



Postoperative Rehabilitation After Posterior Cruciate Ligament Reconstruction and Combined Posterior Cruciate Ligament Reconstruction-Posterior Lateral Corner Surgery

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The management of injuries to the posterior cruciate ligament (PCL) and the posterior lateral corner (PLC) of the knee, although relatively rare, presents a challenge to both orthopedic surgeons and rehabilitation specialists. Injuries to the PCL can occur in isolation or in combination with a PLC injury. Surgical intervention is often warranted with the goal of surgery to have a stable, well-aligned knee and to restore the preinjury kinematics of the knee joint. Principles guiding rehabilitation should be followed following a PCL reconstruction or a combined PCL-PLC surgery. Advancement through the rehabilitative course should be based on meeting set criteria while adhering to set time frames to allow sufficient healing. Therapeutic interventions, when introduced to the rehabilitation program, have sound evidence to support their inclusion. A functional progression is followed throughout the rehabilitative course. Criteria via objective and qualitative measures are used and should be met before allowing an athlete or patient to return to sport or normal activities of daily living. Compliance by a patient throughout the course of rehabilitation is vital in achieving a successful outcome. Oper Tech Sports Med 23:372-384 © 2015 Elsevier Inc. All rights reserved.

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Introduction

In the general population, injury to the posterior cruciate ligament (PCL) accounts for approximately 3% of all knee injuries.¹ In patients who present to trauma centers with knee injuries, the incidence is reported as high as 37%.² Isolated PCL injuries may occur at a rate of 40%.³

The most frequent mechanism of injury in isolated PCL tears is a direct blow on the anterior tibia with the knee in the flexed position,⁴ for example, motor vehicle accidents involving the knee hitting the dashboard. In athletics, the

most common mechanism of injury involves a fall on a flexed knee with the foot in a plantar flexed position.^{5,6} The PCL and posterior capsule can also be torn by a hyperextension mechanism.⁷

Most PCL injuries present with concurrent knee injuries, including those to the anterior cruciate ligament (ACL), medial collateral ligament, or posterolateral corner (PLC). Fanelli and Edson⁸ have reported that 62% of PCL injuries in a trauma setting involved a concomitant injury to the PLC.

PLC injuries that present in athletic traumas, motor vehicle accidents, and falls have been reported to account for 16% of knee ligament injuries.⁹ Common mechanisms leading to PLC injuries include a direct blow to the anteromedial aspect of the knee with the knee at or near full extension, contact and noncontact knee hyperextension injuries, valgus contact force applied to a flexed knee, and a severe tibial external rotation torque applied with the knee in flexion or in hyperextension.^{10,11}

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Management of isolated and combined PCL and PLC injuries often negate surgical intervention. This article discusses the current rehabilitation guidelines following surgical reconstruction of these structures.

Principles Guiding Rehabilitation

Communicate With the Surgeon

A successful outcome following surgery can only be facilitated by open communication between the rehabilitation specialist and the surgeon who performed the procedure(s). Surgical procedure performed, graft choice, and fixation method as well as isometric graft placement contribute to a safe postoperative rehabilitation guideline. PCL reconstructions may be performed using a variety of surgical techniques and graft substitutes. Traditional methods use a transtibial technique, whereas more recently, PCL reconstructions have used the posterior inlay technique as well as a 2–femoral tunnel (double bundle) procedure. Achilles tendon allograft (Fig. 1) and bone-patella-tendon-bone autografts are commonly used as graft substitutes.

Surgical treatment of the PLC can vary, depending on the structural involvement and the time frame of the procedure from the date of injury. However, the goals of the reconstruction are the same for all the procedures: to have a stable, well-aligned knee and to restore the preinjury kinematics of the knee joint. Anatomical reconstruction of the fibular collateral ligament, popliteus tendon, and popliteofibular ligament is recommended.¹²

Incorporate the Knowledge of the Basic Sciences

Understanding the anatomical properties and function of the involved structures (PCL and PLC) supports an evidence-based rationale in rehabilitation program design.

The PCL is the stronger and larger of the cruciate ligaments. The PCL is composed of 2 separate bundles: the anterolateral bundle and the posteromedial bundle. The anterolateral bundle is taut when the knee is flexed and the posteromedial bundle is taut when the knee is near extension.¹³ The anterolateral bundle is stronger and stiffer and has a higher ultimate load to failure than the posteromedial bundle.^{14,15}

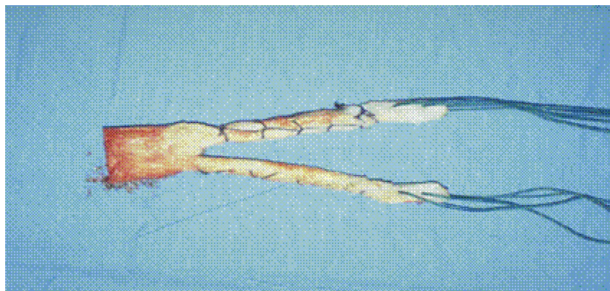


Figure 1 Split Achilles tendon allograft prepared for passage. (Photo courtesy: HSS Sports Medicine Service.) (Color version of figure is available online.)

The PCL has historically been considered a primary restraint to posterior tibial translation. More recent studies have also identified it as a secondary restraint to rotation, particularly between 90° and 120° of flexion.¹⁶

The posterolateral aspect of the knee is a 3-layered complex including the lateral collateral ligament, the popliteofibular ligament, and the popliteus tendon.¹⁷ The PLC has been shown to prevent posterior translation, varus rotation, and external rotation of the tibia.¹⁸

Follow a Functional Progression

A functional progression has been defined by Kegerreis¹⁹ as an ordered sequence of activities that enable the acquisition or reacquisition of skills required for the safe, effective performance of athletic endeavors. To ensure a safe progression, criteria need to be established, whereas a patient demonstrates the mastering of a simple activity before advancing to a more-demanding activity. In rehabilitating a knee following either a PCL or a combination PCL-PLC reconstruction, a rehabilitation specialist should use the following criteria when advancing a patient through the course of rehabilitation:

- Develop quadriceps control or progress range of motion (ROM)
- Establish a normal gait pattern
- Demonstrate the ability to ascend normal steps
- Demonstrate the ability to descend normal steps
- Initiate a running program (if appropriate)
- Initiate a plyometric, sports-specific training program (if appropriate)

Postoperatively, certain time frames need be followed to ensure proper healing. However, a rehabilitation specialist should be sure that certain criteria are indeed met before advancing a patient to more-demanding exercises or activities irrespective of the time elapsed since the operation. Hence, an assessment-based guideline is followed rather than a strict protocol based on the time from surgery. The time frames listed are guidelines to inform therapists and patients regarding what they can expect. Continual reassessment of a patient is vital to ensure a consistent and safe progression of the postoperative rehabilitation program.

Rehabilitation Following PCL Reconstruction

Postoperative Phase I (Postoperative Week 0-6)

Rehabilitation following PCL reconstruction can begin early postoperatively, although in many cases, we immobilize a patient for 4 weeks to allow for improved graft healing and to decrease the risk of laxity related to aggressive early motion (Table 1). Early motion has been shown to minimize the deleterious effects of immobilization, such as articular cartilage degeneration, excessive collagen formation, and pain.²⁰⁻²² Range-of-motion exercises are performed in the sitting

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