Segmental osteotomy with interpositional xenogenous graft in posterior mandible

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ABSTRACT

With the loss of dental elements, natural bone dimensional changes occur, which often make it impossible to install dental implants without the need for grafting procedures prior to implant surgery for the esthetic-functional rehabilitation of our patients. Correcting vertical bone defects to re-establish the correct relationship of the alveolar crest in the posterior mandible is a major challenge for implant dentists.

In the literature, segmental osteotomy associated with interpositional bone grafting has been shown to be a viable alternative for bone rehabilitation in vertical bone defects in the posterior mandible, provided that the correct indications are followed, with the appropriate surgical techniques.

In this specific case, the interpositional grafting technique represented a safe and predictable procedure for vertical bone augmentation with segmental osteotomy associated with interpositional grafting. Segmental osteotomies associated with interpositional grafts are considered a predictable technique, provided they are well indicated and respect biological and technical limits for the rehabilitation of atrophic mandibular posterior regions. Success rates in the literature are very high, as is the survival of dental implants placed in the augmented areas.

Keywords: Atrophic mandible, Bone graft, Bone augmentation, Vertical ridge augmentation, Interpositional graft.

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INTRODUCTION

With the loss of dental elements, there are always natural bone dimensional changes, which often end up making it impossible to install dental implants without the need for grafting procedures prior to implant surgeries for the aesthetic-functional rehabilitation of our patients. The correction of vertical bone defects to reestablish the correct relationship of the alveolar crest in posterior regions of the mandible is considered a great challenge for implantologists (TANAKA, K et al, 2017; De Souza et al,2021; De Souza et al, 2023).

In the literature, segmental osteotomy associated with interpositional bone grafting has been shown to be a viable alternative for bone rehabilitation in vertical bone defects in the posterior region of the mandible, provided that the correct indications are followed, with the appropriate surgicaltechniques. It is reported to be a predictable and viable technique with low complication rates. The correction of moderate vertical bone defects (4-8 mm) andin the posterior mandibular and anterior regions of the maxillae are also indicated to reposition poorly positioned implants and have high success rates (NOIA, C.F et al, 2012; De Souza et al,2022).

In a prospective, controlled, split-mouth study of 11 partially edentulous patients that evaluated the stability of dental implants placed in mandibular areas with angiotomies with interpositional grafts using non-ceramic hydroxyapatite or autogenous grafts tag. After a 1-year loading period, the implant survival rate was 95.45%, with two implant losses (one from each group). Among the surviving implants (42 out of 44), two did not meet the success criteria; Therefore, the success rate of the implantwas 90.90%. Stability measures were similar between groups during the 12-month follow-up ($p > 0.05$). The interpositional graft technique seems to represent a safe and successful procedure, at least after a 12-month follow-up (DOTTORE A.M, 2012). In a systematic review of the literature on the success of Segmental Sandwich Osteotomy of the posterior mandible in pre-implantation surgery, only 17 articles met the predetermined inclusion and exclusion criteria. They consisted of 9 retrospective or serial case reports and 8 prospective randomized controlled trials. Overall, thestudiesincluded 174 patients. In these patients, 214 bone augmentation procedures with segmental osteotomies associated with interpositional implants were performed in the posterior mandibula and 444 implants were installed . The follow-up period after implant loading ranged from 8 months to 5.5 years. The success rate ranged between 90% and 100%. Segmental osteotomies associated with interpositional grafts should be considered as a well-documented technique for the rehabilitation of atrophic posterior regions ofthe mandible with long-term postoperative follow-up. Success rates are very high, as well as the survival of dental implants placed inthe increased area (KAMPEROS, G et al, 2016).

DESCRIPTION OF THE CLINICAL CASE

A 37-year-old female patient came to the private clinic reporting functional discomfort in the posterior region of the mandible, in addition to great aesthetic dissatisfaction. After a detailed anamnesis, it was found that the patient did not have any systemic involvement. Clinical examination revealed a severe vertical bone discrepancy in the left mandibular posterior region (Figure 1). On CT scanning, elements 35, 36 and 37 were absent, as well as an increase in the interocclusal space and insufficient bone height for the installation of conventional dental implants between the alveolar crest and the inferior alveolar nerve (Figures 2a and 2b).

Figure 1. Initial appearance showing vertical bone defect in the posterior of the left mandible .

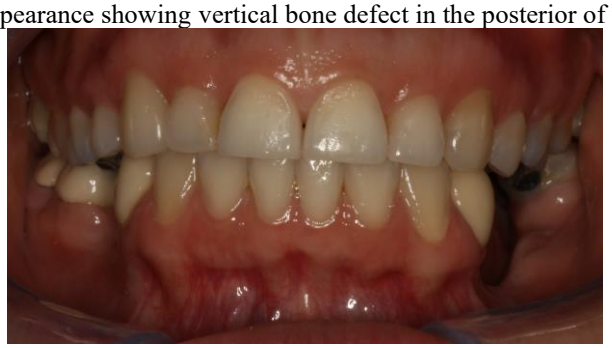
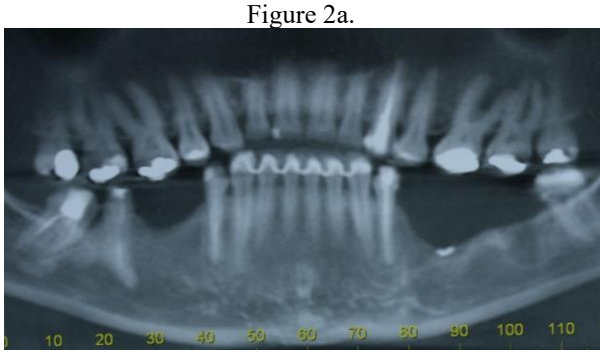
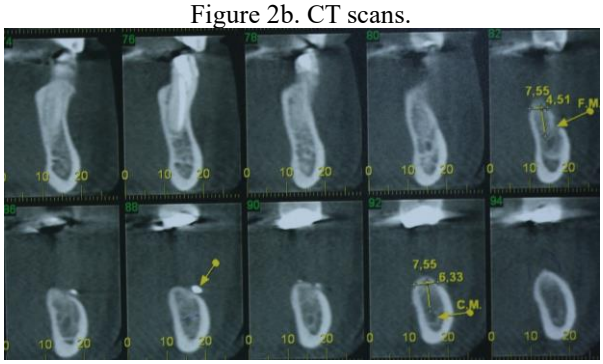


Figure 2a.



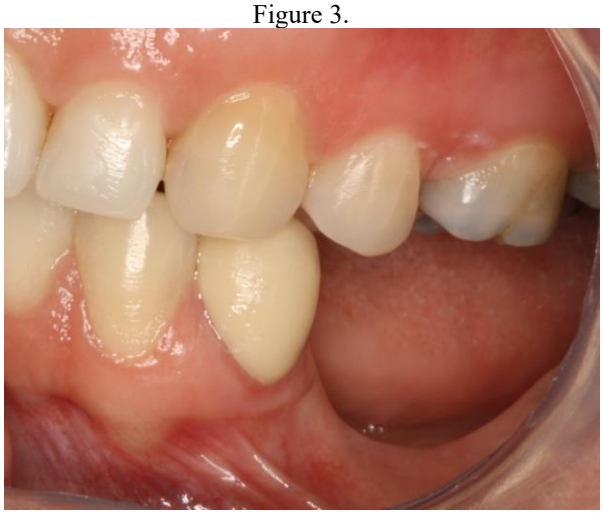
Note the presence of vertical deficiency in the posterior region of the left jaw.

Figure 2b. CT scans.



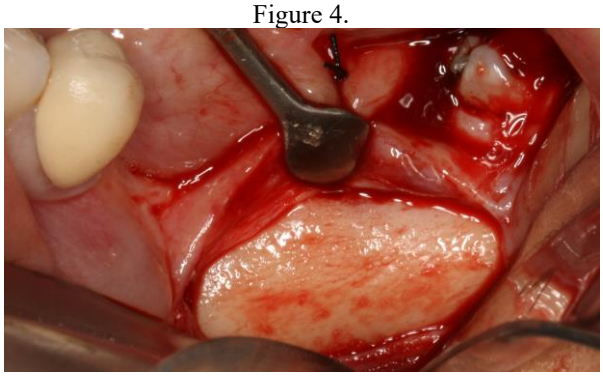
The case wascarefully planned and the technique chosen was segmental osteotomy with interpositional graft with biomaterial (Geistlich Bio-Oss®), aiming at the adequate rehabilitation of the alveolar ridge, prior to the installation of dental implants, followed by prosthetic rehabilitation.

Figure 3.



Lateral view of the bone defect. Notice bone discrepancy present.

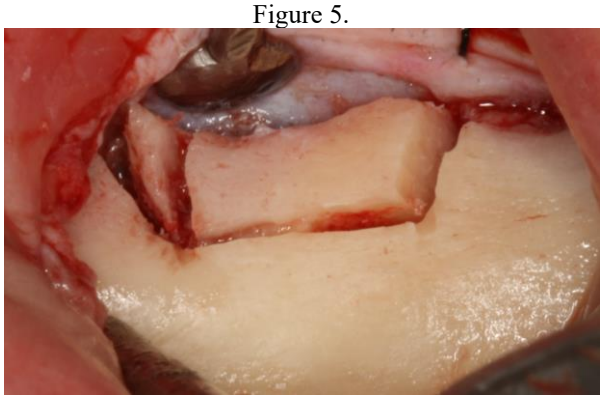
Figure 4.



Incision at the bottom of the groove and detachment.

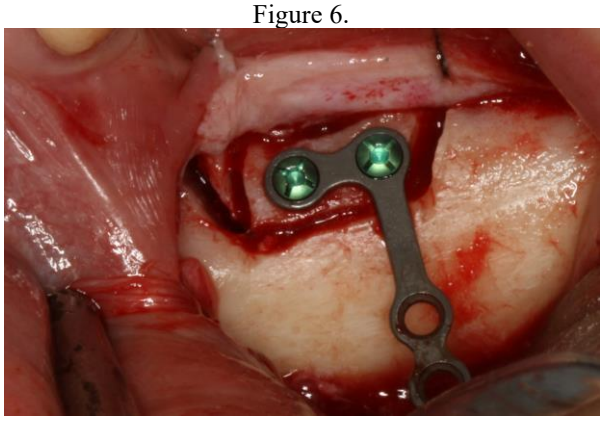
The anesthetic procedure of inferior alveolar nerve block, lingual and buccal block, was performed with a 2% lidocaine solution with a vasoconstrictor of 1:100,000 (DFL, Rio de Janeiro/RJ, Brazil). Soon after, a linear incision was made with an approximate location of 3 mm below the mucogingival line, giving access to the decodingof the mucoperiosteal flap (Figure 4) and the creation of two divergent vertical osteotomies and one horizontal osteotomies , using a 701 drill in high rotation (Figure 5).

Figure 5.



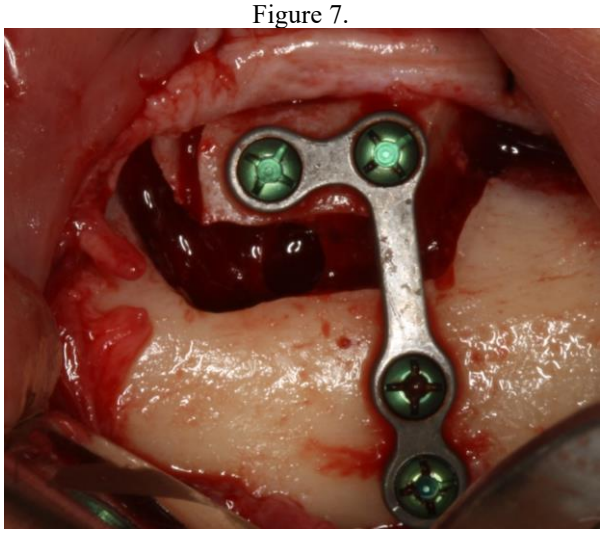
Osteotomy. Note the divergent vertical osteotomies.

Figure 6.



Attaching the plate to the block. The bone block remains attached to the lingual periosteum to ensuremaintenance of irrigation.

Figure 7.

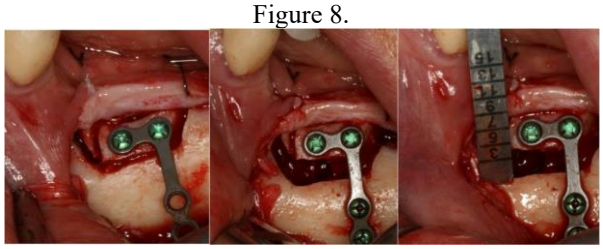


Fixation.

Catheters were used to complete the osteotomy in order to avoid laceration of the lingual mucosa, which is of fundamental importance for the maintenance of bone block irrigation. The mobilized bone segment was fixed with plates and screws (Figs 6 and 7) at the determined height (Figure 8). Then, the gap was filled with Bio-Oss® (Geistlich) grafting biomaterial (Figure 9) and stabilized with Bio-G-ide® membrane (Figure 9b). To complete the procedure, a final suture was performed (Figure 10). After 6 months, agraphic examination was requested (Figures 10b and 10c)

and reopening (Figure 10d) was performed to remove the plaque and install the dental implants (Figure 11).

Figure 8.



Remaining Space Fill (GAP).

Figure 9.Filling the gap with Bio-O ss®.

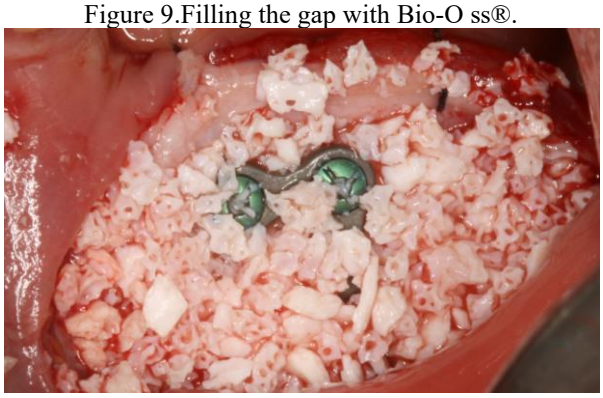
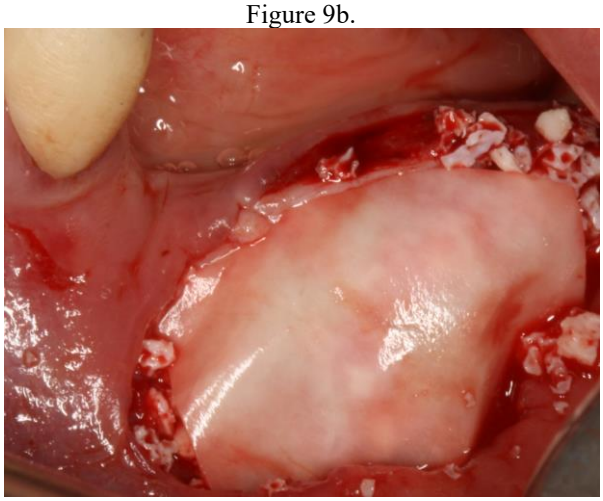
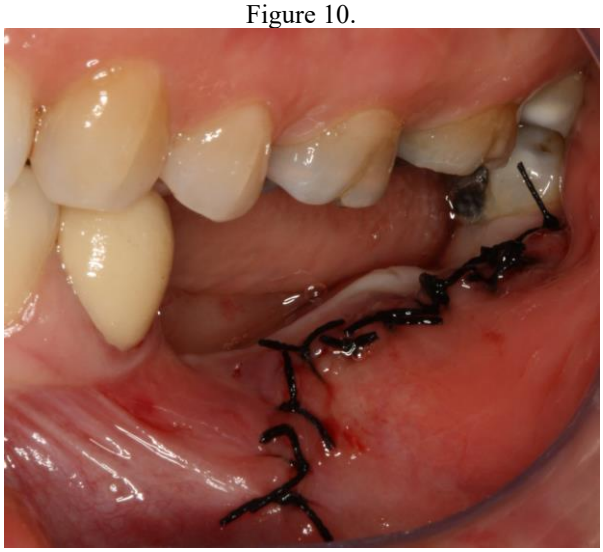


Figure 9b.



Bio-G ide® membrane placement.

Figure 10.



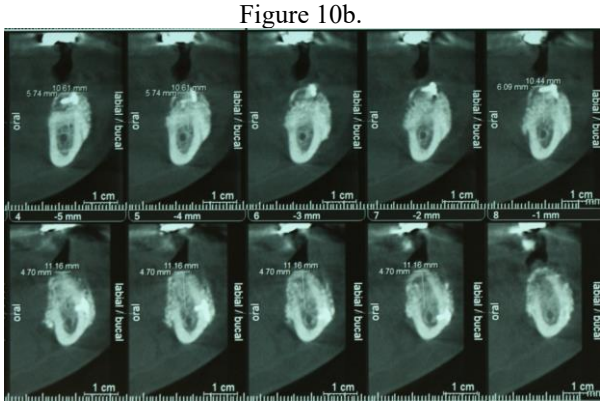
Final suture.

Figure 10d. Time of reopening: 6 months after grafting for plaque removal.

Figure 10a.

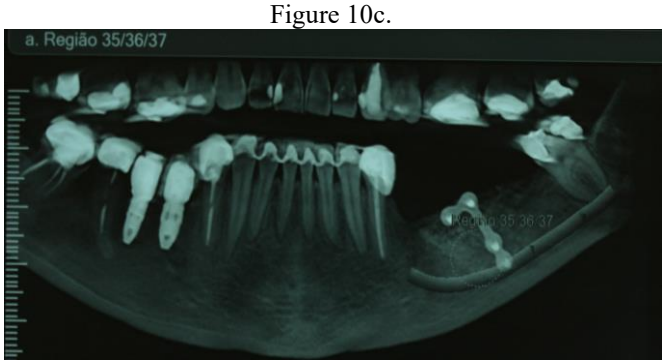
Final side view.

Figure 10b.



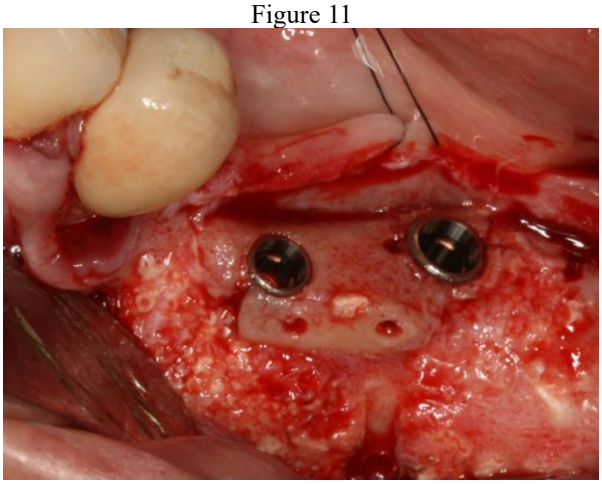
CT scan 6 months after grafting.

Figure 10c.



CT scan 6 months after grafting. Note the relevant vertical gain obtained.

Figure 11



FINAL THOUGHTS

Vertical bone loss in the posterior jaw , due to the low bone height and the presence of the mandibular canal, ends up limiting the installation of dental implants in thisregion.

There is also an aesthetic limitation and also from the biomechanical point of view, due to the increase in the interocclusal space, making thecrown/implant ratio disproportionate due to the increase in the size of the teeth.

In this clinical case, after evaluating the region to be operated, it was planned to segmental osteotomy with interpositional xenogenous bone graft (Geistlich Bio-Oss®) andGeistlich Bio-

Gade® collagen membrane). The technique described, when well indicated, is predictable and presents another great option for performing vertical bone augmentation surgeries in the posterior region of the mandible.

It is another safe tool within our range of tools to treat vertical atrophies, with less surgical morbidity compared to other autogenous grafting and osteogenic dysfunction techniques.

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