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Comparative Outcomes of QT, HT, and BPTB Autografts In Adolescent ACL Reconstruction: A Systematic Review

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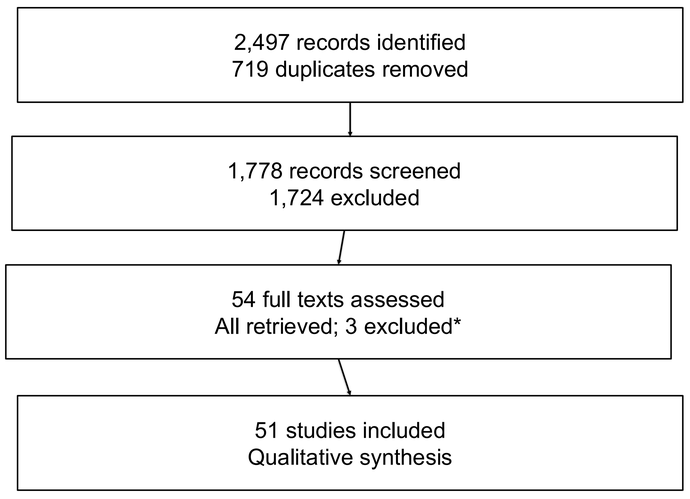
Background

While graft comparisons have been extensively studied in adults, their applicability to adolescents remains unclear. [1]

Objective: Compare quadriceps tendon (QT), hamstring tendon (HT), and bone–patellar tendon–bone (BPTB) autografts in patients under 20 years. Return to sport was the primary outcome; secondary outcomes included graft failure, strength recovery, patient-reported outcomes, and complications.

Methods

- PRISMA 2020 review [2]; PROSPERO CRD42026135276.
- PubMed/MEDLINE, Embase, and Web of Science: March 2006–March 2026.
- Primary QT, HT, or BPTB ACL reconstruction; age <20 years; follow-up ≥6 months.
- Two independent reviewers. Eligible autograft data only. Qualitative synthesis without pooled estimates.



*Full-text exclusions (n=1 each): allograft only, no relevant outcome, and outcomes inseparable from a hybrid arm.



Figure 2. Per-study failure/revision rates. Panel A: [5–8]. Panel B: [3,9–11]. No pooled estimate. Follow-up varies.
Overlapping Norwegian registry cohorts [5,6], not independent replications.

Results

- Evidence: 51 studies (28 HT-only, 3 QT-only, 3 BPTB-only, 17 multiple-graft). No randomized trials.
- Return to sport: No consistent graft-attributable difference. Same-level return: QT 50% vs HT 56% at 24 months, not significant. [3]
- Graft failure: Comparative studies generally favored QT and BPTB over HT (Figure 2). [3,5–11]
- Strength: QT/BPTB quadriceps deficits; HT hamstring deficits. [4,10–12] Within 12 months, 45% of QT vs 81% of HT patients reached ≥90% quadriceps limb symmetry. [4]
- Patient-reported outcomes: Most QT-versus-HT differences were not significant. [3,11]
- Complications: Only 17/51 studies reported complications. No included BPTB study reported anterior knee pain.

Discussion

- Graft selection is best understood as a tradeoff between failure risk and donor-site morbidity. [3–5,9–12]
- Comparisons were limited by predominantly retrospective, HT-dominated evidence, overlapping registry cohorts [5,6], and heterogeneous outcomes. Missing complication reports do not establish absence of harm.
- Risk-of-bias and certainty assessments remain pending.

Conclusion

No consistent graft-attributable return-to-sport difference emerged. Comparative studies generally favored QT/BPTB for failure [3,5–11], while strength deficits followed the harvest site. [4,10–12] Higher-quality prospective studies with standardized outcomes are needed before a single optimal graft can be recommended.

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