

PHYSICAL THERAPY PROTOCOL

Achilles Tendon Repair

Acute Mid-Substance Rupture · Percutaneous or Open Repair

FOR THE PHYSICAL THERAPIST

Overview and Goals

This protocol governs rehabilitation following surgical repair of an acute mid-substance Achilles tendon rupture. It applies to both percutaneous/minimally invasive and open repair: functional outcomes and rerupture rates are equivalent between the two, and they follow the **same** rehabilitation structure. The only difference is more vigilant wound monitoring after open repair, noted where relevant.^{1,2,4}

The central evidence-based principle is that early weight-bearing combined with early ankle motion produces superior functional outcomes and satisfaction without increasing rerupture, compared with prolonged cast immobilization. The protocol protects the repair through a plantarflexed boot with heel wedges that are removed gradually, while progressively restoring motion, weight-bearing, and calf strength.^{7,8}

PROTECT THE REPAIR — NO DORSIFLEXION PAST NEUTRAL UNTIL WEEK 8–10

The repair is lengthened by dorsiflexion. Active plantarflexion is encouraged early, but passive or active dorsiflexion is limited to neutral (0°) until weeks 8–10, and stretching and eccentric loading wait until week 12. Pushing dorsiflexion or loading too early causes tendon elongation, which permanently weakens push-off strength.

OPEN REPAIR — WOUND-MONITORING MODIFICATION

Open repair carries a higher superficial infection rate (~6% vs. ~0.4% percutaneous). Inspect the incision at 48–72 hours and again at 10–14 days, avoid soaking the wound, and delay boot progression if wound concerns arise. Scar mobilization begins only once the incision is fully healed (typically week 3–4). Percutaneous repairs instead warrant sural-nerve monitoring — check for lateral-foot numbness at each visit (~3.4% transient neuropraxia).

Rehabilitation Phases

PHASE	BOOT / WEIGHT BEARING	ROM GOALS	EXERCISES	CRITERIA TO ADVANCE
PHASE 1 Weeks 0–2 <i>Maximum protection</i>	- Below-knee equinus cast or boot in 20–30° plantarflexion.^{5,9} - Non-weight-bearing for the first 2 weeks, with crutches.	- No active dorsiflexion. - No passive dorsiflexion beyond the cast/boot position. - Toe motion permitted.	Permitted: - Active toe flexion/extension - Quadriceps and gluteal isometrics - Hip and knee ROM (seated/supine) - Upper-body conditioning Strict restrictions: - No active plantarflexion or dorsiflexion - No walking without the boot - Elevate the limb when not ambulating	- Wound healing (inspect 10–14 days) - Pain controlled - No calf/DVT signs - Minimum 2 weeks elapsed
PHASE 2 Weeks 2–6 <i>Early protected motion</i>	- Transition to removable boot with 5 heel wedges (~30° equinus).^{8,10} - Progress to full weight-bearing in the	- Active plantarflexion: free/unrestricted.⁶ - Dorsiflexion limited to neutral (0°) — do not go past	ROM (begin week 2): - Active plantarflexion (gravity-eliminated → against gravity) - Dorsiflexion to neutral only - Seated ankle alphabet Strengthening:	- FWB in boot without crutches - Active PF restored - DF to neutral - Wound fully

PHASE	BOOT / WEIGHT BEARING	ROM GOALS	EXERCISES	CRITERIA TO ADVANCE
	boot without crutches by week 4. • Remove 1 wedge every 3–4 weeks (slowed-down schedule). ⁸	neutral. ^{5,6} • Gentle inversion/eversion in pain-free range.	• Isometric plantarflexion (submaximal, pain-free) • Bilateral seated heel raises (no resistance) from week 4 • Hip/quad/core proximal strengthening Gait: • Normalize gait in the boot; avoid antalgic pattern	healed • Minimum 6 weeks elapsed
PHASE 3 Weeks 6–12 <i>Progressive strengthening</i>	• Wean from boot into shoes with a 1/8–1/4" heel cushion at ~week 8. ⁵ • Continue heel cushion 4–8 weeks.	• Continue active plantarflexion through full range. • Begin gentle passive dorsiflexion past neutral at weeks 8–10, progressing gradually. ^{5,9} • No stretching or eccentric work until week 12.	Strengthening (cornerstone of this phase): • Bilateral concentric heel raises from week 6; progress bilateral → unilateral as strength permits. ⁹ • Theraband plantarflexion, inversion, eversion (light) Neuromuscular: • Single-leg balance: stable → unstable surface Aerobic: • Stationary bike (low resistance), pool walking/swimming once wound healed • Antigravity treadmill for gait and running prep	• Weaned into shoes • DF progressing past neutral • Bilateral heel raises without pain • Minimum 12 weeks elapsed
PHASE 4 Weeks 12–20 <i>Advanced strengthening & early return</i>	• Regular shoes. No restrictions.	• Full, symmetric ankle ROM. • Gentle gastrocnemius/solus stretching may begin at week 12.	Eccentric loading (begin week 12): • Bilateral eccentric heel drops (Alfredson) → single-leg eccentric loading Progressive strengthening: • Single-leg heel raises (progress reps and height) • Leg press, calf-press machine Plyometrics (bilateral → unilateral): • Mini-hops, jump rope (~week 14–16) • Agility ladder, lateral shuffles, cutting drills (~week 16–18) Running: • Jogging begins when a single-limb heel rise is achieved (mean ~12.6 weeks): antigravity/pool → flat-surface → interval, over 4–6 weeks. ^{14,16}	• Single-limb heel rise achieved • Symmetric ROM • Jogging without pain or antalgia • Minimum 20 weeks elapsed
PHASE 5 Weeks 20–28+ <i>Return to sport</i>	• No restrictions.	• Full, symmetric ROM.	Criteria-based sport progression: • Progress plyometrics and sport-specific drills • Sport-specific functional testing Target: • Sport initiation averages ~24 weeks; gated by heel-raise repetition criteria, not the calendar. ^{5,14}	• Meets RTS criteria (below) • ATRS ≥ 80 • Sport-specific testing passed • Dr. Roth's clearance

Procedure-Specific Considerations

Tendon Elongation — Why the Wedges Come Out Slowly

Tendon elongation is the central concern of Achilles rehabilitation: a lengthened tendon has a shorter working range and permanently weaker push-off. The soleus portion is already elongated substantially within the first week after surgery, before rehabilitation begins. The slowed-down wedge-removal schedule (one wedge every 3–4 weeks rather than every 2) reduces elongation and yields a better tendon resting angle, higher outcome scores, and more symmetric strength at 12 months — which is why it is the default here.^{8,22}

Percutaneous vs. Open — Same Rehab, Different Watch-Points

The rehabilitation timeline is identical for both approaches. Open repair warrants closer wound surveillance (higher superficial infection rate) and carries a higher risk of adhesion, so gentle scar mobilization once healed is useful. Percutaneous repair carries a small risk of transient sural-nerve neuropraxia — monitor for lateral-foot numbness, which usually resolves spontaneously.^{1,3}

Functional Milestones Over the Calendar

Two heel-rise milestones drive progression. The ability to perform a single-limb heel rise correlates with jogging readiness and is the gate to running. The ability to perform a full 20-repetition single-limb heel rise correlates with readiness for full sport. Progress patients on these functional achievements rather than fixed dates — the weeks listed are population means, not targets.¹⁶

Rerupture Window

Most reruptures occur in the first 3–6 months, and elevated BMI raises the risk. Patients should be reassured that early functional rehabilitation does not increase rerupture, while also being counseled to respect the dorsiflexion and loading restrictions during this vulnerable window.^{20,21}

Return-to-Sport Criteria

Return to sport is criteria-based, with heel-raise repetitions as the strongly recommended primary gate. Mean return across studies is ~20–24 weeks.^{5,14,17} All criteria below should be met before clearance.

Domain	Criterion
Heel-raise capacity	5 sets of 25 single-leg concentric heel raises (Saxena) — failure to meet this significantly delays safe return ¹⁷
Calf symmetry	Calf circumference within 1 cm of the contralateral side ¹⁷
Range of motion	Dorsiflexion and plantarflexion symmetric to the contralateral side ¹⁷
Functional	Pain-free hopping, jumping, and sport-specific movements; sport-specific testing passed ¹⁷
Patient-reported	ATRS $\geq$ 80/100 ¹⁷
Psychological	Readiness supported by validated measures (e.g., Ankle-GO composite at 6 months) ¹⁸
Clearance	Final clearance by Dr. Roth

References

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3. Sural Nerve Injury and Approach-Specific Complications After Achilles Repair.
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7. Early Weightbearing and Early Motion After Achilles Repair: Level I Evidence Synthesis.
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9. Functional Bracing and Equinus Positioning After Achilles Repair.

10. Heel-Wedge Boot Protocols and Neutral-Angle Progression.
11. DVT After Achilles Repair: Incidence, Risk Factors, and IPC Prophylaxis.
12. Immobilization-Associated VTE and Age Risk After Achilles Repair.
13. Intermittent Pneumatic Compression Under Orthosis Reduces DVT After Achilles Repair.
14. Return to Running and Sport After Achilles Repair: Timelines (mean 20.6 weeks).
15. Antigravity Treadmill and Progressive Running After Achilles Repair.
16. Single-Limb Heel-Rise Milestones Correlate With Jogging and Sport Readiness.
17. Saxena A, et al. Heel-Raise Repetition Criteria for Return to Activity After Achilles Repair.
18. Ankle-GO Composite Score Predicts Return to Same-Level Sport After Achilles Rupture.
19. Rerupture Rate and BMI Risk After Surgical Achilles Repair.
20. Timing of Reruptures After Achilles Repair (first 3–6 months).
21. Tendon Elongation After Achilles Repair: Soleus vs. Gastrocnemius Behavior.

Glossary

ATRS — Achilles Tendon Total Rupture Score; a patient-reported outcome measure (0–100).

ATRA — Achilles Tendon Resting Angle; a clinical measure of tendon length/elongation.

Concentric / eccentric — Muscle contraction while shortening (concentric, e.g., rising onto toes) vs. lengthening under load (eccentric, e.g., lowering the heel).

Dorsiflexion / plantarflexion — Ankle motion bringing the foot up toward the shin (dorsiflexion) or pointing it down (plantarflexion).

Equinus — A plantarflexed ankle position, maintained by heel wedges to protect the repair.

Heel rise — Rising onto the ball of the foot; single-limb heel-rise capacity gates jogging and sport return.

NWB / FWB / WBAT — Non-weight-bearing / full weight-bearing / weight-bearing as tolerated.



Kevin M. Roth, MD

Board-Certified Orthopaedic Surgeon · Subspecialty Certification in Sports Medicine

Dr. Roth completed his orthopaedic surgery residency at Harvard Medical School and his sports medicine fellowship at the Kerlan-Jobe Orthopaedic Clinic in Los Angeles. In practice since 2013, he specializes in advanced arthroscopic techniques and sports medicine procedures, and sees patients at Palo Alto Medical Foundation's Palo Alto and Dublin offices. He welcomes calls from physical therapists about his patients or this protocol.

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