Surgical Indications and Technique for Anterior Cruciate Ligament Reconstruction Combined with Lateral Extra-articular Tenodesis or Anterolateral Ligament Reconstruction

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KEYWORDS

- Anterior cruciate ligament (ACL) • ACL reconstruction
- Lateral extra-articular tenodesis (LET) • Anterolateral ligament (ALL)

KEY POINTS

- After anterior cruciate ligament (ACL) rupture, anteroposterior and rotational instability in the knee causes clinical symptoms and possible secondary intra-articular damage.
- ACL reconstruction techniques evolved over time, trying to recreate anatomy as much as possible and address residual laxity.
- Recently, more attention has gone to combined intra-articular and extra-articular reconstruction types, in an attempt to better control rotational laxity and the pivot shift phenomenon.
- Biomechanical and clinical studies are being performed, to evaluate if the newer techniques result in superior clinical outcomes, without possible detrimental effects on the intra-articular cartilage.
- Lateral extra-articular tenodesis or anterolateral ligament reconstructions can be indicated in certain clinical settings. Clinical efficiency is not yet completely proven however.

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INTRODUCTION

Anterior cruciate ligament (ACL) ruptures result in anterior and rotational laxity of the proximal tibia relative to the distal femur. With surgical treatment, the aim is to stabilize the knee to prevent further injury to articular cartilage and the menisci and to maximize patient function in activities of daily life and sports activity.

Historically, ACL ruptures were treated surgically by isolated extra-articular tenodesis, as described by Lemaire and Ireland, among many others.[1,2] These techniques effectively limited the rotational laxity, but provided only moderate control of the anterior translation. The overall long-term results of isolated extra-articular tenodesis are poor, with only half of the patients reporting good to excellent outcomes.[3] Moreover, increased degenerative changes of the lateral tibiofemoral compartment have been described after these procedures, possibly due to overtensioning of the graft leading to overconstraint of this compartment.[4]

The extra-articular tenodesis was largely abandoned when single-bundle, intra-articular ACL reconstruction became the gold standard. The original single-bundle reconstruction consisted of a vertical graft position resulting in poor rotational control, with some patients experiencing persistent rotatory laxity.[3,5,6]

Double-bundle ACL reconstruction was subsequently developed in the early 2000s, with the concept of the additional posterolateral bundle to the more standard anteromedial graft, better controlling rotation. Because it is technically more difficult and it did not show better clinical outcomes, the double-bundle technique has since lost popularity.[3,6]

Currently, anatomic single-bundle ACL reconstruction, with a more oblique orientation of the graft and tunnel positioning in the anatomic footprint on the femoral and tibial insertion points, is considered the gold standard. This technique results in good to excellent outcomes in most patients.[3]

However, even in the face of a well-perfumed single-bundle or double-bundle ACL reconstruction, rotational laxity has been demonstrated to persist. Two metaanalyses by Prodromos and colleagues[7] (2005) and Mohtadi[8] (2008) showed that up to 34% and 22% of patients, respectively, continue to have a positive pivot shift, the presence of which has been correlated with worsening outome.[9] This is one reason that has led to a greater interest in the anterolateral side of the knee.

Detailed anatomy of the structures at the anterolateral side of the knee have recently been described, with particular attention on the anterolateral ligament (ALL).[10–13] However, other structures have been identified as having an important role in controlling anterolateral rotational laxity, and, as such, newer techniques are being developed to reproduce original anatomy as close as possible. However, clinical advantages of these new reconstructive techniques are yet to be shown to be efficacious.

ANATOMY

The ACL is a primary restraint to anterior translation and contributes to restraint of internal tibial rotation and varus/valgus laxity. It has been described as being composed of 2 bundles, each having a different kinematic role: the anteromedial (AM) and posterolateral (PL) bundles, which are taut in flexion and extension, respectively. The AM bundle is more dominant in controlling anteroposterior stability, the PL bundle more in controlling rotational stability. The noncontact mechanism of injury involves a combination of forces, but has been described as similar to those forces involved in the pivot shift test: an axial load on the lateral compartment with a valgus force as the knee moves from flexion to extension.[14] This mechanism results in the pathognomonic bone bruising of the posterior aspect of the lateral tibial plateau and