Dentistry

Clinical Sheet

MAXILLARY SINUS LIFT AND CONCOMITANT VERTICAL RIDGE AUGMENTATION WITH 12-YEAR FOLLOW-UP

The sinus membrane can be suitably protected by a cortical bone membrane.

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The correct implant rehabilitation of patients with very extensive atrophy of the posterior maxilla may require performing complex surgery procedures, where the regeneration of a sufficient volume of bone tissue for inserting the implants is obtained by combining multiple regenerative/reconstructive techniques. This type of approach involves a greater operative burden for the surgeon as well as for the patient. Surgery lasts longer and that is why the patient's compliance plays an essential role. It may be appropriate, in some cases, to resort to conscious sedation techniques. The surgeon is required to have greater manual dexterity, especially with regard to the management of flaps which, although fundamental in any regenerative surgery, is essential in more complex procedures. In this context, it is equally important to be able to use bone substitutes which, due to their composition, three-dimensional structure, as well as interaction with the cellular elements of the bone tissue, assure the success of the regenerative intervention also in the long term. The bone substitute must be chosen wisely, considering multiple factors, such as the surgeon learning curve, the anatomical condition to be restored and rehabilitated, the specific conditions of the patient being treated. Adequate sinus lift management, performed with the appropriate biomaterials, makes it possible to perform surgical re-entry procedures even after 4 months, as shown by in the available literature on bone substitutes with preserved bone collagen[1].

1. Di Stefano, D.A., et al. Bone formation following sinus augmentation with an equine-derived bone graft: a retrospective histological and histomorphometric study with 36-month follow-up. Int J Oral Maxillofac Implants, 31 (2), 406-412 (2016).

Materials

The equine bone substitute used (Osteoxenon, Bioteck) consists of cancellous and cortical granules (1:1) sized 0.5 – 1 mm, and it was used in conjunction with a cortical bone membrane (Osteoplant - Osteoxenon Cortical Membrane, Bioteck). Both are obtained through the enzymatic deantigenation process, Zymo-Teck. The hydrolytic enzymes, which Zymo-Teck is based on, selectively degrade the antigen molecules and make it possible to keep the mineral composition of the bone tissue unaltered and to preserve the collagen in its native structure. These features allow both biomaterials to physiologically interact with the cellular components that lead to remodeling, and therefore undergo complete replacement by newly formed bone. The cortical bone membrane is made flexible by a partial demineralization process, which further exposes the preserved collagen. Membranes in collagen extracted from equine tendon were used to cover the bone graft (Biocollagen, Bioteck). They are particularly easy to handle and perfectly adhere to the grafting site in the presence of blood. Their protection time is 4-6 weeks.

Fig. 1 *– Panoramic X-ray. The patient has numerous compromised teeth and her rehabilitation requires a well-structured intervention plan. Note the significant vertical bone loss in Q2.*

Fig. 2 *– The patient's clinical condition upon first presentation. Note the lack of the fundamental aesthetic parameters of a smile.*

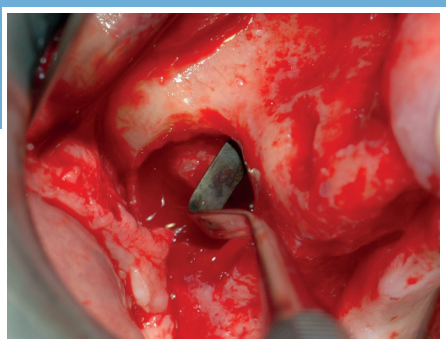

Fig. 3 *– Maxillary sinus lift: after performing the antrostomy, the sinus membrane is detached.*

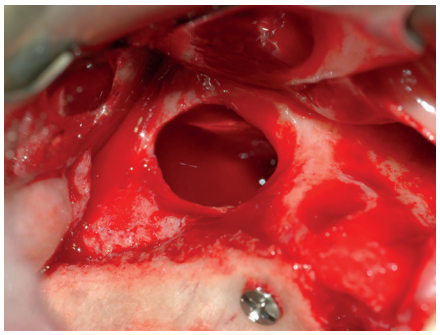

Fig. 4 *– The sinus membrane is protected by inserting a cortical bone membrane underneath it. The autogenous block is already positioned and fixed by osteosynthesis means. It will allow verticality to be corrected, enabling an adequate smile line in the posterior sector.*

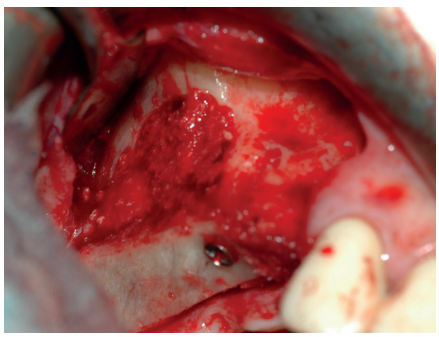

Fig. 5 *– The sinus volume between membrane and sinus floor is grafted with the heterologous bone substitute mixed with autogenous bone.*

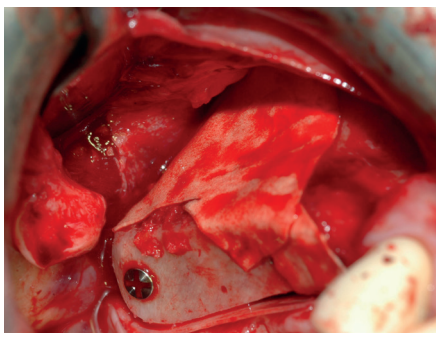

Fig. 6 *– The entire reconstruction is protected with collagen membrane. An appropriate periosteal release was also performed.*

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Results

The patient presented to the surgeon's attention requiring the rehabilitation of both arches, her wish being a high level of aesthetics for the future rehabilitation. Many teeth had undergone endodontic or conservative treatment, almost all of which could be considered irreversibly compromised. A treatment plan was drawn up aimed at the rehabilitation of both arches. The sheet only presents the procedures performed in the upper arch.

Bone atrophy in the two posterior sectors was such that it was deemed appropriate to proceed according to a combined approach, involving – in addition to the extraction of the compromised teeth – execution of a lateral sinus lift as well as a vertical ridge augmentation procedure through autogenous bone graft harvested from the iliac crest. The procedure was performed in general anesthesia. After performing the usual antibiotic prophylaxis, the patient consecutively underwent maxillary sinus lift for both right and left sides and ridge augmentation. Sinus lift was performed according to the lateral access technique. After osteotomy, the sinus membrane was detached, using a flexible cortical membrane to protect it, and the granular graft was inserted, mixed with autogenous bone previously harvested from the vestibular wall with a bone scraper. Vertical regeneration was performed through vertical onlay grafting of the autogenous block previously harvested, after freshening the recipient site with a round bur, blocked through appropriate osteosynthesis. The grafts and the antrostomy were protected with collagen membranes. Suture ensued. No intra- or post-operative complications were observed.

Implant placement took place 4 months later, in the context of which some bone biopsies were taken for subsequent histological analysis. The histological and histomorphometric analysis of the samples taken was compatible with a picture of successful bone regeneration, since particles of bone substitute were no longer visible, and the area occupied by the newly formed tissue was 38%. No inflammatory infiltrates were observed. The patient was permanently rehabilitated using the three implants placed on each side, and the remaining five natural anterior abutments, duly prepared. The follow-up CBCT performed 12 years later showed excellent maintenance of the regenerated volume.

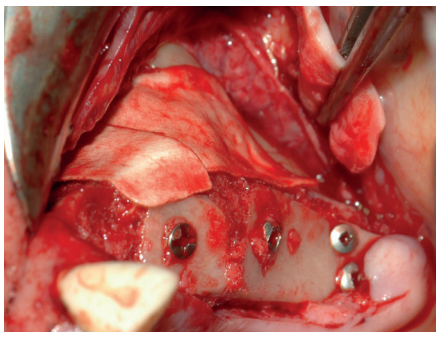

Fig. 7 *– The same procedure is repeated contralaterally.*

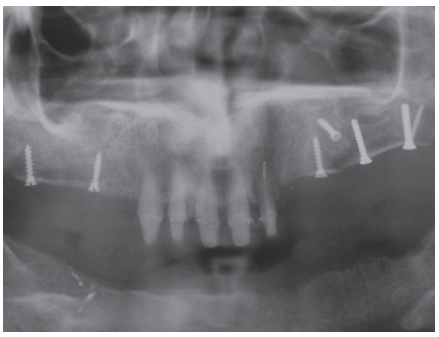

Fig. 8 *– Control panoramic X-ray at the end of the procedure. The volumetric increase obtained is appreciated.*

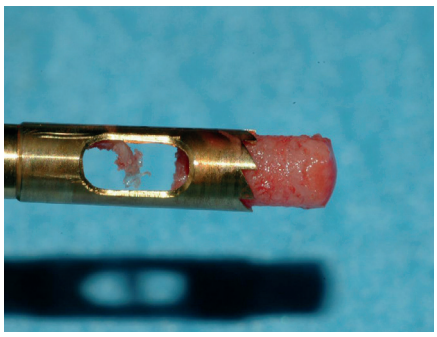

Fig. 9 *– Upon returning, 4 months later, bone biopsies can be taken at the same time as implant placement.*

Fig. 10 *– The final rehabilitation of both of the patient's jaws.*

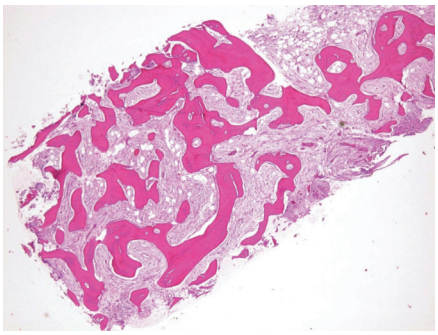

Fig. 11 *– Hematoxylin and eosinstain histology. The graft appears completely remodeled, the newly formed tissue is about 38%, there are no signs of inflammation.*

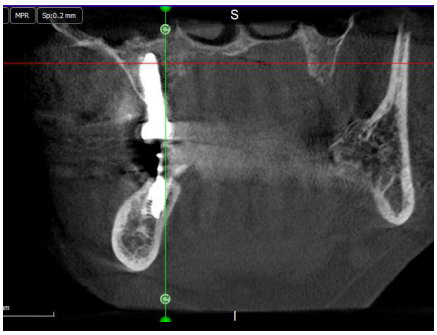

Fig. 12 *– Follow-up CBCT after 12 years. The regenerated volume is preserved. A thin layer of cortical bone can be glimpsed next to the sinus membrane.*

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