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Rehabilitation After 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.¹ 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).² This provides the main resistance to lateral patellar translation (which is the most common direction of displacement), especially beyond 20 degrees of knee flexion.³ 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.⁴ The MPFL is the primary restraint to lateral displacement of the patella during the first 20 to 30 degrees of knee flexion.³ 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 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

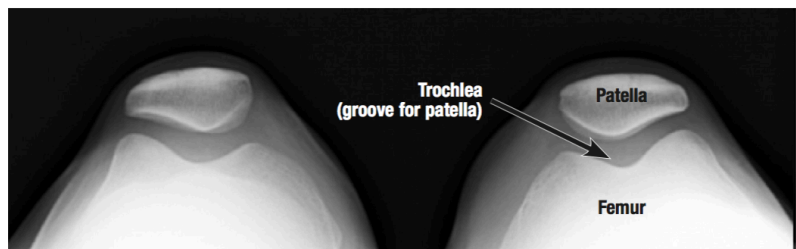


Figure 1. Radiograph of the patellofemoral joint with the knee in slight flexion. The lateral aspect of the trochlear groove is normally about 1 cm higher than the medial.

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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 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.

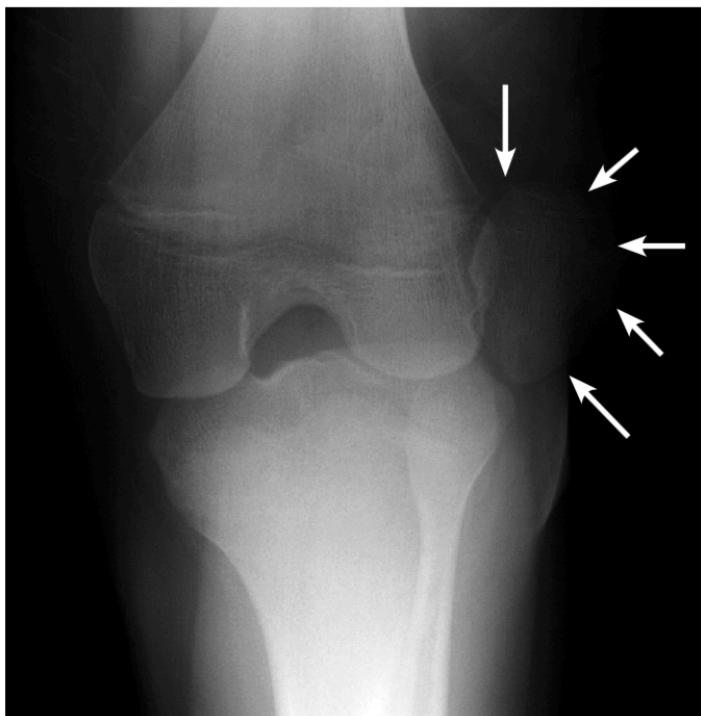


Figure 2. Radiograph of the knee, arrows show the laterally dislocated patella

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Phase I (Surgery to 2 weeks after surgery)

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| Range of Motion Exercises | <ul style="list-style-type: none">○ Post-op day 1<ul style="list-style-type: none">○ Brace ROM: locked in full extension○ Weight bearing/ROM: touch down, weight bearing○ Week 1<ul style="list-style-type: none">○ Brace ROM: locked in full extension at all times○ Weight bearing/ROM: full weight bearing as tolerated |
| Therapeutic Exercises | <ul style="list-style-type: none">○ Post-op day 1<ul style="list-style-type: none">○ Quad sets○ Ankle pumps○ Cryotherapy device○ Elevation○ Week 1<ul style="list-style-type: none">○ Heel slides○ Seated flexion○ Prone flexion○ Wear knee brace for at least 6 weeks post-op |

Phase II (2 weeks to 6 weeks following surgery)

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| Range of Motion Exercises | <ul style="list-style-type: none">○ Brace ROM: locked in full extension at all times○ Weight bearing/ROM: full weight bearing as tolerated |
| Therapeutic Exercises | <ul style="list-style-type: none">○ Weeks 2-3<ul style="list-style-type: none">○ Straight-leg raises with no weight○ Weeks 4-5<ul style="list-style-type: none">○ Straight-leg raises with 1-lb weight○ Should have 90 degrees of flexion |

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Phase III (6 weeks to 24 weeks following surgery)

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| Range of Motion Exercises | <ul style="list-style-type: none">○ Weeks 6-12<ul style="list-style-type: none">○ Brace ROM: Discontinue brace when quadriceps strengthening allows; neoprene sleeve with altered buttress optional○ Weight bearing/ROM: full; should have normal ROM○ Months 3-6<ul style="list-style-type: none">○ Brace ROM: Full; no brace○ Weight bearing/ROM: full |
| Therapeutic Exercises | <ul style="list-style-type: none">○ Weeks 6-12<ul style="list-style-type: none">○ Continue stationary bike○ Start shuttle jumps at week 12○ Treadmill○ Isotonic leg presses○ Toe press○ Leg curl○ Stool scooter○ Months 3-6<ul style="list-style-type: none">○ Initiate progressive jogging program○ Advance to cutting and sport-specific drills○ Return to regular sports if cleared by MD |

References

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4. E. Nomura, Y. Horiuchi and M. Inoue, Correlation of MR imaging findings and open exploration of medial patellofemoral ligament injuries in acute patellar dislocations, *Knee* 9 (2002), pp. 139, 143.
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