

PATELLA CARTILAGE GRAFT RECOVERY A GUIDE TO PHYSICAL THERAPY

THE ROLE OF PHYSICAL THERAPY IN YOUR RECOVERY

An osteochondral allograft (OCA) replaced damaged cartilage on your kneecap or the groove it tracks in (the trochlea). Unlike OCA on the thigh bone, you can put weight on your leg right away — but your brace must stay locked straight during walking to protect the graft from bending forces. For the first four weeks, you avoid bending the knee fully under load to protect the graft where it is most vulnerable. Return to sport is approximately six months.

Important: Brace locked straight for all weight-bearing from Day 1. Avoid the last 30° of straightening under load for the first four weeks — this is the most vulnerable zone for this graft.

YOUR RECOVERY TIMELINE

PHASE	TIMEFRAME	PT VISITS	WHAT YOU'RE WORKING ON
1	Weeks 1–6	2–3× per week	• Weight-bearing with brace locked straight — crutches for 2–3 weeks • Avoid terminal knee extension (last 30° of straightening) × 4 weeks • Quad and VMO activation from Day 1 — electrical stimulation if needed • Kneecap mobilization begins immediately; free ROM when non-weight-bearing
2	Weeks 6–14	2× per week	• Brace unlocked — full weight-bearing without restriction • Stationary bike, step-ups, and progressive quad strengthening • Single-leg balance and proprioceptive training • No deep squatting or high-impact activity yet
3	Months 3–5	1–2× per week + home program	• Leg press, functional squats, jogging program begins • Limb symmetry testing at Month 3–4 • Running mechanics screen before return to running • No cutting until Phase 4
4	Months 5–6	As needed	• Cutting, agility, and sport-specific drills • Final hop and strength testing before clearance • Return to sport at approximately 6 months • Dr. Merritt confirms clearance before contact or pivoting sport

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

OSTEOCHONDRAL ALLOGRAFT — PATELLA OR TROCHLEA PHYSICAL THERAPY PROTOCOL

Patient Name: _____
Date of Surgery: _____

Surgeon: Andrew L. Merritt, MD
PT Start Date: _____

Overview & General Principles

Osteochondral allograft (OCA) transplantation of the patella or trochlea replaces full-thickness cartilage and subchondral bone with a size-matched donor plug. Like femoral condyle OCA, healing is osseous — bone-to-bone integration at the graft-host interface — which supports a faster return-to-sport timeline (approximately 6 months) compared with MACI. The patellofemoral protocol differs from the femoral condyle protocol in two key ways: weight bearing is allowed immediately with the brace locked in extension, and terminal knee extension is avoided for the first 4 weeks to protect the trochlear or patellar articular surface.

1. **WBAT — BRACE LOCKED IN EXTENSION:** WBAT is permitted from Day 1 with the brace locked in full extension (0°). The brace protects the graft by preventing loaded knee flexion during stance. Crutches are used for comfort and stability in the first 2–3 weeks, then weaned as tolerated.
2. **TERMINAL EXTENSION AVOIDANCE × 4 WEEKS:** Avoid terminal knee extension (the final 0–30° of extension) for the first 4 weeks to protect the trochlear or patellar graft during its most vulnerable integration period. Terminal knee extension exercises and resisted extension in this arc are restricted during Phase 1.
3. **ROM UNRESTRICTED — NO CPM:** Active and active-assisted ROM exercises are used throughout — no CPM. ROM without load is unrestricted from Day 1. Gentle patellar mobilization begins immediately.
4. **OSSEOUS INTEGRATION ADVANTAGE:** OCA heals through bone-to-bone integration, which is more rapid and structurally robust than MACI's cellular scaffold ingrowth. This supports return to sport at approximately 6 months vs. 12–18 months for MACI.

CONCOMITANT PROCEDURE MODIFICATIONS

Concomitant MPFL Reconstruction

5. MPFL reconstruction does not change the rehabilitation protocol. Proceed per the standard OCA patella/trochlea timeline.

Concomitant Lateral Retinacular Lengthening

6. Lateral retinacular lengthening does not change the rehabilitation protocol. Gentle medial patellar mobilization may be performed per surgeon preference — avoid excessive patellar compression against the cartilage graft surface.

PHASE 1 — PROTECTION (Weeks 0–6)

INFORMATION FOR THE PATIENT — What to Expect This Phase

You can put full weight on your leg from Day 1, but your brace must be locked straight — at 0° — whenever you are standing or walking for the first six weeks. This protects the cartilage graft at the positions where the kneecap puts the most pressure on the joint.

For the first 4 weeks, avoid the last part of straightening your knee (terminal extension) to protect the graft surface. Quad exercises and electrical stimulation begin immediately. You may bend your knee freely while seated or lying down.

Goals:

7. Protect graft osseous integration — WBAT with brace locked in extension × 6 weeks
8. Avoid terminal knee extension (0–30° arc) × 4 weeks
9. Full active ROM (0–130°+) by Week 4–6
10. Restore quad activation — SLR without extensor lag by Week 3
11. Begin patellar mobilization from Day 1
12. Control swelling and pain; aggressive cryotherapy
13. Begin supervised PT within 3 days post-op

Weight-Bearing Status: Weight bearing as tolerated (WBAT) with brace locked in full extension (0°) × 6 weeks. Crutches for comfort and stability Weeks 1–3, then wean as tolerated. Brace must remain locked for all standing and walking. Brace may be unlocked for seated or supine ROM exercises only. Deep-water aquatherapy from Week 3–4 with surgeon approval.

Bracing: Hinged knee brace locked at 0° (full extension) for all weight-bearing activity × 6 weeks — non-negotiable. Unlock brace only for ROM exercises performed seated or supine, and for hygiene. Wean from brace at Week 6 as weight bearing and quad control are confirmed.

Range of Motion: Unrestricted from Day 1. Active and active-assisted ROM exercises — no CPM. Avoid terminal knee extension (0–30°) × 4 weeks: no resisted terminal extension, no TKE with band until Week 4. All exercises performed non-weight bearing (seated or supine). Target full ROM by Week 4–6. Stationary bike when ROM reaches 90°+ (typically Week 3–4).

Exercises:

14. NMES to quadriceps — 20–30 min, 2× daily; begin Day 1–2 post-op
15. Quad sets — 3×15, every waking hour; VMO activation priority
16. Straight-leg raises (hip flexion, then all 4 planes) — 3×10 each
17. Heel slides (active-assisted knee flexion, full ROM) — 3×15
18. Ankle pumps — hourly
19. Hamstring curls — 3×12
20. Hip abductor, adductor, and gastrocnemius strengthening — 3×15
21. Patellar mobilization: superior, inferior, and gentle medial glides — 2×10, 2× daily; begin Day 1. Avoid direct compression of graft surface.
22. Closed-chain exercises without resistance (brace locked, bilateral stance) — begin Week 2–3
23. Stationary recumbent bike — begin when ROM ≥90° (typically Week 3–4); low resistance, 10–15 min
24. Pool deep-water walking (when incision healed, Week 3–4): forward, backward, sideways — full offloading
25. Well-leg cardiovascular conditioning and upper extremity exercises as tolerated
26. Ice and elevation after each session — 20 minutes; aggressive cryotherapy

Progression Milestones — Must Meet All Before Advancing:

27. WBAT compliance with brace locked maintained × 6 weeks

- 28. Full active ROM (0–130°+) by Week 4–6
- 29. SLR without extensor lag by Week 3
- 30. Pain and swelling diminishing

PHASE 1 PRECAUTIONS — GRAFT PROTECTION

- 31. Brace locked at 0° for ALL weight-bearing activity × 6 weeks — non-negotiable
- 32. Avoid terminal knee extension (0–30°) × 4 weeks — no TKE exercises, no resisted terminal extension
- 33. All ROM exercises must be non-weight bearing (seated or supine) — no loaded knee flexion
- 34. Gentle patellar mobilization only — no direct compression of graft surface
- 35. No resisted quad extension (OKC) in Phase 1
- 36. Monitor for reactive effusion — increased swelling warrants load reduction

Rationale: OCA osseous integration requires 6–8 weeks for initial bone-to-bone healing. The brace locked in extension prevents loaded patellofemoral contact in the vulnerable mid-range arc during stance. Avoiding terminal extension × 4 weeks protects the graft surface at the zone of highest patellofemoral contact during early integration.

PHASE 2 — RETURN TO LOADING (Weeks 7–12)

INFORMATION FOR THE PATIENT — What to Expect This Phase

Your brace gradually opens over 2 weeks, allowing more knee bend during walking. By Week 8–10 you will be walking without a brace or crutches. Resisted knee straightening exercises begin with light weight and increase each week. Cycling and pool therapy continue as your primary cardio.

Goals:

- 37. Wean from brace over Weeks 7–8; full WB without brace by Week 8–10
- 38. Assure adequate quad control before advancing weight bearing without brace
- 39. Quad strength 50–60% contralateral
- 40. OKC knee extension with progressive resistance established
- 41. Stationary cycling and closed-chain strengthening without pain

Weight-Bearing Status: Begin WBAT without brace at Week 7 — confirm adequate quad control first. Progress: gradually open brace over Weeks 7–8 → discontinue brace by Week 8–10. Progress crutches → single crutch → no crutch by Weeks 10–12. Reduce activities for pain or effusion.

Bracing: Gradually open brace over Weeks 7–8. Discontinue brace by Week 8–10 as quad control and weight bearing are established.

Range of Motion: Full, unrestricted. Terminal extension restriction lifted at Week 4 — TKE and full-arc OKC extension now permitted. Progress loaded knee flexion gradually: limit to 60° initially (Weeks 7–10); advance to 90° by Week 14. Avoid loaded flexion past 60° until Weeks 10–12 — patellofemoral loading is highest in the 60–90° range.

Exercises — Weeks 7–10:

- 42. Active OKC knee extension with progressive resistance — begin 5 lbs Week 7, increase 2–3 lbs/week, 3×15 (limited arc initially, avoiding deep flexion loading)
- 43. Ergometry / stationary bike — progress to 20–25 min; increase resistance progressively

44. Mini-squats (0–45° only) — 3×15; advance to 60° by Week 10
45. Leg press (0–60° arc) — 3×12; avoid loaded deep flexion
46. Step-ups (2–4 inch) — 3×10
47. Terminal knee extension (TKE) with resistance band — 3×15 (begin after Week 4 restriction lifted)
48. Standing hip abduction/adduction/flexion/extension with progressive resistance — 3×12
49. Hamstring curls with resistance — 3×12
50. Proprioceptive / neuromuscular exercises: single-leg balance on firm surface — 3×30 sec
51. Aquatherapy: shallow-water walking and strengthening exercises
52. Calf raises (bilateral → single-leg) — 3×15
53. Cryotherapy after every exercise session

Exercises — Weeks 10–12 (add to above):

54. Elliptical trainer — low to moderate resistance; introduce when FWB without crutch
55. Mini-squats advance to 0–90° as tolerated — monitor for PF pain and reactive effusion
56. Leg press: advance ROM to 0–90° by Week 14; increase resistance
57. Step-ups progress to 4–6 inch — 3×10
58. Single-leg balance: progress to foam or unsteady surface

Progression Milestones — Must Meet All Before Advancing:

59. Full WB without brace or crutch, near-normal gait
60. Mini-squat (0–45°) ×15 without pain or patellofemoral discomfort
61. Stationary bike 20 min without reactive effusion
62. Quad strength ≥55% contralateral

PHASE 2 PRECAUTIONS

63. Confirm adequate quad control before advancing weight bearing without brace
64. Patellofemoral pain with squatting or leg press — avoid the movement and return to isometric exercises
65. No loaded knee flexion past 60° through Weeks 10–12 — highest PF compression zone
66. No leg extension machine (resisted OKC extension in 0–30° arc is restricted through Week 14)
67. No running, jumping, or impact activities in Phase 2
68. Reactive effusion after exercise — reduce load; cryotherapy required after every session

PHASE 3 — RETURN TO FUNCTION (Weeks 13–16)

INFORMATION FOR THE PATIENT — What to Expect This Phase

This phase adds plyometrics, a step-down program, and running preparation. Running begins when you can perform an 8-inch step-down with good mechanics — typically 14–16 weeks. Deep squatting past 90° is now permitted. If you notice anterior knee pain with squatting or leg press, avoid these movements and return to isometrics.

Goals:

69. Quad strength ≥80% contralateral
70. 8-inch step-down with symmetric mechanics and no pain or PF symptoms
71. Begin plyometric progression (bilateral)

- 72. Initiate running program (walk-jog intervals) at 14–16 weeks
- 73. Enhance strength, flexibility, endurance, and neuromuscular control

Weight-Bearing Status: Full, unrestricted.

Range of Motion: Full, unrestricted. Loaded deep flexion past 90° now permitted.

Exercises:

- 74. Continue all Phase 2 exercises with progressive resistance and duration
- 75. Progressive squatting program — advance from 90° to full depth; increase resistance. Avoid if anterior knee pain — return to isometrics temporarily.
- 76. Leg press program — progress ROM and resistance. Avoid if patellofemoral pain — resume isometrics.
- 77. Progressive step-down program: 4 inch → 6 inch → 8 inch — focus on eccentric quad control and patellar tracking
- 78. Balance board squats — bilateral, then single-leg
- 79. Plyometric drills — begin bilateral jump/land; progress to single-leg hops; introduce Week 13–14
- 80. Ergometer, StairMaster, elliptical — progressive resistance and duration
- 81. Walk-jog intervals — initiate when 8" step-down satisfactory (after 14–16 weeks); flat surface, short intervals
- 82. Agility ladder, lateral shuffles, direction change drills — low intensity initially

Progression Milestones — Must Meet All Before Advancing:

- 83. Quad strength $\geq 80\%$ contralateral
- 84. 8-inch step-down with symmetric mechanics — required before running
- 85. Running 10+ minutes continuous without pain or anterior knee symptoms
- 86. Bilateral plyometrics without pain or effusion

PHASE 3 PRECAUTIONS

- 87. Running not before 14 weeks AND 8" step-down criteria met — both required
- 88. Patellofemoral pain with squatting or leg press — avoid and return to isometric exercises; do not push through anterior knee pain
- 89. Cutting, jumping, and pivoting sports not before 22 weeks (Phase 4)
- 90. Reactive effusion after loading — reduce intensity and reassess

PHASE 4 — RETURN TO IMPACT ACTIVITIES (Weeks 17–26)

INFORMATION FOR THE PATIENT — What to Expect This Phase

Running progresses toward continuous sport-level running. Cutting, jumping, and agility drills begin — not before 22 weeks. Return to sport is gradual and MD-directed, typically after 6 months once all criteria are met.

Goals:

- 91. Isokinetic quad strength $\geq 90\%$ contralateral
- 92. Isokinetic hamstring strength $\geq 100\%$ contralateral
- 93. Single-leg hop test $\geq 90\%$ limb symmetry index

94. Full return to sport or recreational activity

Weight-Bearing Status: Full, unrestricted.

Range of Motion: Full, unrestricted.

Exercises:

95. Running program — progressive build from walk-jog intervals to continuous running; increase duration and pace
96. Cutting, jumping, and general agility drills — not before 22 weeks post-operative
97. Sport-specific agility exercises and skill program — progressive functional difficulty
98. Plyometric progression: bilateral jump/land → single-leg hops → reactive drills
99. Hop testing: single-leg hop, triple hop, crossover hop, timed 6-meter hop
100. Continue quad and hip maintenance program 3–4×/week

Progression Milestones — Clearance for Sport:

101. Isokinetic quad strength $\geq 90\%$ contralateral
102. Isokinetic hamstring strength $\geq 100\%$ contralateral
103. Single-leg hop test $\geq 90\%$ limb symmetry index
104. Running 20 minutes continuous without anterior knee pain or reactive effusion
105. Functional knee scores completed (IKDC, KOOS, Lysholm, Tegner)
106. Surgeon clearance — gradual return to sport after 6 months, MD directed

PHASE 4 PRECAUTIONS

107. Cutting, jumping, and pivoting — not before 22 weeks; criteria-based only
108. Gradual return to full sport after 6 months — MD directed; do not rush based on subjective readiness alone
109. Anterior knee pain or effusion with running warrants imaging evaluation before progression

RETURN TO ACTIVITY CRITERIA

All criteria below must be satisfied AND surgeon clearance obtained before return to cutting, jumping, or pivoting sports.

Return-to-Activity Criterion	Required Threshold
Isokinetic Quadriceps (LSI)	$\geq 90\%$ contralateral limb
Isokinetic Hamstrings (LSI)	$\geq 100\%$ contralateral limb
Single-Leg Hop Testing (LSI)	$\geq 90\%$ contralateral (single, triple, crossover, timed)
Full Pain-Free ROM	Equal to contralateral
No Reactive Effusion	No joint effusion after functional activity
Functional Knee Scores	IKDC, KOOS, Lysholm, Tegner completed
Minimum Time — Running	14–16 weeks (after 8" step-down criteria met)

Minimum Time — Cutting/Jumping	Not before 22 weeks post-operative
Surgeon Clearance	Required; gradual return to sport after 6 months (MD directed)

Clinical Timeline Summary

Weight bearing as tolerated (brace locked): Weeks 0–6

Supervised PT begins: Within 3 days post-op

Terminal extension avoidance (0–30°): Weeks 0–4

Brace gradually opened: Weeks 7–8

Brace discontinued: Weeks 8–10

FWB without crutch: Weeks 10–12

OKC resistance begins: Week 7 (5 lbs; +2–3 lbs/week)

Low-impact cardio (cycling, elliptical): Weeks 7–10

Loaded flexion to 90°: Weeks 10–14

Plyometrics: Weeks 13–14

Running (walk-jog): 14–16 weeks — after 8" step-down criteria met

Cutting / jumping / agility drills: Not before 22 weeks

Return to sport: After 6 months — criteria-based, MD directed

Note: OCA osseous integration supports a faster return-to-sport timeline than MACI. Progression is criteria-based — strength, hop testing, and surgeon clearance determine advancement. Anterior knee pain with loading warrants regression before advancing.

Surgeon Notes / Special Instructions: