The Role of an Extraarticular Tenodesis in Revision of Anterior Cruciate Ligament Reconstruction

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KEYWORDS

• High-grade laxity • Pivot shift • Iliotibial tract • Anterolateral ligament • ACL revision • Extraarticular tenodesis

KEY POINTS

- Despite modern techniques and a technically well-positioned anterior cruciate ligament (ACL) graft, failure can still occur.
- Patients with high-grade ligamentous laxity are at increased risk for ACL graft failure.
- Iliotibial tract tenodesis should be considered as an ACL revision adjunct in select patients.
- Anterolateral ligament reconstruction or lateral extraarticular tenodesis is contraindicated in patients with posterolateral corner injuries or lateral compartment degenerative joint disease.

INTRODUCTION

Although an intraarticular anterior cruciate ligament (ACL)reconstruction using current methods can be expected to result in a reliable knee and allow return to activities as desired,[1–3] some patients will experience graft failure[4,5] and require revision surgery.[6–10] Although most failures are secondary to technical errors, a subset of patients will have residual objective or subjective instability expressed by a persistent pivot shift or lateral rotatory instability despite a well-positioned graft of appropriate size and managed with an acceptable postoperative rehabilitation program.[11,12] When assessing revision options for this group of reconstruction failures,[13–16] those patients with generalized joint laxity[17,18] and revisions requiring the use of soft tissue grafts, the addition of a lateral extraarticular tenodesis should be considered as a possible adjunct to the intraarticular revision component of the procedure.[19–23] A lateral stabilization procedure should not be used to supplement the intraarticular

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Clin Sports Med ■ (2017) ■–■
http://dx.doi.org/10.1016/j.csm.2017.07.010
sportsmed.theclinics.com

component of the revision in patients with posterolateral corner injuries[15] and lateral compartment articular compromise.[24–26] Regardless of the extraarticular procedure selected, just as with the intraarticular revision, the impact of prior surgical approaches, skin quality, retained hardware, bone loss, and the intraarticular revision itself may impact the feasibility and value of the extraarticular supplement.[2,27–31] The addition of an extraarticular procedure, although not a "cure all" for ACL revision challenges, may be the adjunctive reconstruction component necessary to provide sufficient improvement in rotational stability that leads to an improved functional outcome for a select subset of patients.

In the United States, it is estimated that approximately 175,000 to 330,000 ACL injuries occur per year with 75 to 100,000 ACL reconstructions performed annually.[1,32] Acceptable outcomes for ACL reconstructions using current surgical techniques are reported in between 75% and 90%[1–3] of primary ACL procedures.

Although intraarticular reconstructions are associated with generally acceptable outcomes,[1–3,33] as reflected by improvement in laxity and return to activities, International Knee Documentation Committee scores after reconstruction are generally between 80% and 95%[1] with persistent instability reported in 11% to 30% of patients and dissatisfaction after reconstruction is often associated with a residual positive pivot shift or complaints of abnormal mechanics during activities.[34–38]Biau and colleagues[39] reported that 32% of autograft ACL reconstructions had a persistent positive Lachman test and 22% had a positive Pivot after reconstruction. The MOON group has reported a 4.4% failure rate at 2 years and progression to 7.7% at 6 years.[4,5] Failure to restore joint kinematics is higher than generally expected and the actual incidence of reconstruction failure, for a variety of reasons, is most likely underreported.[40]

Tibor's review of trends in ACL techniques from 2007 to 2014 quotes a consistent rate of revision at 2.3%, despite the evolution in preferred operative techniques[8,9] during this time frame.[41] The rate of ACL reconstruction revision is reported to range from 3.1% according to the Swedish National Registry Study of 17,000 plus reconstructions[6] to 4.1% rate of revision according to the Danish registry[10] and as high as 8.4% as reported by Yabroudi and colleagues.[7] These estimated rates of revision range from as few as 3000 to as many as 10,000 ACL revision procedures per year.[42,43]

As described by several authors, failure can be defined in a number of manners, including pain, stiffness, extensor mechanism dysfunction, infection,[44,45] inability to return to sports,[46] and, for the purposes of this discussion, objective laxity or patient perception of residual instability when performing sports or daily activities.[2] Although residual laxity or instability is most commonly associated with graft failure owing to technical causes[47] (and reported in as many as 77%-95% of failures seen within 6 months of surgery),[32] unrecognized or untreated associated instability increases the load on the ACL graft during the early healing and revascularization phase with the potential for graft compromise.[2] Untreated ligamentous laxity has been reported to occur in 7%[47] to 15% of ACL graft failures.[48] The most common associated ligamentous injury is medial collateral ligament injury seen in 20% of knees with an ACL injury[49] and posterolateral corner injuries are reported in up to 15% of chronic ACL-deficient knees.[50] However, the presence of residual lateral rotational instability, as defined by the presence of a persistent pivot shift, has been the instability pattern often linked to patient dissatisfaction and associated compromises in ability to return to sports.[51]

A well-performed ACL reconstruction, using current techniques of graft placement and appropriate graft selection, can be expected to lead to control of the pivot shift[1] in the presence of intact lateral structures.[13] It is, however, recognized that, despite the