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Effect of Lateral Extra-Articular Tenodesis Associated with Primary Anterior Cruciate Ligament Reconstruction on Graft Failure: A Systematic Review and Meta-analysis

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ADMINISTRATIVE INFORMATION**Support** - No support.**Review Stage at time of this submission** - Completed but not published.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202670125**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 30 July 2026 and was last updated on 30 July 2026.**INTRODUCTION**

Review question / Objective The objective of this systematic review and meta-analysis is to determine whether the addition of lateral extra-articular tenodesis (LET) to primary anterior cruciate ligament reconstruction (ACLR) reduces the risk of graft failure compared with isolated ACL reconstruction in patients undergoing primary ACL reconstruction.

Rationale Anterior cruciate ligament (ACL) reconstruction is the standard treatment for restoring knee stability after ACL injury. However, graft failure remains a significant complication, particularly in young and physically active patients. Lateral extra-articular tenodesis (LET) has been proposed as an adjunctive procedure to improve rotational stability and reduce the risk of graft failure. Although several randomized controlled trials have evaluated the effectiveness of LET combined with primary ACL reconstruction, the available evidence has not been consistently synthesized. Therefore, this systematic review and

meta-analysis aims to provide high-quality evidence regarding the effect of LET on graft failure following primary ACL.

Condition being studied Anterior cruciate ligament (ACL) injury requiring primary anterior cruciate ligament reconstruction (ACLR). This review evaluates whether the addition of lateral extra-articular tenodesis (LET) to primary ACL reconstruction reduces graft failure compared with isolated ACL reconstruction.

METHODS

Search strategy A systematic literature search was conducted in ****PubMed (MEDLINE)**** and the ****Cochrane Library**** from database inception to ****30 May 2026****. The search strategy combined Medical Subject Headings (MeSH) and free-text terms related to anterior cruciate ligament reconstruction and lateral extra-articular tenodesis. The following terms were used in different combinations: ****("anterior cruciate ligament" OR "ACL") AND ("reconstruction" OR "anterior**

cruciate ligament reconstruction" OR "ACLR") AND ("lateral extra-articular tenodesis" OR "LET")**. Reference lists of the included studies were also screened to identify additional eligible studies. Only randomized controlled trials published in English were considered for inclusion.

Participant or population Patients with anterior cruciate ligament (ACL) injury undergoing **primary anterior cruciate ligament reconstruction (ACLR)**. Only randomized controlled trials including patients who underwent primary ACL reconstruction with or without lateral extra-articular tenodesis (LET) were eligible for inclusion.

Intervention Primary anterior cruciate ligament reconstruction (ACLR) combined with lateral extra-articular tenodesis (LET), regardless of graft type or surgical technique.

Comparator Isolated primary anterior cruciate ligament reconstruction (ACLR) without lateral extra-articular tenodesis (LET), regardless of graft type or surgical technique.

Study designs to be included Only randomized controlled trials (RCTs) comparing primary anterior cruciate ligament reconstruction (ACLR) combined with lateral extra-articular tenodesis (LET) versus isolated primary ACL reconstruction were included. Observational studies, cohort studies, case-control studies, case series, case reports, narrative reviews, systematic reviews, meta-analyses, cadaveric studies, animal studies, biomechanical studies, conference abstracts, and studies without a comparator group or without data on graft failure were excluded.

Eligibility criteria Studies were eligible if they met the following criteria: (1) randomized controlled trials; (2) included patients undergoing primary anterior cruciate ligament reconstruction (ACLR); (3) compared ACLR combined with lateral extra-articular tenodesis (LET) versus isolated ACLR; and (4) reported graft failure as an outcome. Studies were excluded if they were observational studies, cohort studies, case-control studies, case series, case reports, reviews, meta-analyses, conference abstracts, biomechanical, cadaveric or animal studies, lacked a comparator group, or did not report data on graft failure.

Information sources The electronic databases **PubMed (MEDLINE)** and the **Cochrane Library** were systematically searched from database inception to **30 May 2026**. In addition, the reference lists of all included studies were

manually screened to identify any additional eligible studies.

Main outcome(s) The primary outcome was **graft failure** following primary anterior cruciate ligament reconstruction. Graft failure was defined according to the criteria reported in each included randomized controlled trial. The effect measure was the risk ratio (RR) with a 95% confidence interval (95% CI), and pooled estimates were calculated using a random-effects meta-analysis.

Additional outcome(s) No additional outcomes were pre-specified. The review focused exclusively on graft failure as the primary outcome.

Data management Records retrieved from the database searches were screened for eligibility based on titles, abstracts, and full texts. Data from the included studies were extracted using a standardized data extraction form, including study characteristics, participant demographics, intervention and comparator details, and graft failure outcomes. The extracted data were organized in Microsoft Excel and analyzed using Review Manager (RevMan) software.

Quality assessment / Risk of bias analysis The methodological quality and risk of bias of the included randomized controlled trials were assessed using the **Cochrane Risk of Bias 2 (RoB 2) tool**. The following domains were evaluated: bias arising from the randomization process, deviations from intended interventions, missing outcome data, outcome measurement, and selection of the reported results. Each study was classified as having **low risk of bias**, **some concerns**, or **high risk of bias** according to the RoB 2 guidance. Any disagreements between reviewers were resolved by discussion and consensus.

Strategy of data synthesis Data synthesis was performed using **Review Manager (RevMan)** software. Dichotomous outcomes were analyzed by calculating **risk ratios (RRs)** with **95% confidence intervals (95% CIs)**. A **random-effects model** was used to pool the results across studies. Statistical heterogeneity was assessed using the **I² statistic** and the **Chi-square (χ^2) test**. Where appropriate, the results were presented in forest plots. A p-value < 0.05 was considered statistically significant.

Subgroup analysis No subgroup analyses were planned or performed due to the limited number of eligible randomized controlled trials and the

expected clinical and methodological heterogeneity among the included studies.

Sensitivity analysis No sensitivity analyses were planned or performed because of the limited number of included randomized controlled trials. The robustness of the findings was assessed through the overall meta-analysis and evaluation of statistical heterogeneity using the I^2 statistic.

Language restriction Only studies published in **English** were considered eligible for inclusion.

Country(ies) involved Brazil.

Keywords Anterior cruciate ligament reconstruction; Lateral extra-articular tenodesis; ACL reconstruction; Graft failure; Systematic review; Meta-analysis; Randomized controlled trials.

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