



Posterolateral Reconstruction of the Knee: Capsular Procedures

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It is well recognized that significant morbidity can result from undiagnosed and untreated components of posterolateral instability of the knee. Restoration of normal knee anatomy is crucial to obtain a good surgical outcome. During direct capsular repairs, a comprehensive understanding of this anatomy allows surgeons to repair the injured structures with the aim of restoring function to both the static and the dynamic components of the region. Compared with the direct approach, an osteotomy of the lateral femoral condyle often permits superior visualization of the injured structures. These include the attachments of the fibular collateral ligament, the popliteal tendon, the popliteofibular ligament, and the lateral meniscus and its attachment, as well as the deeper structures. The osteotomy permits not only enhanced visualization, but also the proper positioning of sutures in the posterior capsule; this in turn allows a capsular shift to tighten and repair the injured structures following their direct repair. The extensile exposure provided by the osteotomy allows the deep structures to be repaired with subsequent reattachment of the bone block and attached structures without appreciably affecting the anatomical isometry. Although an osteotomy is not needed in every case of capsular posterolateral knee reconstruction, it does allow for excellent visualization of the deeper structures when needed. The capsular shift can be done alone or in combination with other reconstructive procedures for the treatment of the injured posterolateral corner. *Oper Tech Sports Med* 23:315-320 © 2015 Elsevier Inc. All rights reserved.

KEYWORDS posterolateral reconstruction, capsular shift, posterolateral instability, lateral condyle osteotomy

Posterolateral rotatory instability is defined as posterior translation combined with external subluxation of the lateral tibial plateau on the lateral femoral condyle around the axis of an uninjured posterior cruciate ligament.¹⁻⁶ As the tibia rotates externally, it becomes prominent on the posterior aspect of the knee. Increased recognition of this injury pattern has led to detailed appreciation of the anatomy, pathology, and biomechanics involved, as well as the treatment options available.

The posterolateral corner of the knee consists of both static and dynamic structures. To enable proper functioning of the

knee, it is imperative that these structures work synergistically. In this article, we first define and review the pertinent aspects of capsular repairs. These capsular repair techniques may be used alone or to complement other reconstruction procedures for the posterolateral corner.

Background

Treatment of both acute and chronic posterolateral corner injuries requires the surgeons to have a detailed anatomical knowledge of the associated structures. In the literature, Baker et al² have reported the repair of acute posterolateral corner injuries. All patients in the study underwent repair within 12 days of the injury and acute was defined as having occurred < 2 weeks ago.

The capsular shift with osteotomy procedure for chronic posterolateral rotatory instability (PLRI) has been reported as demonstrating good results by Hughston and Jacobson.³ The procedure has previously been described in the literature, but

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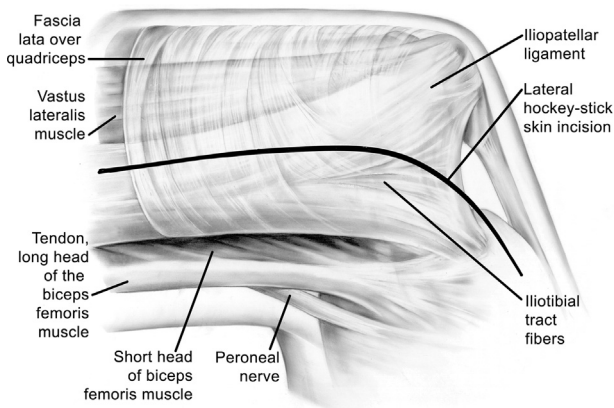


Figure 1 The lateral hockey-stick incision used to expose the posterolateral aspect of the knee. Care is taken to develop full-thickness skin flaps over the iliotibial band and the biceps femoris muscle (long and short heads).

since then, the anatomical nomenclature of the posterolateral corner has been modified. In fact, before the unification of the nomenclature by Moorman and LaPrade,⁷ both incorrect identification of and inconsistent terminology for these anatomical structures were common. For example, early depiction of the posterolateral repair incorporated the arcuate complex—a structure reported to consist of the arcuate ligament, the fibular collateral ligament, the popliteal tendon, and the lateral head of the gastrocnemius, as well as the fabellofibular and popliteofibular ligaments.

Surgical Technique

An office or on-field examination alerts the surgeon about the presence of posterolateral instability. Examination of the knee under anesthesia is the initial step in the surgical treatment of posterolateral instability and can serve to support or confirm the preoperative diagnosis. Using all the posterolateral examination tests, the surgeon identifies the magnitude and pattern of instability, thus recapitulating the mechanism of injury. The different kinds of examinations used to assess the posterolateral corner include the dial test in both 30° and 90°, the external rotation recurvatum test, the reverse pivot shift test, adduction at 30° of flexion, and the posterolateral external rotation test at both 30° and 90° of knee flexion. Additionally, each physical examination should be performed to quantify the momentum and vector of motion of the injured extremity compared with the uninjured one. The examination tends to be more distinct when there are no muscle spasms and guarding. Important physical examination findings should be accurately classified and documented. Creating a checklist of the documented pathoanatomy allows the surgeon to plan the procedure. It also helps him or her to decide which structures may be amenable to direct repair and which may require augmentation.

At the beginning of the procedure, a well-padded, non-sterile, pneumatic tourniquet is applied to the proximal thigh. The operative leg is then prepared and draped in sterile fashion. If the results of an magnetic resonance imaging or

physical examination have warranted it, an arthroscopic examination is performed at this time. Care is taken to note the fluid used during the arthroscopic procedure, as the extravasation of the fluid through any capsular injuries could make recognizing injured structures difficult.

Next, the patient is placed supine; the operative extremity is flexed 45° at the hip and 90° at the knee, with the femur slightly adducted. The limb is then exsanguinated and the tourniquet inflated. A lateral hockey-stick incision is made and full-thickness skin flaps are developed (Fig. 1). The visualization of the fibular head within the incision marks the extent to which the posterior skin flap is elevated. It is important to identify, protect, and release the peroneal nerve as it travels around the proximal metaphyseal flare of the fibula. The biceps fascia covering the nerve can be released proximally until the nerve exits the posterior thigh and distally to the peroneal muscles. Releasing the nerve allows it to be protected during the procedure. Additionally, decompressing the fibro-osseous canal that surrounds the nerve decreases the risk of nerve palsy secondary to hematoma.

A total of 3 separate incisions to access the posterolateral corner anatomy are described in the literature by Terry and LaPrade (Fig. 2).⁸ The initial incision starts at the midpoint of Gerdy tubercle and follows proximally, in line with the fibers of the iliotibial band. The lateral capsule and the capsulo-osseous structures can be accessed through this approach. More of the posterior structures can be localized once the capsulo-osseous structures are dissected off the lateral intermuscular septum. The meniscofemoral and meniscotibial attachments of the midthird lateral capsular ligament, the popliteal attachments, and the body of the lateral meniscus can all be accessed by an incision through the lateral capsule.

The interval between the posterior aspect of the iliotibial tract and the short head of the biceps femoris outlines the second incision. This incision follows along the fascia, beginning 6-7 cm proximal to the lateral epicondyle and extending

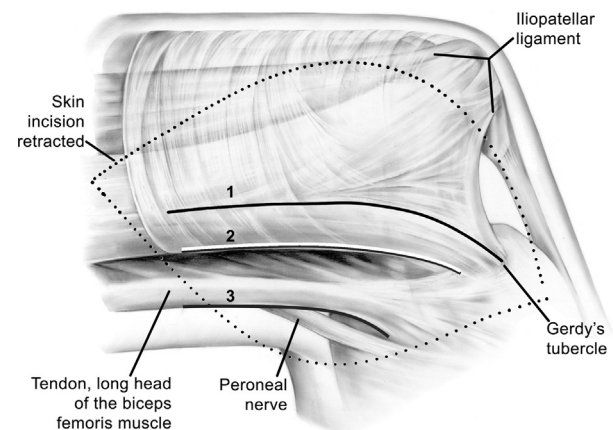


Figure 2 Overall, 3 fascial incision used to evaluate posterolateral corner injuries, (1) fascial-splitting incision in line with the fibers of the iliotibial tract extending from Gerdy tubercle; (2) incision using the interval between the posterior border of the iliotibial tract and the short head of the biceps femoris muscle; and (3) incision along the posterior aspect to the tendon of the long head of the biceps femoris muscle.

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