

Quantitative Analysis of Meniscus Size and Position in Patients with Arthroscopic Meniscus Allograft Transplantation

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Objects: Meniscal tears are very common in the population. They can cause meniscus subluxation (extrusion) and are known to increase with age and athleticism. When the patient is symptomatic, very often an arthroscopic meniscectomy is performed. Since it is known that the meniscus plays an important role in distributing loads and reducing contact stress within the knee joint, a loss of the meniscus substance as well as meniscal extrusion which leads to less tibial plateau coverage is associated with reduced mechanical protection of knee cartilage and therewith a faster structural progression of knee osteoarthritis. To decelerate this process, we perform arthroscopic meniscal transplantation using meniscus allografts. The aim of this study was to determine differences in quantitative meniscus volume and position (extrusion, tibial plateau coverage in percent) measures in knees before and after lateral meniscus transplantation.

Methods: Lateral meniscus allograft transplantation was performed in 17 patients (11 men, 6 women, mean age 39,6±11,1 years) in our clinic between August 2012 and July 2014. Pre- and postoperative MRIs were performed from all participants. Manual segmentation of the entire lateral tibial plateau and lateral meniscus was performed on coronal 3T DESSwe images. From 3D reconstructions, quantitative meniscus measures (extrusion, tibial plateau coverage in percent, volume) were determined. Pre- and postoperative knees were compared using paired t-tests.

Results: Lateral meniscus volume increased significantly from preoperative 1.18ml±0.58ml, to 1.91ml±0.74ml (p<0.05) postoperative. Lateral tibial plateau coverage by the lateral meniscus also increased from preoperative 23.9%±10.5% to 30.6%±8.1% postoperative (p=0.175). The lateral meniscal extrusion was 1.44mm±2.0mm preoperative and 2.37mm±2.48mm postoperative and in the central five slices which can be best measured with coronal MR images it was 1.45mm±1.41mm preoperative and 1.82mm±1.76mm.

Conclusion: Our results show that lateral meniscus transplantation significantly increases meniscus volume and leads to a greater lateral tibial plateau coverage by the lateral meniscus. No significant difference was seen for meniscus extrusion. The preoperative position of the meniscus with its surrounding capsule seems to play an important role for determining the postoperative position. In conclusion, lateral meniscus transplantation increases lateral tibial plateau coverage by the meniscus which may lead to a greater mechanical protection of knee cartilage and may slower structural progression of knee osteoarthritis.