

Introduction: The technical skill required to safely perform arthroscopic procedures requires the instruction of basic skills to orthopaedic surgery residents. Changes in the Accreditation Council of Graduate Medical Education (ACGME) resident work hour guidelines coupled with the emergence of realistic arthroscopic simulation may provide an alternative method to improve basic arthroscopic skills. Our goal was to evaluate the correlation between timed task performance in an arthroscopic shoulder simulator and the clinical arthroscopy experience of residents.

Methods: Twenty-seven residents were recruited from an orthopedic residency program. Each subject was tested annually for three consecutive years on a standardized arthroscopic shoulder simulator and objectively scored on time to completion of a standardized object selection program. The total number of arthroscopies and shoulder arthroscopies for each resident by postgraduate year was calculated from ACGME case log. Regression analysis was performed to determine the correlation between simulation performance and number of both total and shoulder arthroscopies by postgraduate year.

Results: Table 1 denotes the number of both total and shoulder arthroscopies as well as basic arthroscopic simulator task performance measurements by postgraduate year of training. The performance time ($R^2=0.89$) and camera distance ($R^2=0.94$) on the simulation program correlated strongly with total number of shoulder arthroscopies performed. Additionally, performance time ($R^2=0.72$) and camera distance ($R^2=0.84$) on the simulation program correlated strongly with total number of arthroscopies performed.

Conclusion: These results show a strong correlation between performance of basic arthroscopic tasks in a simulator model and the number of both total and shoulder arthroscopies performed by postgraduate year of training. Clinical Relevance: This study suggests that the clinical arthroscopy experience of residents may be indicative of basic arthroscopic task performance in a simulator environment. Basic arthroscopic task performance results in this study can be used to assess individual resident performance given ACGME arthroscopic caseload data.

Osteochondral Patello-Femoral Lesions Treated With One Step Surgery Using Bone Marrow Derived Mesenchymal Stem Cells: Results at Three Years (SS-26)

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Introduction: The purpose of our study was to determine the effectiveness of cartilage repair in patellofemoral lesions utilizing a one step surgery with Bone Marrow Aspirate Concentrated (B.M.A.C.) and collagen I/III matrix. Good results have been published with the two-step Autologous Chondrocyte Implantation but very few studies have analyzed single step procedure with bone marrow derived mesenchymal cells.

Methods: We prospectively followed up for 3yrs, 15 patients (mean age 48 years) operated at our Institution from April 2007 for grade IV patello femoral osteochondral lesions of the knee. The average size of the lesions was 7.3 cm^2 . All patients were transplanted with Bone Marrow Aspirate Concentrated (B.M.A.C.) covered with collagen matrix (ChondroGide-Geistlich Wollhusen, CH). Bone marrow was harvested from ipsilateral iliac crest and subjected to concentration and activation with Batroxobin solution (Plateltexact-Plateltex S.R.O. Bratislava, SK). All patients followed the same specific rehabilitation program for a minimum of 6 months. X-rays and MRI were collected preoperative and at final follow up. VAS, IKDC, KOOS, Lysholm, Marx, and Tegner scores were collected at pre-op, 6, 12, 18 months and at final follow up. Four patients gave their consent for second-look arthroscopy and two of them for a concomitant biopsy

Results: Patients showed significant improvement in all scores at 6, 12, 24 and 36 months follow up ($p < 0.05$). Patients presenting with small lesions ($1-5 \text{ cm}^2$) showed higher improvement. No adverse reactions or post-op complication were noted. MRI showed good coverage of the lesions. Hyaline-like histological findings were reported for the specimens analysed.

Conclusion: This study shows that one-step surgery with B.M.A.C. and collagen scaffold can be a viable technique in the treatment of grade IV patello-femoral osteochondral lesions.

Transplantation of Tissue-engineered Cartilage for Repair of Osteochondral Defects in the Knee (SS-27)

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Introduction: The use of chondral progenitor cells is an innovative therapeutic option for treatment of osteochondral lesions of the knee and this study was conducted to evaluate the clinical outcome at medium-term follow-up.

Methods: Arthroscopic repair of osteochondral lesion of the knee by autologous highly committed chondrogenic precursors (Co.don AG, Teltow, Germany) was per-

formed in twenty-three patients, 18 men and 5 women with a mean age of 29.2 ± 10.4 years. Fifteen lesions were located on medial femoral condyle, six on lateral and two on femoral throclea. The average size was 3.4 ± 1.0 cm(2). All patients were evaluated preoperatively and postoperatively using VAS score, Lysholm knee score and International Knee Documentation Committee(IKDC). Magnetic resonance imaging (MRI) examinations were performed at 12 and 24 months after surgery. Three patients had second-look arthroscopies and biopsies.

Results: No early or late complications related to arthroscopic procedure were reported. Median follow-up time was 39 months (36-41). Clinical evaluation showed significant improvement in the Lysholm score (from 54.8 to 82.5), IKDC (from 48.5 to 72.5) ($P \leq .001$). The average VAS score decreased from a preoperative value of 5.6 (SD:2.5) to 1.8 (SD:2.0). The postoperative MRI examinations showed complete defect filling in 22 of 23 treated patients. The second-look arthroscopies and biopsies were done 18.5 ± 5.4 months after transplantation. All the second-look arthroscopies confirmed good integration of repair tissue to the adjacent cartilage and complete defect filling. Biopsies were categorized as hyaline cartilage in all cases.

Conclusion: arthroscopic transplantation of autologous highly committed chondrogenic precursors is an effective and safe method of treating symptomatic osteochondral defects of the knee. The reported medium-term outcomes are encouraging, however, further study with longer follow-up are necessary to determine the inner endurance of reparative tissue and its structural integrity over time.

Chondropenia Severity Score: An Arthroscopic Stratification tool of Structural Cartilage Changes in the Knee as Correlated to Patient Reported Outcomes (SS-28)

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Introduction: The natural history of isolated chondral injuries remains to be elucidated. Arthroscopy remains the most accurate assessment of cartilage lesions in the knee. Here we propose an intra-operative grading system of articular cartilage changes (Chondropenia Severity Score (CSS)) and offer correlation to pre-operative International Knee Documentation Committee patient outcome score (IKDC) and Knee Osteoarthritis Outcome Score (KOOS). The CSS is a scale from 0-100 based on a modified Outerbridge classification of articular cartilage lesions and is divided into 4 grades for overall comparisons. This modification includes consideration of

lesion size. 100 points represents the best score in a knee with no meniscus or articular cartilage pathology (please reference the CSS scoring form).

Methods: A cross-sectional cohort of consecutive knee arthroscopy patients presenting for meniscus surgery comprised the study group. Patients were excluded if younger than 18 years old, had anterior cruciate ligament (ACL) rupture or previous ACL reconstruction, chondrocalcinosis, neoplasm, arthrofibrosis, bucket-handle meniscus tears and septic arthritis. Ninety-three (93) patients met the inclusion criteria and consented to participate in the study. This cohort also completed pre-operative IKDC and KOOS scores within 30 days of undergoing arthroscopic surgery. CSS scores were stratified into grades based upon the following criteria: grade 100-85 points (grade A), 84-71 points (grade B), 70-56 points (grade C) and <56 points (grade D) for statistical comparisons. Pearson correlation coefficient was calculated to compare pre-operative outcome scores to intra-operative CSS scores. Chi-squared analysis was compared for grade of CSS score to risk of post-operative intervention (aspiration and/or injection therapy) within 6 weeks post-operative. ANOVA analysis was completed for comparison of age and body mass index to CSS grade.

Results: The overall profile of the pre-operative KOOS scores in our cohort of patients approximated that which was seen during validation of the KOOS patient reported instrument. The CSS score is statistically correlated to pre-operative IKDC score ($r=0.22$, $p=0.03$) and pre-operative KOOS sub-scores of pain ($r=0.20$, $p=0.05$), symptoms ($r=0.28$, $p=0.01$) and ADL's ($r=0.20$, $p=0.05$). The risk of post-operative intervention significantly increases as CSS grade decreases (Chi-squared $p < 0.001$). There is also a statistically significant trend of lower CSS grade for those patients who had had previous arthroscopy on the knee by chi-squared analysis ($p=0.01$). ANOVA analysis revealed that younger patients were more likely to be in the higher CSS grades ($p < 0.001$).

Conclusion: The CSS is a valid grading system that can be used to provide an overall global objective grade to articular cartilage and meniscus changes in the surgical knee. Future studies can help provide long-term prognosis based upon CSS grade.

Arthroscopic and Magnetic Resonance Imaging (MRI) Grading of Articular Cartilage Lesions of the Knee: Inter-rater Reliability and Reliability Between Modalities (SS-29)

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