

# Lateral Extra-Articular Tenodesis is Cost-Effective in Primary Anterior Cruciate Ligament Reconstruction

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## INTRODUCTION:

Recent data have demonstrated favorable outcomes following anterior cruciate ligament reconstruction (ACLR) with lateral extra-articular tenodesis (LET) augmentation. However, the cost-effectiveness of this procedure compared to ACLR alone is unclear. The purpose of this study was to evaluate the cost-effectiveness of ACLR with LET augmentation in athletes with primary ACL ruptures compared to treatment with ACLR alone.

## METHODS:

A Markov chain Monte Carlo probabilistic model was developed to evaluate the outcomes and costs of 1,000 athletes undergoing ACLR+LET (iliotibial band) compared to ACLR alone. Costs, utility values, graft failure rates, and transition probabilities were derived from existing literature. Targeted meta-analysis of failure rates and patient reported outcomes in randomized controlled trials of ACLR vs. ACLR+LET was performed. Model outcomes included costs, quality-adjusted life-years (QALYs), and the incremental cost-effectiveness ratio (ICER). Sensitivity analyses assessed the cost-effectiveness of ACLR+LET across a range of clinical scenarios.

## RESULTS:

Meta-analysis demonstrated a weighted graft failure rate of 5% (95% CI: 3%-9%) for ACLR+LET compared to 11% (95% CI: 7%-18%) for ACLR alone (relative risk 0.39, 95% CI: 0.27-0.57,  $p < 0.001$ ; Figure 1). Across a five-year treatment horizon, the mean total cost of ACLR alone was \$68,605  $\pm$  \$9,472 compared to \$56,217  $\pm$  \$7,349 for ACLR+LET. ACLR+LET was associated with an additional 1.88  $\pm$  0.30 QALYs compared to 1.54  $\pm$  0.30 QALYs for ACLR alone, and ACLR+LET was determined to be the preferred treatment in 98.1% of patients in the microsimulation model (Figure 2). In sensitivity analyses varying the failure rates of ACLR+LET or ACLR alone, ACLR+LET remained the most cost-effective treatment strategy when increasing the ACLR+LET failure rate up to a failure rate of 11.3% (Figure 3) or decreasing the ACLR alone failure rate down to a failure rate of 4.8% (Figure 4).

## DISCUSSION AND CONCLUSION:

LET augmentation is a cost-effective treatment option for athletic patients undergoing primary ACLR. The results of this Monte Carlo microsimulation suggest that ACLR+LET yields both superior outcomes and lower overall costs than ACLR alone. In sensitivity analysis, we found that only small improvements in graft failure rates were required for LET augmentation to be the favored treatment, suggesting that LET may be a cost-effective treatment option when used even beyond the highest risk athletes.

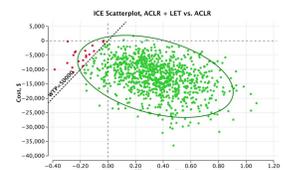
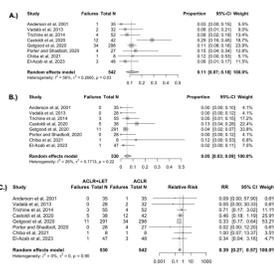


Figure 2. Incremental cost-effectiveness (ICE) scatterplot from the Monte Carlo simulation. At a willingness-to-pay threshold of \$50,000, points (in green) to the right of the dashed willingness-to-pay (WTP) line represent the patients for whom anterior cruciate ligament reconstruction (ACLR) with lateral extra-articular tenodesis (LET) augmentation was the most cost-effective treatment strategy, while patients to the left of the dashed line (in red) represent the patients for whom ACLR alone would have been the most cost-effective strategy. The model's 95% confidence interval is represented by the ellipse.

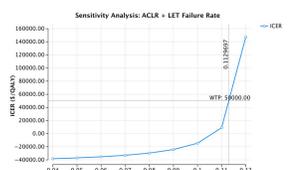


Figure 3. One-way sensitivity analysis assessing the incremental cost effectiveness ratio (ICER) of anterior cruciate ligament reconstruction (ACLR) with lateral extra-articular tenodesis (LET) augmentation compared to ACLR alone as a function of varying ACLR+LET graft failure rates, while holding the literature-observed ACLR alone failure rate constant (i.e., 11.9%). When the ICER becomes greater than the willingness-to-pay (WTP) threshold of \$50,000, ACLR+LET would no longer be considered the more cost-effective treatment strategy compared to ACLR alone. This occurs at an ACLR+LET failure rate of 11.3%. The ACLR+LET failure rate remaining cost-effective even slightly above the ACLR alone failure rate (11.9%) owes to the improved knee function-related quality of life observed with ACLR+LET in the literature.

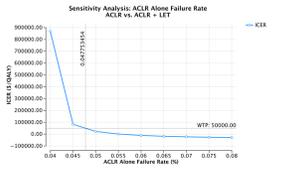


Figure 4. One-way sensitivity analysis assessing the incremental cost effectiveness ratio (ICER) of anterior cruciate ligament reconstruction (ACLR) with lateral extra-articular tenodesis (LET) augmentation compared to ACLR alone as a function of varying ACLR alone graft failure rates, while holding the literature-observed ACLR+LET failure rate constant (i.e., 5.9%). When the ICER becomes greater than the willingness-to-pay (WTP) threshold of \$100,000, ACLR+LET would no longer be considered the more cost-effective treatment strategy compared to ACLR alone. This occurs at an ACLR alone failure rate of 4.8%. The ACLR alone failure rate requiring a failure rate even slightly below the ACLR+LET failure rate (5.9%) to become cost-effective owes to the improved knee function-related quality of life observed with ACLR+LET in the literature.

Figure 1. Random effects meta-analysis of randomized controlled trials with 95% confidence intervals (CI) demonstrating A) weighted graft failure rates for anterior cruciate ligament reconstruction (ACLR) alone and B) ACLR+LET (lateral extra-articular tenodesis (LET) CI) Relative risk (RR) of graft failure between ACLR+LET versus ACLR alone.