

# Rehabilitation Guidelines for Medial Patellofemoral Ligament Repair and Reconstruction

The knee consists of four bones that form three joints. The femur is the large bone in the thigh and attaches by ligaments and a capsule to the tibia, the large bone in the lower leg commonly referred to as the shin bone. Next to the tibia is the fibula, which runs parallel to the tibia on the outside of the leg. The patella, commonly called the knee cap, is embedded in the quadriceps and patellar tendon which articulates with the front of the femur, which forms the patellofemoral joint. The patella acts as a pulley to increase the amount of force that the quadriceps muscle can generate.<sup>1</sup> The patella sits in a groove on the end of the femur called the trochlear groove. This groove varies in depth from person to person. While the knee flexes (bends), the patella travels down the groove and as the knee extends (straightens) the patella moves up the groove. As the patella travels up and down in the trochlear groove, the patella should maintain congruent bony alignment, which is often referred to as normal patellar tracking.

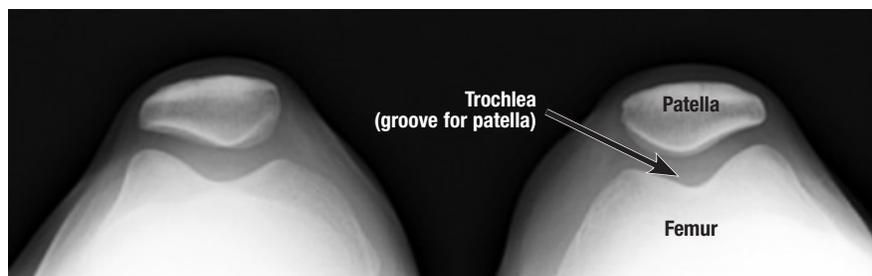
There are several structures that work together to keep the patella aligned and stabilized in the femoral groove to prevent the patella from excessive lateral

movement (movement towards the outside of the leg). The lateral aspect of the trochlear groove is normally about 1 centimeter higher than the medial (inside of the leg) aspect of the trochlear groove, which helps keep the patella in the trochlear groove by providing a buttress on the lateral side (Figure 1).<sup>2</sup> This provides the main resistance to lateral patellar translation (which is the most common direction of displacement), especially beyond 20 degrees of knee flexion.<sup>3</sup> People who have a shallow trochlea are more susceptible to patellar instability.

Proper stabilization of the patella is also affected by the soft tissue structures (ligaments and muscles) surrounding the knee. The medial patellofemoral ligament (MPFL) is a continuation of the deep retinaculum and vastus medialis

oblique (VMO) muscle fibers (inner portion of the quadriceps muscle) on the inside of the knee. These structures provide a significant force (near 60% total) against lateral displacement of the patella, as their force is directed inward or medially.<sup>2,4</sup> The MPFL is the primary restraint to lateral displacement of the patella during the first 20 to 30 degrees of knee flexion.<sup>3</sup> This ligament is a passive stabilizer and extends from the upper inner side of the patella to the medial aspect of the femur. The patellomeniscal ligament and retinaculum also contribute more than 20% of the restraining force.

These ligaments can be injured and torn with an initial acute traumatic patellar dislocation (knee cap quickly going out of place). The most common mechanism for a patellar dislocation is a forceful inward

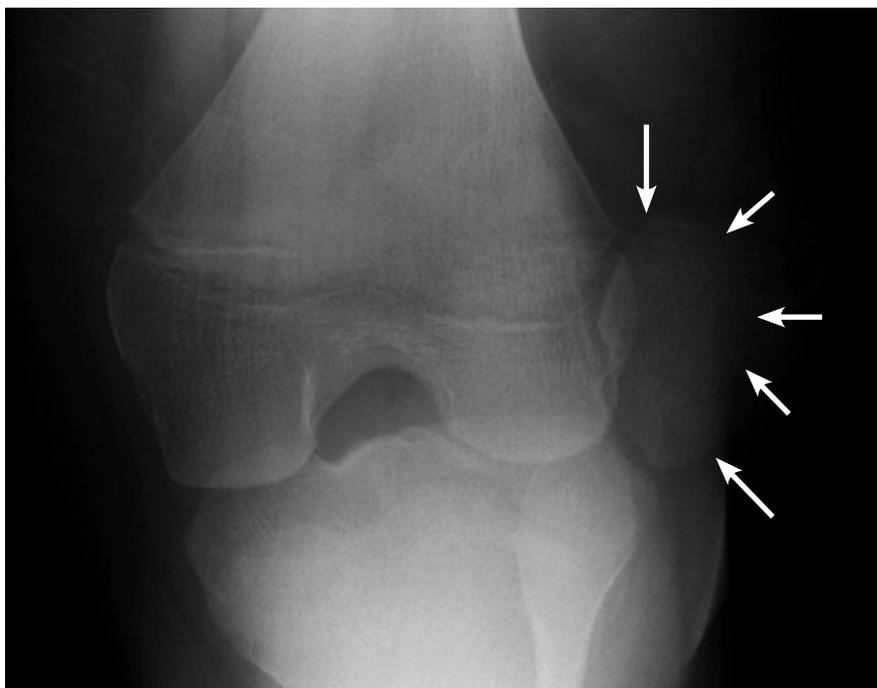


**Figure 1.** Radiograph of the patellofemoral joint with the knee in slight flexion. The lateral aspect of the trochlear groove is normally about 1 cm higher than the medial.

rotation of the body on a planted foot. The radiograph below is that of a 12 year old boy in the emergency room after such an injury (Figure 2). Often times the patella will go back in to place (or relocate to the groove) as the knee is gently straightened. In this case the patient was unable to straighten his knee in the emergency room and his patella was still dislocated laterally. Note on the radiograph that there is no overlap of the femur and patella.

In studying 26 patients who had an acute patellar dislocation at a mean age of 18 years, Nomura et al. reported evidence of MPFL damage in 96% (26/27) of the knees examined during open surgical exploration). In an acute patellar dislocation, when a tear of the MPFL is identified, surgical repair (fixing the original ligament) of the MPFL may be a good treatment option. In the young athletic population, recurrence rates for patients treated conservatively are high with some studies reporting 40%. In recurrent or chronic patellar dislocations, it may be necessary to perform reconstruction of the MPFL. Reconstruction differs from repair in that graft tissue (such as a hamstring tendon) is used to replace or reinforce the MPFL. In these cases the MPFL reconstruction may also be combined with other patellar stabilization procedures.

A quality post-operative rehabilitation program is essential to having a successful outcome from a MPFL procedure. The goals of rehabilitation will initially



**Figure 2.** Radiograph of the knee, arrows show the laterally dislocated patella

focus on protection for healing, mobility and range of motion. After this early phase, strengthening and neuromuscular control is emphasized throughout the entire leg and core. In the final stages of rehabilitation, the focus will be on dynamic lower extremity control during sport specific movements, such as change of direction and rotational movements.

The UW Health Sports Medicine rehabilitation guidelines below are presented in a criterion based progression. General time frames are given for reference to the average, but individual patients will progress at different rates depending on their age, associated injuries, pre-injury health status, rehabilitation compliance and injury severity.

Modifications in the specific time frames, restrictions and precautions may also be made to protect healing tissues based on the specific surgical repair/reconstruction procedure performed.

**PHASE I (Surgery to 6 weeks after surgery)**

<b>Appointments</b>	<ul style="list-style-type: none"> <li>• Rehabilitation appointments begin 7 to 10 days after surgery and continue once every 10 to 14 days</li> </ul>
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>• Protection of the post-surgical knee</li> <li>• Restore normal knee range of motion</li> <li>• Normalize gait</li> <li>• Eliminate effusion (swelling)</li> <li>• Restore leg control</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>• Brace locked in extension for gait and activities of daily living</li> <li>• Use axillary crutches for gait as needed with brace on, weight bearing as tolerated</li> <li>• Range of motion limitations as stated below</li> </ul>
<b>Range of Motion Exercises</b>	<ul style="list-style-type: none"> <li>• 0° – 90° of knee flexion for passive and active assisted range of motion</li> </ul>
<b>Suggested Therapeutic Exercises</b>	<ul style="list-style-type: none"> <li>• Quadriceps sets</li> <li>• Four way leg lifts with brace on in supine for hip strengthening</li> <li>• Ankle pumps</li> <li>• Ankle isotonic with exercise band</li> </ul>
<b>Cardiovascular Exercises</b>	<ul style="list-style-type: none"> <li>• Upper body circuit training or use of an upper body ergometer</li> </ul>
<b>Progression Criteria</b>	<ul style="list-style-type: none"> <li>• 6 weeks after surgery</li> </ul>

**PHASE II (begin after meeting Phase I criteria, usually 6 weeks after surgery)**

<b>Appointments</b>	<ul style="list-style-type: none"> <li>• Rehabilitation appointments are 1 to 2 times per week</li> </ul>
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>• Single leg stand control</li> <li>• Good control and no pain with short arc functional movements, including steps and partial squats</li> <li>• Good quad control</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>• Use of lateral buttress knee sleeve if directed by physician or physical therapist</li> <li>• Avoid over-stressing fixation: begin movement control and gentle strengthening with closed chain movements in a shallow arc of motion and by using un-weighting techniques (such as the pool or double leg support)</li> <li>• Avoid post-activity swelling</li> </ul>

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<b>Suggested Therapeutic Exercises</b>	<ul style="list-style-type: none"> <li>• Gait drills (begin with pool)</li> <li>• Functional single plane closed chain movements (begin with pool)</li> <li>• Continued gradual progression of range of motion</li> <li>• Gradual progress of lower extremity strengthening with precautions to avoid dynamic valgus or medial knee displacement</li> <li>• Balance and proprioception exercises</li> </ul>
<b>Cardiovascular Exercises</b>	<ul style="list-style-type: none"> <li>• Upper body circuit training or upper body ergometer</li> </ul>
<b>Progression Criteria</b>	<ul style="list-style-type: none"> <li>• Normal gait on level surfaces</li> <li>• Good leg control without extensor lag, pain or apprehension</li> <li>• Single leg balance greater than 15 seconds</li> <li>• At least 12 weeks after surgery</li> </ul>

### PHASE III (begin after meeting Phase II criteria, usually 12-14 weeks after surgery)

<b>Appointments</b>	<ul style="list-style-type: none"> <li>• Rehabilitation appointments once every 1 to 2 weeks</li> </ul>
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>• Full range of motion</li> <li>• No effusion (swelling)</li> <li>• Improve quadriceps strength</li> <li>• Improve proximal hip and core strength</li> <li>• Improve balance and proprioception</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>• Avoid closed chain exercises on land past 90° of knee flexion to avoid over-stressing the repaired tissues and increased patellofemoral forces</li> <li>• Avoid post-activity swelling</li> </ul>
<b>Suggested Therapeutic Exercises</b>	<ul style="list-style-type: none"> <li>• Continue range of motion exercises and stationary bike</li> <li>• Closed chain strengthening begin with single plane progress to multi-plane</li> <li>• Single leg press</li> <li>• Balance and proprioception exercises: single leg stand, balance board</li> <li>• Hip and core strengthening</li> <li>• Stretching for patient specific muscle imbalances</li> <li>• Initiate low amplitude agility drill in the sagittal plane – avoid frontal and transverse initially because of the potential for dynamic valgus</li> </ul>
<b>Cardiovascular Exercises</b>	<ul style="list-style-type: none"> <li>• Swimming with flutter kick (no breast stroke) or StairMaster</li> <li>• No Running</li> </ul>
<b>Progression Criteria</b>	<ul style="list-style-type: none"> <li>• Full range of motion</li> <li>• No effusion (swelling)</li> <li>• No patellar apprehension</li> <li>• Single leg balance with 30° of knee flexion greater than 15 seconds</li> <li>• Good control and no pain with squats and lunges</li> </ul>

**PHASE IV (begin after meeting Phase III criteria, usually 16 to 18 weeks after surgery)**

<b>Appointments</b>	<ul style="list-style-type: none"> <li>Rehabilitation appointments are approximately once every 2 to 3 weeks</li> </ul>
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>Good eccentric and concentric multi-plane dynamic neuromuscular control (including impact) to allow for return to work/sports</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>Post-activity soreness should resolve within 24 hours</li> <li>Avoid post-activity swelling</li> </ul>
<b>Suggested Therapeutic Exercises</b>	<ul style="list-style-type: none"> <li>Impact control exercises beginning 2 feet to 2 feet, progressing from 1 foot to the other and then 1 foot to the same foot</li> <li>Movement control exercises beginning with low velocity, single plane activities and progressing to higher velocity, multi-plane activities</li> <li>Progression to multi-planar agility drills with progressive increase in velocity and amplitude</li> <li>Sport/work specific balance and proprioceptive drills</li> <li>Hip and core strengthening</li> <li>Stretching for patient specific muscle imbalances</li> </ul>
<b>Cardiovascular Exercises</b>	<ul style="list-style-type: none"> <li>Replicate sport or work specific energy demands</li> </ul>
<b>Progression Criteria</b>	<ul style="list-style-type: none"> <li>Return to sport/work criteria:</li> <li>Dynamic neuromuscular control with multi-plane activities and without pain, instability or swelling</li> <li>Approval from the physician and/or sports rehabilitation provider</li> </ul>

These rehabilitation guidelines were developed collaboratively between Marc Sherry, PT, DPT LAT, CSCS and the UW Sports Medicine physician group.

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**References**

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