

Contact Area and Pressure Changes in the Medial Compartment of the Knee in Horizontal Cleavage Tears of the Medial Meniscus (SS-36) *Kian-Chun Chong, M.B.B.S., F.R.C.S., Roland Chong, M.B.B.S., Jee Lim Tan, M.B.B.S., F.R.C.S., Barry Pereira, Ph.D., M.Eng, B.Eng.(Sing)*

Introduction: Horizontal meniscus tears are challenging and the surgeon has to decide whether to repair, resect either of the upper or lower leaf of the tear, or do a segmental meniscectomy. There is currently no biomechanical data to support either method of treatment. We present a human cadaveric biomechanical study to investigate the changes in the contact area and pressure distribution at the medial tibial plateau of the knee, following the management of a simulated horizontal cleavage tear.

Methods: 7 fresh frozen human cadaveric knees are used. A medial parapatellar arthrotomy is made to expose the medial compartment of the knee. A contoured template of a pressure-sensitive film is placed between the meniscus and the surface of the medial tibial plateau, to capture changes in contact area and pressure. A compression load of 740N and 1100N is applied and maintained for 5 seconds, before unloading. The medial compartment is divided into 13 Regions of Interest; 7 beneath the medial meniscus (M1 to M7), 3 in a transition zone (T1 to T3), and 3 in the exposed surface not covered by the meniscus (E1 to E3). A densitometer is used to record the intensity of the color change, indicative of the mean applied pressure. Each template is also digitized and the average contact area calculated. A horizontal cleavage tear of the medial meniscus is created. The specimens are loaded and imprints taken under the following groups: 1) horizontal cleavage tear alone, 2) repair with two vertical mattress sutures, 3) meniscectomy of the upper leaf, 4) meniscectomy of the lower leaf, and 5) segmental meniscectomy of the cut region.

Results: The mean total contact area measured in the medial compartment after each experiment showed no significant change ($p=0.68$) when compared to the intact condition. In the presence of a horizontal cleavage tear, there is no significant change in the location of the contact area and mean contact pressure, even after repair with sutures. Following upper leaf meniscectomy, there is an increase in the mean pressure by 57% in the ROI of M4 and M5 (Scheffe, $p=0.19$). Between upper and lower leaf meniscectomies, upper leaf meniscectomy leads to a significant increase in pressure in ROI M4 by about 100% (Scheffe, $p<0.001$), and in ROI M5 by about 130% (Scheffe, $p<0.001$). Lower leaf meniscectomy leads to a 2 times increase in pressure in ROI M6 at the

posterior horn of the medial meniscus (Scheffe, $p=0.003$). Segmental meniscectomy leads to a shift in the contact area, and increases the mean contact pressure by 3.5 times in ROI E2 and T2

Conclusion: This study indicates that segmental meniscectomy results in more direct unprotected cartilage-to-cartilage contact. The best treatment for a horizontal cleavage tear of the meniscus will be to repair it. If repair is not possible, a meniscectomy of the lower leaf of the tear will be the next best alternative.

Clinical Results of Arthroscopic Salvage Repair including Popliteus Tendon as a Temporary Post for Complex Lateral Meniscus Tear (SS-37) *Sang Eun Park, M.D., Ph.D.*

Introduction: This study was undertaken to document the clinical results and technical aspects of arthroscopic repair including popliteus tendon as a post for the treatment of complex lateral meniscus in young people indicated as total meniscectomy.

Methods: From June 2004 to May 2006, we prospectively studied arthroscopic repairs on 35 young people knees with symptomatic complex lateral meniscus that was treated by all inside repair technique. Mean age at operation was 28.7 years (range, 17 to 42 years), and the mean follow-up period was 42.9 months (range, 36 to 60 months). Clinical results were evaluated using Lysholm knee scores preoperatively and at final follow-up. 2nd look arthroscopy or MRI was taken at final follow-up.

Results: All patients were able to return to their previous life activities with little or no limitation, and no reoperation was required after an average follow-up of 43 months. Mean Lysholm knee scores improved from 65 (range, 55 to 74) preoperatively to 93.9 (range, 79 to 100) at the final follow-up ($P < .0001$). 80% meniscus healing was found on arthroscopic or MRI follow up.

Conclusion: Arthroscopic repair using Popliteus tendon as a post is effective for treating young people with complex lateral meniscus tear as a salvage procedure.

Patients Undergoing Lateral Unicompartmental Knee Arthroplasty: Can we Guarantee Success and Return to Sport? (SS-38) *Kevin D. Plancher, M.D., Shariff K. Bishai, D.O., Tarik Ibrahim, B.S.*

Introduction: Unicompartmental arthroplasty in athletic individuals with osteoarthritis in the past have had limited success returning patients to sports. Patients who are arthritic and symptomatic in one compartment of the knee may provide better physiological function and quicker recovery compared with knee arthroplasty. The

purpose of this study was to prospectively evaluate outcomes following lateral unicompartmental knee arthroplasty.

Methods: Patients that underwent unicompartmental arthroplasty by one surgeon from 2000-2005 were prospectively studied. Nineteen patients underwent lateral unicompartmental knee replacements. The average age for the lateral unicompartmental group was 68 (range, 50-80). Assessment included preoperative and postoperative range of motion, subjective testing, KT-1000, radiographic evaluation consisting of a full plain radiograph knee series including 3-foot alignment films. An MRI was completed in all patients but one who had a pacemaker. All patients had the same implant utilized.

Results: All patients reported severe knee pain preoperatively involving the lateral compartment. No patients were lost to follow-up. One patient was converted to a total knee arthroplasty. Average follow-up was 33 months (range: 24-56 months). The average post-surgical Lysholm score was 91 (range, 67-100) points with a pre-operative Lysholm score of 64 ($P=0.001$). The pre-operative Tegner was 4 (range, 1-7) with a postoperative Tegner of 5 (range, 1-8) ($p=0.001$). The preoperative HSS score was 67 (range, 45-87) with a postoperative score of 92 (range, 82-100) ($p=0.001$). Physical examination and subjective questioning along with MRI correlation helped predict successful outcomes. The average medial compartment Outerbridge grade was 2.2 for the medial femoral condyle and 2.3 for the medial tibial plateau. The average trochlear groove Outerbridge grade was 2.3 and for the patella was 2.2. Overall, patients reported a return to skiing in 5 months, tennis in 4 months, and 1-2 months for walking and jogging.

Conclusion: Determining specific patient selection criteria improves patient outcomes and helps with patient education. This study will give the guidelines necessary to offer an alternative to repeat arthroscopic intervention or total knee arthroplasty and allow patients the ability to return to their activities of daily living and sport. Long term results need to be carefully followed. We are not aware of any previous study attempting to report success with lateral unicompartmental knee arthroplasty in a population having returned to sport.

Effects of HYLAN G-F 20 (Synvisc) Supplementation on Cartilage Preservation in Osteoarthritis of the Knee: A Two-Year, Single-blind Clinical Trial (SS-A)

Stephen Hall, M.D., Yuanyuan Wang, M.D., Fahad Hanna, M.D., Anita E. Wluka, M.D., Gail Grant, M.D. Marie Feletar, M.D., Flavia M. Cicuttini, M.D.

Introduction: To assess the effect of viscosupplementation with Hylan G-F 20 on the progression of cartilage loss over two years in patients with knee osteoarthritis (OA).

Methods: A single-blind, parallel control group pilot clinical trial was performed in 78 eligible patients with symptomatic knee OA (Kellgren Lawrence grade II and III). Patients were assigned to either an intervention group ($n=39$, receiving four courses ($3 \times 2.0\text{cc}$) of intra-articular HYLAN-G-F 20 injections at six months intervals or a control group ($n=39$, without injections but receiving usual care for OA). Magnetic resonance imaging the target knee was performed at baseline, 6, 12, and 24 months and images were analyzed blinded both to patient group and sequence. Tibial cartilage volume, tibiofemoral cartilage defects and bone marrow lesions were assessed at baseline and follow up.

Results: 55 subjects (71%) completed 2-year follow up. There was no significant difference in age, gender, BMI, baseline cartilage volume, bone marrow lesions and bone area in those who completed and those who did not (all $P>0.13$). Analysis of completers demonstrated a significantly reduced annual percentage rate of medial, lateral and total tibial cartilage loss in the intervention group (mean \pm SD, $-0.3 \pm 2.7\%$, $-1.4 \pm 4.3\%$ and $-0.5 \pm 2.3\%$) compared with the control group ($2.3 \pm 2.6\%$, $1.4 \pm 2.6\%$, $1.6 \pm 1.8\%$, $P=0.001$, 0.005 and 0.001 for difference, respectively). The intervention group also showed a significant reduction in the increase of cartilage defect score in the medial and total tibiofemoral compartments (0.1 ± 1.3 and 0.5 ± 2.0) compared with the control group (0.8 ± 1.5 and 1.6 ± 2.0 , all $P=0.05$). There was no significant difference of change in bone marrow lesions between the intervention and control groups.

Conclusion: 6 monthly intra-articular injections of HYLAN-G-F 20 administered without regard to symptoms have a beneficial effect on knee cartilage preservation as measured by both cartilage volume and cartilage defect score. Over two years, the control group continues to lose cartilage while there is no significant loss of cartilage in the HYLAN G-F treated group. HYLAN G-F 20 could be further evaluated in larger trials as a possible disease-modifying agent in patients with knee OA.

A Prospective Randomized Study of 4-strand Hamstring Tendon Anterior Cruciate Ligament Reconstruction Comparing Single-Bundle and Double-Bundle Techniques (SS-39) *Sang Eun Park, M.D., Ph.D.*

Introduction: A randomized clinical study was conducted to compare the outcome between double-bundle and single-bundle anterior cruciate ligament (ACL) re-