

patients with severe osteoarthritis. Conclusions: Arthroscopic debridement and capsular release provided relief of pain for an average of over nine months even in cases of severe osteoarthritis. Patients with moderate osteoarthritis had a good functional outcome after surgery and their results were superior to those with severe degenerative changes. Based upon these results, arthroscopic debridement and capsular release appears to be beneficial in the treatment of mild and moderate glenohumeral osteoarthritis.

David P. Richards, M.D., F.R.C.S.C., Stephen S. Burkhart, M.D.

Load Bearing at the Menisco-Femoral Joint: An In Vitro Study in the Canine Knee (SS-22)

The purpose of this study was to determine the contact areas (CA) and local contact stresses (LCS) at the canine menisco-femoral joint during ROM, and to determine the influence of a partial or total meniscectomy. Materials: Both knees of 3 hound-type canines were tested in a universal testing machine, configured for an axial-load of 90-120 N. Measurement of CA and LCS was done at 30°, 50°, and 70° and with intact menisci, after partial meniscectomy, and after total meniscectomy. Pressure distribution was estimated using pressure sensitive film inserted above the menisci. Results: Medial meniscus at 50°: the average CA decreased from 2.1 cm² in the intact knee, to 1.6 cm² after partial meniscectomy, to 0.5 cm² after total meniscectomy; the average LCS increased from 1.3 MPa in the intact knee, to 1.7 MPa after partial meniscectomy, to 2.1 MPa after total meniscectomy. Medial meniscus at 30°: the average CA decreased from 1.7 cm² in the intact knee, to 1.3 cm² after partial meniscectomy, to 0.4 cm² after total meniscectomy; the average LCS increased from 1.2 MPa in the intact knee, to 1.5 MPa after partial meniscectomy, to 2.5 MPa after total meniscectomy. Medial meniscus at 70°: the average CA decreased from 2.4 cm² in the intact knee, to 1.7 cm² after partial meniscectomy knee, to 0.5 cm² after total meniscectomy; the average LCS remained at 1.7 MPa in the intact knee and after partial meniscectomy, but increased to 2.3 MPa after total meniscectomy. Lateral meniscus at 50°: the average CA decreased from 3.3 cm² in the intact knee, to 2.4 cm² after partial meniscectomy knee, to 0.7 cm² after total meniscectomy; the average LCS remained at 1.5 MPa in the intact knee and after partial meniscectomy, but increased to 2.9 MPa after total meniscectomy. Lateral meniscus at 30°: the average CA decreased from 3.0 cm² in the intact knee, to 2.3 cm² after partial meniscectomy, to 0.5 cm² after total meniscectomy; the average LCS remained at 1.3 MPa in the

intact knee and after partial meniscectomy, but increased to 2.4 MPa after total meniscectomy. Lateral meniscus at 70°: the average CA decreased from 3.2 cm² in the intact knee, to 2.4 cm² after partial meniscectomy, to 0.8 cm² after total meniscectomy; the average LCS increased from 1.4 MPa in the intact knee, to 1.6 MPa after partial meniscectomy, to 2.9 MPa after total meniscectomy. These differences were statistically significant ($P < .05$). Conclusions: Partially excised menisci offer a sufficient "spacer effect" to protect the femoral cartilage. The contact area and local contact stress differ minimally, both in the intact knee and after partial meniscectomy, when tested with low loads during physiologic gait. A dramatic decrease of contact area followed by an increase of local contact stress was noted after total meniscectomy.

Pier Francesco Indelli, M.D., John A. Szivek, Ph.D., Andrew Schnepf, B.S., William A. Grana, M.D., M.Ph.

Biomechanical Effects of Meniscal Repair Techniques on Articular Contact Pressure at Various Knee Flexion Angles (SS-23)

Objective: Articular cartilage injury can occur after meniscal repair with biodegradable implants. Previous contact pressure analysis of the knee have been based on the tibial side of the meniscus at limited knee flexion angles. We investigated articular contact pressures on the posterior femoral condyle with different knee flexion angles and surgical repair techniques. Methods: Medial meniscus tears were repaired in 30 fresh bovine knees (10 suture, 10 biodegradable screw implant, 10 biodegradable arrow implant). Knees were mounted on a 6 degrees-of-freedom jig and statically loaded to 200 N at 45, 70, 90, and 110 degrees of knee flexion under three conditions: normal meniscus, with 2 cm posterior medial meniscal vertical tear, and after repair of tear. For each repair, three sutures or biodegradable implants were used. A Tekscan pressure sensor was used to determine the contact area and peak pressure. Peak pressures over each implant position were also measured. Statistical analysis was performed using the ANOVA test and $P < .05$ defined statistical significance. Results: Peak pressure increased significantly as knee flexion increased in normal, injured, and repaired knees. The change in peak pressure in knees with implant repairs were significantly higher than suture repairs at all knee flexion angles. The most medial and/or middle implant had higher peak pressures among the 3 implants, but statistical significance was found only with the biodegradable screw. Conclusions: Articular contact pressure on the posterior femoral condyle increases with knee flexion. Meniscal