

High Tibial Osteotomy

Physical Therapy Protocol · Medial Opening-Wedge HTO (Staged Weight Bearing for Bone Healing)



Based on the Ohio State University Wexner Medical Center High Tibial/Distal Femur Osteotomy clinical practice guideline (2023) and the Mass General Brigham HTO rehabilitation protocol, cross-referenced with the University of Virginia HTO/DFO protocol.

AT A GLANCE

TIMELINE	6-12 months; progression is gated by radiographic bone healing at the osteotomy site plus functional criteria
WEIGHT BEARING	Medial opening wedge: TTWB weeks 0-2, 25% weeks 2-4, 50% weeks 4-6, WBAT weeks 6-8, full WB off crutches ~week 8
KEY MILESTONES	Full extension by week 4; flexion >120° in Phase 1; strength symmetry ≥80% before running (~4+ months)
RETURN TO ACTIVITY	Walk-jog ~4-6 months once strength criteria met; return to sport 6-12 months with ≥90% LSI and physician clearance

KEY PRECAUTIONS

- Weight-bearing progression follows the operative note and surgeon's radiographic assessment of osteotomy healing - do not advance on time alone.
- Avoid active hamstring work for the first 2 weeks; expect prolonged quadriceps weakness (recovery can exceed 6 months, especially with larger corrections).
- Red flags: DVT signs (calf swelling >3 cm, pitting edema), lack of full extension by week 4, mechanical block or instability episodes - refer back to the surgeon.
- With concomitant procedures (meniscal repair: no forced flexion >90° for 4 weeks; cartilage restoration: full WB may be delayed to 8-12 weeks) the more restrictive protocol governs.

PHASED REHABILITATION

PHASE 1 – PROTECTION		Weeks 0-4
GOALS	- Protect the osteotomy while respecting weight-bearing restrictions (TTWB then 25%) - Restore ROM: full passive extension and flexion >120° - Re-establish quadriceps activation; minimize pain and effusion	
INTERVENTIONS	- TTWB weeks 0-2 progressing to 25% WB weeks 2-4 with crutches; hinged brace 0-90° initially per surgeon, unlocked as quad control returns - ROM: heel slides, wall slides, prone hangs; initial flexion limit 0-110°, progress to full after week 2 - Quadriceps, gluteal, and hamstring isometrics (no active hamstring work first 2 weeks); 4-way SLR; prone terminal knee extension - Patellar mobilizations in all directions - NMES to quadriceps in long sitting (continue until deficit <20%) - Recumbent bike for ROM only from week 2; cryotherapy/elevation for effusion; DVT surveillance	
CRITERIA TO ADVANCE	- Pain-free flexion >120° and full passive extension - Strong quadriceps isometric contraction; SLR without lag - Proficient heel-to-toe gait pattern at current weight-bearing allowance	

PHASE 2 – EARLY LOADING		Weeks 4-8
GOALS	- Advance weight bearing 50% to WBAT per healing; normalize full active ROM - Build quadriceps, gluteal, and core strength within protected loads	
INTERVENTIONS	- WB progression: 50% weeks 4-6, WBAT with crutches weeks 6-8; gait training throughout - Multi-angle quadriceps isometrics (90-60°); standing terminal knee extension - Bridges, trunk stability work, partial-body-weight shuttle/leg press, mini-squats, wall sits, heel raises - OKC hamstring strengthening from week 6; OKC knee extension 90-30° from week 7 - Blood flow restriction training from week 6 with physician clearance (20-40% 1RM, 80% limb occlusion pressure) - Stationary cycling with progressive resistance	
CRITERIA TO ADVANCE	- Full, painless active ROM with normalized patellar mobility - Effusion <1+ - Tolerates closed-chain exercise without increased pain or swelling	

PHASE 3 – STRENGTHENING & RETURN TO FUNCTION		Weeks 8-16
GOALS	- Discharge crutches with normalized gait - Progress balance, neuromuscular control, and lower-extremity strength - Quadriceps/hamstring symmetry $\geq 80\%$ on strength testing	
INTERVENTIONS	- Gait training to full unassisted ambulation (~week 8, radiographic healing confirmed) - Squat progression 0-45° advancing in depth; step-ups 6-8 in; lateral heel taps; single-leg sit-to-stand - Unstable-surface squats/lunges; single-leg balance and perturbation training - Resisted OKC quadriceps through full ROM from weeks 12-14 - Elliptical, swimming, and cycling for conditioning from 12 weeks - Isometric strength testing at 2-3 months; hip/core progression (band walks, monster walks)	
CRITERIA TO ADVANCE	- Full pain-free ROM; effusion $< 1+$ - Isometric/isokinetic quadriceps and hamstring symmetry $\geq 80\%$ - Proper lower-extremity mechanics with single-leg loading	

PHASE 4 – RETURN TO ACTIVITY		Months 4-6
GOALS	- Initiate walk-jog progression and light plyometrics once strength criteria met - Restore full-range strength for occupational and recreational demands	
INTERVENTIONS	- Progressive resistance: squats, leg press, deadlifts, multi-directional lunges, leg extension/curl - Walk-jog progression after isokinetic testing $\geq 80\%$ (quad and hamstring, 60°/s and 300°/s), effusion $\leq 1+$, pain-free hopping in place - Partial to full body-weight jumping progression; single-leg Romanian deadlifts, BOSU balance - Core progression on static and dynamic surfaces - Isokinetic testing at 6 months; hop test battery once $\geq 80\%$ symmetry achieved	
CRITERIA TO ADVANCE	- Full, pain-free, symmetrical ROM - Isokinetic quadriceps/hamstring symmetry $\geq 80\%$ - Normalized gait and jogging mechanics without reactive effusion	

PHASE 5 – RETURN TO SPORT		Months 6-12
GOALS	Return to sport- and occupation-specific demands with symmetric strength and power	
INTERVENTIONS	- Agility progression at 50-75% effort: side shuffles, carioca, figure-8s, zig-zags, backpedaling, resisted jogging - Advanced plyometrics: bilateral to single-leg, surface and rotational variations, hop-downs up to 12-in box - Sport- and position-specific training; ongoing maintenance strengthening	
CRITERIA TO ADVANCE	- Isokinetic quadriceps/hamstring LSI $\geq 90\%$ (60°/s and 300°/s) - Hop test battery LSI $\geq 90\%$ - No reactive effusion with sport-specific activity - Physician clearance (typical return to sport 6-12 months; MGB reports 7-9 months for many athletes)	

GUIDING PRINCIPLES

This protocol follows criterion-based progression over rigid time-based advancement; phased rehabilitation balancing tissue healing with controlled stress application; objective milestones (ROM, strength LSI, functional testing) to guide phase transitions; individualization based on surgical findings, tissue quality, and patient factors; and ongoing surgeon–therapist communication throughout recovery.

REFERENCES

1. Ohio State University Wexner Medical Center Sports Medicine. High Tibial/Distal Femur Osteotomy Clinical Practice Guideline. 2023. https://medicine.osu.edu/-/media/files/medicine/departments/sports-medicine/medical-professionals/knee-ankle-and-foot/high-tibial_distal-femur-osteotomy_2023.pdf
2. Mass General Brigham Sports Medicine. Rehabilitation Protocol for High Tibial Osteotomy. <https://www.massgeneral.org/assets/mgh/pdf/orthopaedics/sports-medicine/physical-therapy/rehabilitation-protocol-for-high-tibial-osteotomy.pdf>
3. University of Virginia Orthopaedic Surgery, Sports Medicine. Post-Operative Rehabilitation Protocol: HTO/DFO. 2021. <https://med.virginia.edu/orthopaedic-surgery/wp-content/uploads/sites/242/2021/06/HTO-DFO-Protocol-1.pdf>

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