Introduction Previous biomechanical cadaveric studies have demonstrated residual laxity in knees that have undergone anterior cruciate ligament reconstruction (ACLR) with associated anterolateral complex (ALC) injury, assessed during ‘in vitro’ internal-external or anterior-posterior laxity. The role of the ALC has never been evaluated during simulated activities of daily living (ADL) such as cutting or pivoting motions. Thus, the purpose of this study was to examine the contributions of the ALC during ‘in vitro’ clinical laxity tests and simulated ADL movements Method Twelve intact cadaveric knees were mounted onto a joint motion simulator (AMTI Vivo). The ALC was transected and anatomic single-bundle ACLR was performed using a synthetic graft with an initial tension of 80 N at 30° of flexion angle, which was measured using a loadcell attached to the graft. Each knee was subjected to clinical laxity tests (Pivot-shift, Lachman, and anterior drawer), as well as simulated ADL, comprising cutting maneuvers and inside and outside pivoting. Tension was applied to the quadriceps and hamstrings to simulate dynamic muscle force during ADL. ALC dissection was performed by releasing the tibial attachment of the anterolateral ligament from the lateral meniscus and the femoral attachment from the most posterior limit of the iliotibial band as far proximal as the distal Kaplan fiber attachment, which was left intact. All tests were applied in the following stages: ACLR, ACL-Cut, ACL-R + ALC-Cut, and ALC-Cut + ALC-Cut. After cutting ALC, the measured kinetics of both ACLR and ALC-Cut conditions were fed back to the knee to determine the force contribution of the ALC based on the sequential resection and superposition technique. Results In the ACLR stage, resection of the ALC led to an increase in anterior translation and internal rotation of 2.3 mm and 4.5°, respectively, and by 2.7 mm and 3.9° in the ACL-Cut stage. During Lachman and anterior drawer tests, cutting the ALC caused an increase in tibial translation by 1.7 mm and 1.5 mm in the ACLR stage, versus 3.0 mm and 2.4 mm in the ACL-Cut stage, respectively. In both ACLR and ACL-Cut stages, statistically, significant differences were detected between the kinematics in intact and injured ACL. During the simulated cutting maneuver and inside and outside pivoting, dissection of the ALC resulted in an average increase in internal rotation by 2.3°, 2.1°, and 1.7° with the ACLR versus 2.8°, 1.5°, and 1.7° with the ALC-Cut, respectively. During pivot shift, Lachman and anterior drawer test, in the ACLR stage, the average anterior force contribution of the ALC was 34%, 7%, and 10%, respectively, whereas it was 49%, 30%, and 29% in the ACL-Cut stage. Furthermore, the average anterior force contribution of the ALC was 16%, 15%, and 9% in ACLR, and 31%, 44%, and 49% in ACL-Cut, respectively, for the cutting maneuver, inside pivoting, and outside pivoting. Conclusion An ‘in vitro’ combined ALC + ACL knee injury results in a significant increase of AP translation compared to an ACL injury alone. ALCR alone failed to restore knee kinematics during simulated ADL when a concomitant ALC Injury was performed. This study provides further evidence that ALC should be addressed when treating ACL-injured knees with preoperative high-grade rotatory laxity.

Category: Knee - Lateral Extraarticular Tenodesis

Isolated Lateral Extra-articular Tenodesis (LEAT) for Chronic Rotational Instability following Primary Anterior Cruciate Ligament (ACL) Reconstruction has Low Surgical Morbidity and Improves Knee Stability

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Summary:
The isolated LEAT procedure appears appropriate and successful in addressing ongoing subjective and objective rotational instability in the ACL reconstructed knee.

Data:
Background Augmentation of the lateral structures of the knee using a Lateral Extra-Articular Tenodesis (LEAT) in combination with ACL reconstruction is thought to improve rotational instability, though the exact indications for LEAT remain controversial. We propose that the LEAT procedure can also be used in isolation in the ACL reconstructed knee with an intact graft but mild to moderate chronic subjective and objective rotational instability. This procedure ideally provides sufficient adjunctive knee stability while avoiding the higher surgical morbidity, complication rate and prolonged post-operative rehabilitation of full revision ACL reconstruction. Methods A prospective consecutive case series of patients undergoing isolated LEAT by a single surgeon for chronic rotational instability following previous ACL reconstruction were followed from 2016 to 2022. Inclusion criteria consisted of an ACL reconstruction with appropriately placed bone tunnels and intact graft on MRI, with subjective knee instability and positive pivot shift on clinical examination. Patient demographics, pre-operative imaging, pre- and post-operative patient-reported outcome measures (PROMs) were analysed. Results Twelve patients were identified. Mean age was 29.3 years (Range: 20-41 years) and 50% were male. A modified MacNintosh LEAT was used for all patients. The mean time from ACL reconstruction to the LEAT procedure was 68 months. Mean follow up time was 15.5 months (Range: 8-59 months). In all patients the pivot shift was obliterated post-LEAT procedure. Four patients underwent concomitant meniscal repair (33%) and three patients underwent meniscal debridement (25%) at the same operation. No complications were reported but one patient was awaiting removal of interference screw for superficial irritation. Significant improvements were demonstrated in PROMs including Sane, Tegner, ACL-RSI and EQ-5D scores.

Conclusions The isolated LEAT procedure appears appropriate and successful in addressing ongoing subjective and objective rotational instability in the ACL reconstructed knee with intact graft and appropriate tunnel positioning and is a useful option in this cohort of patients. It offers a low surgical morbidity and complication rate in comparison to revision ACL reconstruction and provided good patient-reported outcomes across a series of measures. This study is the largest of its kind in the available published literature.

Category: Knee - Lateral Extraarticular Tenodesis

Clinical Outcomes of Combined ACL & Anterolateral Ligament Reconstruction Versus Isolated ACL Reconstruction: A Matched-Pair Analysis of 2018 Patients

Abstract ID# 21582

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Summary:
Risk of ACL graft rupture is 3-fold greater with isolated ‘gold standard’ BTB grafts when compared to ACL+ALLR with hamstring autografts

Data:
Background: The aims of this study were to compare the clinical outcomes following “gold standard” ACL reconstruction (ACLR) with a bone patellar-tendon bone (BPTB) autograft versus ACLR combined with an anterolateral ligament reconstruction (ALLR) using hamstring tendon autografts (HT), in a large series of propensity matched patients. The hypothesis was that combined reconstructions would confer better graft rupture rates and lower non-graft rupture related re-operation rates than isolated ACLR with BPTB Methods: A retrospective analysis of prospectively collected data was performed. Patients undergoing combined ACLR+ALLR using HT between 2003 and 2019 were propensity matched in a 1:1 ratio to patients undergoing isolated ACLR using BPTB. At the end of the study period rates of graft rupture, contralateral knee injury and any other re-operations or complications that occurred were identified by database interrogation, review of medical records and standardized telephone interview. It was anticipated that there would be significant differences in the duration of follow-up between the groups due to a larger proportion of patients undergoing combined reconstructions toward the latter part of the study period. For that reason, statistical techniques that are unaffected by any differences in durations of follow up between groups were used to evaluate graft survivorship, re-operation free survivorship and the significance of potentially important risk factors. Specifically, Kaplan Meier survivorship analyses and Cox-proportional hazards models were used because both evaluate time to event data and are independent of the overall duration of follow up. Results: A total of 2018 patients (1009 matched pairs) were included. The mean duration of follow up was 101.3. Kaplan Meier Analysis demonstrated a significantly better graft survivorship in the ACLR+ALLR group when compared to the BPTB group at every time point assessed. The Cox model demonstrated that patients in the BPTB group were > 3-
fold more likely to experience graft failure than those in the ACLR + ALLR group (Hazard Ratio (HR) = 3.554 [1.744;7.243], p = 0.0005). Patients aged less than 20 years were at particularly high risk of graft rupture (HR = 5.65 [1.834;17.241], p = 0.0002) and further analysis of this subgroup demonstrated that isolated ACLR with BPTB also conferred a > 3 fold increased risk of graft rupture in young patients when compared to ACLR + ALLR. Multivariate analysis did not identify any other significant risk factors for graft rupture. Overall, there was a significantly higher reoperation rate following isolated ACLR (BPTB group 20.5%, ACLR + ALLR group 8.9%, p < 0.0001). This finding was accounted for by significantly higher rates of graft rupture (9.9% vs 3.5%, p < 0.0001), cyclops syndrome (3.3% vs 1.5%, p < 0.0001), and secondary meniscectomy (5% vs 2.9%) in the BPTB group. Discussion and Conclusion: Patients who underwent isolated ACLR with BPTB autografts experienced significantly worse ACL graft survivorship and overall re-operation free survivorship when compared to those who underwent combined ACLR + ALLR with hamstring autografts. The risk of graft rupture was more than 3-fold higher in patients who underwent isolated ACLR using BPTB.

Category: Knee - Lateral Extraarticular Tenodesis

The Addition Of Either An Anterolateral Ligament Reconstruction or An Iliotibial Band Tenodesis Is Associated With A Lower Failure Rate After Revision Anterior Cruciate Ligament Reconstruction: A Retrospective Comparative Trial

Abstract ID# 21835

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Summary:
Patients who underwent revision ACL reconstruction with a laterally based augmentation procedure had a lower failure rate than patients who underwent isolated revision ACL reconstruction

Data:
Purpose: To compare the failure rate in patients who underwent revision anterior cruciate ligament (ACL) reconstruction alone or associated with an extra-articular procedure. Secondary objectives were to compare ACL laxity, patient-reported outcome measures, and complication rates in these patients and, subsequently, to compare the outcomes of patients who underwent revision ACL reconstruction associated with anatomical anterolateral ligament (ALL) reconstruction or lateral extra-articular tenodesis (LET). Methods: This was a retrospective comparative study. Patients were classified into two groups, according to whether (Group 2) or not (Group 1) an extra-articular reconstruction was performed. Patients who underwent an extra-articular procedure were further divided into ALL reconstruction (Group 2A) and LET (Group 2B). Baseline demographic variables, operative data and post-operative data were evaluated. Results: The groups with (86 patients) and without (88 patients) an associated extra-articular reconstruction had similar preoperative data. Group 2 had a lower failure rate (4.6%vs.14.7%;p=0.038), better KT-1000, better pivot shift, and better Lysholm. There was no difference regarding complications, except more lateral pain in Group 2. Regarding the groups who underwent ALL reconstruction (41 patients) and LET (46 patients), Group 2A showed better Lysholm scores. Both groups had similar failure rates and complications. Conclusion: Patients who underwent revision ACL reconstruction with a laterally based augmentation procedure had a lower failure rate than patients who underwent isolated revision ACL reconstruction. KT-1000 and pivot shift examination were also significantly better when a lateral augmentation was performed. Complications were similar except for an increase in lateral pain in the augmented group. No clinically important differences were found when comparing the LET group to the ALL group other than a statistical improvement in the Lysholm functional scale, likely not clinically meaningful, favoring the ALL group and an increased duration of post-operative lateral pain in the LET group.

Category: Knee - Lateral Extraarticular Tenodesis

Repair Of the ACL and Anterolateral Structures Versus Reconstruction and Lateral Extra-Articular Tenodesis: A Prospective Comparative Study of Acute ACL-Injured Knees

Abstract ID# 22218

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Summary:
the results of our study show that in selected patients, superimposable results can be obtained between repair of ACL and anterolateral structures and reconstruction of ACL and LET.

Data:
Background: Lateral extra-articular procedures (LEAPs) have been effective in reducing graft rupture rates in ACL reconstruction but the evidence supporting their role in ACL repair is sparse Purpose: To compare clinical and radiological outcomes of ACL reconstruction and lateral extra-articular tenodesis (ACLR + LET) against combined repair of the ACL and anterolateral structures (ACLR + AL repair). The hypothesis was that patients undergoing ACL + AL repair would have non-inferior clinical and radiological outcomes with respect to IKDC scores, knee laxity parameters, and MRI characteristics. Furthermore, it was hypothesized that patients undergoing repair would have significantly better FJS-12 scores and shorter times to return to the pre-injury level of sport, without any increase in the rate of ipsilateral second ACL injury. Study Design: Prospective comparative non-randomized study Methods: Consecutive patients presenting with acute ACL tear were considered for study eligibility. ACLR + LET was only performed when intra-operative tear characteristics contra-indicated ACL repair. Patient reported outcome measures (PROMS), re-injury rates, anteroposterior side-to-side laxity difference and MRI characteristics were reported at a minimum follow up of two years Results: One hundred patients (47 ACLR + LET, 53 ACL + AL Repair) with a mean follow-up of 25.2 months (range, 24-31) were enrolled and underwent surgery within 15 days of injury. At final follow up differences between groups with respect to the IKDC Score, anteroposterior side-to-side laxity difference, and signal-to-noise quotient (SNQ) did not exceed non-inferiority thresholds. ACL + AL repair was associated with shorter time to return to the pre-injury level of sport (ACLR + LET, mean, 9.5 months; ACL + AL repair, mean, 6.4 months; p<.001), better FJS-12 scores (ACLR + LET, mean, 97.4; ACL + AL repair, mean, 91.4 months; p=.04), and a higher proportion of patients achieving PASS for KOOS subdomains (symptoms, 88.2% vs 67.4%, p=.005; sport and recreational function, 94.1% vs 67.4%, p<.001; quality of life, 92.2% vs 73.9%, p<.01). There were no significant differences between groups with respect to ipsilateral second ACL injury rates (ACLR + AL repair group 3.8% and ACLR + LET group, 2.1% (n=1), p=.63). Conclusion: ACL + AL repair yielded clinical outcomes that were non-inferior (or not significantly different) to ACLR + LET with respect to IKDC Subjective, ACL RSI, Tegner and Lysholm scores, knee laxity parameters, graft maturity and rates of failure and re-operation. However, there were significant advantages of ACL + AL repair including shorter duration of time to return to the pre-injury level of sport, better FJS-12 scores, and a higher proportion of patients achieving PASS for KOOS subdomains (symptoms, sport and recreational function, quality of life).

Category: Knee - Lateral Extraarticular Tenodesis

Combined Lateral Extra-Articular Tenodesis or Combined Anterolateral Ligament Reconstruction and Anterior Cruciate Ligament Reconstruction Improves Outcomes Compared to Isolated Reconstruction for Anterior Cruciate Ligament Tear: A Network Meta-Analysis

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