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Operative Techniques in

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Posterolateral Reconstruction of the Knee: Surgical Technique with 2 Grafts ☆

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Many aspects of the posterolateral corner (PLC) of the knee have been extensively studied within the past 20 years. Quantitative anatomic and biomechanical studies have demonstrated the importance of the 3 static stabilizers of the lateral side of the knee: the fibular collateral ligament, the popliteus tendon, and the popliteofibular ligament. Biomechanically, a 2-graft anatomic PLC reconstruction has been reported to restore varus and external rotational stability to the knee and clinical outcome studies have demonstrated that the anatomic technique leads to improved patient outcomes. A 2-graft anatomic PLC reconstruction also allows passive range of motion exercises early in the postoperative rehabilitation program, decreasing the risk of postoperative arthrofibrosis without compromising clinical results. This article presents a summary of the biomechanical basis of a 2-graft anatomic PLC reconstruction and provides a degraft description of the surgical technique. Additionally, a description of the postoperative rehabilitation program is presented and clinical outcomes of treating acute and chronic PLC injuries are summarized.

KEYWORDS posterolateral corner, anatomic reconstruction, fibular collateral ligament, popliteus tendon, popliteofibular ligament, surgical technique

Introduction

The complex anatomy of the posterolateral corner (PLC) of the knee used to be known as the "dark side of the knee" because of the lack of anatomic and biomechanical understanding.[1] PLC injuries have been reported to account for up to 5%-9% of knee ligament injuries[2,3]; one study reported that 9.1% (30 of 331) of patients presenting with hemarthrosis had a PLC injury on magnetic resonance imaging .[3] Many patients with PLC injuries present with multiligament injuries, often occurring with concurrent with anterior cruciate ligament (ACL) or posterior cruciate ligament (PCL) tears.[4,5] Unfortunately, residual PLC injuries have been reported to increase the risk of ACL and PCL graft failures.[6-8]

The basis of an anatomic 2-graft PLC reconstruction is in the anatomy. Anatomic and biomechanical studies have determined that the fibular collateral ligament (FCL), the popliteus tendon, and the popliteofibular ligament (PFL) are the 3 static stabilizers of the lateral side of the knee.[9-13] The FCL has been reported to be the primary varus stabilizer of the knee and a secondary external rotational stabilizer between 0° and 30° of flexion.[11] The popliteus tendon and the PFL have been reported to primarily act as external rotational stabilizers.[9,11,14] Anatomically, the FCL femoral attachment is 18.5-mm proximal and posterior to the popliteus tendon attachment.[15] Distally, the FCL inserts on the lateral aspect of the fibular head, whereas the popliteus tendon inserts on the posteromedial tibia. The PFL consists of 2 divisions, both originating at the popliteus musculotendinous junction and inserting on the anteromedial and posteromedial downslopes of the fibular head.[15]

The goal of an anatomic 2-graft PLC reconstruction is to recreate the anatomy and static function of the FCL, popliteus tendon, and the PFL by forming graft tunnels at the anatomic attachment sites (Fig. 1). Biomechanically, the anatomic technique has been validated to restore stability to the knee. In vitro testing results have reported significant improvement

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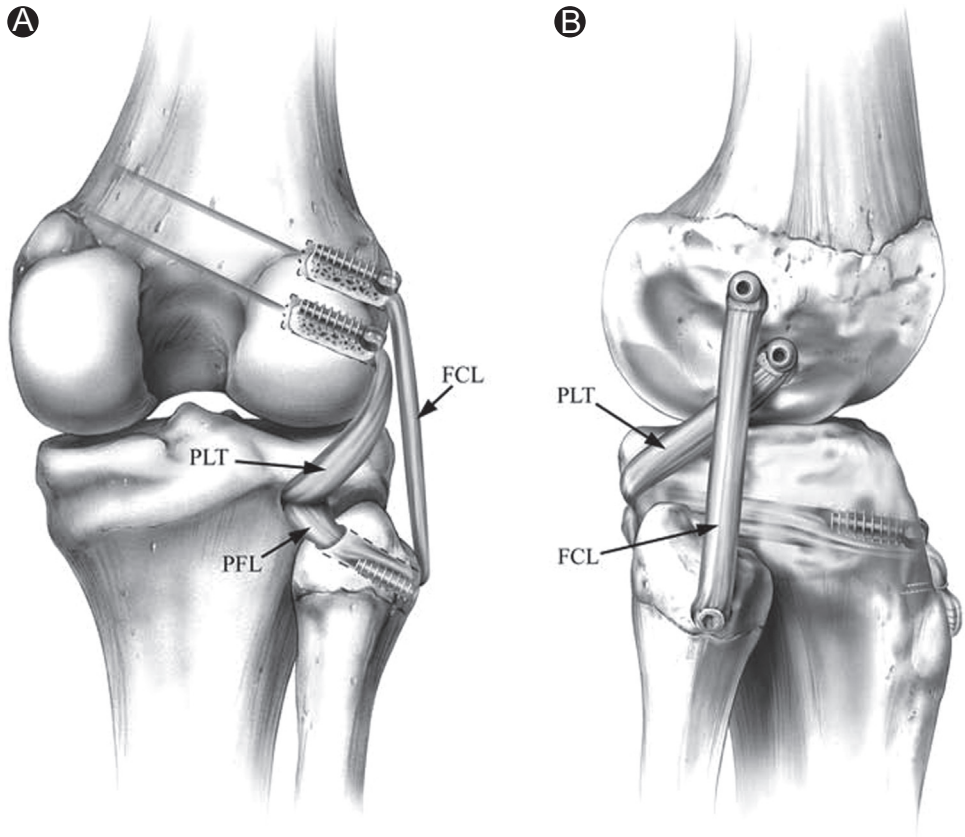

Figure 1 Posterior and lateral views of an anatomic 2-graft PLC reconstruction. (A) Posterior view, right knee. (B) Lateral view, right knee. FCL, fibular collateral ligament; PLT, popliteus tendon; PFL, popliteofibular ligament. (Adapted with permission from LaPrade et al.[16])

in varus translation and external rotation compared with the simulated grade III PLC injury sectioned state.[16] Additionally, McCarthy et al[17] demonstrated the importance of reconstructing the PFL with the 2-graft anatomic technique. They reported small but significant increases in varus translation and external rotation when the PFL was not reconstructed. The anatomic 2-graft reconstruction also restored knee motion to the intact state without overconstraining the knee.

Indications for anatomic 2-graft PLC reconstructions include acute or chronic grade III PLC injuries or grade II PLC injuries combined with ACL or PCL tears. Varus stress radiographs can help assess the severity of a PLC injury. A grade III PLC injury presents with ≥ 4.0 mm of varus gapping compared with the uninjured knee (Fig. 2), whereas an isolated FCL injury presents with 2.7-$<$4.0 mm of gapping on varus stress radiographs.[18] Assessing axial alignment is important in cases of chronic grade III PLC injuries. Patients with varus malalignment benefit from a first-stage proximal tibial osteotomy before a PLC reconstruction to improve knee stability.[19,20]

Surgical Technique

The surgical technique for an anatomic PLC reconstruction is described subsequently. Before starting the surgery, the patient is positioned supine on the operating table. A well-padded tourniquet is wrapped around the proximal thigh of the injured leg with the distal thigh placed in a leg holder. The uninjured leg is abducted in a leg holder away from the surgical field.

With the patient properly positioned, it is important to verify instability by examining the injured and uninjured legs with the patient under anesthesia. The examination under anesthesia should include an evaluation of patellofemoral stability, varus and valgus stress tests, Lachman's test, posterior drawer test, pivot shift test, reverse pivot shift test, posterolateral drawer test, and dial test at 30° and 90° of flexion.

The surgical approach starts on the proximolateral thigh following the middle portion of the iliotibial band distal to Gerdy's tubercle. Before making the first incision, it is helpful to mark the fibular head, Gerdy's tubercle, the tibial tubercle, the lateral epicondyle, and the path of the initial incision with a surgical pen. The initial hockey stick shape incision should start proximal to the knee joint line and extend to Gerdy's tubercle to provide access to the fibular head, the lateral femoral condyle, and the anterolateral proximal tibia (Fig. 3).

The incision is extended down to the superficial layer of the iliotibial band. Next, a posterior-based subfascial flap is formed to expose the long and short heads of the biceps femoris. At this point, it is important to meticulously dissect the surrounding tissue to locate the common peroneal nerve without injury (Fig. 4). Often, the common peroneal nerve