

Osteochondral Allograft Transplantation (Knee)

Physical Therapy Protocol · Graft Incorporation-Paced; Imaging-Gated Impact Progression

Based on the University of Virginia Department of Orthopaedic Surgery osteochondral allograft post-operative protocol and the IJSPT clinical commentary on OCA rehabilitation and return to play in professional athletes (Patel et al., 2021), cross-referenced with Twin Cities Orthopedics and Mass General Brigham osteochondral transplant protocols.



AT A GLANCE

TIMELINE	9-14+ months; allograft bony incorporation is slower than autograft, so impact progression is gated by imaging (x-ray, and MRI at ~6 months in athletes) plus clinical criteria; median return to competitive play in professional athletes is ~14 months
WEIGHT BEARING	TTWB-25% BW weeks 0-2, ~50% BW weeks 2-8, then WBAT from week 8 (some centers advance faster for small condylar grafts); hinged brace 0-90° for the first 2 weeks, opened as tolerated and discontinued at ~6 weeks
KEY MILESTONES	Full extension week 1; flexion to 90° by week 2 progressing to full ROM; brace off at 6 weeks; full unassisted WB with normal gait by ~12 weeks; eccentric step-down control before running
RETURN TO ACTIVITY	Low-impact conditioning from 8-12 weeks; running progression after ~6 months once imaging confirms graft incorporation; sport-specific/plyometric training months 6-9; return to play 9-14 months with ≥90% limb symmetry and physician clearance

KEY PRECAUTIONS

- No running, jumping, or impact until the surgeon confirms graft healing on imaging (x-ray; MRI at ~6 months for athletes) - biologic incorporation of the allograft lags behind clinical recovery.
- Respect the WB progression strictly for femoral condyle and tibial grafts; patellofemoral grafts follow WBAT in an extension-locked brace with avoidance of resisted knee extension and deep loaded flexion (per TCO/MGH location-specific guidance).
- OCD variants: internal fixation of an osteochondritis dissecans fragment or transarticular drilling is typically rehabilitated on a similar protection framework (approximately 6 weeks protected WB with early protected ROM); confirm specifics against the operative note.
- Avoid post-activity swelling throughout; DVT prophylaxis per surgeon during the protected-WB weeks, and monitor for DVT signs.

PHASED REHABILITATION

PHASE 1 - PROTECTION & EARLY MOTION		Weeks 0-6
GOALS	- Protect the graft during earliest incorporation; control pain and effusion - Full passive extension by week 1; flexion 0-90° by week 2 then progressive - Prevent quadriceps shutdown	
INTERVENTIONS	- TTWB-25% BW weeks 0-2, then ~50% BW with crutches; hinged brace 0-90° for 2 weeks, opened to available range weeks 2-6 - Heel props/prone hangs for full extension; heel slides and early PROM/AAROM for flexion (CPM if ordered by surgeon) - NMES-assisted quad sets, quad/gluteal isometrics, 4-way SLR, patellar mobilization, ankle pumps - Core activation and uninvolved-limb/upper-body conditioning - Cryotherapy, compression, elevation; incision care and DVT surveillance	
CRITERIA TO ADVANCE	- Full passive extension; flexion ≥90-120° - SLR without extension lag; effusion controlled - Compliance with WB restriction and brace weaned by week 6 per surgeon	

PHASE 2 - PROGRESSIVE WEIGHT BEARING		Weeks 6-12
GOALS	- Advance 50% BW to WBAT (from week 8) and normalize gait - Full pain-free active ROM - Initiate protected closed-chain strengthening	
INTERVENTIONS	- Discontinue brace at 6 weeks; progressive gait training with crutch weaning as WB advances - Stationary bike for ROM and conditioning - Leg press 0-60°, mini squats, wall sits, TKEs, bilateral CKC strengthening - Pool program: gait drills and protected weight-bearing exercise - Hip-hinge patterning and multiplanar gluteal/hip strengthening - Proprioceptive progression in bilateral stance	
CRITERIA TO ADVANCE	- Full pain-free active ROM - Full WB with normalized gait, no assistive device, by ~week 12 - No reactive effusion with progressive loading	

PHASE 3 - STRENGTHENING & NEUROMUSCULAR CONTROL		Months 3-6
GOALS	- Restore single-leg strength with eccentric quadriceps control - Quadriceps/hamstring symmetry $\geq 80\%$ by HHD or isokinetic testing - Full graft incorporation on imaging before impact loading	
INTERVENTIONS	- Single-leg progression: step-ups, eccentric step-downs (8-inch step goal), single-leg squat and press, lunges, BOSU squats, RDLs - Eccentric leg press emphasis; continued OKC quad strengthening per lesion location - Balance/proprioception integration: dynamic single-leg, unstable surfaces, perturbations - Cardiovascular conditioning: bike intervals, elliptical, pool running - Imaging review at ~6 months (x-ray; MRI in athletes) to confirm articular surface integrity and bony incorporation before running	
CRITERIA TO ADVANCE	- Descends an 8-inch step with good eccentric control and no pain - Quad/hamstring limb symmetry $\geq 80\%$; single-leg stance >30 seconds with proper form - Surgeon confirms graft healing on imaging; no effusion with full strengthening loads	

PHASE 4 - IMPACT & RUNNING PROGRESSION		Months 6-9
GOALS	- Return to running with symmetrical mechanics - Introduce plyometrics and controlled agility	
INTERVENTIONS	- Running progression after imaging clearance; anti-gravity or pool treadmill useful for graded re-loading before land running - Plyometric progression: double-leg to single-leg, low to moderate amplitude, forgiving surfaces first - Agility: straight-plane to multi-plane, non-reactive to reactive drills - Advanced eccentric and heavy-resistance strengthening; load management with 24-hour symptom rule	
CRITERIA TO ADVANCE	- Pain-free running with normalized mechanics and no reactive effusion - Quad/hamstring limb symmetry approaching 90% - Tolerates plyometric progression without symptom flare	

PHASE 5 - RETURN TO SPORT		Months 9-14+
GOALS	- Sport-specific readiness and staged return to competition $\geq 90\%$ limb symmetry on strength and hop testing	
INTERVENTIONS	- Sport-specific drills: non-contact practice, contact scrimmage, controlled live play, then full participation (minute restrictions initially for athletes) - High-level plyometrics and reactive agility - Isokinetic and hop-test batteries to document symmetry - Expect 3-4 months of sport conditioning after formal rehab before pre-injury performance level	
CRITERIA TO ADVANCE	- Isokinetic and hop-test LSI $\geq 90\%$; movement without asymmetrical compensation - Full pain-free ROM, no effusion with sport activity - Physician clearance; median return to competitive play ~14 months in professional 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. University of Virginia Department of Orthopaedic Surgery. Osteochondral Allograft Post-operative Rehabilitation Protocol. <https://med.virginia.edu/orthopaedic-surgery/wp-content/uploads/sites/242/2021/06/osteochondral-allograft-protocol-1.pdf>
2. Patel S, Amirhekmat A, Le R, Williams RJ III, Wang D. Osteochondral Allograft Transplantation in Professional Athletes: Rehabilitation and Return to Play. *Int J Sports Phys Ther*. 2021;16(3):941-958.
3. 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
4. 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>

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.