**Effect of Tibial Rotation at Time of Graft Fixation in Single and Double Bundle ACL Reconstructed Knees**

**Methods:** In ten fresh-frozen human cadaveric knees (range 62-77 years), lateral tibial translation tests were performed in an intact knee, knee fixed at neutral and external tibial rotation. To exclude any interference the order of rotation at fixation was randomized. Statistical analyses were performed using a two-factor repeated-measures analysis of variance (ANOVA) and a post-hoc Tukey test.

**Results:** Under 134 N anterior tibial load, anterior tibial translation (ATT) of the intact knee was a mean of (± standard deviation) 7.1 (±1.7) mm, 11.0 (±1.87) mm, 11.6 (± 1.9) mm, and 10.2 (± 1.6) mm at full extension, 30, 60, and 90° of knee flexion, respectively. After the ACL was sectioned, the translations increased significantly at all flexion angles tested (p<0.05). The resulting ATT under 134 N anterior tibial load was a mean of 12.6 (±2.6) mm, 25.3 (±1.1) mm, and 19.4 (±2.8) mm. After SB ACL reconstruction with the graft fixed in neutral tibial rotation, the ATT was a mean of 6.5 (±3.0) mm at full extension, 13.6 (±3.1) mm at 30°, 13.3 (±3.6) mm at 60°, and 10.8 (±2.6) at 90° of knee flexion (Fig.5). This difference was statistically not significant when compared to intact knee (p=0.05). ATT after DB reconstruction with internal tibial rotation at time of fixation resulted in a mean ATT of 16.5 (±1.3) mm, at 30°, 14.8 (±3.3) mm, 14.5 (±3.1) mm, and 11.6 (±3.0) mm at full extension, 30, 60, and 90° of knee flexion, respectively. The ATT at 30 and 60° was statistically higher when compared to the intact knee (p<0.05). External tibial rotation at time of fixation showed no statistically significant difference when compared to the intact knee. When the resulting ATT after fixation at neutral, internal and external tibial rotation were compared to each other, no significant difference was found (p=0.05). After SB ACL reconstruction with the graft fixed in neutral, internal and external tibial rotation, ATT was statistically not significant when compared to intact knee (p=0.05). When the different tibial rotations were compared to each other, there was also statistically significant difference (p=0.05).

In response to a combined rotatory load, the anterior tibial translation (ATT) for the intact knee was 5.7 (±1.3) mm, 13.0 (±1.9) mm, 12.9 (±1.7) mm, and 11.8 (±2.3) mm for 0°, 30°, 60°, and 90° of knee flexion, respectively. The values increased after sectioning of the ACL up to 9.2 (±1.9) mm at 0°, 17.8 (±2.0) mm at 30°, 18.0 (±3.5) mm at 60°, and 17.9 (±3.2) mm at 90°. The increase in ATT was statistically significant at all flexion angles (p<0.05). After SB ACL reconstruction with the graft fixed in neutral tibial rotation, the ATT showed no statistically significant difference when compared to intact knee (p=0.05). External tibial rotation at time of fixation resulted in ATT of 16.8 (±2.8) mm at 30° of knee flexion.

When the tibia is externally rotated however, the rotation seems to be capable of reducing the increased mobility of the lateral tibial plateau in the ACL deficient knee. If the graft is then tensioned and subsequently fixed in external tibial rotation, the tension of the ACL graft will further increase in coupled internal motion thereby reducing anterior tibial translation under pivot shift loads. The clinical relevance of these findings is that the surgeon needs to be aware of the impact different knee rotation position have on the resulting knee kinematics (Fig). In the clinical setting, ACL reconstructions are performed using leg holder or in a sitting position with the foot of the patient on the thighs of the surgeon. In both techniques, the rotation of the tibia may be not well observed. Therefore it is important that the surgeon pays attention to the rotation of the knee when fixing the graft.