

Tibial Tubercle Osteotomy

Physical Therapy Protocol · Bone-Healing Driven, 6-12 Month Timeline

Modeled on the Brigham and Women's Hospital Standard of Care for Tibial Tubercle Osteotomy (Fulkerson anteromedialization) and the Ohio State University Wexner Medical Center MPFL Reconstruction with Fulkerson Osteotomy Clinical Practice Guideline (2023).



AT A GLANCE

TIMELINE	6-12 months; progression is gated by osteotomy healing on radiographs, not time alone
WEIGHT BEARING	Protected x 6 weeks: TDWB-PWB (<40 lb) or NWB per surgeon, hinged brace locked at 0° for all gait; advance toward FWB weeks 6-12 as union is confirmed
KEY MILESTONES	Flexion $\geq 90^\circ$ by 3 weeks · 110° by 6 weeks · full ROM by 12 weeks · brace discharged ~6-8 weeks with SLR and no lag
RETURN TO ACTIVITY	Jogging no earlier than ~4.5-6 months once strength criteria met; running/jumping/plyometric sport commonly deferred until 9-12 months

KEY PRECAUTIONS

- Weight bearing restrictions protect the osteotomy from fixation failure/fracture - always confirm WB status and progression against the operative note and follow-up radiographs.
- No SLR and no active knee extension in the early phase (extensor pull stresses the tubercle fragment); passive extension only until surgeon clearance.
- No resisted OKC terminal knee extension until bony union; avoid high patellofemoral compression (deep squats) throughout early rehab.
- Modify activity if increasing pain, catching, or effusion occurs; monitor for DVT and compartment syndrome acutely.

PHASED REHABILITATION

PHASE 1 — PROTECTION AND EARLY MOTION		Weeks 0-6
GOALS	- Protect the osteotomy: strict protected weight bearing in brace locked at 0° - Flexion $\geq 90^\circ$ by week 3 and $\sim 110^\circ$ by week 6; full passive extension - Re-establish quadriceps activation without loading the tubercle	
INTERVENTIONS	- TDWB-PWB (<40 lb) or NWB per surgeon with crutches x 6 weeks; hinged brace locked at 0° for all mobility and gait (may unlock sitting/in bed) - PROM/AAROM flexion: heel slides and seated flexion (CPM 0-30° advancing $\sim 10^\circ$/day when prescribed) - Passive extension only - no SLR, no active knee extension this phase - Sub-maximal quad sets and gluteal sets; NMES to quadriceps at 60-90° flexion for activation deficit; ankle pumps - Gentle multidirectional patellar mobilizations from day 1 (avoid lateral stress if concomitant MPFL reconstruction) - Stationary bike without resistance once $\sim 90^\circ$ flexion achieved ($\sim$week 4) - Daily bag hang/heel prop extension program; edema management and elevation	
CRITERIA TO ADVANCE	- Flexion ≥ 90-110° with full passive extension - Quad set with full tetany and superior patellar glide - Incision healed; effusion controlled ($\leq 2+$ trending down) - No signs of hardware irritation or loss of fixation	

PHASE 2 — PROGRESSIVE WEIGHT BEARING		Weeks 6-12
GOALS	- Advance to full weight bearing with normalized gait as radiographic healing allows - Full ROM symmetrical to contralateral limb by week 12 - Initiate quadriceps loading in protected ranges	
INTERVENTIONS	- Progress WB from TDWB to full over ~ 4 weeks per surgeon/radiographs; wean crutches when gait is non-antalgic; discharge brace once 500+ ft ambulation without deviation and 3x10 SLR without lag - SLR program (once cleared) without extensor lag; 4-way hip strengthening - CKC strengthening in functional arcs: terminal knee extension 0-40° and 120-70°, mini squats, leg press light load - No resisted OKC knee extension; avoid deep squats and high PF-compression exercise - Stationary bike with very low resistance; treadmill forward/retro walking; elliptical as tolerated - Aquatic therapy: flutter kick and water walking/running once incision healed - Balance and proprioception: weight shifts to single-leg stance	
CRITERIA TO ADVANCE	- Radiographic evidence of osteotomy healing with surgeon clearance for FWB - Full AROM equal to contralateral side - Normalized gait without assistive device or brace - SLR without lag; no reactive effusion with exercise	

PHASE 3 — STRENGTHENING		Months 3-6
GOALS	- Restore quadriceps, hip, and core strength toward symmetry - Tolerate single-leg loading with good mechanics	
INTERVENTIONS	- Progressive CKC loading: squats to controlled depth, leg press, step-ups/step-downs, lunges - OKC quadriceps strengthening (short arc to long arc) after confirmed union, light resistance first - Single-leg progressions: step-downs, single-leg RDL, single-leg balance on varied surfaces - Bilateral shuttle jumping below 50% body weight late in phase if criteria trending - Hip abductor/external rotator and core strengthening for patellofemoral control - Low-impact conditioning: bike, elliptical, pool	
CRITERIA TO ADVANCE	- Quad/hamstring strength $\geq 80\%$ of uninvolved limb (isokinetic or dynamometry) to enter jogging progression - Full pain-free ROM; effusion $\leq 1+$ - Pain-free hopping in place with normalized mechanics	

PHASE 4 — RUNNING, PLYOMETRICS, AND RETURN TO SPORT		Months 6-12
GOALS	- Progress running, jumping, and cutting without patellofemoral symptoms - Meet objective return-to-sport criteria	
INTERVENTIONS	- Walk-jog progression advancing to continuous running (many programs defer running/plyometrics until 9-12 months for isolated TTO - follow surgeon guidance) - Plyometric progression with landing-symmetry emphasis: bilateral to single-leg, increasing surface and height demands - Agility at 50-75% effort progressing to full speed; sport-specific drills - Maintenance quadriceps/hip strengthening and PF load management education	
CRITERIA TO ADVANCE	- Isokinetic quad and hamstring $\geq 90\%$ at $60^\circ/\text{sec}$ and $300^\circ/\text{sec}$ - Hop testing LSI $\geq 90\%$; no reactive effusion with sport activity - No patellar instability or apprehension; radiographically healed osteotomy - Physician clearance (typical 6-12 months; adolescents may need longer)	

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

- Brigham and Women's Hospital Rehabilitation Services. Standard of Care: Tibial Tubercle Osteotomy. <https://www.brighamandwomens.org/assets/BWH/patients-and-families/rehabilitation-services/pdfs/knee-high-tibial-osteotomy-bwh.pdf>
- Ohio State University Wexner Medical Center Sports Medicine. MPFL Reconstruction with Fulkerson Osteotomy Clinical Practice Guideline. 2023. https://medicine.osu.edu/-/media/files/medicine/departments/sports-medicine/medical-professionals/knee-ankle-and-foot/medial-patellofemoral-ligament-reconstruction_fulkerson_2023.pdf
- Sherman SL, Erickson BJ, Cvetanovich GL, et al. Tibial Tuberosity Osteotomy: Indications, Techniques, and Outcomes. *Am J Sports Med*. 2014;42(8):2006-2017.

For clinical use by licensed physical therapists treating patients of Robert Pettit, MD. This document is a rehabilitation guideline, not a substitute for clinical judgment. Progression must be individualized based on intraoperative findings, tissue quality, and patient response. Scan the QR code for the current version of this protocol.