

From granules to foam

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Literature



In 1997 curasan launched its first β -TCP based bone regeneration material in granule form CERASORB[®]. Primary discussed very controversial as not comparable to the golden standard iliac crest spongiosa, the development of the biomimetic bone regenerating materials didn't stop, at least due to requirements of health politics and patients' sensitivity.¹ CERASORB[®] M, significantly closer to natural bone structure was a logical improvement of CERASORB[®] and ended up in CERASORB[®] Foam, where the β -TCP granules are imbedded in a collagen foam matrix, due to its flexibility enhancing the indication of β -TCP based bone regeneration materials considerably.

For more than a decade (16 years), the author attended the development of these modern augmentation materials, collecting clinical experience from hundreds of patients. In the following, some exemplary cases are shown, demonstrating the vast range of CERASORB[®] products.

Case 1: CERASORB[®]

The case documented in 2000 shows the use of the original rounded form of CERASORB[®].

A patient came to the hospital with unclear discomfort in the right mandibular region. Radiologically (Fig. 1), a retained and displaced wisdom tooth with clear and impressive translucency in area 46 and 47 dominated. Block and damage of the inferior alveolar nerve was probable, as well as devitalisation of the two molars. Clinically, a prominent swelling in area 46 and 47 could be seen and a perforation of the soft tissue over the erupting wisdom tooth. After preparation of a soft-tissue flap (Fig. 2) and the sparing removal of the wisdom tooth, the cyst was carefully extirpated. The alveolar nerve could be saved and the enormous defect was filled with CERASORB[®] granules (Fig. 3). The final wound closure was done by readapting the soft-tissue flap and a sealed off suture. The vitality of the molars was kept, as well as the sensitivity of the inferior alveolar nerve. After nine months, a control panoramic scan was made and a sufficient bony consolidation with only a few residual CERASORB[®] granules was noticed (Fig. 4).

Case 2: CERASORB[®] M

The second case from 2005 documents the further development and improvement of CERASORB[®] into

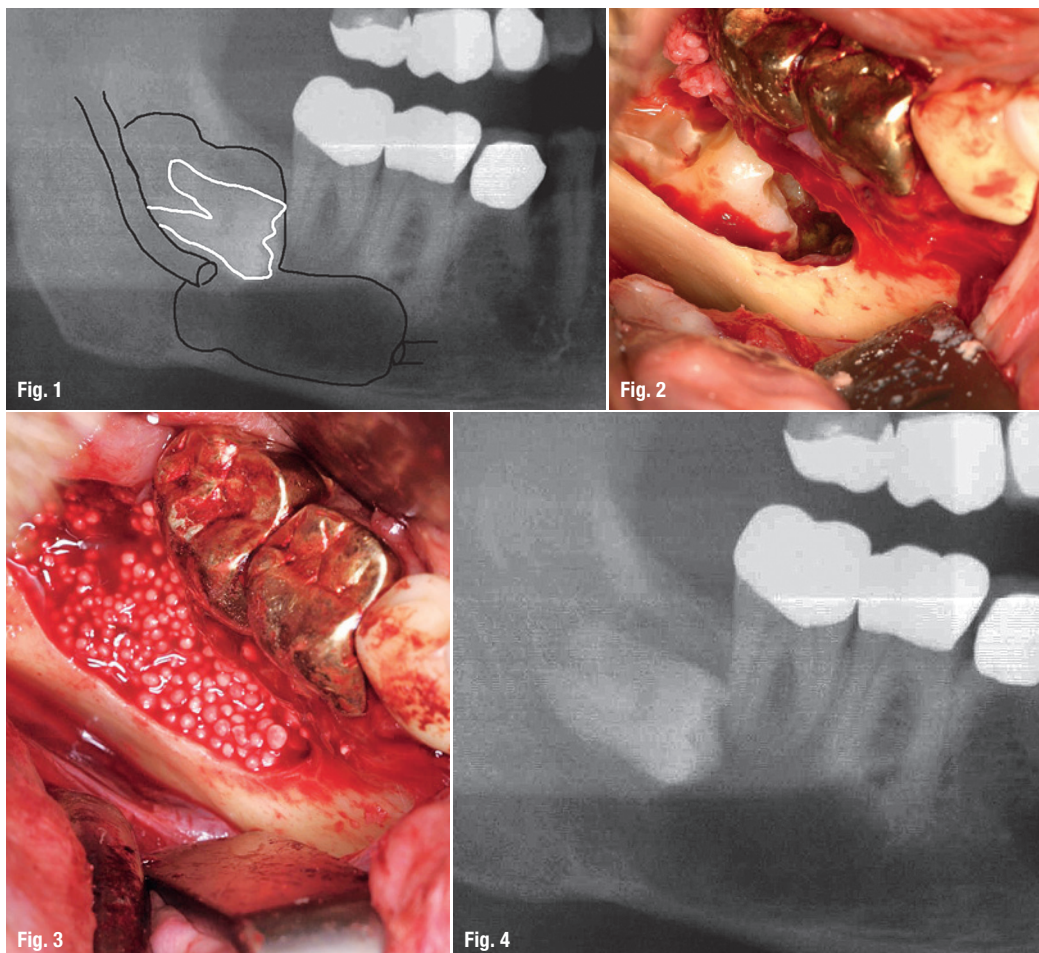


Fig. 1: Pre-op X-ray in right mandibular.

Fig. 2: After opening and preparation of a mucoperiosteal flap.

Fig. 3: Defect filling with CERASORB® Classic granules.

Fig. 4: Control X-ray after nine months shows a sufficient bony consolidation.

more porous and polygonal shaped CERASORB® M. Here, after removal of teeth #26, #27 and #28, the ridge was preserved with the new product.

The extraction of the deeply destroyed molar teeth and the dislocated wisdom tooth left an extensive hard- and soft-tissue defect (Fig. 5). The extraction sockets were filled with dry CERASORB® M granules to allow a better evaluation of the defect's bleeding capacity (Fig. 6). Regarding the extensive soft-tissue loss, the wound was additionally covered with a resorbable membrane (Epi-Guide®; Fig. 7) and fixed with sutures. The following healing process exposed a soft-tissue defect (Fig. 8), which afterwards healed completely. The control X-rayscan after six months showed a homogenous bony rehabilitation of the extraction sockets and a complete preservation of the alveolar ridge dimension (Fig. 9).

Case 3: CERASORB® Foam

In 2015 after surgical removal of teeth #16 and #17 following the "basic protocol" alio loco, the patient visited the clinic. After clinical examination, a compromised alveolar ridge, lowered sinus and an iatrogenic damage of the Schneiderian

membrane were noted. An implant treatment was the best choice in this situation (Fig. 10).

Firstly, a mucoperiosteal flap was designed and elevated. Then, the lateral window was cut to expose the Schneiderian membrane. After elevation of the Schneiderian membrane, CERASORB® Foam was inserted to provide outline and to keep the membrane elevated (Fig. 11). The residual space was filled with CERASORB® M granules (Fig. 15).

In area 17, an implant was inserted, which was not possible for the first molar area due to a lack of primary stability (Fig. 12).

The postsurgical healing process was absolutely uncomplicated. The postimplantation scan (Fig. 13) revealed a significant growth of volume in the grafted area, providing the basement for an additional implant.

Case 4: CERASORB® Foam, Epi-Guide® membrane

The patient introduced in 2015 to our clinic with a surgical and prosthetic treatment done in Switzerland in 2012/13 asked for rehabilitation with an implant-

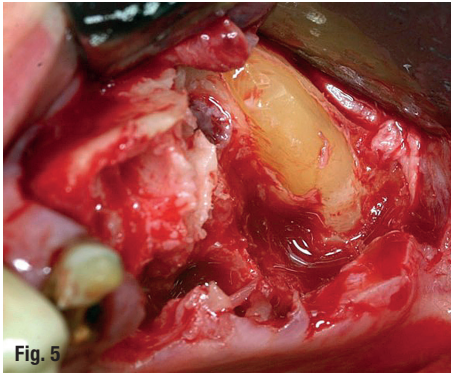


Fig. 5

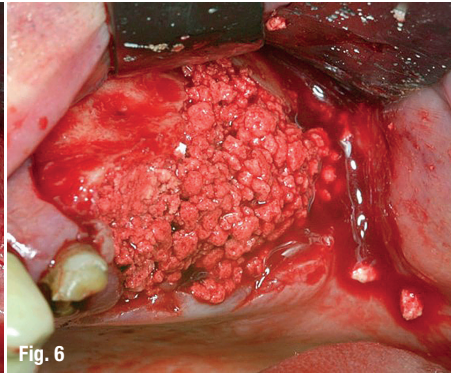


Fig. 6

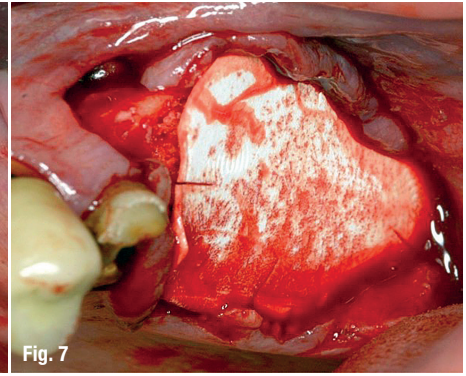


Fig. 7

Fig. 5: Extended hard- and soft-tissue defect after extraction.

Fig. 6: Dry CERASORB® M granules filled into the defect.

Fig. 7: Covering the wound area with a resorbable Epi-Guide® membrane.

Fig. 8: Soft-tissue dehiscence during the healing process.

Fig. 9: Control X-ray after six months: homogenous bony bridging and preservation of the alveolar crest dimension.

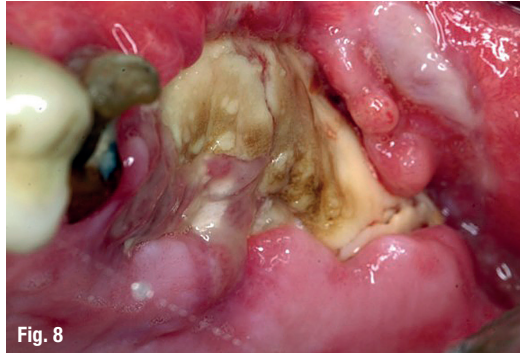


Fig. 8

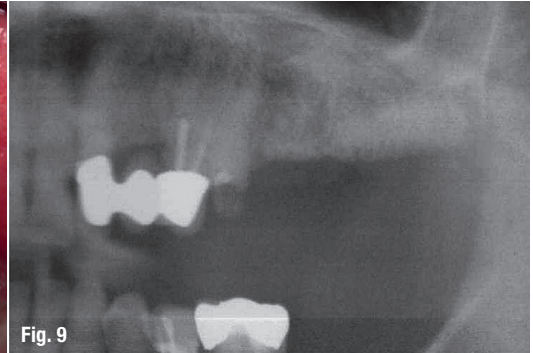


Fig. 9

based solution. The first inspection demonstrated the complexity of this case, that required a few interventions and posttreatments.

The CT scan (Fig. 14) displayed seven stainless steel leaf implants and a one-piece screw implant with partly relevant signs of osteolysis and an enormously big bone destruction. The complete construction had to be classified as inadequate and a complete clinical revision was needed.

The first surgical intervention in general anaesthesia was to remove the complete prosthetic construction and the implants. The implants were completely imbedded in inflammatory soft tissue. This provided a removal of the implants without any additional iatrogenic destruction of the considerable compromised alveolar bone.

After complete removal of the inflammatory soft tissue, there was a need for protection of the dam-

Fig. 10: Initial situation in the X-ray. Wish for implant solution.

Fig. 11: CERASORB® Foam for protection of the Schneiderian membrane.

Fig. 12: Implant in area 17. Defect reconstruction with CERASORB® M.

Fig. 13: Control X-ray after implant insertion.

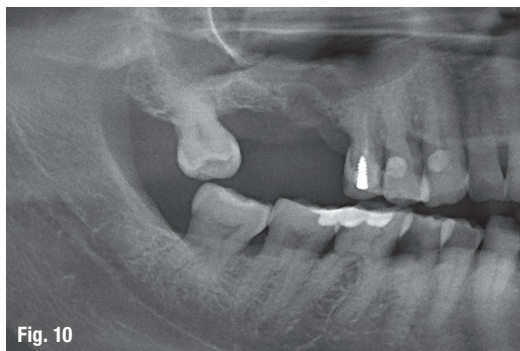


Fig. 10

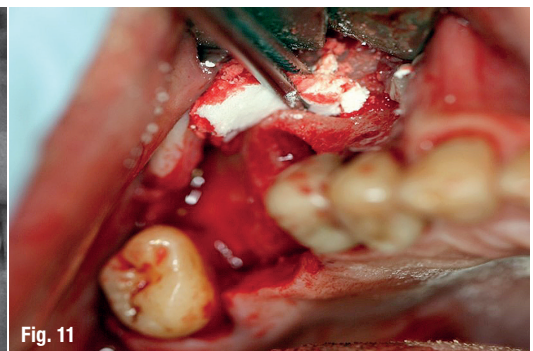


Fig. 11

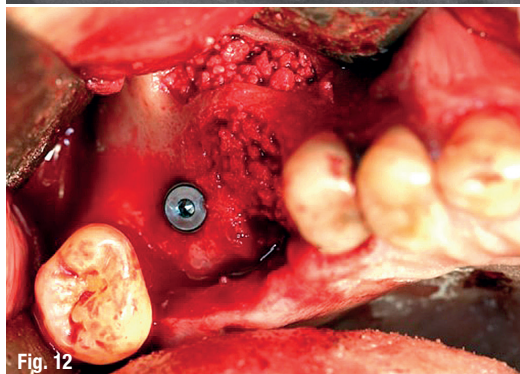


Fig. 12



Fig. 13

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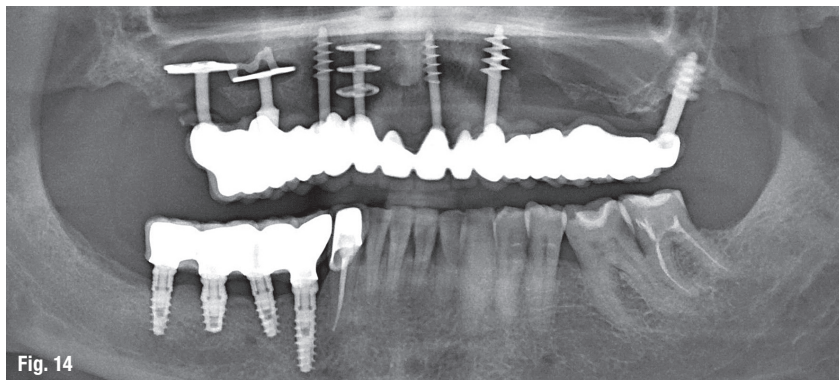


Fig. 14

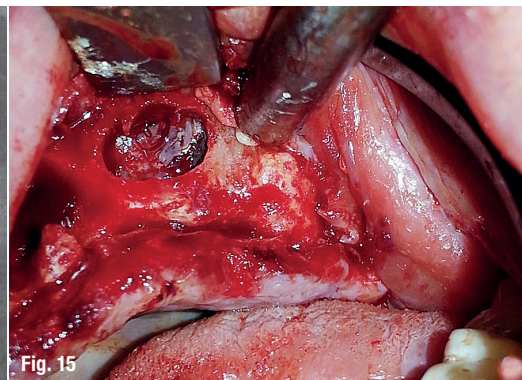


Fig. 15

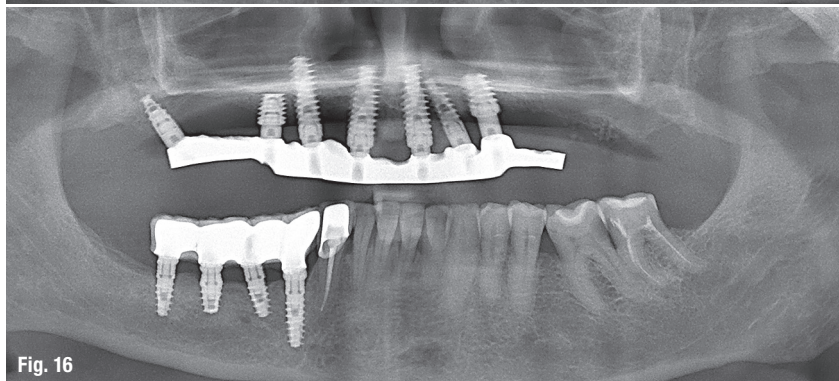


Fig. 16

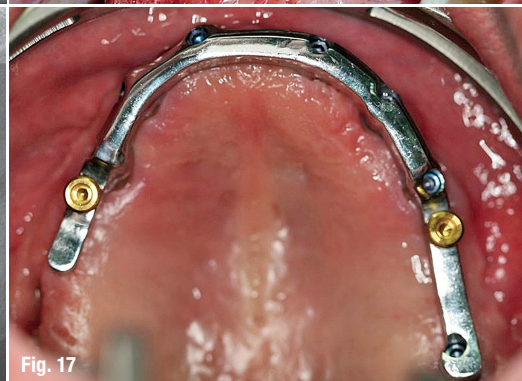


Fig. 17

Fig. 14: Initial situation (CT scan): massive hard-tissue defects with blade and screw type implants in the maxilla.

Fig. 15: Massively compromised sinus maxillaris on both sides.

Fig. 16: Second surgical treatment after nine months with implants and connecting rail.

Fig. 17: Milled rail with additional locators.

Fig. 18: Long-term provisory denture.

aged maxillary sinus (Fig. 15). This was done with CERASORB® Foam as a protective barrier. The residual defect was filled and reconstructed with CERASORB® M granules and for further stabilisation covered with an Epi-Guide® membrane. In the incisal area, three implants could be inserted. The reopening six months later was for insertion of four new implants. The removable, provisional prosthetic construction was created six months later and based on a rail and locators (Figs. 16 & 17). Even if the initial wish of the patient for a fixed construction is not yet fulfilled, a more than satisfactory solution was created (Fig. 18).

Summary

After first hostility, biomimetic bone regeneration materials and bone substitutes are established by a continuous development and improvement. A vast scientific data base certifies the high potential espe-

cially of the pure phase β -tricalcium phosphates to regenerate host bone.^{4,5} These materials are available in an unlimited amount and can avoid the morbidity of a donor bone site in most of the treatments.

Especially the collagen matrix imbedded β -TCP CERASORB® Foam earns a significant importance due to its easy application, protection of the Schneiderian membrane in sinus floor elevations and the collagen providing fast transformation to vital bone, which is important for most of the augmentation indications.

First, user observations and clinical studies are promising,^{6,7} particularly the histological results of biopsies prove the high potential for bone regeneration.^{8,9}

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Fig. 18

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