

ACL RECONSTRUCTION

Physical Therapy Protocol

PATIENT

SURGEON

Andrew L. Merritt, MD

DATE OF SURGERY

PT START DATE

For the patient

Surgery rebuilds the ligament. **Physical therapy is what makes your knee work again.** The two things we protect most early on are **getting your knee fully straight** and **getting your quad muscle working**. If you fall behind on either, it is much harder to catch up. Your therapist and I share the same goals, and this protocol shows what to expect at each stage. You move to the next phase when your knee meets the goals, not just because a number of weeks has passed.

PROTOCOL AT A GLANCE

WEIGHT BEARING	As tolerated from day 1, with 2 crutches. Most people are off crutches by 4 to 6 weeks
BRACE	Locked straight for walking until good quad control (straight-leg raise without a lag), then unlocked. Not needed for sleep. Often stops around 3 to 4 weeks , once off crutches
MOTION GOALS	Full straightening (0°) by the end of week 1. Bending 90° by week 1, 110° by week 2, 125° by week 6
PHYSICAL THERAPY	Starts 5 to 7 days after surgery, 2 times a week at first
KEY PRECAUTIONS	No open-chain knee extension from 0° to 40° until week 8. Hamstring graft: no resisted curls until week 6
RUNNING · SPORT	Running around 4 to 5 months . Cutting sports no sooner than 9 months , after testing

Recovery Timeline

Phase	When	PT visits	Focus
1	Weeks 0–2	2× a week	Protect the graft, full straightening, wake up the quad
2	Weeks 2–6	2× a week	Off crutches, bending to 125°, early strength
3	Weeks 6–12	1× a week + home program	Full motion, gym strength, stairs, balance
4	Months 3–6	Every 1–2 weeks	Heavier strength, jumping and landing, return to running
5	Months 6–9+	Weekly, or more before return	Sport drills, testing, return to sport

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

- **Criterion-based.** Patients advance when they meet the goals for each phase, not on a set date. Pain, swelling, and quad control govern progression. Please contact us about setbacks or significant delays.
- **Extension first.** Full extension is the priority in every phase; flexion follows.
- **Control effusion.** Swelling drives quad inhibition (arthrogenic muscle inhibition) and slows recovery.
- **Closed chain first.** Closed kinetic chain (CKC) exercises are preferred early to limit anterior tibial shear.
- **Blood flow restriction (BFR)** is approved and encouraged throughout, especially in Phases 1–2 to limit quad and hamstring atrophy at low loads.
- **Cold compression:** a compression cryotherapy unit is preferred over ice bags in Phases 1–2. 20 minutes on, 20 minutes off, after exercise and as needed.
- **Train the other leg.** Bilateral strength work improves outcomes and gives more accurate LSI comparisons at return-to-sport testing.
- **Scheduled testing:** baseline LSI at month 3 and pre-return screening at month 6. Do not wait for the patient to ask about return to sport.
- **NMES** is provided at PT visits when volitional quad activation is poor. No home unit is needed.
- **Prehab** is strongly recommended when surgery is delayed.

Procedures done at the same time

ACL + LET (lateral extra-articular tenodesis)

- Added in higher-risk patients to lower the re-tear rate.
- The standard ACL protocol applies, with no timeline changes.
- Avoid aggressive resisted internal tibial rotation in Phase 1.

PHASE

1

Protection and Early Recovery

Weeks 0–2

For the patient: what to expect

You'll be on crutches but walking from day 1. That is safe and important. **Your number-one job is getting your knee fully straight**, not bending it farther. Ice often, keep your leg up, and do your quad-tightening exercises every hour. Swelling is your biggest obstacle in this phase, so control it. Avoid the leg-extension machine: your new ligament is fragile for the first couple of months.

WEIGHT BEARING	As tolerated with 2 crutches. Advance to 1 crutch or a cane by week 2 if quad control allows
BRACE	Locked at 0° for walking until the straight-leg raise has no lag, then unlocked for walking. Not needed for sleep, rest, motion exercises, or PT
MOTION	Extension first: prone hangs 10–15 min, 2–3× a day, and heel props. Flexion by active-assisted motion and heel slides; do not force. Patellar mobilization in all 4 directions from day 1

Goals

- Full passive extension (0°) by the end of week 1
- Flexion 90° by week 1 and 110° by week 2
- Visible VMO contraction with a quad set
- Normal gait pattern on crutches
- Pain and effusion controlled

Move on when

- ☐ Full passive extension (0°)
- ☐ Flexion ≥90°
- ☐ Visible or palpable VMO contraction with a quad set
- ☐ Walking independently on crutches with minimal pain

Exercises

Exercise	How
Quad sets	Against a rolled towel, every waking hour
Straight-leg raise	Once it can be done without an extension lag
BFR	Quad sets and SLR with the BFR cuff; high priority if quad inhibition is significant
Hip strengthening	SLR in 4 planes; side-lying abduction and adduction
NMES / biofeedback	At PT, if volitional quad activation is poor
Cold compression	20 min on, 20 min off after exercise; keep the leg elevated

Precautions

- No isolated open-chain knee extension (anterior tibial shear is highest at the graft)
- Hamstring graft: no aggressive hamstring stretching or resisted curls through week 6
- Do not force flexion; it increases effusion and inhibits the quad
- No loading beyond 90° of knee flexion

Why: The graft is at its weakest in weeks 0–4 (about 10–20% of native ACL strength). Body-weight loading is safe because compression neutralizes tibial shear; isolated quad extension is not.

PHASE

2

Early Strengthening

Weeks 2–6

For the patient: what to expect

You'll drop the crutches and start building real strength. Expect some soreness from squats, step-ups, and the stationary bike. That's normal. Your knee should not swell much after exercise; if it does, you did too much, so back off and ice. Focus on walking normally, bending to 120°, and keeping the swelling down. By week 6 you should feel stronger and more stable. Your brace often comes off around 3 to 4 weeks, once you are off crutches with good quad control.

WEIGHT BEARING	2 crutches → 1 crutch → full weight. Most people are off crutches by weeks 4–6. Limit loaded knee flexion to 90° through week 8
BRACE	Hinged brace for walking. Stop it once there is full extension, good quad control, and a normal gait, often around weeks 3–4
MOTION	0–120° by week 4; 0–125° by week 6. The stationary bike (seat high) is the preferred motion and conditioning tool

Goals

- Motion 0–125° by week 6
- Full weight bearing without a device by weeks 4–6
- Normal gait on level ground
- Quad working in functional closed-chain exercise
- Minimal effusion at rest

Move on when

- ☐ Motion 0–120° without pain
- ☐ Walking without a limp
- ☐ Mini squats without pain or more swelling
- ☐ Single-leg stance ≥30 sec

Exercises

Exercise	How
Stationary bike	Seat high, flexion no more than 90°, low resistance, 10–20 min
Mini squats · leg press	Mini squats 0–45°, leg press 0–60°; both legs, controlled
Step-ups	4-inch step, forward and lateral
Single-leg balance	30–60 sec; eyes closed in Phase 3
Hip strengthening	Lateral band walks and hip work
BFR	Leg press and mini squats with the BFR cuff
Pool walking	From week 4, once the incisions are healed

Precautions

- No open-chain knee extension from 0° to 40° (anterior shear still matters through week 8)
- Hamstring graft: no resisted hamstring curls through week 6
- No loaded flexion beyond 90°
- No running, jumping, or pivoting

Why: The graft is revascularizing but still weak (about 30% of native ACL at week 6). Closed-chain exercise is safe because the hamstrings co-contract; open-chain quad extension is not.

PHASE

3

Intermediate Strengthening

Weeks 6–12

For the patient: what to expect

This is when your knee starts to feel like a knee again. You'll work harder in the gym and take stairs without the railing. No outdoor running yet, but the elliptical and bike will build your conditioning. Full bending (135° or more) is the last motion goal. If swelling is limiting you, controlling it matters more than forcing the stretch.

WEIGHT BEARING	Full. Aqua jogging if available and criteria are met
BRACE	Off for most people. May continue for confidence with activity
MOTION	Full, pain-free motion by week 12. Deficits at this stage are usually from effusion

Goals

- Full motion (0–135°+)
- Quad and hamstring strength toward 70% LSI
- Normal stair pattern
- Start neuromuscular and proprioceptive training
- Better endurance and conditioning

Move on when

- ☐ Full motion (0–135°+)
- ☐ Stairs reciprocally without pain or compensation
- ☐ Single-leg stance 60 sec, stable
- ☐ No effusion at rest

Exercises

Exercise	How
Bike · elliptical	Bike with progressive resistance and time; add the elliptical at weeks 8–10
Squats	Body weight to loaded; progress toward parallel
Leg press	Progressive load; widen the arc past 60° as tolerated
Step-ups	6–8-inch step; add weight
Hamstring curls	Light to moderate resistance (after week 6 for a hamstring graft)
Open-chain knee extension	From week 8, 90–40° arc only
Balance	Eyes closed, perturbation, balance board
Stairs	Reciprocal pattern without the rail

Precautions

- No outdoor running (graft about 50% of native ACL strength at month 3)
- No pivoting or lateral cutting (the highest-risk load for a maturing graft)
- Open-chain extension: 90–40° arc only

Why: New collagen is forming but not yet organized; graft strength is about 30–50% at month 3. Controlled gym loading is appropriate; impact and rotation are not.

PHASE

4

Advanced Strengthening and Neuromuscular Training

Months 3–6

For the patient: what to expect

You'll start jogging, learn to jump and land safely, and begin sport-type movements. This is when most people want to rush. Don't. Your graft is still maturing, and returning to sport too early is the biggest risk factor for re-tearing it. Every new activity should feel controlled before you add speed or load. Watch your swelling after each new activity; it tells you when your knee needs more time.

WEIGHT BEARING	Full
RUNNING	Return-to-run program once criteria are met, usually around months 4–5
CUTTING	Controlled change-of-direction drills late in this phase (about months 5–6). Full-speed cutting after 6 months

Goals

- Quad and hamstring strength 80–90% LSI
- Start and progress plyometrics
- Return-to-run program
- Sport-specific movement patterns
- Psychological readiness addressed alongside physical criteria

Move on when

- ☐ Running without pain, swelling, or gait change
- ☐ Single-leg hop for distance $\geq 70\%$ LSI
- ☐ Quad and hamstring strength $\geq 80\%$ LSI
- ☐ No effusion with running or high-demand activity

Exercises

Exercise	How
Heavy compound lifts	Barbell squat, leg press, hip hinge
Single-leg strength	Single-leg squats and lunges with progressive load
Nordic hamstring curls	Eccentric emphasis
Running mechanics screen	Before running: check for pelvic drop, knee valgus, and forward trunk lean; correct deficits first
Return to run	Walk-run intervals on flat ground once the screen is passed
Double-leg plyometrics	Vertical, broad, and box jumps with controlled landing
Single-leg hops	Once double-leg testing is symmetric
Agility	Cones, ladder, figure-8 at increasing speed
Change of direction	Late Phase 4 (about months 5–6): controlled cutting and deceleration drills

Precautions

- No return to pivoting sport before return-to-sport criteria are met
- Plyometrics only after an adequate strength base ($\geq 70\%$ LSI); poor landing with a weak quad loads the graft and the other knee
- Significant swelling after activity means the load was too high; reduce it
- Assess psychological readiness: fear of re-injury independently predicts not returning to sport

Why: Graft strength is about 50–70% of native ACL at months 3–6. Ligamentization is active but incomplete, and the highest re-tear risk is at return to sport, so thorough testing is not optional.

PHASE

5

Return to Sport

Months 6–9+

For the patient: what to expect

You're close, but **the 9-month minimum is not negotiable**. Athletes who return earlier re-tear their ACL at about 4 times the rate of those who wait. You'll pass strength and hop tests before Dr. Merritt clears you. Feeling ready matters as much as the numbers; if you're anxious about returning, tell your therapist. Keep lifting after you return. Strong hamstrings are your best long-term protection.

ACTIVITY	Full, once criteria are met
STRENGTH WORK	2–3 sessions a week; do not stop at return to sport

Goals

- Quad and hamstring strength $\geq 90\%$ LSI
- Pass the single-leg hop battery
- Full sport movements at speed
- Psychological readiness (ACL-RSI ≥ 65)
- Formal return-to-sport clearance from Dr. Merritt

Move on when

- ☐ Quad $\geq 90\%$ LSI; hamstring-to-quad ratio $\geq 60\%$
- ☐ Single-leg hop and triple hop $\geq 90\%$ LSI
- ☐ Y-balance composite $\geq 94\%$
- ☐ No pain, effusion, or instability with sport
- ☐ ACL-RSI ≥ 65

Exercises

Exercise	How
Phase 4 program	Continue at progressive intensity
Sport practice	Positional drills, scrimmage, game simulation
Strength maintenance	2–3 sessions a week; do not stop at return to sport. Keep a hamstring emphasis: the hamstring is the main dynamic restraint of the ACL
Injury prevention	After clearance: FIFA 11+ (or equivalent) warm-up before every practice and game

Precautions

- Minimum 9 months from surgery, regardless of strength testing; time is an independent predictor of re-tear
- Returning before 9 months carries about 4× the re-tear rate of returning at 9 months or later
- Psychological readiness testing is required; a low ACL-RSI predicts re-tear independent of physical criteria
- Hamstring graft: confirm hamstring strength recovery before clearance

Why: Ligamentization continues for about 2 years. A full return-to-sport battery (strength, hop testing, and psychological readiness) is the current evidence-based standard.

Return to Sport

All criteria must be met before clearance.

Measure	Target
Time from surgery	At least 9 months
Quadriceps strength	≥90% LSI (consider ≥100% for pivoting or contact sport)
Hamstring strength	≥90% LSI; hamstring-to-quad ratio ≥60%
Single-leg hop · triple hop	≥90% LSI
Y-balance composite	≥94%
ACL-RSI	≥65
Symptoms	No pain, effusion, or instability with high-demand activity
Clearance	Formal clearance from Dr. Merritt

Functional testing

- Strength: isokinetic dynamometry preferred; handheld dynamometry acceptable
- Hop battery: single hop, triple hop, crossover hop, 6-meter timed hop
- Y-balance or Star Excursion Balance Test
- ACL-RSI psychological readiness scale

LSI compares the surgical leg with the other leg, which is often weaker than normal. LSI can overestimate function, so compare with age-matched norms when available.

Graft-Specific Considerations

Hamstring autograft (semitendinosus ± gracilis)

- Protect the harvest site: no aggressive hamstring stretching, prone knee flexion, or resisted curls through week 6
- Hamstring weakness can last 6–12 months; emphasize hamstring strength in every phase
- Confirm hamstring recovery before return-to-sport clearance; a deficit is a leading re-tear risk

Patellar tendon (BTB) autograft

- Anterior knee pain and kneeling discomfort are expected for 6–12 months; counsel the patient
- Bone-to-bone healing allows slightly faster early closed-chain progression
- Patellofemoral pain may limit step-downs and deep squats; modify to pain
- Make sure full extension is reached; an extension lag raises the risk of a cyclops lesion
- Anterior knee pain with quad work is common between months 4 and 7. No need to refer back to Dr. Merritt

Quadriceps tendon autograft

- Front-of-thigh soreness at the harvest site is expected for 4–6 weeks; early quad activation is safe
- Less anterior knee pain than BTB; no kneeling restriction
- Progression mirrors the patellar tendon graft, but quad recovery is often slower. BFR is encouraged