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Case Report Article

Split crest technique: a solution for atrophic anterior maxilla – case report

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Abstract

Introduction: The rehabilitation of atrophic anterior maxilla can be done by different techniques. Among the procedures for bone augmentation, we can use block grafting, guided bone regeneration, and split crest technique (SCT). SCT consists in bone crest osteotomy, followed by manual/mechanical expansion up to the splitting of the buccal plate from the lingual/palatal plate through greenstick fracture. SCT advantage is the possibility of simultaneously installing a dental implant. However, SCT planning should consider the remaining bone width and the flap type to obtain success. **Objective:** To report a case of implant-supported rehabilitation of an atrophic anterior maxilla using the split crest technique with insertion of 4 immediate implants, showing the effectiveness of the technique.

Introduction

The dental losses throughout life cause functional and esthetic limitations in individuals, causing many times psychosocial alterations. The oral rehabilitation aims at improving the quality of life, returning oral functions. Implantodontics has contributed to the rehabilitation of these individuals. However, in many cases, the dental losses are associated to important alveolar bone loss due to infectious processes, limiting the vertical and horizontal support for implant installation. In these cases, techniques for the alveolar bone augmentation must be considered [6].

Among the techniques of alveolar augmentation, the expansion of the alveolar crest technique, so-called split crest, has been described as an excellent alternative in atrophic ridges, which have enough bone height and a minimum thickness of 3 mm [17]. In some cases, when the minimum thickness is of 3 mm and the bone height greater than 10 mm, the implant is simultaneously installed with SCT [9]. Split crest technique (SCT) was described by Nentwig, in 1986 [10], and it is a simple, fast, and predicable technique for the expansion of the atrophic alveolar crest. SCT allows bone augmentation without requiring a second surgery, minimizing the morbidity of the autologous bone removal, reducing the risks of large edema, injury of the inferior alveolar nerve, and postoperative pain [16]. Moreover, the technique provides an improvement of the bone contour, allowing the implant installation in a favorable position for

prosthetic rehabilitation [14]. However, the success depends on the correct indication. The technique is favorable and must be avoided in bone ridges smaller than 3 mm of thickness, therefore SCT can lead to large bone resorption [4].

Case report

A female patient, aged 58 years, searched for dental care at Positivo University, for implant-supported rehabilitation of edentulous mandible. She complaint about discomfort with the removable prosthesis and desired individual teeth. She had removable partial denture in the anterior area of the maxilla, reporting a history of multiple tooth losses due to trauma, approximately 15 years ago and demonstrating important esthetic complaints of her smile. At clinical examination, we noted loss of teeth #12, #11, #21, and #22, associated with the atrophy of the anterior alveolar ridge.

Because of the patient's complaints and conditions found in the clinical examination, we requested cone beam tomography examination, to verify the available bone structure for implant-supported rehabilitation. The examination demonstrated a bone thickness of approximately 3 mm and height of 12 mm, evidencing the need of bone augmentation (figure 1). Among the available techniques of grafting, the clinical conditions of the patient allowed to the accomplishment of split crest technique with immediate installation of implants, which was the technique of choice to decrease the surgical appointments, the time of treatment, and the surgical morbidity.

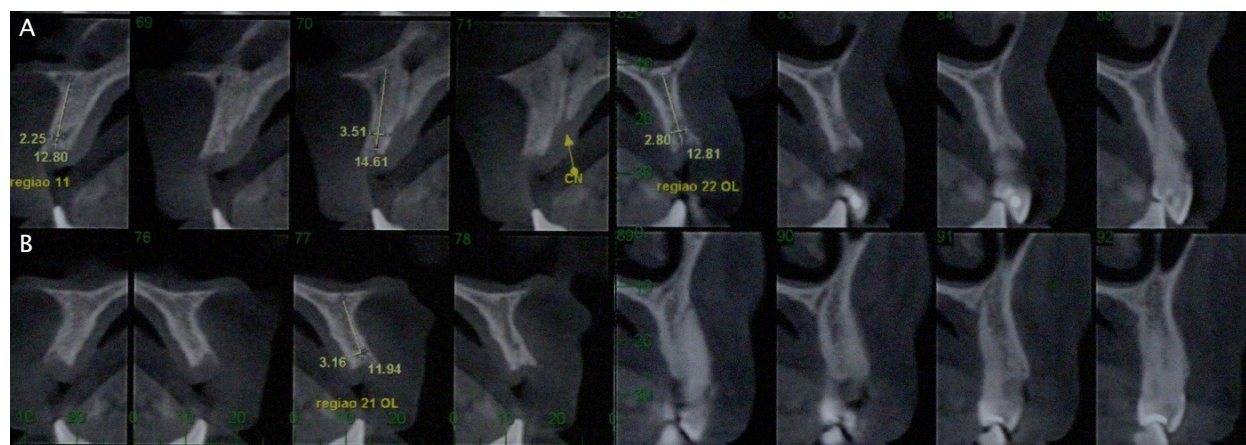


Figure 1 – CBCT examination of the anterior maxilla showing little bone thickness (A and B)

Surgical technique

Previously to the surgery, Betamethasone 2 mg was prescribed (2 tablets 1 hour prior the procedure). For the accomplishment of the surgical technique, initially intrabuccal asepsis with 0.12% chlorhexidine digluconate was carried and the area was anesthetized locally (Articaine 4%, New DFL). Total incision on the edentulous ridge was performed, but we executed a divided flap on the vestibule bottom to allow adequate irrigation (figure 2A), and two relaxing incisions in the distal of the teeth (figure 2B). After the flap raising, horizontal osteotomy with serrated disc #943HL (Komet, Germany) was executed on the alveolar crest (figure 2C) and two vertical osteotomies on the mesial sides of the canine teeth, creating a trapezium (figure 2D). After that, a thin chisel was used to accomplish the greenstick fracture with caution to keep the labial bone ridge adhered superiorly. Then, 4 3.5x11

cortical implants (Neodent, Curitiba, Brazil) were installed, anchored in the bone structure located superiorly. The implants were installed in the area of teeth #12, #11, #21 and, #22 (figure 2E-F), with torque of 32N, 32N, 45N and 20N, respectively. Because of the expansion of the labial bone after installation of implants, we opted to install three 5x12 mm screws (Curitiba, Brazil, Neodent), introduced in the area between the implants to better stabilize the bone segment (figure 2H). The space between the bone segments was filled with 2 g of medium-grit lyophilized bovine bone (Bioss-Geistlich). Finally, the flap was closed with isolated sutures, with 5.0 nylon thread (figure 2I-J).

Postoperative pain was managed by prescribing Dexamethasone 4 mg (at every 12 hours, for 3 days) and Tylex (at every 8 hours, for 3 days). Also, we prescribed Amoxicillin 500 mg (at every 8 hours, for 7 days), to decrease the risks of postoperative infection.

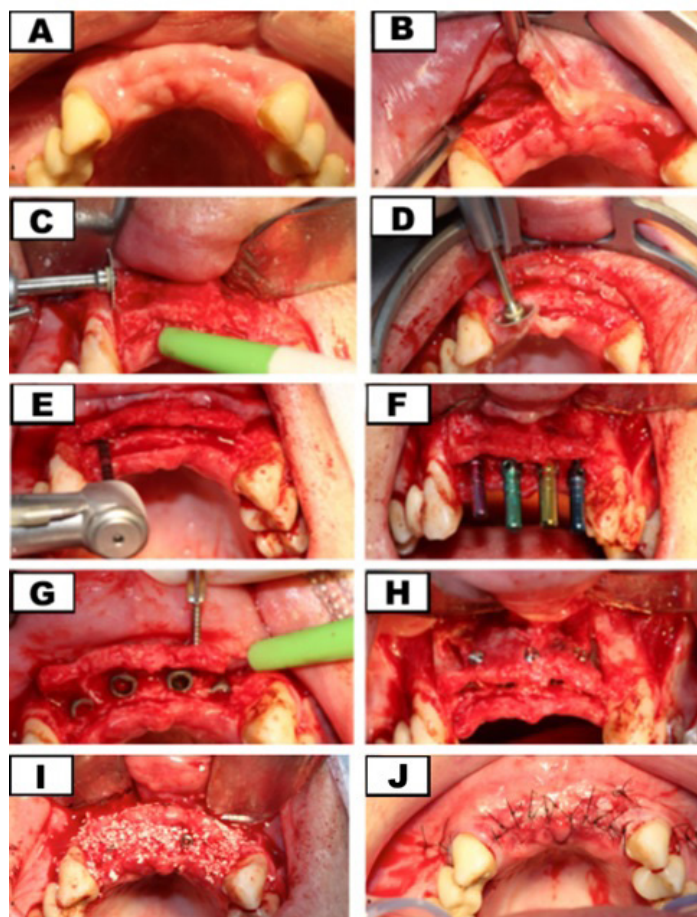


Figure 2 – View of the edentulous ridge (A); relaxing incision on the superior part of the flap raising (B); beginning of the osteotomy with diamond saw in the vertical direction (C) and horizontal direction (D); beginning of the perforations with the spear (E); 4 parallel templates (F); implants installation and insertion of the first screw to fix the labial bone cortical (G); after the ending of the installation of the 3 screws (H); graft with granulated bovine biomaterial filling the spaces (I); flap positioned and closed with simple suture (J)

After the period of 6 months, the implants were reopened, and impression was carried out for provisional crowns construction. The provisional crowns were kept for 3 months for gingival conditioning, and finally the impression for the definitive crowns was executed. The crowns were constructed individually. At 4-year follow-up, the patient lost tooth #13, without relation with the surgical procedure and prosthetic rehabilitation. In the control radiograph, bone saucerization of the implant area can be noticed (figure 3).

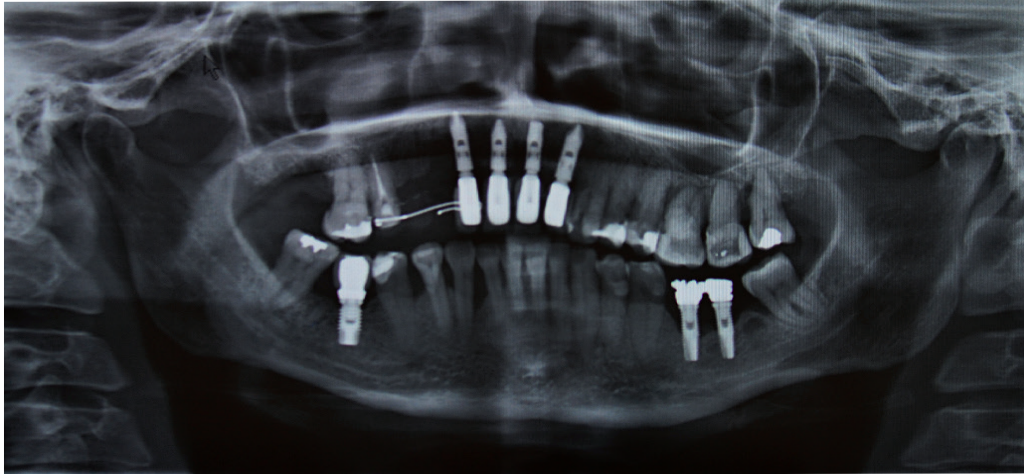


Figure 3 – Image of the 4-year following-up panoramic radiograph

After all the following-up period, the gingival height was maintained, with normal masticatory and phonetic function, reporting satisfaction with both function and smile esthetics.

Discussion

The alveolar expansion is an excellent tool for augmentation of alveolar bone, but the technique must be carefully executed to prevent the breaking of the labial bone cortical, which leads to the devitalization of the bone fragment and consequently to resorption. When the technique is carried out with partial flap or minimum periosteum raising, bone resorption is decreased, and long-term stability increased [7]. Thus, in this present case report, we opted for the total flap raising only in the necessary portion for the cuts with the saw. In the palatal bone wall, the flap was not raised; at the apical portion, the flap was divided to allow the bone grafting.

The installation of the implants immediately after the split crest technique, biologically behaves in the same way of an implant located in a fresh tooth socket. In this surgical procedure, only the apical portion of the implant was located in the alveolar bone, with insertion torque only in contact with the labial and lingual walls. Thus, it was expected that, similar to immediate implant installation after tooth

extraction, bone remodeling during healing occurs and the bone tends to displace apically [1].

A study proves the effectiveness of the split crest technique, with a success rate of 95% [5]. The method of expansion with osteotomes is used frequently and of great utility in certain patients with maxillary bone atrophy [11]. The use of rotatory conical osteotomes also has demonstrated satisfactory results [8]. Other less sophisticated techniques using of Beavers blades no.64, chisels and osteotomes for recovery of the bone volume also have been effective [12].

The high success rates of SCT technique depending on some factors. The primary stability of the implant, when installed in the same appointment is one of the most crucial factors for the success in osseointegration [3]. This factor depends on the bone quality and quantity, the implant design, and surgical site [13], so the importance of correct indication of this surgical technique. The labial bone cortical needs to be kept with a minimum thickness from 1 to 1.5 mm [15]. Most of the implants of this present study had immediate torque greater than 30 N, only one implant had the torque of only 20 N.

Despite being an effective technique, complications have been reported, and could be observed in the case presented, as: increased fracture of labial bone cortical, which had to be fixed with graft screws. The literature reports the occurrence of total fracture of the labial wall with the accomplishment of this technique. González-García *et al.* [6] believe that, when this complication occurs, the careful setting of the labial segment must be carried in the palatal wall, with two bicortical microscrews, keeping the stability of the fragment and the preservation of gap. Another complication of the present report was the resorption in the cervical portion of the implants, but the esthetic was not affected. Jensen *et al.* [7] reported that the most common complication was the resorption of the labial wall and gingival recession. This occurred in 14.7% during the period of the study, with at least 2 mm of bone loss height, for all the used flap techniques. The worse obtained result was total flap, where 10 of 12 cases more had had 2 mm or more of bone loss [7].

Despite of the aforementioned complications, the SCT is considered by most of the authors a little invasive procedure, and the survival of the installed implants is close to the conventional procedures of implant installation [2].

Conclusion

The present case demonstrates that the split crest technique associated with the immediate installation of implants is effective and safe when correctly indicated and allows the reduction of the surgical steps, decreasing morbidity when compared to alternatives bone graft techniques.

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