

OSTEOCHONDRAL ALLOGRAFT WITH ACL RECONSTRUCTION

Physical Therapy Protocol

PATIENT

SURGEON

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DATE OF SURGERY

PT START DATE

For the patient

You had two procedures: a donor plug of cartilage and bone on your thigh bone (OCA), and a new ACL. **The cartilage graft sets the early rules:** toe-touch only for 6 weeks. **The ACL sets the late rules:** no running before 4 to 5 months, and at least 9 months before sport. This is a big recovery, but the goal is a stable knee with restored cartilage. You move to each phase when your knee meets the goals, not just because weeks have passed.

PROTOCOL AT A GLANCE

WEIGHT BEARING	Toe-touch only for 6 weeks (about 10 to 15 pounds, for balance). Weight added from week 7; off crutches by 8 to 10 weeks
BRACE	Hinged, unlocked for walking from day 1. Off for sleep. Worn until you are off crutches (8 to 10 weeks)
MOTION GOALS	Fully straight (0°) by the end of week 1. Bending 90° by week 1, 110° by week 2
PHYSICAL THERAPY	Starts 5 to 7 days after surgery, 2 times a week at first
KEY PRECAUTIONS	No anti-inflammatory medicines for 6 weeks. No resisted straightening until week 7
RUNNING · SPORT	Running at 4 to 5 months . Sport no sooner than 9 months , after testing

Recovery Timeline

Phase	When	PT visits	Focus
1	Weeks 0–6	2× a week	Toe-touch, full straightening, quad activation
2	Weeks 7–12	2× a week	Weight added, off crutches and brace, 90–40° extension
3	Weeks 13–16	1–2× a week + home program	Strength, step-downs, month 3 testing
4	Months 4–6	1–2× a week + home program	Return to running, plyometrics, agility
5	Months 6–9+	Weekly, as needed	Sport drills, testing, return at 9 months+

For the Therapist

Check the surgeon notes first. They override anything else in this protocol. Questions or setbacks: call (425) 656-5060.

Surgeon notes and special instructions

General principles

- **Dual healing.** OCA integration is osseous (bone to bone, faster); ACL ligamentization is slower and continues for 12–24 months. The OCA drives early restrictions; the ACL drives return to sport.
- **Toe-touch × 6 weeks (OCA).** About 10–15 lb, for balance only. This overrides the ACL's weight-as-tolerated progression.
- **Brace:** hinged, unlocked for walking from day 1; off for sleep and ROM exercises. Worn until off crutches (weeks 8–10), with full extension and good quad control.
- **Open-chain extension:** none resisted in Phase 1 (OCA and ACL). From week 7, 90–40° arc only (ACL).
- **No NSAIDs for 6 weeks, including topical** (e.g., diclofenac gel). They can slow bone and cartilage healing.
- **BFR** is approved and encouraged throughout, especially in weeks 0–6 when toe-touch limits closed-chain work.
- **NMES** at PT visits from the first visit; no home unit. **Cold compression:** 20 min on, 20 min off.
- **Running at months 4–5 (ACL).** Both the 8-inch step-down and a running mechanics screen are required first.
- **9-month minimum for sport (ACL).** Test strength, hops, Y-balance, and ACL-RSI formally before clearance. Progression is criteria-based, not calendar-based.

Procedures done at the same time

ACL + LET (lateral extra-articular tenodesis)

- Added in higher-risk patients to lower the re-tear rate. The combined protocol applies, with no timeline changes.
- Avoid aggressive resisted internal tibial rotation in Phase 1.

PHASE

1

Protection

Weeks 0–6

For the patient: what to expect

Toe-touch only: your foot rests on the floor for balance (about 10 to 15 pounds). Brace unlocked for walking, off for sleep. **Your number-one job is getting the knee fully straight.** Bend gently to 90° by week 1 and 110° by week 2; don't force it.

WEIGHT BEARING	Toe-touch × 6 weeks (about 10–15 lb, for balance). No partial or full weight bearing before week 7
BRACE	Hinged, unlocked for walking from day 1. Off for sleep and ROM exercises
MOTION	Extension first: 0° by the end of week 1. Flexion active-assisted, not forced

Goals

- Full passive extension (0°), equal to the other knee, by week 1
- Flexion 90° by week 1 and 110° by week 2
- Visible VMO contraction; SLR without lag by weeks 2–3
- Toe-touch × 6 weeks; pain and effusion controlled

Move on when

- ☐ Toe-touch maintained × 6 weeks
- ☐ Full passive extension (0°)
- ☐ Flexion ≥90° (target 110° by week 2)
- ☐ SLR without extensor lag
- ☐ Pain and effusion decreasing

Exercises

Exercise	How
Quad sets	Against a towel roll, every waking hour; VMO priority
NMES	20–30 min at PT visits from the first visit, until SLR without lag
Extension · patella	Heel props and prone hangs, 10–15 min, 2–3× a day. Patellar mobilization, 4 directions, from day 1
Straight-leg raise	Once there is no extensor lag; all 4 planes as tolerated
Heel slides · ankle pumps	Heel slides 3 × 15, as tolerated; ankle pumps hourly
Hip strengthening	Abduction, adduction, ER, extension (side-lying, prone); 3 × 15
BFR	Quad sets and SLR with the cuff; high priority if quad inhibition
Recumbent bike	Once flexion ≥100° (typically weeks 4–6); low resistance, 10–15 min
Pool · conditioning	Deep-water walking weeks 4–5 (incisions healed, surgeon approval). Other-leg and upper-body cardio
Cold compression	20 min on, 20 min off after exercise; elevate

Precautions

- Toe-touch × 6 weeks. No squatting, lunging, loaded knee flexion, or resisted open-chain extension
- Hamstring graft: no aggressive stretch or resisted curls through week 6
- Do not force flexion; it increases effusion and inhibits the quad

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Return to Loading

Weeks 7–12

For the patient: what to expect

Weight bearing starts at week 7, once your therapist confirms your quad control. You'll go from 2 crutches to 1, then none, by 8 to 10 weeks. Keep the brace on until you are off crutches. Straightening exercises with light weight start in a safe range for your ACL. No running or jumping yet.

WEIGHT BEARING	Partial from week 7, once quad control is confirmed. 2 crutches → 1 → none by weeks 8–10
BRACE	Unlocked for walking; stop once off crutches with full extension and good quad control (weeks 8–10)
MOTION	Full. 0–125° by week 8. Loaded flexion ≤90° through week 8 (ACL)

Goals

- Off crutches by weeks 8–10; normal gait and stairs
- Quad strength 50–60% LSI
- Open-chain extension (90–40°) with progressive resistance
- Cycling and closed-chain work without effusion

Move on when

- ☐ Off crutches, near-normal gait
- ☐ ROM 0–120° without pain
- ☐ Squat 0–90° × 15 without pain
- ☐ 20 min bike without reactive swelling
- ☐ Quad strength ≥55% LSI

Exercises

Exercise	How
Open-chain extension	90–40° arc: 5 lb at week 7, +2–3 lb a week; 3 × 15
Bike · elliptical	Bike to 20–30 min, more resistance. Elliptical once off crutches (weeks 10–12)
Mini squats	0–60°, 3 × 15; 0–90° by week 12, watching for effusion
Leg press	Both legs, 0–60°, 3 × 12; flexion ≤90° through week 8; single leg by week 12
Step-ups · stairs	4–6-inch, forward and lateral, 3 × 10. Stairs without the rail, weeks 10–12
Calf raises	Both legs → single leg, 3 × 15
Hip strengthening	All 4 directions, progressive resistance, 3 × 12
Hamstring curls	Resisted: hamstring graft from week 7; BTB or quad tendon from weeks 6–7
Single-leg balance	Firm surface 3 × 30 sec; foam or unstable from week 10
Aquatherapy · BFR	Shallow-water walking, heel raises, gentle squats. BFR leg press and mini squats

Precautions

- Open-chain extension in the 90–40° arc only (ACL); loaded flexion ≤90° through week 8
- Confirm quad control before advancing weight bearing; delay if inhibition persists
- No running, jumping, or impact; check effusion and ice after every session

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Intermediate Strengthening

Weeks 13–16

For the patient: what to expect

You'll work harder in the gym, but **no running yet**: your new ACL is still maturing. The bike, elliptical, and stair machine keep you fit. Passing an 8-inch step-down test is your gate to running at 4 to 5 months.

WEIGHT BEARING	Full, unrestricted
BRACE	Off (may continue for confidence, per surgeon)
RUNNING	Not yet: deferred to months 4–5 for ACL graft maturation. Non-impact conditioning only

Goals

- Quad and hamstring strength toward 70–80% LSI
- Full ROM (0–135°+)
- 8-inch step-down, symmetric and pain-free
- Start controlled bilateral plyometric preparation
- Stairs, endurance, neuromuscular training

Move on when

- ☐ Quad $\geq 70\%$ LSI (month 3 testing)
- ☐ 8-inch step-down, symmetric
- ☐ Bilateral plyometrics without effusion
- ☐ Full ROM; no effusion at rest
- ☐ At least month 4 after surgery

Exercises

Exercise	How
Phase 2 program	Continue with progressive resistance and duration
Squats · leg press	Deeper and heavier; leg press to single leg. PF pain: back to isometrics
Step-down program	4 → 6 → 8-inch; eccentric control, symmetric mechanics
Open-chain extension	More resistance in the 90–40° arc; wider arc per surgeon by week 16
Hamstrings	Heavy prone and seated curls; Nordic curls when strength allows
Balance	Eyes closed, perturbation, balance board
Conditioning	Bike, elliptical, StairMaster; aqua jogging if available
Plyometric preparation	From weeks 13–14: depth landing, jump to box, bilateral jump and land
Agility	Ladder, lateral shuffles, change of direction at low intensity
BFR · testing	BFR for quad and hamstring. Month 3 LSI testing: schedule it and share results

Precautions

- No outdoor running (ACL graft about 30–50% of native strength at month 3); no pivoting or cutting
- Open-chain extension stays 90–40° through week 16 unless the surgeon clears a wider arc
- PF pain with squats or leg press, or reactive effusion: reduce load and reassess

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4

Advanced Strengthening and Return to Running

Months 4–6

For the patient: what to expect

You'll start jogging, learn to jump and land well, and begin sport-type movements. Don't rush: your ACL graft is still maturing. Every new activity should feel controlled before you add speed or load. Swelling after activity means you did too much.

WEIGHT BEARING	Full, unrestricted
RUNNING	Walk-jog once the step-down and mechanics screen are passed and the surgeon clears it (months 4–5)

Goals

- Quad and hamstring strength 80–90% LSI
- Return-to-run program
- Plyometrics: bilateral → single leg
- Sport-specific movement patterns
- Month 6 pre-return strength and hop screen

Move on when

- ☐ Running 20 min without pain, swelling, or limp
- ☐ Single-leg hop $\geq 70\%$ LSI
- ☐ Quad and hamstring $\geq 80\%$ LSI
- ☐ No effusion with high-demand activity
- ☐ At least month 6 after surgery

Exercises

Exercise	How
Heavy compound lifts	Barbell squat, leg press, hip hinge
Single-leg strength	Squats and lunges with progressive load
Nordic hamstring curls	Eccentric emphasis; the hamstring is the main dynamic ACL restraint
Running mechanics screen	Check pelvic drop, valgus, trunk lean; correct before adding volume
Return to run	Walk-run intervals on flat ground; build duration and pace over 4–6 weeks
Plyometrics	Vertical, broad, box jumps; single-leg hops once double-leg is symmetric
Agility · sport moves	Cones, ladder, figure-8. Cutting and deceleration at 50–75% speed
Month 6 testing	Formal strength and hop testing; document LSI

Running criteria (all required)

- 8-inch step-down, symmetric and pain-free; running mechanics screen passed
- Quad $\geq 70\%$ LSI; no effusion after Phase 3 loading
- Surgeon clearance; at least month 4 after surgery

Precautions

- No pivoting sport before return-to-sport criteria are met
- Plyometrics only with $\geq 70\%$ LSI; poor landing with a weak quad loads the graft
- Marked swelling after activity: reduce load. Assess fear of re-injury

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Return to Sport

Months 6–9+

For the patient: what to expect

You're close, but **the 9-month minimum is not negotiable**. Athletes who return earlier re-tear their ACL at about 4 times the rate. You'll pass strength and hop tests, and a confidence questionnaire, before Dr. Merritt clears you. Keep lifting after you return.

BRACE	Per surgeon; consider a sport brace for high-risk pivoting sport
EARLIEST RETURN	9 months after surgery; evidence-based and not negotiable

Goals • Quad $\geq 90\%$ LSI; hamstring-to-quad ratio $\geq 60\%$ • Hamstring $\geq 100\%$ LSI (OCA criterion) • Hop battery $\geq 90\%$ LSI; Y-balance $\geq 94\%$ • ACL-RSI ≥ 65; clearance from Dr. Merritt	Move on when
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Exercises

Exercise	How
Phase 4 program	Continue at progressive intensity
Sport practice	Positional drills, scrimmage, game simulation
Strength maintenance	2–3 sessions a week; do not stop at return. Keep a hamstring emphasis
Injury prevention	After clearance: FIFA 11+ (or equivalent) warm-up before every practice and game

Precautions

- Returning before 9 months carries about 4× the re-tear rate
- A low ACL-RSI predicts re-tear independent of physical criteria; testing is required

Return to Sport

All criteria must be met, and Dr. Merritt must clear the patient, before cutting or pivoting sports.

Measure	Target
Time from surgery	At least 9 months (ACL)
Quadriceps strength	≥90% LSI (consider ≥100% for pivoting or contact sport)
Hamstring strength	≥100% LSI (OCA criterion); hamstring-to-quad ratio ≥60%
Hop testing	≥90% LSI: single, triple, crossover, timed 6-meter
Y-balance · SEBT	Composite ≥94%
ACL-RSI	≥65; fear avoidance assessed
ROM · effusion	Full, pain-free, no extensor lag; no effusion after activity
Knee scores	IKDC, KOOS, Lysholm, Tegner completed
Clearance	Formal clearance from Dr. Merritt; gradual, criteria-based

OCA integration is usually complete by 4–6 months, so no extra OCA delays are needed after month 4.

Clinical Timeline Summary

TOE-TOUCH	Weeks 0–6 (OCA-driven); weight added at week 7; off crutches weeks 8–10
BRACE · NSAIDS	Brace unlocked from day 1, stops once off crutches (weeks 8–10). No NSAIDs weeks 0–6
OPEN-CHAIN	From week 7: 90–40° arc, 5 lb, +2–3 lb a week
CARDIO · PLYOMETRICS	Bike once flexion ≥100°; elliptical once off crutches. Bilateral plyometric prep from weeks 13–14
TESTING · RUNNING	Schedule month 3 LSI and month 6 screens. Running months 4–5, after step-down, mechanics screen, clearance
CUTTING · SPORT	Drills months 6–9 (criteria-based); sport no sooner than 9 months

Graft-Specific Considerations

Hamstring autograft (semitendinosus ± gracilis)

- No aggressive stretching, prone knee flexion, or resisted curls through week 6
- Weakness can last 6–12 months: emphasize hamstrings; confirm ≥100% LSI before clearance

Patellar tendon (BTB) autograft

- Anterior knee and kneeling pain for 6–12 months (often months 4–7); no need to refer back
- Slightly faster closed-chain progression; modify step-downs and deep squats to pain
- Full extension is critical; an extension lag risks a cyclops lesion

Quadriceps tendon autograft

- Harvest-site soreness for 4–6 weeks; early quad work is safe; no kneeling limit
- Mirrors BTB, but quad recovery is often slower; BFR strongly encouraged