

OATS / Osteochondral Autograft Transfer (Knee)



Physical Therapy Protocol · Plug Incorporation-Paced, Lesion Location-Specific

Based on the Massachusetts General Hospital rehabilitation protocol for the OATS procedure and the Twin Cities Orthopedics osteochondral autograft/allograft transplant protocol, with running/return-to-sport staging cross-checked against the Nebraska Orthopaedic OATS physical therapy protocol.

AT A GLANCE

TIMELINE	8-12 months to unrestricted sport; graft (plug) incorporation is typically confirmed radiographically at ~6 weeks and 3 months before major loading progressions
WEIGHT BEARING	NWB-TTWB for the first 2 weeks for all lesions, then location- and size-based progression (25% to full) with full WB by weeks 6-10; hinged knee brace locked in extension for ambulation early
KEY MILESTONES	CPM from day 1 (0-60° condylar, 0-40° large patellofemoral; +5-10°/day); flexion 0-90° by week 2-3, 0-125° by weeks 5-6; brace weaned weeks 6-8; normal gait and full ROM by ~week 12
RETURN TO ACTIVITY	Interval running 4-5 months; cutting program 5-6 months; plyometrics 6-8 months; unrestricted sport 8-12 months with ≥90% strength and hop symmetry plus physician clearance

KEY PRECAUTIONS

- Condylar lesions: protect WB (NWB/TTWB early); may perform OKC active knee extension 90°-40° early. Patellofemoral lesions: WB advances faster in an extension-locked brace but avoid resisted knee extension and loaded flexion angles that engage the graft.
- Avoid loading the knee at deep flexion angles, impact, and pivoting until Phase 3+; post-activity soreness should resolve within 24 hours and post-activity swelling should be avoided throughout.
- Maintain full passive extension from week 1 - loss of extension is a red flag; nighttime brace locked in extension for the first ~2 weeks.
- High-impact athletic activity may jeopardize long-term graft health; low-impact conditioning is recommended indefinitely for large or uncontained lesions.

PHASED REHABILITATION

PHASE 1 - IMMEDIATE POST-OP PROTECTION		Weeks 0-6
GOALS	- Protect osteochondral plug(s) during early incorporation - Restore ROM: 0-90° by weeks 2-3, 0-125° by weeks 5-6; full passive extension immediately - Quadriceps reactivation without extension lag	
INTERVENTIONS	- NWB-TTWB with crutches for 2 weeks (all lesions), then progress 25% toward full WB per lesion size/location; hinged brace locked in extension for ambulation, unlocked for exercise - CPM from day 1: 0-60° (condylar, small PF) or 0-40° (large PF), advancing 5-10° per day; target 4-6 hours/day of combined ROM work (CPM, heel/wall slides) - Quad sets with NMES as needed, 4-way SLR, ankle pumps, patellar mobilization, hamstring/calf stretching - OKC active knee extension 90°-40° for condylar lesions only; PF lesions avoid resisted extension - Prone hangs/bolster extension work; nighttime brace locked in extension first 2 weeks - Cryotherapy and elevation for effusion control	
CRITERIA TO ADVANCE	- Full passive extension; flexion ≥120-125° - SLR without quadriceps lag; minimal pain and effusion (trace to none) 6-week radiographs demonstrate early graft incorporation (surgeon review)	

PHASE 2 - WEIGHT BEARING & GAIT RESTORATION		Weeks 6-12
GOALS	- Full WB with normalized gait; wean brace weeks 6-8 - Full pain-free ROM (~130° flexion) - Initiate closed-chain strengthening without reactive effusion	
INTERVENTIONS	- Unlock brace and progress to full WB by weeks 6-10; gait training and soft-tissue mobilization - Discontinue CPM at ~8 weeks - CKC progression: wall sits, mini squats (condylar 0-60° at week 8; PF 0-45°), toe raises, glute bridges, clamshells - Leg press week 10 (condylar 0-90°; PF 0-60°); OKC extension condylar 0-90°, PF 0-30° - Unilateral stance and balance activities; hip and core strengthening - Stationary cycling, aquatic therapy after wound closure, treadmill walking	
CRITERIA TO ADVANCE	- Full pain-free ROM and normalized gait without assistive device or brace - No effusion or swelling after exercise sessions - Single-leg balance >15 seconds	

PHASE 3 - PROGRESSIVE STRENGTHENING		Months 3-5
GOALS	- Restore single-leg strength and lumbopelvic control - Symmetrical proprioception and eccentric control for pre-running readiness	
INTERVENTIONS	- Squat-to-chair progressions, single-leg wall slides, step-ups and step-downs, retro step-ups, lunges and lateral lunges, Romanian deadlifts, single-leg press - Multiplanar gluteal/hip strengthening and lumbopelvic stability work - Balance progression: static to dynamic, stable to unstable surfaces, perturbation training, joint-position retraining - Conditioning: elliptical, stair climber, cycling with progressive resistance - Interval running program initiated at 4-5 months (walk/jog progression, straight-line first) once gait, strength, and effusion criteria met	
CRITERIA TO ADVANCE	- No effusion or swelling after exercise; symmetrical ROM and proprioception - Normal gait mechanics with full single-leg loading 3-month radiographs confirm graft incorporation (surgeon review)	

PHASE 4 - TRANSITIONAL / EARLY SPORT PREPARATION		Months 5-6
GOALS	- Tolerate sub-maximal sport-specific training in the sagittal plane - Strength indices $\geq 80\%$ (quadriceps, hamstring, gluteal)	
INTERVENTIONS	- Cutting program at 5-6 months: lateral movement, figure-8s, controlled change of direction - Plyometric preparation: bilateral partial-WB progressing to full-WB landing drills - Continued heavy strengthening and eccentric single-leg work - Impact-control progression from two-foot to single-foot, multi-plane activities	
CRITERIA TO ADVANCE	10 reps single-leg squat to 60° flexion with good form - Quadriceps/hamstring/gluteal indices $\geq 80\%$ by HHD or isokinetic testing - KOOS-Sports subscale $>70\%$; no reactive pain or swelling with multi-plane work	

PHASE 5 - RETURN TO SPORT		Months 6-12
GOALS	- Full plyometric and agility capacity; hard cutting/pivoting per sport demands - Unrestricted return to play, typically 8-12 months post-op	
INTERVENTIONS	- Plyometrics (box hops, double-leg to single-leg) from 6-8 months; multi-plane agility progression - Sport-specific drills progressing from non-contact practice to full participation; functional brace if prescribed - Isokinetic (Biodex) testing targeting 85-90%+ of the uninvolved side - Ongoing load management; low-impact cross-training emphasized for long-term graft health	
CRITERIA TO ADVANCE	- Hop testing $\geq 90\%$ limb symmetry with controlled landing mechanics - Quadriceps/hamstring/gluteal indices $\geq 90\%$; KOOS-Sports $>90\%$ - No reactive effusion with sport-specific training; physician clearance	

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. Massachusetts General Hospital Sports Physical Therapy. Rehabilitation Protocol for Osteochondral Autograft/Allograft Transfer System (OATS) Procedure. <https://www.massgeneral.org/assets/mgh/pdf/orthopaedics/sports-medicine/physical-therapy/rehabilitation-protocol-for-osteochondral-autograft-allograft-transfer-system-oats-procedure.pdf>
2. Twin Cities Orthopedics (Wulf CA). Osteochondral Autograft/Allograft Transplant Rehabilitation Protocol (2019). https://tcomn.com/wp-content/uploads/2019/03/Wulf_Osteochondral_Autograft_or_Allograft_Transplant_Protocol_2019-03.pdf
3. Nebraska Orthopaedic Center. Physical Therapy Protocol: Osteochondral Autograft Transfer (OATS) for the Knee. <https://nebraskaortho.com/wp-content/uploads/2023/04/PT-Protocol-Osteochondral-Autograft-Transfer-OATS.pdf>

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.