



the bone inside the pore

Frios Algiopore – 20 years in clinical use

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INTRODUCTION

Missing bone volume – irrespective of the cause – is a relative contraindication for placing an implant. However, to make implant placement possible it is necessary to rebuild lost volume. For this reason, bone augmentation using grafting procedures and improving the bony site is one of the most important tasks in pre-prosthetic surgery. It essentially involves two things: replacing lost bone substance by building volume and restoring the support function. Not only the quantity, but also the quality of bone where the implant is to be placed is an essential part of ensuring a patient's optimum denture restoration.

Ideal bone augmentation not only means mending, but is a process of bone regeneration enabling the reconstruction of substance, form and function. Success in bone augmentation depends on the applied surgery technique as well as the choice of a suitable bone augmentation material. Although the benefits of an autogenous bone transplant (gold standard) are undisputed, we must not lose sight of its disadvantages either. Among these are the limited availability and postoperative problems at the donor site with significant resorptions leading

to volume loss. One of the possible alternatives guaranteeing an equivalent and sometimes even better treatment result is the use of inorganic alloplastic materials.

Calcium phosphate ceramic materials have been in clinical use as bioactive, osteoconductive bone substitutes or bone augmentation materials for a number of decades. In their stoichiometry they are most similar to the composition of human bone. It is desirable for the resorption of augmentation material to coincide with new bone formation. This way, volume loss in the grafted area can be avoided and these foreign objects do not remain in the organism any longer than necessary. It is largely recognized that the resorption of bone substitutes is largely determined by their physicochemical and structural-morphological characteristics (porosity, pore size and pore geometry).

NOT ALL HYDROXYAPATITES ARE THE SAME

Most commercially available bone augmentation materials are based on hydroxyapatite. It is either manufactured synthetically or of animal origin. Although chemically the materials correspond to natural bone, “in vivo” they turn out to be very

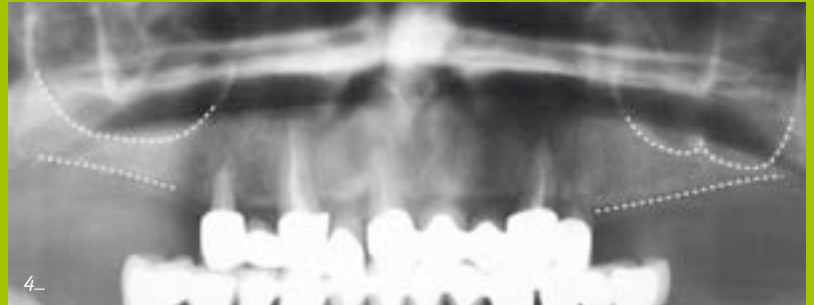


1_ A Frios Algipore core with oblong, inter-connected pores (300 x magnification)

2_ Bone formation in pores by Frios Algipore six months after augmentation (Human preparation, 20 x magnification)

3_ After 26 months Frios Algipore is almost completely resorbed and replaced by new bone. (Human preparation, 20 x magnification)

4_ Distinct atrophy after many years of tooth loss



stable and barely resorbable. Resorption of hydroxyapatite in terms of bone regeneration mainly depends on the physical and morphological structure of the material. Pore size, pore distribution and their geometry play an important role. As the clinical results (see below) show, Frios Algipore is a material which is largely resorbed and replaced by new bones. Frios Algipore is the inorganic skeleton of a certain variety of red algae. This basic scaffold possesses an interconnecting porous microstructure (Fig. 1). The phycogenic (i.e. extracted from algae) hydroxyapatite has a specific chemical composition. Like human bone it is a weakly crystalline apatite substituted with trace elements.

Frios Algipore has been in clinical use for over 20 years and has proven to be an outstanding augmentation material as documented in numerous clinical studies. The structure of the material is used as a matrix to support the newly forming bone. Parallel to osteoneogenesis (new bone formation) this biological material is resorbed over time due to cellular processes. A few months after augmentation, young newly formed bone tissue causes osseous splinting of the apatite granules. Bone cells penetrate the pores and travel to the

interior of the granula and form new bone (Fig. 2). Remodeling causes the originally formed reticulated bone to be resorbed and gradually transferred into mature lamellary bone. Long-term clinical observations show that the complete resorption time for phycogenic apatite is approx. 2 to 5 years (Fig. 3). The continual degradation and thus resorption of the inorganic bone augmentation material and the parallel running osteoneogenesis therefore ensure the desired volume constancy.

INDICATIONS

The most important indications for Frios Algipore are filling up of:

- Periodontal bone pockets
- Extraction alveolar cavities
- Cystic cavities
- Bone defects
- Sinus elevation.

Depending on case and indication, the material can either be used by itself or in combination with autogenous bone (chips). To promote new bone formation, it is possible to add a thrombocyte concentrate (platelet rich plasma — PRP).



5_ Preparation of a bone groove and elevation of the intact Schneider's membrane

6_ Filling up the recessus alveolaris with a mixture of Frios Algipore, autogenous bone and PRP

7_ Six months after sinus lift and grafting

8_ Removal of the titanium membrane over the graft

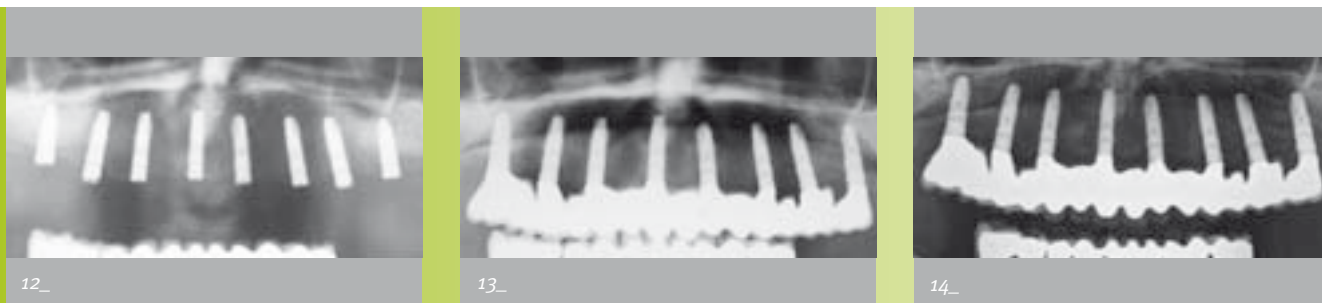
A LONG-TERM RESULT

The use of Frios Algipore proved to be an effective solution for sinus lift cases. In one clinical study with an observation period lasting 12 to 14 years, the implants had a 95.6 percent survival rate. These results will be presented as an example by means of a short case report. A patient, aged 60, with bilaterally shortened rows of teeth showed distinctly atrophied edentulous sections of jaw (Fig. 4). A sinus lift with internal augmentation of the alveolar ridge was performed on both sides. A combination of Frios Algipore, autogenous bone chips and thrombocyte concentrate (PRP) was used as grafting material. The graft was covered and stabilized with a titanium

membrane (Figs. 5 and 6). It was possible to place eight Xive implants without any complications after a six month healing phase (Figs. 7 to 12). The prosthetic restoration of the implants followed half a year later. The patient has been under clinical and radiological observation for over ten years (Figs. 13 to 15).

SUMMARY

More than two decades of clinical experience show that Frios Algipore is a resorbable bone augmentation material offering an outstanding osteoconductive and bioactive lead structure. Frios Algipore differs from bovine material since its plant-derived origin rules out the danger of transmitting pathogens

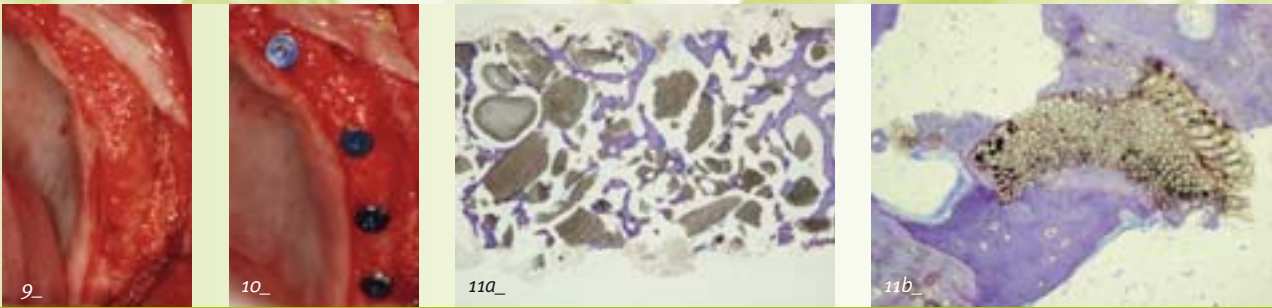


12_ Three months after implant placement

13_ Situation three years after the denture restoration

14_ The condition of the bone in the grafted area is still stable ten years later.

15_ Situation eleven years after grafting and ten years after denture restoration



9_ Firm bone condition for the implant placement in the grafted area

10_ Xive in situ

11a, 11b_ Histology after six months of healing time. In the general view (a) and the detail (b) the new bone formation can be detected within the granules of Frios Algipore.

or prions. Thanks to its specific chemical parameters and the interconnecting porous microstructure, Frios Algipore is subject to a successive substitute resorption which causes the material to be completely resorbed and replaced by newly formed bone. These remodeling processes ensure the constant stabilization of the grafting area. Frios Algipore has a broad indication spectrum, even in combination with autogenous bone and thrombocyte concentrate. Hence, a promising future application for Frios Algipore is as a biological substrate for bone-inductive substances. ■

Literature on request from the authors



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