

Calf Muscle Strain: Injury of the Gastrocnemius and Soleus

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ABSTRACT

CLINICAL PRESENTATION & EXAM: Calf strains are usually the result of a sudden pushing off movement or over-stretching of the muscle and usually afflict athletes and others later in life. They occur more in men than women, and afflicted patients tend to report calf tightness days before the injury. During the patient history, the patient usually presents with a sharp pain at the back of the lower leg and has pain and weakness in active plantarflexion. Additionally, the patient should be observed for swelling, bruising, and overpronation. Resisted muscle tests and functional tests can be conducted, and if needed, special tests such as Thompson's test for complete muscle rupture should be conducted in which the foot will plantar flex if the calf muscle is squeezed and the Achilles tendon is intact. **ANATOMY & PATHOLOGY:** The calf muscle consists of the big gastrocnemius muscle at the back of the lower leg and the soleus muscle that is smaller and is below and covered by the gastrocnemius. The gastrocnemius originates from the medial and lateral condyles of the femur bone, above the knee joint, and inserts into the heel through the Achilles tendon to the calcaneus. It is innervated by the tibial nerve and has the primary action of plantarflexion of the foot and secondary action of flexion at the knee. The soleus originates below the knee from the tibia and fibula and also inserts to the heel through the Achilles tendon. It shares the same innervation and plantarflexes the foot. Calf strains are commonly found in the medial head of the gastrocnemius, and the muscle as a whole is considered high risk because it crosses both the ankle and knee joints and has a high density of type II fast twitch muscle fibers, causing rapid and forceful contractions. The soleus is considered lower risk for injury and crosses only the ankle joint. Soleus muscle damage usually occurs lower in the leg and is not painful when bending the knee. **DIAGNOSTIC TESTING & CONSIDERATIONS:** Differential diagnosis of a gastrocnemius versus a soleus injury in a calf strain can be done through palpation and strength and flexibility testing. When palpating, tenderness in the musculotendinous junction indicates a gastrocnemius injury, whereas soleus strain pain is more lateral. Additional, gastrocnemius and soleus strains can be distinguished by plantarflexing the foot at varying degrees of knee flexion. In maximal flexion at the knee the soleus primarily plantarflexes, and in full extension the gastrocnemius is the primary plantarflexor. In addition to resisted, functional, and special tests on the calf muscle, imaging tests such as ultrasound

and MRI may be needed as well to see the actual rupture or damage to the muscle. MRI can also show hematomas, which sometimes occur following serious injuries. **TREATMENT & RETURN TO ACTIVITY:** Calf muscle strains are graded from I-III, representing the degree of muscle fiber tear: <10%, 10%-50%, and >50%, respectively. The treatment depends on the grade; however in general the RICE technique should be utilized – rest, ice, compress, elevate – after which gentle stretching and massage can help ease the swelling and relax the muscle. In addition, a compression bandage or crutches should be used as needed. After some time, calf strain strengthening and rehabilitative exercises should be employed in the order of isometric, isotonic, and then dynamic contractions alongside passive stretching. NSAID's should be restricted for first few days after which COX-2 inhibitors are an option. Acetaminophen or narcotic pain medication can also be used. **If the strain is grade III, surgery may be required to reattach the damaged muscle and tendon.**

