Abstract:

INTRODUCTION: The options available after meniscus loss offer only limited chances for a long-term success. In the following experimental study, we investigated the effect of meniscus tissue engineering on properties of the collagen meniscus implant (CMI). METHODS: Autologous fibrochondrocytes, obtained per biopsy from adult Merino sheep (n=25), were released from the matrix, cultured in-vitro and seeded into CMI scaffolds (n=10, group 1). Following a 3-week in-vitro culture, the tissue engineered menisci were used for autologous transplantation. Macroscopical and histological evaluation were performed in comparison with non-seeded CMI controls (n=10, group 2) and with meniscus-resected controls (n=5, group 3) after 3 weeks (each 1 animal group 1 and 2) and 3 months. RESULTS: The lameness score did not show any difference between the groups. Meniscus tissue was found in seven knee joints (group 1), in five knee joints (group 2) and in two knee joints (group 3). The size of the transplants reduced from 25.9 +/- 4.5 to 20.1 +/- 10.8 mm (group 1) and from 25.9 +/- 1.5 to 14.4 +/- 12.5 mm (group 2). Histologically, enhanced vascularisation, accelerated scaffold re-modelling, higher content of extra-cellular matrix and lower cell number were noted in the pre-seeded menisci in comparison with non-seeded controls. Dense
high-cellular fibrous scar tissue was found in two of five cases in the resection control group.

CONCLUSION: Tissue engineering of meniscus with autologous fibrochondrocytes demonstrates a macroscopic and histological improvement of the transplants. However, further development of the methods, especially of the scaffold and of the cell-seeding procedure must prove the feasibility of this procedure for human applications.