Implant rehabilitation of partially edentulous patient by GBR and mini sinus lift

with a Flex Cortical Sheet associated with collagen-preserved equine-derived granules

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DESCRIPTION

The article presents a clinical case of a 60-year-old man with distal edentulousness of the 4 quadrants. Specifically, the patient came to the attention of the surgeon as a result of excessive mobility and apical migration of the metal-ceramic bridge at the level of elements 13-15. Following clinical and radiographic investigation, a vestibular bone deficit of 6mm was observed at site 13, and rehabilitation of site 16 required a mini sinus lift. The vestibular bone deficit was treated by GBR and concomitant implant placement at locations 13 and 14. Regenerative surgery was performed with heterologous collagen-preserved grafts of equine origin (Osteoxenon® Cortical-Cancellous Granules, Bioteck Spa, Arcugnano - Vicenza), covered and protected by a 0.5-mm-thick flexible cortical bone sheet (Osteoxenon® Flex Cortical Sheet, Bioteck Spa, Arcugnano - Vicenza).

INTRODUCTION

The alveolar process is a closely interconnected component of the dental element[1]. In fact, following the extraction of a tooth, the alveolar bone undergoes a process of resorption, which as early as within the next 3 months can reach 50% of its initial size[1]. Other factors may intervene and exacerbate resorption, such as an infection, genetic factors, and possible trauma resulting from tooth extraction. The presence of periodontal disease combined with socioeconomic factors can then lead to situations of partial or complete edentulism[2]. In this condition, bone resorption is inevitable and with it soft tissues also undergo shrinkage. This is particularly relevant at the time of implant rehabilitation. However, multiple alveolar preservation and reconstruction techniques have been developed in order to enable implant rehabilitation.

One of the most widely used and predictable techniques is Guided Bone Regeneration (GBR), which meets 4 key principles (PASS).[3]: 1) Closure by first intention to limit the risks of infection, 2) Support angiogenesis, 3) Create a space for mesenchymal cell colonization, and 4) Protect the clot/graft material from non-osteogenic cells and micromovements. GBR cannot disregard a proper choice of materials to be used. Although autologous bone represents the *"gold standard"* in terms of osteoconductive, osteoinductive and osteogenic properties, it is also true that it results in a higher likelihood of intra- and postoperative complications by often requiring a donor site far from the affected area. To this end, there are alternatives consisting of homologous, heterologous and synthetic bone substitutes. The case presented here shows the clinical and radiographic results of the insertion of 3 implants contextual to a peri-implant GBR and a mini sinus lift, performed with a collagen-preserved equine-derived heterologous graft and the aid of a flexible cortical bone lamina.

CLINICAL CASE

The clinical case deals with a healthy 60-year-old man who presented in counseling to the attention of the surgeon following excessive mobility and apical migration of the metal-ceramic bridge at elements 13-15. Following clinical and radiographic investigation (Fig.1-3), a vestibular bone deficit of 6mm was observed at site 13, and rehabilitation of site 16 required a mini sinus lift surgery. The vestibular bone deficit was treated by peri-implant GBR and concomitant implant placement at site 13 and 14.

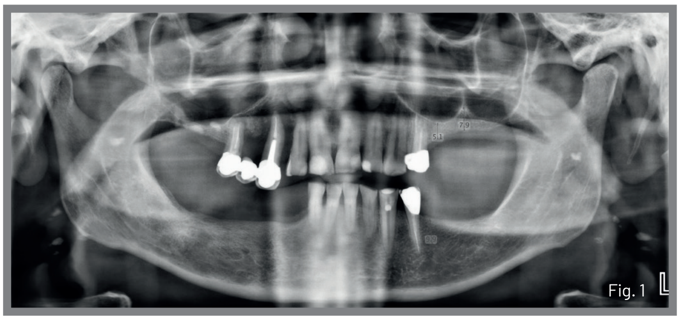
The graft material consisted of collagen-preserved equine-derived bone granules of 0.25-1mm size (Osteoxenon® Cortical-Cancellous Granules, Bioteck Spa, Arcugnano - Vicenza) covered and protected by a 0.5-mm-thick flexible cortical bone sheet (Osteoxenon® Flex Cortical Sheet, Bioteck Spa, Arcugnano - Vicenza). The mini sinus lift of the maxillary sinus at site 16 was performed with the same bone granules of equine origin.

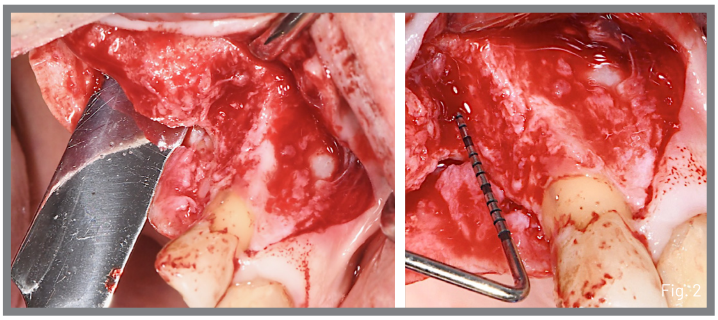
The heterologous grafts used, obtained by an enzymatic deantigenation process (Zymo-Teck®, Bioteck SpA, Arcugnano - Vicenza) are characterized by the presence of the unaltered mineral component and bone collagen in native conformation. Due to these properties, the graft is physiologically recognized by osteoclasts and osteoblasts[4] and is remodeled with the patient's own bone within a physiological time frame[5,6].

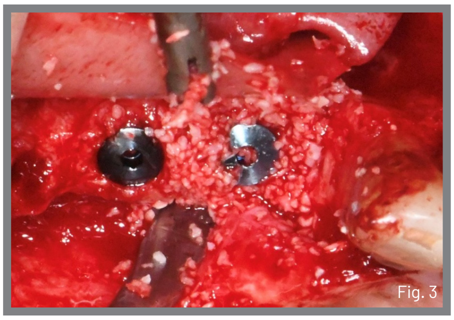
In addition, the cortical lamina of equine origin undergoes an additional treatment of partial demineralization, which exposes the preserved collagen. This allows its characteristic flexibility upon hydration and makes it easily adaptable to the different geometries of the alveolar ridge[7,8].

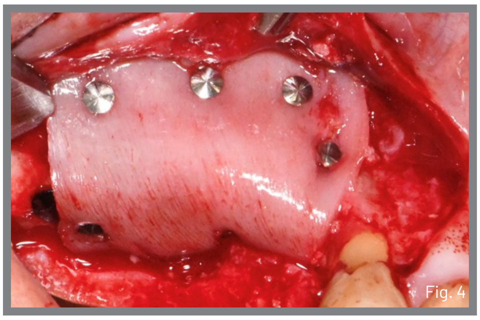
The day before surgery, the patient was given antibiotic therapy with Amoxicillin and Clavulanic Acid 1 g tablets every

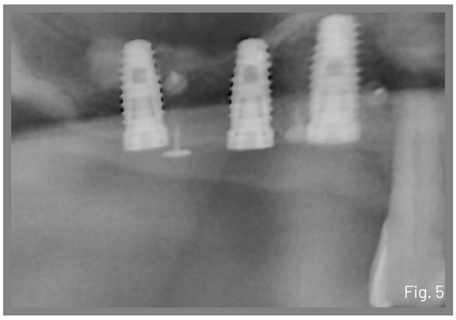
12 hours. On the day of surgery, antibiotic prophylaxis was performed 1 h before the start with 1 g Amoxicillin+ Clavulanic Acid, and local anesthesia with Articaine + adrenaline 1:200,000 was given. Following skeletonization of the site at position 13, implants were inserted at positions 13 (4x11.5 mm) and 14 (4x10mm). Cortico-cancellous collagen-preserved granules were applied to the vestibular bone defect and cover the threads of two implants, which were protected with flexible cortical lamina, prehydrated for about 10 seconds in warm saline solution (Fig.3-4). The flexible cortical lamina was fixed appropriately with 4 pins at the buccal level and 3 pins at the palatal level (Fig.4). The flaps were closed with 6-0 PGA sutures to promote healing by first intention. The implant (4x10 mm) in position 16 was inserted at the same time as the mini si-

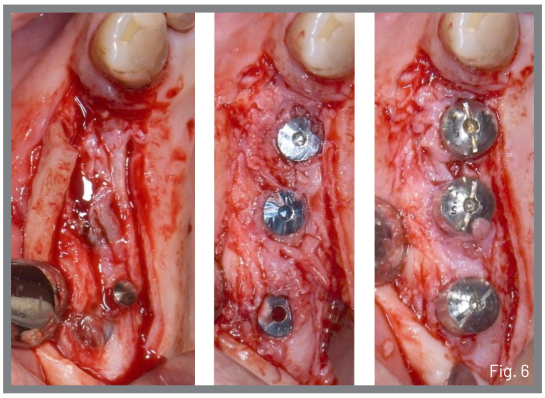


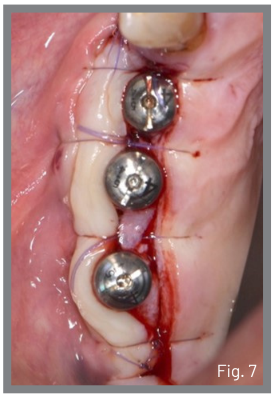


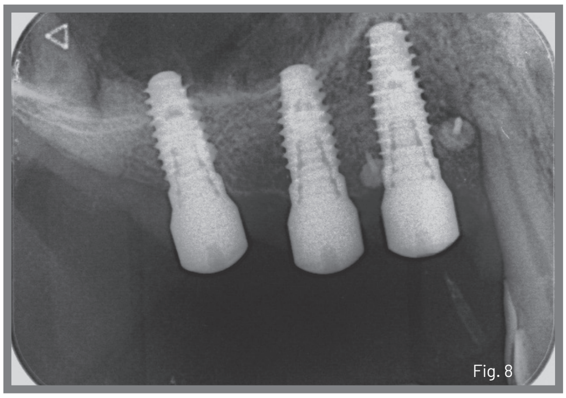












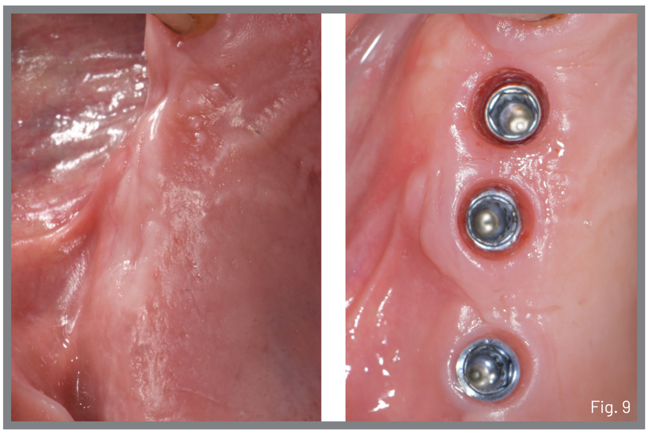


Fig. 1. Initial orthopantomography: metal ceramic bridge of 13-14-15 with pillar elements mobility and apical migration. Fig. 2. Skeletonization and measurement of the bony defect at site 13: 6 mm vestibular bone dehiscence is shown. Fig. 3. Implants placed in site 13 and 14 with defect filling in site 13 using collagen-preserved equine bone granules. Fig. 4. The graft was stabilized using a flexible cortical bone lamina attached buccally with 4 pins and palatally with 3 pins. Note how the implants in positions 13 and 14 are covered with the lamina, in contrast to the implant in position 16. Fig. 5. Postoperative RX, at site 16 the implant was placed after mini-sinus lift made with collagen-preserved equine bone. Fig. 6. 2nd surgical time: uncovering of implants by partial-thickness palatine flap placed vestibularly. It is evident that at the implants at sites 13 and 14, the vestibular bone thickness is greater than at the implant at site 16. Fig. 7. Suture of the vestibularly placed palatine flap with PGA 6-0. Fig. 8. Control Rx at 3 weeks after placement of healing abutments. Fig. 9. On the left, the pre-surgical situation. On the right is the situation at the removal of the provisional at 6 months; while implants 13-14 maintained an excellent soft-tissue profile due to the GBR procedure and the use of the flexible cortical bone lamina, the implant at site 16 lost much of its vestibular bone support resulting in a reduced proportion of keratinized tissue. Fig. 10. One year after uncovering, it is evident that the keratinized tissue at the distal implant is reduced while implants 13 and 14 have an adequate band of keratinized mucosa.

nus lift performed with equine-derived preserved collagen granules. After surgery, the patient followed home therapy of amoxicillin ac. clavulanicum 875/125mg: 1 tablet every 12 hours for 6 days. In addition, Ibuprofen 600 mg: 1 tablet every 12 hours the first 2 days. At the operated site, washes with 10 ml Chlorhexidine 0.12% for 30 s were prescribed for 10 days. At 6 months after GBR and mini sinus lift, the clinical appearance showed excellent healing of the peri-implant tissues around implants 13-14 covered by the cortical lamina, while the implant in position 16 and unprotected by the cortical lamina, showed strong vestibular bone resorption and subsequent resorption of adherent soft tissue (Fig.6-9). At approximately 1 year after uncovering the implants, it is evident that the keratinized tissue at the distal implant is reduced while implants 13 and 14 have an adequate band of keratinized mucosa (Fig. 10).

DISCUSSION AND CONCLUSIONS

The clinical case presented shows the interdependence of hard and soft tissues. Indeed, there is increasing evidence that the amount of keratinized tissue promotes implant survival by acting as a barrier to infection and protecting bone from resorption[9]. In this clinical case, the ability of the flexible cortical lamina to protect the bone graft, promoting its remodeling, while supporting the thickening of the keratinized tissue around the implants emerged (Fig.9).
At 6 months after GBR, the large amount of newly formed bone and the absence of residual biomaterial could be appreciated (Fig. 6).
This result stems from the careful planning of the regenerative surgery and the optimal combination of the fundamental components of bone regeneration present in the residual alveolar bone and the properties of the heterologous graft used. In fact, the latter, thanks to the preservation of the native collagen and mineral component turns out to have a shorter remodeling time than calcined biomaterials[5, 6].
This is particularly relevant in prosthetic rehabilitations, as from a biological point of view, in the long term, it is certainly preferable to have an implant completely surrounded by the patient's bone, rather than a biomaterial.

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