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Rehabilitation of patients with thin ridges by conical expanders and immediate cone morse dental implant: a case report

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Abstract. – BACKGROUND: Horizontal atrophic ridges need a regenerative procedure for implant positioning and fixed rehabilitation. Cone Morse taper implants are characterized by the intimate fitting of the prosthetic interface with the absence of microgaps and micromovements of the interfaces. The aim of this case report was to evaluate the clinical outcome of Cone Morse implant design in split crest augmentation treatment.

CASE REPORT: A female patient with partial edentulism of atrophic posterior maxilla was treated for split crest procedure and implant-supported rehabilitation. A full-thickness flap was elevated, and horizontal and vertical osteotomic lines were produced with piezoelectric device. A total of 4 Cone Morse Taper implants (Universal III, Implacil de Bortoli, Brasil) were positioned and the site was grafted with bone substitute and covered by a heterologous membrane.

CONCLUSIONS: A complete healing of the surgical site was evident at the follow-up with no evidence of bone resorption. No radiolucency or inflammatory aspects of the treated site were evident in the radiographic control. Simultaneous Cone Morse implants positioning with split crest technique seems to be a promising treatment for posterior maxillary rehabilitation of atrophic edentulous ridges.

Key Words:
Split crest, Alveolar ridge expansion, Cone morse.

Introduction

The tooth extraction produces an adaptative and functional bone tissue resorption of the alveolar ridges[1,2]. These changes could produce horizontal or vertical components of the defects and are substantially localized in the coronal portion of the ridge, where the decrease of the hard tissue volume is higher. On the contrary, minor alterations are localized in the apical and middle parts of the alveolar socket[3].The horizontal bone resorption related with tooth extractions represents a frequent anatomical critical factor that could limit the placement of a dental implant[4-6]. The model of the physiological alveolar bone remodeling is able to produce significant alterations of the bone volume during the first 8 week of the extraction socket's healing period[3,7]. The first phase is characterized by a resorption of the bundle bone that is replaced by woven bone[3]. Since the crest of the buccal bone wall was comprised solely of bundle, this modelling resulted in substantial vertical reduction of the buccal crest. During the phase 2 the resorption occurred from the outer surfaces of both bone walls. The reason for this additional bone loss is completely clarified[3] and other factors can influence the bone loss[8,9]. Many different techniques have been proposed for the treatment of the atrophic ridges for horizontal augmentation such us Guided Bone Regeneration (GBR)[10], titanium micromesh[11,12], bone grafting[13,14], ridge expansion osteotomy[7,15,16]. The split crest technique is a ridge expansion osteotomy technique that produce an horizontal augmentation of the bone tissue with a high survival rate with the simultaneously positioning of the implant fixture in maxillary defects, with or without interpositional bone grafting[17,18]. In the literature some authors described different kind

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of complications related to this mechanical (i.e., bone fragment fracture) or biological technique[13]. Generally, in the presence of an increased bone density, such as posterior mandible, a two-stage expansion approach and implant positioning have been proposed to reduce the risk of ridge cortical fragment fracture[15]. The secondary bone resorption of the surgical site represents a postoperative possible biological complication that could influences the stability of the peri implant tissue and the long-term results of the procedure[19]. Conical Morse implant connections have shown high level of biomechanical stability than flat-to-flat connections[20]. This mechanical tight interaction between the fixture-abutment complex produced no detectable gap between the interfaces, which produced the absence of microleakage, and a high-level stability of the peri implant hard and soft tissues, *in vivo* and *in vitro*[21]. The aim of the present case report was to evaluate Cone Morse Taper Implant Design in posterior maxillary ridge expansion.

Case Report

The present investigation received the ethical approval of the Inter-Institutional Ethics Committee of Faculdade Ingá, UNINGÁ, PR, Brazil and it was conducted in accordance with the good clinical practice guidelines and the ethical principles of the Declaration of Helsinki. A 57 years-old female patient with a non-contributory medical anamnesis was treated at the Department of Oral Implantology (Dental Research Division, College Ingà, UNINGÁ, Cachoeiro de Itapemirim) for implant placement for fixed prosthetic in the left posterior maxilla. The medical history reported no relevant diseases such as osteoporosis, irradiation treatment, immunosuppression, bisphosphonates therapy, diabetes, or periodontitis. Intraoral examination revealed healthy mucosa and there was not any sign of infection. A three-dimensional cone beam computed tomography (CBCT) scan was taken to evaluate the fracture of the elements 2.3 and 2.7 and the residual bone volume of the surgical site. CBCT showed a good height and insufficient width. The patient was scheduled for teeth extraction, stage ridge expansion and dental implant positioning (Figures 1-2).

Surgical Procedure

Prior the procedure, oral rinses of chlorhexidine digluconate solution 0,2% (Curaden Healthcare S.p.A., Saronno, Italy) was administered to the patient for 2 minutes. The anesthesia was

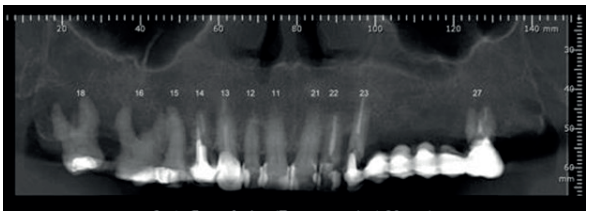

Figure 1. Panoramic view of the patient upper maxilla.

obtained by Articaine (Pierrel, Milan, Italy) associated with epinephrine 1:100,000. After the extraction of the compromised elements 2.3 and 2.7, a mucoperiosteal trapezoidal full-thickness flap was elevated to access the alveolar ridge (Figure 3). The linear osteotomies were produced by ultrasonic surgical device (Surgysonic, Esacrom, Imola, Italy). A sagittal osteotomy of the alveolar ridge and two vertical corticotomies in the buccal wall was produced (Figures 4 A-B). The ridge expansion was obtained by scapels and dedicated bone expander kit (Implacil de Bortoli, Sao Paulo, Brasil) to produce a controlled distraction of the cortical walls (Figure 5). After the

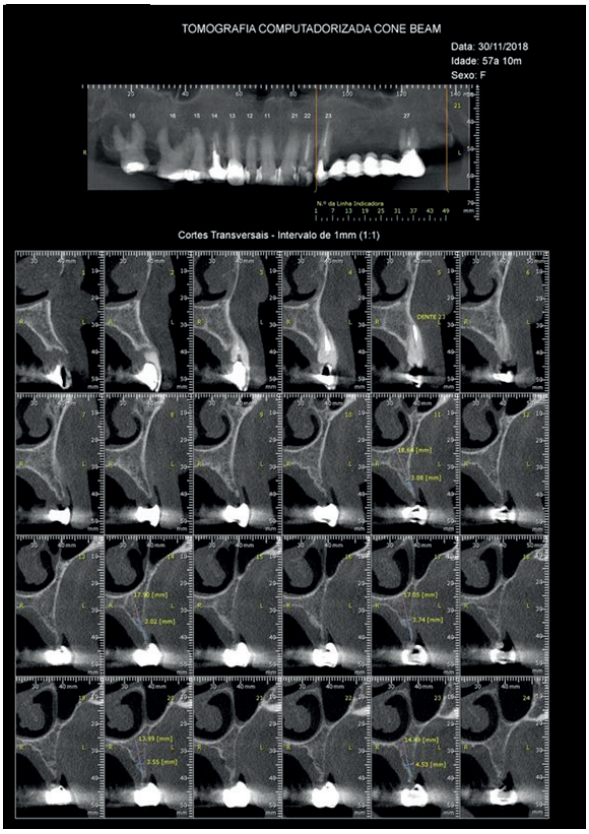

Figure 2. CBCT Scan of the subject. The reduced width of bone ridge is appreciable.

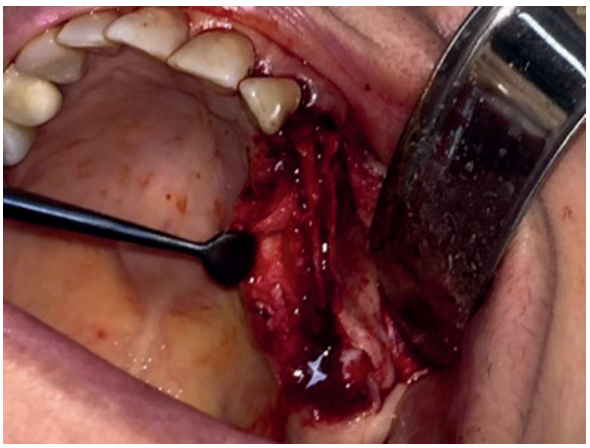

Figure 3. Mucoperiosteal full-thickness flap elevated.

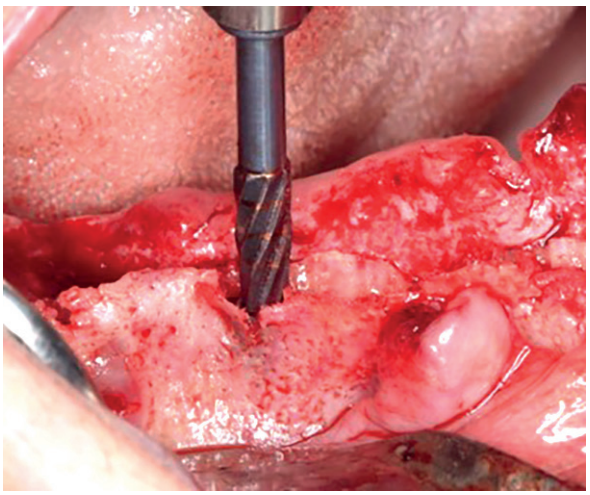

Figure 5. Bone expansion of the alveolar ridge.

preparation of the surgical site under cooling saline irrigation (Figure 6 A-B), a total of 4 implant fixture (Implacil de Bortoli, Sao Paulo, Brasil) were positioned (Figure 7). The site was grafted with bovine bone substitute (Rebone, Ubgen, Padova, Italy) and covered with by pericardium membrane (Shelter slow, Ubgen, Padova, Italy)[22] (Figure 8 A-B). The flap was closed without tension by sutures (Vicryl 4.0, Ethicon FS-2; St. Stevens-Woluwe, Belgium) that was removed at 7 days (Figure 9). After 6 weeks, in the second

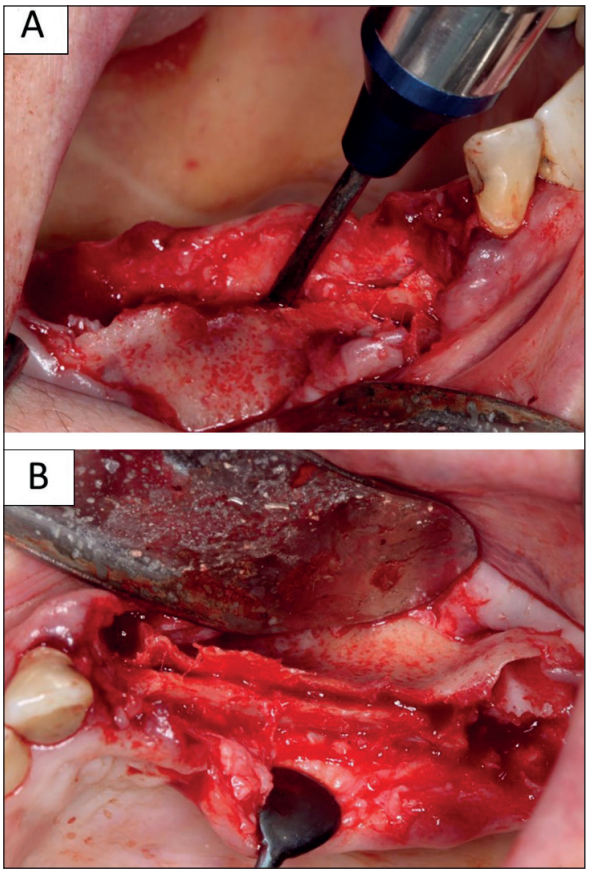

Figure 4. Osteotomies produced on the bone ridge (**A-B**).

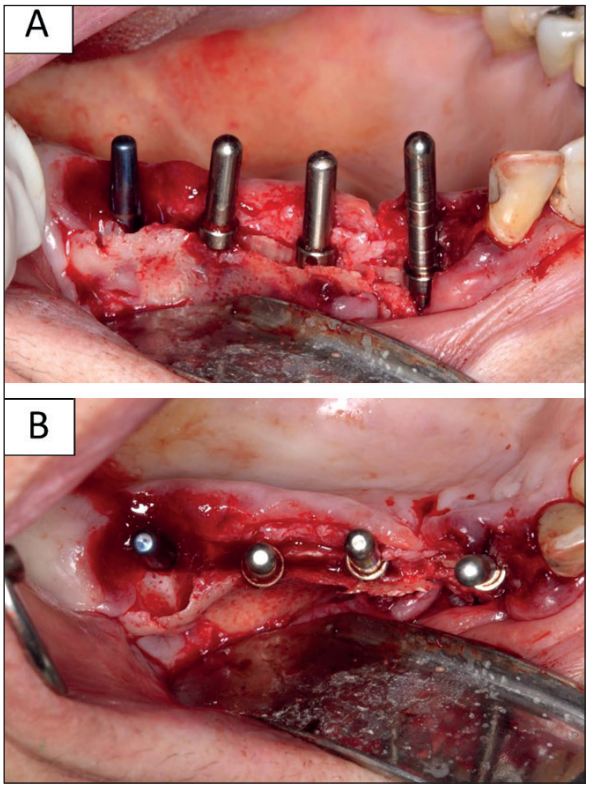

Figure 6. Parallelism check of the drilling preparation sites (**A-B**).

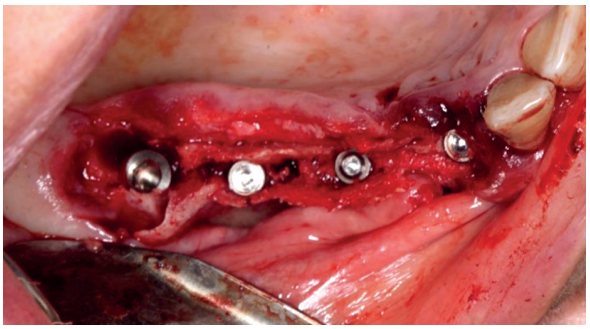

Figure 7. Implant positioned in the bone sites.

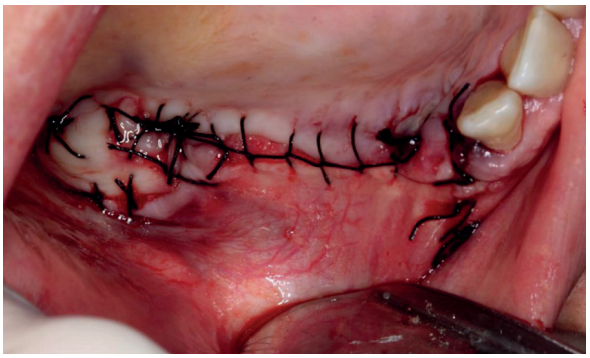

Figure 9. Surgical flap sutured.

stage surgery, a limited reflection of a soft tissue flap was produced to expose the implant for healing abutment positioning and finalized by a fixed prosthetic restoration (Figure 10). During oral surgery, the dentist and all operators wore a mask to prevent the virus that causes COVID-19 to spread[23-25].

The postoperative period was uneventful, and the patient reported no relevant symptoms after the healing phase. The absence of bone resorption and aspects of new bone growth were evident at the follow up. No radiolucency of the treated site was present. The second stage of surgery was performed after the complete healing of the hard and soft tissue of the surgical site. No evidence of local inflammation or tissue ingrowth were present. The implant fixture appeared completely surrounded by new formed bone and appeared clinically stable after the percussion test.

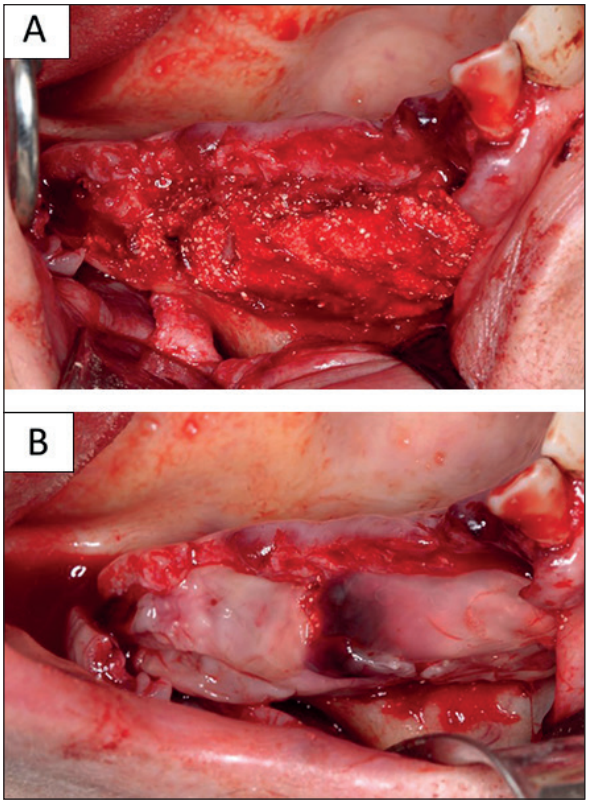

Figure 8. A, Bone graft positioned in the surgical site. **B**, Pericardium membrane covering of the treated maxillary ridge.

Conclusions

The horizontal expansion technique is a surgical procedure which aims at obtaining sufficient buccal/lingual volume for implant positioning[26,27]. The stability of the peri-implant hard and soft tissue represents a critical point of the expansion ridge procedure[17,18]. Jensen et al[28] reported that the horizontal resorption after posterior maxillary expansion procedure between 2 mm after 12 months loading, with a survival rate of the implant of the 92.5%. In this study, the postopera-

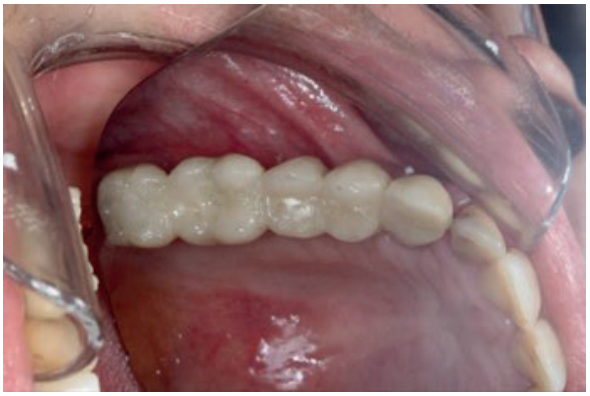

Figure 10. After the placement of the final prosthesis.

tive course was uneventful, and no complications related to the bone ridge expansion was reported. Moreover, a high stability of hard and soft tissue after the procedure was reported at the follow up. Minimizing the surgical trauma and respecting the blood supply represent critical points of the procedure to reduce the risk of the bone resorption of the augmentation[13]. This way, the preservation of periosteal vascularization during the surgery and the presence of keratinized gingiva around the peri-implant interface are crucial for the graft osteogenesis and the long-term predictability of the procedure[19,28]. Thus, the microbial colonization and loading of dental implants could also represent critical cofactors for crestal bone resorption in augmented bone ridges[20]. Histologically, on retrieved implants, no evidence of bone resorption was observed around submerged implants, where the bacteria contamination or micromovements of the interface are not present[29]. Cone Morse taper implant provides an intimate fitting and adaptation of the fixture-abutment connection which produce the absence of the microgap between the parts and without mechanical micromovements at the interface level[21,30]. The split crest procedure is a bone augmentation technique with high success rate when properly accompanied by a properly surgical planning, which provides minimal surgical trauma. Cone Morse taper implant in ridge expansion technique provided a satisfactory clinical outcome, achieving the rehabilitation of edentulous ridges with a quality aesthetic and functional solution for the patients.

Conflict of Interest
The Authors declare that they have no conflict of interests.

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Availability of Data and Materials
All data generated or analyzed during this study are included in this published article.

Authors' Contribution
All authors were involved with the literature review and performance of the surgery. All authors read and approved the final manuscript.

Ethics Approval
The present investigation received the ethical approval of the Inter-Institutional Ethics Committee of Faculdade Ingá, UNINGÁ, PR, Brazil and it was conducted in accordance with the good clinical practice guidelines and the ethical principles of the Declaration of Helsinki.

Informed Consent
Written informed consent was obtained from the patient for publication of this case report and accompanying images.

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