

# OPENING-WEDGE DISTAL FEMORAL OSTEOTOMY

## Physical Therapy Protocol

PATIENT

SURGEON

Andrew L. Merritt, MD

DATE OF SURGERY

PT START DATE

### For the patient

Your thigh bone (femur) was realigned with an opening-wedge osteotomy: a cut at the lower end of the femur, held open with a bone graft or implant and a plate. With no bone-to-bone contact yet, the correction must be protected. **For 6 weeks, your foot only touches the floor for balance, and your crutches carry your weight.** After the 6-week X-ray, you add weight step by step. **This is the most important rule of your recovery.**

### PROTOCOL AT A GLANCE

|                  |                                                                                                                                                                                                                                |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WEIGHT BEARING   | <b>Toe-touch only (about 10 to 15 pounds, for balance) until the 6-week X-ray.</b> Then 25% at week 6, 50% at week 8, 75% at weeks 9–10, and full weight at weeks 10–12. Most people are off crutches by <b>10 to 12 weeks</b> |
| BRACE            | Hinged and <b>unlocked from day 1</b> , for walking and sleep. Hinge 0–90° in week 1, 0–105° in week 2, then fully open. Stops <b>after you are off crutches</b>                                                               |
| MOTION GOALS     | <b>Full straightening (0°) at all times.</b> Bending 90° by week 1, 105° by week 2, 115° by week 3, 125° by week 4                                                                                                             |
| PHYSICAL THERAPY | Starts <b>5 to 7 days</b> after surgery, <b>2 times a week</b> at first                                                                                                                                                        |
| KEY PRECAUTIONS  | No pillow under the knee. No hamstring exercises for 2 weeks. <b>No anti-inflammatory medicines for 6 weeks.</b> No nicotine for 3 months                                                                                      |
| RUNNING · SPORT  | Running at <b>6 months</b> if the X-ray shows solid healing. 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   | Toe-touch only, quad activation, full straightening, staged bending to 125° |
| 2     | Weeks 6–12   | 2× a week   | After the X-ray: add weight step by step, wean crutches, early strength     |
| 3     | Weeks 12–20  | 1–2× a week | Full weight, strength and balance, low-impact activity                      |
| 4     | Months 5–12+ | As needed   | Running from month 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

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### General principles

- **Toe-touch is non-negotiable for 6 weeks.** The opening wedge at the distal femur has no compressive stability until bridging callus forms. Premature loading risks graft subsidence and loss of correction.
- **Criterion-based weight progression.** Weight bearing advances only after X-ray confirmation of early callus at week 6, then in steps: 25% at week 6, 50% at week 8, 75% at weeks 9–10, full at weeks 10–12. Do not advance on the calendar alone.
- **Protect the hamstring early.** Muscles and soft tissue near the bone cut need 2 weeks to heal: no isolated hamstring contractions for the first 2 weeks, then co-contractions. Resisted hamstring work from week 8.
- **Quad activation from day 1.** Arthrogenic muscle inhibition (AMI) after DFO is significant. Quad sets begin immediately. **NMES is provided at each PT visit, starting at the first visit;** no home unit. BFR is approved throughout.
- **Extension first.** Full active extension from day 1. No pillow under the knee at rest.
- **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.** Hinged and unlocked from day 1, for walking and sleep. When weight bearing starts at week 6, it stays unlocked if the SLR has no lag; otherwise lock it for walking until it does. It stops after the patient is off crutches.
- **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; it substantially delays bone healing. Reinforce cessation counseling and refer for support if needed.

## PHASE

## 1

## Protect the Osteotomy

Weeks 0–6

**For the patient: what to expect**

For 6 weeks, your foot only touches the floor for balance, about 10 to 15 pounds; your crutches carry your weight. Squeeze your quad every hour, ice 20 minutes on and 20 minutes off, and keep the leg up and straight, with no pillow under the knee. Bend a little more each week. No hamstring exercises for the first 2 weeks.

|                |                                                                                                                                     |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------|
| WEIGHT BEARING | Toe-touch: foot on the floor for balance only, about 10–15 lb. Two crutches for all walking. No progression before the week 6 X-ray |
| BRACE          | Hinged, unlocked for walking and sleep. Hinge 0–90° in week 1, 0–105° in week 2, then fully open                                    |
| MOTION         | Full extension (0°) at all times. Flexion 90° by week 1, 105° by week 2, 115° by week 3, 125° by week 4                             |

**Goals**

- Protect the osteotomy with toe-touch
- Active quad contraction (quad sets, NMES)
- Full extension; flexion to 125° by week 4

**Move on when**

- ☐ Toe-touch kept; SLR without a significant lag
- ☐ Extension 0°; flexion at the week's goal
- ☐ Independent on crutches and stairs
- ☐ Week 6 X-ray: bridging callus (required)

**Exercises**

| Exercise                | How                                                                                                                                                    |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Quad sets · ankle pumps | Quad sets, knee straight: 3 × 15 every 1–2 hours while awake. Ankle pumps: 3 × 20 every hour                                                           |
| NMES                    | Quadriceps, 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: 3 × 60 sec           |
| SLR · hip isometrics    | Supine SLR once the quad fires: 3 × 10 (skip abduction SLR if it causes posterior hip or thigh pain at first). Hip flexor and glute isometrics: 3 × 10 |
| Co-contractions         | Isometric quad + hamstring from week 2: 5-sec hold × 10. No isolated hamstring contractions in weeks 0–2                                               |
| Crutch gait · BFR       | Toe-touch 2-point or 3-point pattern. BFR quad sets once tolerated                                                                                     |

**Precautions**

- Strict toe-touch for 6 weeks: no standing weight shifts or standing loading exercises
- 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; a flexion contracture during toe-touch is very hard to correct
- Cold therapy (20 min on, 20 min off) is required: effusion shuts down the quad (AMI)

*Why: Graft and plate hold the osteotomy open with no compressive stability. NMES is the most effective single tool for early quad recovery.*

## PHASE

## 2

## Progressive Weight Bearing

Weeks 6–12

**For the patient: what to expect**

Once your 6-week X-ray shows early healing, you add weight step by step: about a quarter of your weight at week 6, half at week 8, three-quarters at weeks 9 to 10, and full weight at weeks 10 to 12. Keep icing after PT. Most people are off crutches by week 10 to 12, and the brace stops after that.

|                       |                                                                                                                                                                                |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>WEIGHT BEARING</b> | Only after the X-ray confirms early callus: 25% at week 6 → 50% at week 8 → 75% at weeks 9–10 → full at weeks 10–12. Wean 2 crutches → 1 → none as quad control and gait allow |
| <b>BRACE</b>          | For walking until off crutches. Unlocked if the SLR has no lag; otherwise locked for walking until it does. Stops after crutches, around weeks 10–12                           |
| <b>MOTION</b>         | Progress to full: 0° extension, flexion ≥125°                                                                                                                                  |

**Goals**

- Step-by-step weight bearing after the X-ray
- Off crutches by weeks 10–12
- Full motion; normal gait; step training
- Progressive hamstring strengthening

**Move on when**

- ☐ 0° extension, flexion ≥125°
- ☐ Normal gait without a device
- ☐ 6-inch step with control; no quad lag
- ☐ Hamstring loading without posterior knee pain

**Exercises**

| Exercise                            | How                                                                                                            |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Quad sets · SLR · BFR</b>        | Continue quad sets, NMES (at PT visits), and BFR. SLR all planes with progressive resistance                   |
| <b>Hamstrings</b>                   | Week 6: gravity-assisted wall slides. Week 8: active free curls, then resisted work                            |
| <b>Extension stretching</b>         | Prone hang or seated heel prop, daily                                                                          |
| <b>Bike · patellar mobilization</b> | Bike: short crank if flexion <90°, full crank once >110°. Patellar glides: continue, add inferior glide        |
| <b>Mini squats · step-ups</b>       | Mini squats 0–45° with support, from 50% weight bearing; step-up and step-down on a 2–4-inch step with support |
| <b>Hip · gait</b>                   | Standing hip abduction, extension, flexion with resistance; heel strike and full extension at loading response |

**Precautions**

- No weight progression before week 6 X-ray confirmation. Cold therapy after every session through week 8
- No high-resistance open-chain hamstring curls before week 8; closed-chain first
- Do not rush crutch weaning: poor quad control adds torsional stress at the osteotomy
- Watch for patella infera; keep up motion and patellar mobilization

*Why: This is the move from graft-dependent to callus-dependent stability. Gradual loading stimulates remodeling (Wolff's law) within the construct's tolerance.*

## PHASE

## 3

## Strength and Function

Weeks 12–20

**For the patient: what to expect**

Solid bone healing is under way. The focus is now your strength and function: balanced quad and hamstring work, leg press, squats, and balance. Cycling, swimming, and the elliptical are cleared. BFR keeps speeding up your strength gains. No running yet.

**WEIGHT BEARING**

Full, no device, no restrictions. No brace

**CONDITIONING**

Forward and retro treadmill walking, elliptical, cycling cleared

**Goals**

- Symmetric quad, hamstring, and hip strength
- Balance and single-leg control
- Low-impact recreation

**Move on when**

- ☐ Strength  $\geq 4+/5$ ; quad LSI approaching 80%
- ☐ Single-leg squat, 5 reps with control
- ☐ Single-leg stance  $\geq 45$  sec, firm surface
- ☐ 30-min walk without more swelling

**Exercises**

| Exercise                   | How                                                                                                  |
|----------------------------|------------------------------------------------------------------------------------------------------|
| <b>Leg press</b>           | Both legs → single leg → eccentric; progressive load                                                 |
| <b>Step-up · step-down</b> | Advance to a 6–8-inch step                                                                           |
| <b>Squats · lunges</b>     | Functional squats 0–90° (wall, ball, body weight). Lunges forward, reverse, lateral from weeks 14–16 |
| <b>Hamstring · glutes</b>  | Prone curls, Nordic preparation, single-leg deadlifts; single-leg bridges, monster walks, band walks |
| <b>Balance</b>             | Single-leg stance progression, foam, perturbation                                                    |
| <b>BFR · core</b>          | Single-leg leg press with BFR; dead bugs, planks, Pallof press                                       |

**Precautions**

- No running until 6 months: cortical remodeling must be complete before impact
- No pivoting, cutting, or jumping until Phase 4 and surgeon clearance
- Persistent swelling after activity: reduce the load

*Why: Complete cortical union after DFO typically takes 16–24 weeks. Low-impact loading is safe now; high-impact and torsional forces are not. BFR builds quad hypertrophy while keeping joint stress low.*

## PHASE

## 4

## Return to Activity and Sport

Months 5–12+

**For the patient: what to expect**

Running begins at 6 months with a walk-jog program. Cutting and pivoting sports come at 9 months at the earliest, with X-ray clearance and passing strength and hop tests. Stay consistent with strength work: quad and hamstring weakness after DFO can last beyond 6 months and is the main thing you can change to lower your risk.

|                |                                                                      |
|----------------|----------------------------------------------------------------------|
| <b>BRACE</b>   | None. Functional brace for sport at Dr. Merritt's discretion         |
| <b>RUNNING</b> | Walk-jog program from month 6 if X-ray union is confirmed            |
| <b>CUTTING</b> | 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 6 months, surgeon clearance)
- Return to sport (minimum 9 months, surgeon clearance)
- Long-term maintenance program

**Move on when**

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

**Exercises**

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

**Precautions**

- Pivoting and cutting sport before 9 months is not allowed without X-ray clearance and ≥90% LSI on strength and hop tests
- Do not progress running or sport if swelling increases

*Why: The dual gate (imaging and functional testing) prevents a premature return that risks implant failure or correction loss. Long-term quad and hamstring strength also protects the medial compartment, which carries more load after the lateral side is unloaded.*

## Return to Activity and Sport

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

| Measure                            | Target                                                                          |
|------------------------------------|---------------------------------------------------------------------------------|
| <b>Running</b>                     | At least 6 months, with X-ray confirmation of solid union and surgeon clearance |
| <b>Cutting · pivoting sport</b>    | At least 9 months, with X-ray clearance and functional testing                  |
| <b>Quad and hamstring strength</b> | ≥90% LSI                                                                        |
| <b>Single-leg hop for distance</b> | ≥90% LSI                                                                        |
| <b>Bone healing</b>                | Complete union on X-ray, confirmed by Dr. Merritt                               |
| <b>Symptoms</b>                    | No pain, swelling, or instability with sport drills at game speed               |
| <b>Clearance</b>                   | Formal clearance from Dr. Merritt                                               |

### Functional testing

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

Weight-bearing advancement requires X-ray callus confirmation at week 6. If imaging does not confirm adequate healing, keep toe-touch and recheck at week 8. Running clearance also requires X-ray confirmation of solid cortical union; functional readiness alone is not enough for impact activity.