolar ridge expansion (ARE) surgical technique in the anterior region and maxillary sinus floor lift (SL) in the posterior regions, along with autogenous bone graft removed from the ascending branch of the mandible. **Conclusion:** ARE and SL are viable, safe and predictable alternatives for increasing the thickness and height of the alveolar ridge with rehabilitation purposes.

Keywords: Alveolar ridge expansion. Maxillary sinus. Dental implants.

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Introduction

For a successful dental implant rehabilitative therapy, the presence of bone in a suitable quantity and quality is mandatory.¹ As result, atrophic alveolar ridges in edentulous maxilla are borderline to the prosthetic rehabilitation with implants.²

Edentulous areas in the posterior maxilla present an insufficient bone quantity due to the pneumatization of the maxillary sinus and bone crest resorption after tooth loss, especially in the vertical direction. In the anterior region, the resorption is predominantly caused by labial pressure, consequently, the loss is more significant in the horizontal direction.³

Aiming at the restoration of an appropriate surgical site and implant placement, procedures as guided bone regeneration, alveolar osteogenesis distraction, using alloplastic materials and bone grafts to achieve bone height and thickness, are used.⁴

In 1970, Tatum⁵ first presented the technique for lifting the maxillary sinus floor, named as sinus lift (SL). However, Boyne and James,⁶ in 1980, were the first to report a case in which they described the technique to elevate the maxillary sinus for placing autogenous grafts in order to achieve bone height and thickness, allowing the installation of dental implants.

In 1992, Simion et al¹⁵ described the surgical technique for alveolar ridge expansion (ARE), to increase bone thickness and allow the implant placement in atrophic ridges. The technique consists in conducting a longitudinal greenstick fracture on the atrophic ridge, by making a horizontal osteotomy in the bone crest and two vertical osteotomies, attached to the first one, in mesial and distal ends.

Its indication is restricted to alveolar ridges presenting cancellous bone between the buccal and lingual/palatal walls,

base larger than the bone crest, at least 3 mm thick and 10 mm high. As main advantages are cited the low cost, the possibility of immediate implant placement and shorter treatment time.^{8,9,10}

The aim of this paper is to describe the immediate implant placement in an atrophic edentulous maxilla after performance of alveolar ridge expansion surgical technique and sinus lifting in combination with autogenous bone graft removed from the ascending branch of the mandible.

Case report

A 72-year-old male, leucoderma patient sought the Dental School of Piracicaba, State University of Campinas (FOP-UNICAMP), complaining about the instability of upper and lower dentures, and showing interest in rehabilitation with upper and lower fixed prostheses.

Physical examination showed moderate atrophy of the alveolar ridge crest (Fig 1) and radiographically, it was observed bilateral pneumatization of the maxillary sinus in the posterior region and less than 5 mm height from residual ridge, unlike the anterior region, with 10 mm (Fig 2).

The treatment plan was the rehabilitation of mandible and maxilla using 5 and 6 implants, respectively, under local anesthesia, for subsequent installation of fixed prostheses. It was performed the technique of bilateral sinus lifting in the posterior region and surgical expansion of the alveolar ridge in the anterior region.

A longitudinal incision was performed under the alveolar crest, with mesiodistal limits beyond the osteotomy area, bilaterally onto the first molar region, and two relaxing vestibular incisions. A full-thickness flap was lifted on the buccal aspect, preserving the vascularity of the palatal bone segment (Fig 3).

In the posterior region, maxillary sinus was accessed by the lateral wall of the maxilla with the aid of a spherical carbide drill at low speed and the membrane was lifted with non-cutting curettes (Figs 4 and 5). Horizontal osteotomy was performed using a #700 drill in the atrophic alveolar ridge, to break the cortical bone and to reach cancellous bone (Fig 6). Expansion of the buccal wall was obtained by using straight chisels to a height of 6 mm (Fig 7). Surgical sites were then prepared for placement of four 11-mm long implants in the anterior region and two 9-mm long implants in the poste-

rior region (Fig 8), obtaining primary stability for all of them. Then, the bone graft from the ascending ramus of the mandible was used to fill the windows obtained by sinus lifting and spaces between the implants (Figs 9 and 10). Finally, the flap was positioned and sutured in such a way to completely cover the bone and implants. In a second procedure, it was performed the installation of five implants in the anterior mandible. It can be observed in the postoperative radiographs (Fig 11) an adequate sinusal bone gain and proper positioning of the implants.



Figure 1 - Atrophy of the alveolar ridge.

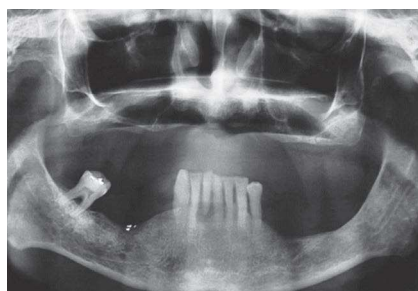


Figure 2 - Pneumatization of the maxillary sinus and sufficient bone height.

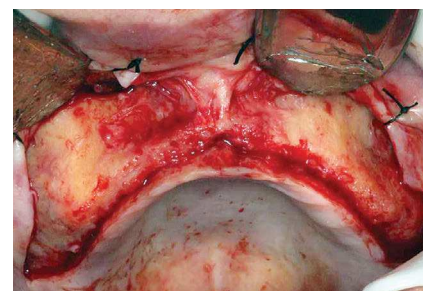


Figure 3 - Detachment of the mucoperiosteal flap.

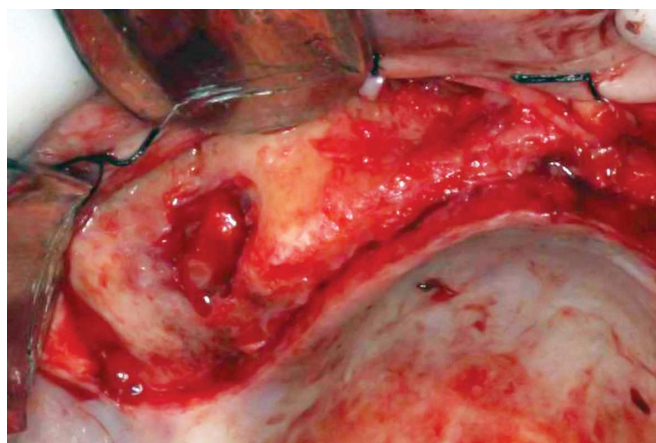


Figure 4 - Right maxillary sinus lift.

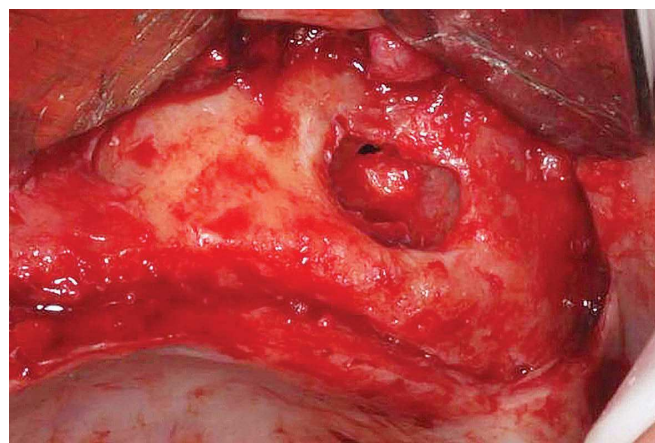


Figure 5 - Left maxillary sinus lift.

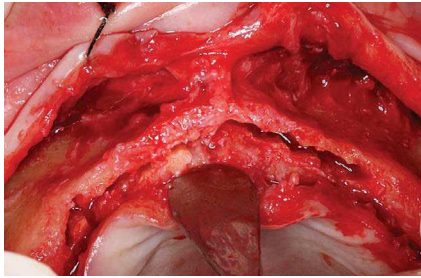


Figure 6 - Osteotomy in the alveolar ridge crest.

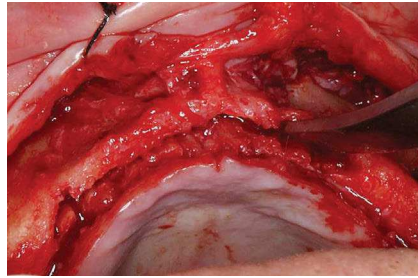


Figure 7 - Alveolar expansion with the aid of chisels.

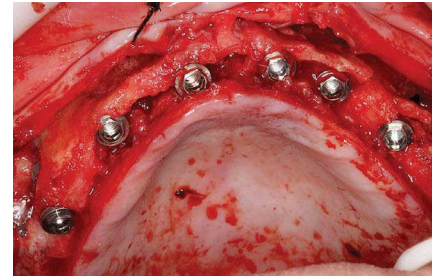


Figure 8 - Installation of 6 implants in the maxilla.

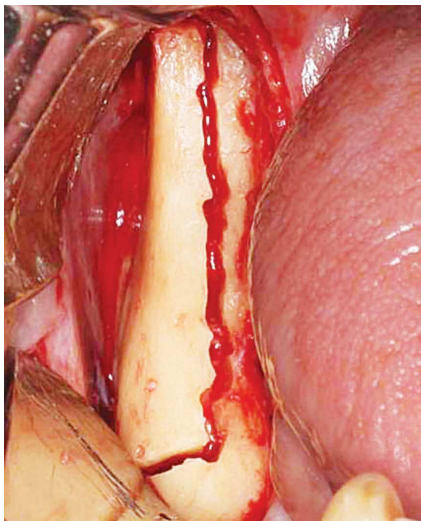


Figure 9 - Donor area.

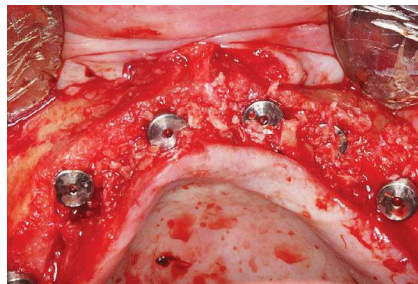


Figure 10 - Filling the maxillary sinuses and the spaces between implants.

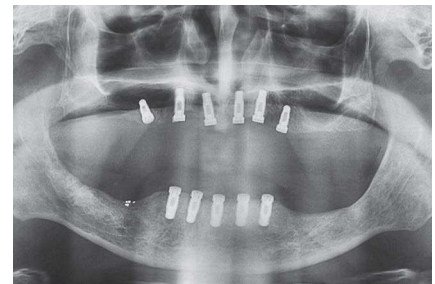


Figure 11 - Appearance of implants placed in the maxilla and mandible.

Discussion

The risk of sinus membrane perforation during the procedure of lifting the maxillary sinus is smaller in atraumatic technique. However, the choice between one or the other is based on sub-sinus bone density and height required for placement of dental implants. To perform the atraumatic technique it is required a sub-sinus bone length of 5 to 6 mm for a bone gain of 3.5 to 5 mm to be obtained, whereas for the traumatic technique it is required 2 to 5 mm of bone¹¹ for an elevation of 10 to 12 mm. In the present case, the height of the bone in the posterior alveolar crest was about 2 to 3 mm, reason why traumatic technique was chosen.

In the literature, the surgical technique described for carrying out the ARE is a longitudinal greenstick fracture of the vestibular bone wall, in which two parallel osteotomies in vestibular bone wall are joined by another osteotomy in the bone crest.^{8,12} In this case reported, it was performed only the longitudinal osteotomy, also described by other authors.^{10,13} This fact is justified by the predominance of type III bone in the anterior maxilla, which exerted little mechanical resistance during the expansion process, thus complementary osteotomies were not required.

This technique is limited to ridges which present bone marrow between the buccal and lingual/palatal walls and have a base larger than the bone crest, thus being restricting for cases of patients with atrophic ridges where it is intended to gain bone only in horizontal axis.^{8,10,13} However, another viable option for subsequent rehabilitation with implants would be bone grafting for reconstruction of the entire maxilla. The iliac crest is the most used extraoral site for extensive reconstructions, and has the disadvantage of requiring hospitalization, general anesthesia, presenting high morbidity, higher costs and cutaneous scar formation.¹⁴

It was observed that with the use of these two techniques simultaneously to bone grafting, immediate installation of implants was possible, significantly reducing the treatment time and amount of bone needed for reconstruction.

It must be observed the importance of proper planning, bringing greater predictability when the ARE and SL are indicated.

Conclusions

In the case presented, the ARE provided satisfactory horizontal gain that allowed the placement of dental implants.

The surgical procedure should be carried out within biological limits, using suitable instruments in order to avoid an undesirable fracture during expansion and/or rupture of the sinus membrane.

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