

# A New Bioresorbable Membrane in Augmentation Surgery

Guided bone regeneration (GBR) using modern augmentation techniques has pushed the limits of implant dentistry to include cases where inadequate bone volume has until now precluded the placement of implants.

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Fig. 8

Fig. 1\_ Preparation of the membrane.

Fig. 2\_Pre-op OPG showing the septum.

Fig. 3\_Elevation of the Schneiderian membrane.

Fig. 8\_End of treatment.

The barrier function of membranes used in GBR prevents the downgrowth of soft tissue cells during primary healing and is therefore crucial to new bone formation. Since connective tissue and epithelial cells grow faster than bone, this barrier function should be maintained at least until a sufficient quantity of stable osteoid has formed and is firmly attached to the host bone. Today's expanded indications for GBR, however, pose ever increasing challenges for modern membrane techniques. While premature membrane exposure may result in bacterial contamination of the area to be regenerated, mechanical factors may prevent graft taking.

Modern membranes should fulfill certain requirements, including most importantly: effective barrier function, mechanical stability, insensitivity to membrane exposure, biodegradability, bioactivity, biocompatibility, absence of allergic risks, and ease of handling. So far there has been no single

membrane to fulfill each of these requirements, and thus membrane selection tended to result in a good compromise at best. A fully synthetic trimethylene carbonate (TMC), L-poly lactide (LPLA) and polyglycolic acid (PGA) membrane, the now available INION® membrane (distributor: curasan AG, Kleinostheim,

Germany), meets nearly all requirements. The corresponding fixation tacks also consist of TMC and D-, L-poly lactide (DLPLA). These polymers degrade in vivo by hydrolysis to form alpha-hydroxy acids, which the body then metabolizes into carbon dioxide and water. The membrane retains its barrier function for approximately 8–12 weeks and is completely resorbed within one to two years.

The preparation time needed to make the membrane ready for use is about ten minutes, so it is expedient to prepare it before starting the surgical procedure. The membrane is sterile packed in a plastic tray with two recesses. After opening the package, an N-methyl-2-pyrrolidone (NMP) solution is poured over the membrane, which is left in one of the recesses completely

covered with the liquid for 20–30 seconds to make it supple and pliable. It is then picked up with forceps and held until any excess liquid is drained away before being placed into the other recess for five to ten minutes to allow the NMP to diffuse into it (Fig. 1). The membrane is now ready for use. It retains its malleability for several hours under room conditions. The membrane can be cut into the required shape with sterile scissors. Contact with moisture, e.g., blood, starts the curing process, which begins slowly and is completed after approximately 30 minutes.

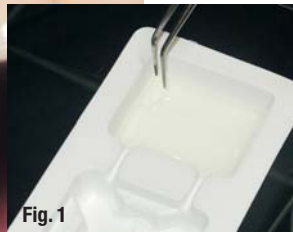


Fig. 1

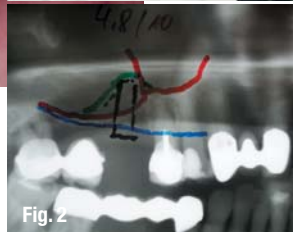


Fig. 2

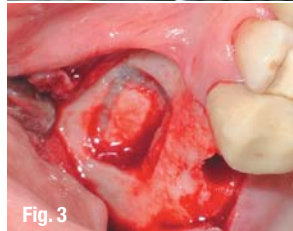
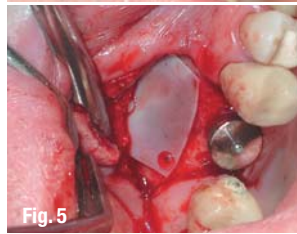


Fig. 3

The range of applications is in regenerative periodontal surgery (guided tissue regeneration, GTR) as well as in pre-implant bone regeneration (GBR). The membrane's benefits include its easy handling, completely non-allergenic biodegradability, spacemaking characteristics resulting from its rigidity after curing, safe barrier function resulting from its specific structure, and its proven bioactivity.

## Case report

A 71-year-old patient requested a single implant-supported crown for tooth 16. It was obvious from the OPG alone that the procedure might be not without problems, since a bone height of only 3–4 mm was available. Additionally, there was a septum in the sinus in the immediate vicinity of the surgical site (Fig. 2). Following preparation of an access window, the Schneiderian membrane was carefully detached to create space for the augmentation material (Fig. 3). Despite all precautions the Schneiderian membrane ruptured, and the tear, starting at the septum, was so long that it would have warranted terminating the procedure altogether. However, the special characteristics of the Inion membrane permitted continuing the procedure. The membrane, which had been prepared according to the manufacturer's instructions, was trimmed into the shape required by the defect geometry and was then placed into the sinus. On account of its being soft and of an easily manageable shape, the tear in the sinus membrane could be completely covered while overlapping to the healthy area (Fig. 4). The packing of the graft material into the posterior sinus could be resumed after just a few minutes because, once exposed to blood, the initially soft membrane was gradually starting to cure. The graft material used for augmentation was a combination of Cerasorb® M, grain size 500–1,000 µm, fresh blood from the host site, and PRP (platelet rich plasma). Experience has shown that mixing autologous bone is not necessary under these circumstances. Cerasorb® M reflects the latest scientific findings in the field of bone regeneration and offers a number of advantageous properties and characteristics: e.g., interconnecting, open multiporosity with micro-, meso- and macro-pores (5–500 µm); a total porosity of approximately 65%; a polygonal granule structure; and a shorter complete resorption time with simul-



taneous new bone formation. After the application of Cerasorb® M the procedure was completed as usual.

The access window to the maxillary sinus was closed using the remaining membrane material (Fig. 5). Healing was uneventful despite the ruptured sinus membrane (Fig. 6). At six months of sinus augmentation and implant placement the Periotest value was –7, so it was decided to proceed to the restorative phase of treatment (Fig. 7). Treatment was concluded after a total of seven months with the insertion of the definitive single crown 16 (Fig. 8).

## Conclusion

The characteristics of a new fully synthetic, resorbable membrane used to treat the present case were convincing. The membrane's soft consistency prior to placement permits easy and accurate positioning, its gradual hardening after some minutes and complete curing after approximately 30 minutes maintains the space required for bone regeneration to occur. The texture and structure of the membrane ensure a safe barrier function, and its specific surface characteristics evidently involve a bioactive potential, ideally combined with the bone regeneration material Cerasorb® M. In the present case the procedure was concluded according to plan despite the occurrence of a complication associated with possible risks. The definitive single crown restoration was successfully delivered as early as after seven months, although the residual bone height was to be considered borderline for a single-stage procedure. Apart from long waiting periods, the patient was thus also spared the risk and discomfort of secondary and subsequent procedures.

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