Introduction: Infrapatellar Contracture Syndrome (IPCS) [1] is a common post-operative complication following ACL reconstruction describing a pathological condition resulting in a vertical lowering of the patella relative to the knee joint, which can have dire implications for both anterior knee pain [2] and mobility [3, 4]. This condition, often referred to as patella baja, is induced via two non-exclusive pathways: patella tendon (PT) adhesion formation and irreversible PT contracture. The aim of this study was to investigate how the removal of a PT graft for ACL reconstruction influences PT length and patellar tracking in the in-vitro sheep knee.

Materials and Methods: This study was performed on 18 skeletally mature sheep divided into 3 (n=2), 6 (n=6), 12 (n=6) and 24 (n=4) week groups. All animals underwent an operation on the right knee to harvest the central-third of the PT without reconstruction of the cruciate ligament. An anteromedial para-patellar incision was made between the patella and tibial tuberosity to expose the PT and extended proximally to expose the anterior apex of the patella (found by palpitation). The central-third of the PT was then harvested without disturbance of the tibial and patellar insertions. The PT defect was left open and not approximated. At the time of sacrifice the animals were sectioned through the trunk in the axial plane to isolate the pelvis-lower extremities complex from the remainder of the carcass. This complex was then left undisturbed in a supine position for approximately 3 hours for rigor mortis to set in at which point they were transferred to a freezer. Whilst frozen, the 2 limbs were then separated by sectioning in the mid-sagittal plane to isolate the pelvis-lower extremities complex from the remainder of the carcass. This complex was then left undisturbed in a supine position for approximately 3 hours for rigor mortis to set in at which point they were transferred to a freezer. Whilst frozen, the 2 limbs were then separated by sectioning in the mid-sagittal plane to expose the PT and extended proximally to expose the anterior apex of the patella (found by palpitation). The central-third of the PT was then harvested without disturbance of the tibial and patellar insertions. The PT defect was left open and not approximated.

Discussion: This study used a sheep model to examine implications which removal of the central-third of the PT has on in-vitro patellar tracking and PT length. At 6 weeks following surgery the length of the PT increased to an average of 102.83% of the control value (range: 99.50% to 106.15%), at 12 weeks this value returned to 100.49% (range: 99.95% to 100.79%) whilst at 24 weeks this value had increased to 101.59% (range: 99.48% to 104.41%). In our model removal of the central-third of the PT resulted in a condition of patella alta at 6 weeks post-operatively. The return to baseline at 12 weeks suggests that the biological activity responsible for contracture of the PT is dominant from 6-12 weeks post-operatively. In this study we have shown that removal of the central 1/3 of the PT affect both PT and patellar kinematics.

References:
5. Grood, E.S. and W.J. Suntay, J Biomech Eng, 1983, 105, 136-144