

# FEMORAL DEROTATIONAL OSTEOTOMY

## Physical Therapy Protocol

PATIENT

SURGEON

Andrew L. Merritt, MD

DATE OF SURGERY

PT START DATE

### For the patient

A femoral derotational osteotomy (FDO) corrected the rotation of your thigh bone (femur). The femur was cut near your knee, turned to the right position, and held with a plate and screws. **You can put weight on your leg from day 1**, with crutches for balance. Your quad shuts down after bone surgery, so **waking it up is your first job**. Starting PT in the first week leads to much better results.

### PROTOCOL AT A GLANCE

|                  |                                                                                                                                                                     |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WEIGHT BEARING   | <b>Full weight as tolerated from day 1</b> , with crutches for balance. Most people are off crutches by <b>4 to 6 weeks</b>                                         |
| BRACE            | Hinged brace for walking, <b>locked straight until good quad control</b> (straight-leg raise without a lag), then unlocked. Stops <b>after you are off crutches</b> |
| MOTION GOALS     | No fixed limit: bend as tolerated. <b>90° or more</b> by the end of Phase 1; full motion by week 12                                                                 |
| PHYSICAL THERAPY | Starts <b>5 to 7 days</b> after surgery, <b>2 times a week</b> at first                                                                                             |
| KEY PRECAUTIONS  | No hamstring exercises for 2 weeks. <b>No squats in the first 6 weeks. No anti-inflammatory medicines for 6 weeks</b>                                               |
| RUNNING · SPORT  | Running around <b>4 to 5 months</b> . Straight-line sport around <b>6 months</b> ; cutting and pivoting sports <b>no sooner than 9 months</b> , after testing       |

## Recovery Timeline

| Phase | When       | PT visits                  | Focus                                                                 |
|-------|------------|----------------------------|-----------------------------------------------------------------------|
| 1     | Weeks 0–6  | 2× a week                  | Full weight with crutches, quad activation, motion, patellar mobility |
| 2     | Weeks 6–12 | 2× a week                  | Off crutches, then off the brace; squats, step-ups, leg press         |
| 3     | Months 3–5 | 1–2× a week + home program | Single-leg strength, conditioning, running prep                       |
| 4     | Months 5–9 | As needed                  | Running; straight-line sport ~6 months, cutting ~9 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

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### General principles

- **The operation.** FDO corrects femoral anteversion or retroversion: the distal femur is divided, rotated, and fixed with a lateral plate and screws. PT begins 5–7 days after surgery.
- **Weight bearing:** as tolerated with crutches from day 1; crutches are for balance, not a strict restriction. Wean once gait is near normal, typically weeks 4–6.
- **Brace:** hinged, worn for walking. Locked in extension until the SLR has no lag, then unlocked; no motion limit in the brace. Remove for exercises and hygiene. It comes off after the crutches, not before.
- **NMES + BFR are essential.** The distal plate lies next to the quadriceps, and arthrogenic inhibition causes marked quad shutdown. **NMES is provided at each PT visit, starting at the first visit;** no home unit. BFR starts in weeks 1–2.
- **Patellar mobilization from week 1.** The distal femoral incision disrupts the lateral retinaculum and soft tissue around the patella. Mobilize in all 4 directions from the first visit.
- **Motion:** progress as tolerated, active and active-assisted. The rotational correction changes proprioceptive feedback; the knee may feel "different" with familiar movements, which resolves with neuromuscular re-education.
- **No active hamstrings for 2 weeks** to protect the distal fixation: no resisted curls, Nordics, or resisted knee flexion until week 2 or later.
- **No squats in Phase 1.** No deep squats (loaded flexion past 90°) until healing is confirmed on imaging, typically weeks 8–12.
- **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.

### Procedures done at the same time

#### FDO + MPFL reconstruction

- May be done at the same time; it does not significantly change this timeline.
- Apply the standard MPFL motion and quad activation guidelines alongside this FDO protocol.

## PHASE

## 1

## Protection and Early Recovery

Weeks 0–6

**For the patient: what to expect**

You can put weight on your leg right away, with crutches for balance. The brace stays locked for walking until you can lift your leg straight without it sagging. Your main job is waking up your quad; your therapist will use electrical stimulation and blood flow restriction to help. Ice 20 minutes on, 20 minutes off. No squats yet, and no hamstring exercises for 2 weeks.

|                       |                                                                                                                                                    |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>WEIGHT BEARING</b> | As tolerated with crutches from day 1; 1 crutch once gait is symmetric; off crutches by weeks 4–6                                                  |
| <b>BRACE</b>          | For walking: locked in extension until the SLR has no lag, then unlocked with no motion limit. Off for exercises and hygiene. Stops after crutches |
| <b>MOTION</b>         | Active and active-assisted as tolerated; no forced motion or manual stretching                                                                     |

**Goals**

- Volitional quad activation with NMES and BFR (first priority)
- Less swelling; motion as tolerated; patellar mobility
- Safe walking on crutches; protect the fixation

**Move on when**

- ☐ SLR without a lag, 20 in a row
- ☐ Active flexion  $\geq 90^\circ$  supine
- ☐ Near-normal gait on crutches
- ☐ Effusion trace or absent at rest

**Exercises**

| Exercise                       | How                                                                                                                                    |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Quad sets · ankle pumps</b> | Quad sets: 3 × 15, 5-sec hold, 3–4× a day from day 1. Ankle pumps: 2 × 20                                                              |
| <b>NMES</b>                    | At each PT visit: 15 contractions, 10 sec on / 50 sec off, paired with volitional quad sets; continue until QI $\geq 70\%$             |
| <b>BFR</b>                     | Quad sets or short-arc quads with the cuff, weeks 1–2 on: 30-15-15-15, 20–30% 1RM, 40–50% LOP                                          |
| <b>SLR · short-arc quads</b>   | Supine SLR once a quad set is present: 3 × 15; goal 20 in a row without a lag. Short-arc quads (towel roll, 0–30°) from week 2: 3 × 15 |
| <b>Patellar mobilization</b>   | All 4 directions, 1–2 min each, from week 1                                                                                            |
| <b>Heel slides · bike</b>      | Heel slides, supine: 3 × 15 (main early motion exercise). Bike, no resistance, from weeks 2–3: partial arc to full pedal stroke        |
| <b>Hip · pool</b>              | Side-lying abduction from week 2, glute sets, clamshells: 3 × 15. Pool once incisions are healed (not before week 4)                   |

**Precautions**

- No weight-bearing closed-chain exercises (squats, step-ups, lunges); motion and quad work lying or seated, not standing
- No active hamstring exercises (curls, Nordics, resisted flexion) for 2 weeks
- No running, jumping, impact, or forced motion. Watch for DVT signs and hardware irritation
- Extension lag beyond week 4: increase NMES use at PT visits and notify Dr. Merritt

## PHASE

## 2

## Progressive Loading

Weeks 6–12

**For the patient: what to expect**

You should be off crutches or close to it, with motion near full. Now you rebuild real strength with squats, step-ups, leg press, and the bike. Once the X-ray shows healing (usually 8 to 12 weeks), you can squat deeper. The brace comes off after the crutches. Consistency drives your progress.

|                       |                                                                                 |
|-----------------------|---------------------------------------------------------------------------------|
| <b>WEIGHT BEARING</b> | Full; wean crutches as gait normalizes. Gait, not the date, is the criterion    |
| <b>BRACE</b>          | Stop after the patient is off crutches; if already stopped, continue without it |
| <b>SQUAT DEPTH</b>    | Mini squats 0–45°; to 90° only after X-ray healing (typically weeks 8–12)       |

**Goals**

- Full weight without crutches; normal gait
- Full, symmetric active motion
- Quad and hip strength toward LSI ≥70%
- Single-leg balance on a firm surface

**Move on when**

- ☐ Normal gait without crutches; full symmetric motion
- ☐ Mini squats to 90° pain-free (after X-ray healing)
- ☐ Step-ups, 10 reps on a 4-inch step without compensation
- ☐ Single-leg stance ≥20 sec; no significant effusion
- ☐ X-ray healing confirmed by Dr. Merritt

**Exercises**

| Exercise                       | How                                                                                                                        |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>SLR · mini squats</b>       | SLR with ankle weight: 3 × 15. Mini squats 0–45°, body weight: 3 × 15, neutral knee, no valgus; to 90° after X-ray healing |
| <b>Leg press · wall sits</b>   | Leg press 0–90°, both legs, from weeks 6–8: 3 × 12–15. Wall sits 0–45°: 3 × 20–30 sec                                      |
| <b>Step-ups · sit-to-stand</b> | 4-inch step from weeks 7–8: 3 × 10. Sit-to-stand: 3 × 10, progress to unsupported                                          |
| <b>Hip · bridges</b>           | Lateral band walks 3 × 15 steps each way, band clamshells; bridges and single-leg bridges: 3 × 12–15                       |
| <b>Open chain</b>              | Hamstring curls from week 6+; knee extension, short-arc to full-arc, from weeks 7–8+                                       |
| <b>Balance</b>                 | Single-leg stance, firm surface, once off crutches: 3 × 20–30 sec                                                          |
| <b>Conditioning · BFR</b>      | Bike with light resistance, pool walking; BFR as an adjunct; self patellar mobilization 1–2 min daily                      |

**Precautions**

- No deep squats past 90° until X-ray healing is confirmed
- No step-ups until mini squats to 45° are pain-free with consistent quad control
- Brace comes off after crutches, not before
- Effusion after new loading: reduce load and contact the office. Avoid valgus collapse. No running or impact

## PHASE

3

## Neuromuscular Conditioning and Running Prep

Months 3–5

**For the patient: what to expect**

This phase builds real strength with single-leg work and heavier loads, plus conditioning on the elliptical, bike, and in the pool. Running comes next, but only when you meet the strength goals.

|                       |                                                                |
|-----------------------|----------------------------------------------------------------|
| <b>WEIGHT BEARING</b> | Full, no restrictions. No brace                                |
| <b>RUNNING</b>        | Not until Phase 4 criteria are met (month 4–5 at the earliest) |

|                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Goals</b> <ul style="list-style-type: none"> <li>• Full-depth and single-leg squats without compensation</li> <li>• Quad and hamstring LSI <math>\geq 75</math>–80%</li> <li>• Conditioning, single-leg control, plyometrics from month 4</li> </ul> | <b>Move on when</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Single-leg squat to 60°, 10 reps without valgus; smooth step-down</li> <li><input type="checkbox"/> Quad LSI <math>\geq 75\%</math>; single-leg hop <math>\geq 75\%</math></li> <li><input type="checkbox"/> No osteotomy pain or effusion with loading</li> </ul> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Exercises**

| Exercise                     | How                                                                                                                    |
|------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Squats · leg press</b>    | Goblet and barbell squats to 90°+ (healing confirmed): 3 × 12–15. Leg press both legs then single leg, 0–90°+          |
| <b>Step-ups · step-downs</b> | 6–8-inch step-ups and eccentric step-downs from month 3: 3 × 12–15; lateral step-ups (8-inch)                          |
| <b>Single-leg strength</b>   | Single-leg mini squats 0–30° → 60°: 3 × 8–10 with mirror feedback. Bulgarian split squats from months 3–4: 3 × 10–12   |
| <b>Posterior chain</b>       | Nordic curls (assisted → unassisted) from months 3–4: 3 × 6–10; single-leg bridges 3 × 12; Copenhagen adduction 3 × 15 |
| <b>Balance</b>               | Foam or wobble board 3 × 30–45 sec; therapist perturbations 3 × 30 sec; band walks 3 × 20 each way                     |
| <b>Conditioning</b>          | Elliptical from month 3 (low resistance, no incline); lap swimming, aqua jogging; bike with resistance                 |
| <b>Plyometrics</b>           | Month 4+: double-leg vertical jump and stick 3 × 8; bilateral lateral bounds 3 × 6 each way                            |

**Precautions**

- No single-leg plyometrics until single-leg squat mechanics are controlled
- Osteotomy pain with loading: reduce load; still tender at week 12+ warrants imaging and contact with Dr. Merritt before impact
- Anterior knee pain past 90° may be patellofemoral irritation from the new rotational alignment: reduce depth; contact Dr. Merritt if it persists
- Assess running mechanics (dynamic valgus, trunk lean, pelvic drop) before adding jogging distance

*Why: Most patients show early union by weeks 12–16, but the neuromuscular system must be retrained around the new patellar tracking created by the femoral osteotomy.*

## PHASE

## 4

## Return to Running and Sport

Months 5–9

**For the patient: what to expect**

This is the final phase: running, agility, and sport training. You start with a walk-jog program and build to full speed and direction changes. Straight-line sport is usually possible around 6 months; cutting and pivoting sports wait until at least 9 months. Dr. Merritt gives the final clearance. Don't rush.

|                         |                                                                                                                                         |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>RUNNING CRITERIA</b> | All required: surgeon clearance, at least month 4, full motion equal to the other side, quad LSI $\geq 75\%$ , no effusion, normal gait |
| <b>SPORT</b>            | Straight-line sport about 6 months; cutting and pivoting about 9 months, once criteria are met                                          |

**Goals**

- Walk-jog progression once running criteria are met
- Quad and hamstring LSI  $\geq 90\%$ ; hop battery  $\geq 90\%$
- Full-speed cutting, pivoting, and deceleration
- Formal clearance from Dr. Merritt

**Move on when**

- ☐ Quad LSI  $\geq 90\%$  (dynamometer,  $60^\circ/\text{sec}$ )
- ☐ Hop battery  $\geq 90\%$  LSI
- ☐ Full-speed cutting without pain, instability, or apprehension
- ☐ Confidence  $\geq 8/10$ ; no osteotomy symptoms

**Exercises**

| Exercise                    | How                                                                                                                                                        |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Walk-jog</b>             | Treadmill 60 sec walk / 60 sec jog, advance weekly; then full-speed straight-line sprints                                                                  |
| <b>Cutting drills</b>       | $45^\circ$ cuts at progressive speed (planned, then reactive); $90^\circ$ direction changes: T-drill, 5-10-5 shuttle                                       |
| <b>Plyometrics</b>          | Single-leg jump and stick $3 \times 5-8$ ; depth jumps (both legs $\rightarrow$ one) from week 22: $3 \times 5-6$ ; crossover bounds $3 \times 8$ each way |
| <b>Sport sequences</b>      | Acceleration, cut, deceleration, pivot                                                                                                                     |
| <b>Strength maintenance</b> | Single-leg squats $3 \times 12$ , lateral band walks $3 \times 20$ , Nordic curls $2 \times 10$                                                            |

**Precautions**

- No sport clearance before 6 months; cutting and pivoting sport no sooner than 9 months
- Time alone is not a criterion: LSI  $< 90\%$  at return raises re-dislocation and re-injury rates
- Apprehension with lateral movement or cutting is disqualifying: return to Phase 3 and reassess
- Any post-operative patellar subluxation or dislocation: stop return-to-sport activity and notify Dr. Merritt
- Address psychological readiness and fear of re-injury before contact or cutting sport

## Return to Sport and Activity

*All criteria must be met before clearance.*

| Measure                     | Target                                                              |
|-----------------------------|---------------------------------------------------------------------|
| Time from surgery           | At least 6 months; at least 9 months for cutting and pivoting sport |
| Quadriceps strength         | ≥90% LSI (isokinetic or handheld dynamometry at 60°/sec)            |
| Hamstring strength          | ≥90% LSI                                                            |
| Single-leg hop for distance | ≥90% LSI                                                            |
| Triple hop · crossover hop  | ≥90% LSI                                                            |
| 6-meter timed hop           | ≥90% LSI                                                            |
| Y-balance composite         | ≥90% symmetry                                                       |
| Symptoms                    | No pain or effusion at the osteotomy with sport-level activity      |
| Psychological readiness     | 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