



# Clinical Case Report Competition

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The effects of massage therapy in reducing chronic muscle spasms and myalgia in triceps surae and plantar muscles of the foot

## Table of Contents

Abstract	3
Overview	4
Case Introduction	
Case History	8
Observations	9
Palpation	10
Movement	10
Referred Pain	10
Special Tests	11
Assessment Protocol	11
Treatment Protocol	12
Remedial Exercise	13
Hydrotherapy	14
Treatment Results	14
Subjective Patient Reporting	17
Discussion	17
Conclusion	20
References	21
Acknowledgement	22

## **Abstract**

### **Objective**

The purpose of this study is to test the efficacy of massage therapy in treating chronic, debilitating muscle spasms and myalgia in the leg and foot of an active, healthy individual.

### **Methods**

The treatment plan consisted of 10 massage therapy sessions ranging from 60 to 90 minutes in duration. Each treatment session included myofascial release, swedish techniques, passive stretching, myofascial trigger point release, joint mobilization, hydrotherapy, skin rolling and circular frictions. Knee and ankle ranges of motion, manual muscle testing, a 13-week walk-run program and a numeric pain rating scale were used as assessment tools to track changes.

### **Results**

Chronic muscle spasms, previously experienced approximately every 10 days, resolved. Myalgia in the affected leg and foot resolved, which enabled a return to running and the ability to perform a specific yoga pose. Ankle inversion increased bilaterally by 5°. Right and left knee flexion decreased by 2° and 6° respectively. The mobility of the surgical scar tissue on the unaffected leg increased in both superior and lateral directions.

### **Conclusion**

Results of this study indicate that massage therapy is effective in treating chronic muscle spasms and myalgia experienced in the muscles of the leg and foot.

### **Keywords**

muscle spasms, myalgia, myofascial release, passive stretching, trigger point release, joint mobilization, hydrotherapy, skin rolling, circular frictions, range of motion, surgical scar tissue.

## Overview

### **Anatomy and Physiology of Gastrocnemius and Soleus Muscles**

The gastrocnemius and soleus muscles, which together work as a synergistic unit, share a common attachment to the achilles tendon, which crosses the ankle attaching to the posterior aspect of the calcaneus. While the medial and lateral heads of the gastrocnemius cross the knee, attaching to the distal femur, the soleus muscle does not. The gastrocnemius is the more superficial of the two muscles and together they are referred to as the calf, or triceps surae (Travell & Simons, 1993).

The gastrocnemius and soleus muscles, as a unit, are the prime movers for plantar flexion. In addition to plantar flexion, gastrocnemius also supinates the foot. While gastrocnemius crosses the knee, it is not the prime mover for knee flexion but rather assists the prime movers, the hamstring muscles, along with gracilis and sartorius muscles. Gastrocnemius also assists in stabilizing the knee (Travell & Simons, 1993).

Soleus plantar flexes, assists in inversion and acts critically as a skeletal pump for the venous system, which is very important for running and jumping (Travell & Simons, 1993).

Gastrocnemius, as a plantar flexor, is especially important in certain activities including cycling, ascending steep grades, jumping and ascending and descending stairs. In order for these functional activities to be performed optimally, adequate ROM at the ankle is required (Brukner & Khan, 2006).

The triceps surae plays a key role in running and cycling. Optimal functioning of this muscle group is often compromised by physical overloading with activities such as running, cycling and climbing, which can create myofascial trigger points in both gastrocnemius and soleus muscles. Subsequently activities which place the foot in excessive plantar flexion for long durations often sustain these myofascial trigger points (Travell & Simons, 1993).

### **Muscle Spasms and Myalgia in the Calf and Plantar Muscles**

Muscle spasms, also known as muscle cramps, are described as involuntary, often very painful muscle contractions, which may be caused by muscle fibre ischemia, dehydration or an imbalance of electrolytes (Taber, 2009). Patients with latent myofascial trigger points in mostly the medial head, but sometimes in the lateral head of gastrocnemius, usually complain primarily of calf cramps. While patients with active myofascial trigger points are usually aware of calf pain, which may also be referred into the posterior knee and plantar surface (Travell & Simons, 1993).

Myalgia is defined as point tenderness in a muscle related to myofascial trigger points (Travell & Simons, 1993).

Nocturnal calf cramps, primarily involving the gastrocnemius muscle, are the most clearly identified symptom related to myofascial trigger points in the same muscle (Travell & Simons, 1993). Calf cramps, which are also known as systemma, occur in approximately 33% of the population (Blyton, Chuter & Burns, 2012).

Of the four commonly identified trigger point locations (TrP1, TrP2, TrP3 and TrP4), TrP1, the most common, often refers pain down the posteromedial leg to the plantar surface of the foot at the instep. Referral pain associated with the most common trigger point in the soleus muscle, TrP1, can refer pain to the posterior and plantar aspects of the heel, the distal portion of the achilles tendon, and may extend as far as the instep (Travell & Simons, 1993).

Systemic conditions have been associated with many conditions, including dehydration, electrolyte deficiency, Parkinson's disease, cancer, compression of nerve roots in the lumbar region, certain drugs and proximal tibiofibular joint hypomobility. Systemic conditions are not, however, related to occlusive vascular disease (Travell & Simons, 1993).

Both calf cramps and myofascial trigger points are made worse in situations where the muscle is in a prolonged shortened state, with the knee bent and the foot in plantar flexion, as well as if a forceful contraction is applied when the muscle is in a shortened state. Activities which can aggravate gastrocnemius trigger points include climbing or running uphill, cycling and swimming involving plantar flexion, sleeping with the foot in a prolonged state of plantar flexion, as well as excessive plantar flexion sometimes required while driving (Travell & Simons, 1993).

### **Common Medical Intervention**

Within the medical community there are several commonly prescribed treatments for nocturnal calf cramps, including membrane-stabilizing drugs,

circulatory drugs, electrolyte replacement therapies, vitamin supplementation and electrical stimulation. Inactivating myofascial trigger points and stretching have also been prescribed and recommended as treatment (Travell & Simons, 1993).

Quinine, has been a commonly prescribed, although controversial membrane-stabilizing drug. Controversial, as its efficacy and safety for the treatment of muscle cramps is unclear (El-Tawil, Al Musa, Valli, Lunn, El-Tawil, Weber, 2010). Other membrane-stabilizing drugs include aminophylline, chloroquine, procainamide HCl, phenytoin, diazepam, diphenhydramine and carbamazepine.

Papaverine HCl has reportedly been prescribed as a circulatory drug treatment (Travell & Simons, 1993).

Electrolyte replacement, which specifically addresses low levels of calcium has been used (Travell & Simons, 1993).

Vitamin supplementation, which specifically recommends the use of Vitamin E, has also been prescribed as a treatment. Magnesium supplementation has shown positive results in treating nocturnal leg cramps in pregnant, geriatric and type 1 Diabetes Mellitus patients. As well, the use of magnesium salts is common in some European and Latin American countries (Frusso, Zarate, Augustovski, Rubinstein, 1999).

Electrical stimulation has also been used, including transcutaneous nerve stimulation to provide relief of the calf cramp (Travell & Simons, 1993).

Stretching of the gastrocnemius has repeatedly shown positive results in resolving calf cramps. The use of reciprocal inhibition, by contracting the antagonist,

tibialis anterior, has also shown positive results. The use of vapocoolant spray combined with a passive stretch of gastrocnemius, may be more effective than purely a passive stretch, indicating that inactivation of myofascial trigger points followed by stretching may be key elements of treatment for calf cramps (Travell & Simons, 1993).

### **Treatment Goals**

The primary treatment goal was to reduce the frequency of, or resolve chronic muscle spasms experienced in the right triceps surae and plantar muscles of the right foot. A secondary goal was to relieve myalgia associated with running. With this in mind, it was important to understand the possible causes of systemma and gastrocnemius myalgia and to include recommended techniques in the treatment protocol, in order to gain positive results. The goal of this study was to reduce chronic myofascial leg and foot pain associated with myofascial trigger points in the triceps surae muscle group in an otherwise healthy individual.

## **Case Introduction**

### **Case History**

The subject of this case study is a 50 year old healthy male. He leads a physically active lifestyle, both recreationally and in his duties as a Police Officer. He maintains a very healthy diet and does not smoke. He is an avid cyclist and practices yoga 1 - 2 times per week. Formerly, he was also a distance runner. He ran regularly,

successfully completing a marathon. He discontinued running in May of 2010, due to frequent, debilitating muscle spasms experienced in his right triceps surae and right plantar muscles. Muscle spasms in his right calf and foot were experienced often while driving a car, and nocturnal calf cramps were experienced approximately every 10 days. In addition, sharp myalgia was experienced in his right calf almost immediately upon attempting to run.

He was diagnosed with melanoma, and subsequently had a mole and some surrounding tissue surgically removed from his left gastrocnemius on August 31, 2012.

In addition, he also has diagnostic evidence of a slight scoliosis in the lower lumbar region (as evidenced by an X-ray report), osteophytes in C6 - C7 (as evidenced by an X-ray report), and a medial meniscus flap tear in his right knee (as evidenced by a MRI report).

### **Observations**

A reduced arch and moderately excessive eversion was noted bilaterally, in addition to hypolordosis of the cervical and lumbar spine.

Surgical scar tissue was noted on the left gastrocnemius muscle, proximal to the achilles tendon, and distal to the branching of the medial and lateral heads of the gastrocnemius muscle.

A ganglion cyst was noted on the left tibialis anterior muscle, just distal to the tibial plateau.

## **Palpation**

Hypertoned hamstring muscles, gluteus maximus muscles, lateral hip rotator muscles and iliotibial bands were noted.

Upon assessment of the surgical scar tissue on the left gastrocnemius muscle, fascial restrictions were noted superiorly and laterally.

## **Movement**

Both ankle inversion and knee flexion were found to be limited upon the initial assessment. AROM assessments were measured using a BASELINE™ goniometer. Ankle inversion and knee flexion were subsequently tested and measured as per the charts below.

Manual muscle tests were performed bilaterally on gastrocnemius, soleus, tibialis anterior, biceps femoris, semitendinosus and semimembranosus muscles prior to treatments 1, 4, 7 and 10. All manual muscle tests were found to be grade 5 normal, with no pain elicited.

## **Referred Pain**

The subject complained of referral pain associated with myofascial trigger points during treatments 2, 3 and 4.

## **Special Tests**

The Supine to Sit Test yielded positive results in treatments 1, 4, 7 and 10. As well, McMurray Test was positive on the right medial meniscus in treatment 1. The Trendelenburg Test and Ober's Test were both negative in treatment 1.

## **Assessment Protocol**

Active range of motion, manual muscle tests and Supine to Sit Test assessment procedures were carried out four times; at the start of treatment 1 (May 24, 2012), treatment 4 (June 3, 2012), treatment 7 (June 13, 2012) and treatment 10 (June 27, 2012). Three tests were performed only once, at the start of treatment 1 (May 24, 2012); McMurray Test, Trendelenburg Test and Ober's Test.

Active range of motion of knee flexion and ankle inversion were measured bilaterally using a BASELINE™ goniometer.

Manual muscle tests of gastrocnemius, soleus, tibialis anterior, biceps femoris, semitendinosus and semimembranosus were performed bilaterally according to *Muscles: Testing and Function with Posture and Pain, Fifth Edition*.

The Supine to Sit Test, McMurray Test, Trendelenburg Test and Ober's Test were performed bilaterally according to *Orthopedic Physical assessment, Fifth Edition*.

## **Treatment Protocol**

Treatments were performed twice per week between May 24, 2012 and June 27, 2012, for a total of 10 treatments. Hands on treatment times ranged from 60 to 90 minutes, not including assessment time.

All treatments began with diaphragmatic breathing, full body compressions and 5 minutes of warm, moist heat, using a Thermophore®, applied to the left gastrocnemius to pre-treat the surgical scar tissue. This was followed by a sacral float and lumbar decompression to increase mobility of the pelvis; swedish to the back to increase circulation; knuckle kneading and myofascial release of the gluteal muscles to reduce hypertonicity; pin and stretch of the piriformis muscles to reduce hypertonicity; sacrotuberous ligament release bilaterally to increase mobility of the pelvis and related musculature; myofascial release of the hamstring attachments at the knee and swedish to the hamstrings bilaterally to reduce hypertonicity; pinch and lift, circular frictions and skin rolling to the surgical scar tissue on the left gastrocnemius to reduce scar tissue adhesions; ischemic compression to myofascial trigger points found in the gastrocnemius and soleus muscles to reduce myofascial pain; myofascial release of the gastrocnemius, soleus muscles and achilles tendons bilaterally to reduce fascial restrictions; passive stretching of the gastrocnemius bilaterally to create length, inactivate trigger points and to help realign fibres post-scar tissue treatment; swedish to the quadriceps, iliotibial bands, tibialis anterior and fibularis longus muscles to increase circulation; lateral gapping of the subtalar joints bilaterally to increase subtalar joint inversion; swedish to the plantar surfaces to

increase circulation; metatarsophalangeal joint play bilaterally, passive range of motion of the ankles and talocrural distraction to increase mobility of the ankles and joints of the feet; posterior glide of the distal fibula to increase mobility in the distal tibiofibular joints; and posterior glide of the talocrural joints bilaterally to increase dorsiflexion in the ankle joints.

The treatment protocol was chosen in order to treat the condition holistically. This meant that not only were myofascial trigger points in the affected leg treated, but that muscles of the back, gluteal muscles, lateral hip rotator muscles, hamstring muscles and quadricep muscles were also addressed, as well as fascial restrictions related to surgical scar tissue on the compensatory leg and reduced range of motion in the ankles and knees were also treated.

### **Remedial Exercise**

The 13-Week Walk-Run Program was administered as a remedial exercise and assessment tool, as per *The Beginning Runner's Handbook: The Proven 13-Week Walk-Run Program*.

Bilateral self-stretching was given as homecare for the gastrocnemius muscles, soleus muscles, gluteus maximus muscles, hamstring muscles and quadricep muscles according to *Muscles: Testing and Function with Posture and Pain, Fifth Edition* and *Therapeutic Exercise: Foundations and Techniques, Fifth edition*. The protocol suggested for these stretches was as follows: to be performed bilaterally; once per day and after every run; with an intensity of 60 seconds; for the duration of

the study. In addition, a specific stretch for the gastrocnemius muscle was recommended as homecare for post-myofascial trigger point treatment, with a suggested intensity of 60 seconds.

### **Hydrotherapy**

Cryotherapy instructions were given as homecare, to be applied to the left gastrocnemius muscle, to reduce any inflammation post-surgical scar tissue treatment. The suggested frequency was once post-treatment; intensity was 10 minutes; duration was limited to the day of treatment.

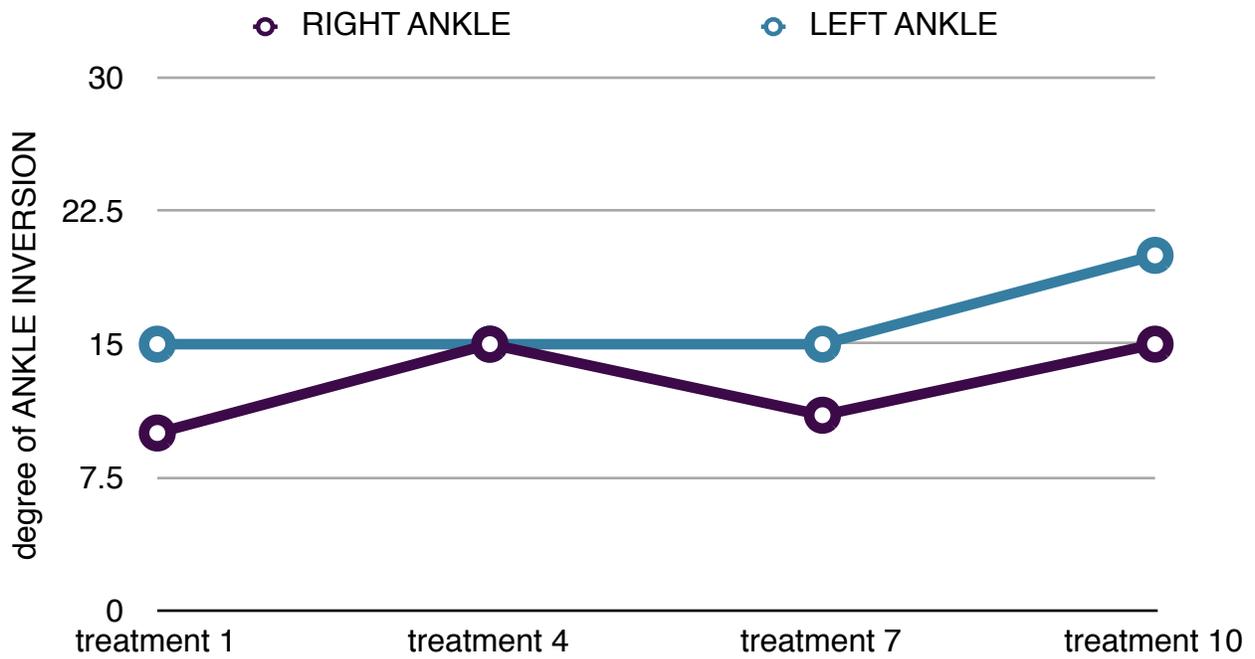
Thermotherapy instructions were given as homecare for post-myofascial trigger point therapy. The suggested frequency was once post-treatment; intensity was 10 minutes; duration was limited to the day of treatment.

### **Treatment Results**

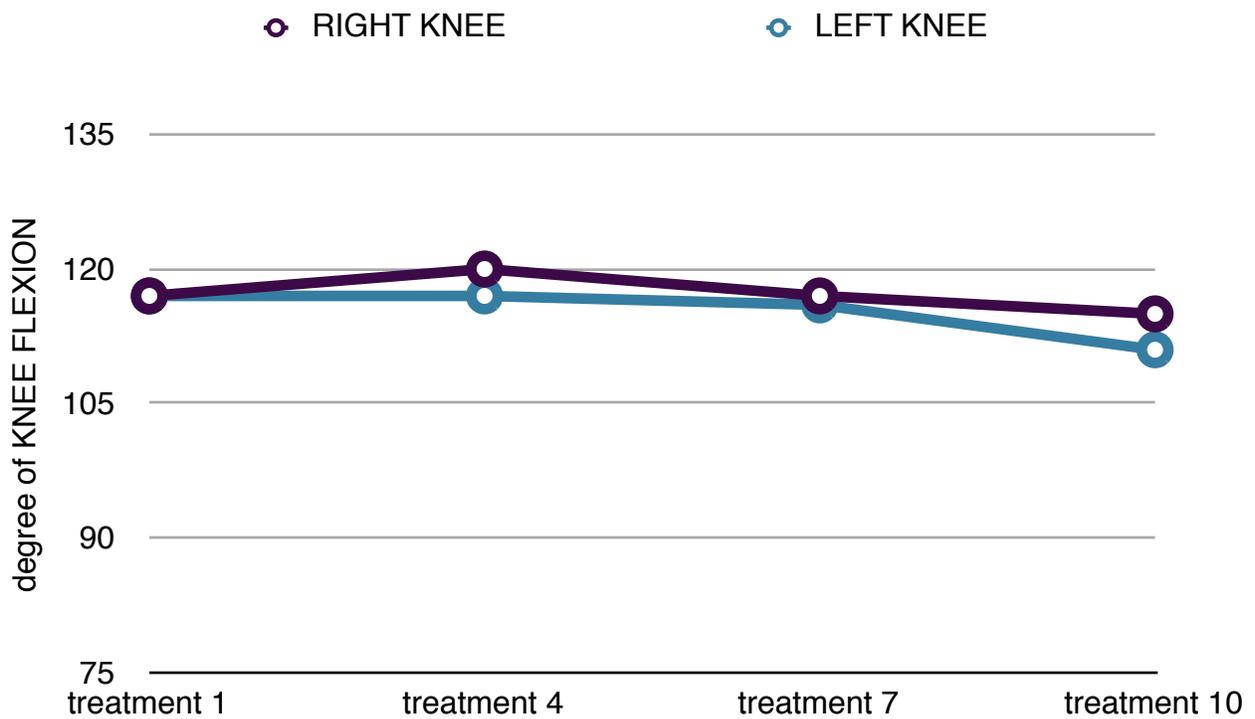
#### **Range of Motion**

Range of motion of the ankle and knee joints were examined in the initial assessment. Findings upon this assessment were that ankle inversion and knee flexion were both limited. Ankle inversion and knee flexion were then reassessed prior to treatments 4, 7 and 10.

At the beginning of treatment 1, inversion of the right and left ankles were measured at 10° and 15°, respectively. At the beginning of treatment 10, right ankle inversion had improved to 15°, and left ankle inversion had improved to 20°.



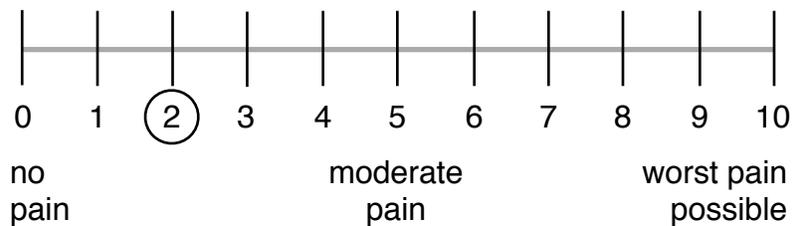
At the beginning of treatment 1, flexion of the right and left knees were measured at 117°. At the beginning of treatment 10, right knee flexion was reduced to 115°, and left knee flexion was reduced to 111°.



## Running

Running has been successfully resumed. For the duration of this case study, the subject was able to complete 7 walk-run sessions without experiencing any significant myalgia. Mild discomfort was noted (2 out of 10 on a numeric pain rating scale) on June 3, 2012 and June 16, 2012. Each walk-run session was comprised of a total of 30 minutes, with alternating walk-run intervals. The run intervals were of a 1 minute duration, while the walk intervals were of a 2 minute duration. Walk-run sessions were completed on May 28, 2012, May 31, 2012, June 3, 2012, June 16, 2012, June 17, 2012, June 20, 2012 and June 24, 2012.

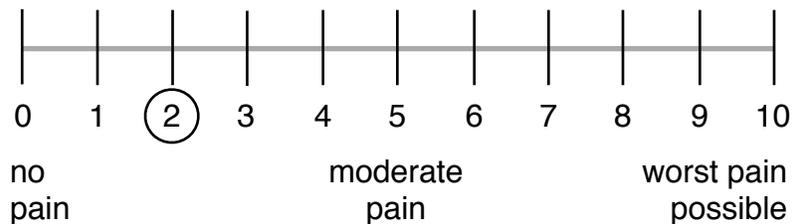
0 - 10 Numeric Pain Rating Scale



task: WALK-RUN SESSION

date: 06/03/2012 session duration: 30 minutes

0 - 10 Numeric Pain Rating Scale



task: WALK-RUN SESSION

date: 06/16/2012 session duration: 30 minutes

## **Subjective Patient Reporting**

Prior to commencement of treatments, on May 24, 2012, the subject reported experiencing nocturnal muscle spasms in his right triceps surae and right plantar surface approximately once every 10 days. He has not experienced any systemma in these areas since treatments began.

Prior to commencement of treatments, on May 24, 2012, the subject reported being unable to run for more than 1 year, due to immediate myalgia in his right triceps surae when attempting to run. Since treatments began he has been able to complete six walk-run sessions without any myalgia in his leg.

Prior to commencement of treatments, on May 24, 2012, the subject reported being unable to perform a specific yoga pose, involving weight bearing solely on tarsal and metatarsal joints. He is now able to successfully perform this pose without any systemma or leg myalgia.

On July 23, 2012 the subject of this case study reported that he has still not experienced any systemma.

## **Discussion**

Reducing the frequency of chronic, debilitating muscle spasms in the muscles of the affected leg and foot was the main treatment goal. Secondly, was a return to recreational running with minimal or no myalgia in the affected right triceps surae and plantar muscles of the foot.

Myofascial trigger point release of the soleus muscle has an immediate effect, especially when combined with a passive stretch, on improving dorsiflexion, even after only one treatment (Grieve, Clark, Pearson, Bullock, Boyer & Jarrett, 2011). Moderately strong evidence suggests a link between immediate pain relief and the use of ischemic pressure to treat myofascial trigger points (Vernon & Schneider, 2009).

Inactivation of myofascial trigger points in gastrocnemius and soleus muscles, along with stretching, has been recommended to treat systemma (Travell & Simons, 1993).

The use of superficial moist heat to reduce muscle spasms may be due to a reduction of muscle spindle activity and an increase in golgi tendon activity. In addition, moist heat may indirectly reduce pain by increasing metabolism and blood flow, both of which help with the repair and healing of the muscle (Wright & Sluka, 2001). The use of a heating pad, placed on the affected calf muscle at night, is recommended to reduce activation of trigger points and the likelihood of systemma (Travell & Simons, 1993).

A posterior glide of the talocrural joint may be an effective tool to increase dorsiflexion of the ankle. A lateral gap of the subtalar joint may be an effective tool to increase inversion of the subtalar joint (Edmond, 2006).

The results of this study indicate that the resolution of muscle spasms and myalgia was a direct result of treating these conditions with myofascial trigger point release, stretching and thermotherapy. Once these conditions were resolved,

restoration of proper function was achieved, which enabled the ability of the subject to resume his activities, specifically running and a yoga pose. In addition, ankle inversion was increased bilaterally, indicating that joint mobilization was an effective treatment for reduced range of motion. Although most of the results of this study were positive, knee flexion was reduced. By treatment 4 right knee flexion increased and left knee flexion was maintained, however, by the end of treatment 10 knee flexion was reduced bilaterally. This result may have been due, at least in part, to exercise-induced hamstring muscle soreness experienced after the completion of a long cycle just prior to treatment 10. Or, it may have been due to a lack of specific treatment, which might have included proximal tibiofibular joint mobilization, to effectively reduce the subject's chronic hamstring hypertonicity.

Due to the high prevalence of nocturnal calf cramps and myalgia associated with trigger points in the gastrocnemius and soleus muscles, the lack of currently recognized effective and long-lasting treatment, and the lack of evidence supporting massage therapy as an effective tool to treat these conditions, more research needs to be done. More specifically, a larger study needs to be conducted, following patients over several months or even years to document long term effects, including the resolution of muscle spasms and myalgia and the subsequent restoration of normal functioning, following massage therapy treatment. The results of this study indicate that treating this condition with a holistic approach, utilizing a combination of all of the techniques previously shown to be effective, gained positive results. The significance of this study for clinical practice is that it illustrates that positive results,

specifically resolution of muscle spasms and myalgia, enabling a subsequent return to activities, can be gained in a short period of time by treating this condition with massage therapy.

### **Conclusion**

The results of this case study indicate that massage therapy is an effective treatment in reducing chronic muscle spasms and myalgia in triceps surae and plantar muscles of the foot.

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