# Rehabilitation Guidelines for Achilles Tendon Repair

## About the Achilles Tendon

The achilles tendon connects two muscles of your calf, your soleus and your gastrocnemius, to your calcaneus (heel bone). The main function of your calf complex and achilles tendon is to point (plantarflex) your foot and ankle for "push off" during walking, running, and jumping. The achilles tendon is the strongest and largest tendon in the body.

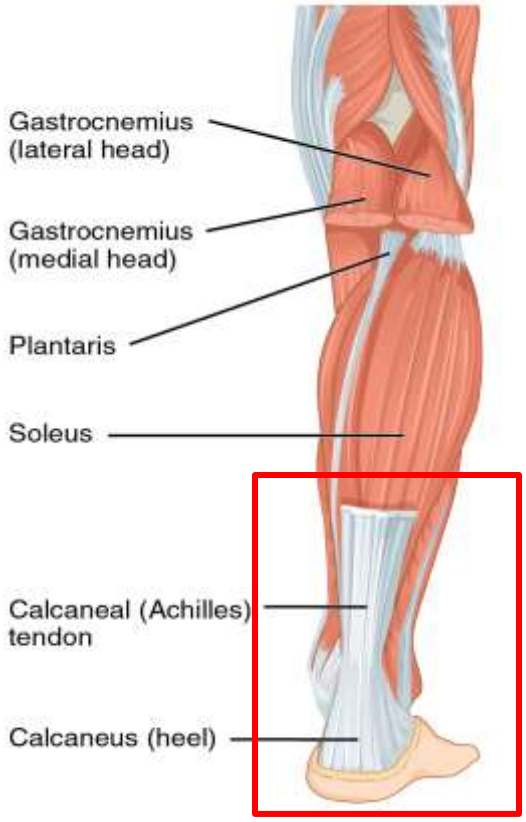


Image 1: Anatomy of the Achilles Tendon

## Mechanism of Injury

Achilles tendon ruptures often occur due to: 1) a sudden and excessive stretch / load, or 2) cumulative degenerative damage. These tendon ruptures can also occur as a consequence of systemic disease. The injury is often accompanied by an audible pop, followed by a limited ability to push-off the injured foot.

You can think of your achilles tendon as a rubber band. Much like a rubber band, your tendon has an inherent amount of elasticity to it. It constantly stretches and returns to its original shape as you use it. However, just like a rubber band your achilles tendon has a failure point. This failure point can be influenced by a variety of factors including your age, activity level and history, your general strength, your overall health and certain medications.

## Diagnosing an Achilles Tendon Rupture

Your healthcare provider will utilize several methods to diagnose a possible achilles tendon rupture. They will start by asking you a variety of questions about how your injury occurred and what symptoms you are experiencing. Your provider will also perform a thorough physical examination during which they will perform several physical tests to assess the state of your calf musculature and achilles tendon. If your healthcare provider suspects a rupture, they will likely request diagnostic imaging be taken of your foot and lower leg.

Relevant diagnostic imaging may include radiographic (X-Ray) images to ensure no bony injury is present. Ultrasound or Magnetic Resonance Imaging (MRI) may also be ordered to further assess the extent of your injury. Both MRI and Ultrasound have been shown to be highly accurate in diagnosing Achilles tendon rupture.

## Treatment Options for Achilles Tendon Tear

Your medical team will consult with you regarding two main treatment options for this injury, either non-operative treatment or surgical treatment. The decision for operative versus non-operative treatment will be based on: your age, your activity level, lifestyle goals and overall health history.

Non-operative treatment can be a successful option to return individuals to their prior level of function after achilles tendon rupture. Non-operative treatment involves rehabilitation that

follows a similar trajectory as that of rehabilitation following operative intervention.

If operative intervention is chosen, your surgeon may select one of several surgical methods to repair your achilles tendon. The goal of the operative approach is to identify the two separated ends of your tendon and use surgical sutures to approximate these ends and tie them together.

Image 2: Simplified depiction of surgery

## Rehabilitation Following Surgical Repair

Achilles tendon repair is generally performed within 2 weeks of the initial injury, and recovery is expected to take between **6-9 months**. Return to sport may take closer to **9-12 months** depending on injury severity and your desired level of sport. Returning to work will depend on how physically demanding your occupation is. If your occupation requires predominantly desk work, you may be able to return to work as early as 2 months. If your job demands more time on your feet, returning to work may take place closer to 3 months following surgery. However, if your job demands allow for use of a knee scooter, your return to work timeline may be accelerated.

Your rehabilitation will follow six general phases. In **Phase I**, the primary goal is to protect the surgical repair, prevent complications, and limit the amount of pain and swelling you experience. In this phase ,you will not be allowed to put weight on your injured limb.

In **Phase II**, the main goal is to provide early strengthening to your calf muscles and load tolerance for your tendon to best set you up for success later on. The second goal is to continue to protect the surgical repair. By the end of this phase, the goal is to have you fully walking utilizing a boot.

In Phase **III and IV**, the goals are to continue to increase the strength of your calf, and to improve your ease of performing daily activities by helping you return you to walking in your normal shoes.

In Phase **V and VI**, the goals are to continue to improve the strength and endurance of your calf muscles and entire lower body, to progress towards running and finally return you to participation in your sport or activities of choice.

Throughout rehabilitation, your physical therapist and surgeon will help guide you through this progression. Each phase of rehabilitation is geared with your specific goals in mind. Depending on your level of desired activity, you may not need to progress through all phases in order to reach your desired level of function.

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## Rehabilitation Guideline

Achilles tendon repairs are commonly performed following an acute or chronic tear of the achilles tendon. The protocol outlined in this document is designed for the rehabilitation of general achilles tendon repairs. When there are additional structures involved, or poor tissue quality, rehabilitation following surgery will need to be adjusted.

| **Phase I: Early Post-Op Protection Phase (0-2 weeks post-surgery)** | |
|---|---|
| **Appointments** | Surgeon / Physician Assistant follow-up: 2 week(s) post-op<br>Physical Therapy appointments: *not indicated* |
| **Precautions** | • Non-weight bearing using crutches or assistive device<br>• Splinted in 20 degrees Plantarflexion (PF) |
| **Rehabilitation Goals** | 1) Ensure closure and healing of surgical incision<br>2) Reduce edema<br>3) Educate on risk of DVT / LE thrombus prevention and pain control<br>4) Assistive device gait training |
| **Range of Motion** | • Relaxed / splinted foot and ankle<br>• No active or stretching into ankle PF/DF |
| **Therapeutic Interventions** ***(Examples, but not limited to…)*** | Strengthening: contralateral / non-operative limb and seated upper extremity strengthening only<br>Cardio: Upper Extremity Ergometer |
| **Criteria for Progression to Next Rehabilitation Phase** | ✓ Surgeon approval discharge from splint |
| **Special Considerations** | Outcome Measure: Achilles Tendon Rupture Score (ATRS) |

# Rehabilitation Guidelines for Achilles Tendon Repair

| Phase II: Protection with Early Loading (2-6 weeks post-surgery) | |
|---|---|
| **Appointments** | Physical Therapy appointments: (if indicated by surgeon) 1-2x / week |
| **Precautions** | Weightbearing:<br>**Weeks 2-4**<br>• Non-weight bearing in walking boot with full heel lift<br>**Weeks 4-6**<br>• Weight-bearing as tolerated (WBAT) in walking boot with full heel lift<br>Range of Motion:<br>• Active dorsiflexion (DF) to neutral (0º) only |
| **Rehabilitation Goals** | 1) Protect repair<br>2) Initiate early foot/ankle strengthening<br>3) DF PROM/AROM to 0º (with knee ext) |
| **Range of Motion** | Weeks 2-4<br>• PROM and AROM DF to neutral (0º) only<br>• PROM PF to 15º from neutral DF<br>Weeks 4-6<br>• AROM DF to neutral (0º) only<br>• AROM PF to 30º from neutral DF |
| **Therapeutic Interventions** *(Examples, but not limited to…)* | Weeks 2-4<br>• Gait training: non-weightbearing with assistive device<br>• Foot intrinsic strengthening<br>• Submaximal ankle isometrics in all planes: ≤ 0º ankle DF<br>• Open Kinetic Chain (OKC) strengthening for: quadriceps, hamstrings, glutes, & upper extremity<br>• Cardiovascular: Upper Extremity Ergometer<br>Weeks 4-6<br>• Gait training WBAT in boot with: 2 crutches → full weight bearing (FWB) in boot<br>• Progressive force ankle isometrics (up to 50% MVIC) in all planes: ≤ 0º ankle DF<br>• Continued OKC lower extremity strengthening<br>• Lower extremity proprioception drills within WBAT precautions<br>• Cardiovascular: Upper Extremity Ergometer, bike with boot when medically cleared |
| **Criteria for Progression to Next Rehabilitation Phase** | ✓ Full weight bearing in controlled ankle motion (CAM) boot<br>✓ 0º ankle DF (with knee extension)<br>✓ No Reactive swelling or pain with exercise progression |
| **Special Considerations** | Outcome Measure: Achilles Tendon Rupture Score (ATRS) |

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# Rehabilitation Guidelines for Achilles Tendon Repair

| Phase III: Initial Strengthening (6-12 weeks post-surgery) | |
|---|---|
| **Appointments** | Surgeon / Physician Assistant follow-up: 12 week(s) post-op<br>Physical Therapy appointments: 1-2x / week |
| **Precautions** | Avoid aggressive stretching into dorsiflexion<br>• Monitor achilles tendon resting angle (ATRA) for signs of tendon elongation |
| **Rehabilitation Goals** | 1) Wean from boot and heel lifts (ideally by post-op week 8)<br>○ Normalize gait mechanics on level surfaces<br>2) Isometric ankle PF strength ≥60% of uninvolved / non-surgical ankle PF<br>3) Ankle DF to 10º (with knee extension) |
| **Range of Motion** | PROM / AROM:<br>• Full plantarflexion, inversion, eversion<br>• Gradual progression of DF (avoid aggressive/passive stretching) – bias AROM vs PROM |
| **Therapeutic Interventions** ***(Examples, but not limited to…)*** | Gait training: * crutches as needed to maintain normal gait<br>Week 6-8: begin removal of heel lift layers (1 layer per week if tolerated)<br>Week 8: wean from walking boot (1 hour progression each day)<br>Mobilizations:<br>• Soft tissue and scar mobilization if wound is fully healed<br>• Joint mobilizations as indicated<br>Strengthening:<br>• Progressive resistance into ankle DF/eversion<br>• Plantarflexion progression – starting in neutral ankle DF (DL in each position prior to SL)<br>○ Banded PF (knee bent -> knee straight)<br>○ Seated heel raise<br>○ Use of shuttle / leg press<br>○ Standing heel raise progression<br>• Balance/proprioception progression<br>○ Pronation/supination control<br>• Lower extremity squat and hip hinge progressions<br>○ Considerations for achilles loading rate<br>• Continue open kinetic chain lower extremity load<br>Cardio:<br>• Upright bike in shoe (low resistance)<br>• Seated/kneeling medicine ball circuits<br>**Can consider aquatic therapy for gait and strength training if wound is fully healed* |
| **Criteria for Discharge from Walking Boot** | ✓ Physician / physical therapist clearance<br>✓ 0-5º ankle DF<br>✓ Non-antalgic, pain-free gait |
| **Criteria for Progression to Next Rehabilitation Phase** | ✓ Full weight bearing in shoe with no heel lift<br>✓ 5-10º ankle DF (with knee extension)<br>✓ Initiation of standing heel raise progression<br>✓ No reactive pain or swelling |
| **Special Considerations** | Closed chain achilles loading rate progression (via Baxter et al, 2021)<br>Squat → Step up (leading leg) → Lunge (leading leg) → Low Step Up (trailing leg) → Low Step down (trailing leg) → High Step Down (trailing leg) → Lunge (trailing leg) → Low Step Down (leading leg) → High Step Up (trailing leg) → High Step Down (leading leg)<br>Heel raise progressions: considerations for 2:2 → 2:1 → 1:1 (bilateral -> eccentric -> unilateral) |

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# Rehabilitation Guidelines for Achilles Tendon Repair

| Phase IV: Advanced Strengthening (12-16 weeks post-surgery ) | |
|---|---|
| **Appointments** | Physical Therapy appointments: 1-2x / week |
| **Rehabilitation Goals** | 1) Achieve full ankle ROM in all planes<br>2) Normalize gait mechanics on all surfaces, including stairs<br>3) Isometric ankle PF strength ≥65% of uninvolved / non-surgical ankle PF<br>4) Ankle DF to ≥ 10º (with knee extension) |
| **Precautions** | Follow soreness rules when progressing strength, power, and impact tasks as indicated |
| **Range of Motion** | • Improve ROM in all planes to symmetry<br>• Avoid aggressive / passive stretching into ankle DF<br>Consider self-soft tissue mobilizations for calf muscle complex mobility deficits |
| **Therapeutic Interventions** ***(Examples, but not limited to…)*** | Strengthening:<br>• Standing heel raise progression<br>○ DL heel raise<br>○ 2 up : 1 down heel raise<br>○ Band/cable assisted SL heel raise<br>• Seated heel raises (soleus bias)<br>• End range heel raise progressions<br>○ Assisted end-range isometric holds (DL assisted, band-assisted)<br>○ Leg press/shuttle end-range pulses<br>Closed chain achilles loading rate progression (see reference above)<br>Balance/Proprioceptive Training:<br>• Foot/ankle pronation and supination control<br>• Introduce reaction time and dual-tasking as indicated<br>Cardio:<br>• Upright bike in shoe (progressive speed & resistance)<br>• Treadmill walking intervals (progressive incline and speed)<br>• Seated/kneeling medicine ball circuits<br>Impact progressions: *must meet criteria outlined below<br>• DL shuttle plyometric progressions<br>• Continued progression for balance and proprioception |
| **Criteria for Progression to Next Rehabilitation Phase** | ✓ Normalized gait mechanics with no assistive device, all surfaces<br>✓ Ankle ROM within 80% contralateral/non-operative ankle (except ankle DF)<br>✓ 10 SL heel raises with ≥60% heel height and repetition symmetry |
| **Special Considerations** | Criteria to initiate impact training<br>• At least 16 weeks post-op (met criteria for transition to next rehab phase above)<br>• See **Appendix B** |

# Rehabilitation Guidelines for Achilles Tendon Repair

| Phase V: Elastic Strengthening (16-24 weeks post-surgery) | |
|---|---|
| **Appointments** | Physical Therapy appointments: 1x / 1-2 week(s) |
| **Rehabilitation Goals** | 1) Continued improvement in endurance/strength/power<br>✓ Especially in end range PF<br>2) Plyometric progressions<br>3) Introduction of jogging / running |
| **Precautions** | Follow soreness rules when progressing strength, power, and initiating return to run |
| **Range of Motion** | • Improve ROM in all planes to symmetry<br>• Avoid aggressive / passive stretching into ankle DF<br>Continue self-soft tissue mobilizations for calf muscle complex mobility deficits |
| **Therapeutic Interventions** | <u>Strengthening:</u><br>• Seated and standing heel raise progressions<br>○ DL and SL heel raise for speed<br>○ Band/cable assisted SL heel raises for end-range<br>○ Time-under-tension end-range holds<br>• Increased load, volume and power focus with open and closed-kinetic chain LE tasks<br><u>Balance/Proprioceptive Training:</u><br>• Foot/ankle pronation and supination control<br>• Progress activity/sport-specific reaction time and dual-tasking as indicated<br><u>Cardio:</u><br>• Upright bike in shoe (progressive speed & resistance)<br>• Treadmill walking intervals (progressive incline and speed)<br>• Standing medicine ball circuits<br><u>Impact progressions:</u><br>• Plyometric progression (example via Baxter 2021)<br>○ BIL rebound heel raise → SL rebound heel raise → 2:2 CMJ → Drop Jump → BIL hopping → SL hopping |
| **Criteria for Progression to Next Rehabilitation Phase** | ✓ Normalized jogging gait mechanics without reactive pain/swelling<br>✓ Ankle ROM within 90% contralateral/non-operative ankle (except ankle DF)<br>✓ SL heel raises with ≥70% heel height and repetition symmetry |
| **Special Considerations** | <u>Return to jogging/running criteria:</u><br>✓ At least 20 weeks post-op (met criteria for transition to next rehab phase above)<br>✓ Calf circumference within 10 mm of contralateral limb, measured 10 cm distal to tibial tubercle<br>✓ Able to tolerate fast walking for 10 minutes without reactive pain or swelling<br>✓ 2 legged hop x30 seconds without reactive symptoms<br>✓ See **Appendix B** |

# Rehabilitation Guidelines for Achilles Tendon Repair

| Phase VI: Return to Sport (24+ weeks post-surgery) | |
|---|---|
| **Appointments** | Physical Therapy appointments: 1x / 2-3 week(s) |
| **Rehabilitation Goals** | 1) Restoration of full LE strength, power, and endurance<br>2) Return to sport participation |
| **Therapeutic Exercises** | • Continued progression for gastroc/soleus strength, endurance, power and rate of force development<br>• Continued plyometric progressions<br>• Challenge agility and change of direction drills as relevant to sport and position |
| **Criteria for Progression to Return to Sport** | Physician clearance<br>Mobility<br>• ≥90% symmetry ROM in all ankle planes (except DF ≥80%)<br><br>Strength, Power, & Endurance<br>• ≥80% symmetrical SL heel raises for height and repetitions<br>Patient Reported Outcome Measures<br>• Achilles Tendon Rupture Score ≥90/100<br>Other<br>• See **Appendix B**<br>• No reactive pain or swelling with running progression<br>• 5 mm or less difference in calf circumference, measured 10 cm distal to tibial tubercle |

***Important to continue participation in ongoing preventative strength, power and motor control exercises at return to sport**

*All physical therapy appointment frequencies are recommendations only. Your physical therapy provider will work with you to select an appointment frequency that best fits your individual needs.*

***Developed by**: Quinn Garner PT, DPT, SCS & Dr. Jason Lin*
***Edited/reviewed by**: Shanon Williams PT, DPT, SCS; Shawn Cole PT, DPT, SCS*
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