

MPFL RECONSTRUCTION WITH PATELLAR TENDON IMBRICATION

Physical Therapy Protocol

PATIENT

SURGEON

Andrew L. Merritt, MD

DATE OF SURGERY

PT START DATE

For the patient

Your surgery rebuilt the MPFL, the main ligament that keeps your kneecap from slipping out to the side. Dr. Merritt also **tightened your patellar tendon** (the cord below the kneecap), called an imbrication. To protect it, **your brace stays locked straight whenever you stand or walk for 6 weeks**. Sitting or lying down, you can bend as much as is comfortable. After 6 weeks you follow the standard MPFL plan. Getting your thigh muscle (quad) working early matters most, and **don't let your knee collapse inward**.

PROTOCOL AT A GLANCE

WEIGHT BEARING	As tolerated from day 1, only with the brace locked straight . Most are off crutches by weeks 2 to 3
BRACE	Locked straight for all standing and walking for 6 weeks . Not needed for sleep, exercises, PT, or rest. Unlocked at 6 weeks, off by week 8
MOTION GOALS	No limit while sitting or lying down. 0–90° by week 4 ; full motion by week 12. Never put weight on a bent knee for 6 weeks
PHYSICAL THERAPY	Starts 5 to 7 days after surgery, 2 times a week at first
KEY PRECAUTIONS	No weight on a bent or unlocked knee for 6 weeks. No lateral kneecap glides through week 4. No valgus. No resisted leg-extension machine through week 12
RUNNING · SPORT	Jogging from about weeks 14 to 16 . Return to sport at 5 to 6 months ; cutting and pivoting not before 6 months

Recovery Timeline

Phase	When	PT visits	Focus
1	Weeks 0–6	2× a week	Weight only with the brace locked straight; free motion off your feet; quad, VMO, hips
2	Weeks 6–12	2× a week	Brace unlocked, off by week 8; mini squats, step-ups, balance
3	Weeks 12–20	1× a week + home program	Single-leg strength, jogging, early plyometrics
4	Weeks 20–24+	Weekly, as needed	Cutting, jumping, testing; sport at 5–6 months

For the Therapist

Check the surgeon notes first. They override anything else in this protocol. Questions or setbacks: call (425) 656-5060.

Surgeon notes and special instructions

General principles

- **What the surgery does.** The MPFL provides about 50–60% of the medial restraint to lateral patellar displacement. The reconstruction uses a soft-tissue graft fixed at the medial patella and the medial femoral epicondyle.
- **Patellar tendon imbrication** was added to improve patellar tracking by tightening the patellar tendon insertion. It changes the weight-bearing rules for the first 6 weeks.
- **Weight bearing in locked extension only, weeks 0–6.** The imbrication must heal under controlled tension, so weight bearing is allowed only with the brace locked at 0°. This protects it from repeated flexion loading under body weight. After week 6, weight bearing as tolerated without locking.
- **Motion as tolerated from day 1 when not weight bearing.** Stiffness is a main complication of MPFL reconstruction. The restriction is on the weight-bearing position only; there are no flexion limits in exercises or PT.
- **Brace locked in full extension for all walking, weeks 0–6** (unlike the standard MPFL protocol, where it is unlocked). It may be unlocked or removed for seated or supine motion work and PT. After week 6, unlocked hinged brace, then weaned as in the standard protocol.
- **Quad activation is the top early priority.** Arthrogenic muscle inhibition is common; aggressive early quad work, with NMES if needed, is key to brace independence.
- **VMO emphasis in every phase.** The VMO is continuous with the medial retinaculum and is the main dynamic stabilizer of patellar tracking.
- **Avoid valgus stress in every phase.** Hip abductor and external rotator strengthening is included in every phase to prevent dynamic knee valgus.
- **Graft type** does not change the progression. **Lateral retinacular lengthening** is a standard part of the operation and does not change the protocol; therapist-performed patellar glides are enough.
- **NMES** is provided at PT visits when quad activation is poor (no home unit). **BFR** is approved for all strengthening when available. **Cold compression:** 20 minutes on, 20 minutes off.

PHASE

1

Protection and Early Motion

Weeks 0–6

For the patient: what to expect

You can walk with full weight right away, but **your brace must be locked straight whenever you are on your feet for 6 weeks**. This protects the tendon repair. When you sit, lie down, or do your exercises, bend your knee as much as is comfortable. **Never put weight on a bent knee**. Your main jobs are waking up your quad and getting your knee moving. Never push your kneecap toward the outside.

WEIGHT BEARING	As tolerated from day 1, brace locked in full extension for all walking and standing. 2 crutches → 1 → none as quad control improves (most by weeks 2–3)
BRACE	Hinged brace locked at 0° for all walking, weeks 0–6. May be unlocked or removed for seated or supine motion work and PT. Exercises and rest without motion limits
MOTION	As tolerated from day 1 when not weight bearing: heel slides, seated flexion, and therapist-assisted motion are all encouraged. 0–90° by week 4

Goals

- Weight bearing with the brace locked; off crutches by weeks 2–3
- Motion 0–90° by week 4 (non-weight-bearing); 20 straight-leg raises without a lag
- VMO activation, with biofeedback or NMES as needed
- Pain and effusion controlled
- Patellar mobility kept (superior, inferior, medial glides only)

Move on when

- ☐ 20 straight-leg raises in a row without an extension lag
- ☐ Active motion 0–120° (non-weight-bearing)
- ☐ Walking with the brace locked, without crutches, on level ground
- ☐ Effusion trace or absent at rest

Exercises

Exercise	How
Quad sets · straight-leg raises	Quad sets 3 × 15, 5-sec hold, 3–4× a day from day 1 (NMES at PT if activation is absent). Supine SLR 3 × 15 once a quad set is present; goal 20 without a lag by weeks 4–6
VMO isometric adduction	Supine pillow squeezes, 3 × 15; confirm VMO activation by palpation or biofeedback
Heel slides · short-arc quads	Heel slides 3 × 15, pain-limited (main early motion exercise). Short-arc quads 0–30° over a towel roll, 3 × 15, from weeks 2–3
Ankle pumps · glute sets · hip abduction	Ankle pumps 2 × 20; glute sets 3 × 15; supine hip abduction 3 × 15 from week 2
Patellar mobilization	By the therapist: superior, inferior, and medial glides only, 1–2 min per direction. No lateral glides through week 4
Cold compression	After each session, 20 min on, 20 min off

Precautions

- Do not bear weight with the knee unlocked or bent for the first 6 weeks; flexion loading under body weight can compromise the imbrication
- No lateral patellar glides or lateral mobilization through week 4; lateral glides tension the graft directly at its medial patellar anchor
- Avoid valgus in all weight-bearing activity (hip adduction with internal rotation loads the graft); cue neutral alignment from day 1
- Do not force flexion; it increases effusion, worsens quad inhibition, and delays recovery
- Extension lag beyond week 4: add prone extension stretching and increase NMES intensity at PT; resolve before Phase 2

Why: Fibrous ingrowth at the anchors (weeks 0–4), then early collagen maturation (weeks 4–8). The imbrication also needs protection from repeated flexion-extension under load. Axial load in full extension is well tolerated; flexion under load and lateral or valgus force are not.

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2

Brace Wean and Early Strengthening

Weeks 6–12

For the patient: what to expect

At 6 weeks your brace is unlocked and you move from walking with a straight knee to normal walking. The brace comes off completely by week 8. You will start loading the knee more: squats, step-ups, and balance work to build the strength that protects your kneecap when you move. Your thigh will probably feel much weaker than the other side at first. That is normal and improves quickly with steady work. Keep your knee lined up over your toes; don't let it cave inward.

WEIGHT BEARING	Week 6: from locked-extension to full weight bearing with the brace unlocked. Full weight bearing in all settings by week 8
BRACE	Week 6: unlock the hinges and use as a standard hinged brace for walking. Wean off first on level indoor surfaces. May continue for community walking or stairs until quad control and confidence return. Off completely by week 8
MOTION	Full active motion, equal to the other side (0–140° or more)

Goals

- Full active motion (0–140° or more), symmetric with the other side
- Full weight bearing in all settings without the brace
- Quad and VMO strength toward 70% LSI before Phase 3
- Closed-chain strengthening to 45° squat depth
- Better single-leg balance on a firm surface
- Normal gait with no quad-avoidance pattern

Move on when

- ☐ Full symmetric motion (0–140° or equal to the other side)
- ☐ Single-leg stance 30 sec on a firm surface without deviation
- ☐ 15 step-ups on a 6-inch step with a 15-sec hold, no compensation
- ☐ Mini squat to 45° with neutral knee alignment
- ☐ Quad strength 70% LSI (dynamometer or clinical estimate)

Exercises

Exercise	How
Straight-leg raises	Progressive ankle weight (1–3 lb), 3 × 15
Short-arc quads	Unresisted, 3 × 15
Mini squats	0–30°, 3 × 15, mirror feedback for valgus
Wall sits	0–45°, 3 × 30-sec holds; progress to 60 sec by week 12
Step-ups	4-inch step, surgical leg leads, 3 × 12 with a 10-sec hold; progress to 6-inch by week 10
Sit-to-stand	3 × 10; progress from armrests to no armrests
Side-lying hip abduction	3 × 15–20; add ankle weight at week 8
Lateral band walks	3 × 15 steps each way; continue in every phase
Clamshells	Resistance band, 3 × 15–20
Single-leg balance	Firm surface, 3 × 30 sec per leg; start week 8
Patellar self-mobilization	All directions, 1–2 min a day

Precautions

- Do not allow valgus collapse during step-ups or mini squats. If it persists despite cueing, add hip abductor loading before progressing depth or load
- Avoid aggressive prone quad stretching while patellar sensitivity persists; gentle passive flexion is fine
- No resisted open-chain knee extension (leg-extension machine) through week 12. Patellofemoral joint reaction force is highest at 0–30° of open-chain extension, which concentrates force at the graft anchors
- If pain or effusion flares, reduce activity; notify Dr. Merritt if an extension lag returns or effusion clearly worsens

Why: Weeks 6–12 are the early graft incorporation period. The imbrication has healed enough for weight bearing through range. The graft has initial tensile strength but its collagen is still maturing. Closed-chain work is preferred because compression improves patellar tracking; resisted open-chain extension concentrates shear at the patellar anchors.

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3

Advanced Strengthening and Early Plyometrics

Weeks 12–20

For the patient: what to expect

This is the hardest phase: single-leg exercises, early jumping, and the start of jogging. Your thigh needs to be strong enough to protect your kneecap every time you land or change direction. Push hard, but respect pain. Pain at the front of the knee with loading means back off and fix your form. By the end of this phase you should feel stable enough to start sport training.

WEIGHT BEARING	Full, with progressive single-leg and impact loading
BRACE	None. Patellar taping at PT discretion if tracking correction is needed
RUNNING	Jogging from weeks 14–16 on a flat surface, once single-leg stance is pain-free

Goals

- Full-depth single-leg squat without compensation
- Quad and hamstring strength $\geq 80\%$ LSI; target 90% for Phase 4
- Start and progress two-leg plyometrics
- No valgus on single-leg squat or step-down
- Advanced proprioception on unstable surfaces
- Normal running mechanics; start and progress jogging

Move on when

- ☐ Single-leg squat to $60^\circ \times 10$ without valgus or trunk deviation
- ☐ Step-down: smooth eccentric control, no dynamic valgus, symmetric
- ☐ Quad strength $\geq 80\%$ LSI (progress to 90% before Phase 4)
- ☐ Single-leg hop for distance $\geq 80\%$ LSI
- ☐ Jogging 20 min continuously on a flat surface, pain-free
- ☐ Two-leg plyometrics pain-free with correct mechanics

Exercises

Exercise	How
Single-leg squats	3 × 8–10 with mirror or video for valgus; start weeks 14–15; full depth by week 18
Goblet squats	Full depth 0–90°, 3 × 12–15; start week 14
Step-downs	8-inch step, eccentric, 3 × 12–15 per leg; start week 15
Bulgarian split squats	Surgical leg in front, 3 × 10–12 per leg; start week 16
Lateral step-ups	8-inch step, 3 × 12–15 per leg; start week 16
Nordic hamstring curls	Assisted to unassisted, 3 × 6–10; start week 16
Single-leg glute bridges	3 × 12 per leg; start week 14
Copenhagen adduction	Side-lying or partner-assisted, 3 × 15; start week 14
Balance	Single-leg on foam or wobble board, 3 × 30–45 sec per leg from week 14; add therapist arm perturbations, 3 × 30 sec
Jogging	From weeks 14–16 on a flat surface; progress distance and speed weekly
Two-leg jumps	Vertical jump and stick, 3 × 8 from weeks 16–17; quiet, valgus-free landing
Lateral bounds · box jumps	Lateral bounds 3 × 6 each way from weeks 17–18; box jumps (12–18 inch, step down) 3 × 6 from weeks 18–19

Precautions

- No single-leg plyometrics until single-leg squat mechanics are controlled; valgus on landing reproduces the dislocation mechanism
- If anterior knee pain develops with loading, reduce squat depth and step-down range and build VMO and hip strength before progressing. Tell Dr. Merritt about persistent pain
- Assess running mechanics before adding volume: dynamic valgus, trunk lean to the same side, and pelvic drop on the other side all raise patellofemoral load
- Resisted open-chain extension (leg-extension machine) allowed from week 16 in the 90–40° arc only, once single-leg closed-chain strength is established; closed chain remains the priority

Why: This is the functional remodeling phase of graft maturation. The graft can take progressive closed-chain loading, but reactive and single-leg plyometric demands must be introduced gradually and by criteria.

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4

Return to Sport

Weeks 20–24+

For the patient: what to expect

The last phase is sport preparation: cutting, jumping, and reacting at full speed. Your knee should feel stable and confident, not just strong. If you feel your kneecap is about to slip, or you feel nervous during drills, tell your therapist and Dr. Merritt, and don't push through it. Most people return to sport at 5 to 6 months, but cutting and pivoting sports wait until at least 6 months. Clearance is based on testing, not time alone.

WEIGHT BEARING	Full, no restrictions
BRACE	None. A patellar stabilizing sleeve is optional for contact sports, at athlete or surgeon preference
STRENGTH WORK	Maintenance 2–3× a week through the season

Goals

- Quad and hamstring strength $\geq 90\%$ LSI
- Single-leg hop tests $\geq 90\%$ LSI (single, triple, crossover, 6-meter timed)
- Full-speed cutting, pivoting, and deceleration without apprehension
- No anterior knee pain or instability with sport
- Psychological readiness: confident, without fear
- Unrestricted return to sport with clearance from Dr. Merritt

Move on when

- ☐ Quad $\geq 90\%$ LSI on isokinetic or handheld dynamometry at $60^\circ/\text{sec}$
- ☐ Single hop, triple hop, and crossover hop $\geq 90\%$ LSI
- ☐ 6-meter timed hop $\geq 90\%$ LSI
- ☐ Y-balance composite $\geq 90\%$ symmetry
- ☐ Full-speed cutting and pivoting without instability or apprehension
- ☐ Athlete confidence $\geq 8/10$

Exercises

Exercise	How
Single-leg jump and stick	3 × 5–8 per leg; hold the landing
Single-leg lateral hops	3 × 8 each way; progress amplitude
Depth jumps	12-inch box, two legs then one, 3 × 5–6; week 22+
Crossover lateral bounds	3 × 8 strides each way
Sprinting	Full-speed straight-line progression
Cutting drills	45° cuts at progressive speed, planned then reactive (partner-cued); 90° changes of direction (T-drill, 5-10-5 shuttle) at full speed
Sport sequences	Acceleration, cut, deceleration, pivot
Strength maintenance	2–3× a week through the season: single-leg squats 3 × 12, lateral band walks 3 × 20, Nordic curls 2 × 10 per leg

Precautions

- No cutting or pivoting sport before 6 months: graft ligamentization takes 6–9 months regardless of test results. Testing confirms readiness; it does not speed up biology
- Apprehension with lateral movement or cutting disqualifies; return to Phase 3 training and reassess mechanics before reactive drills
- Do not use time alone for clearance; LSI below 90% at return to sport is linked to much higher re-injury rates
- Any post-operative patellar subluxation or dislocation: stop all return-to-sport activity and notify Dr. Merritt right away

Why: Re-dislocation after MPFL reconstruction ranges from 0–11% depending on graft and anatomy. The main modifiable risks are weak VMO, persistent dynamic valgus, and returning to cutting and pivoting before neuromuscular control is fully restored.

Return to Sport

All criteria must be met before clearance.

Measure	Target
Time from surgery	5–6 months; cutting and pivoting sports not before 6 months
Quadriceps strength	≥90% LSI
Hamstring strength	≥90% LSI
Single hop · triple hop · crossover hop	≥90% LSI
6-meter timed hop	≥90% LSI
Y-balance composite	≥90% symmetry
Symptoms	No anterior knee pain, instability, or apprehension with full-speed cutting and pivoting
Confidence	Athlete confidence ≥8/10
Clearance	Formal clearance from Dr. Merritt

Functional testing

- Strength: isokinetic or handheld dynamometry at 60°/sec
- Hop battery: single hop, triple hop, crossover hop, 6-meter timed hop
- Y-balance test