The Posterolateral Corner of the Knee

Anatomic Dissection and Surgical Approach

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ABSTRACT: The surgical anatomy and biomechanical role of the posterolateral corner of the knee has received significant attention in recent years. Nevertheless, because of the relative infrequency with which injuries to this area are treated operatively, the surgical approach to this area of the knee may be unfamiliar to many residents and practicing orthopedic surgeons. Accurate knowledge of the appropriate anatomy, planes of dissection, and surgical approach is vital to the safe access of these structures for purposes of repair or reconstruction. This article describes the step-by-step anatomic approach to the posterolateral corner of the knee using paired cadaveric images, with emphasis on the relevant surgical anatomy.


INTRODUCTION

Disruption of the posterolateral corner (PLC) of the knee can produce laxity in varus rotation, external tibial torsion, and posterior tibial translation,\(^1\,^2\,^3\) generally referred to as posterolateral rotatory instability.\(^4\,^5\,^6\,^7\) The mechanism of injury to the posterolateral structures of the knee occurs either with knee hyperextension during excessive varus rotation or after direct impact to the anteromedial proximal tibia.\(^8\) Although posterolateral corner injuries can occur in isolation, they are frequently associated with injury to the posterior cruciate ligament (PCL), anterior cruciate ligament (ACL), or both.\(^9\,^10\) Posterolateral knee injuries can also result in injury to the common peroneal nerve. In cases where reconstruction of the PCL is indicated and associated with significant laxity to varus stress, combined reconstruction of the PCL and repair or reconstruction of posterolateral corner structures is necessary to limit strain on the reconstructed graft and restore rotary, as well as posterior, instability.\(^11\,^12\,^13\) In instances of ACL and PLC injury, combined reconstruction is advised to decrease the incidence of ACL graft failure.\(^14\,^15\,^16\)

The goal of PLC repair or reconstruction is to correct the varus instability and excessive external tibial rotation that occurs with damage to the PLC. Knowledge of the anatomy and the specific surgical approach to the posterolateral aspect of the knee is necessary. The surgical approach should offer broad exposure to the common peroneal nerve, popliteus tendon, fibular collateral ligament, fabellolateral ligament, popliteofibular ligament, lateral head of the gastrocnemius, and the iliotibial tract. The purpose of this article is to describe, using fresh cadaveric dissections, a step-by-step sequence demonstrating the posterolateral surgical approach to the knee, along with relevant superficial and deep surgical anatomy.

MATERIALS AND METHODS

Side-by-side images depict the relevant anatomy and surgical approach to the posterolateral corner using two separate dissections of the same fresh-frozen cadaveric knee. The first dissection depicts the common limited surgical approach, with a subsequent global anatomic dissection. These images outline a step-by-step anatomic approach to the posterolateral corner of the knee.
with emphasis on the popliteus tendon, fibular collateral ligament, fabellolateral ligament, popliteofibular ligament, lateral head of the gastrocnemius, and iliotibial tract.

**SURGICAL TECHNIQUE**

The patient is placed in a supine position with a well-padded tourniquet on the proximal thigh of the operative extremity, although in most circumstances inflation of the tourniquet is not required. A low-profile, circumferential thigh holder or lateral post is used to stabilize the extremity and maximize the surgical field. The foot of the table is dropped completely, and the nonoperative extremity is positioned in a well leg holder, with particular attention given to protecting the peroneal nerve in the region around the fibular head. The operative extremity is then prepped and draped in typical fashion.

The knee is flexed approximately 60°, and a longitudinal incision is made parallel to the posterior aspect of the iliotibial band, starting just proximal to the lateral femoral condyle and continuing distally to a point midway between the fibular head and Gerdy’s tubercle. If the...
Figure 3. Approach. Incision coursing parallel to the posterior aspect of the iliotibial band, proximal and in line with Gerdy’s tubercle (A). Note the short head of the biceps, as well as the lateral gastrocnemius muscle. Deeper dissection (B). The fibular collateral ligament is visualized as it attaches to the femoral condyle. Note the course of the common peroneal nerve posterior to the long head of the biceps. (P=patella, JL=joint line, GT=Gerdy’s tubercle, ITB=iliotibial band, LHG=lateral gastrocnemius muscle, SHB=short head biceps, FH=fibular head, CPN=common peroneal nerve, PT=patellar tendon, VL=vastus lateralis, FCL=fibular collateral ligament, LHB=long head biceps.)

incision is too anterior, it may be difficult to access the common peroneal nerve (Figure 1).

Dissection is continued down to the superficial layer of the iliotibial band fascia. Full-thickness flaps are developed anteriorly and posteriorly (Figure 2). The interval between the iliotibial band and the short head of the biceps femoris is incised longitudinally. Anterior and posterior flaps are then made with gentle, blunt dissection (Figure 3). The lateral head of the gastrocnemius and the fibular collateral ligament can be visualized at this time. Figure 4 details further dissection of the lateral knee with the lateral capsule removed. Note the relationship of the lateral collateral ligament attachment posterior to the attachment of the popliteus tendon.

A second, longitudinal fascial incision, located approximately 2 cm posterior to the initial incision, can be made through the thin fascia directly anterior to the long head of the biceps tendon. This incision allows visualization of the muscle fibers of the short head of the biceps as it inserts onto the long head of the biceps. A third fascial incision may be made longitudinally just posterior to the long head of the biceps to isolate the common peroneal nerve. Careful dissection around the posterior iliotibial band may isolate the inferior branch of the lateral geniculate artery (Figure 5).

Three surgical windows provide appropriate access to deeper anatomical structures. As described by Terry and LaPrade, the first window courses in line with Gerdy’s tubercle at the proximal aspect of the iliotibial tract, allowing access to the femoral origin of the lateral collateral ligament and popliteus origin. The second window courses as a fascial incision between the iliotibial band and anterior to the short head of the biceps, allowing one to retract the short head of the biceps and visualize the fascia of the lateral head of the gastrocnemius. An incision through this fascia allows one to develop the plane between the posterior aspect of the lateral tibial plateau and the lateral head of the gastrocnemius, such as would be required during inside-out repair of the lateral meniscus. This is also necessary when one incorporates a tibial tunnel for popliteus bypass procedures. The third fascial window is oriented parallel to the peroneal nerve and posterior to the long head of the biceps. This window is used to identify and mobilize the common peroneal nerve, allowing one to retract the long head of the biceps anteriorly and palpate the posterior fossa of the fibular head safely. This is critical when performing a posterolateral reconstruction using a drill hole through the fibular head (Figure 6).

**DISCUSSION**

The posterolateral corner of the knee has been shown to play a significant biomechanical role in knee stability.
It resists varus stress, external rotation, and to a lesser extent, acts as a secondary stabilizer to anterior and posterior translation of the tibia on the femur in the face of anterior or posterior cruciate ligament injury.\textsuperscript{6,18,23,25} Although an uncommon pathology, injury to the PLC has received significant attention in recent years.\textsuperscript{3,18,21,23} When untreated, significant PLC injury can lead to instability, early articular cartilage damage, and failure of ACL or PCL reconstruction.\textsuperscript{2,7,11,12} As a result, orthopedic surgeons are now more inclined to repair or reconstruct the posterolateral corner of the knee after high-grade injury.\textsuperscript{2,8,15,19,24}

The surgical anatomy of the PLC of the knee was initially described when Seebacher et al.\textsuperscript{18} performed 35 cadaveric knee dissections, and classically divided the posterolateral corner of the knee into 3 layers. The iliotibial tract, biceps femoris, and common peroneal nerve make up layer one. Layer two consists of the quadriceps retinaculum, the lateral head of the gastrocnemius, and the two patellofemoral ligaments. The third layer comprises the lateral joint capsule, lateral collateral ligament, popliteus tendon, and fabellofibular ligament.

Terry and LaPrade\textsuperscript{21} dissected 30 cadaveric knees using the posterolateral approach. The posterolateral knee was accessed through three separate fascial incisions. The initial fascial incision bisected the iliotibial band, allowing access to the long and short heads of the biceps femoris, posterior capsule, mid-third capsular ligament, and the lateral collateral ligament. On deeper dissection through this interval, the lateral gastrocnemius, popliteus tendon, lateral meniscus, popliteofibular ligament, and inferior lateral geniculate artery are visualized. The second fascial incision coursed between the iliotibial band and the long head of the biceps, allowing access to the short head of the biceps insertion site onto the long head of the biceps, the biceps-capsulosseus confluentes, and the fabellofibular ligament. The third fascial incision coursed posterior to the long head of the biceps, allowing evaluation of the peroneal nerve and subsequent appreciation of the lateral gastrocnemius, fabellofibular ligament, popliteofibular ligament, popliteus muscle, and inferior lateral geniculate artery.

There are a variety of surgical techniques to treat PLC instability, ranging from primary repair to nonanatomic reconstructive options. Regardless of technique, a fundamental knowledge of the appropriate anatomy and surgical approach is essential to safely treat injury to the PLC. This article describes the relevant anatomic relationships, as well as the surgical correlation of these relationships to the posterolateral knee. The reader is referred to LaPrade’s recently published textbook, *Posterolateral Knee Injuries: Anatomy, Evaluation and Treatment*,\textsuperscript{9} for more extensive discussion of this complex topic.
REFERENCES


