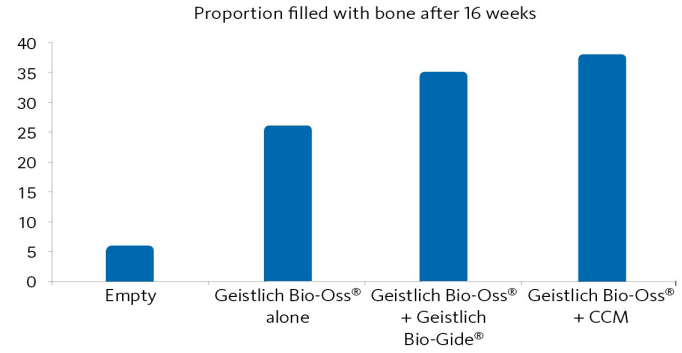
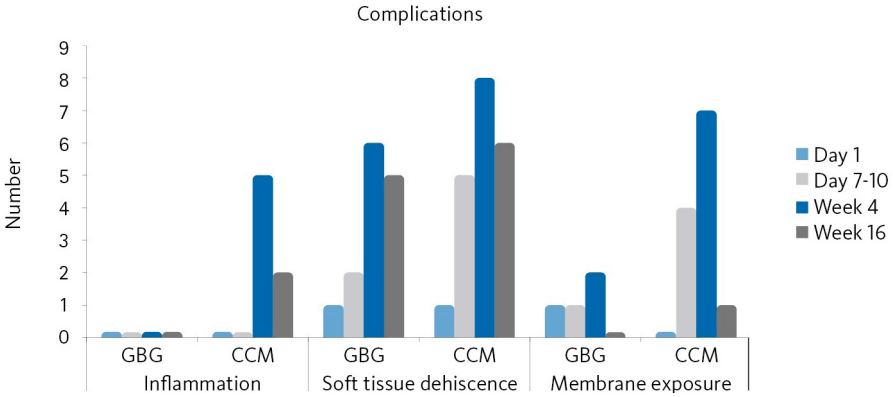
Comparable new bone formation with cross-linked and native collagen membranes – less dehiscence with natural collagen

Results

Bone level formation in pre-clinical (Bornstein et al. 2009) and clinical studies (Becker et al. 2009) was comparable after treatment with an experimental cross-linked collagen membrane (CCM) or the native collagen membrane Geistlich Bio-Gide® (GBG).



Furthermore, the natural collagen membrane, Geistlich Bio-Gide®, leads to fewer membrane exposures and less inflammation of the adjacent tissue compared to cross-linked membranes.



Conclusion

The experimental cross-linked collagen membrane did not deliver better results compared to Geistlich Bio-Gide®. This provides proof that extended resorption time and barrier duration do not increase new bone formation. Geistlich Bio-Gide® with its natural structure leads to better wound healing and less soft-tissue complications, in turn yielding higher tissue quality.

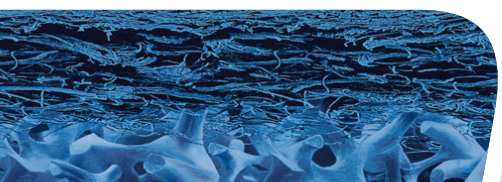
Study design

Becker et al. 2009

- Prospective, randomized, controlled, double-blind, clinical multicenter study.
- Dehiscence type defect in 54 patients.
- Quality of new tissue (primary parameter) and complications (secondary parameter) were investigated.

Bornstein et al. 2009

- Randomized, controlled study in pigs.
- 64 calvarial defects.
- Bone regeneration after 16 weeks healing time was evaluated histologically and histomorphometrically.



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Use of a new cross-linked collagen membrane for the treatment of dehiscence-type defects at titanium implants: a prospective, randomized controlled double-blinded clinical multicenter study

Becker J, Al-Nawas B, Klein MO, Schliephake H, Terheyden H, Schwarz F. Clin. Oral Impl. Res. 2009; 20: 742-749.

Objectives: The aim of the present randomized-controlled double-blinded clinical multicenter study was to assess the use of either a new cross-linked (VN) or a native collagen membrane (BG) for the treatment of dehiscence-type defects at titanium implants.
Material and methods: A total of n=54 patients were recruited in four German university clinics. According to a parallel-groups design, dehiscence-type defects at titanium implants were filled with a natural bone mineral and randomly assigned to either VN or BG. Submerged sites were allowed to heal for 4 months. Primary (e.g., changes in defect length – ΔDL, quality of newly formed tissue [0–4] – TQ) and secondary parameters (e.g., membrane exposure, tissue conditions at dehisced sites) were consecutively recorded.
Results: Four patients were excluded due to an early wound infection (VN:3; BG:1), and one patient was lost during follow-up (VN). The mean ΔDL was 3.0 ±2.5mm in the VN, and 1.94 ± 2.13mmin the BG group. The assessment of TQ revealed comparable mean values in both groups (VN: 3.05 ±1.66, BG: 3.46 ±1.48). A significant correlation between membrane exposure and inflammation of the adjacent soft tissue was observed in the VN group. In both groups, the mean DL and TQ values were not significantly different at either non-exposed or exposed implant sites.
Conclusion: The results of the present study have indicated that VN supported bone regeneration on a level non-inferior to BG. However, in case of a premature membrane exposure, cross-linking might impair soft-tissue healing or may even cause wound infections.

Effect of Two Bioabsorbable Barrier Membranes on Bone Regeneration of Standardized Defects in Calvarial Bone: A Comparative Histomorphometric Study in Pigs

Michael M. Bornstein, Guy Heynen, Dieter D. Bosshardt, and Daniel Buser. J Periodontol 80(8): 1289-99.

Background: The effect of two different bioabsorbable collagen membranes on bone regeneration was assessed in standardized, membrane protected calvarial defects in pigs.
Methods: Two standardized defect types (6x6x6 mm and 9x9x9 mm) were produced in the calvaria of pigs: empty defects without a membrane (group 1; eight defects per size); defects filled with deproteinized bovine bone mineral (DBBM) without a membrane (group 2; eight defects per size); defects filled with DBBM and covered by a collagen membrane (group 3; eight defects per size); and defects filled with DBBM and covered by a cross linked collagen membrane (CCM) (group 4; eight defects per size). Sacrifice took place 16 weeks after surgery, and the following parameters were analyzed: descriptive histology; semiquantitative histology (SQH), assessing bone regeneration in the whole defect area; and histomorphometric analysis of the percentage of bone and DBBM in the regenerated area at three different depth levels of the defect.
Results: Using SQH, both membrane types resulted in significantly better bone regeneration compared to groups 1 and 2, irrespective of the defect size ($P < 0.005$), with no difference between the two membranes. In the histomorphometric analysis, the layer immediately below the surface exhibited a significantly higher percentage of bone in groups 3 (27%) and 4 (36%) versus the two other groups for the 9 · 9 · 9-mm defects. No such differences were apparent for the 6x 6x 6-mm defects or the other two depth levels (bottom and middle layer) for either defect size.
Conclusions: The two collagen membranes tested significantly enhanced bone regeneration, especially in the superficial level of the calvarial bone defects. The prototype CCM did not provide any further advantage in the present animal model.