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Rehabilitation Protocol Posterior Cruciate Ligament Reconstruction

The knee has three joints--the patellofemoral joint (knee cap), the tibiofemoral joint and the tibiofibular joint. Joints are named for the two bones that articulate with each other. Most people think of the tibiofemoral joint when thinking of the knee. This is the joint that is primarily responsible for flexing (bending) and extending (straightening) of the knee. A small amount of rotation occurs at this joint as well. Ligaments are bundles of connective tissue that attach from bone to bone. There are four main ligaments that stabilize the knee. The collateral ligaments (medial and lateral) are on the inside and outside of the knee and provide side to side stability for the knee. The cruciate ligaments (anterior and posterior) are two large ligaments that cross in the middle of the knee and provide rotational stability and stability front to back. The posterior cruciate ligament is a large, broad ligament that attaches from the back of the tibia and travels forward as it moves up to attach to the femur (Figures 1 and 2). Its primary function is to resist posterior translation of the tibia on the femur, especially in flexion. It is also a secondary stabilizer for rotation and varus stability.

Injuries of the posterior cruciate ligament (PCL) occur less frequently than those of the anterior cruciate ligament (ACL). The PCL is taught (tight) when the knee is in flexion, thus most PCL injuries occur in flexion. The most common cause of PCL tears (Figure 3) are sports injuries (37%) and trauma (56%).¹ In sports, the most common mechanism is falling on a flexed knee. In auto accidents, the most common mechanism is hitting the upper shin against the dashboard with the knee flexed during an accident (dashboard injury). Immediately after the injury it is common to have swelling in the knee, general knee pain and a loss of motion.¹ It is often difficult to predict the long term outcome of a PCL injury.¹ Some patients show significant symptoms and subsequent articular deterioration after a PCL injury, while others are essentially asymptomatic, maintaining normal function.² Evidence from randomized controlled trials to determine a single treatment of PCL injuries is lacking. Observational studies suggest that isolated PCL injuries may be treated conservatively, with good prognosis. Shelbourne treated 22 isolated grade 1 and grade 2 PCL injuries with extension bracing for six weeks.³ In Shelbourne's study 19 of the 22 patients went on to show healing by MRI, and demonstrated stability.³ Bracing is primarily effective when it can be started within one week of the injury.



Figure 1 Posterior (back) view of the knee with the PCL shaded in red

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Surgical reconstruction is indicated in patients with PCL injuries that are combined with other ligament injuries in the knee (combination injuries or multi-ligamentous injuries), isolated grade 3 injuries or PCL injuries with chronic instability. Patients with chronic instability rarely suffer complete giving way episodes. More often it is a general sense of instability with pain in the front of their knee, especially with running or stair climbing.¹ Posterior laxity can be assessed with a posterior drawer test, the dial test or a KT1000 test, although laxity is not directly correlated to instability. Surgical reconstruction is done by replacing the torn PCL with a graft. This graft can be a single strand/bundle of tissue or two strands (double bundle). Grafts can be taken from areas of your own body (autograft), such as the patellar tendon, or from cadavers (allograft). To date there have not been significant differences in outcome studies comparing the various graft choices.¹ The grafts are placed and anchored in tunnels drilled in the femur and tibia.

The rehabilitation process begins the first week after surgery. During the first four weeks the weight bearing and range of motion is limited to protect the healing of the graft. Hamstring exercises are also avoided because the hamstring pulls the tibia posteriorly (backward), which would cause stress to the healing graft. In phase 2 patients will begin to work more aggressively on strength and range of motion, usually discontinuing all use of the brace by six weeks. Prior to returning to sports, patients must regain strength, movement control, proprioception and force control. This often involves several months of progressive rehabilitation exercises. The rehabilitation guidelines below are presented in a criterion based progression. Specific time frames, restrictions and precautions are given to protect healing tissues and the surgical repair/reconstruction. General time frames are also given for reference to the average, but individual patients will progress at different rates depending on their age, associated injuries, pre-injury health status, rehab compliance and injury severity.

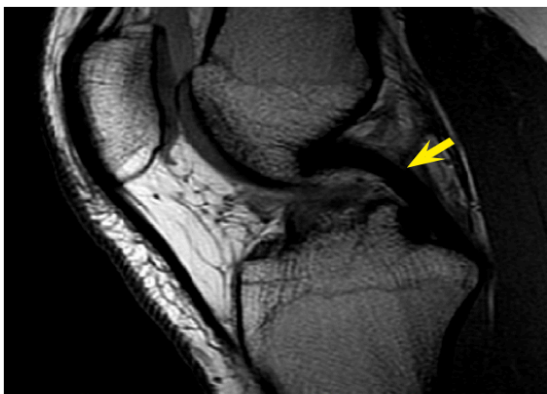


Figure 2 Sagittal PD MRI demonstrating a normal PCL

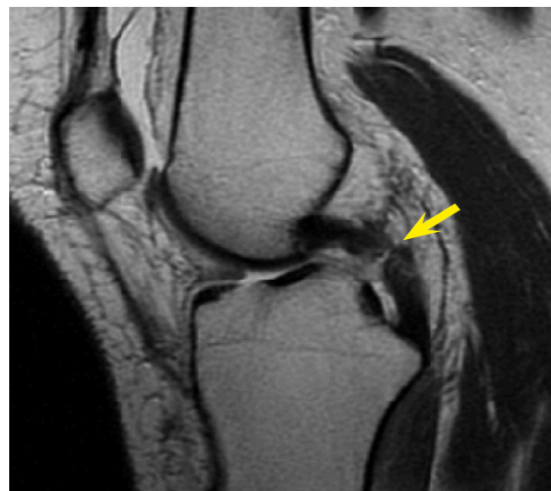


Figure 3 Sagittal T1 MRI demonstrating a torn PCL

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Phase I (Surgery to 4 weeks after surgery)

Weightbearing	As tolerated with crutches (may be modified if concomitant posterolateral corner reconstruction, meniscal repair/meniscal transplant or articular cartilage procedure is performed)
Bracing	<ul style="list-style-type: none"> ○ Locked in hinged knee brace in full extension for ambulation and sleeping (Week 0-1) ○ Locked in hinged knee brace in full extension for ambulation – removed for therapy sessions (Week 1-4)
ROM	<ul style="list-style-type: none"> ○ Weeks 0-1: none ○ Weeks 1-2: PROM 0-30° ○ Weeks 2-4: PROM 0-90° (maintain anterior pressure on proximal tibia as knee is flexed from 1-4, need to prevent posterior sagging at all times)
Therapeutic Exercises	<ul style="list-style-type: none"> ○ Quad/Hamstring sets and ankle pumps ○ Straight-Leg Raise with brace in full extension until quad strength prevents extension lag ○ Hip abduction/adduction (RESISTANCE MUST BE PROXIMAL TO THE KNEE) ○ Hamstring/Calf stretch – Calf press with theraband progressing to standing toe raises with knee in full extension
Other Suggestions	Avoid active hamstring activity and active knee extension from 90-70° until post-op week 4

Phase II (4 weeks to 12 weeks following surgery)

Weightbearing	○ As tolerated with crutches – D/C crutch use at 6-8 weeks post-op
Bracing	<ul style="list-style-type: none"> ○ Weeks 4-6: unlock for gait training/exercise only ○ Weeks 6-8 unlocked for all activities ○ D/C brace at 8 weeks post-op
ROM	○ Maintain full knee extension – work on progressive knee flexion (goal of 110° by week 6)
Therapeutic Exercises	<ul style="list-style-type: none"> ○ Weeks 4-8: Gait training, wall slides (0-30°), Mini-squats (0-30°), Leg press (0-60°) ○ Weeks 8-12: Stationary bicycle (with seat higher than normal), Stairmaster, Closed-chain terminal knee extension, Legg press (0-90°), Balance and proprioception activities

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Phase III (12 weeks to 9 months following surgery)

Weightbearing	<ul style="list-style-type: none">○ Full weightbearing with normalized gait pattern
ROM	<ul style="list-style-type: none">○ Full/painless ROM
Therapeutic Exercises	<ul style="list-style-type: none">○ Advance closed chain strengthening exercises, progress with proprioception/balance activities○ Maintain flexibility○ Begin treadmill walking – progress to jogging

Phase IV (9 months and beyond)

Goals	<ul style="list-style-type: none">○ Maintain strength, endurance and function – initiate plyometric program○ Begin cutting exercises and sport-specific drills○ Return to sports as tolerated
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References

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