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Immediate implant rehabilitation by horizontal GBR 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 58-year-old woman who required immediate implant rehabilitation in positions 44 and 46. Following clinical and radiographic investigation, a horizontal bone deficit was observed at the level of the area to be rehabilitated. Therefore, a horizontal GBR and concomitant implant placement in position 44 and 46 was performed. Regenerative surgery was performed with heterologous preserved collagen graft of equine origin (Osteoxenon® Cortical-Cancellous Granules, Bioteck Spa, Arcugnano Italy) protected by a 0.5 mm thick flexible cortical bone sheet (Osteoxenon® Flex Cortical Sheet, Bioteck Spa, Arcugnano - Italy).

INTRODUCTION

The interdependence of tooth element and alveolar bone is the basis of the latter's preservation[1] . Following extraction of the tooth element, the synergy between the two components fails and the alveolar bone undergoes a process of resorption, which as early as 3 months after extraction can reach 50% of the initial size[2] . Other factors may intervene and exacerbate resorption, such as an infection, genetic factors, and possible trauma from tooth extraction. The presence of periodontal disease combined


Figure 1

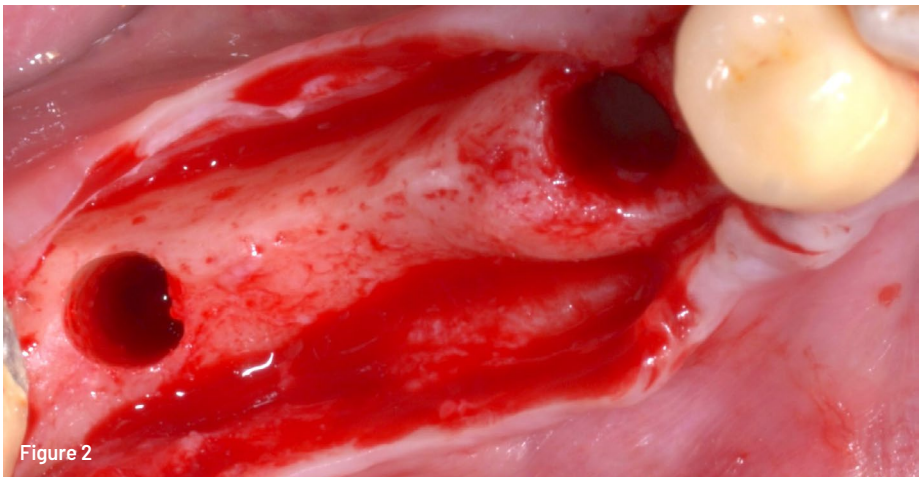


Figure 2

Figure 1. Initial orthopantomography: metal ceramic bridge of 44-45-46 with abutment element mobility.
Figure 2. Defect skeletonization and implant tunnel preparation.

Figura 3. Implant placement and measurement of horizontal atrophy of approximately 5.5 mm.
Figura 4. Use of a sterile template in order to properly shape the cortical lamina.
Figura 5. Equine-derived flexible cortical lamina fixation with 2 pins

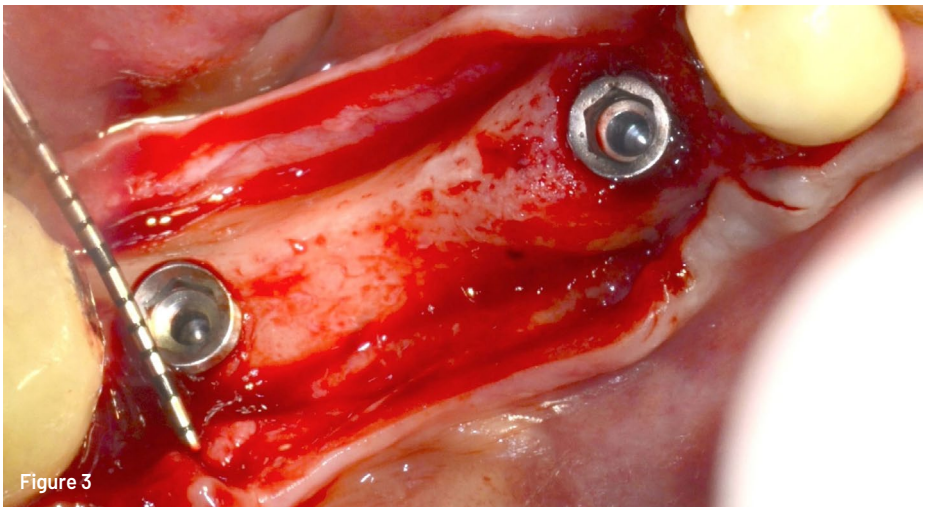


Figure 3

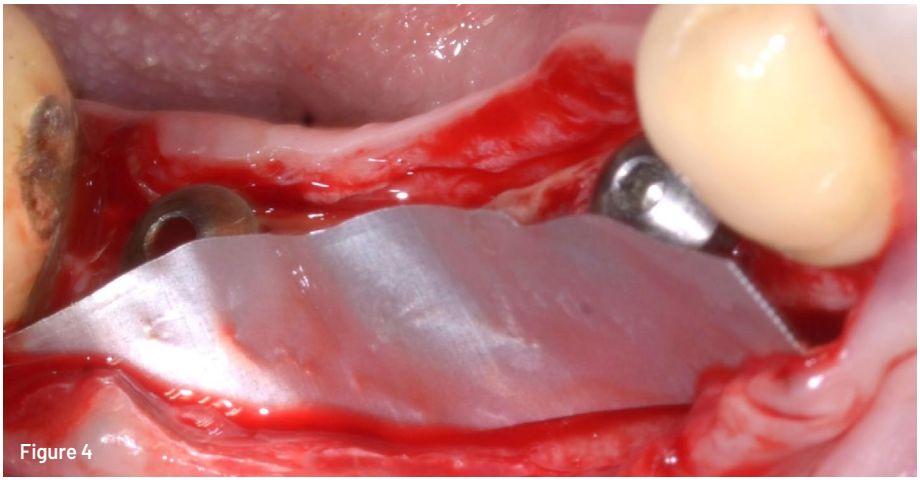


Figure 4

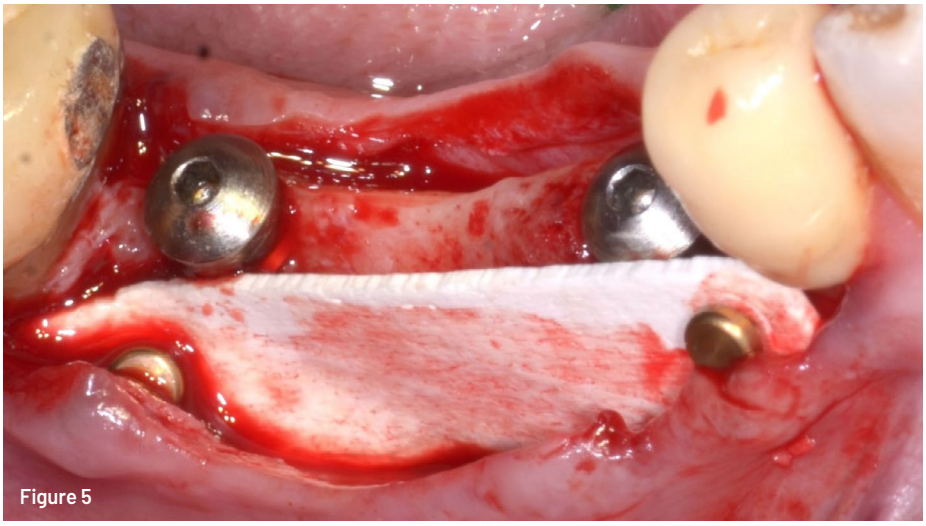


Figure 5

with socioeconomic factors can then lead to situations of partial or total edentulism[3] . In addition to bone resorption, there is also that of soft tissue adhering to the alveolar bone. This is particularly relevant at the time of implant planning, where assessment of the amount of residual alveolar bone is accompanied by soft tissue analysis. One option is immediate implant placement. However, there must be certain requirements to use this option: primary stability of the implant, good osseointegration at a qualitative level, correct three-dimensional implant placement, and aesthetics of the result[4] . In order to achieve the latter goal, it is often necessary to use bone substitutes that go to reduce any gaps between the implant and alveolar bone, in addition to the possible need to correct the aesthetic profile of the alveolar ridge.
In these situations, one of the most widely used and predictable techniques is Guided Bone Regeneration (GBR), which meets 4 key principles (PASS)[5] : 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 placement of 2 implants contextual to a horizontal GBR, performed with a collagen-preserved equine-derived heterologous graft and the aid of a flexible cortical bone lamina.

CLINICAL CASE

The clinical case involves a 58-year-old healthy woman who presented to the surgeon's attention to request implant rehabilitation following excessive mobility and apical migration of the metal-ceramic bridge at the level of elements 44-46. Following clinical and radiographic investigation (Fig. 1), a horizontal bone deficit was observed. Therefore, a horizontal GBR and concomitant implant placement at positions 44 and 46 were performed.
The graft material consisted of collagen-preserved equine-derived bone granules of 0.25-1mm grain size (Osteoxenon® Cortical-Cancellous Granules, Bioteck Spa, Arcugnano -- Italy) covered and protected by a 0.5 mm thick flexible cortical bone sheet (Osteoxenon® Flex Cortical Sheet, Bioteck Spa, Arcugnano -- Italy).
The heterologous grafts used, obtained by an enzymatic deantigenation process (Zymo-Teck®, Bioteck SpA, Arcugnano - Italy) are characterized by the presen-

ce of the unaltered mineral component and bone collagen in native conformation. Due to these properties, the graft is physiologically recognized by osteoclasts and osteoblasts[6] and is remodeled with the patient's bone in physiological time[7,8].

In addition, the cortical lamina of equine origin undergoes an additional treatment of partial demineralization, which exposes the preserved collagen and allows its characteristic flexibility that makes it easily adaptable to the different geometries of the alveolar ridge[9,10] .

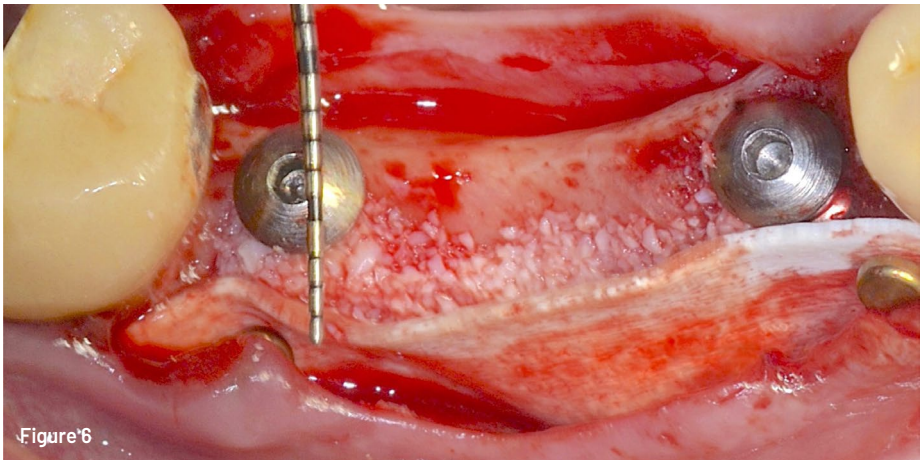
The day before surgery, the patient underwent antibiotic therapy with Amoxicillin and Clavulanic Acid 1 g tablets every 12 hours. On the day of surgery, antibiotic prophylaxis was performed 1 h before the start with 1 g Amoxicillin+ Clavulanic Acid, and local anesthesia with Articaine + adrenaline 1:200,000 was given. Next, a full-thickness linear incision was made in the ridge along the full extent of the defect, combined with two vestibular release incisions also at full thickness. Careful subperiosteal flap debridement was then performed in order to obtain adequate visibility of the defect area. Then the implant tunnel was prepared at sites 44 and 46, and implants, measuring 5x10 mm and 4.1 x 8.5 mm, respectively, were inserted (Fig. 2-3). Clinically, horizontal alveolar ridge atrophy of 5.5 mm between the two implants was observed. To resolve the horizontal atrophy, it was decided to proceed with a GBR procedure using heterologous granules and Flex Cortical Sheet. The latter was firstly shaped by the use of a sterile template (Fig. 4). Following hydration for about 10 seconds in warm saline solution, it was fixed buccally with 3 pins (Fig 5). The space between the basal bone and cortical lamina was filled using collagen-preserved cortical-cancellous granules (Fig 6). The flaps were closed with 5-0 VYCRIL sutures to promote healing by first intention (Fig.7-8). Postoperative X-ray confirmed correct implant placement (Fig.9). 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.

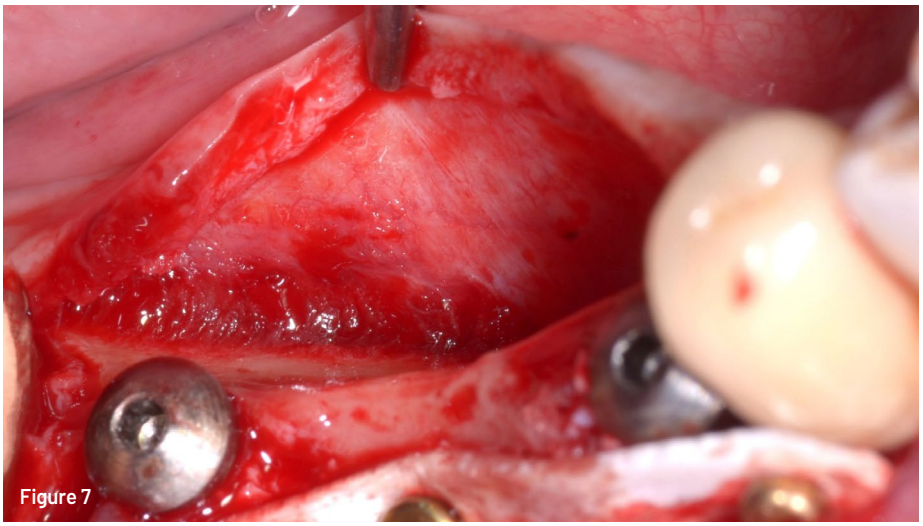
At 4 months after GBR, the clinical appearance showed the excellent amount of newly formed and well-vascularized bone (Fig.10). The cortical lamina had completely remodeled into new bone, and the pins were extracted. Healing screws were applied to prepare the soft tissue (Fig.11) for definitive prosthesis. A 3-unit ceramic fixed bridge was delivered 2 months later, with the abutments in place 44 and 46.

About 1 year after the delivery of the prostheses, the patient showed excellent soft tissue appearance as well as a properly restored aesthetic profile (Fig 12).

DISCUSSION AND CONCLUSIONS

In this clinical case, the ability of the flexible cortical lamina to protect the bone graft, promoting its remodeling and contributing to the resolution of horizontal atrophy emerged (Fig.12). At 4 months after GBR, the large amount of newly formed bone could be appreciated (Fig.





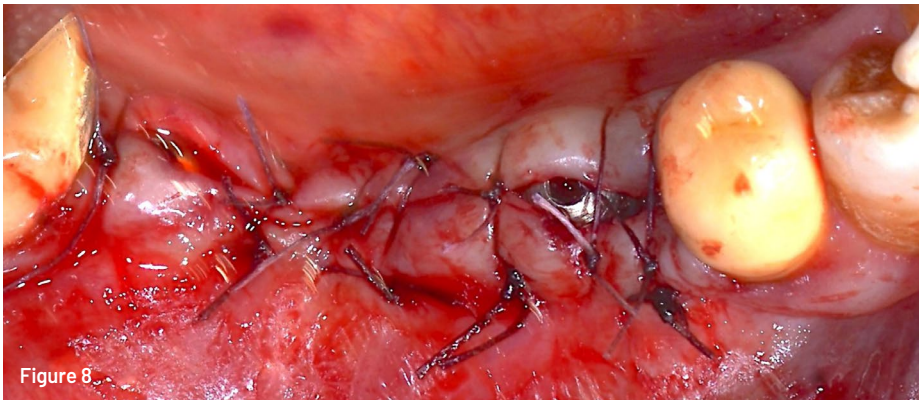
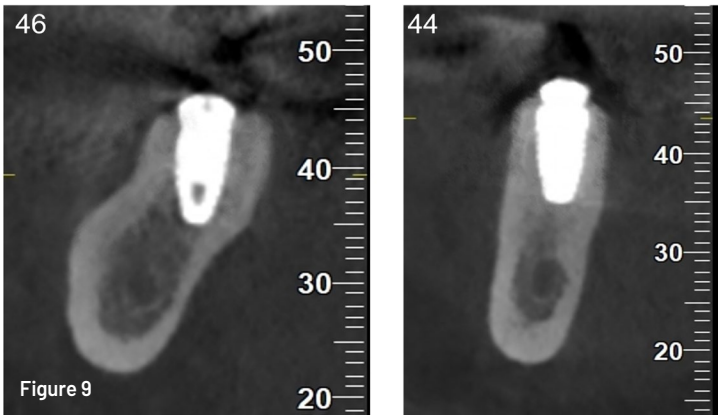


Figura 6. Horizontal volume enhancement by cortical-cancellous granules of equine origin with preserved collagen.

Figura 7. Passivation of the flap to allow closure by first intention. Note the insertion of the third stabilization pin of the flexible cortical lamina.

Figura 8. Flap closure and healing by first intention.

10). This result stems from the careful planning of the regeneration 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[7, 8] . 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.



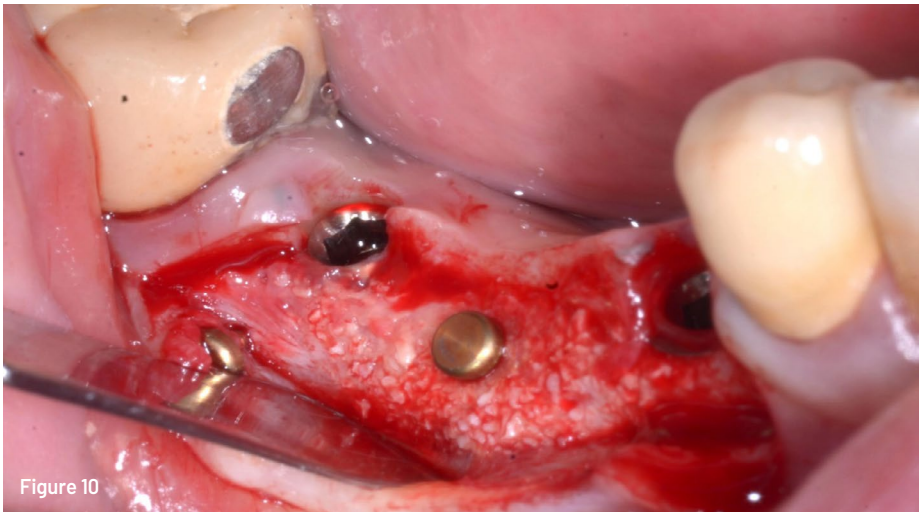


Figura 9. CBCT showing correct implant placement at sites 44 (right) and 46 (left).
Figura 10. Reopening at 4 months showing the excellent amount of newly formed bone and good vascularization of the site, a sign of vital and mature bone. The horizontal increment is 3 mm.

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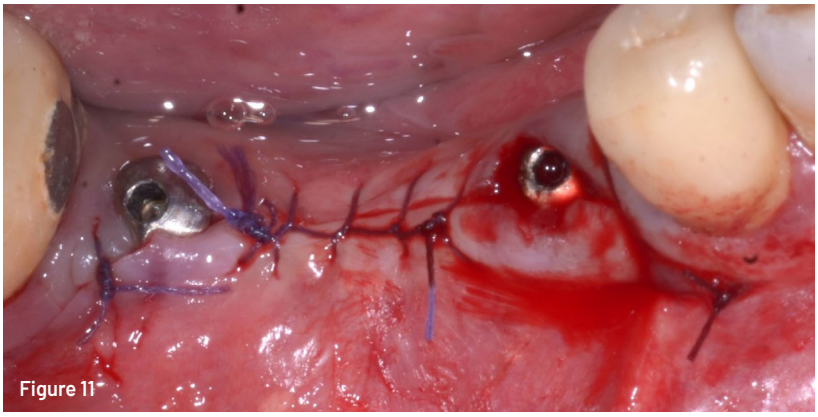

Figura 11. Application of healing screws in preparation for definitive prosthesis.
Figura 12. Follow-up at 1 year after definitive prosthesis shows the excellent appearance of the soft tissues.