

Graft Selection in Anterior Cruciate Ligament Surgery

Who gets what and why?

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KEYWORDS

• ACL • Allograft • Autograft • Anterior cruciate ligament • Graft selection

KEY POINTS

- Rupture of an anterior cruciate ligament graft is a devastating complication.
- Surgeon preference significantly influences graft choice.
- Autograft provides superior outcomes to allograft in the young, active patient population.
- Bone-patella tendon-bone and hamstring tendon autograft provide equivalent outcomes based on the best available evidence.

INTRODUCTION

Anterior cruciate ligament (ACL) tears are a common orthopedic injury, most frequently affecting young and active patients.¹ For those interested in returning to high-level athletic competition, arthroscopic ACL reconstruction has become the standard of care, with nearly 200,000 ACL reconstruction procedures performed annually in the United States.² Since the first described report of ACL reconstruction in the early 1900s,^{3,4} the amount and quality of research on this topic has expanded exponentially. This research has led to improved understanding of ACL anatomy and function as well as refinement of surgical techniques. Despite the vast amount of research, a great deal of debate still surrounds graft choice during ACL reconstruction and the effect of graft choice on subsequent graft failure.

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Recently performed prospective cohort studies have allowed us to recognize patient and surgical factors that predict graft failure following ACL reconstruction.⁵⁻⁸ Younger patient age, increased activity level, and the use of allograft have all been consistently identified as risk factors for ACL reconstruction graft failure.^{5,6,9-11} Of these factors, graft choice is the only modifiable surgical factor for young, active patients who wish to return to competitive sport. As a result, a great deal of time is often spent counseling patients and their families on the risks and benefits associated with various graft options. Given that the surgeon's recommendation remains the primary influence on patients' graft choice,¹² it is imperative that orthopedic surgeons who routinely perform ACL reconstruction not only fully understand graft options but also the goals and nonmodifiable risk factors for patients that can affect their outcomes.

Using the best available evidence, the authors aim to describe the influence of graft choice on outcomes following ACL reconstruction for skeletally mature patients. In doing so, the authors hope to clarify graft options for a diverse patient population, ranging from the competitive high school, college, or professional athlete to the active adult, all of whom have unique goals and risks that must be considered when planning for ACL reconstruction.

MEASURING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION OUTCOMES

In order to assess outcomes following ACL reconstruction, it is important to understand the primary end point of interest or, in simpler terms, to understand what is considered a success or failure. The goal of ACL reconstruction is to restore stability of the knee in order to reduce the risk of subsequent articular cartilage and meniscal injury. Throughout the literature, graft failure following ACL reconstruction is the most consistently reported variable; however, this dichotomous outcome fails to address the primary goal of ACL reconstruction. Additionally, this outcome does not acknowledge other outcomes that are important in this active patient population, such as return to sport, activity level, KT-1000 arthrometer laxity measurements, special physical examination tests, and range-of-motion testing.

As health care enters the value-based era, patient-reported outcome measures have become commonplace for a variety of musculoskeletal procedures.^{13,14} Although there was initially some thought that these so-called subjective outcome measures were inferior to objective clinician measurements when assessing ACL reconstruction,¹⁵ in reality, the validity of patient-reported outcome measures may better predict return to high-level activity or improved overall health as compared with more objective historical measures.¹⁶ Sorting through the numerous general health and disease-specific outcome measures that have been used to report ACL reconstruction can be arduous,^{17,18} and inconsistent reporting of measures can make comparing studies difficult. Additionally, the high frequency of concomitant articular cartilage and meniscal injuries that occur at the time of the ACL injury have been shown to significantly influence outcomes following ACL reconstruction, making it difficult to isolate the effect of ACL reconstruction alone.^{19,20} Recent recommendations suggest that a combination of special physical examination tests, activity measures, and patient-reported outcome measures may improve the assessment of ACL reconstruction²¹; but most of the existing literature fails to incorporate all of these recommended measures.

Although the aforementioned issues can make interpretation of the ACL reconstruction literature difficult, it is important to consider when critically analyzing the literature. Although graft failure remains the most consistently reported outcome in high-level studies comparing the influence of graft choice following ACL reconstruction, more recent studies have recognized the importance of including validated

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