

Lateral Extra-articular Tenodesis Reduces Rotation with BTB ACL-R

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INTRODUCTION: The biomechanical effect of lateral extra-articular tenodesis (LET) performed in conjunction with ACL reconstruction (ACL-R) on knee kinematics is not clear. The purpose of this study was to quantify the effect of LET on ACL-R knee kinematics. We hypothesized that LET would increase knee stability in response to simulated pivoting loading and internal rotation (IR) torque.

METHODS: With Institutional approval (Committee for Oversight of Research and Clinical Training Involving Decedents), ten unpaired fresh-frozen human cadaveric knees (mean age: 40.6 years) were tested using a robotic system under three loads and various flexion angles: (a) an 89N anterior tibial translation (ATT) load, (b) a 5Nm IR tibial torque, and (c) simulated pivot shift (PS) loading (7 Nm valgus moment followed by 5 Nm internal rotation torque). Kinematic data was acquired for the intact, ACL-deficient (ACL-DEF), ACLR and ACLR+LET states. ACL-R was performed with bone-patellar tendon-bone graft and fixed 80N at 20° of flexion [1]. A LET procedure was performed 20N tension at 70° of flexion [2]. A one-way Anova was to check for statistical difference between the groups follow by pairwise T-tests with Bonferroni correction with significance set at $p < 0.05$.

RESULTS SECTION: Under ATT load, there was no statistical difference in ATT between the ACL-R and ACL-R+LET states at any knee flexion angle (Fig. 1). A significantly higher ATT was detected at 0°, 15°, 30°, 45° and 60° of flexion in the ACL-R and ACL-R+LET states compared to the intact state. There was also no statistically significant difference between the ACL-R+LET and intact states during IR torque at any knee flexion angle (Fig. 1). Adding LET to ACL-R did reduce the internal rotation (Fig. 2). In response to simulated PS load, no statistically significant difference was detected between the ACL-R and intact states at any knee flexion angle (Fig. 2). Statistically significant reductions were detected in the tibial displacement at all flexion angles after augmenting ACL-R with LET. Statistically significant less tibial displacement was detected in ACL-R+LET state compared to intact state at 15° of knee flexion.

DISCUSSION: In this cadaver study, ACL-R and ACL-R+LET did not restore intact knee ATT which is not uncommon. Under IR loading ACL-R+LET generally had lower rotation than the intact ACL but not significantly so. ACL-R+LET caused over-constraint at 15° of knee flexion during simulated PS loading. Based on the results of this study, the LET procedure can be used with ACL-R to reduce rotational laxity.

SIGNIFICANCE/CLINICAL RELEVANCE: Based on the results of this cadaver study, the LET procedure can be used with ACL-R to reduce rotational laxity.

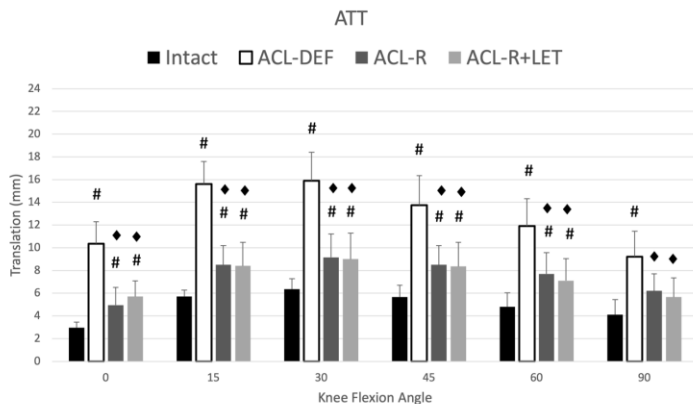


Figure 1: ATT under 89 N anterior tibial loading (left) at different flexion angles (# $p < 0.05$ vs Intact. ♦ $p < 0.05$ vs ACL-DEF).

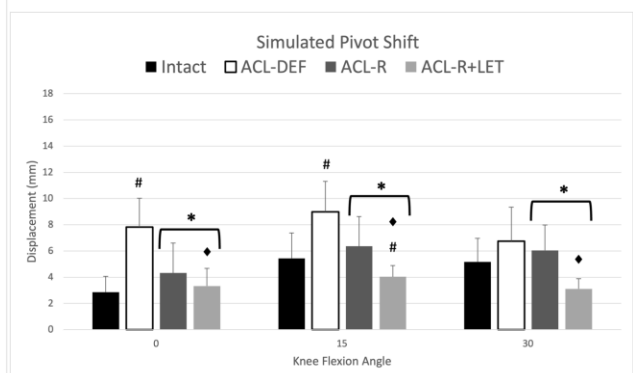
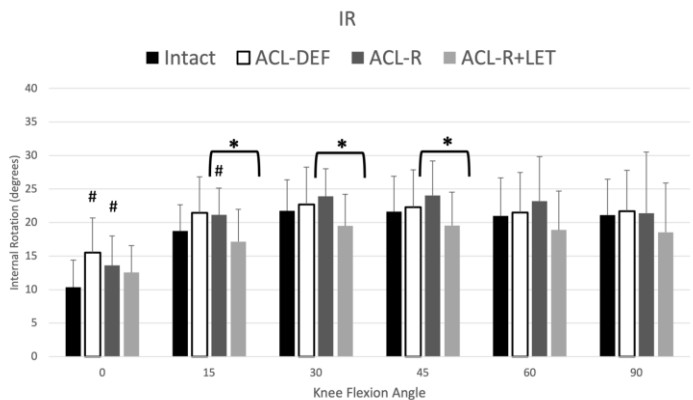


Figure 2: Internal rotation (left) and tibial displacement (right) under simulated pivot shift loading (# $p < 0.05$ vs Intact. ♦ $p < 0.05$ vs ACL-DEF).