Case Report: Medial Gastrocnemius Strain Rehabilitation

By

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In partial fulfillment of the
requirements for the course:
PT 7243 Evidence-Based Practice Seminar II
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September, 2022

Abstract

Background and Purpose: Gastrocnemius tears are relatively rare, especially when in comparison to the more common Achilles tendon injury. This case study set out to provide insight on setting up a successful rehabilitation program for patients with a medial gastrocnemius strain.

Case Description: The patient was a 37-year-old male who presented with a grade II medial gastrocnemius strain that was sustained while dancing on vacation. The patient's only comorbidity was a BMI of 37 (despite somewhat muscular frame) & the evaluation revealed no red flags. The patient was motivated to heal to walk his kid to school and begin a new exercise journey.

Outcomes: Over the 9-week span, the patient improved from 21/80 to 63/80 (55% increase) on the Lower Extremity Functional Scale. The patient's passive dorsiflexion (leg extended) improved from 5 degrees and painful to 15 degrees and non-painful. Additionally, the patient reported "high satisfaction" with care.

Discussion: This study has shown that fostering patient buy-in/compliance, setting expectations for tissue healing times, and a graded exercise program can lead to positive outcomes in patients with a medial gastrocnemius strain.

Key Words: Gastrocnemius, Strain, Rehabilitation, Tennis Leg

Introduction

Gastrocnemius tears are relatively rare, especially when in comparison to the more common Achilles tendon injury. The prevalence is unknown, and the research is relatively sparse on the treatment of this injury. However, gastrocnemius tears have been coined “tennis leg” as the tennis playing population is somewhat prone to this injury likely due to the explosive lateral movements. Additionally, the literature also reports that medial gastrocnemius tears are more common than lateral, and that middle-aged people are more likely to have this injury. As far as the mechanism goes, the injury commonly happens during an eccentric contraction with the knee extended and ankle dorsiflexed.[1] The following case study is unique due to the lack of literature available regarding this injury and important because it provides an example of a successful rehabilitation program.

Case Description

The patient in this review was a 37-year-old Caucasian male that works in information technology & is married with children. The patient reports that he injured his calf while dancing on his last day of vacation in Spain. He was stepping laterally and slightly forward with the common mechanism of injury as described above. The patient demonstrated high motivation to return to activities & begin new activities as rehabilitation moved forward. The patient's primary complaint was pain with movement and walking. The patient's primary goal for physical therapy was to return to prior level of function without surgery. The patient was screened for any red flag symptoms or complaints (hematoma, fracture, etc.). The patient had no prior medical conditions or relevant medical history regarding his injury. However, patient did have a BMI of 37. The patient weighed 295lbs and was 6'5". Subjectively, the patient appeared overweight, however by the lens of appearance, the patient also did not look to be nearing morbidly obese as BMI suggests.

Examination

Ruling the patient's injury of gastrocnemius tear was done through Cyriax tissue tension testing.[2] Active plantar flexion, active dorsiflexion, & passive dorsiflexion were painful, however passive plantarflexion was not painful which is consistent with the finding of a plantar flexor injury. Plantar flexion strength was not tested due to the acuteness of the injury. From clinical observation, the patient would be categorized as a grade 2 muscle strain due to the weak and painfulness state of the calf at the time of assessment. The patient's Achilles was palpated and then Thompson's test was performed to rule out Achilles tear.[3] Both tests were negative for Achilles rupture. A straight leg raise test with a tibial nerve bias gave a negative test. The neural screen and swelling measurements are presented in **Table 1 & Table 2**. The patient had 5 degrees of passive dorsiflexion (knee extended) with pain on the right (affected) side & 15 degrees on the left. With observation, the patient showed some bruising over the medial gastrocnemius muscle. After examination, our clinical findings were consistent with the original referral of a medial gastrocnemius tear. We considered other potential diagnoses such as compartment syndrome, soleus/posterior tibialis/ plantaris injury, fracture, neuro/vascular insufficiency, hematoma, & high ankle sprain. None of these ideas seemed to line up with or contribute to clinical findings in the way medial gastrocnemius tear did. Due to the patient's high motivation, younger age, lack of comorbidities the patient has an excellent prognosis to return to prior level of function. We set expectations with our patient that it would take somewhere between 6-12 weeks for his grade II strain to heal to the point where he would feel ready to return to higher level physical activity (ie. running, jumping, cutting).[1]

Interventions

The interventions presented in this study were largely guided by tissue healing times, strength and conditioning principles, & patient preferences.[4,5] The treatment plan was carried out in three phases; acute (weeks 1 & 2), subacute (weeks 3-6), & return to sport (weeks 7-9).[6] **(Tables 3-5)** The phases were more of a continuum rather than a trichotomy. However, for understanding sake, this paper will present three example sessions that best represent the spirit of each phase. During the acute phase, the primary goal was to calm the injury site down while giving the injured area a low-level stimulus for adaptation while maintaining proximal and distal musculature strength. The reasoning behind the prescription for the subacute phase was to start re-exposing the healing tissue to higher loads so the patient could return to daily meaningful tasks such as walking his kid to school. It also served as a springboard to build enough strength to transition into the plyometric-focus phase. The sport-specific phase focused on higher level activities such as weighted step ups, double leg hopping, and ladder drills. This phase served to build confidence and tissue capacity for higher velocity demands as the patient wanted to begin hiking regularly which requires power of the lower extremities & especially of the plantar flexors.

Outcomes

The patient reported "high satisfaction" with plan of care and results from going to therapy over a span of 9 weeks and 16 visits. The patient on initial eval started with a passive & painful dorsiflexion ROM of 5 degrees (with knee extended) and returned to pain free and symmetrical ROM (15 degrees of passive dorsiflexion) by the 8th week. The patient's lower extremity functional scale improved from 21/80 to 63/80 which indicates a 55% improvement.[7] The patient showed steady improvement from session to session in tolerability as well as capacity to perform higher volumes and more advanced exercises. The patient was unable to perform calf raises on initial evaluation but was able to perform 6 single leg calf raises 8 weeks out during a re-evaluation. Surprisingly, there were no significant differences in the swelling measurements after 8 weeks.

Regarding interruptions, the patient only missed 2 appointments due to personal responsibilities. During the 4th week, the patient reported a new soreness on the posteromedial border of the tibia that increased in pain with plantar flexion activities. The soleus was ruled out through giving the patient weighted calf raises in the seated position where he had no pain or weakness with the movement. Medial tibial stress syndrome was not ruled out completely, however the area of pain was on soft tissue, not the bone. The tibialis posterior was ruled in through performing a heel raise with focus on ankle inversion which increased the pain. It seemed most likely that the tibialis posterior was increasingly sore due to overcompensation for a weakened/inhibited gastrocnemius. This pain slowly phased itself out after a couple more weeks of rehabilitation. The therapist handled the situation by addressing the patient concerns and continuing to treat the "cause of the cause" which was likely the inhibited gastrocnemius.

Discussion

The case study by Nsitem (2013) showed that treating a gastrocnemius strain can be a straightforward path through using manual therapy and exercise interventions. This case study looked at a 44-year-old male who was diagnosed with a grade II gastrocnemius strain who also injured himself while dancing. Both studies employed similar strategies, however, Nsitem's study appeared to have a greater focus on passive approaches such as low-level laser therapy, ankle, knee, & lumbopelvic manipulations. Whereas the patient case above had a greater emphasis on graded exercise with soft tissue massage used as an adjunct. In both instances, the patient compliance was high, and the patient improved significantly. The strength of this study was the patient's high compliance with his home exercise program and consistency with showing up to appointments. This study was limited in that the patient's full gastrocnemius strength was not returned before the patient decided to discharge. The patient felt that he returned to a high enough level of function and confidence to continue rehabilitation outside the clinic. This patient was unique in that he began a new activity (hiking) during his rehabilitation which may have influenced the results of the study. The patient began hiking 2-4 miles a day towards the end of the plan of care. After follow up 4 weeks later, the patient shared data of average hikes of 4 miles a day, 6-7 days a week with the longest hike at 10 miles. Future could investigate the differences in outcomes in this injury with fewer visits compared to the higher number of visits described in the above case study to have a better understanding of the value of allocating financial and temporal resources to coming to physical therapy for this injury. This study has shown that fostering patient buy-in/compliance, setting expectations for tissue healing times, and a graded exercise program can lead to positive outcomes in patients with a medial gastrocnemius strain.

Tables:

Table 1: Neural Screen

Myotomes Lower		
	Right	**Left**
L1, 2 Iliopsoas	Normal	Normal
L3 Quadriceps	Normal	Normal
L4 Anterior Tibialis	Normal	Normal
L5 EHL	Normal	Normal
S1 Gastroc	Normal	Normal
S2 Hamstrings	Normal	Normal
Dermatomes Lower		
	Right	**Left**
L1, 2 Mid Anterior Thigh	Normal	Normal
L3 Distal Inner Thigh	Normal	Normal
L4 Anterior Tibialis	Normal	Normal
L5 EHL	Normal	Normal
S1 Lateral Foot	Normal	Normal
S2 Mid Gastoc/Hamstring	Normal	Normal
Lower Reflexes		
All Normal	Yes	
	Right	**Left**
Knee Jerk (L4)	2 + Normal	2 + Normal
Ankle Jerk (S1)	2 + Normal	2 + Normal

Table 2:

Swelling Measurements (cm)

Location	**Left**	**Right (affected side)**
Ankle joint line	**28**	**30**
10 cm superior	**30**	**32.5**
20 cm superior	**42**	**42**
Midfoot	**27**	**27.5**

Patient reports that right calf has always been more “stalky” than the left which may affect our measurements and perception of swelling.

Table 3: Acute Phase (weeks 1 & 2)

Intervention	Prescription	Goal
Bike	5' @RPE 3, pain < 3	Enhance healing, decrease pain, facilitate tissue loading tolerance.
Ankle 4-way	30x red theraband	Low level stimulus for neuromuscular adaptations.
Runners Stretch	3 x 30"	Enhance neuromuscular system's tolerance to stretch.
Straight leg raise 3-way (supine hip flexion, side lying hip abduction, prone hip extension)	3x10	Strengthen hip musculature.
Sagittal plane weight shifts (Lunge stance) Ambulation in between sets	3x12 40 feet	Neuromuscular reeducation of proper gait mechanics.
Arch Raises (Seated)	3x10	Facilitate activation of foot musculature to offload injured gastrocnemius and other compensating plantar flexors.

Table 4: Subacute Phase (weeks 3-6)

Intervention	Prescription	Goal
Bike	10' @RPE 4, pain < 2	Enhance healing, decrease pain, facilitate tissue loading tolerance.
Hip Sled Squats	5' @ 37.5#	Load gastrocnemius & lower body with low load long duration intensity to facilitate healing.
Runners Stretch	5 x 30"	Enhance neuromuscular system's tolerance to stretch.

4 Way Lunges (forward, lateral, backward, rotational)	3x5 each leg (10# KB)	Load patient in varying planes of motion to replicate daily activities.
Bilateral Heel Raises (w/ hand support as needed)	2x Fatigue (body weight), feet pointed outwards	Strengthen lower leg with emphasis on medial gastrocnemius.
Single Leg Romanian Deadlifts	20x each leg (body weight)	Balance and proprioception training along with posterior chain strengthening
Soft tissue mobilization to lower leg musculature. (Effleurage for 2' followed by petrissage with active movement for 8'.)	10' + 50 ankle pumps	Provide sensory stimulus to desensitize pain & increase blood flow for healing.

Table 5: Return to Sport Phase (weeks 7-9)

Intervention	**Prescription**	**Goal**
Elliptical	10' @RPE 4, pain < 1	Enhance healing, decrease pain, facilitate tissue loading tolerance.
Ladder Drills (Icky shuffle, 1 foot in each -forward/ backwards/lateral, double leg hops, toe walks, etc.)	2 laps of each	Load patient in varying planes of at higher speeds to prepare for plyometric activities.
8" Box Step Ups	3x12 with 20lb Dumbbells	Specific to hiking with backpack, strengthening a functional movement.
Bilateral Heel Raises (Metatarsals on 4-inch box)	2x Fatigue (body weight),	Strengthen gastrocnemius.
Kettlebell Deadlifts	3x12 30#	Balance and proprioception training along with posterior chain strengthening.

Instrument assisted soft tissue mobilization to lower leg musculature. (Effleurage for 2’ followed by petrissage with active movement for 8’.)	10’ + 50 ankle pumps	Provide sensory stimulus to desensitize pain & increase blood flow for healing.

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