

Medial Patellofemoral Ligament Reconstruction

1. Defined

- a. Reconstruction of the medial patellofemoral ligament in an effort to restore medial patellar stability and reduce chances of lateral dislocation. Collagenous structures typically fail at a range of 20-30% of elongation, which equates to about 12-18 mm of lateral patellar tracking.
- b. The MPFL is the primary soft tissue restraint of lateral patellar displacement – providing anywhere from 50-60% of the total medial stabilizing force. The medial patella-meniscal ligament and the medial patella-tibial ligament also serve in this role. Dynamic stabilizers such as the VMO and adductor magnus help in this capacity as well.
- c. There are a wide range of techniques used to reconstruct the MPFL. Some techniques involve harvesting a semitendinosus, adductor magnus, or quadriceps tendon autograft or allograft.
- d. This procedure is often performed in conjunction with a lateral release to the distal iliotibial tract.

2. Goals

- a. Restore motion
- b. Restore lower extremity control
- c. Maintain knee stability
- d. Protect the healing graft and donor site

3. Rehabilitation Principles (MPFL specific)

- a. Patient progression is time and function based and any deviation from clinical guidelines should be relayed to physician and documented.
 - i. Incorporation and revascularization
- b. Understand graft strain concepts in order to protect the graft.
- c. Patellar lateral shifting increases greatly from 20-90 degrees of knee flexion.
- d. The moment-arm of lateral patellar translation is much greater in the open-chain environment as the patella has greater surface area contact in the closed-chain models.
- e. The IT band tension and flexibility should be assessed and addressed early in the process, as it will be the greatest lateral counterforce producer.

- f. Lateral patellar mobilizations early in the rehab cycle could produce a dangerous amount of lateral translation, so the initiation of this process is initially contraindicated. Will be started when physician clears.
- g. Closed- chain exercises are most protective for the patellofemoral joint when performed at 0-45 degrees of flexion. Open-chain exercises are much safer in the 0-5 degree and 90-140 degree ranges.
- h. Be aware of increased risk factors for eventual return of excessive lateral tracking and an increased Q Angle:
 - i. Pronation
 - ii. Genu Valgum
 - iii. Increased Femoral Anteversion
 - iv. Laterally located tibial tubercle
 - v. Patella alta – associated with a long patella tendon. In patellae alta, the ratio of tendon length to the patella body length is increased, placing the patella in an elevated position that delays patella engagement of the trochlea until an increased angle of flexion.
 - vi. Hypoplastic trochlea – 4 grades of dysplasia can be identified on radiograph
- i. Limit muscular inhibition and atrophy from effusion.
- j. Initiate early activity of quads (isometric, isotonic, resistive) with e-stim and biofeedback.
- k. Initiate eventual closed-chain activity to provide compression across the knee joint while activating co-contraction of the quads and hamstrings (6 weeks)
- l. Address eventual limb confidence issues with progression of unilateral activity (not before 8-9 weeks)
- m. Address eventual limb velocity issues during gait with verbal and tactile cueing
- n. Incorporate eventual comprehensive lower extremity (hip and calf) muscle stabilization and strengthening activities as well as core strengthening activities (not before 6 weeks)
- o. Identify motion complications early and begin low-load, long duration stretching activity.
 - i. Range of motion expectations
 - 1. Week 1 – 3: 0 – 90 degrees
 - 2. Week 3 – 6: 90-120 degrees
 - 3. Week 6: work toward full motion
- p. Encourage life-long activity modification to include low impact cardiovascular activity and patellofemoral protection strategies (especially those found to have CMP at surgery).
- q. Incorporate sports-specific performance into rehab.

4. Post op functional guidelines

a. All Physician dependent

- i. Refer to physician preferences

b. Driving

- i. Refer to physician preference for right leg
- ii. No research to support recommendations for return to driving
- iii. Typically 7-14 days for left leg, unless driving manual transmission
- iv. Refer patient to drug precautions
- v. Refer patient to auto insurance coverage
- vi. Dependent on
 1. extremity involved
 2. adequate muscle control for braking and acceleration
 3. proprioceptive/reflex control
 4. adequate, functional ROM to get into driver's side
 5. confidence level

c. Work

- i. Refer to physician preference
- ii. Sedentary up to 1-2 weeks
- iii. Medium to high physical demand level will be physician preference

d. Jogging on the treadmill

- i. Check physician preference
- ii. 8-12 weeks and possibly in functional brace
- iii. Observe and minimize limb velocity asymmetry
- iv. Encourage lower impact activity

e. Acceleration training

- i. check physician preference
- ii. 3-4 months (12-16 weeks) and possibly in a functional brace

f. Sports

- i. Most sports – 4-6 months
 - a. Dependent upon good quad control, full range of motion, >80% score on hop test, normal KT test (when ordered, recommended or appropriate) and 80% isokinetic score (when ordered, recommended or appropriate). Golf could possibly start earlier.

5. Post op equipment guidelines

a. Polar care

- i. Physician dependent
- ii. As needed for pain and inflammation

b. Post-op Brace

- i. May be locked for ambulation until quad control regained
- ii. Unlock brace 0-60 degrees, when non-weight bearing, first three weeks

iii. DC brace at the end of week 4 (typically coincides with MD follow up appointment)

c. Crutches

- i. 2 crutches for 2 weeks, partial weight bearing in locked brace
- ii. Then wean from 2 crutches to 1 (and one to none) when patient has met criteria below
- iii. Dependent upon adequate quad control, no observed gait deviations, no change in pain, swelling, or effusion

d. Functional Brace

- i. Physician dependent

6. Clinical Restrictions

- a. No lateral patellar glides until MD clearance
- b. No motion beyond 90 degrees for first 3 weeks (unless cleared by MD)
- c. Brace 0-60 degrees for 3 weeks and then 60-90 for weeks 3-6
- d. Crutches needed until MD clearance and adequate quad control (2 crutches for at least 3 weeks)
- e. No active quad exercises beyond 0-60 degrees first 3 weeks

7. Rehabilitation for MPFL reconstruction

a. Weeks 1-3

i. Clinical Guidelines

1. control post-op swelling and effusion
2. start to restore ROM (working toward 0-90 degrees by end of third week)
3. inhibit post-op muscle shut down (e-stim reeducation, biofeedback,, verbal/tactile cueing)
4. soft tissue work to distal IT band, avoiding aggressive stretches as that could compromise the reconstructed MPFL
5. gentle, pain-free patella mobilizations (*except in the lateral direction)
6. gentle open-chain hamstring, calf, and IT band stretching
7. straight leg raises (except adduction – first 3 weeks)
8. ankle/calf strengthening with Theraband
9. patient may bike 0-90 degrees after first week (*only if clinician can assist with stoppage at 60 degree mark)
10. patient may do active, controlled (*and initially assisted) active quad exercises 0-60 degrees if VMO/Quad activation occurring

ii. Clinical Expectations by the end of week 3

1. ROM: 0 degrees to 90 degrees
2. Visible quad contraction (home stim immediately if poor)
3. Independent straight leg raise without extensor lag
4. Independent ambulation with axillary crutches first two weeks, weaning down as appropriate, without deviation

b. Weeks 4-6:

i. Clinical guidelines

1. Stationary bicycle if pain-free and no great patellar forces (high seat initially)
2. Isometric hamstring exercises
3. Still avoid lateral patellar mobilizations
4. Initiate terminal knee extensions if patient capable of controlling eccentric component of technique
5. progress gait independence, confidence, velocity, and heel strike
6. multi-angle hip machine abduction
7. leg press 0-80 degrees only (pain-free)
8. standing calf raises
9. standing calf stretches
10. active quad strengthening 0-90 degrees (no leg extension machine – may do pain-free isometric)
11. may initiate forward, assisted step-ups if patient can do with adequate control in a pain-free manner

ii. **Clinical Expectations by the end of week 6**

1. ROM: 0 degrees to 120 degrees
2. Visible/moderate intensity quad contraction (fair to fair+)
3. Independent straight leg raise without extensor lag
4. Ambulation without axillary crutches and with minimal deviation
5. Mild swelling only

c. **Week 6-12:**

i. **Clinical guidelines**

1. Increase cardiovascular endurance – may start elliptical machine and recreational walking
2. Isotonic hamstring exercises (pain-free)
3. Initiate and progress bilateral and unilateral closed chain activity to improve limb confidence
4. Initiate and progress bilateral and unilateral proprioceptive activity and reactive neuromuscular training (RNT)
5. Progress unilateral flexion under weight-bearing activity (i.e. lateral step ups)
6. Eventual weight shifting exercises (sagittal, working toward frontal plane) with focus on eccentric safety and control
7. When ready, initiate bilateral, low amplitude hopping activities with emphasis on quality movement (document if not appropriate and deviation from guidelines occurs) – some patients may qualify for unilateral jumping before week 12
8. Jogging may begin no earlier than 8 weeks, although most patients will not fit clinical criteria of necessary eccentric strength
9. GAP referral when appropriate

ii. **Clinical Expectations by the end of week 12**

1. Good quad contraction
2. Full, symmetrical motion
3. Minimal gait deviations
4. Minimal eccentric weakness
5. Minimal swelling
6. Patient nearing GAP referral

d. **Week 12-?:**

i. **Clinical guidelines (when clinically appropriate)**

1. Continue bilateral, low-amplitude hopping activities with emphasis on deliberate, quality movement.
2. Continue unilateral, low-amplitude hopping activities with emphasis on deliberate, quality movement.
3. Initiate unilateral, moderate-amplitude hopping activities with emphasis on quality movement.
4. Initiate bilateral, high-amplitude hopping activities with emphasis on quality movement. (high amplitude = 6-12 inches high, 50-75% max distance.)
5. Able to demonstrate good landing with low, moderate and high-amplitude hopping activities to include the following:
 - a. good athletic posture (spine erect and shoulders back)
 - b. no valgus with landing
 - c. soft landing
 - d. able to “stick” the landing
6. Proper coordination with higher-level agility activity **with cutting.**
7. Demonstrate 80% score on single leg hop test.
8. Repeat 3PQ RPD at 75% BW and 100% BW
9. Dartfish Plyometric test/retest
10. GAP - acceleration training referral when appropriate
11. Sports at 4-6 months if ALL criteria met

References

1. Bicos J, Fulkerson, JP, Amis A. The medial patellofemoral ligament. *Am J Sports Med.* 2007; 35: 484-492.
2. Drez, David. Results of Medial Patellofemoral Ligament Reconstruction in the Treatment of Patellar Dislocation. *Arthroscopy*, 2001; 17(3): 298-306.
3. Donnell S. Patellofemoral dysfunction-extensor mechanisms malalignment. *Curr Orthop.* 2006;20:103-111.
4. Elias D, White L. Acute lateral patellar dislocation at MR imaging. *Radiology.* 2002; 225: 736-743.
5. Fithian D, Gupta N. Patellar instability: principals of soft tissue repair and reconstruction. *Tech Knee Surg.* 2006;5: 19-26.
6. Smith T, Walker J. Outcomes of medial patellofemoral ligament reconstruction for patellar instability: a systematic review. *Knee Surg Sport Traumatol Arthrosc.* 2007; 15: 1301-1314.