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Case Report

Split Crest Technique for Horizontal Alveolar Augmentation and Simultaneous Dental Implant Placement: A Case Report

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Abstract

The oral rehabilitation with implant supported prosthesis it is challenging in areas where there is not enough thickness. This is the case of atrophies in the maxilla or mandible in edentulous patients. To achieve a satisfactory bone volume that allows the installation of implants, several techniques can be performed. This report presents the case of a 55-year-old female patient with insufficient bone thickness between the maxillary canines, but with a satisfactory height for implant placement. The Split crest technique was per-formed, taking advantage of the bone height and the medullary portion in the region, al-lowing the immediate installation of implants with bone graft. The postoperative period was uneventful and at 6 months it was possible to install the provisional crowns. There-fore, it is concluded that the Split crest technique is predictable and allows safe oral rehabilitation.

Keywords: Oral rehabilitation; Split crest technique; Prosthesis; Tooth Loss.

Introduction

The tooth loss is related to aesthetic, functional and social consequences. Furthermore, it results in the absence of stimuli to the alveolar bone. Stimulation of the alveolar bone is responsible for maintaining bone volume. Without stimulation the bone will undergo a process of atrophy, which is characterized in the maxilla first by the reduction in thick-ness and then by vertical resorption. In the anterior region of the maxilla, the need to re-store the anatomy to ideal conditions becomes critical, due to the great aesthetic importance of the region [1]. There are many established techniques for bone reconstruction and anatomical restoration

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of the anterior maxillary region. The split crest technique is a method of bone graft used to increase thickness, commonly indicated for this area due to the characteristic of low local density and pattern of bone resorption. To perform this technique, it is necessary that there is remaining bone in thickness, with medullary bone between the cortical bones. [2].

In this technique, vertical osteotomies are performed to allow the splitting the alveolar ridge longitudinally in two parts. The buccal cortical bone plate is separated from the bone marrow and displaced in a labial direction to increase the alveolar ridge width to enable insertion of implants. This technique allows the immediate installation of dental implants in the created gap, reducing the total time of recovery for rehabilitation [3,4]. This report shows a case of split crest technique with immediate implant placement.

Case report

A 55-year-old female patient came to the dental office complaining about the esthetics of her smile, dental absences, and referring interest in oral rehabilitation with im-plant-supported prosthesis. The clinical exam showed absence of 4 upper incisors and horizontal bone deficiency (Figure 1, 2). Computed tomography showed the presence of 3mm of remaining bone thickness, with medullary bone, and preservation of alveolar bone height (Figure 3). In view of the observed condition, the proposed planning was to carry out the Split Crest technique, installing 4 implants, replacing the 4 missing teeth.

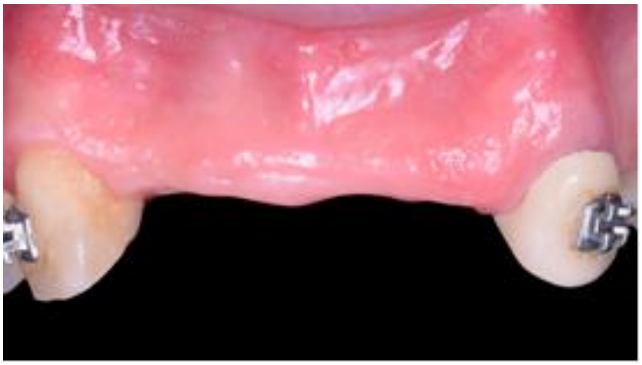

Figure 1: The clinical exam showed absence of 4 upper incisors and horizontal bone deficiency.

Figure 2: The clinical exam showed absence of 4 upper incisors and horizontal bone deficiency.

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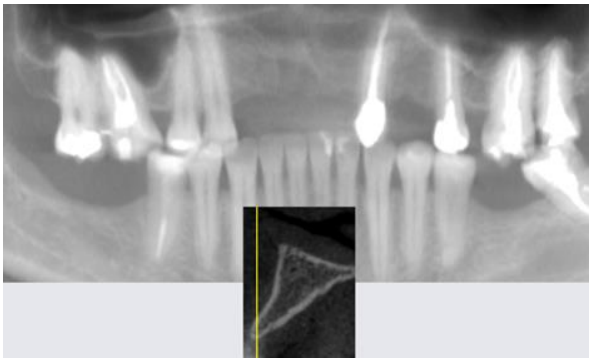

Figure 3: Computed tomography showed the presence of 3mm of remaining bone thickness, with medullary bone, and preservation of alveolar bone height.

To perform the surgery, the rigorous process to maintain the aseptic chain was followed. Anesthesia of the anterior superior alveolar nerves and incisive nerve was per-formed bilaterally. A horizontal incision, slightly displaced towards the palatal aspect was performed on the alveolar ridge, with two vertical relaxing incisions distal to the canines. After the mucoperiosteal detachment (Figure 4), the incisive canal was emptied with a super-cutting bur (Implacil De Bortoli, São Paulo, SP, Brazil) (Figure 5).

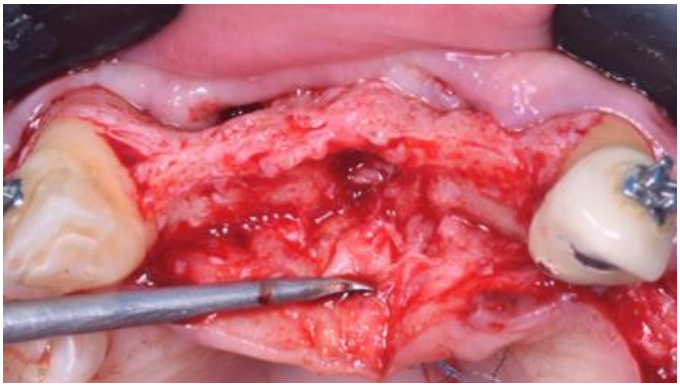

Figure 4: The mucoperiosteal detachment.

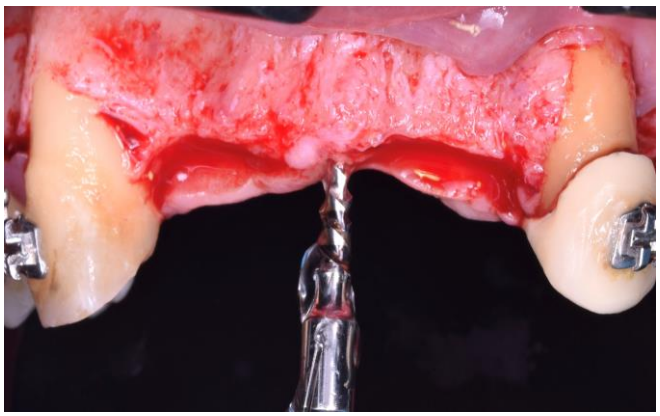

Figure 5: The incisive canal was emptied with a super-cutting bur.

Three vertical osteotomies were performed in the buccal cortical bone up to the medullary portion, at the mesial of the canines and midline (Figure 6), followed by

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alveolar ridge crest osteotomy between the canines (Figure 7). All osteotomies were performed under abundant irrigation with saline solution. Subsequently, the surgical guide was tested, observing the positioning of each implant (Figure 8).

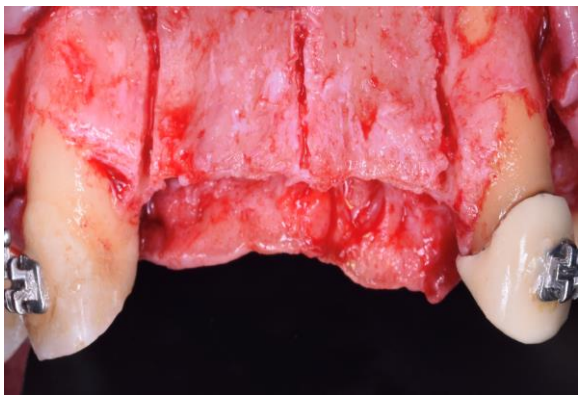

Figure 6: Three vertical osteotomies were performed in the buccal cortical bone up to the medullary portion, at the mesial of the canines and midline.

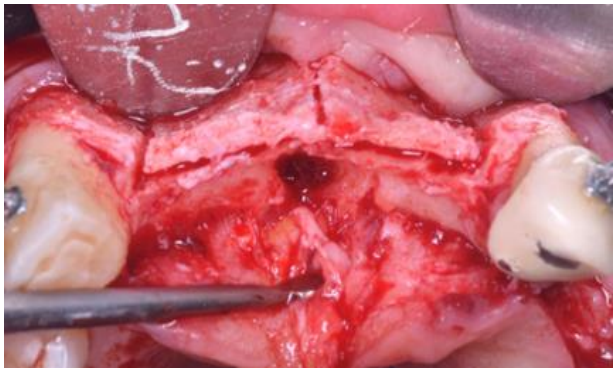

Figure 7: Alveolar ridge crest osteotomy between the canines

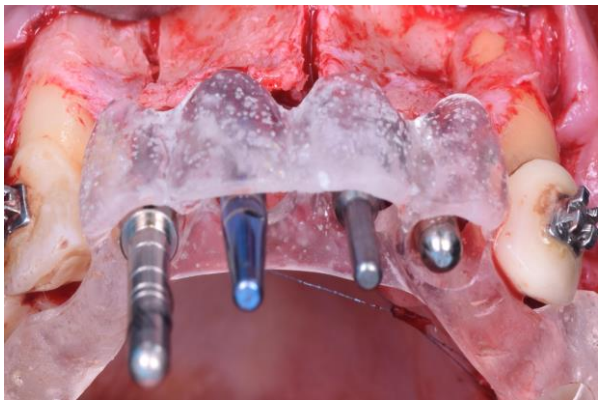

Figure 8: Testing of Surgical Guide.

The crest division was performed with the aid of chisels (Figure 9) and with digital rotary expanders (Supremo surgical instruments, Sp, Brazil) installed with a ratchet, evolving from the smallest to the largest caliber until obtaining 3.3 mm in diameter (Figure 10 and 11). The bone expansion obtained was sufficient for the installation of Osseo integrated implants at the same surgery at the sites of teeth 11, 12,

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21, and 22 (Figure 12, 13). After that, the gaps were filled with particulate bone graft Lumina Bone Porous large (Criteria Biomateriais, São Carlos, SP, Brazil) (Figure 14, 15, 16) being covered with calcium sulfate hemihydrate Lumina Set (Criteria Biomateriais, São Carlos, SP, Brazil) (Figure 17), in order to optimize the stability of the bone graft. Subsequently, the surgical site was covered with a resorbable membrane Lumina Coat double time (Criteria Biomateriais, São Carlos, SP, Brazil) (Figure 18, 19, 20). The suture was performed after periosteum incision for flap release. It was performed with polypropylene thread (Microsuture, São Paulo, SP, Brazil) (Figure 21, 22), with two horizontal mattress sutures for approximation of edges and simple stitches until complete closure of the flap. The post-operative period was uneventful.

The 6 months postoperative computed tomography (Figure 23) shows the optimal placement of implants (Figure 24), allowing the reopening and installation of provisional crowns.

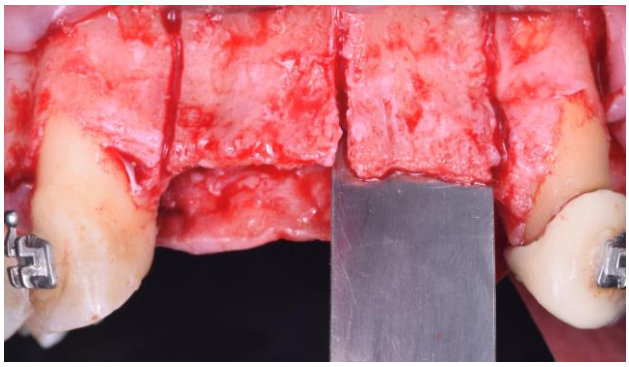

Figure 9: The crest division was performed with the aid of chisels.

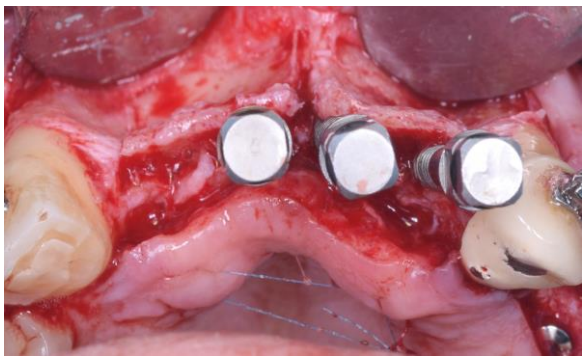

Figure 10: Digital rotary expanders installed.

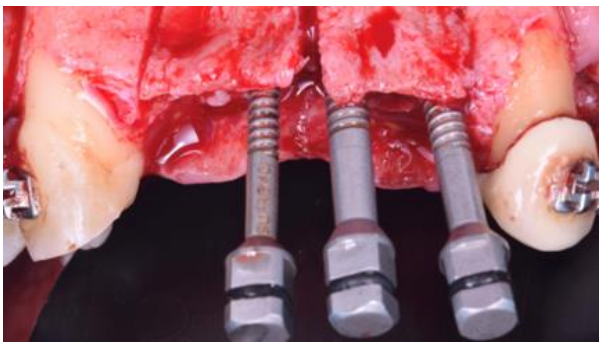

Figure 11: Digital rotary expanders installed.

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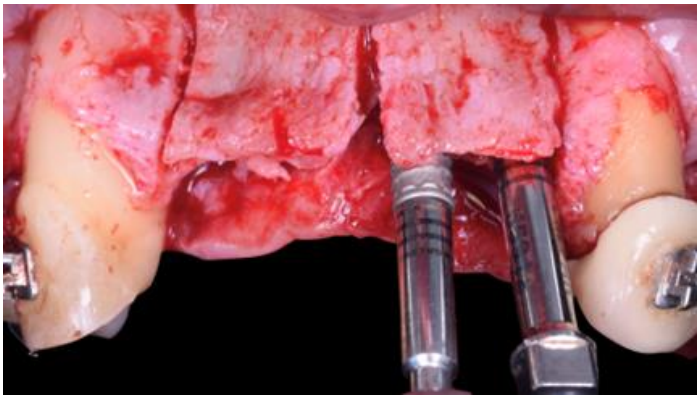

Figure 12: The bone expansion obtained for the installation of Osseo integrated implants.

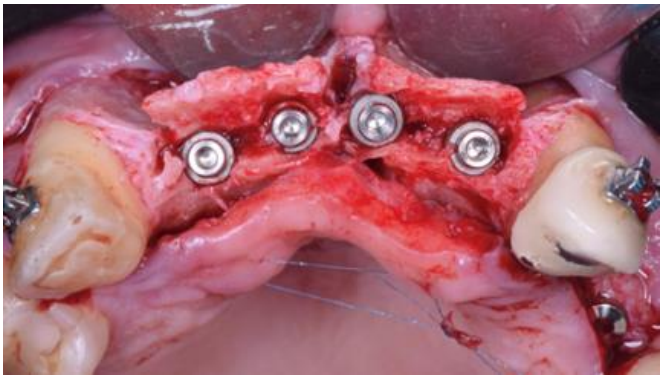

Figure 13: The bone expansion obtained for the installation of Osseo integrated implants.

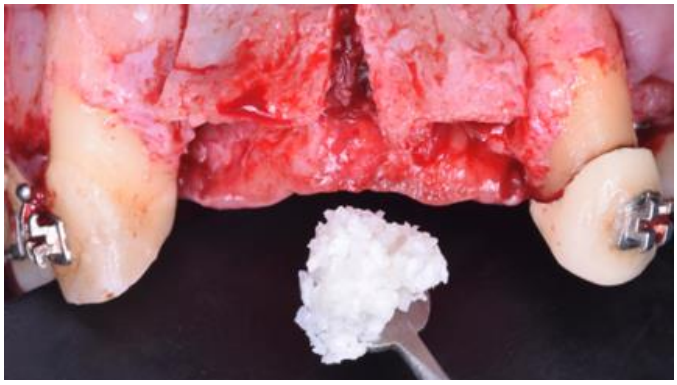

Figure 14: The gaps were filled with particulate bone graft Lumina Bone Porous large.

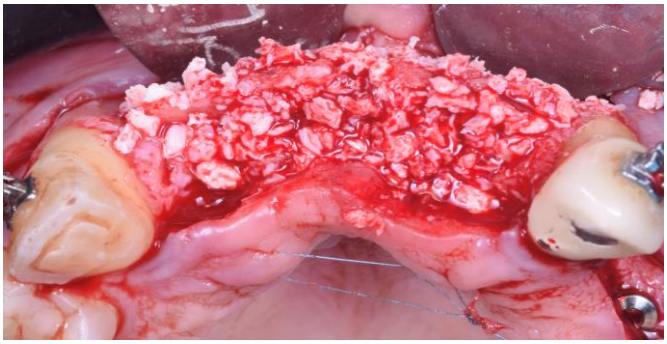

Figure 15: The gaps were filled with particulate bone graft Lumina Bone Porous large.

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Figure 16: The gaps were filled with particulate bone graft Lumina Bone Porous large.

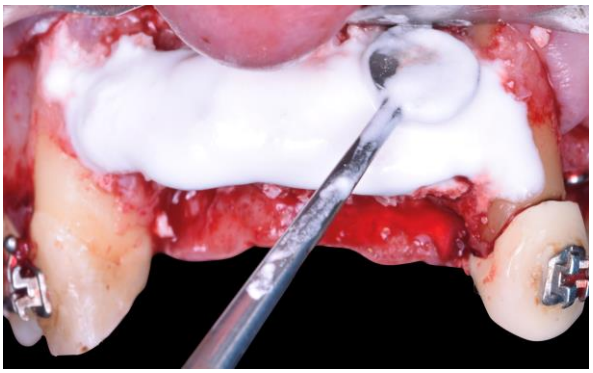

Figure 17: The gaps were filled with particulate bone graft Lumina Bone Porous large covered with calcium sulfate hemihydrate Lumina Set.

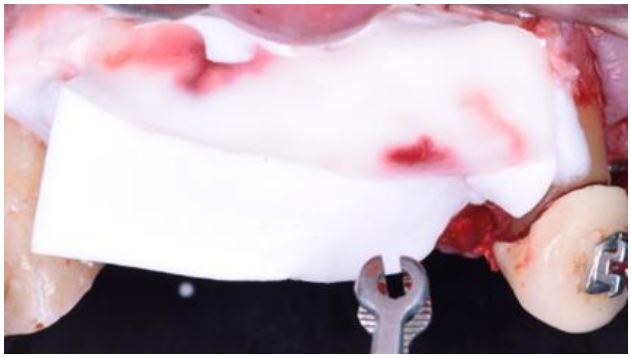

Figure 18: The surgical site was covered with a resorbable membrane Lumina Coat double time.

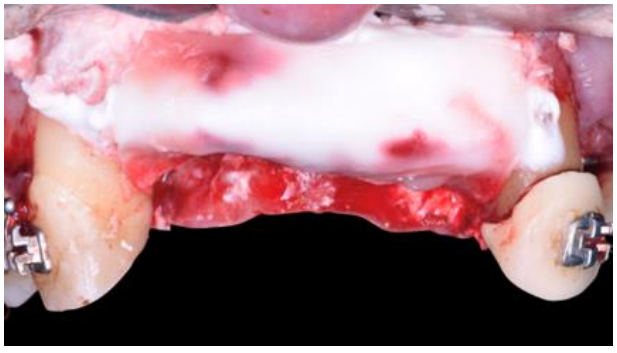

Figure 19: The surgical site was covered with a resorbable membrane Lumina Coat double time.

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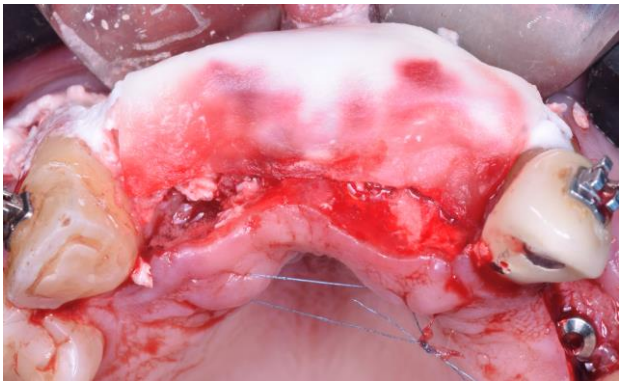

Figure 20: The surgical site was covered with a resorbable membrane Lumina Coat double time.

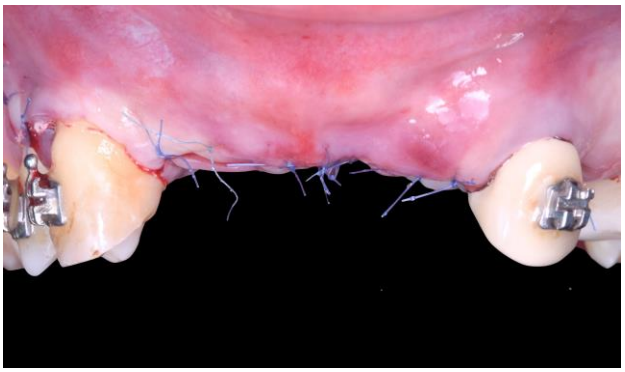

Figure 21: The suture was performed after periosteum with polypropylene thread.

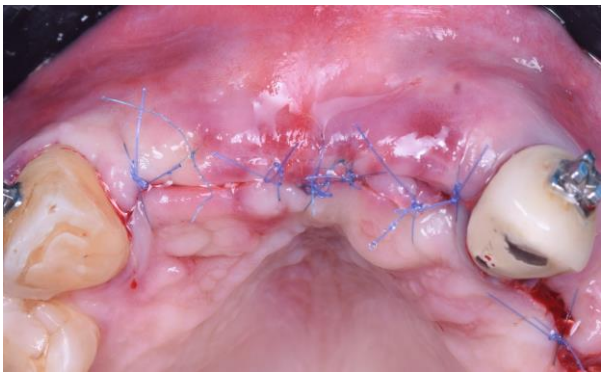

Figure 22: The suture was performed after periosteum with polypropylene thread.

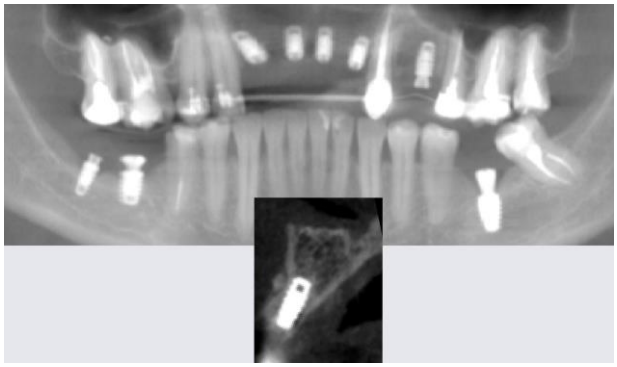

Figure 23: The 6 months postoperative computed tomography shows the optimal placement of implants.

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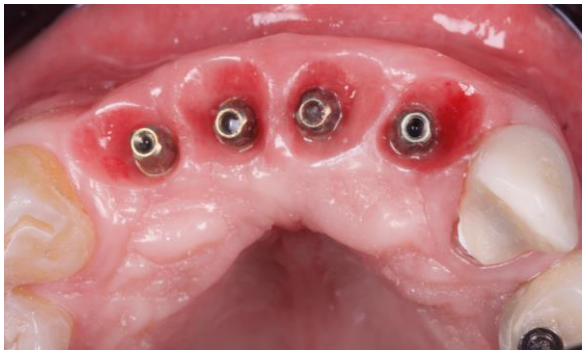

Figure 24: The 6 months image shows the optimal placement of implants.

Discussion

The technique initially described by Simion et al, in 1992, consists of performing vertical osteotomies joined by a horizontal osteotomy over the alveolar ridge. The initial technique used chisels to promote a greenstick fracture, keeping the apical portion together. Using rotary expanders, the cortical bone is moved away until it is possible to position the implant in the provided gap. A limitation of this technique is the absence of medullary bone, in order to be possible, the technique needs to be performed preferably in bone type 3 and 4 with a minimum of 3 millimeters of remaining bone tissue [5,6].

This is because the bone is more flexible and vascularized, reducing the risk of fracture due to its flexibility and ease of revascularization. Immediate implant placement and bone expansion is well accepted in the literature, with a success rate ranging from 91.7% to 100%, which is compatible with the success rate of other grafting techniques [7,8]. The gain in bone width in the graft region is on average 2.97 mm, thus achieving good bone thick-ness and, consequently, a good aesthetic appearance [9]. The gap formed between the bone boards after expansion presents less bone resorption if filled with bone graft and covered with resorbable membrane, when compared to the split crest technique without graft [10]. The use of calcium sulfate as a barrier helps to limit the invasion of connective tissue in the graft, allowing bone regeneration at the surgical site [11].

Conclusion

The split crest technique is a viable alternative for cases of horizontal bone re-sorption, mainly because it presents the possibility of bone grafting with the immediate installation of Osseo integrated implants.

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