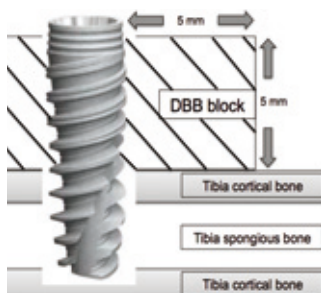


Influence of a Collagen Membrane and rhPDGF on Early Bone Formation after Vertical Augmentation with Bovine Bone in Rabbits

Introduction: Combination of bone substitute materials with growth factors may enhance prognosis of vertical bone augmentations (VBA). The aim of the study was an evaluation of the effect of a collagen membrane (Bio-Gide, Geistlich, Wolhusen, Switzerland) and a signal protein (rhPDGF, Sigma, St. Louis, USA) on VBA together with an implant-fixed bovine bone block (DBB; Bio-Oss, Geistlich, Wolhusen, Switzerland) in a rabbit animal model.

Figure 1:
Fixation of the DBB-block with dental implants (NobelActive, 3.5 x 11.5 mm, Nobel Biocare, Zürich, Switzerland)



Materials and Methods: In 16 rabbits, a DBB-block was implant fixed on the tibia in a split-leg design (figure 1). The groups were:

- 1) **DBB only** (control; n=8),
- 2) **DBB+collagen membrane** (test; n=8),
- 3) **DBB+rhPDGF** (test; n=8) and
- 4) **DBB+collagen membrane+rhPDGF** (test; n=8).

Prior operation as well as 1h, 24h, 72h, 7d, 2 weeks and 3 weeks after operation, **blood samples** were taken and evaluated for **alcalic and acid phosphatase (ALP, AP)**. Histomorphometric evaluation for **new bone area (NBA; %)** and **new vertical bone height (VBH; mm)** was conducted after 3 (n=16) and 6 weeks (n=16).

Results: ALP and AP were significant higher in the membrane-groups after 1h and 72h (all $p < 0.05$). After 7d, values were similar in all groups and after 2 and 3 weeks, the values in the groups without membranes were significant elevated (all $p < 0.05$; exemplary figure 2).

Histological analysis revealed no significant differences after 3 weeks. After 6 weeks, NBA and VBH were significantly elevated in the membrane groups (both $p < 0.01$). rhPDGF (additional and alone) showed a non-significant early increase of bone metabolism and formation only.

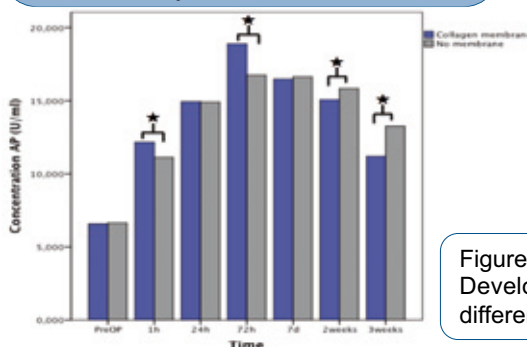


Figure 2 (left):

Development of AP-concentrations over the different time points. Significant differences are shown. Same significant differences were seen for ALP.

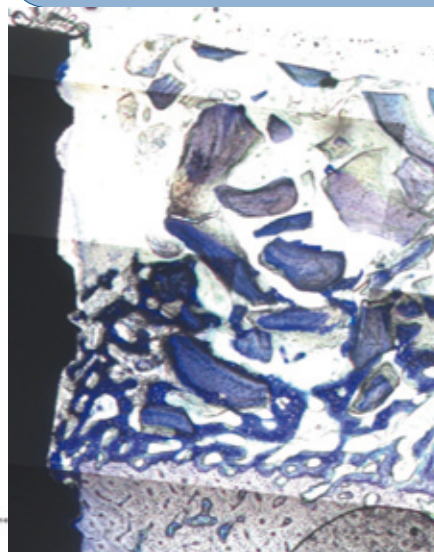


Figure 3:
Representative histological specimen of the **DBB+membrane+rhPDGF** group after 6 weeks.

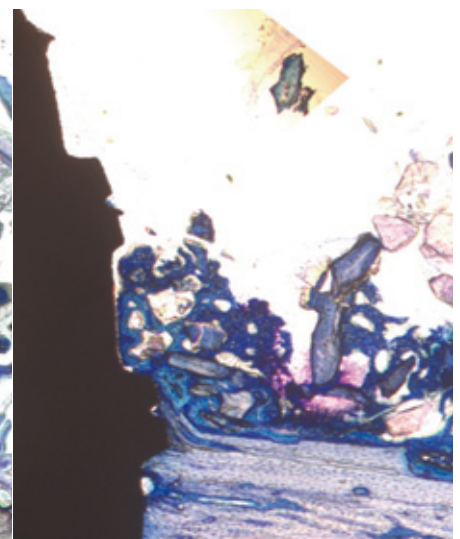


Figure 4:
Representative histological specimen of the **DBB only** group after 6 weeks. Less new woven bone is seen.

Discussion: In vertical bone augmentation, the use of a collagen membrane led to an initially increased bone turnover manifesting in increased bone formation in a later phase of healing. Early rhPDGF-effects were seen for both bone metabolism and bone formation but turned out to be non-significant.

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