

## Pediatric Rehabilitation Protocol For Calcaneal Apophysitis (Sever's Disease)

This protocol is intended to guide clinicians through the post-operative course for Calcaneal Apophysitis (Sever's Disease). This protocol is time based (dependent on tissue healing) as well as criterion based. Specific intervention should be based on the needs of the individual and should consider exam findings and clinical decision making. The timeframes for expected outcomes contained within this guideline may vary based on preference, additional procedures performed, and/or complications. If a clinician requires assistance in the progression of a patient, they should consult with the referring physician.

The interventions included within this protocol are not intended to be an inclusive list of exercises. Therapeutic interventions should be included and modified based on the progress of the patient and under the discretion of the clinician.

### PHASE I: ACUTE PHASE (0-2 WEEKS AFTER INJURY)

<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>• Reduce pain and swelling</li> <li>• Minimize the impact on daily activities</li> <li>• Maintain pain-free ankle mobility</li> <li>• Maintain hip strength</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>• Avoid weight bearing activities that trigger pain</li> <li>• Utilize an assistive or immobilization device to offload the lower extremity as needed</li> </ul>
<b>Interventions</b>	<p><i>Activity modification</i></p> <ul style="list-style-type: none"> <li>• Avoid aggravating activities</li> </ul> <p><i>Pain management</i></p> <ul style="list-style-type: none"> <li>• Cryotherapy</li> <li>• Heel cup, heel cushion or heel lift</li> <li>• Taping method</li> </ul> <p><i>Manual therapy</i></p> <ul style="list-style-type: none"> <li>• Mobilization of talocrural, subtalar, midtarsal, and tibio-fibular joints</li> <li>• Soft tissue mobilization/myofascial release of gastrocnemius/soleus</li> </ul> <p><i>Range of motion/Mobility</i></p> <ul style="list-style-type: none"> <li>• Initiate pain-free ankle AROM             <ul style="list-style-type: none"> <li>○ <a href="#">Ankle pumps</a></li> <li>○ <a href="#">Ankle inversion</a></li> <li>○ <a href="#">Ankle eversion</a></li> <li>○ <a href="#">Ankle circles</a></li> <li>○ <a href="#">Ankle alphabet</a></li> </ul> </li> </ul> <p><i>Stretching</i></p> <ul style="list-style-type: none"> <li>• Non-weight bearing             <ul style="list-style-type: none"> <li>○ <a href="#">Gastrocnemius stretch</a></li> <li>○ <a href="#">Soleus stretch</a></li> <li>○ <a href="#">Plantar fascia stretch</a></li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>• Gentle stretching of proximal muscle groups as indicated <ul style="list-style-type: none"> <li>○ <a href="#">Prone quad stretch</a></li> <li>○ <a href="#">Supine hamstrings stretch</a></li> <li>○ <a href="#">Kneeling hip flexor stretch</a></li> <li>○ <a href="#">Piriformis stretch</a></li> </ul> </li> </ul> <p><i>Strengthening</i></p> <ul style="list-style-type: none"> <li>• Foot intrinsic muscle recruitment <ul style="list-style-type: none"> <li>○ <a href="#">Towel crunches</a></li> <li>○ <a href="#">Seated foot doming</a></li> </ul> </li> <li>• Non-weight bearing hip strengthening <ul style="list-style-type: none"> <li>○ <a href="#">SLR flexion</a></li> <li>○ <a href="#">SLR abduction</a></li> <li>○ <a href="#">SLR extension</a></li> <li>○ <a href="#">Sidelying clamshells</a></li> <li>○ <a href="#">Sidelying hydrants</a></li> <li>○ <a href="#">Bridging</a></li> </ul> </li> </ul> <p><i>Cardio</i></p> <ul style="list-style-type: none"> <li>• Upper body ergometer or upright stationary bicycle</li> </ul>
<b>Criteria to Progress</b>	<ul style="list-style-type: none"> <li>• Pain should be significantly reduced or absent</li> <li>• Ability to perform daily activities without increased pain</li> </ul>

### **PHASE II: SUBACUTE PHASE (3-6 WEEKS AFTER INJURY)**

<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>• Restore full ankle and foot mobility</li> <li>• Begin ankle strengthening without pain</li> <li>• Begin weight bearing exercise</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>• Monitor for any signs of recurring pain during exercises</li> <li>• Avoid impact activities</li> </ul>
<b>Interventions</b> <i>*Continue with Phase I interventions</i>	<p><i>Supportive footwear</i></p> <ul style="list-style-type: none"> <li>• Ensure proper cushioning and support of the heel</li> <li>• Orthotics as needed or prescribed</li> <li>• Sneakers with a rocker heel</li> </ul> <p><i>Stretching</i></p> <ul style="list-style-type: none"> <li>• Initiate in weight bearing <ul style="list-style-type: none"> <li>○ <a href="#">Gastrocnemius stretch</a></li> <li>○ <a href="#">Soleus stretch</a></li> <li>○ <a href="#">Plantar fascia stretch</a></li> </ul> </li> </ul> <p><i>Strengthening</i></p> <ul style="list-style-type: none"> <li>• <a href="#">Ankle 4-way with resistance band</a></li> <li>• <a href="#">Seated bilateral heel raises</a> progressing to <a href="#">standing bilateral heel raises</a> with increasing body weight <ul style="list-style-type: none"> <li>○ If calf raises in weight bearing are painful, can initiate them in an elevated heel position utilizing a heel wedge and progress to neutral as tolerated</li> </ul> </li> <li>• <a href="#">Standing hip abduction with resistance band</a></li> <li>• <a href="#">Standing hip extension with resistance band</a></li> <li>• <a href="#">Wall sits with resistance band</a></li> </ul> <p><i>Cardio</i></p> <ul style="list-style-type: none"> <li>• Upright stationary bicycle</li> </ul>
<b>Criteria to Progress</b>	<ul style="list-style-type: none"> <li>• Full, pain-free range of motion in the foot and ankle</li> <li>• Ability to perform stretching and strengthening exercises without pain</li> <li>• Normalized gait pattern</li> </ul>

### PHASE III: STRENGTHENING PHASE (7-12 WEEKS AFTER INJURY)

<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>Strengthen the muscles of the foot and lower extremity</li> <li>Enhance endurance of the muscles of the foot and lower extremity</li> <li>Increase pain-free load capacity of the Achilles</li> <li>Promote proper movement patterns</li> </ul>
<b>Precautions</b>	<ul style="list-style-type: none"> <li>Avoid painful activities</li> <li>Continue to avoid impact activities</li> </ul>
<b>Additional Interventions</b> <i>*Continue with Phase I-II Interventions</i>	<p><i>Flexibility</i></p> <ul style="list-style-type: none"> <li>Maintain stretching routine focused on gastroc, soleus and plantar fascia</li> </ul> <p><i>Strengthening</i></p> <ul style="list-style-type: none"> <li>Progression of Achilles loading with increased dorsiflexion once calf muscle length normalized and patient is pain-free             <ul style="list-style-type: none"> <li><a href="#">Bilateral straight knee heel raises</a> and <a href="#">bent knee heel raises off step</a> <ul style="list-style-type: none"> <li>If able to perform bilateral standing heel raises with 75% of body weight through the full range of involved limb, progress to <a href="#">eccentric calf raises</a> (bilateral raises, unilateral lowering on involved) followed by progression to <a href="#">unilateral heel raises</a>.</li> </ul> </li> <li><a href="#">Bilateral squats</a> progressing to single leg</li> <li><a href="#">Bilateral deadlifts</a> progressing to single leg</li> <li><a href="#">Step ups</a></li> <li><a href="#">Step downs</a></li> <li><a href="#">Lunges</a></li> <li><a href="#">Side steps with resistance band</a></li> <li><a href="#">Monster walks with resistance band</a></li> <li>Gym equipment: <a href="#">hamstring curl machine</a>, <a href="#">leg extension machine</a>, <a href="#">leg press machine</a></li> </ul> </li> </ul> <p><i>Balance/Proprioception</i></p> <ul style="list-style-type: none"> <li><a href="#">Double limb standing balance utilizing uneven surface</a> (wobble board)</li> <li><a href="#">Single limb balance</a> progressing to uneven surface including perturbation training</li> </ul> <p><i>Plyometrics</i></p> <ul style="list-style-type: none"> <li><i>Initiate Beginner level plyometrics</i> <ul style="list-style-type: none"> <li>Once able to perform 3 sets of 15 of bilateral standing heel-raises with equal weight bearing progress to <a href="#">bilateral rebounding heel raises</a>.</li> <li>Once able to perform 3 sets of 15 unilateral heel raises progress to <a href="#">rebounding unilateral heel raises</a>.</li> <li>Once able to demonstrate good performance/tolerance with rebounding heel raises then initiate <a href="#">bilateral hopping</a> sequence (in place, forward/back, lateral) and then progress to <a href="#">unilateral hopping</a> sequence able</li> </ul> </li> </ul> <p><i>Cardio</i></p> <ul style="list-style-type: none"> <li>Cycling or elliptical</li> </ul>
<b>Criteria to Progress</b>	<ul style="list-style-type: none"> <li>Able to complete WB strength routine pain free</li> <li>Able to perform 25 single leg heel raises without pain</li> <li>80% LSI of quad, hamstring, and gluteus medius strength with HDD</li> <li>No swelling/pain with 30 minutes of fast-paced walking</li> </ul>

### PHASE IV: RETURN TO RUNNING/SPORT (3-5 MONTHS AFTER INJURY)

<b>Rehabilitation Goals</b>	<ul style="list-style-type: none"> <li>Continue strengthening and proprioceptive exercises</li> <li>Initiate sport specific training program</li> <li>Symmetrical performance with sport specific drills</li> <li>Initiate return to ground running program</li> <li>Maintain strength and flexibility without recurrent symptoms</li> </ul>
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<b>Precautions</b>	<ul style="list-style-type: none"> <li>No pain during impact activities</li> </ul>
<b>Additional Intervention</b> <i>*Continue with Phase I-III interventions</i>	<p><i>Cardio</i></p> <ul style="list-style-type: none"> <li>Interval running program (<a href="#">return to running program</a>)</li> </ul> <p><i>Plyometrics/Agility</i></p> <ul style="list-style-type: none"> <li>Criteria to progress to an <a href="#">agility and plyometrics program</a>: <ul style="list-style-type: none"> <li>Good tolerance/performance of beginner level plyometrics in previous phase</li> <li>Completion of Phase 1 return to running program with good tolerance</li> </ul> </li> <li>Multi-plane sport specific plyometrics program</li> <li>Multi-plane sport specific agility program</li> <li>Include hard cutting and pivoting depending on the individuals' goals</li> <li>Non-contact practice → Full practice → Full play</li> </ul>
<b>Criteria to Discharge</b>	<ul style="list-style-type: none"> <li>95% LSI of quad, hamstring, and gluteus medius strength with HHD</li> <li>Hop Testing ≥95% compared to contralateral side, demonstrating good landing mechanics</li> <li>Participate in running, plyometrics, and sports and activities without pain or swelling</li> </ul>

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<b>Contact</b>	Please email <a href="mailto:MGHSportsPhysicalTherapy@partners.org">MGHSportsPhysicalTherapy@partners.org</a> with questions specific to this protocol
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References:

- Fares, Mohamad Y., et al. "Sever's Disease of the Pediatric Population: Clinical, Pathologic, and Therapeutic Considerations." *Clinical Medicine & Research*, vol. 19, no. 3, Sept. 2021, pp. 132–137, <https://doi.org/10.3121/cm.2021.1639>.
- Grävare-Silbernagel, Karin, et al. "Aspects of Treatment for Posterior Heel Pain in Young Athletes." *Open Access Journal of Sports Medicine*, Dec. 2010, p. 223, <https://doi.org/10.2147/oajsm.s15413>.
- Hernandez-Lucas, Pablo, et al. "Conservative Treatment of Sever's Disease: A Systematic Review." *Journal of Clinical Medicine*, vol. 13, no. 5, 28 Feb. 2024, p. 1391, <https://doi.org/10.3390/jcm13051391>.
- James, Alicia M, et al. "Effectiveness of Interventions in Reducing Pain and Maintaining Physical Activity in Children and Adolescents with Calcaneal Apophysitis (Sever's Disease): A Systematic Review." *Journal of Foot and Ankle Research*, vol. 6, no. 1, Jan. 2013, <https://doi.org/10.1186/1757-1146-6-16>.
- James, Alicia M., et al. "Health Related Quality of Life of Children with Calcaneal Apophysitis: Child & Parent Perceptions." *Health and Quality of Life Outcomes*, vol. 14, no. 1, 24 June 2016, <https://doi.org/10.1186/s12955-016-0497-4>.
- Kuyucu, Ersin, et al. "Assessment of the Kinesiotherapy's Efficacy in Male Athletes with Calcaneal Apophysitis." *Journal of Orthopaedic Surgery and Research*, vol. 12, no. 1, 6 Oct. 2017, <https://doi.org/10.1186/s13018-017-0637-5>.
- Nieto-Gil, Pilar, et al. "Risk Factors and Associated Factors for Calcaneal Apophysitis (Sever's Disease): A Systematic Review." *BMJ Open*, vol. 13, no. 6, June 2023, p. e064903, <https://doi.org/10.1136/bmjopen-2022-064903>.
- Uvelli, Katherine, and Jon Neher. *Treatment for Calcaneal Apophysitis*. Vol. 96, no. 2, 2017.

