

ANDREW L. MERRITT, MD — PROLIANCE ORTHOPEDIC ASSOCIATES

YOUR ACL REPAIR (BEAR IMPLANT) RECOVERY

A GUIDE TO PHYSICAL THERAPY

THE ROLE OF PHYSICAL THERAPY IN YOUR RECOVERY

Your ACL was repaired — not reconstructed — using the BEAR implant, which helps your own ligament heal by providing a biological scaffold. Because your native ACL is healing rather than being replaced by a new graft, the early phase requires more careful protection against stress on the repair. The brace and crutch protocol is more structured than ACL reconstruction, but your native hamstring strength is typically better preserved at the end. Return to sport is 9 to 12 months.

Important: You advance through phases based on meeting clinical milestones — quad control, range of motion, and swelling — not the calendar alone. Do not rush into the next phase until criteria are met.

YOUR RECOVERY TIMELINE

PHASE	TIMEFRAME	PT VISITS	WHAT YOU'RE WORKING ON
1	Weeks 1–8	2–3× per week	• Partial weight-bearing with crutches for first 4 weeks • Brace locked for walking — unlocked at Week 4 when quad is strong • Quad activation with electrical stimulation (NMES) — essential • Gradual range of motion — no overpressure or forced stretching
2	Weeks 8–16	1–2× per week	• Full weight-bearing — wean off crutches • Stationary bike, step-ups, and progressive strengthening • Functional brace for activity through Week 14+ • Balance and single-leg control training
3	Months 4–6	1× per week + home program	• Running begins at Week 12–20 after surgeon clearance and strength testing • Progressive loading: jogging → tempo → straights • Limb symmetry testing at Month 3 and 6 • No cutting or pivoting until Phase 4
4	Months 7–12	Weekly as needed	• Sport-specific agility and cutting drills from Week 36+ • Final hop testing and psychological readiness assessment • Return to unrestricted sport typically at 9–12 months • Criteria-based clearance — Dr. Merritt and PT collaborate

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

ACL REPAIR (BEAR IMPLANT) · PHYSICAL THERAPY PROTOCOL

Patient Name: _____
Date of Surgery: _____

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

Overview and General Principles

The BEAR (Bridge-Enhanced ACL Repair) procedure uses the BEAR Implant (Miach Orthopaedics) to stimulate biological repair of the torn ACL rather than reconstruct it with a tendon graft. Blood is injected into the implant scaffold at surgery, which serves as a bridge for ACL healing. Rehabilitation must protect the healing ACL while promoting neuromuscular recovery. This protocol follows the 8-phase Miach Orthopaedics rehabilitation framework adapted to Dr. Merritt's practice standards.

1. **BEAR IMPLANT — BIOLOGIC HEALING:** The BEAR procedure repairs the native ACL through biologic healing. Avoid excessive anterior tibial translation and torsional loads during the healing phase (Weeks 0–12). No overpressure stretching into extension.
2. **BRACE PROTOCOL:** Brace locked 0° for WB ambulation Weeks 0–2, then 0–90° Weeks 2–4. Unlocked from Week 4 when criteria met. Functional ACL brace from Weeks 6–14+ per surgeon.
3. **WEIGHT BEARING:** Partial weight bearing (up to 50% BW) with crutches Weeks 0–4. WBAT with crutch wean from Week 4 when normal gait, no extensor lag, good quad control, and minimal pain achieved.
4. **NMES — ESSENTIAL:** NMES is a primary modality for quadriceps re-education (10–15 reps × 10-second contractions with 50-second rest). Continue until QI ≥80%. BFR training is optional adjunct.
5. **NO CPM, NO MANUAL PROM:** No CPM. No manual PROM during Phases 1–3. ROM is gained through active and active-assisted exercises only. No scar massage until Phase 3 (Week 7+).
6. **RETURN-TO-SPORT TIMELINE:** Running begins Week 12–20 only after: surgeon clearance, QI ≥80%, zero effusion, and full ROM. No cutting or pivoting until Phase 7 (Week 36+). Return to sport is criteria-based, typically 9–12 months.

Concomitant Procedures

Concomitant Procedures (check all that apply):

7. Meniscus repair (see Meniscus Repair Protocol addendum — WB and ROM restrictions may take precedence)
8. Lateral extra-articular tenodesis (LET) / anterolateral ligament (ALL) reconstruction
9. Medial collateral ligament (MCL) reconstruction or repair
10. Articular cartilage procedure
11. Other: _____

Note: If concomitant meniscus repair is performed, weight-bearing and ROM restrictions from the meniscus repair protocol supersede this protocol during Phase 1. Confirm with Dr. Merritt.

BRACE ROM PROTOCOL

Time Period	ROM Setting	Notes
Weeks 0–2	ROM: 0–45°	Locked 0° for WB; unlocked for seated ROM exercises
Weeks 2–4	ROM: 0–90°	Locked 0° for WB ambulation; unlocked for seated ROM
Weeks 4–6	Progress to full ROM	Unlocked for ambulation when gait is normal and pain-free
Weeks 6–14	Functional ACL brace	Worn when AROM $\geq 110^\circ$; transitioning away from hinged brace
Week 14+	Functional brace per surgeon	Continue per Dr. Merritt's guidance until RTS clearance

PHASE 1 — IMMEDIATE POST-OP (Weeks 0–4)

Weight Bearing: Partial weight bearing (PWB) up to 50% BW — crutches required

Brace: Locked 0° for WB ambulation Weeks 0–2; locked 0° for sleep $\times$ 4 weeks; unlocked for seated ROM exercises

ROM: 0–45° seated active range Weeks 0–2; advance to 0–90° by Weeks 2–4

Goals:

12. Minimize effusion and pain
13. Restore quad activation and inhibit quadriceps shutdown
14. Protect healing ACL repair — no anterior tibial translation stress
15. Achieve full passive extension equal to contralateral
16. Maintain hip and core strength

Exercises:

17. Quad sets with NMES: 10–15 reps $\times$ 10-second contraction, 50-second rest; continue until QI $\geq 80\%$
18. Ankle pumps — begin immediately post-op
19. Heel prop for full passive extension — no towel rolls under knee
20. SLR (straight leg raise) — only if no extensor lag; may apply NMES
21. Hip abduction and ER strengthening (sidelying, clamshells)
22. Hip extension in prone (non-WB)
23. Stationary bike: no load, limited ROM after surgeon clearance (typically Week 2–3)
24. Cryotherapy after all sessions — 15–20 minutes

Precautions:

25. No active knee extension from 0–30° (OKC terminal extension) until Phase 2
26. No manual PROM — no stretching, no overpressure
27. No pivot, cutting, or rotational loads
28. No scar massage until Phase 3

29. Brace locked 0° for all ambulation Weeks 0–2

Criteria to Advance to Phase 2:

30. Normal gait pattern on crutches with PWB
31. No extensor lag with SLR
32. Knee flexion ROM $\geq 90^\circ$
33. Minimal effusion (trace or less)
34. Pain controlled (VAS $\leq 4/10$)

PHASE 2 — EARLY REHABILITATION (Weeks 4–7)

Weight Bearing: WBAT — wean crutches at Week 4 if criteria met (normal gait, no pain, no extensor lag, good quad control)

Brace: Unlocked for ambulation; transition to functional ACL brace per surgeon

ROM: Progress to full symmetrical ROM; active and active-assisted only

Goals:

35. Achieve WBAT and independent ambulation without compensatory gait
36. Full or near-full ROM symmetrical to contralateral
37. Good quad control — SLR without extensor lag consistently
38. Continue quad strengthening toward QI $\geq 80\%$

Exercises:

39. Long arc quads (LAQ): 90–0° progressive resistance; advance 2–3 lbs/week
40. SLR: all four planes (flexion, extension, abduction, adduction)
41. Mini squats 0–45° with bilateral support
42. Step training: step-ups (4"), step-downs (4")
43. Stair training with rail support
44. Stationary bike: full pedal revolution with light resistance
45. Standing hip strengthening: abductors, extensors, ER with resistance band
46. Calf raises: seated and standing
47. NMES: continue until QI $\geq 80\%$
48. BFR (blood flow restriction): optional adjunct for quad and hamstring hypertrophy

Precautions:

49. No overpressure to knee or forced ROM
50. No running, jumping, or impact activities
51. No manual PROM
52. Avoid antalgic gait — use crutches until normalized

Criteria to Advance to Phase 3:

53. WBAT with normal gait, no assistive device required
54. AROM $\geq 90^\circ$ flexion, full extension (0°)
55. SLR ≥ 20 repetitions without extensor lag
56. Quad activation with QI progressing toward 80%

57. Minimal to trace effusion

PHASE 3 — INTERMEDIATE STRENGTHENING (Weeks 7–12)

Weight Bearing: Full weight bearing; discontinue crutches when criteria met

Brace: Transition to functional ACL brace when AROM $\geq 110^\circ$; worn during activity per surgeon

ROM: Full ROM expected; active and active-assisted; progressive resistance

Goals:

- 58. Full symmetrical ROM
- 59. Independent ambulation without assistive device
- 60. QI advancing toward 60–80%
- 61. Begin low-impact cardiovascular conditioning
- 62. Restore neuromuscular control and proprioception

Exercises:

- 63. OKC knee extension ($90-0^\circ$ full arc progressive resistance): add 2–3 lbs/week
- 64. OKC hamstring curls: seated or prone progressive resistance
- 65. Leg press $0-60^\circ$ (bilateral then unilateral)
- 66. Lunges and step-downs (forward and lateral, 4–6")
- 67. Single-leg balance: eyes open, progressing to perturbation training
- 68. Aqua jogging: Week 8+ (non-impact deep-water running with floatation belt)
- 69. Stationary bike: progressive resistance
- 70. Elliptical (low resistance, no incline): Week 10+
- 71. NMES: continue until QI $\geq 80\%$
- 72. BFR: optional adjunct
- 73. Scar massage: begin Week 7+ when incisions fully healed

Precautions:

- 74. No running on land until Phase 4 criteria met
- 75. No cutting, pivoting, or lateral agility
- 76. No plyometrics
- 77. No manual PROM

Criteria to Advance to Phase 4:

- 78. Full AROM equal to contralateral (no extensor lag, flexion symmetrical)
- 79. SLR ≥ 20 reps without lag
- 80. Normal gait; crutches discontinued
- 81. QI 60–80%
- 82. Minimal effusion
- 83. Minimum 12 weeks post-op

PHASE 4 — ADVANCED STRENGTHENING (Weeks 12–20)

Weight Bearing: Full weight bearing; no restrictions

Brace: Functional ACL brace per surgeon; wean per Dr. Merritt's guidance

Running: Treadmill walk-jog after surgeon clearance + QI $\geq 80\%$ + zero effusion + full ROM; minimum Week 12

Goals:

- 84. QI $\geq 80\%$ (quad and hamstring LSI)
- 85. Initiate return-to-running program (criteria-based)
- 86. Develop single-leg strength, balance, and neuromuscular control
- 87. Prepare for jumping and cutting activities in Phase 5

Exercises:

- 88. OKC quad extension: full range, progressive resistance
- 89. OKC hamstring curls: progressive resistance
- 90. Leg press: bilateral and unilateral (0–90°)
- 91. Step-ups and step-downs: 6–8" height progression
- 92. Bulgarian split squats, single-leg squats
- 93. Hip strengthening: all planes with resistance band and cable
- 94. Neuromuscular: single-leg balance with perturbation, BOSU, wobble board
- 95. Treadmill walk-jog progression (when criteria met): 60s walk / 60s jog intervals, advance weekly
- 96. Stationary bike, elliptical, swimming (progressive intensity)
- 97. BFR: optional adjunct

Running Criteria (ALL required before initiating treadmill running):

- 98. Surgeon clearance for running
- 99. QI $\geq 80\%$ (quad and hamstring)
- 100. Zero effusion with activity
- 101. Full ROM equal to contralateral
- 102. Minimum 12 weeks post-op

Precautions:

- 103. No cutting, pivoting, lateral shuffles, or sport-specific agility
- 104. No bilateral jumping until Phase 5
- 105. Monitor for effusion after each session — reduce intensity if effusion increases

Criteria to Advance to Phase 5:

- 106. Running without pain or effusion for 4+ consecutive sessions
- 107. QI $\geq 80\%$ (quad and hamstring)
- 108. Single-leg balance 60 seconds
- 109. 50% hop height on single-leg hop in brace
- 110. Minimum 20 weeks post-op

PHASE 5 — RUNNING PROGRESSION (Weeks 20–30)

Weight Bearing: Full weight bearing; no restrictions

Brace: Functional ACL brace per surgeon

Running: Straight-line running progressing to speed; NO cutting, pivoting, or lateral agility in this phase

Goals:

- 111. Running without pain or effusion at progressive speeds
- 112. Bilateral and unilateral jumping with symmetrical landing mechanics
- 113. Hop testing $\geq 80\%$ LSI
- 114. Continue strength progression toward $\geq 90\%$ LSI

Exercises:

- 115. Treadmill running: interval progression (increase duration, then speed; reach 75% max speed)
- 116. Double-leg jump to landing: soft landing mechanics, knee-over-toe alignment, no valgus
- 117. Hopping: bilateral then unilateral (in brace); progress height and distance
- 118. OKC quad and hamstring: continue heavy progressive resistance
- 119. Leg press, split squat, single-leg squat: heavy loading
- 120. Hip strengthening: all planes, heavy resistance
- 121. Plyometric preparation: depth landing, jump-to-box, low box drops
- 122. Agility prep: lateral shuffle (non-pivoting) — begin late Phase 5 per surgeon
- 123. Neuromuscular: perturbation training, reactive drills

Precautions:

- 124. NO cutting or pivoting movements until Phase 6
- 125. Monitor for effusion — any reactive swelling requires reduction in load
- 126. Avoid valgus collapse on landing — correct biomechanics before advancing

Criteria to Advance to Phase 6:

- 127. Running without pain or effusion
- 128. Single-leg balance ≥ 60 seconds
- 129. Hop tests $\geq 80\%$ LSI (single-leg hop in brace)
- 130. QI $\geq 80\%$ (quad and hamstring)
- 131. Minimum 30 weeks post-op

PHASE 6 — RETURN-TO-RUNNING / PRE-SPORT (Weeks 30–36)

Weight Bearing: Full weight bearing; no restrictions

Brace: Functional brace per surgeon during cutting and sport activities

Running: Running patterns up to 75% speed; introduce change of direction and sport-specific patterns

Goals:

- 132. Running at 85% of maximum speed without pain or effusion
- 133. Hop testing $\geq 85\%$ LSI
- 134. QI $\geq 85\%$ (quad and hamstring)
- 135. IKDC Q10 score ≥ 8 (0–10 scale)

- 136. Max vertical jump without pain

Exercises:

- 137. Running: advance to 85% maximum speed; introduce 45° cuts and direction change
- 138. Plyometrics: bilateral and unilateral jumping, bounding, reactive hops
- 139. Agility ladder drills: progressing speed and complexity
- 140. Sport-specific movement patterns — non-competitive, controlled environment
- 141. Cutting and pivoting drills at 50–75% speed
- 142. Strength maintenance: heavy progressive loading (quad, hamstring, hip)
- 143. Eccentric quad and hamstring: Nordic curls, RDL, high step-downs
- 144. Deceleration and landing mechanics refinement

Precautions:

- 145. No full-speed sport-specific cutting or contact until Phase 7
- 146. No full team practice until RTS criteria met
- 147. Monitor for effusion or pain with increased activity

Criteria to Advance to Phase 7:

- 148. Max vertical jump without pain
- 149. Hop tests $\geq 85\%$ LSI (single, triple, crossover, timed 6-meter)
- 150. Running at 85% speed without pain or effusion
- 151. IKDC Q10 ≥ 8
- 152. QI $\geq 85\%$
- 153. Minimum 36 weeks post-op

PHASE 7 — RETURN TO SPORT (Weeks 36–52)

Weight Bearing: Full weight bearing; no restrictions

Brace: Functional brace during sport per surgeon guidance

Timeline: Week 36 minimum; 9–12 months recommended for full unrestricted return to cutting/pivoting sport

Goals:

- 154. Achieve all RTS criteria prior to return to full sport
- 155. QI $\geq 90\%$ (quad and hamstring)
- 156. Hop tests $\geq 90\%$ LSI
- 157. IKDC Q10 ≥ 9
- 158. Surgeon clearance obtained

Exercises / Activities:

- 159. Full sport-specific training: drills, conditioning, team practice
- 160. Gradual return to competition: limited minutes, graduated exposure
- 161. Cutting and pivoting at full speed
- 162. Contact drills (sport-dependent) — after surgeon clearance
- 163. Continue maintenance strength program (2×/week minimum)

- 164. Neuromuscular and proprioception maintenance
- 165. Psychological readiness assessment (ACL-RSI or similar) — recommended

Precautions:

- 166. Do not rush RTS — premature return significantly increases re-injury risk
- 167. Psychological readiness is a component of RTS — address fear-avoidance behaviors
- 168. Continue brace per surgeon — do not discontinue without Dr. Merritt's clearance

Return-to-Sport Criteria

Return-to-Activity Criterion	Required Threshold
Isokinetic Quadriceps (LSI)	≥90% contralateral limb
Isokinetic Hamstrings (LSI)	≥90% contralateral limb
Single-Leg Hop Testing (LSI)	≥90% contralateral (single, triple, crossover, timed)
Single-Leg Balance	60 seconds eyes open without loss of balance
Full Pain-Free ROM	Equal to contralateral; no extensor lag
Minimal Effusion	No reactive joint effusion after functional activity
Functional Knee Scores	IKDC Q10 score ≥9 (0–10 scale)
Minimum Time – Running	Week 12–20 post-op (QI ≥80% + surgeon clearance + zero effusion + full ROM)
Minimum Time – Cutting/Pivoting	Week 36 post-op (minimum); 9–12 months recommended
Surgeon Clearance	Required; criteria-based, MD directed

Clinical Timeline Summary

Surgery: BEAR Implant ACL repair; begin prehab if not yet meeting Phase 0 criteria

Supervised PT begins: Within 3–5 days post-op

Weight bearing: PWB (up to 50% BW) with crutches Weeks 0–4; WBAT from Week 4 when criteria met

Crutch D/C: Week 4–7 when normal gait, no extensor lag, good quad control

Brace: Locked 0° WB Weeks 0–2; unlocked Week 4+ when criteria met; functional ACL brace from Week 6–14

ROM 0–90°: Weeks 0–4 (seated active ROM)

Full ROM: Weeks 4–7; equal to contralateral

Aqua jogging: Week 8+ (non-impact deep-water running)

Low-impact cardio: Phase 2–3 (Weeks 4–12); stationary bike, elliptical

Running (walk-jog): Week 12–20 — surgeon clearance + QI ≥80% + zero effusion + full ROM

Plyometrics (bilateral): Phase 5 (Weeks 20–30)

Cutting / pivoting drills: Phase 6 (Weeks 30–36) at 50–75% speed; full speed Phase 7

Return to sport: Week 36 minimum; 9–12 months recommended for cutting/pivoting sport

QI targets: 60–80% by Phase 3; $\geq 80\%$ for running; $\geq 90\%$ for RTS

Note: All phase progressions are criteria-based, not calendar-based. Minimum time thresholds must be met AND functional criteria satisfied. Do not advance based on time alone.

Surgeon Notes / Special Instructions: