considered “Complex” due to the addition of Meniscal Allograft Transplantation (8) or Meniscal Scaffold (3) or High Tibial Osteotomy (3). The remaining 14 cases (50%) were considered as “Isolate”. Mean WOMAC score was 84.6 ± 11.4, Lysholm 81.7 ± 12.3, subjective IKDC 77.2 ± 12.1, median Tegner score (IQ 6-8) at preoperative and at final follow-up. Statistically significant inferior values of WOMAC (p = 0.0079), Lysholm (p = 0.0185) and Subjective IKDC (p = 0.0193) was detected between “Complex” and “Isolate” revision groups. Higher average value of anterior translation at KT-1000 at both 125 N (p = 0.0346) and manual maximum displacement test (p = 0.0299) were reported in “Complex” respect to “Isolate” revisions. Four patients were considered as failures and occurred in patients with “Complex” revisions, none occurred in the “Isolate” (30%/vs50%; p = 0.0407). Conclusion: Good mid-term clinical results can be obtained after repeated ACL revision with allograft in patients that experienced multiple failures, however, who need additional procedure due to malalignment or post-meniscectomy syndrome reported lower objective and subjective results.

Category: Knee - ACL
Autograft Demonstrates Superior Outcomes For Revision Anterior Cruciate Ligament Reconstruction When Compared to Allograft: A Systematic Review

Abstract ID# 22405
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Summary:
Patients undergoing revision ACLR with autograft can be expected to experience lower rates of graft retear, higher rates of return to sport, and less postoperative anteroposterior knee laxity when compared to patients undergoing revision ACLR with allograft.

Data:
Background: Multiple studies have compared outcomes between patients undergoing revision anterior cruciate ligament reconstruction (ACLR) with autograft versus allograft. Purpose: To perform a systematic review of clinical outcomes following revision anterior cruciate ligament reconstruction (rACLR) with autograft versus allograft. Study Design: Systematic Review of Level I–IV comparative studies. Methods: A systematic review of the literature was performed by searching PubMed, the Cochrane Library, and Embase to identify studies that compared outcomes between patients undergoing rACLR with autograft versus allograft. The search phrase used was: autograft allograft revision anterior cruciate ligament reconstruction. Graft re-rupture rates, return to sport rates, anteroposterior laxity, and patient-reported outcome scores (PROs) (Subjective International Knee Documentation Score, Tegner Score, Lysholm Score, and Knee Injury and Osteoarthritis Outcome Score) were evaluated. Results: Twelve studies met inclusion criteria, including 3,011 patients undergoing rACLR with autograft (mean age 28.9 years) and 1,238 patients undergoing rACLR with allograft (mean age 28.0 years). Mean follow-up was 57.3 months. The most common autograft and allograft types used were bone-patellar tendon-bone grafts. Overall, 6.2% of patients undergoing rACLR experienced graft retear, including 4.7% in the autograft group and 10.2% in the allograft group (p < 0.0001). Among studies that reported return to sport rates, 66.2% of autograft patients returned to sport compared to 45.3% of allograft patients (p = 0.01). Two studies found significantly greater postoperative knee laxity in allograft patients compared with autograft patients (p < 0.05). Among all PROs, only one study found one significant difference between groups, in which autograft patients had a significantly higher postoperative Lysholm score when compared to allograft patients. Conclusion: Patients undergoing revision ACLR with autograft can be expected to experience lower rates of graft retear, higher rates of return to sport, and less postoperative anteroposterior knee laxity when compared to patients undergoing revision ACLR with allograft.

Category: Knee - ACL

Higher Risk of Medial Meniscal Repair Failure Following Concurrent Anterior Cruciate Ligament Reconstruction with a Hamstring Tendon Autograft: Results from the New Zealand ACL Registry

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Summary:
The use of a hamstring tendon autograft increases the risk of medial meniscal repair failure following concurrent ACL reconstruction.

Data:
Introduction: Anterior cruciate ligament (ACL) reconstruction with concomitant meniscal injury occurs in up to 80% of cases. Meniscal repair is associated with improved long-term outcomes compared to resection, but is also associated with a higher reoperation rate. Knowledge of the risk factors for repair failure may be important in optimizing patient outcomes. The aim of this study was to identify the patient and surgical risk factors for meniscal repair failure following concurrent primary ACL reconstruction. Methods: Prospective data recorded by the New Zealand ACL Registry were reviewed. Primary ACL reconstructions with a concurrent repair of either a medial or lateral meniscal tear recorded between April 2014 and December 2018 were analyzed, allowing for a minimum follow-up of two years. Meniscal repair failure was defined as a patient who underwent subsequent meniscectomy, and was identified after cross-referencing data from the ACL Registry with the national database of the Accident Compensation Corporation (ACC), which is the New Zealand Government’s sole funder of ACL reconstructions and any subsequent surgery. The predictor variables of interest included age, gender, time from injury-to-surgery, graft type, femoral tunnel drilling technique, surgeon case volume and concomitant cartilage injury as recorded in the New Zealand ACL Registry. Failure rates were compared via Chi-square test. Multivariate Cox regression was performed to produce hazard ratios (HR) with 95% confidence intervals (CI) to identify the risk factors for meniscal repair failure. Results: A total of 2041 meniscal repairs were performed during concurrent primary ACL reconstruction (medial repair = 1235 and lateral repair = 806). The overall failure rate was 9.4% (n = 192). Failure occurred in 11.1% of medial (137/1235) and 6.8% of lateral (55/806) meniscal repairs. The risk of medial failure was higher with hamstring tendon autografts (adjusted HR = 2.00, 95% CI 1.23 – 3.26, p = 0.006) and in those with cartilage injury in the medial compartment (adjusted HR = 1.56, 95% CI 1.09 – 2.23, p = 0.015). The risk of lateral failure was higher when the procedure was performed by a surgeon with an annual case volume of less than 30 ACL reconstructions (adjusted HR = 1.92, 95% CI 1.10 – 3.33, p = 0.021). Age, gender, time from injury-to-surgery and femoral tunnel drilling technique did not influence the risk of meniscal repair failure. Discussion and Conclusion: When repairing a meniscal tear during primary ACL reconstruction, the use of a hamstring tendon autograft and the presence of cartilage injury in the medial compartment are factors that increase the risk of medial meniscal repair failure. Lower surgeon case volume was associated with an increased risk of lateral meniscal repair failure.

Category: Knee - ACL
Clinical Application of Machine Learning Models on Risk Analysis for Ramp Lesions in Anterior Cruciate Ligament Injuries

Abstract ID# 23009
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Summary:
The prediction model of this study showed the feasibility of using machine learning models as a supplementary diagnostic tool for ramp lesions in ACL-injured knees.

Data:
Background: Peripheral tears of the posterior horn medial meniscus, known as “ramp lesions,” are commonly found in anterior cruciate ligament (ACL)-deficient knees, but frequently missed on routine evaluation. Purpose: To predict the presence of ramp lesions in ACL-deficient knees using machine learning methods
with associated risk factors. Methods: This study included 362 patients who under- went ACL reconstruction between June 2013 and March 2019. The exclusion criteria were combined fractures and multiple ligament injuries, except for medial collateral ligament injury. Patients were grouped according to the presence of ramp lesions by arthroscopy. Binary logistic regression was used to analyze risk factors including age, sex, body mass index, time from injury (<3 or >3 months), mechanism of injury (contact or non-contact), side-to-side laxity, grade of pivot shift, medial and lateral tibial/meniscal slope, location of bone contusion, mechanical axis angle, and lateral femoral condylar (LFC) ratio. Receiver-operating characteristic (ROC) curves and area under the curve (AUC) were also evaluated. Results: Ramp lesions were identified in 112 patients (30.9%). The risk for ramp lesions increased with a steeper medial tibial and meniscal slope, higher knee laxity, and increased LFC ratio. Comparing the final performance of all prediction models, the random forest model yielded the best performance (AUC=0.944), although there were no significant differences among the models (p=0.05). The cut-off values for ramp lesions in ROC analysis were as follows: medial tibial slope >5.5° (p<0.001); medial meniscal slope >5.0° (p<0.001); and LFC ratio >71.1% (p=0.033). Conclusion: A steep medial tibial and meniscal slope, an increased LFC depth and a higher knee rotational laxity were observed risk factors for ramp lesions in patients with an ACL injury. The prediction model of this study showed the feasibility of using machine learning models as a supplementary diagnostic tool for ramp lesions in ACL-injured knees. In general, care should be taken in patients with ramp lesions and risk factors during ACL reconstruction.

Category: Knee - ACL

Almost Four Times Lower Failure Rate When Adding a Lateral Extra Articular Tenodesis in the Setting of Revision ACL-R after 4 A Mean of Years Follow-Up

Abstract ID# 23324
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Summary:
Failure rate was almost 4 times lower for patients treated with a lateral augmentation alongside the revision ACLR in comparison to isolated revision ACLR. Although all patients returned to some sports practice, only almost 60% were able to maintain the same level according to the Tegner score at the last follow-up, whether with or without a lateral tenodesis.

Data:
Introduction After several years of disagreement about lateral extra-articular plasty (LEAP), we know that one of the main goals in the setting of Revision ACL-R is to reduce the failure rate. Therefore, the purpose of this study was to compare the failure rate, clinical outcomes and return to sports of a consecutive series of patients operated on for Revision ACL with and without a LEAP. Materials and Methods Patients treated with an isolated revision ACL-R between 2010 and 2015 (group 1) were compared to those treated with revision ACL-R associated with a Modified Lemaire LEAP between 2015 and 2019 (group 2). Surgical technique and graft used in primary ACL-R, revision ACL-R and lateral tenodesis were analyzed. Failure rate, determined as recurrent instability that required re-revision surgery was recorded. Subjective scores were calculated for Lysholm and International Knee Documentation Commit- tee (IKDC) forms. Sport activity was evaluated through the Tegner Score. Re- sults A total of 122 patients were included. Sixteen were lost in follow-up. Therefore, 42 patients in group 1 and 64 in group 2 were evaluated with a mean follow-up of 4.1 years (SD 2.1 years), 6.1 years (SD 2.2) for group 1 and 3.2 years (SD 0.9) for group 2. Mean age was 34 years (SD 8.9 years) for Group 1 and 29 years (SD 7.6 years) for Group 2. Failure rate was 23% (n=10) for Group 1 and 6.25% (n=4) for Group 2 (p 0.009) at a mean of 2.9 years. Mean pre and postoperative Lysholm score was 58 (SD 19) and 87 (SD 8.8) in Group 1 and 59 (SD 15) and 88 (SD 8.3) in Group 2 (p <0.01). Mean pre and post- operative IKDC scores were 51 (SD 13) and 81 (SD 10) in Group 1 and 54 (SD 14) and 82 (SD 9.4) in Group 2 (p <0.01). When comparing sport activity previous to the previous to the ACL-R and at final follow up, Tegner score decreased in 40.5% (43/106) of patients (43% in group 1 and 39% in group 2, p=0.1). Conclusion After a mean of 4 years follow-up, the failure rate after revision ACL-R was almost 4 times less when adding a LEAP. Although all patients returned to some sports practice, only almost 60% were able to maintain the same level according to the Tegner score at the last follow-up, whether with or without a LEAP.

Category: Knee - ACL

Evaluation of Extension Deficit, Anterior Fibrosis and Return to Sports Using Five Different Techniques for Tissue Preservation in ACL-R

Abstract ID# 23384
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Summary:
We found no difference in terms of anterior fibrosis, extension deficit, subjective scores, return to sports and failure rates. We believe there is an important role for tissue preservation.

Data:
Introduction In the past decade, several authors discussed the presence of...