

Bone-Patellar Tendon-Bone Autograft Associated With Higher Rates of Long-Term Osteoarthritis Compared to Hamstring Autograft After Anterior Cruciate Ligament Reconstruction: A Systematic Review

Gray W Ricca, Avanish Yendluri, Alexander Yu, Kareem S Mohamed, Dennis Bienstock, Hulaimatu Jalloh, James N Gladstone

INTRODUCTION:

Post-traumatic osteoarthritis (OA) remains a persistent problem following anterior cruciate ligament reconstruction (ACLR) despite successful short-term outcomes. Data comparing long-term development of OA based on ACLR graft type is lacking. The purpose of this study was to systematically review studies that assess outcomes after ACL reconstruction with a minimum 10-year follow-up, with the goal of evaluating long-term rates of OA following ACLR by graft type.

METHODS:

A comprehensive search of PubMed, Embase, and MEDLINE databases was performed to identify relevant studies assessing primary ACLR outcomes stratified by graft type. Studies that reported radiographic OA outcomes and had a minimum follow-up of 10 years were included. Studies were excluded if they included ACLR with significant concomitant orthopaedic procedures that could otherwise impact long-term outcomes (such as multiligamentous knee injuries or peri-articular osteotomies). Additionally, studies that included pediatric patients (exception: standard transphyseal reconstruction), systematic reviews, meta-analyses, and cadaveric/biomechanical studies were excluded. OA outcomes were assessed using standardized grading scales (International Knee Documentation Committee, Kellgren-Lawrence, Fairbank, Ahlbäck, and Jäger-Wirth Classification Scales). The proportion of patients who developed at least moderate OA was calculated for each graft type, based on equivalent OA scoring thresholds. Rates are reported for studies with follow-up of 10+ years, as well as for 15+ years. Chi-square analysis was used to compare OA rates by graft type.

RESULTS:

Of the 47 included studies, 24 examined bone-patellar tendon-bone (BTB) grafts only, 11 evaluated hamstring grafts only, and 12 compared both graft types with a mean follow-up of 14.59 ± 4.55 years. There were no studies that met the inclusion criteria that examined long-term outcomes after a quadriceps tendon graft was used for ACLR. Among patients with ≥ 10 -year follow-up, there were 4,497 knees available for radiographic analysis, with 3,011 undergoing ACLR with BTB autografts and 1,486 with hamstring autografts. The rate of OA was significantly higher for patients undergoing ACLR with BTB (32.2%, 968/3,011) compared to hamstring autograft (18.6%, 277/1,486; $p < 0.001$). For patients with ≥ 15 -year follow-up, there were 2,159 knees analyzed, with 1,531 receiving BTB autografts and 628 receiving hamstring autografts. The rate of OA was significantly higher for BTB (31.7%, 486/1531) compared to hamstring autografts (13.5%, 85/628; $p < 0.001$).

DISCUSSION AND CONCLUSION:

Compared to BTB autografts, hamstring autografts are associated with a significantly lower rate of radiographic OA 10 and 15 years after ACLR. These results emphasize the importance of surgeons weighing both short- and long-term factors when counseling patients on graft type for ACLR and suggest that patients undergoing ACLR with a BTB graft should be cautioned regarding a higher long-term risk of OA relative to other graft types.

Figure 1. PRISMA diagram demonstrating systematic screening and article identification across PubMed, Embase, and MEDLINE databases

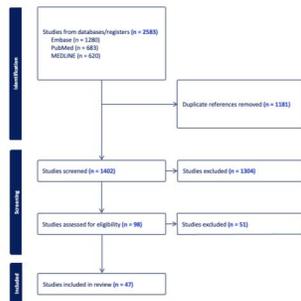


Table 1. Rates of osteoarthritis by graft type for anterior cruciate ligament reconstruction among studies with 10+ and 15+ year follow-up

Minimum follow-up	Total knees	BTB Graft OA % (n/total)	Hamstring Graft OA % (n/total)	p-value
10+ Years	4497	32.2% (968/3011)	18.6% (277/1486)	<0.001
15+ Years	2159	31.7% (486/1531)	13.5% (85/628)	<0.001