

# Rehabilitation Guidelines for Achilles Tendon Rupture Repair

## About the Achilles Tendon

The Achilles tendon connects two muscles of your calf, your soleus and gastrocnemius, to your heel. It's main function is to point (plantarflex) your foot and ankle and allow you to "push off" during walking, running, and jumping. The Achilles tendon is the strongest and largest tendon in the body.

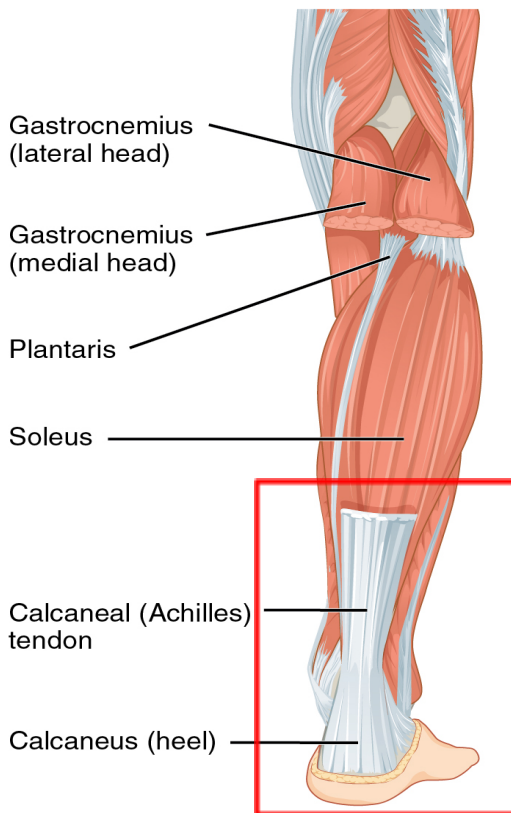


Image 1: Anatomy of the Achilles Tendon

## Mechanism of Injury

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 environmental factors, your age, strength, injury history, certain types of

medication, your activity level and regularity of activity, and your overall physical health.

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

## 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 the symptoms you are experiencing. Following this, they will perform a thorough physical examination by looking at your foot, calf, and the rest of your body. They may perform several physical tests to look at 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.

Your healthcare provider may first want to assess your foot and leg utilizing radiographic (x-ray) images to ensure no bony injury is present. They may request Ultrasound or Magnetic Resonance Imaging (MRI) to further assess the extent of your injury. Both MRI and Ultrasound have been shown to be highly accurate in diagnosing Achilles tendon rupture.

## Achilles Tendon Tear Treatment Options

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

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.

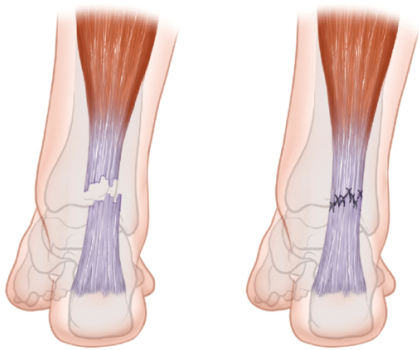


Image 2: Simplified depiction of surgery

### 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. If your occupation requires predominantly desk work, you may be able to return to work as early as 2-3 weeks. If your job demands more time on your feet, returning to work may take place closer to 3 months following surgery. 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 goal is to provide early strengthening to your calf and tendon in order to best set you up for success later on, as well as 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 goal is to continue to increase the strength of your calf and return you to walking in your normal shoes.

In Phase V and VI, the goal is to normalize the strength of your calf and entire lower body and progress towards running and finally return to 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.

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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)	
<b>Appointments</b>	No Physical Therapy appointments indicated Surgeon Follow-up at 2 weeks
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Ensure closure and healing of surgical incision</li> <li>• Protect repair</li> <li>• Awareness of signs/symptoms of DVT and infection</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>• Non-weight bearing</li> <li>• Splinted in 20 degrees Plantarflexion (PF)</li> </ul>
<b>Range of Motion (ROM)</b>	<ul style="list-style-type: none"> <li>• Relaxed foot and ankle</li> <li>• No active PF or DF</li> </ul>
<b>Criteria for Progression to Next Rehabilitation Phase</b>	<ul style="list-style-type: none"> <li>• Surgeon approval discharge from splint</li> </ul>
<b>Special Considerations</b>	Outcome Measure: Achilles Tendon Rupture Score (ATRS)

Phase II: Protection with Early Loading (2-6 weeks post-surgery)	
<b>Appointments</b>	No Physical Therapy appointments unless otherwise recommended by surgeon
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>• Protect repair</li> <li>• Initiate early foot/ankle strengthening</li> <li>• DF PROM/AROM to 0 degrees (with knee extension)</li> </ul>
<b>Precautions</b>	<p><u>Weeks 2-4</u></p> <ul style="list-style-type: none"> <li>• Non-Weight Bearing (NWB) in CAM boot with full onion skin heel lift</li> <li>• Active dorsiflexion (DF) to neutral only</li> </ul> <p><u>Weeks 4-6</u></p> <ul style="list-style-type: none"> <li>• Weight Bearing As Tolerated (WBAT) in boot with full heel wedges</li> </ul>
<b>Range of Motion (ROM)</b>	<p><u>Weeks 2-4</u></p> <ul style="list-style-type: none"> <li>• Active dorsiflexion to neutral only</li> <li>• Passive plantarflexion</li> </ul> <p><u>Weeks 4-6</u></p> <ul style="list-style-type: none"> <li>• Active dorsiflexion to neutral only</li> <li>• AROM to 30 degrees PF allowed from neutral DF</li> </ul>
<b>Therapeutic Interventions</b>	<p><u>Weeks 2-4</u></p> <ul style="list-style-type: none"> <li>• Foot intrinsic strengthening</li> <li>• Submaximal ankle isometrics in all planes, below neutral DF</li> <li>• Open Kinetic Chain (OKC) strengthening for: Quads, hamstrings, glutes, upper extremity</li> </ul>

	<ul style="list-style-type: none"> <li>Cardiovascular: Upper Extremity Ergometer, bike with boot when medically cleared</li> </ul> <p><u>Weeks 4-6</u></p> <ul style="list-style-type: none"> <li>Gait training WBAT in boot with 2 crutches → single crutch -&gt; full weight bearing (FWB) in boot</li> <li>AROM in all planes, DF below neutral</li> <li>Isometrics in all planes, below neutral DF</li> <li>Isometric Electrical Stimulation (NMES) in standing, neutral DF</li> <li>Seated heel raise from neutral DF starting weeks 5-6</li> <li>Continued OKC lower extremity strengthening</li> <li>Cardiovascular: Upper Extremity Ergometer, bike with boot when medically cleared</li> </ul>
<b>Criteria for Progression to Next Rehabilitation Phase</b>	<ul style="list-style-type: none"> <li>Full weight bearing in controlled ankle motion (CAM) boot</li> <li>0 Degrees Dorsiflexion with knee straight</li> <li>No Reactive swelling or pain with exercise progression</li> </ul>
<b>Special Considerations</b>	Outcome Measure: Achilles Tendon Rupture Score (ATRS)

### Phase III: 6-12 weeks post-surgery - Initial Strengthening

<b>Appointments</b>	2x / Week
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>Wean from boot and heel lifts, ideally by week 8</li> <li>Normalize gait mechanics on level surfaces</li> <li>≥5 single leg heel raises</li> <li>Increase ankle ROM in all planes, DF to 15 degrees</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>Begin removal of heel lift layers (1 per week)</li> <li>Avoid stretching into dorsiflexion</li> <li>Monitor Achilles Tendon Resting Angle for signs of tendon elongation</li> </ul>
<b>Range of Motion</b>	<ul style="list-style-type: none"> <li>Full plantarflexion, inversion, eversion</li> <li>Gradual progression of dorsiflexion while avoiding aggressive stretching</li> </ul>
<b>Therapeutic Interventions</b>	<ul style="list-style-type: none"> <li>Inversion/eversion/dorsiflexion progressive resistance exercise</li> <li>Plantarflexion progression <ul style="list-style-type: none"> <li>Banded PF (knee bent progressing to straight)</li> <li>Seated heel raise</li> <li>Use of Shuttle / leg Press</li> <li>Standing heel raise Progression</li> </ul> </li> <li>Balance/proprioception progression</li> <li>Closed Chain lower extremity strength progression as tolerated with Achilles loading rate consideration</li> <li>Open Chain Lower Extremity strength progression to tolerance</li> <li>Bike in shoe, low resistance</li> <li>Soft tissue and scar mobilization if wound is fully healed</li> <li>Joint mobilizations as indicated</li> <li>Pool therapy if wound is fully healed</li> </ul>
<b>Criteria for Discontinuation of Boot</b>	<ul style="list-style-type: none"> <li>0 Degrees Dorsiflexion</li> <li>Non-antalgic, pain-free gait</li> </ul>

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	<ul style="list-style-type: none"> <li>• Surgeon clearance</li> </ul>
<b>Criteria for Progression to Next Rehabilitation Phase</b>	<ul style="list-style-type: none"> <li>• Full weight bearing in shoe with no heel lift</li> <li>• Full dorsiflexion with a bent knee</li> <li>• Initiation of standing heel raise progression</li> <li>• No reactive pain or swelling</li> </ul>
<b>Special Considerations</b>	<ul style="list-style-type: none"> <li>• Wean from boot with use of: <ul style="list-style-type: none"> <li>○ Heel wedges in normal shoe as needed to maintain normal gait</li> <li>○ Crutches as needed to maintain normal gait</li> <li>○ Gradual reduction of heel wedges/crutch use as gait normalizes</li> </ul> </li> <li>• Heel raise progressions <ul style="list-style-type: none"> <li>○ Starting from neutral dorsiflexion</li> <li>○ Gravity eliminated to gravity resisted</li> <li>○ 2:2 → 2:1 → 1:1 (bilateral -&gt; eccentric -&gt; unilateral)</li> </ul> </li> <li>• Closed Chain Achilles loading rate progression (via Baxter et al, 2021) <ul style="list-style-type: none"> <li>○ Squat → Lunge (leading leg) → Step up (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)</li> </ul> </li> </ul>

<b>Phase IV: 12-16 weeks post-surgery - Advanced Strengthening</b>	
<b>Appointments</b>	1x / Week
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>• Achieve normal ROM in all planes</li> <li>• Normalize gait mechanics on all surfaces, including stairs</li> <li>• 25 single leg heel raises with <math>\geq 80\%</math> heel height symmetry</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>• Follow soreness rules when progressing strength, power, and initiating return to run</li> </ul>
<b>Range of Motion</b>	<ul style="list-style-type: none"> <li>• Improve ROM in all planes to symmetry</li> <li>• Avoid stretching into dorsiflexion once symmetrical and meets functional sporting demands</li> </ul>
<b>Therapeutic Interventions</b>	<ul style="list-style-type: none"> <li>• Standing heel raise progression</li> <li>• End range heel raises</li> <li>• Soleus raises</li> <li>• Shuttle plyometric progression</li> <li>• Anterior step down / heel taps</li> <li>• Continued progression for closed and open chain lower extremity strength</li> <li>• Continued progression for balance and proprioception</li> <li>• Non-impact cardiovascular training</li> </ul>
<b>Criteria for Progression to Next Rehabilitation Phase</b>	<ul style="list-style-type: none"> <li>• 25 single leg heel raises with <math>\geq 80\%</math> heel height symmetry</li> <li>• Ankle ROM within 80% contralateral limb</li> <li>• Normalized gait mechanics with no assistive device, all surfaces</li> </ul>
<b>Special Considerations</b>	<p><u>Criteria to initiate plyometric progression</u></p> <ul style="list-style-type: none"> <li>• No reactive pain/swelling with strengthening exercises</li> <li>• 25 single leg heel raises with <math>\geq 80\%</math> heel height symmetry</li> <li>• Ankle ROM within 80% contralateral limb</li> </ul>





	<ul style="list-style-type: none"><li>• <math>\geq 80\%</math> dorsiflexion, quadriceps and hamstring LSI</li><li>• Normalized gait mechanics with no assistive device, all surfaces</li></ul>
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Phase V: 16-24 weeks post-surgery - Elastic Strengthening	
<b>Appointments</b>	1x / Every Two Weeks
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"><li>• Continued improvement in endurance/strength/power, especially in end range PF</li><li>• Plyometric progression</li><li>• Return to running</li></ul>
<b>Precautions</b>	<ul style="list-style-type: none"><li>• Follow soreness rules when progressing strength, power, and initiating return to run</li></ul>
<b>Range of Motion</b>	<ul style="list-style-type: none"><li>• Improve ROM in all planes to symmetry</li><li>• Avoid stretching into DF once symmetrical and meets functional sporting demands</li></ul>
<b>Therapeutic Interventions</b>	<ul style="list-style-type: none"><li>• Continued strengthening/endurance of gastroc/soleus</li><li>• Plyometric progression (example via Baxter 2021)<ul style="list-style-type: none"><li>◦ BIL rebound heel Raise <math>\rightarrow</math> SL rebound heel raise <math>\rightarrow</math> 2:2 CMJ <math>\rightarrow</math> Drop Jump <math>\rightarrow</math> BIL hopping <math>\rightarrow</math> SL hopping</li></ul></li><li>• Continued progression for closed and open chain lower extremity strength</li><li>• Continued progression for balance and proprioception</li></ul>
<b>Criteria for Progression to Next Rehabilitation Phase</b>	<ul style="list-style-type: none"><li>• Return to jogging with no reactive symptoms</li><li>• <math>\geq 80\%</math> Symmetrical number of SL heel raises with at least 80% heel height symmetry</li><li>• <math>\geq 90\%</math> ankle ROM in all planes</li></ul>
<b>Special Considerations</b>	<p><u>Return to run criteria</u></p> <ul style="list-style-type: none"><li>• <math>\geq 80\%</math> symmetrical number of SL heel raises with at least 80% heel height symmetry</li><li>• Calf circumference within 10 mm of contralateral limb, measured 10 cm distal to tibial tubercle</li><li>• Able to tolerate fast walking for 10 minutes without reactive pain or swelling</li><li>• 2 legged hop x30 seconds without reactive symptoms</li><li>• Adequate jogging mechanics</li></ul>



## Phase VI: 24+ weeks post-surgery - Return to Sport

<b>Appointments</b>	1x / Every Three Weeks
<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"><li>● Restoration of full strength, power, and endurance</li><li>● Return to sport</li></ul>
<b>Therapeutic Exercises</b>	<ul style="list-style-type: none"><li>● Continued progression for gastroc/soleus strength and power</li><li>● Continued plyometric progression</li><li>● Agility and change of direction</li><li>● Sport specific drills</li></ul>
<b>Criteria for Progression to Return to Sport</b>	<p><u>Physician clearance</u></p> <p><u>Mobility</u></p> <ul style="list-style-type: none"><li>● <math>\geq 90\%</math> symmetry ROM in all ankle planes</li></ul> <p><u>Strength, Power, and Endurance</u></p> <ul style="list-style-type: none"><li>● <math>\geq 90\%</math> symmetrical number of SL heel raises with <math>&gt;80\%</math> heel height</li><li>● <math>\geq 90\%</math> soleus, quadriceps, hamstring, hip abduction strength LSI</li><li>● <math>\geq 90\%</math> symmetry with hop testing</li></ul> <p><u>Neuromuscular Control</u></p> <ul style="list-style-type: none"><li>● <math>\geq 90\%</math> symmetry with Y-Balance testing</li></ul> <p><u>Patient Reported Outcome Measures</u></p> <ul style="list-style-type: none"><li>● Achilles Tendon Rupture Score <math>\geq 90/100</math></li></ul> <p><u>Other</u></p> <ul style="list-style-type: none"><li>● No reactive pain with running progression</li><li>● 5 mm or less difference in calf circumference, measured 10 cm distal to tibial tubercle</li></ul>