

# Lateral Extra-Articular Tenodesis via an All-Suture Anchor

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**Background:** In young patients, anterior cruciate ligament (ACL) reconstruction often results in graft failure. This may be due, in part, to concomitant injury to anterolateral complex (ALC) of the knee leading to rotatory laxity. The modified Lemaire lateral extra-articular tenodesis (LET) technique is intended to address the anterolateral rotatory instability due to injury to the ALC and to protect the ACL graft and meniscus.

**Indications:** The International Anterolateral Complex Consensus Group Meeting identified 4 appropriate indications for the modified Lemaire LET procedure: revision ACL, high-grade pivot shift, generalized ligamentous laxity/genu recurvatum, and young patients returning to pivoting activities.

**Technique Description:** The technique consists of harvesting an 8-cm long by 1-cm wide graft from the iliotibial band. The graft is released proximally and remains attached distally to Gerdy's tubercle. The graft is then passed deep to the lateral collateral ligament (LCL) from distal to proximal. The graft is then affixed to a point proximal and posterior to the lateral femoral epicondyle with an all-suture button. The graft is then tensioned with knee at 30° of flexion and neutral rotation, and then secured in place.

**Results:** With the modified Lemaire LET, there was previously concern for overconstraint and lateral compartment degeneration. However, recent studies have shown that there is no increased risk for these complications with the LET procedure. The STABILITY trial found that the addition of LET to ACL reconstruction significantly reduces re-rupture and residual laxity when compared with ACL reconstruction alone. Moreover, the addition of LET to ACL reconstruction can restore native knee kinematics.

**Conclusion:** The addition of the modified Lemaire LET technique to traditional ACL reconstruction is a safe and effective adjunct that reduces the occurrence of graft rupture, addresses residual rotational laxity, and can restore native knee kinematics in appropriately indicated patient populations.

**Patient Consent Disclosure Statement:** The author(s) attests that consent has been obtained from any patient(s) appearing in this publication. If the individual may be identifiable, the author(s) has included a statement of release or other written form of approval from the patient(s) with this submission for publication.

**Keywords:** revision ACL; anterolateral ligament complex; lateral extra-articular tenodesis; anterior cruciate ligament; modified lemaire LET

## VIDEO TRANSCRIPT

The following video covers our technique for a modified Lemaire lateral extra-articular tenodesis (LET).

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Our relevant disclosures are listed here.

The following is a brief overview of what will be discussed in this video.

Biomechanical studies have shown that anterior cruciate ligament (ACL) reconstruction alone does not restore native rotational knee kinematics.<sup>5</sup> Moreover, graft failure rates after ACL reconstruction in young patients are estimated to be as high as 18%.<sup>9</sup>

These outcomes may be due, in part, to rotatory laxity after completion of their ACL reconstruction due to concomitant injury to anterolateral structures of the knee.<sup>5</sup> Injuries to both the ACL and anterolateral structures are common—in a recent study by Ferretti et al,<sup>3</sup> 54 of 60 patients with ACL injury also had some level of macroscopic injury to the anterolateral complex. In combined injuries to the ACL and anterolateral complex, many patients continue to have knee laxity after only ACL reconstruction.<sup>1</sup> Rotatory laxity is correlated with poor clinical outcomes, graft failure, and need for revision.<sup>5</sup>



The modified Lemaire lateral extra-articular tenodesis (LET) technique is intended to help assist with anterolateral rotatory instability upon injury to the anterolateral complex and to protect the ACL graft and meniscus.<sup>6</sup>

The anterolateral complex is a set of structures most important to the prevention of internal tibial rotation at the knee.<sup>10</sup> The ALC consists of the superficial and deep iliotibial (IT) band, capsulo-osseous layer of the IT band and Kaplan fibers, the anterolateral capsule, including the mid-third capsular ligament, and the anterolateral ligament (ALL).<sup>5,7</sup>

Current indications for LET were developed from the International Anterolateral Complex Consensus Group Meeting in 2017. The group outlined 4 appropriate indications: revision ACL, high-grade pivot shift, generalized ligamentous laxity/genu recurvatum, and young patients returning to pivoting activities.<sup>4</sup>

Our patient is a healthy 18-year-old woman who presented for evaluation of her left knee. The patient reports a rugby-related injury to her left knee 7 months after a hard tackle. X-rays at the time were unremarkable for fracture or dislocation. She had a delay in presentation to our clinic, and had been managing her injury with compression, non-steroidal anti-inflammatory drugs (NSAIDs), and ice, but her left knee pain and feelings of instability continued to worsen.

Examination of her left knee demonstrated a 2+ effusion, tenderness to palpation about the medial joint line, active range of motion (ROM) from 0° to 120° of flexion, stable varus and valgus stress tests, positive Lachman test, positive pivot shift, and 5/5 left quadriceps strength. Patient is neurovascularly intact in her left lower extremity.

Magnetic resonance imaging was ordered for further evaluation. The anterior cruciate ligament was found to be completely ruptured, as shown by the ligament's deformity and increased signal intensity. A ramp lesion of the medial meniscus was also observed as indicated by the vertically oriented linear intermediate signal intensity along and within the peripheral fibers of the posterior horn of the medial meniscus. No additional injuries were observed on imaging.

The patient was counseled on her treatment plan and consent was given to proceed with ACL reconstruction, medial meniscus repair, and modified Lemaire lateral extra-articular tenodesis (LET).

The patient met specific criteria as laid out by the International Anterolateral Complex Consensus Group Meeting. The patient exhibited a high-grade pivot shift and is a young female athlete looking to return to rugby, which is inherently a high-impact sport that relies on pivoting movements.

ACL reconstruction with quadriceps tendon autograft and medial meniscal repair were completed before the modified Lemaire lateral extra-articular tenodesis (LET) was performed.

The patient had a grade 2B Lachman test as well as a positive pivot shift test on preoperative examination under anesthesia.

The patient was positioned supine on a standard operating room table. A 4-cm incision was made extending proximally from just distal to the lateral femoral condyle in line with the IT band. The dissection was carried down to the IT band.

An IT band graft was measured to be 8-cm long by 1-cm wide. Our preferred method for ACL reconstruction involves suspensory fixation on the femoral side, and the incision required for this type of fixation on the IT band is incorporated during graft harvest. Our goal is to be in the posterior one-thirds of the IT band with graft harvest. The graft was released proximally and left attached to Gerdy tubercle distally. The graft was then whipstitched using a #2 Fiberloop suture.

The lateral collateral ligament (LCL) was then identified attached to the lateral epicondyle, within the IT band window that we had created with graft harvest. The graft was passed deep to the LCL from distal to proximal using a right-angle clamp.

A point was selected just proximal and posterior to the lateral femoral epicondyle for graft fixation. Bleeding bony surface was prepared. A 2.6-mm pilot hole for an all-suture Arthrex (Naples, FL) Fibertak button was drilled, and button was seated.

Sutures on the graft were shuttled through the button using the included 2-0 Fiberlink sutures. The graft was tensioned with the knee in 30° of flexion and neutral rotation. A free needle was used to pass one limb of the sutures through the graft. A knot was tied to secure it in place. Graft was examined while taking the knee through gentle ROM to evaluate for laxity.

The wound was then copiously irrigated and closed with a running locking 0-Vicryl suture for the IT band split. Skin was closed with buried 2-0 Vicryl and interrupted 3-0 nylon sutures.

Our preferred postoperative protocol for the modified Lemaire LET procedure is the same as an ACL reconstruction, which involves immediate postoperative weight-bearing with a ROM knee brace locked in extension. For this patient, weight-bearing was restricted due to her meniscus repair. She was made partial weight-bearing for 4 weeks with her knee locked in extension. When the patient is non-weight-bearing, the brace can be unlocked to allow ROM from 0° to 90°. After 4 weeks, she was allowed to be weight-bearing as tolerated.

A potential concern for the modified Lemaire LET technique is overconstraint of the anterolateral compartment, although there is no clear consensus of this.<sup>10</sup> More recent literature, by Spencer et al<sup>8</sup> and Williams et al,<sup>10</sup> found that LET did not lead to this complication.

Current practices to avoid overconstraint recommend holding the LET graft taut during femoral fixation and to apply approximately 20 N, with the foot at neutral rotation, and the knee flexed to 30°.

The concern for overconstraint of the lateral compartment also lends to fears of lateral compartment degeneration.<sup>2</sup> This is in addition to the concerns for knee osteoarthritis after ACL rupture, which are estimated to be as high as 50% at 10 to 20 years after reconstruction.<sup>2</sup>

However, per a recent systematic review by Devitt et al,<sup>2</sup> there is no increase in the long-term rates of osteoarthritis with the addition of LET to ACL reconstruction.

Based on the results of the STABILITY trial, the addition of LET to ACL reconstruction significantly reduced re-rupture and residual rotatory laxity postoperatively when compared with ACL reconstruction alone.<sup>5</sup> In addition, the STABILITY trial found that concomitant LET during ACL reconstruction can restore normal knee kinematics.<sup>5</sup>

Current evidence suggests that a LET in addition to traditional ACL reconstruction techniques is a safe and effective adjunct.

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