

ANDREW L. MERRITT, MD — PROLIANCE ORTHOPEDIC ASSOCIATES

YOUR FEMORAL OSTEOTOMY RECOVERY (OPENING WEDGE) A GUIDE TO PHYSICAL THERAPY

THE ROLE OF PHYSICAL THERAPY IN YOUR RECOVERY

Your thigh bone (femur) was realigned with an opening wedge osteotomy — a precise cut at the end of the femur that is held open with a bone graft or implant. Unlike a closing wedge, there is no bone-to-bone contact yet, so the correction must be protected while the graft heals. For six weeks, your toes barely touch the ground — crutches carry your weight. After your six-week X-ray confirms healing, weight-bearing progresses steadily.

Important: Six weeks of toe-touch weight-bearing is mandatory. No advancement before X-ray confirmation at Week 6 — this is the most critical rule of this recovery.

YOUR RECOVERY TIMELINE

PHASE	TIMEFRAME	PT VISITS	WHAT YOU'RE WORKING ON
1	Weeks 1–6	2–3× per week	• Toe-touch only — toes contact floor for balance, crutches carry your weight • Quad sets every hour — electrical stimulation from Day 1 • Ice every 2 hours to control swelling • Range of motion 0–90°; full knee straightening maintained at all times
2	Weeks 6–12 (after X-ray OK)	2× per week	• Weight-bearing advances after X-ray confirms healing at Week 6 • Wean crutches as quad control and comfort allow • Stationary bike and progressive strengthening begin • Range of motion progresses beyond 90°
3	Months 3–6	1–2× per week	• Squats, leg press, and step-up progression • Walking and low-impact conditioning • Limb symmetry testing to guide return to activity • Return to low-impact sport as strength and X-rays allow
4	Months 6–12	As needed	• Return to higher-impact activity with surgeon clearance • Sport-specific training based on individual goals • Most patients reach full function by 9–12 months • Dr. Merritt confirms clearance based on healing and strength

Questions about your PT progress? Call our office or bring them to your next appointment. We are always glad to coordinate with your therapist.

OPENING WEDGE DISTAL FEMORAL OSTEOTOMY PHYSICAL THERAPY PROTOCOL

Patient Name: _____ **Surgeon:** Andrew L. Merritt, MD
Date of Surgery: _____ **PT Start Date:** _____

Overview & General Principles

- **TTWB IS NON-NEGOTIABLE FOR 6 WEEKS** — the opening wedge at the distal femur has no inherent compressive stability until bridging callus forms. Premature loading risks graft subsidence and correction loss.
- **PROTECT THE HAMSTRING EARLY** — the distal femoral location and posterior soft tissue dissection require avoiding isolated hamstring contractions for the first 2 weeks. Progress to co-contractions, then resisted hamstring work after Week 2.
- **QUAD ACTIVATION AND NMES FROM DAY 1** — arthrogenic muscle inhibition after DFO is significant. Quad sets and NMES begin immediately and continue throughout.
- **AGGRESSIVE CRYOTHERAPY** — ice 20 minutes every 2 hours while awake throughout Phase 1. Effusion control is a prerequisite for quad activation.
- **CRITERION-BASED WB PROGRESSION** — weight-bearing advances only after radiographic confirmation of early callus at Week 6. Do not advance on calendar alone.
- **EXTENSION PRIORITY** — full active knee extension must be established and maintained from Day 1. No pillow under the knee when resting.

PHASE (Weeks 0–6)

INFORMATION FOR THE PATIENT — What to Expect This Phase

For 6 weeks, your toe barely touches the floor when walking — crutches carry your weight. The bone graft filling the correction cannot be loaded until it heals. Squeeze your quad every hour, ice every 2 hours, and keep the leg elevated and straight. Unlike knee replacement, you will not be doing aggressive knee bending right away — protection of the surgical site comes first.

Goals:

- Maintain TTWB to protect the distal femoral osteotomy site during early healing
- Establish quad activation via quad sets and NMES from Day 1
- Achieve ROM 0–90°; maintain full extension; prevent flexion contracture
- Control post-operative swelling with aggressive cryotherapy and elevation
- Protect posterior soft tissue from early isolated hamstring loading

Weight-Bearing Status:

TOE-TOUCH WEIGHT BEARING (TTWB) × 6 weeks — surgical foot contacts floor for balance only (~10–15 lbs). Bilateral crutches required during all ambulation. No WB advancement before Week 6.

Bracing:

Hinged knee brace. Unlocked 0–90°

Exercises:

- Quad sets (isometric, knee straight): 3 × 15 reps every 1–2 hours while awake
- NMES to quadriceps: 20-minute sessions 2–3×/day — begin Day 1 for AMI
- Ankle pumps: 3 × 20 reps every hour — DVT prophylaxis
- Heel slides (supine, gravity-assisted, within 0–90°): 3 × 10 reps
- SLR (supine): when quad contraction present — 3 × 10 reps; avoid abduction SLR if it provokes posterior hip/thigh discomfort initially
- Hip flexor and glute isometrics: 3 × 10 reps
- Isometric co-contractions (quad + hamstring simultaneously): begin Week 2 — hold 5 sec × 10 reps; NO isolated hamstring contractions in Weeks 0–2
- Patella mobilization once incision stable: 3 × 60 sec
- Crutch gait training: TTWB 2-point or 3-point pattern
- Cryotherapy: 20 minutes every 2 hours while awake — mandatory throughout Phase 1
- BFR quad sets: begin when tolerated — approved throughout rehabilitation

Progression Milestones:

- TTWB maintained consistently × 6 weeks
- Active quad contraction present; SLR without significant lag
- ROM: full extension (0°), flexion ≥90°
- Swelling and pain controlled
- Independent crutch ambulation and stair negotiation
- Week 6: Radiographic bridging callus confirmed — required for WB advancement

PRECAUTIONS — Phase 1: Protect the Osteotomy Site

- TTWB STRICTLY ENFORCED × 6 weeks. Opening wedge constructs have no compressive stability until the graft begins to incorporate.
- NO ISOLATED HAMSTRING CONTRACTIONS Weeks 0–2 — the distal femoral dissection involves posterior soft tissue; active hamstring loading creates traction forces at the surgical site before healing is established.
- NO PILLOW UNDER THE KNEE — leg rests straight. Flexion contracture established during TTWB is very difficult to correct.
- Aggressive cryotherapy every 2 hours is mandatory — effusion causes AMI and quad shutdown; controlling swelling is a prerequisite for quad activation.
- Smoking substantially delays bone healing — reinforce cessation counseling. Refer to medical team for cessation support if not already engaged.

Rationale: The distal femoral osteotomy site is maintained open by bone graft and plate fixation with no inherent compressive stability between bone ends. Premature loading risks graft subsidence and angular correction loss. The posterior soft tissue around the distal femur (including hamstring origins) requires 2 weeks of protection before isolated contraction loads are applied. NMES bypasses the arthrogenic muscle inhibition reflex by directly stimulating the motor nerve — it is the most effective single intervention for early quad recovery after periarticular knee surgery.

PHASE (Weeks 6–12)**INFORMATION FOR THE PATIENT — What to Expect This Phase**

Week 6 marks a turning point — once the X-ray shows early healing, we begin adding weight gradually. You'll go from crutches to a single cane and then walking freely over the next 4–6 weeks. Keep icing after PT. The stationary bike is excellent once you have enough knee bend. Getting off crutches by Week 10–12 is the target.

Goals:

- Advance WB progressively after radiographic callus confirmation at Week 6
- Achieve full weight-bearing without crutches by Weeks 10–12
- Progress ROM to full: 0° extension, flexion $\geq 120^\circ$
- Normalize gait; eliminate quad lag; progress step-up/down training
- Introduce progressive hamstring strengthening

Weight-Bearing Status:

Week 6: Progress: WB as pain and quad allow. Advance from bilateral crutches → single crutch → no device as quad control improves.

Bracing:

Continue brace until ambulating with good quad control with no crutches. Wean brace as WB tolerance and quad control advance — typically by Week 8–10.

Exercises:

- Continue quad sets, NMES, BFR throughout Phase 2
- SLR all planes with progressive resistance
- Progress to active hamstring exercises: Week 6 — gravity-assisted wall slides; Week 8 — active free curls; avoid aggressive resisted loading before Week 8
- Passive extension stretching: prone hang or seated heel elevation — daily
- Cycle ergometry: short crank if $< 90^\circ$; full crank once $> 110^\circ$
- Patella mobilization — continue; add inferior glide for extensor mechanism
- Mini-squats (0–45°) with support: begin at 50% WB
- Step-up/step-down (2–4 inch) with support
- Standing hip strengthening: abduction, extension, flexion with resistance
- Gait training: heel strike, full knee extension at loading response

Progression Milestones:

- ROM: full extension (0°), flexion $\geq 120^\circ$
- Ambulates without assistive device with normal gait
- Ascends 6-inch step with control; no quad lag on SLR
- Progressive hamstring loading tolerated without posterior knee pain

PRECAUTIONS — Phase 2

- WB may NOT advance before Week 6
- Hamstring loading remains cautious through Week 8 — avoid high-resistance open-chain hamstring curls before Week 8; closed-chain emphasis first.
- Continue cryotherapy after every session through Week 8.
- Do not rush crutch weaning — inadequate quad control during gait increases torsional stress at the osteotomy site.
- Monitor for patella infera — maintain aggressive ROM and patella mobilization.

Rationale: Phase 2 represents the transition from graft-dependent to callus-dependent stability. Progressive weight-bearing allows controlled loading of the developing callus, stimulating remodeling per Wolff's Law while staying within the healing construct's load tolerance. Hamstring loading is introduced more gradually in DFO than HTO due to the posterior dissection — this is a DFO-specific modification to standard osteotomy rehabilitation.

PHASE (Weeks 12–20)**INFORMATION FOR THE PATIENT — What to Expect This Phase**

Solid bone healing is progressing. The focus shifts entirely to getting your strength and function back. Balanced quad and hamstring strengthening, leg press, functional squats, and balance work are the pillars of this phase. Cycling, swimming, and elliptical are all cleared. BFR continues to accelerate strength recovery.

Goals:

- Full weight-bearing with no device
- Build symmetrical quad, hamstring, and hip strength
- Advance proprioception and single-leg control
- Return to low-impact recreational activity

Weight-Bearing Status:

Full weight-bearing. No restrictions.

Bracing:

None.

Exercises:

- Leg press: bilateral → unilateral → eccentric; progressive loading
- Step-up/step-down: advance to 6–8 inch step
- Functional squats (0–90°): wall, ball, bodyweight
- Lunges: forward, reverse, lateral — begin Week 14–16
- Hamstring strengthening: prone curls, Nordic preparation, single-leg deadlifts
- Glute strengthening: single-leg bridges, monster walks, band walks
- Balance/proprioception: single-leg stance progression, foam, perturbation
- Forward and retro treadmill walking; elliptical; cycling — all cleared
- BFR continuation: unilateral leg press, terminal knee extension
- Core strengthening: dead bugs, planks, Pallof press

Progression Milestones:

- LE strength $\geq 4+/5$; quad LSI approaching 80%
- Single-leg squat 5 reps with controlled alignment
- Single-leg stance ≥ 45 seconds on firm surface
- Tolerates 30-minute walk without increased swelling
- Low-impact recreational activity tolerated without difficulty

PRECAUTIONS — Phase 3

- Running is not cleared until 6 months — cortical remodeling must be complete before impact loading.
- Pivoting, cutting, and jumping restricted until Phase 4 and surgeon clearance.
- Persistent swelling after activity warrants load reduction.

Rationale: Complete cortical bone union for distal femoral osteotomy typically requires 16–24 weeks. Phase 3 corresponds to early-to-mid cortical remodeling — low-impact loading is safe, but high-impact and torsional forces

risk exceeding the construct's tolerance before remodeling is complete. BFR is particularly valuable here, as it produces equivalent quad hypertrophy to heavy loading while keeping joint stress within the healing construct's safe range.

PHASE (Months 5–12+)

INFORMATION FOR THE PATIENT — What to Expect This Phase

This is the return-to-activity phase. Running begins at 6 months with a walk/jog program; cutting and pivoting sports at 9 months with radiographic clearance. Passing strength and hop tests is required before sport return. Stay consistent with your strength work — quad and hamstring deficits after DFO can persist beyond 6 months and are the primary modifiable risk factor for re-injury.

Goals:

- Achieve $\geq 90\%$ LSI on quad/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

Weight-Bearing Status:

Full weight-bearing. No restrictions.

Bracing:

None. Functional brace for sport at surgeon discretion.

Exercises:

- Advanced leg press, squats, lunges with progressive load
- Single-leg deadlifts, Bulgarian split squats, step-down eccentric
- Walk/jog interval program: begin Month 6 if radiographic union confirmed
- Cutting, agility, and lateral shuffle drills: Month 7–9
- Sport-specific training: Month 9+ per surgeon clearance
- Plyometric progression: controlled hops → bounding — surgeon clearance required
- Continue BFR maintenance 2×/week

Progression Milestones:

- Quad and hamstring strength $\geq 90\%$ LSI
- Single-leg hop distance $\geq 90\%$ LSI
- Radiographic complete bone union confirmed by surgeon
- Walk/jog 20 minutes continuously without pain or swelling
- Sport-specific drills at game speed without pain or instability

PRECAUTIONS — Phase 4

- Pivoting and cutting sports before 9 months require both radiographic clearance and functional testing ($\geq 90\%$ LSI on strength and hop testing).
- Do not progress the running or sport program if swelling increases.

Rationale: Return-to-sport after DFO requires both radiographic healing and functional readiness. The dual-gate approach (imaging + functional testing) prevents premature return that risks implant failure or correction loss. Maintaining long-term quad and hamstring strength is also protective against progression of the preserved medial compartment, which is now bearing increased load after lateral compartment unloading.

RETURN TO ACTIVITY & SPORT CRITERIA

Clinical Note

- Weight-bearing advancement requires radiographic callus confirmation at Week 6. If imaging does not confirm adequate healing, maintain TTWB and recheck at Week 8. Running clearance also requires radiographic confirmation of solid cortical union — functional readiness alone is insufficient for return to impact activity.

Surgeon Notes / Special Instructions: