THE ROLE OF ANTEROLATERAL LIGAMENT RECONSTRUCTION OR LATERAL EXTRA-ARTICULAR TENODESIS FOR REVISION ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION: A SYSTEMATIC REVIEW AND META-ANALYSIS OF COMPARATIVE CLINICAL STUDIES

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Faculty Disclosure

- There are no conflicts of interest to disclose
- The study took place at the University Hospitals of Leicester NHS Trust. There was no companies affiliated with this project
- There were no financial aids to support this study

THE ANTEROLATERAL COMPLEX OF THE KNEE

- Renewed interest in the anterolateral complex of the knee
- BM studies stress its importance as a secondary restraint to anterior displacement and tibial internal rotation [1-2]
- Clinically, higher pivot shift and marked anterolateral laxity [3]
- Following widespread success in primary ACLR, use of lateral extra-articular tenodesis (LET) or anterolateral ligament reconstruction (ALLR) has been endorsed in revision surgery.
- Load sharing effects provide a protective element during early rehabilitation. [4]
- Recent consensus meeting of leading experts suggest LET/ALLR should be consider when performing ACL revision [5]

AIMS AND OBJECTIVES

- To perform a systematic review and meta-analysis on clinical comparative studies to investigate wheter revision of augmented ACLR (aACLR) with LET/ALL had superior clinical outcomes and rotational stability compared to revision of isolated ACLR (iACLR)

METHODOLOGY

Literature review

- PRISMA (Preferred Reported Items for Systematic Review and Meta-Analyses) criteria [6]
- Cochrane Controlled Register of Trials, PubMed, Medline and Embase. Inception to 2nd August 2022
- Search items: 'extra-articular' OR 'tenodesis' OR 'anterolateral ligament' OR 'iliotibial' AND 'anterior cruciate ligament' AND 'revision' OR 're-operation'

Eligibility criteria

- Inclusion criteria: clinical comparative studies between revision surgery of aACLR with LET/ALL and iACLR
- Exclusion criteria: primary ACLR, non-human studies, purely biomechanical, case reports, expert opinions and technical tips and publications pertaining to surgical techniques
- PROMS, return to pre-injury level, post-operative rotational stability, failure and complications included

Study selection and Assessment of Quality of Studies

- Independent review of titles and abstracts by two authors (KB and HHC).
- Discrepancies resolved by senior authors (NS, RSA)

- Modified Coleman Methodological Score [7]
- 0 – 100. 85 – 100 -> excellent. 70 – 84 -> good. 55 – 69 -> fair. < 55 poor.
- ROBINS-I for risk of bias [8]

Data Synthesis and Statistical Analysis

- Review Manager 5.4
- Odd Ratio for all dichotomous variables and mean differences for continuous parameters
- P value < 0.1 and I^2 > 50%: statistical heterogeneity -> random effects model. Otherwise fixed effects model used.

RESULTS

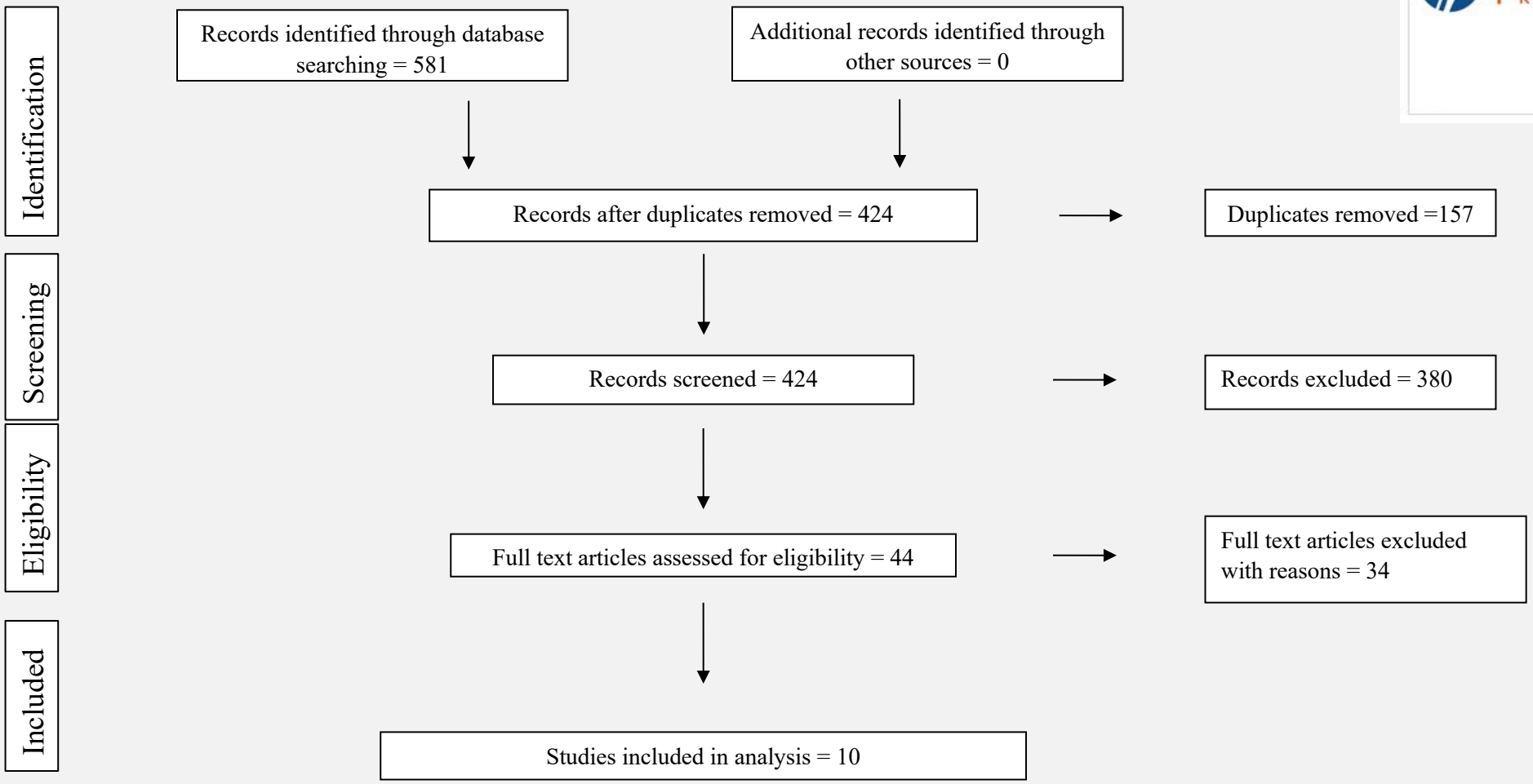

Figure 4. PRISMA flow diagram for study selection

RESULTS

- Overall quality of studies was fair (mean score, 63.2)
- 3 prospective cohorts, 7 retrospective cohort

Baseline characteristics

- Total: 793 patients -> 390 iACLR, 403 aACLR with LET/ALL.
- Mean age and PROMs assessment: 29.2 years and 35 months
- Trauma common cause for failure of primary graft
- Initial primary graft reported in three studies: hamstring commonest
- **4 studies investigated higher-grade pivoting (≥ 2)**
- 5 studies reported on rehabilitation protocol -> differed re. FWB, knee ROM and return to sports (6 to 9 months)
- Meta-analysis for ≥ 4 studies

- Commonest PROMs: subjective International Knee Documentation Score (IKDC), Tegner and Lysholm (7 studies)
- Post-operative Lachmans (6 studies), post-operative pivot shift (7 studies), post-operative side to side difference (6 studies), post operative failure (5 studies)

STUDY RISK OF BIAS ASSESSMENT

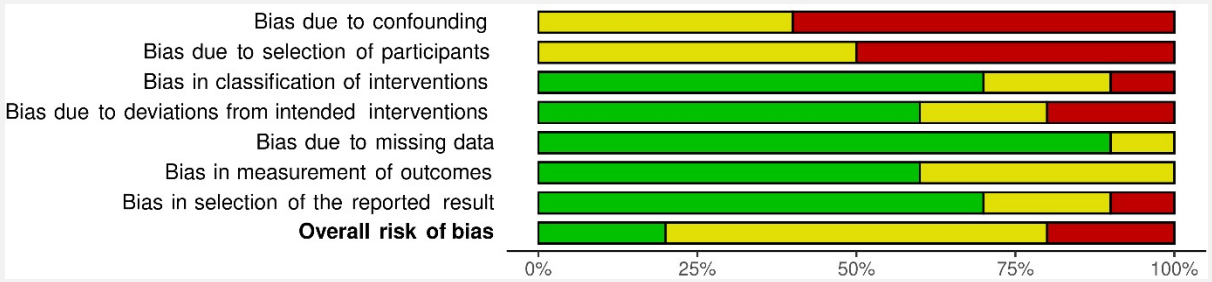

Figure 5. Risk of bias graph

	D1	D2	D3	D4	D5	D6	D7
Trojani 2012	X	X	+	X	+	-	+
Porter 2018	X	X	X	+	+	+	+
DW Lee 2019	-	X	+	+	+	+	+
Alm 2020	X	-	+	+	+	-	-
Ventura 2021	X	-	-	-	+	-	+
Ho Yoon 2021	-	-	+	+	+	+	+
Eggeling 2022	-	X	+	-	+	+	+
Keizer 2022	X	X	+	+	+	+	-
Helito 2022	X	-	+	X	+	-	X
JK Lee 2022	-	-	-	+	-	+	+

Overall risk of bias was moderate to high

Table 2. Risk of bias summary. Red circle, high risk of bias; yellow circle, moderate risk of bias; green circle, low risk of bias. A: Bias due to confounding data (selection bias), B: bias in selection of participants into the study (selection bias), C: bias in classification of interventions (information bias), D: bias due to deviations from intended interventions (performance bias), E: bias due to missing data (attrition data), F: bias in measurement of outcomes (detection bias), G: bias in selection of the reported result (outcome reporting bias)

RESULTS – CLINICAL OUTCOMES AND EXAMINATION

Augmentation with LET/ALL improved post-operative IKDC score, superior rotational stability, lower side to side difference and were less likely to fail

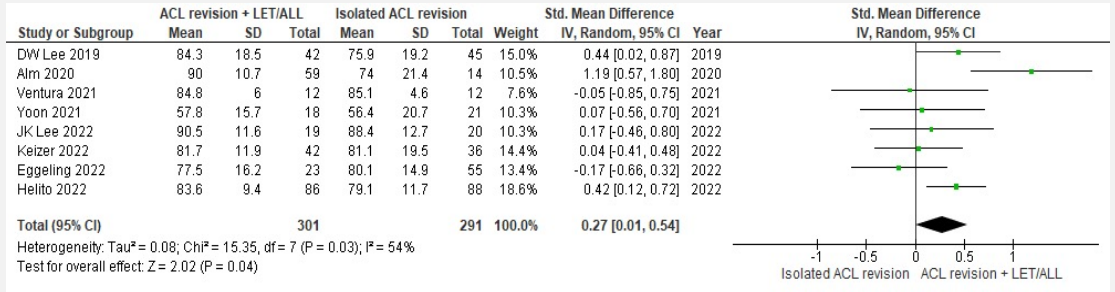

Figure 6. Post-operative IKDC score

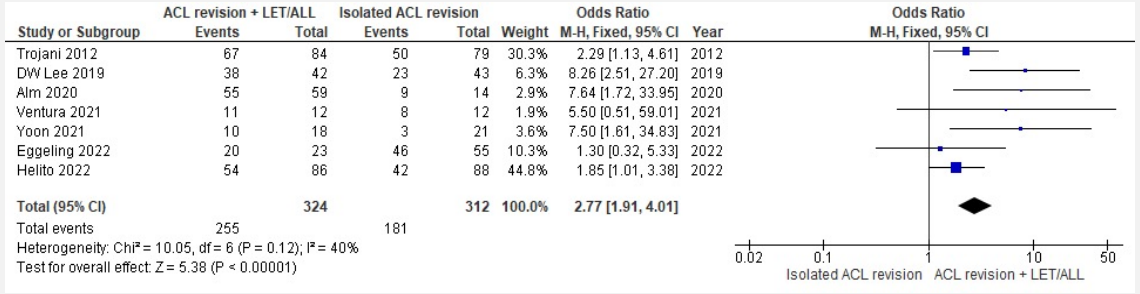

Figure 7. Post-operative negative Pivot shift

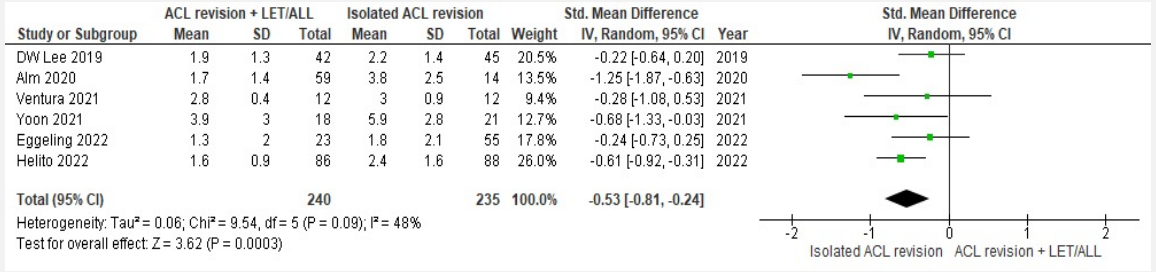

Figure 8. Post-operative side-to-side difference

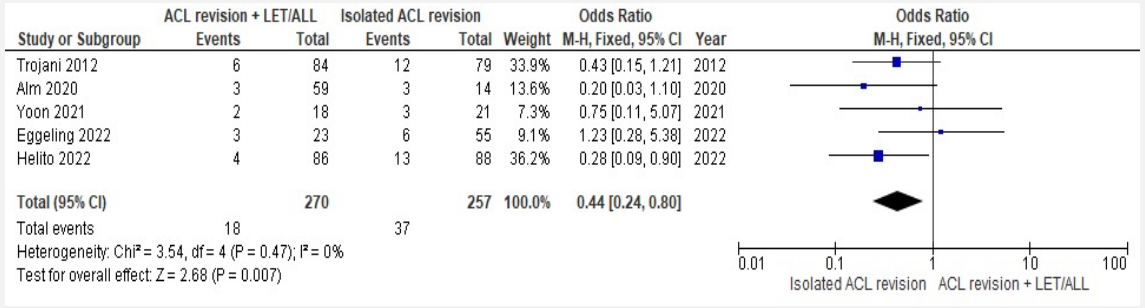

Figure 9. Post-operative failure

RESULTS – PRE-OPERATIVE HIGH GRADE KNEE LAXITY (≥ 2)

Sub-group analysis of those with pre-operative high grade knee laxity revealed even greater performance in post-operative IKDC score and a significant improvement in Lysholm score for the augmentation group

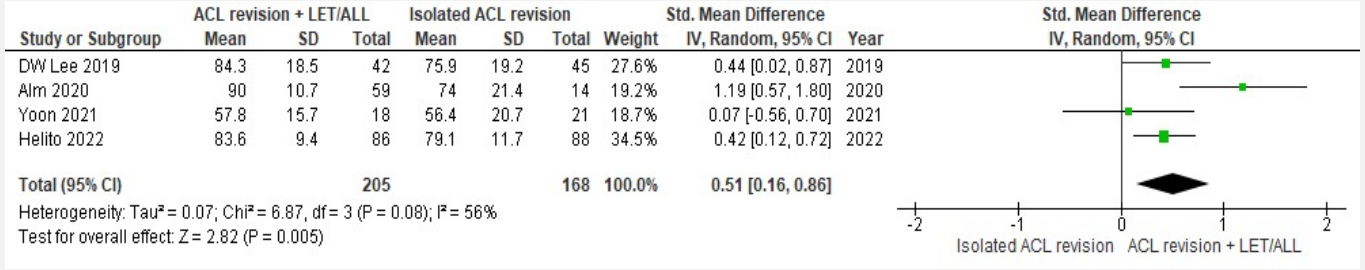

Figure 10. Post operative subjective IKDC

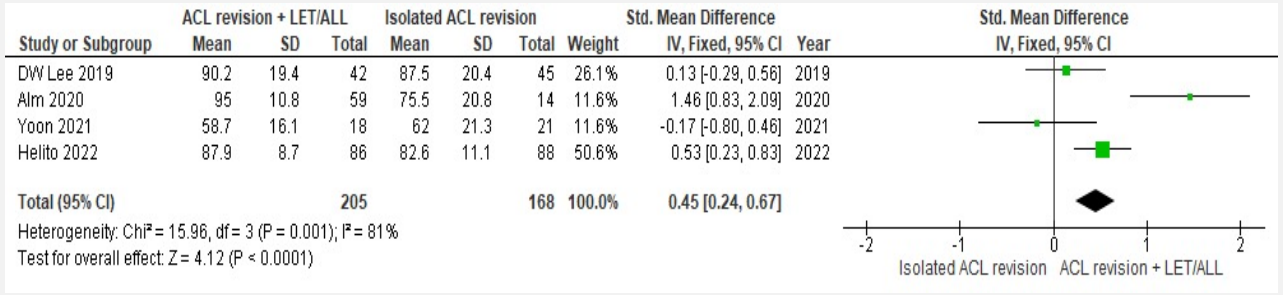

Figure 11. Post-operative Lysholm score

DISCUSSION

- ACL with LET/ALL -> better IKDC score, lower incidence in rotational laxity, greater stability in side-to-side difference and lower failure rates

- Should we perform ALL/LET augmentation in all patients?
- Pre-operative higher grade (≥ 2) laxity -> even further improvement of IKDC score and improved Lysholm score.
- Low grade pivoting < 2 could indicate intact ALL. May explain similar results in other Lysholm and Tegner in all studies.

- Revision ACL surgery is a salvage procedure

- Equal distribution of concomitant injuries, harvesting options and patient-related factors

- Limitations: retrospective designs of studies, short follow up (35 months), subjective measurement for pivot test, differences in rehabilitation between studies

CONCLUSION

- Despite limitations, this meta-analysis provides useful information for clinicians.
- Lateral extra-articular augmentation to a revision ACLR improved subjective IKDC scores, rotational stability and reduced failure rates compared to isolated ACLR revision.
- Although there remains controversy on the necessity of augmenting all revision ACLRs, the current meta-analysis advocates adding a lateral extra-articular procedure in those with a higher-grade pivot shift.

REFERENCES

1. Engebretsen L, Lew WD, Lewis JL, et al. The effect of an iliotibial tenodesis on intraarticular graft forces and knee joint motion. Am J Sports Med. 1990;18(2):169-176.
2. Guenther D, Irarrazaval S, Bell KM, et al. The role of extra-articular tenodesis in combined ACL and anterolateral capsular injury. J Bone Joint Surg Am. 2017;99(19):1654-1660.
3. Monaco E, Ferretti A, Labianca L, et al. Navigated knee kinematics after cutting of the ACL and its secondary restraint. Knee Surg Sports Traumatol Arthrosc. 2012;20(5):870-877:1009-1014.
4. Ferretti A, Conteduca F, Monaco E, et al. Revision anterior cruciate ligament reconstruction with doubled semitendinosus and gracilis tendons and lateral extraarticular reconstruction. J Bone Joint Surg Am 2006;88:2373–2379
5. Musahl V, Getgood A, Neyret P, et al. Contributions of the anterolateral complex and the anterolateral ligament to rotatory knee stability in the setting of ACL injury: a round table discussion. Knee Surg Sports Traumatol Arthrosc. 2017;25(4):997-1008
6. Liberati A, Altman DG, Tetzlaff J, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. J Clin Epidemiol. 2009;6(7):e1000100
7. Coleman BD, Khan KM, Maffulli N, et al. Studies of surgical outcome after patellar tendinopathy: clinical significance of methodological deficiencies and guidelines for future studies. Victorian Institute of Sport Tendon Study Group. Scand J Med Sci Sports. 2000;10:2-11
8. Sterne JA, Hernán MA, Reeves BC, et al. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. BMJ. 2016;355:4–10