

# A Modified LaPrade Technique in Posterolateral Corner Reconstruction of the Knee



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**Abstract:** Posterolateral corner (PLC) injuries represent a complex injury pattern whose repair is essential for varus and rotational stability of the knee. Several surgical techniques have been described for PLC injuries, which can be divided into 2 main groups: anatomical and nonanatomical. Due to insufficiency of posterior stabilization of nonanatomic procedure, LaPrade represented an anatomical reconstruction. In this Technical Note, we describe and illustrate some modifications in the anatomic reconstruction of the PLC and lateral collateral ligament.

Posterolateral corner (PLC) injuries represent a complex injury pattern, with damage to important coronal and rotatory stabilizers of the knee that leads to chronic lateral and external rotation instability.<sup>1-3</sup> The PLC unit has complex anatomy.<sup>4</sup> It includes the lateral (fibular) collateral ligament (LCL) and the popliteus complex, which contain the popliteus muscle tendon, popliteofibular ligament, the fabellofibular ligament, and the popliteomeniscal fibers. These structures are essential for varus and rotational stability of the knee.<sup>1-3</sup>

Several surgical techniques have been described for PLC injuries, which can be divided into 2 main groups: anatomical and nonanatomical.<sup>3</sup> In the nonanatomical procedure, posterior stabilization was not sufficient.<sup>5-10</sup> Because of this, LaPrade presented an anatomical procedure that has better dorsal stability but, placing tunnel in true anatomical location, may need an extensive surgical approach and therefore more adjacent soft-tissue dissection.<sup>1</sup> Therefore, we describe

and illustrate some modifications in the anatomic reconstruction of the PLC and LCL.

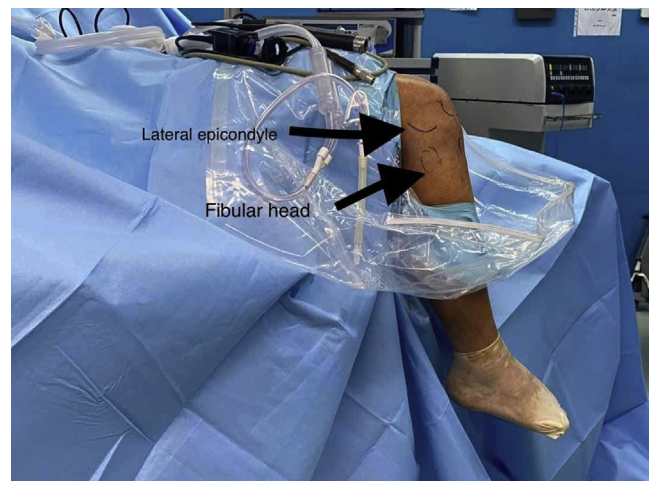
## Surgical Technique

### Patient Positioning

The patient is placed in the supine position on the operating table with the surgical limb hanging in front of the surgeon and other limbs resting on the table. A proximal thigh tourniquet is applied (Fig 1).

### Surgical Approach

The femoral lateral epicondyle is identified by palpation, and a 3-cm lateral longitudinal skin incision is



**Fig 1.** The patient is placed in the supine position on the operating table with the surgical limb hanging in front of the surgeon and other limbs resting on the table. The head of fibula and lateral condyle of femur and patella are marked on the skin.

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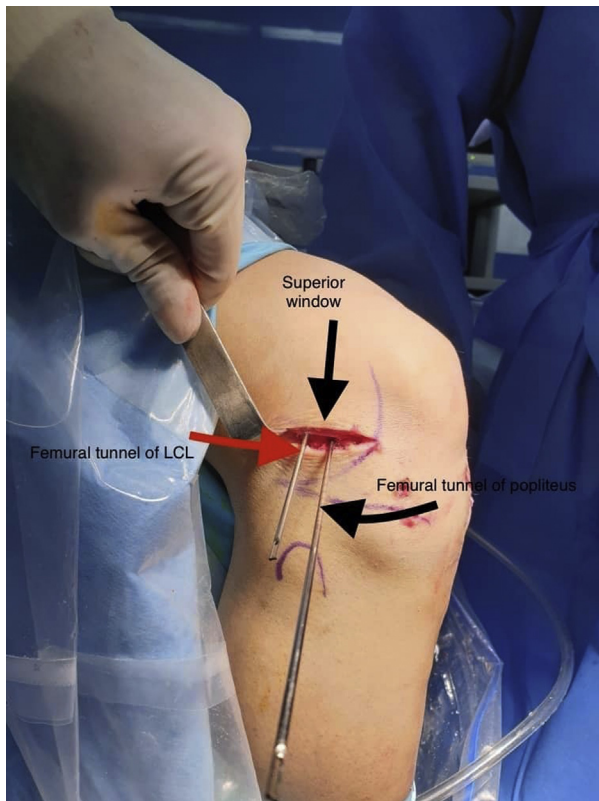
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**Fig 2.** After identification of the lateral epicondyle and exposure of the lateral collateral ligament femoral insertion, one pin is inserted in lateral epicondyle and second in popliteal groove.

made along the lateral epicondyle and extended distally to the lateral joint line. Then, the iliotibial band is split longitudinally. After identification of the lateral epicondyle and exposure of the LCL femoral insertion, the guide pin is drilled to create a femoral tunnel and the pin should exit 5 cm proximal and anterior to the adductor tubercle.

A mini-arthrotomy is performed to identify the exact attachment of the popliteus insertion. The guide pin is inserted parallel to the fibular collateral ligament (FCL) pin (Fig 2).

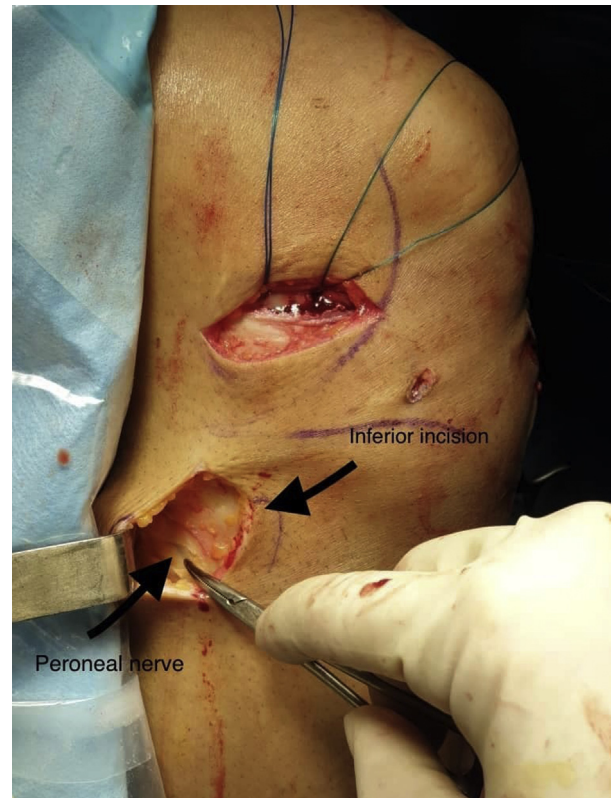
Then, both tunnels are created with 7-mm reamers to a depth of 25 mm. Passing sutures are placed. The second incision is made extending from 1 cm proximal to the fibular head and extending distally 2 cm below it. At the distal end of the incision and posterior aspect of the fibular neck, the fascia over the common peroneal nerve is palpated, explored, and protected (Fig 3).

The distal FCL insertion on the fibular head is palpated and a horizontal window in the biceps bursa and fascia is made posterior to the FCL with the length of 3 cm (Fig 4). The dissection is made between the lateral gastrocnemius and soleus muscles by an index finger. Both the posterior aspects of the fibular head from the tibiofibular joint and the posterior aspect of

the tibial plateau are palpated through the interval between the lateral gastrocnemius and soleus muscles. The fibular head guide pin is inserted anterior to posterior from the FCL attachment on to the posteromedial downslope of the fibular styloid and with a 7-mm reamer. The lateral head of the gastrocnemius muscle is elevated by finger dissection from the biceps window.

Then, the guide pin is inserted from Gerdy's tubercle and aiming toward the posterior aspect of the tibia 1 cm distal to the joint line and 1 cm medial to the proximal tibiofibular joint, where its position is confirmed by a C-arm (Fig 5). We check the tibial tunnel by finger, but some surgeons create this tunnel by using an anterior cruciate ligament tibial jig, then the tunnel is created with a 9-mm reamer (Fig 6).

We use a Nelaton catheter for passing suture placement. We use an Achilles tendon allograft to prepare two 7-cm allografts. Both are tubularized with whip-stitched sutures. Both grafts are inserted into the femoral tunnels and fixed with 8-mm bioscrews. The popliteus graft is passed to the distal incision beneath the iliotibial band in the popliteal hiatus with a clamp. Then, the FCL graft is inserted in the femoral tunnel and fixed by an 8-mm bioscrew (Arthrex, Naples, FL) and



**Fig 3.** The second incision is made extending from 1 cm proximal to the fibular head and extending distally 2 cm below it. At the distal end of the incision and posterior aspect of the fibular neck, the common peroneal nerve is palpated, explored, and protected.



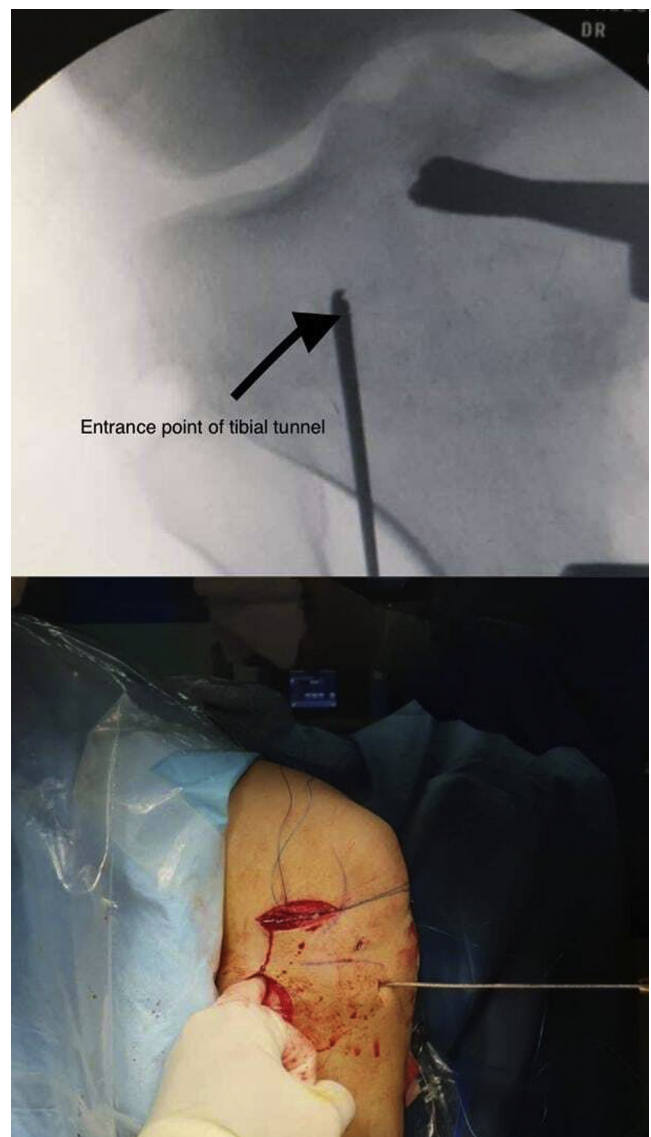
**Fig 4.** The fibular attachment of the fibular collateral ligament (FCL) is identified and a horizontal window is made in the biceps.

passed between the iliotibial band and popliteus graft to the distal incision in the same manner. The FCL graft is passed through the fibular head by Nelaton catheter, and exits through the biceps window. From the biceps window, both grafts are passed posterior to anterior through the tibial tunnel and exit from Gerdy's tubercle. In the position of valgus and 20° of knee flexion, the 7-mm screw (Arthrex) is fixed through the fibular head. Finally, the popliteus and FCL graft are fixed in the tibial tunnel with a 10-mm diameter screw in proper tension at 60° of knee flexion (Video 1 and Table 1).

### Discussion

In this modified surgical technique, by using 2 small separate incisions and making 2 different windows, anatomic reconstruction of the PLC and LCL is achieved.

Anatomic LCL and PLC reconstruction is important for normal biomechanical knee function.<sup>10,11</sup> In the Larson technique, which is a fibulofemoral-based technique, reconstruction is less technically demanding and offers encouraging clinical results, but since it is not anatomical, it has less posterior stabilization and therefore is not suitable for high-grade PLC injuries.<sup>3,12</sup> In the open anatomic reconstruction by LaPrade, better stabilization can be achieved,<sup>1,2,4,5,7</sup> but it is technically demanding and detailed exposure can potentially compromise the soft tissue.<sup>1,2,13</sup> In this modified technique, by making 3 windows, the LCL, popliteus, and popliteofibular ligaments are reconstructed.<sup>2,14</sup> However, we may encounter some problems, such as preparing the fibular and proximal tibial tunnels, which requires the use of an



**Fig 5.** The guide pin is inserted from Gerdy's tubercle and aimed toward the posterior aspect of the tibia 1 cm distal to the joint line and 1 cm medial to the proximal tibiofibular joint and then its position is confirmed by the C-arm.



**Fig 6.** The tunnel is created with a 9-mm reamer.

anterior cruciate ligament jig in true anatomic position during surgery, and may require more soft-tissue dissection.<sup>2,6,13,14</sup>

In this modification, by making 2 small incisions and making 2 windows, by targeting the musculotendinous junction of the popliteus, the proximal tibia tunnel is made, with the pulp of the finger functioning as a protective factor for artery injury. Reaming the posterior aspect of the fibular tunnel also can have the pulp of the finger protect the neurovascular structures as well (Table 2).

In the arthroscopic technique, which was first described by Frosch et al., tenodesis of the popliteus tendon by an arthroscopic technique can be accomplished but in this method, LCL reconstruction was not performed. In a technique described by Frings et al.,<sup>2</sup> arthroscopic

anatomic reconstruction of the PLC and LCL ligament is accomplished, which is less invasive, but this technique requires advanced arthroscopic skill and knowledge of the complex anatomy of the PLC and also is limited by thick soft-tissue layers and patients with obesity.

## Conclusions

In our modified technique, anatomic reconstruction of the LCL and PLC was performed through 2 small incisions with less soft-tissue dissection.

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**Table 1.** Order of Steps With Pitfalls and Pearls

Surgical Steps	Pitfalls	Pearls
Making femoral tunnel of LCL and popliteus	Nonanatomic site	1. Palpate the lateral epicondyle inferior to ITB in knee flexion for the LCL tunnel 2. Lateral arthrotomy and see popliteal groove for popliteus for popliteus tunnel
Exploring popliteal nerve	Damage the peroneal nerve during exploration	Open the fascia just inferior to fibular neck and slightly posterior to observe the common popliteal nerve.
Making fibular tunnel	The entrance of tunnel is not anatomic in LCL and exit of tunnel is not placed in the posterior of the tibiofibular joint	Palpating the head of fibula and posterior border of tibiofibular joint with index finger from inferior window
Making tibial tunnel	Not an appropriate place for the tibial tunnel	The lateral head of gastrocnemius is protracted posteriorly. Then, the junction of muscle and tendon of popliteus is palpated by finger and the exit of pin located 1 cm inferior of lateral tibial plateau and 1.5 cm medial of the tibiofibular joint

ITB, iliotibial band; LCL, lateral collateral ligament.

**Table 2.** Advantages and Disadvantages

Advantages	Disadvantages
Less soft-tissue dissection	Passage of grafts more complicated
Decreased time of surgery	Less accuracy for making tibial tunnel
Less risk of infection	
No need for advanced devices	

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