case report

VERTICAL AND HORIZONTAL BONE REGENERATION

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SUMMARY

There are many different techniques to restore a sufficient bone thickness, in both vertical and horizontal direction, after bone loss due to resorption after extractions or after a long period of edentulism. The aim of the present study is a clinical evaluation of the result obtained using the GBR technique with a e-PTFE titanium reinforced membrane in posterior maxilla (1.4-1.6). A 56-years-old male patient presented an implant lost in zone 1.6 and a mucositis around the implant in zone 1.4; after the latter's removal and ahealing period of 4 months, the large bone defects have been filled with heterologous bovine bone mixed with autologous bone and covered withe-PTFE titanium reinforced membrane fixed to the alveolar ridge. After six months the site was reopened to remove the fixing screws and to place two dental implants (size 4x12) in zone 1.4-1.6; after the osseointegration period of 6 months, the implants were uncovered and two healing-screw were positioned. Despite the exposure of the membrane during the healing period a significative increase in alveolar bone both vertical and horizontal was observed, such as to ensure excellent aesthetic and functional result, showing the success of the procedure.

Key words: bone regeneration, oral implants, titanium-reinforced membranes.

Introduction

To ensure a predictable result in the long term, both from a functional and aesthetic point of view, a sufficient hollow vertical and horizontal alveolar bone component must be present for a correct recipient implant site. In recent years, guided bone regeneration (GBR) has been used as a bone regeneration technique, where there was need to recover that portion of crestal alveolar bone reabsorbed after extractions, infections or after a long period of edentulism of the patient (1, 2).

An adequate bone volume for the total coverage of the circumference around the implant it is indeed very important to guarantee a long-term success of the plant itself (3, 4).

To remedy these reabsorption problems, different regenerative surgical techniques have been used: onlay/inlay grafts (5), guided bone regeneration using non-resorbable titanium fixed membranes with screws, alveolar distraction to guarantee the osteogenic process (6-8).

Several materials have been used to securing the bone material to the recipient site. Non-resorbable titanium membranes (9) fixing screws (10) dental implants (11). One of the most important aspects in order to obtain a correct result of horizontal and vertical regeneration is to create and maintain sufficient space through positioning of a screw (curtain effect) to create the necessary thickness under the membrane (12) so that the grafted bone can proliferate in the following months. The sites for localized ridge augmentation are not space making defects because they are not supported by the bone walls (13) and in these situations an excessive soft tissue pressure could cause a membrane collapse toward the defects (14).

Possible solution therefore to avoid the collapse

of the membrane and thus increase the regenerative possibilities of the bone in a "not sufficient" space has been the use of a non-resorbable rigid titanium e-PTFE membranes (15) retired fixed with mini screws and pins to support and stabilize the membrane (16).
The use of reinforced membrane has been advocated (17).
Even with miniscrews however it is possible to have a lateral collapse of the membrane (18) and so the use of different types of grafts have been proposed to maintain the space between implant and surrounding defect (19).
The use of membrane reinforced in titanium for treatment of vertical component of the ridge deformity (20) are has been advocated and useful.
Aim of the present study is a clinical evaluation of the result obtained in GBR with a titanium reinforced membrane e-PTFE in posterior area (premolar and molar). The present work describes a ridge augmentation with a e-PTFE membrane titanium reinforced shaped by adapting it to a bone defects in posterior area. Semi-rigid membranes are particularly useful for treating the vertical and transverse component of ridge deformity when it is less than half the implant (21, 22).

Material and methods

A 56-year-old male patient presented an implant lost in zone 1.6 about a year before and had mucositis from the implant area 1.4 with drainage of pus. Therefore, after the antibiotic treatment, the implant was removed in the area. 1.4 with careful cleaning of the alveolus, to remove and decontaminate the site from the presence of any inflammatory tissue (Figures 1-5). Once this was done, the implant sites of the 1.4 were left to heal for 4 months. After 4 months the patient returned and presented in both sites a large crestal deficit in both vertical and horizontal direction and therefore necessitated a bone regeneration in order to be able to face the implant repositioning at those sites again (Figures 6-9).

Figure 1
Before the surgical treatment.

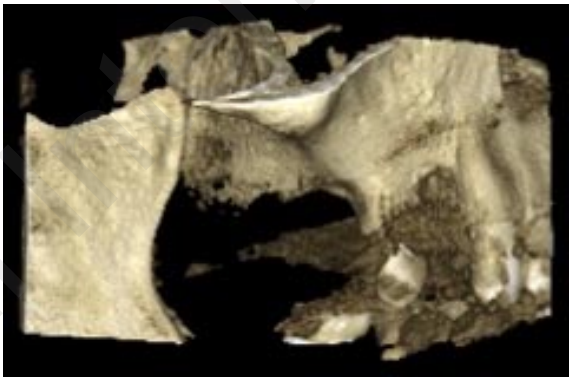

Figure 2
Before the surgical treatment.

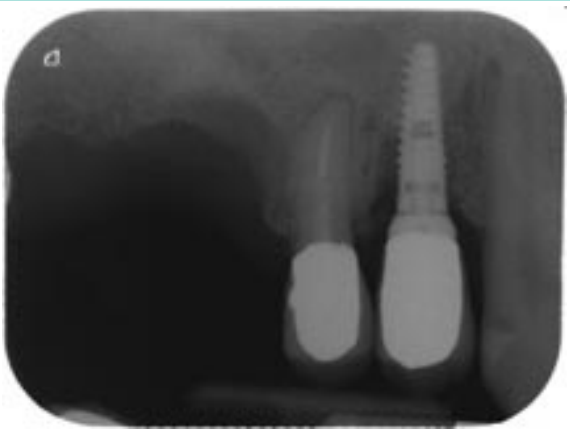

Figure 3
RX before the surgical treatment.

After adequate radiographic examinations (TC dentascan upper right arch) to assess the extent

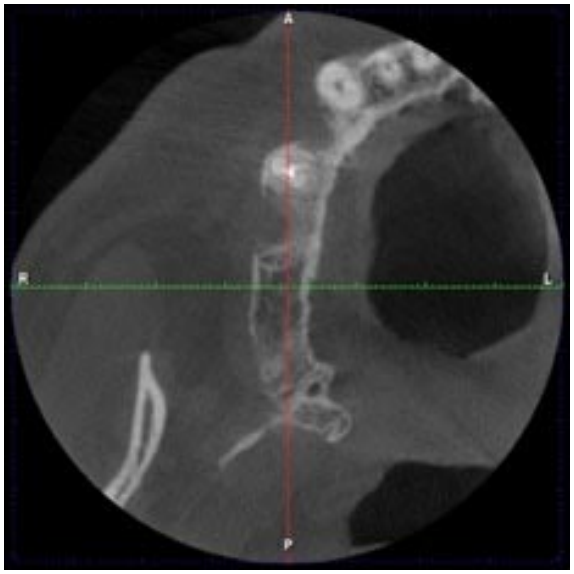

Figure 4
TAC before the surgical treatment.

Figure 5
Extraction of the implant in zone 2.4.

of the intervention to be carried out, they have been used for both Titanium e-PTFE Cytoplast Deore Reinforced Titanium Ti250PS sites fixed to the alveolar ridge using Pro-fix Bone microvites Screws-Self-tapping. To proceed to the regeneration was used bone heterologous bovine Bio-Oss Geistlich and Creos xenogain (Nobel Biocare) mixed with autologous bone of the patient taken using Safescraper TWIST Deore. After correctly proceeding to the positioning of the

Figure 6
Healing after extraction.

Figure 7
TAC after the extraction.

bone, in both vertical and horizonal direction, in order to obtain the bone quota necessary for the future implant repositioning, our membrane has been repositioned to close and protect our graft to allow its proliferation. The whole was covered by the mucosa and sutured with PTFE 4-0 Cytoplast sutures (Figures 10-16). After six months the site was reopened and consequently the removal screws of the membranes were removed to remove them and remove the screws used to obtain the curtain effect necessary for vertical regeneration could therefore be carried out, after verification of the result obtained at the insertion

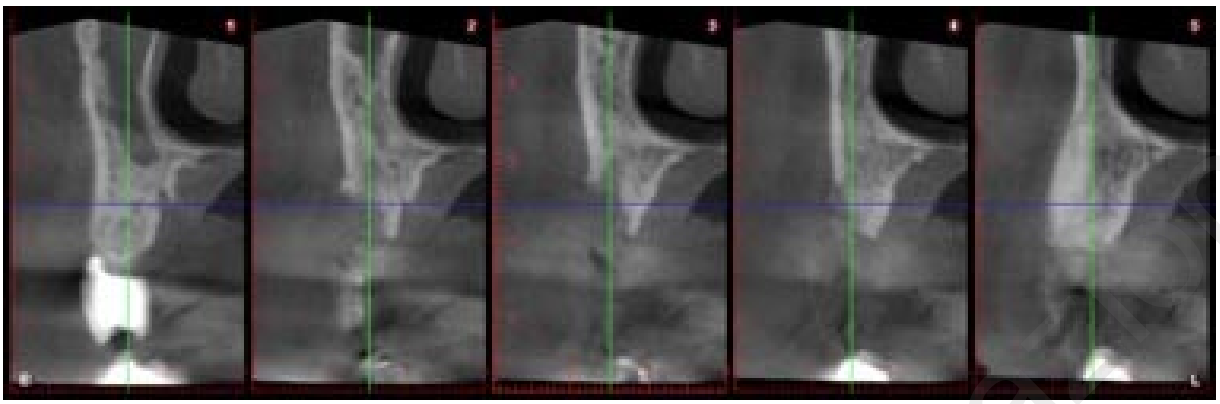

Figure 8
TAC after the extraction.

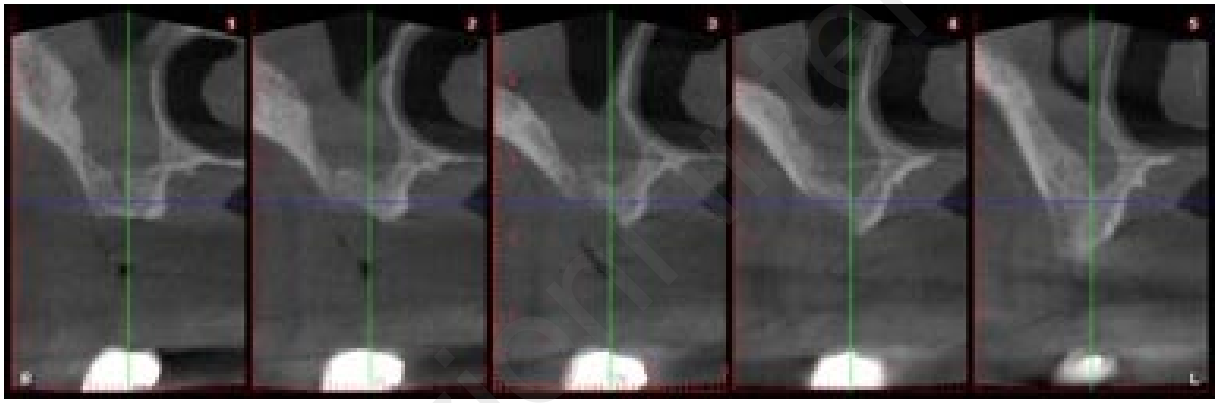

Figure 9
TAC after the extraction.

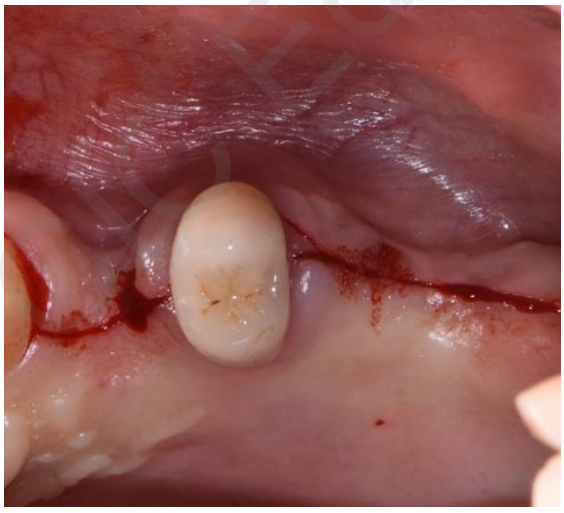

Figure 10
Surgical approach.

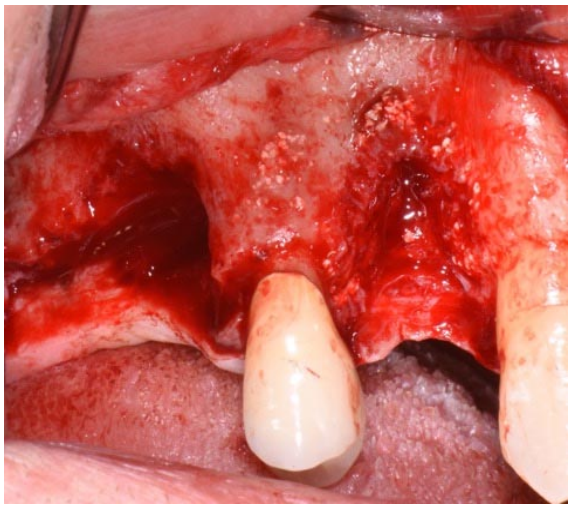

Figure 11
Intraoral defect.

Figure 12
Position of osteosynthesis screws.

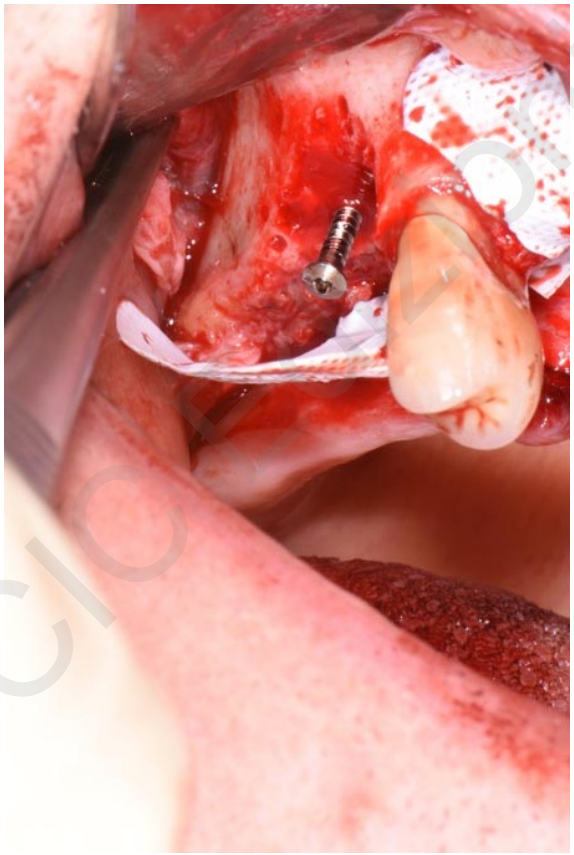

Figure 13
Position of the non-resorbable membrane.

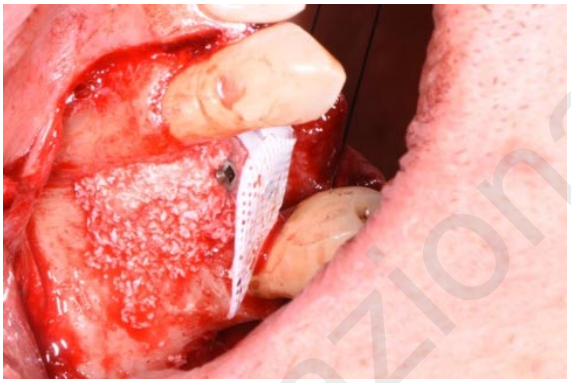

Figure 14
Bone insertion.

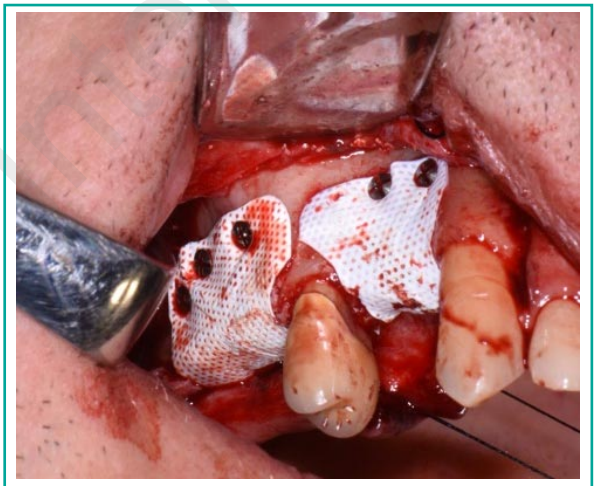

Figure 15
Membrane closure with miniscrews.

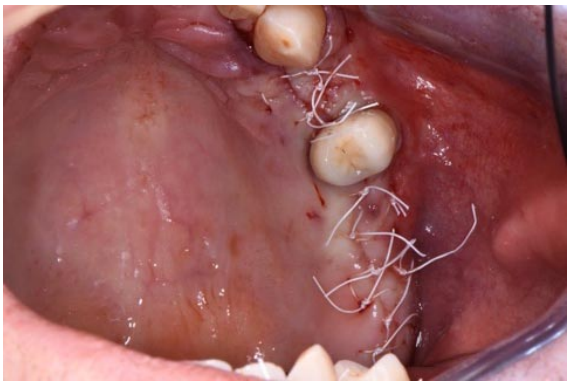

Figure 16
Suture.

Figure 17
Reopening after 6 months.

Figure 18
Membrane removal.

of the two plants in zone 1.4 and 1.6. Two Anthogyr Reg plants BL 4.0 X 12 were used in each site (Figures 17-22). Once positioned, the implants were left osseointegrated for a period of six months, after which the latter were uncovered and two healing screws were positioned and then the final impression was taken the following week, in order to then be able to restore the whole through the positioning of two screwed crowns (Figures 23-26).

Results

The postoperative result despite exposure of a membrane during the healing phases was optimal. During this period the healing was constantly monitored for fear that the exposed membrane portion could lead to possible contamination and underlying bone infection. During this period, it was still present a beautiful dense connective tissue without inflammation. At the end of the six months from a clinical point of view, no residual bone defects were observed, but instead there was a significative increase in bone alveolar both vertical and horizontal, thus being able to observe an excellent aesthetic result and functional of this procedure.

Conclusions

Bone regeneration in combination with the placement of oral implants, the increase of reab-

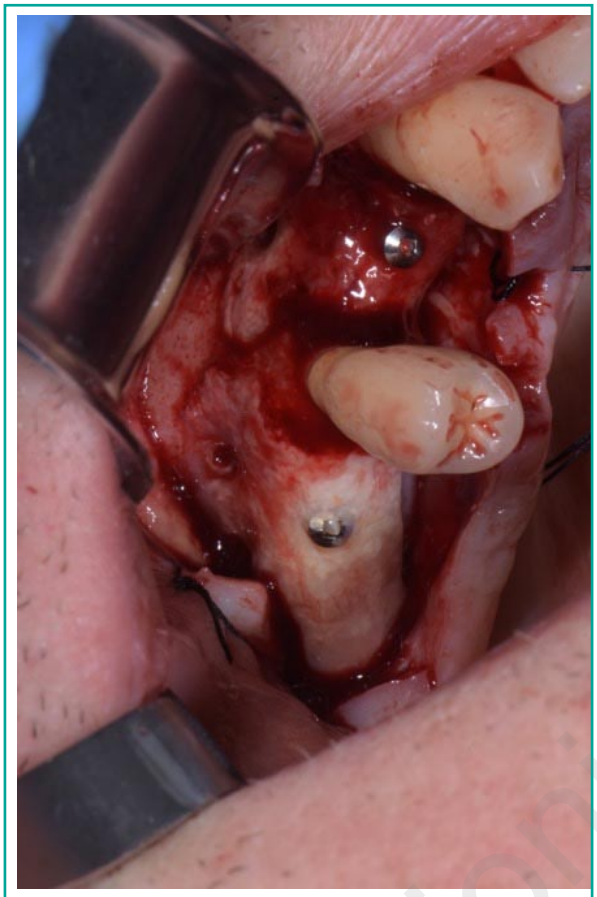

Figure 19
Osteosynthesis screws removal.

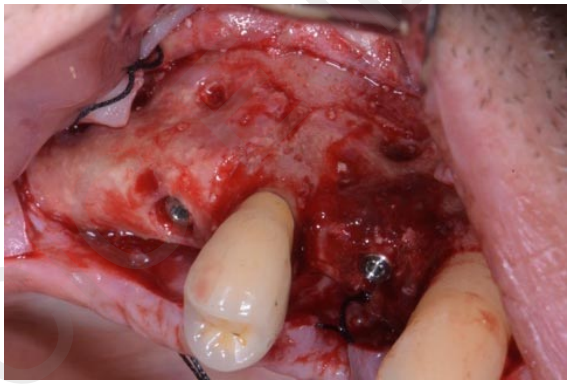

Figure 20
Positioned implants.

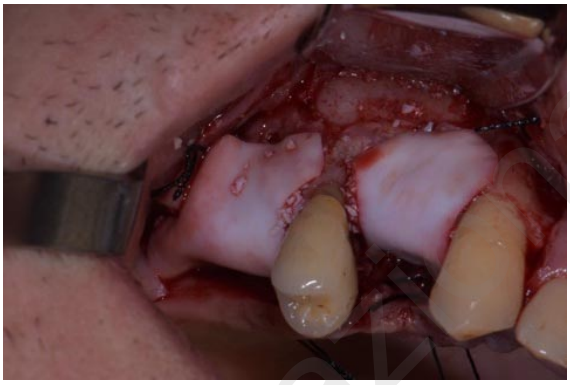

Figure 21
Regeneration with bone and resorbable membrane.

Figure 22
Orthopanoramic after surgery.

Figure 23
Test of the prosthetic structure.

sorbed alveolar ridges and the treatment of localized ridge defects are common clinical situations that can be managed using a precious technique described for the first time in 1959 from Hurley et al. known as guided bone regeneration (GBR), which was developed during experimental reconstructive surgery by Hurley for the treatment of experimental spinal fusion (23) and then applied in oral surgery by Simion and Dahlin (24). A recent clinical study evaluated the survival rates of implants placed simultaneously

Figure 24
Test of the prosthetic structure.

Figure 25
Check after 24 months.

Figure 26
Check after 3 years.

with GBR or inserted into the native bone after an average observation period of 12.5 years (25, 26). The survival rates of the implant for GBR and control groups were found to reach 93% and 95%, respectively. Guided bone regeneration is currently used for the treatment of localized ridge augmentation, based on the membrane concept as a physical barrier designed to minimize the resorption of the grafted bone. There are two types of membrane: resorbable and not resorbable. One of the main problems in the use of occlusive membranes is their lack of rigidity that can produce a collapse of the barrier towards the bone defect, thus reducing the space necessary for bone regeneration (27, 28). This problem can, in part, be overcome by the use of grafts under the membrane, but the influence of the soft tissues overlying the membrane collapse may still be present. The titanium-reinforced membranes used maintain their three-dimensional shape with a specific height and width but with this technique there is also the risk of postoperative mucosa dehiscence that hinders the establishment of a proper vascular supply. In our patient, the titanium micromesh was easy to handle, it was very ductile and seemed to have excellent material creation capabilities, no infection was observed in soft tissue healing. The clinical advantages of this technique include the possibility of correcting vertical and horizontal atrophy. In conclusion, the clinical results of the present study show that the space for bone regeneration is most likely one of the most critical factors in the success of regeneration techniques, that the main closure of the mucoperiosteal flap plays an important role in the protection of the blood clot and in the prevention of infections (29, 30).

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