Dx: ☐ Right ☐ Left

Patient Name: _____

Date of Surgery: _____

PT/OT: Evaluate and treat. Follow the following protocol.

Signature/Date: _____

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MPFL Reconstruction Rehab Protocol

There are two types of patients that have this procedure: patients with a purely traumatic cause of their patellar instability and patients with an atraumatic onset. Patients with a traumatic cause usually have good quadriceps muscle bulk and control, good core strength and normal alignment. Patients with an atraumatic onset tend to be predisposed to patellar instability due to ligament laxity, reduced quadriceps muscle bulk, decreased neuromuscular control and/or alignment.

This second group of patients generally requires extensive rehabilitation of the entire kinetic chain including hip and core strengthening exercises. This group of patients also tends to progress through rehabilitation more slowly than patients with traumatic instability.

Progression through the phases of this rehabilitation program will vary depending on pre-operative strength and function, extent of surgery and commitment to the rehabilitation program.

WEIGHT BEARING - Weight bearing, without rotation or valgus, will not damage the MPFL reconstruction. Valgus (inward) knee and hip internal rotation movements during weight bearing will put the knee in a position that may stress the reconstruction and should be avoided.

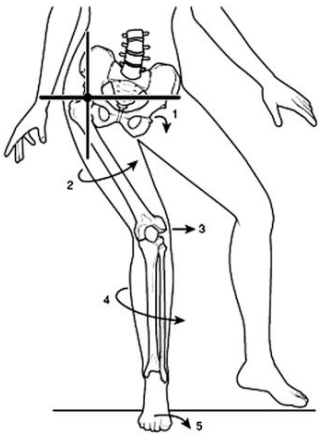


Image of knee valgus and hip internal rotation movements that should be avoided after surgery (Fithian; Clin Sport Med 2010)

RANGE OF MOTION - Range of motion exercises will not stretch the MPFL graft. A properly positioned and securely fixed graft can withstand the physiologic loads placed on it during range of motion exercises. Full extension is usually achieved soon after surgery. Flexion may be limited by pain caused the surgical dissection around the medial epicondyle of the femur.

STRENGTHENING - MPFL reconstruction causes significant quadriceps inhibition post-operatively. Early rehabilitation must focus on regaining quadriceps control and strength. In-line quadriceps strengthening exercises will not harm the graft. **Electrical Muscle Stimulation (EMS)** is a very useful adjunct when combined with voluntary muscle contraction and **should be used at all phases of this protocol.**

CORE & HIP STRENGTHENING – These exercises are very important for good function after surgery and can be started in the first week after surgery.

PHYSICAL THERAPY - Rehabilitation after MPFL reconstruction requires careful monitoring by a physiotherapist. This protocol is not meant as a home program. **There is no time restriction for the progression of phases. Progression will be decided by the physiotherapist based on each patient's clinical progress.** Each patient should have a frank discussion with their physiotherapist about how to best utilize the physiotherapy visits that they can afford. Patients will generally need physiotherapy care and guidance for 6 - 12 months post-operatively.

RETURN TO SPORT - Return to sport is based on progression to sport specific activities and depends on quadriceps and hip strength and control. The MPFL imbrication or reconstruction will be well healed by the time this strength and control is obtained. Most patients take 6 - 12 months to rehabilitate well enough to return to sport although some patients may return slightly earlier with dedication to their rehabilitation programme.

COLD THERAPY - Cold therapy is the use of ice or cold to reduce pain, inflammation, swelling and spasm after surgery. Cold therapy can be applied with a bag of ice, an ice pack, gel pack, or by using a specialized Cold Therapy Unit. Research has proven cold therapy decreases pain, inflammation, swelling, blood loss, and narcotic use after surgery.

You should use cold therapy a minimum of 5 times per day for 20 minutes each for the first 5-7 days after surgery**. It is essential that you protect your skin from the cold therapy product using a cloth or towel.** If you are using a Cold Therapy Unit it is possible to safely keep the cold pads on for much longer periods of time. To get the best results and prevent skin injury, you should always carefully follow the instructions that come with the Cold Therapy Unit.

PHASE 1: Early Post-operative Phase

This is the initial recovery phase and it normally lasts 1 - 3 weeks. In the first week you should rest and elevate your leg for a significant amount of the time.

Goals

1. Control inflammation and swelling
2. Range of motion exercises within pain limits, i.e. active and active-assisted knee flexion (bending) and extension (straightening)
3. Quadriceps muscles activation
4. Hip strengthening

BRACE

A brace was placed on your leg after surgery and it should be worn at all times when you are walking and sleeping. For the first 48 - 72 hours after surgery, the brace should be locked, to protect your knee and for pain control. You may remove the brace to ice the knee or if resting quietly. You should unlock the brace as you gain range of motion (if you can comfortably bend to 30 degrees, unlock the brace to 30 degrees).

WEIGHT BEARING

Use your crutches to weight bear by putting about 50% of your weight through your operative leg. Increase as tolerated to full weight bearing. With your crutches, try to walk using a normal "heel-toe" pattern. Your progression to full weight bearing will depend on swelling, pain, and quadriceps control.

COLD THERAPY & ELEVATION

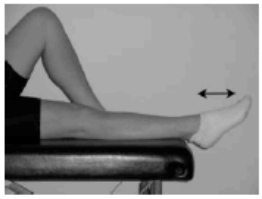
A Cold Therapy Unit or an ice pack should be applied immediately after surgery and used for at least 20 minutes every other hour while you are awake and especially after exercises. Your surgical leg should be elevated with your knee straight when applying cold therapy or resting.



Exercises

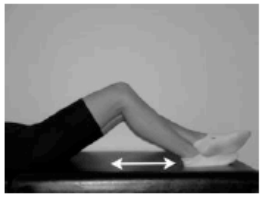
1. **Ankle pumps**

   - The foot and ankle should be actively "pumped" up and down 10-20 times every hour.

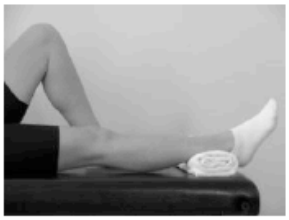


2. **Range of Motion**

   - **Flexion** – In lying, bend your knee by sliding your heel towards your buttocks. You can use your other leg to help you as needed. Perform up to 20 times; repeat 2 - 3 times daily.



- **Extension -** In lying, place a roll beneath your ankle to passively (i.e. allow gravity), stretch your knee into extension. Start with 2 minutes at a time and increase as tolerated up to 5 minutes. Perform 2 or 3 times daily. It is very important in this phase to work on straightening your knee.



3. Strengthening

- **Quadriceps Contraction -** In sitting with your knee straight and leg supported, tighten your thigh muscle by pushing your leg downwards. Focus on tightening the muscle and avoid lifting your leg from the hip. Perform exercise 5 -10 times holding each contraction for 5 secs. Progress to 30 times holding each contraction for 10 secs, resting for 5 secs in between reps. The use of EMS is recommended for this exercise.



- **Hip Adduction -** In lying with your knees bent as shown, squeeze a soft ball or a pillow between your knees. Perform exercise 5 - 10 times holding each contraction for 5 seconds. Progress to 30 times holding each contraction for 10 - 15 secs, resting for 5 secs between reps.



**** Perform all exercises 2-3 times per day to build your strength and endurance**

Also consider:

- Hip strengthening as tolerated
- Straight leg raises, Quads over roll with EMS
- Other ROM exercises as tolerated (heel slides on wall/passive flexion in sitting using other leg to push)
- Stationary bike
- Resisted ankle exercises in sitting using rubber tubing

Requirements for progression to Phase 2:

- Ability to activate quadriceps (specifically VMO)
- Pain levels managed to enable exercise progression
- Full knee extension
- Knee flexion ≥ 60°

PHASE 2: Quads Activation and Core Stability

This is the initial muscle strengthening phase and it normally lasts from 3-12 weeks. This phase emphasizes progressive activation of the quadriceps muscles and significant core strengthening.

Goals

1. Manage pain and swelling
2. Range of Motion: 0° to ≥ 90° by end of 6th week post-operative
3. Good quadriceps muscle contraction; able to perform a straight leg raise
4. Full weight bearing with crutches wearing unlocked or patella stabilizing brace
5. Include stationary bike in daily rehabilitation
6. Focus on quadriceps activation (using EMS) and hip strength

BRACE

The brace placed on your leg after surgery may be taken off at night for sleeping **if** you can do a straight leg raise with no quadriceps lag. As your ability to contract your quadriceps improves, you can start to wean into the Patellar Stabilizing Brace (PSB). This is usually 4 - 6 weeks postoperative. A brace should be worn whenever you are walking outside the house.

WEIGHT BEARING

In order to stop using crutches, you must be able to walk without a limp while using crutches (i.e. you must be able to fully weight bear on the operated leg without compensation). Continue to use your crutches until you can fully weight bear and have good quadriceps control. Wean off using the crutches by the end of this phase.

COLD THERAPY & ELEVATION

Manage knee swelling by continuing to use cold therapy and elevation, particularly after exercise.

Exercises

1. **Range of motion** - Progress flexion using active, active-assisted and passive exercises.

2. **Strengthening**

- **Quadriceps** – Slowly squat with equal weight on each leg. Bend your knees from 0° to a maximum of 90° of flexion, making sure your knees do not move beyond your toes. Start with one set of 10, holding each squat for 5 secs and increase the number of reps as your strength increases, up to 30 reps x 15 sec holds. EMS should be used with this exercise with the 'contraction' time at least double the 'rest' time.





- **Hamstrings** – Lying on your stomach, place a resistance band around your ankle and also have it attached to an anchor point as shown. Bend your knee slowly against the resistance of the band pulling your foot towards your buttock. Start with 1 set of 10 reps and increase to 3 sets of 15 reps.



- **Gluteals** – In lying with your knees bent and your arms by your sides, squeeze your buttocks and lift up to create a bridge. Keep equal weight on each leg and straight alignment from your shoulders to your knees. Be careful not to push down on your neck or shoulders – use your buttocks to do the work. Start with one set of 10, holding each lift for 5 secs. Increase the number of reps as your strength increases. Once you can complete 20 reps holding for 10 secs each, change to single leg bridges.



3. **Proprioception/Balance**

- **Weight Shifting** – Stand without your brace on, slowly shift weight from your non-operated to your operated leg. Slowly increase the amount of weight supported through your operated leg.

- **Single-leg stance -** Once you can comfortably shift all your weight onto your surgical leg progress to balancing. Stand on your non-operative leg first and hold for 10 seconds; then stand for 5 secs on your operative leg. Slowly increase the amount of time you can balance, up to 30 seconds, 5 times each leg.

Also consider:

- Isometric exercises (quadriceps, hamstrings, hip flexors/extensors/rotators)
- Calf raises
- Adductors/abductor with resistance tubing
- Clam shells
- Double leg squats with ball squeeze
- Abdominal and core strengthening (i.e. curl-ups, isometrics, obliques, transversus abdominis, planks, physio ball and Pilates)

Requirements for progression to Phase 3:

- Straight leg raise with no quadriceps lag
- Good core strength
- Double leg squat with good motor control
- Single leg bridges 10 repetitions x 10 sec hold each

PHASE 3: Strength and Control

This is a progressive strengthening and balance phase and normally lasts from 9 – 18 weeks but may take up to 6 months to master.

Goals

1. Full range of motion
2. Walking without crutches normal gait, wearing patellar stabilizing brace
3. Improve proprioception and balance.
4. Aerobic activity 20 - 30 minutes per day.
5. Increase quadriceps, hamstrings, gluteal and core strength

BRACE

You should be in the PSB for all at risk activities. You do not need to wear the brace in safe environments such as at home.

WEIGHT BEARING

You should be full weight bearing without walking aids at this phase.

COLD THERAPY & ELEVATION

Manage knee swelling by continuing to use cold therapy and elevation, particularly after exercise.

Exercises

1. Range of motion - should be full at this stage.

2. Strengthening

- **Single leg squats** - Initially use a chair or railing for support. Standing on one leg, slowly squat bending your knee from 0° to a maximum of 90°, making sure your knee does not move beyond your toes. Start with one set of 10, holding each squat for 5 secs and increase the number of reps as your strength increases, up to 30 reps x 15 sec holds.





- **Step-ups** – Do graduated heights, starting at 4" and increasing to 8". Stand in front of a stair or stepping stool and place one foot on the step in front of you. Rise up onto the step by shifting all of your weight onto this leg and tighten your quadriceps muscles. Put all of your weight through this leg and do not step up onto the step with your other leg. Start with one set of 10, holding at the top of the step-up for 5 secs. Increase the number of reps up to 20 reps with 15 sec holds on each leg.



- **Step-downs -** Do graduated heights, starting at 4" and increasing to 8". Start with one leg standing on the step and slowly bend your knee to lower your other leg to lightly touch the floor. Keep all of your weight through the leg that is on the step. Start with one set of 10, holding at the bottom of the step-down for 5 secs. Increase the number of reps as your strength increases, up to 20 reps with 15 sec holds on each leg.



- **Standing Hamstring Curls -** Attach one end of the tubing securely at heel height and attach the other end to your ankle. Standing with both knees slightly bent, slowly contract your hamstring muscles to bend your knee. Slowly return to your starting position; repeat 15 times on each leg. Increase the resistance of your band and the number of repetitions as you become stronger. Keep a check on your posture and contract your core muscles for stability while you are bending your knee.



3. Proprioception

- **Double leg squats on an unstable surface** (thick carpet → camping mattress → foam pillow → balance disc → BOSU)
- **Single leg stance on an unstable surface** (thick carpet → camping mattress → foam pillow → balance disc → BOSU)
- **Wobble board** balance and weight shift activities
- **Single leg calf raises** +/- mini squat



Also consider:

- Hip abduction, adduction, extension (open chain) in standing; progress to resistance with tubing or weights
- Lunges – forwards/backwards
- Abdominal and core strengthening (i.e. curl-ups, isometrics, obliques, transversus abdominis, planks, physio ball and Pilates)
- Hamstring curls in lying with a physio ball
- Open kinetic chain weight-training exercises (leg press, knee extension, hamstring curls, hip strengthening with pulleys)
- Walking/hiking/jogging/cycling as tolerated
- Pool: flutter kick, easy jogging in waist deep water and running in deep water with aqua-belt

Requirements for Progression to Phase 4:

- Improved strength and endurance
- Ability to demonstrate good core control and posture in single leg stance activities
- Must be able to perform a controlled single leg squat to 70° before commencing plyometrics

PHASE 4: Sport Readiness

This phase begins as early as 3 months after surgery but usually starts around 18 weeks and may last up to 12 months. This phase focuses on improving agility and strength through plyometric exercises, and return to functional activities including sports.

GOALS

1. Improve proprioception and balance
2. Increase aerobic endurance
3. Maximize quadriceps, hamstrings, gluteal and core strength with functional exercises
4. Accurately perform plyometric drills
5. Training with sport specific drills

COLD THERAPY & ELEVATION

Manage knee swelling by continuing to use cold therapy and elevation, particularly after exercise.

Exercises

1. Proprioception

- **Lunges on BOSU -** Step forward/back and lunge as shown. Control the descent ensuring your knee that is forward does not move beyond your toes. Start with 1 set of 10, holding each lunge for 5 secs. Increase the number of reps as your strength increases up to 3 sets of 10 on each leg.





- **Single leg squats on trampoline -** Standing on one leg, slowly squat bending your knee from 0° to a maximum of 90°, making sure your knee does not move beyond your toes. Start with one set of 10, holding each squat for 5 secs and increase the number of reps as your strength increases, up to 20 reps x 15 sec holds on each leg.



- **Single leg stance with ball toss -** Standing on one leg on a BOSU or other unstable surface (i.e. foam block), toss and catch a light ball against a wall. Start with 2 sets of 15 tosses on each leg and increase as strength and balance improve.



2. **Plyometrics** - Patient must be able to perform a controlled single leg squat to 70° before commencing plyometric exercises.

- **Agility jumping** – start with straight-line jumping, backward/forward/side-to-side and progress to diagonals and combined patterns. Once speed and agility are good with jumping, progress through activities using single-leg hopping on each leg.

Agility jumping




Agility hopping




- **Side to side jump steps on the BOSU** – Perform quick steps in both directions over BOSU. Start with 1 set of 10 steps in both directions and progress to 3 sets of 15 steps in both directions as your strength increases.





- **Jumping -** tuck jumps, box jumps, long jumps
- **Hopping -** single-leg hop (distance), 6m timed hop, triple hop (distance), zig-zag hops

3. **Agility**

- **Quick Lateral shuttles from cone to cone**




- **Skipping rope** – double and single leg
- **Grapevine/Cariocas**
- **Figure 8's around cones**
- **Agility Ladder**

4. Running Drills:

- **Shuttle sprints, stop and go drills**
- **Zig-zag running, sideways and backwards drills**
- **Sprinting with cutting and pivoting drills**

5. Sport-specific drills:

a. **Basketball:** lay-up drills, lateral shuttle runs while throwing/catching ball off wall, run-pivot-vertical jump, dodging drills, defence drills (running/jumping backwards)
b. **Soccer:** dribble around cones, shooting drills, defence drills, lateral shuttle runs while kicking ball off wall, tackling drills
c. **Football/Rugby:** dodging/deking drills, running and throwing drills (all directions), defence tackling drills
d. **Hockey:** skating figures, stick handling drills, shooting drills, deking drills

Also consider:

- Open kinetic chain weight-training exercises (leg press, knee extension, hamstring curls, hip strengthening with pulleys)
- Wobble-board balance activities +/- perturbation (throwing/catching ball, raising arms)
- Box hops (up/down starting with 6" block)
- Tiptoe and heel walking along a line → progress to tiptoe and heel skipping
- Rocker board lunges (forwards/backwards)
- Single-leg calf raises + mini squat
- Forward and Sideways leg swings (special attention to core stability)
- Abdominal and core strengthening (i.e. curl-ups, isometrics, obliques, transversus abdominis, planks, physio ball and Pilates)

*Protocol adapted from Banff Sports Medicine protocol August 2011.