

7. Summary

Comparison of the endoligamentous revascularisation and remodelling of free soft tissue auto and allografts after ACL reconstruction A long term histological study using a sheep model

Allograft use for ACL reconstruction has become more and more popular due to the avoidance of graft harvest morbidity, the unlimited supply of grafts for ligament reconstruction and their ease to adapt to any possible anatomic requirement. New improved fixation techniques have evolved that eliminate the previous disadvantages in fixation strength of soft tissue grafts.

The requirement for healing, remodelling and survival of the graft is the revascularisation during the course of healing after ACL reconstruction. We showed that revascularisation starts from the periphery of the grafts, mainly at its synovial sheet. Later vessels start to grow into the graft from the periphery to its central portions. During the first phase of revascularisation the graft shows a hypervascularity and the mechanical properties of the graft decrease. With progressive remodelling the vascularity of the graft nearly returns to the level of the native ACL. In the literature, no general information can be found about the duration of the remodelling and revascularisation process of a free soft tissue allograft after ACL reconstruction. However, it is often hypothesized that revascularisation of free tendon allografts lags behind autologous ACL Reconstruction. At the same time many people proclaim a more aggressive rehabilitation program and an earlier return to full load bearing because of the lower donor- site morbidity of allografts. Some clinical studies report higher failure rates with allograft compared with autograft use. The reason could be a delayed revascularisation of the allografts.

The objective of this study was the comparison of the remodelling and the revascularisation of free soft tissue autologous and fresh frozen allogenic ACL reconstruction.

54 mature sheep underwent open ACL reconstruction using either a free tendon auto- or allograft. Animals were sacrificed at 6, 12 and 52 weeks. Midsubstance tissue samples were obtained and cells were visualized with standard histological techniques, endothelial cells were immunostained with anti-v. Willebrandt factor. Tissue sections were analysed using microscopy and the immunostained tissue sections were analysed using a digital image analysis system.

In this study it was shown that the revascularisation and remodelling of free tendon allografts lag behind autologous graft tissue. The revascularisation of the allografts started delayed and

was not completed at 52 weeks. The autografts showed a return nearly to the level of the native ACL up to 52 weeks without achieving this level exactly.

This was the first study that could show with a new, more sensitive method, that allografts undergo a delayed process of revascularisation but we also could show that there is some revascularisation as we can find in autografts.

In combination with the results of the mechanical tests, which showed significantly reduced mechanical properties of the allografts at one year, we recommend avoiding too early aggressive rehabilitation after ACL reconstruction with allogenic tissue. A steady controlled return from partial to full weight bearing might be a compromise that will ensure adequate graft healing and maturation into a fully functional ACL replacement that provides the biological and mechanical properties to allow unrestricted use of such reconstructed knee joint.