



# Lateral Tenodesis Associated With an Intra-articular Anterior Cruciate Ligament Reconstruction Without Proximal Disinsertion of Iliotibial Band

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**Abstract:** The persistence of rotational instability after anterior cruciate ligament (ACL) reconstruction has been studied by several authors in the past 10 years. Although ACL lesions are currently treated arthroscopically, in the recent past, they were treated with isolated extra-articular tenodesis alone. Understanding the role and importance of anterolateral structures in the pathophysiology of rotational knee instability has increased since the rediscovery of the anterolateral ligament, and combined intra- and extra-articular reconstructions have been increasingly investigated. We sought to describe an option of lateral tenodesis associated with the ACL reconstruction through an iliotibial band tenodesis, without the need for large incisions or extra fixation devices, in a simple, fast, and reproducible manner.

## Introduction

The persistence of rotational instability after anterior cruciate ligament (ACL) reconstruction (ACLR) has been studied by several authors in the past 10 years. Among the main causes of failure, we highlight poor positioning of the tunnels,<sup>1</sup> untreated meniscal root lesions,<sup>2</sup> ramp lesions in the medial meniscus,<sup>3</sup> and anterolateral ligament complex lesions.<sup>4,5</sup> The recurrence or persistence of instability after ACLR varies between 0.7% and 20%.<sup>6</sup>

In the recent past, ACL lesions in the knees were treated with isolated extra-articular tenodesis alone.<sup>7</sup> Such reconstructions showed only moderate

improvement in instability caused by ACL rupture, and with the advent of intra-articular reconstruction techniques, such procedures have fallen into disuse.<sup>7</sup>

Understanding the role and importance of anterolateral structures in the pathophysiology of rotational knee instability has increased since the rediscovery of the anterolateral ligament<sup>8</sup> a few years ago; since then, lateral tenodesis and anatomic anterolateral ligament reconstruction techniques have improved.<sup>9-11</sup>

Our objective is to describe an option of lateral tenodesis associated with the ACLR through an iliotibial band (ITB) tenodesis, without the need for large incisions or extra fixation devices, in a simple, fast, and reproducible manner.

## Surgical Technique

The surgery was performed with patients in the dorsal decubitus position, with a positioner fixed to the surgical table, placed at the level of proximal third of the thigh to achieve intraoperative valgus of the knee. Chlorhexidine detergent was used for skin asepsis preparation, and alcoholic chlorhexidine was used for antisepsis skin preparation. The surgery was performed under spinal anesthesia and femoral nerve block. The limb was exsanguinated, and the tourniquet was inflated to 300 mm Hg.

With a standard technique, the gracilis and semitendinosus tendons were excised, and a quadruple graft

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**Table 1.** Advantages and Disadvantages

|                      | Advantages                                                                                                                                           | Disadvantages                                                               |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Femoral tunnel       | Use of the same femoral tunnel for ACL fixation and ITB tenodesis                                                                                    | Poor positioning of the ACL tunnel compromises the positioning of tenodesis |
| ITB tenodesis        | Do not need to pass the ITB under the LCL, being technically easier to perform; fast and reproducible technique; needs just a small lateral incision | Theoretical biomechanical disadvantage                                      |
| ITB femoral fixation | Femoral fixation of the ITB with the own ACL graft wires, exempt from the use of additional fixation material; less expensive technique.             | Femoral fixation of the ACL graft must be performed with interference screw |

ACL, anterior cruciate ligament; ITB, iliotibial band; LCL, lateral collateral ligament.

was prepared, with the use of Ethibond No. 2 sutures (Ethibond, Somerville, NJ). We placed Krackow-type sutures at their free margins and a bow with Ethibond No. 2 in the fold of these tendons, which served to draw the graft through the tibial tunnel. The 4 legs of the Ethibond sutures to the tendons were used in the tenodesis of ITB. We measured the diameter of the graft to determine the diameter of the tunnel drill bit.

We performed a 3-cm lateral longitudinal incision at the level of the lateral femoral epicondyle (Figure 1A). Then, we identified the iliotibial tract and, initially with a No. 11 scalpel, we made 2 parallel 10-mm-wide incisions in the ITB (Figure 1B). With the use of Metzenbaum scissors, we extended these incisions up to the Gerdy tubercle, and we did not perform proximal disinsertion of the ITB (Figure 1C).

We created anterolateral and anteromedial arthroscopic portals, and the intra-articular inspection was performed in the traditional manner. The tibial tunnel of the ACLR was made with transtibial guidance between the tibial spines, near and posterior to the anterior horn of the lateral meniscus, with the same diameter as the graft.

With the knee at 90°, the femoral tunnel, with the same diameter as the graft, following the concept of anatomic reconstruction, was performed outside-in,

with its own guide, and the entry point of the guide-wire was positioned 5 mm proximal and posterior to the lateral femoral epicondyle and posterior to the Lemaire vessels, using the previous access of ITB dissection (Figure 2). The femoral guide inside the joint was placed in the anatomic footprint of the ACL, leaving an about 3-mm posterior wall.

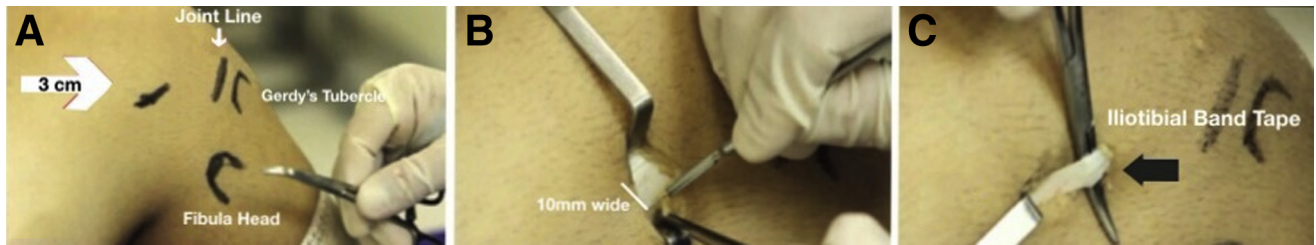
Via arthroscopic visualization, a folded Ethibond wire was introduced through the femoral tunnel, pulled through the tibial tunnel, and used to bring the 4 Ethibond legs sutured into the ACL graft from the entrance of the tibial tunnel to the exit of the femoral tunnel. This served to draw the graft traction wire into the tunnels and allow it to be drawn into the joint, starting from the tibial tunnel to the femoral tunnel. An interference screw (Traumedica, São Paulo, Brazil) 1 number below the tunnel diameter was used for femoral graft fixation and another screw 1 number above the tunnel diameter was used for tibial graft fixation.

Then, the suture strands of the graft were fixed in the femoral tunnel. At this time, 2 of the legs of these traction wires were sutured through the body of the graft and the other 2 legs embraced the previously dissected ITB tape and then were tied (Figure 3). The tenodesis was made with the limb at 30° of flexion and neutral rotation (Video 1).

**Table 2.** Risks and Limitations

|                        | Caution                                                                                                          | Risk                                                                                                                | Limitations                                                                           |
|------------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Femoral tunnel         | At the moment of performing the femoral tunnel, protect ITB graft so that it is not damaged by the femoral drill | Rupture of the ITB graft on contact with the rotating femoral drill                                                 | This technique can only be performed with the femoral tunnel made from the outside-in |
| Preparation of the ITB | Remove structures deeper than the ITB at the time of making the parallel incisions into it                       | LCL injury when preparing the tape of the iliotibial band                                                           | Requires proximal region of ITB tape tenodesis to be intact                           |
| ITB tenodeses          | Perform tenodesis with flexed knee at 30° and neutral rotation                                                   | Increase in lateral compartment constriction, predisposing to early osteoarthritis; loss of some degrees of flexion |                                                                                       |

ACL, anterior cruciate ligament; ITB, iliotibial band; LCL, lateral collateral ligament.



**Fig 1.** The operative limb was the right limb, and the patient was positioned in the dorsal decubitus. (A) Landmarks of lateral incision at about 3 cm of extension, fibular head, joint line, and Gerdy tubercle are marked to facilitate surgical access. (B) We identified the iliotibial band and, initially with a No. 11 scalpel, we made a tape of the ITB through 2 parallel 10-mm-wide incisions in the ITB. (C) Tape of ITB without proximal disinsertion.

## Discussion

To improve rotational control and reduce failure rates, the indications of associated anatomic or nonanatomic reconstruction techniques from the anterolateral periphery to the intra-articular reconstructions of the ACL have broadly expanded. Some of the main indications are Second fracture, high-grade pivot shift, ligament hyperfouling, sportsmen requiring pivotal movements of the knees, and revision surgeries.<sup>12,13</sup>

Two recent systematic reviews have shown that extra-articular procedures combined with ACLR are more effective than isolated intra-articular procedures in patients with high-grade pivot shift.<sup>14,15</sup>

Several lateral tenodesis techniques using ITB have been described, many of them requiring extra fixation devices, making surgery more expensive and less viable, especially in countries with a lower level of economic development.

Although the techniques in which the ITB graft passes under the lateral collateral ligament have a biomechanical justification for their execution, they are technically more demanding and there is a risk of lateral collateral ligament (LCL) injury.<sup>16</sup> Our surgical technique does not require any extra fixation device because it uses the ACL traction wires to anchor the ITB. Because there is no need to dissect the LCL, we used a 3-cm access, which is a little larger than we would use for perforation of the femoral tunnel of the ACLR isolated from the outside to the inside (Figure 4). The advantages and disadvantages related to our technique are shown in Table 1.

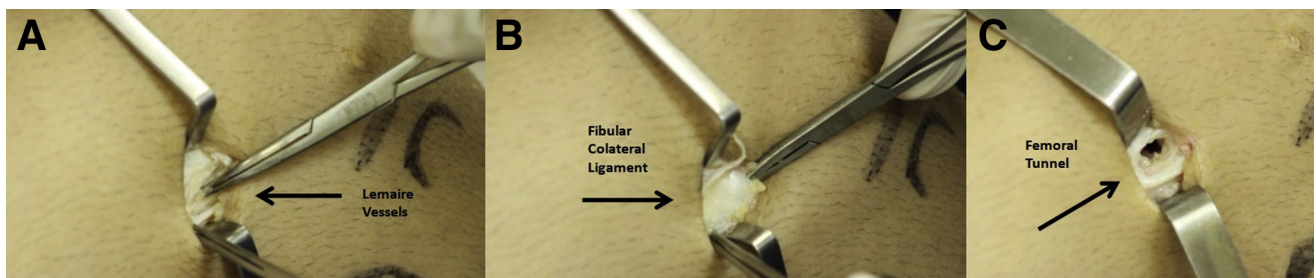
In the execution of our technique, we were careful to position the entrance of the femoral tunnel proximal and posterior to the lateral femoral epicondyle (LFE); poor positioning of this tunnel may imply a positioning error of the fixation site of the tenodesis of the ITB in the femur. Technique cautions, risks, and limitations are described in Table 2.

We observed in the literature several lateral reinforcement techniques with excellent clinical results in relation to rotational control and reduction in the rates of rerupture after reconstruction, based on the principle of attaching the anterolateral aspect of the tibia near the Gerdy tubercle to a proximal and posterior point lateral femoral epicondyle, without the need for the graft to pass under the LCL.<sup>17</sup>

In 2016, Lutz et al.<sup>11</sup> described a technique of ACLR associated with lateral tenodesis using ITB as a graft to reconstruct both anterolateral ligaments and ACLs. In this technique, they also used the ITB and maintained its distal insertion, reaching the distal femur posteriorly and proximal to the LFE. We used the same principle for lateral tenodesis, but we believe that ITB is not the ideal graft for ACLR and therefore we used quadruple graft flexors.

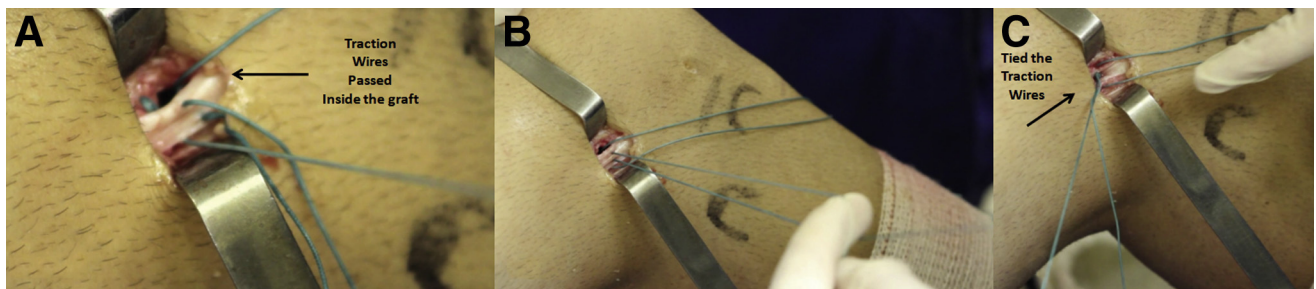
## Conclusion

We believe that our technique is an excellent alternative when you do not have broad financial resources, and one can achieve the same goals of rotational control and prevention of reinjuries in a fast, simple, and reproducible manner.

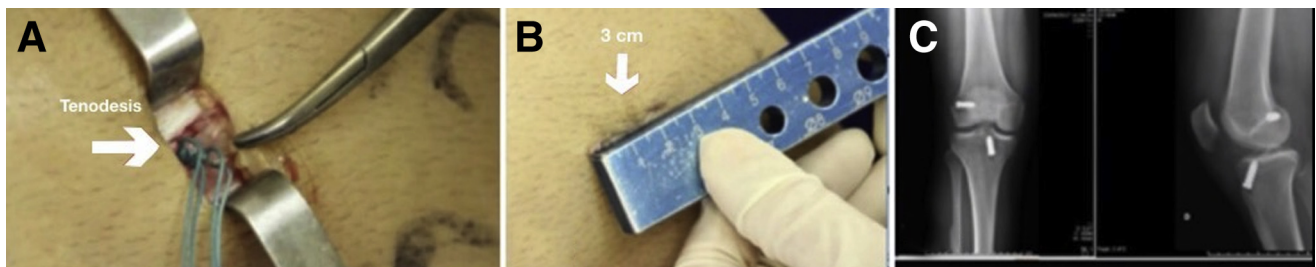


**Fig 2.** The operative limb was the right limb, and the patient was positioned in the dorsal decubitus. (A) Lemaire vessels are identified to aid in the anatomic positioning of the femoral tunnel. (B) Lateral collateral ligament is identified to prevent damage during the femoral tunnel perforation. (C) Femoral tunnel outside-in is realized.





**Fig 3.** The operative limb was the right limb, and the patient was positioned in the dorsal decubitus. (A) Two of the legs of traction wires are sutured through the body of the graft. (B) The other 2 legs embrace the previously dissected iliotibial band tape. (C) The traction wires that were sutured through the body of the tape are tied.



**Fig 4.** The operative limb was the right limb, and the patient was positioned in the dorsal decubitus. (A) Final aspect of tenodesis already performed. (B) Demonstration of the approach, only 3 cm. (C) Postoperative radiograph shows positioning of the femoral and tibial tunnel.

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