Knee Medial Compartment Contact Pressure Rises With Release of the Anterior Intermeniscal Ligament

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Introduction: The anterior intermeniscal ligament of the knee is often encountered during knee arthroscopy and anterior cruciate ligament reconstruction, as well as during tibial nail insertion. No prior studies have looked at the effects of release of the anterior intermeniscal ligament on contact pressures of the medial compartment. We hypothesized that release of the anterior intermeniscal ligament (IML), especially in Nelson and LaPrade[1] type I knees, will result in altered contact pressures in the medial compartment.

Materials and Methods: Five fresh frozen cadaveric knees were examined using arthroscopy to rule out significant pathology and identify an intact intermeniscal ligament. Knees were prepared for rigid potting and mounting into a modified MTS machine that provided axial, torsional, anterior-posterior and knee flexion control. Free medial-lateral movement and free valgus/varus angulation of the knee was allowed. Tekscan contact pressure sensors were inserted inframeniscally covering the medial compartment and sutured to posts in the tibia. The knee was loaded to 1000N and flexed from 0 to 60 degrees while continuously recording the contact pressure. The knees were under 0 force anterior-posterior load control and 0 tibial torque control. Two knee conditions were tested: 1) intact, and 2) after sharp release of the intermeniscal ligament. Post study analysis was done looking at the peak contact pressure in the medial compartment and the amount of contact area seeing pressure. Differences were examined using a paired t test at p<.05.

Results: Sectioning of the IML caused a statistically significant increase in the peak pressure between 17 and 50 degrees of knee flexion (fig 1). The largest changes occurred at 36 and 39 degrees of knee flexion, when the peak pressure increased by 27.9% and 27.4% respectively. Although the contact area decreased with sectioning of the IML, this was not statistically significant (fig 2). Visually, sectioning of the IML caused loss of meniscal hoop stress and medial displacement of the anterior horn of the medial meniscus (fig 3).

Discussion: Wide variability in the location of and the robustness of the anterior intermeniscal ligament has been observed clinically in our institution. Experimentally, it is an average of 7.8mm from the anterior aspect of the ACL[1]. This location puts it at risk during arthroscopic knee debridement, especially during tibial tunnel placement for ACL reconstruction, as well as during insertion of a tibial nail for tibia fracture fixation. As it is routinely sacrificed during ACL reconstruction, we hypothesized that this would have an adverse effect on the contact pressure of the medial compartment. Nelson and LaPrade[1] showed that type I intermeniscal ligaments occur most often (46%), followed by type II (26%) and type III. Type I ligaments attach directly to the anterior horn of the medial meniscus, while type II ligaments attach to the most-anterior margin of the medial meniscus. In that study, 24% of anterior intermeniscal ligaments acted as the primary anchor for the anterior horn of the medial meniscus. Our study showed that release of the anterior intermeniscal ligament causes changes in the medial compartment. Release of the ligament releases the anterior portion of the hoop stress that the meniscus relies on to function. This results in increased peak contact pressure and a not statistically significant decrease in contact area. This is consistent with, although not as dramatic as, the results of radial tear testing within the substance of the medial meniscus[2]. Changes in contact pressure have been implicated in risk of progression to knee osteoarthritis. Prior studies have shown that degenerative changes occur in areas of greatest peak contact stress[2-5]. Based our data, we suggest that care be taken, especially in patients with type I and II intermeniscal ligaments, to avoid resection of the anterior intermeniscal ligament to decrease the risk of osteoarthritis.