2023 Congress Abstracts: Knee - Lateral Extraarticular Tenodesis

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Lateral Extra-Articular Tenodesis: Augmentation of Anterior Cruciate Ligament Reconstruction Does Not Impact Cartilage Health in the Patellofemoral Joint Based on Post-operative Two Year Qualitative and Quantitative MRI Analysis

Abstract ID# 21465

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Summary:
No statistically significant differences in cartilage health were observed in the patellofemoral joint between patients who underwent primary ACLR with or without LET at two years post-operative, as determined via quantitative and qualitative analysis of MRI.

Data:
Introduction: Several clinical and biomechanics studies have concluded that lateral extra-articular tenodesis (LET) is an effective procedure to control rotational laxity, reducing failure rates when performed with an anterior cruciate ligament reconstruction (ACLR). However, there is question whether the addition of an iliotibial band based LET may cause increased contact pressure in the patellofemoral joint (PFJ) that could potentially lead to cartilage damage. The purpose of the current study was to assess PFJ cartilage status in patients that underwent ACLR with or without LET augmentation using magnetic resonance imaging (MRI). It was hypothesized that 1) the addition of LET at the time of ACLR would have no effect on cartilage health on post-operative two-year MRI; 2) higher cartilage relaxation values would be associated with worse patient reported outcome measures (PROM). Methods: A subset of patients from the STABILITY 1 randomized controlled trial were subset of patients from the STABILITY 1 randomized controlled trial were included. All patients underwent primary ACLR with a hamstring autograft. The patients were randomized either to receive LET augmentation or not. Cartilage status in the PFJ between ACLR alone group and ACLR+LET group were compared by quantitative MRI (qMRI) and qualitative assessment by ACL osteoarthritits score (ACLOS) on post-operative two year MRI for surgical and contralateral non-surgical knees. Objective functional outcomes (range of motion (ROM), hop test and isokinetic strength) and patient reported outcome measures including Knee injury and Osteoarthritis Outcome Score (KOOS) and International Knee Documentation Committee (IKDC) score were attained. Results: Ninety-two patients (43 patients in ACLR group, mean age (±SD) 18.9±3.2 years, 60.5% female, and 49 patients in ACLR+LET group, 18.7±3.2 years, 63.3% females) were included. No significant differences were seen in the mean values (milliseconds) for qMRI for adjusted T1 rho against simulated pivot-shift loading of anterior tibial translation (cATT) against simulated pivot-shift loading increased by ACL dissection and a meniscus tear from full extension to 30° (p<0.05 or <0.01). ACL reconstruction restored the increased cATT slightly better with on the hop test was associated with increasing T1 rho (p = 0.04) and T2 (p = 0.01) relaxation in the lateral trochlea. Conclusion: No difference was found in patellofemoral cartilage health between knees undergoing primary ACLR with hamstring tendon autograft with or without LET at two years post-operative. Statistically significant correlations were found between qMRI relaxation times and functional outcome scores and PROMs, however the correlations were weak and the clinical significance of these changes are undetermined.

Concomitant Meniscus Tear in the Anterior Cruciate Ligament Injured Knee Should Be Treated by Repair or Additional Lateral Extraarticular Tenodesis to Achieve Sufficient Stability

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Summary:
Robotic system was used to compare knee kinematics between different treatments for concomitant lateral meniscus test in the ACL reconstructed knee. ACL reconstruction alone did not fully restore knee kinematics, while additional meniscus repair achieved intact level of knee kinematics. Furthermore, lateral extraarticular tenodesis also normalized knee kinematics without meniscus repair.

Data:
Objective: Concomitant lateral meniscus tear in the ACL injured knee could lead to insufficient restoration of rotational knee laxity after ACL reconstruction. Since lateral meniscus tears are not always reparable, additional augmentation procedure, such as lateral extraarticular tenodesis (LET) could be indicated to salvage the stability after the ACL reconstructed knee. However, it is still unknown how the LET affect knee kinematics postoperatively in the ACL reconstructed knee. The purpose was to compare knee kinematics in in-situ force of ACL/ACL grafts between four different conditions of ACL and lateral meniscus. Methods: Eight human cadaveric knees were tested using a 6DOF robotic testing system. The knee was flexed from full extension to 90° while the following loads were applied: (1) anterior loading (i.e. 134N anterior tibial load with 100N compression force), (2) a simulated pivot-shift loading (i.e., 7Nm valgus torque, 7Nm internal tibial torque, and 100N compression force). Knee kinematics and in situ force in the ACL or ACL graft were compared under five conditions: intact knee (INT), ACL dissected knee with a complete radial meniscus tear in the posterior horn (ACLD-LMD), ACL-reconstructed knee with a lateral meniscus tear (ACLR-LMD), ACL-reconstructed knee with a repaired lateral meniscus (ACLR-LMR) and ACL-reconstructed knee with LET and a lateral meniscus tear (ACLR-LET). Results: Anterior tibial translation (ATT) increased by cutting the ACL and the lateral meniscus between full extension and 60° (<0.01). The ACL reconstruction reduced the increase of ATT (p<0.05 or <0.01), but the ATT was still larger that of intact knee without meniscus repair or LET (p>0.05 or <0.01). Additional meniscus repair or LET achieved the intact level of ATT (p<0.05). (Fig.1 Left) Abnormal lateral translation and valgus occurred by cutting the ACL and the meniscus at 15° and 30° (p<0.05 or <0.01), and they were restored by ACL reconstruction and additional meniscus repair or LET (p<0.05). The coupled anterior tibial translation (cATT) against simulated pivot-shift loading increased by ACL dissection and a meniscus tear from full extension to 30° (p<0.05 or <0.01). ACL reconstruction restored the increased cATT slightly better with...
additional meniscal repair or LET. (Fig.1 Right) The in situ force of the ACL and ACL graft under both anterior and simulated pivot-shift loading was not different between five conditions of the ACL and the meniscus (p>0.05). Conclusion: Either additional meniscus repair or LET in addition to the ACL reconstruction was required to restore normal knee kinematics in the ACL and lateral meniscus torn knee. When encountering unreparable lateral meniscus tear in ACL injured knee, LET might be considered in addition to ACL reconstruction.

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Clinical Outcomes And Return To Sport After Revision Acl Reconstruction With Lateral Extraarticular Tenodesis: Comparison To A Control Group At A Minimum 2-Year Follow-Up

Abstract ID# 23103

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Summary:
High risk patients with revision ACL reconstruction using quadriceps tendon autograft and lateral extraarticular tenodesis do just as well as lower risk controls.

Data:
Introduction: High rates of clinical failure and graft rupture remain a problem with isolated ACL reconstruction (ACLr) in at-risk populations. There is therefore a renewed enthusiasm for lateral extra-articular tenodesis (LET) which provides additional extra-articular restraint to better control anterolateral rotational laxity in at-risk cases including revision ACLr. There is a lack of high quality comparative evidence to support this rationale. The purpose of this study is to compare clinical outcomes and return to sport in patients who undergo revision ACLr reconstruction with LET compared to those without LET (control group).

Methods: All patients who underwent revision ACLr reconstruction with and without LET between January 2018 and February 2020 were queried at our institutional registry. The LET group was compared to the control group (revision ACLr without LET) and followed for a minimum of 24 months post-surgery to evaluate patient reported outcome measures, satisfaction, return to sports, rate of reoperation, and psychological readiness for return to sport (using the ACL-Return to Sport after Injury Scale, ACL-RSI).

Results: A total of 81 patients with a mean follow-up of 2.75 years were included. LET group contained 37 patients (76% female) with a mean age of 26.6 years and BMI of 23.5 kg/m² compared to 44 patients (80% female) with mean age of 28.2 years and BMI of 26.9 kg/m². There were no significant differences between the LET and control groups with respect to mean post-operative PROMIS Pain Interference (47.7 ± 48.3, p = 0.46) and PROMIS Mobility scales (53.3 ± 52.9, p = 0.97). In addition, there were no differences in post-operative IKDC (78.9 ± 78.3, p = 0.45), Marx (7.9 vs 7.2, p = 0.64), or SANE (73.1 ± 74.2, p = 0.38) scores. The same held true with regards to post-operative ACL-RSI scores between the groups (43.3 ± 50.1, p = 0.38). Return to play rates after revision ACLr were similar in the LET group compared to the control group (55% vs 45%, p = 0.40) with similar confidence to play their pre-injury sport (scale out of 100, 58.2 ± 56.2, p = 0.82). Conclusion: Satisfaction and patient reported outcome scores after revision ACLr reconstruction are good with or without LET. While both groups have similar rates of return to play and reoperation at greater than 2-year follow-up, these results suggest the addition of LET to revision ACLr may provide similar outcomes in high-risk patients when compared to isolated revision ACLr reconstruction.

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Clinical Outcomes and Failure Rates in Patients Undergoing Revision ACLR With or Without Modified Lemaire Lateral Extra-Articular Tenodesis

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Summary:
A retrospective analysis of patients who underwent revision ACLr reconstruction with or without lateral extraarticular tenodesis (LET) identified similar failure rates between groups; however, patients who had an additional LET demonstrated statistically significant improvements in activities of daily living and sport and recreation KOOS subdomain scores at a minimum 2 year follow up.

Data:
Introduction: Revision anterior cruciate ligament reconstruction (R-ACLr) represents a technically demanding procedure leading to lower clinical outcomes and reduced patient satisfaction compared to primary ACLr reconstruction. The addition of lateral extra-articular tenodesis (LET) has been demonstrated to lower primary ACLr reconstruction failure rates. The purpose of this study was to report a retrospective analysis of patients who underwent R-ACLr with or without LET with a minimum of 2 years follow-up. The hypothesis was that the addition of LET leads to higher patient-reported outcomes (PROMs) and a decrease in failure rate compared to isolated ACLr.

Methods: Seventy-four patients with a minimum of 2 years follow-up (range 24-120 months), who had a high-grade positive pivot shift test under anesthesia (≥ 2) were included. Postoperative radiologic measurements included medial posterior tibial slope (PTS) angle, lateral femoral condylar ratio (LFCR), and osteoarthritis (OA) grade. Knee Injury and Osteoarthritis Outcome Score (KOOS) and the International Knee Documentation Committee (IKDC) Subjective Knee Form were collected. Failure criteria were defined as residual positive pivot test ≤ 2 during clinical assessment, objective knee instability symptoms, and/or postoperative MRI exam showing a complete graft tear. An ANCOVA was used to compare PROMs between groups, adjusted for patient age, study site and length of follow-up. Statistical significance was set at p < 0.05 for all analyses. Results: Thirty-nine patients underwent isolated R-ACLr (mean age (SD) 29.2 ± 12.2) and 35 had an additional LET (24.6 ± 7.4). A first R-ACLr was performed in 84.6% vs 82.8% respectively. Autologous extensor mechanism was the most common graft utilized (71.7% vs 85.7%). One stage revision ACLr was performed in most cases (69.5%). Radiographic analysis showed a similar incidence of postoperative OA changes (KL grade ≥ 2) without a significant difference between the groups (43.6% vs 48.6% p = 0.67). The medial PTS (mean ± SD) (9.6 ± 3.1 vs 8.5 ± 1.8 p = 0.05) and LFCR (mean ± SD) (0.64 ± 0.03 vs 0.66 ± 0.01 p = 0.24) measurement preoperatively were not significantly different. PROMs were higher in the LET group with KOOS ADL (93.5 ± 2.0 vs 97.2 ± 1.6; 0.03*) and KOOS Sport (63.0 ± 3.6 vs 74.3 ± 3.8; 0.049*) subdomains reaching statistical significance, with the latter reaching a minimum clinically important difference threshold. No other differences were found in the other KOOS subdomains or IKDC. No postoperative complications were found related to the addition of LET fixation on the lateral femoral condyle. Failure rates were not significantly different between the groups (12.8% vs 11.4% p = 0.99). Conclusion: Revision ACLr with additional LET showed a similar failure rate compared to isolated R-ACLr in patients presenting with high-grade rotational laxity following failed ACLr. Clinical outcomes suggested better functional results in the LET group with significantly higher activities of daily living, and sport and recreation KOOS subdomain scores. Additional studies should be performed with higher numbers of patients to investigate the potential protective effect of LET in revision ACLr patients.

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Biomechanical Contribution Of The Anterolateral Complex In ACL-Reconstructed And ACL-Deficient Knees During Simulated Activities Of Daily Living

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Summary:
The purpose of this study was to examine the contributions of the ACL during ‘in vitro’ clinical laxity tests and simulated ADL movements and the results of this study provides further evidence that an ACL procedure should be considered in ACL injured knees with high grade rotational laxity.

Data: