

Does the Use of Lateral Extra-Articular Tenodesis in Anterior Cruciate Ligament Reconstruction Enhance Graft Healing? A Matched Cohort Study

George Jacob¹, Yoong Lim, Cristian Andres Brito Ayet, David Parker²

¹Sydney Orthopaedic Research Institute, ²North Shore Knee Clinic

INTRODUCTION:

Lateral extra-articular tenodesis (LET) is a well-established technique that has enjoyed increased interest recently as a supplementary procedure to reduce reinjury after anterior cruciate ligament reconstruction (ACLR). The rationale behind LET was to reduce anterolateral rotatory instability (ALRI) and protect the anterior cruciate ligament (ACL) graft. Biomechanical studies have revealed LET significantly reduces the intra-articular forces across the ACL graft and affects the overall biomechanics of the knee joint. We hypothesized that this protection of the graft could improve graft healing, or conversely possibly stress shield the graft and impair healing. Improved graft healing on MRI has been shown to relate to reduced risk of rerupture, and therefore if addition of an LET can enhance graft healing post ACLR it may in turn provide additional benefit for reduction of rerupture beyond the increased stability it provides. This study aimed to assess graft healing in patients who underwent ACLR alone versus those who underwent ACLR+LET using a previously standardized MRI protocol at one-year post-surgery.

METHODS:

A matched cohort comparison was performed on patients who underwent ACLR with and without the addition of the LET. Patients were matched by age, sex, body mass index, and initial tunnel diameter and graft size. A total of 80 patients who underwent ACLR were enrolled in the study. Forty patients underwent ACL reconstruction alone, while 40 underwent ACLR in addition to LET. All ACLRs performed were single bundle quadrupled hamstring grafts with suspensory fixation on both the femur and tibia. All ACLR+LET surgeries were performed by the senior author and a modified deep Lemaire technique was used for the LET using PEEK screw fixation to the lateral femoral condyle. No revision ACLR surgeries or patients who underwent meniscectomies were included. Patients underwent a standardized postoperative rehabilitation protocol. All patients were weightbearing as tolerated assisted with crutches post-surgery, attended regular physiotherapy, and underwent formal return to sport testing at 9 months. Twelve months post-surgery, patients underwent a standardized 3T magnetic resonance imaging (MRI) scan utilizing a validated protocol which included volumetric and near isotropic (0.5mm x 0.5mm x 0.65mm) turbo spin echo sequences optimized for graft assessment. Two observers performed the MRI analysis on 3 x 20-mm² regions of interest (ROI) on the intra-articular graft (proximal, middle, and distal) using oblique reconstructions both parallel and perpendicular to the graft. The Signal Noise Quotient (SNQ) was calculated with the formula $SNQ = \frac{\text{graft signal} - \text{posterior cruciate ligament signal}}{\text{background signal}}$. Tunnel aperture signal and areas were also measured using multi planar reformation. Tunnel widening was evaluated by determining the difference between the initial intraoperative drilled tunnel diameter and the MRI measured tunnel diameters.

Clinical evaluations were performed using International Knee Documentation Committee Subjective Knee Evaluation Form (IKDC), Tegner Activity Scale (Tegner), and Lysholm Knee Score (Lysholm) both pre-injury and at 12 months post-surgery. Postoperative side to side anterior laxity was determined using a laxity arthrometer.

RESULTS:

A total of 80 patients were included in the study, 40 in each group. The mean age was 18.6±3.74 in the ACLR+LET group and 18.6±3.95 in the ACLR group ($P > 0.05$). The average preoperative BMI was 21.95±8.15 in the ACLR+LET group and 23.89±3.23 in the ACLR group ($P > 0.05$). The mean femoral tunnel widening in the ACLR +LET group was 3.38±1.23 mm² and 4.66±1.2 in the ACLR group ($P = < 0.05$). The mean tibial tunnel widening in the ACLR +LET group was 2.60±1.13 mm² and 3.89±1.03 in the ACLR group ($P = < 0.05$). The mean adjusted graft SNQ was 8.93±14.54 in the ACLR+LET group and 9.58±12.84 in the ACLR group ($P > 0.05$). No significant findings were found between both groups when comparing clinical outcome scores and anterior laxity testing.

DISCUSSION AND CONCLUSION:

At one year postoperatively we noted significantly less femoral and tibial tunnel widening in the ACLR+LET group. This could be explained by the protective effects of the LET on the ACL graft during healing and ligamentization. LET procedures have been shown to increase constraint of the knee joint, particularly reducing internal rotation of the tibia. As a result there is reduction of intra-articular graft forces. Despite no difference in clinical outcome, LET was associated with reduced femoral and tibial tunnel widening in quadrupled hamstring graft ACLR with suspensory fixation. Further studies should help elucidate whether this significant effect imparts any clinical benefit to ACLR patients.