

## 7 Summary

### **Structure and Composition of regenerated Cartilage Tissue in osteochondral Defects in a Sheep model – a histologic, histomorphometric and immunohistochemical examination**

Hyaline articular cartilage does not show a significant self healing potential and so cartilage damage cannot be currently healed. For these reasons cartilage damage generally progresses to osteoarthritis. Over the years many conservative and surgical methods have been developed for the treatment of knee joint cartilage damage. This indicates that an optimal therapy has not yet been found. In the best case these therapies result in hyaline-like cartilages, however, in most cases fibrous cartilage or cicatricial tissue develops. In the long term this regenerated tissue is not able to withstand the heavy loads dominant in the joint and therefore degenerates. The goal of this study was to determine the influence of the limiting mechanical factors of osteochondral implants on the reconstruction of the subchondral bone and cartilage. This study of different therapeutical approaches of osteochondral defects should reflect the connection between the different rigidities of the implants and the immunohistochemical, histologic and histomorphometric healing outcomes.

An osteochondral defect was induced on the lateral and medial condyle of the left knee joint in 24 merino-mix sheep. One defect remained untreated and served as a control while the others were treated with various implants. The reference group was treated with an autologous osteochondral graft. Special attention was directed toward the connection between structural and mechanical influences of the subchondral defect filling and the healing outcomes. In the second group the defect was filled with cancellous bone clusters and covered with a collagen membrane. The defects of the other two groups were treated with biodegradable polylactic-co-glycolic acid (PLGA) scaffolds with different mechanical rigidity. The postoperative healing period amounted to twelve weeks. The femora were removed post mortem and the control defects, the filled defects and the native condyles were analyzed and evaluated immunohistochemically, histologically and histomorphometrically.

The results showed that after twelve weeks the recovery procedure with the autologous osteochondral cylinder was superior to the other three operation methods. A retarded and unsatisfactory regeneration was observed in the autologous cancellous bone group. Up to the time of the examination the defect was only filled with connective tissue, a result that was similar to that of the control group. The scaffold groups showed integration in the edges of the

bone and cartilage area. The scaffold group, with a 84% rigidity in relation to a healthy ovine subchondral bone, exhibited slightly better healing results than the scaffold group with only 58% rigidity. It seems that after twelve weeks a different subchondral treatment in relation to the structure and rigidity influences the regeneration process of osteochondral defects as regards to the amount of tissue, the speed and also the quality of the regenerated material.