

CLOSING-WEDGE DISTAL FEMORAL OSTEOTOMY

Physical Therapy Protocol

PATIENT

SURGEON

Andrew L. Merritt, MD

DATE OF SURGERY

PT START DATE

For the patient

A distal femoral osteotomy (DFO) corrected the alignment of your leg at the thigh bone. In a closing-wedge operation the bone ends touch, so **you can put full weight on your leg right away**. The crutches support you while your quad wakes up. **Getting your quad firing from day 1 is the most important thing you can do.** Keep your knee straight: no pillow under your knee.

PROTOCOL AT A GLANCE

WEIGHT BEARING	Full weight 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. Worn unlocked for sleep. Hinge 0–90° in week 1, 0–105° in week 2, then fully open. Stops after you are off crutches , around 6 to 8 weeks
MOTION GOALS	Full straightening (0°) from day 1 . Bending 90° by week 1, 105° by week 2, 115° by week 3, 125° by week 4
PHYSICAL THERAPY	Starts 5 to 7 days after surgery, 2 times a week at first
KEY PRECAUTIONS	No pillow under the knee. No hamstring exercises for 2 weeks. No anti-inflammatory medicines for 6 weeks . No nicotine for 3 months
RUNNING · SPORT	Running at 5 to 6 months . Cutting and pivoting sports no sooner than 9 months , after testing

Recovery Timeline

Phase	When	PT visits	Focus
1	Weeks 0–4	2× a week	Full weight with crutches, quad activation, full straightening, bending to 125°
2	Weeks 4–8	2× a week	Off crutches, then off the brace; bike, step-ups, hamstring loading
3	Weeks 8–16	1–2× a week	Strength, balance, low-impact activity
4	Months 4–9+	As needed	Running from months 5–6, cutting sports from month 9

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

- **Weight bearing from day 1.** Bone-to-bone contact gives immediate compressive stability. Crutches are for quad control and comfort for 4–6 weeks, not bone protection.
- **Criterion-based crutch weaning.** Crutches stop when quad control and gait quality show safe weight bearing, not on a fixed date.
- **Protect the hamstring early.** Muscles and soft tissue near the bone cut need 2 weeks to heal: no isolated hamstring contractions for 2 weeks, co-contractions from week 2, resisted work progressing from weeks 4–6.
- **Quad activation from day 1.** Quad sets begin immediately. **NMES is provided at each PT visit, starting at the first visit;** no home unit. BFR is approved and strongly encouraged.
- **Extension first.** Full active extension from day 1; no pillow under the knee. An extension lag reflects AMI, not a bony block.
- **Staged flexion.** 90° by week 1, 105° by week 2, 115° by week 3, 125° by week 4. Brace hinge 0–90° in week 1, 0–105° in week 2, then fully open.
- **Brace.** Locked in extension for walking until the SLR has no lag, then unlocked. On, unlocked, for sleep. Wean after the patient is off crutches, around weeks 6–8.
- **Control effusion.** Ice or cold compression 20 min on, 20 min off, throughout Phase 1.
- **No anti-inflammatory medicines (NSAIDs) for 6 weeks, including topical gels such as Voltaren.** They can slow bone healing; Dr. Merritt decides at the 6-week visit. The 81 mg aspirin is part of the plan and continues.
- **No smoking or nicotine** for at least 3 months after surgery; smoking slows bone healing.

PHASE

1

Early Recovery

Weeks 0–4

For the patient: what to expect

You can put weight on the leg right away; the crutches support you while your quad gets stronger. Squeeze your quad every hour, ice 20 minutes on and 20 minutes off, and keep the leg straight when it is up. Do not bend the knee against resistance for the first 2 weeks: the muscles near the bone cut need time to heal.

WEIGHT BEARING	As tolerated from day 1 with 2 crutches
BRACE	Locked in extension for walking until the SLR has no lag, then unlocked. On, unlocked, for sleep and exercises. Hinge 0–90° in week 1, 0–105° in week 2, then open
MOTION	Full extension (0°). Flexion 90° by week 1, 105° by week 2, 115° by week 3, 125° by week 4

Goals

- Active quad contraction (quad sets, NMES)
- Swelling controlled with cold therapy and elevation
- Full extension; flexion to 125° by week 4
- Safe walking on crutches from day 1

Move on when

- ☐ SLR without a significant lag
- ☐ Extension 0°; flexion at the week's goal
- ☐ Walking as tolerated on crutches, gait improving
- ☐ Swelling and pain controlled; safe on stairs

Exercises

Exercise	How
Quad sets · ankle pumps	Quad sets: 3 × 15 every 1–2 hours while awake (primary day 1 exercise). Ankle pumps: 3 × 20 every hour
NMES	Quadriceps and VMO, at each PT visit from the first visit
Heel slides · patella	Heel slides, supine, gravity-assisted, within the week's flexion goal: 3 × 10. Patellar mobilization once the incision is stable
SLR · hip isometrics	Supine SLR once the quad fires: 3 × 10. Hip flexor, glute, and abductor isometrics: 3 × 10
Hamstrings	None isolated in weeks 0–2; isometric quad + hamstring co-contractions from week 2
Gait · stairs · BFR	Crutch gait as tolerated; non-reciprocal stairs with crutches. BFR quad sets once tolerated

Precautions

- No isolated hamstring contractions in weeks 0–2: muscles and soft tissue near the bone cut need 2 weeks to heal
- No pillow under the knee; full extension from day 1
- Cold therapy (20 min on, 20 min off) is required: effusion drives quad inhibition
- Do not rush crutch weaning: compensatory gait stresses the osteotomy

Why: Bone-to-bone contact gives inherent stability; the early barrier is quad inhibition (AMI), not bone healing. NMES and BFR are the main tools against it.

PHASE

2

Crutch Weaning and Early Strength

Weeks 4–8

For the patient: what to expect

This phase is about coming off crutches: when your quad is strong enough for safe walking, the crutches go, and the brace follows. Keep icing after PT and work on full straightening and bending. The stationary bike is great now. Hamstring exercises are added gradually.

WEIGHT BEARING	Full. 2 crutches → 1 → none as quad control and gait allow; goal off crutches by weeks 4–6
BRACE	Wean after off crutches, as quad control allows; typically weeks 6–8
MOTION	Full: 0° extension, flexion ≥125°

Goals

- Off crutches with a normal gait
- Full motion
- Step-up and step-down training
- Progressive hamstring strengthening

Move on when

- ☐ Off crutches with a normal gait (most by weeks 4–6)
- ☐ 0° extension, flexion ≥125°
- ☐ 6-inch step with control; sit-to-stand without arms
- ☐ Independent with daily activities; minimal swelling

Exercises

Exercise	How
Quad sets · SLR · BFR	Continue quad sets, NMES (at PT visits), and BFR. SLR all planes with progressive resistance
Extension stretching	Prone hang or seated heel prop, daily
Bike · patellar mobilization	Bike: short crank if flexion <90°, full crank once >110°. Patellar mobilization throughout
Mini squats · step-ups	Mini squats 0–45° with support, progress as tolerated; step-up and step-down on a 2–4-inch step
Hamstrings	Week 4: gravity-assisted curls. Weeks 5–6: active resisted curls with band; progress gradually
Hip · gait · ADL	Standing hip abduction and extension with band; heel strike, extension at loading response, arm swing; sit-to-stand, car transfers, tub entry

Precautions

- Crutch discontinuation is gated by quad control, not the calendar; assess gait first
- No aggressive open-chain hamstring loading before week 6; closed-chain first
- Cold therapy after every PT session through week 6
- Watch for patella infera; keep up motion and patellar mobilization

Why: Poor quad activation causes compensatory gait (quad avoidance, Trendelenburg) that adds torsional stress at the osteotomy. Closed-chain work loads the hamstring eccentrically at lower tension than open-chain isolation.

PHASE

3

Strength and Function

Weeks 8–16

For the patient: what to expect

You're off crutches and the bone is healing well. The focus is rebuilding balanced quad and hamstring strength; both matter after DFO. Leg press, squats, lunges, and balance work are the pillars. Cycling, swimming, and the elliptical are cleared. No running yet.

WEIGHT BEARING	Full, no device, no restrictions. No brace
CONDITIONING	Forward and retro treadmill, elliptical, cycling cleared at week 8

Goals

- Symmetric quad, hamstring, and hip strength
- Advanced closed-chain strength and function
- Balance and single-leg control
- Low-impact recreation

Move on when

- ☐ Strength $\geq 4+/5$; symmetric quad and hamstring function
- ☐ Single-leg squat, 5 reps with control
- ☐ Single-leg stance ≥ 45 sec
- ☐ 30-min walk without more swelling

Exercises

Exercise	How
Leg press	Both legs → single leg → eccentric emphasis
Step-up · step-down	Advance to a 6–8-inch step
Squats · lunges	Functional squats 0–90° (wall, ball, body weight). Lunges forward, reverse, lateral from weeks 10–12
Hamstring · glutes	Prone curls, Nordic preparation, single-leg deadlifts; single-leg bridges, monster walks, band walks
Balance	Single-leg stance, foam, perturbation
BFR · core	Single-leg leg press with BFR; dead bugs, bird dogs, planks

Precautions

- No running until 5–6 months, and only with surgeon clearance and X-ray confirmation of solid callus
- No pivoting, cutting, or jumping until Phase 4
- Persistent swelling or posterior knee pain: reduce the load and contact Dr. Merritt

Why: Closing-wedge DFO remodeling typically takes 3–4 months; high-impact and rotational forces can still exceed the construct. After DFO the medial compartment carries more load, and good hamstring co-activation helps protect it.

PHASE

4

Return to Activity and Sport

Months 4–9+

For the patient: what to expect

Running starts at 5 to 6 months with a walk-jog program. Cutting and pivoting sports come at 9 months at the earliest, with Dr. Merritt's clearance and passing strength and hop tests. Balanced quad and hamstring strength protects your knee long term, so keep up your strength program.

BRACE	None. Functional brace for sport at Dr. Merritt's discretion
RUNNING	Walk-jog program from months 5–6 with surgeon clearance
CUTTING	Agility drills months 7–9; sport from month 9 with surgeon clearance

Goals

- ≥90% LSI on quad and hamstring strength and hop testing
- Return to running (minimum 5–6 months, surgeon clearance)
- Return to sport (minimum 9 months, surgeon clearance)
- Long-term strength maintenance

Move on when

- ☐ Quad and hamstring ≥90% LSI; single-leg hop ≥90% LSI
- ☐ Solid union on X-ray (surgeon-confirmed)
- ☐ Walk-jog 20 min without pain or swelling
- ☐ Sport drills at game speed without pain

Exercises

Exercise	How
Strength	Advanced leg press, squats, lunges; single-leg deadlifts, Bulgarian split squats, eccentric step-downs
Walk-jog program	From months 5–6 with surgeon clearance
Agility · sport	Cutting, agility, lateral shuffles at months 7–9; sport-specific training at month 9+ with clearance
Plyometrics	Controlled hops → bounding, with surgeon clearance
BFR	Maintenance 2× a week

Precautions

- Running before 5 months requires explicit surgeon clearance with imaging
- Pivoting or contact sport no sooner than 9 months, and only with X-ray clearance and functional testing (≥90% LSI)

Why: Earlier callus in a closing wedge does not shorten the full return much: remodeling and strength recovery still take 6–12 months. Both gates protect against implant stress and correction loss.

Return to Activity and Sport

Both gates, bone healing and function, must be met before clearance.

Measure	Target
Running	At least 5–6 months, with X-ray clearance and surgeon approval
Cutting · pivoting sport	At least 9 months, with X-ray clearance and functional testing
Quad and hamstring strength	≥90% LSI
Single-leg hop for distance	≥90% LSI
Bone healing	Solid union on X-ray, confirmed by Dr. Merritt
Symptoms	No pain or swelling with sport drills at game speed
Clearance	Formal clearance from Dr. Merritt

Functional testing

- Strength: quad and hamstring LSI
- Single-leg hop for distance