Counterstrain for the Lower Extremity

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Disclosure Information

Osteopathic Manipulative Treatment Refresher and Introductory Training for Supervisors of DO Students & Residents

- I have no financial relationships to disclose.
- I will not discuss off label use and/or investigational use in my presentation.

Objectives

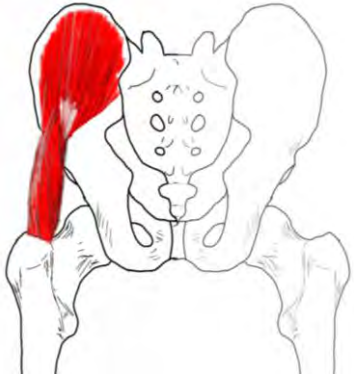
- Identify, describe, and define
  - *Achieve a foundational understanding in core concepts of Osteopathic Physical Exam skills and Osteopathic Manipulative Treatment (OMT) of the Lower Extremities (LE).*
  - *Practice the skills necessary for the supervision of students and residents in the performance of OMT.*
  - *Demonstrate the following OMT techniques: Counterstrain of common LE somatic dysfunctions.*
  - *Perform the skills necessary to integrate OMT into a physician's routine clinical practice.*

Gluteus Maximus

Origin: from between the anterior & posterior gluteal lines on the external surface of the ilium.

Insertion: upon the lateral surface of the greater trochanter of the femur; the tendon is separated from the femur by a bursa.

Gluteus Medius



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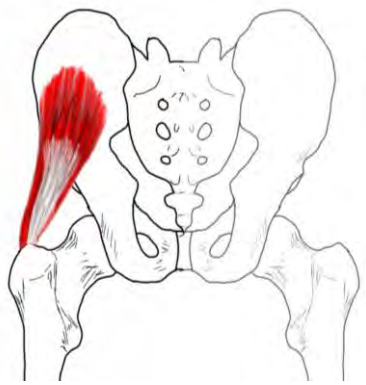

Origin: from between the anterior & inferior gluteal lines on the external surface of the ilium.

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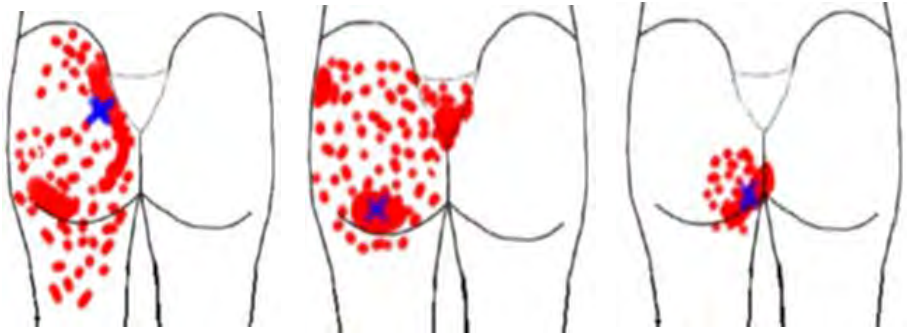

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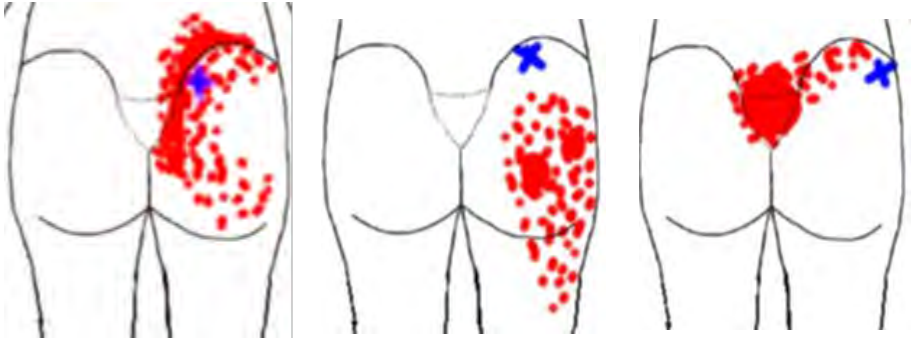

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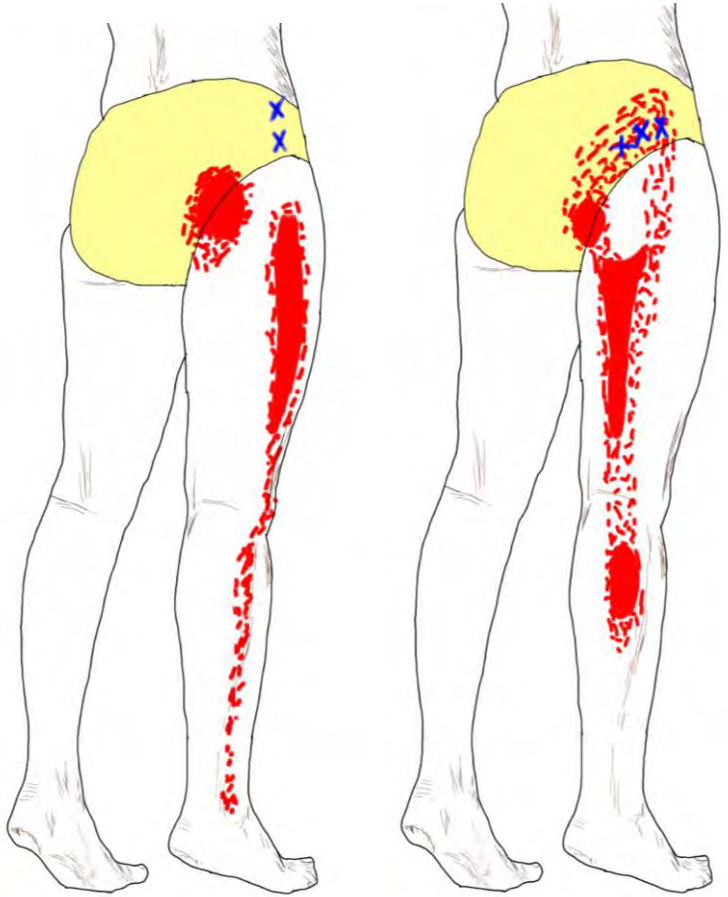

Gluteus Maximus S/Sx's

Pain during the gait cycle, most commonly associated with a Morton's foot
Difficulty sleeping lateral recumbent or supine, compresses the TrPs
Discomfort when sitting
Activated & Aggravated by:
Acute overload & Overuse
Walking favoring one leg:
Morton's foot favors pronation & ER at the hip
Sleeping in the lateral recumbent position & in the supine position.
Iatrogenic: injection of an irritant.
Repetitive stress: leg lift/extension exercises
Irritation from a back pocket wallet or a small hemipelvis
Poor Posture

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Irritation from a back pocket wallet or a small hemipelvis
Poor Posture

Gluteus Minimus S/Sx's

Hip pain during the gait cycle
Difficulty sleeping lateral recumbent
Discomfort when sitting
Difficulty in rising from the seated position
Activated & Aggravated by:
Acute overload & Overuse
Walking favoring one leg:
Sleeping in the lateral recumbent position & in the supine position
Iatrogenic: injection of an irritant.
Irritation from a back pocket wallet or a small hemipelvis

Gluteus ROM Test

The physician flexes the patient at the hip & knee to approximate the knee to the chest. Inability to approximate the knee to the chest is positive for hypertonicity of the gluteus maximus.

* figure 1 = (+)
* figure 2 = (-)

1

2

Glutues Maximus Counterstrain

- TrP Identification: TrP1&2 are located by flat palpation; TrP3 can be located using a pincer grasp
- Treatment: The patient's leg is extended, some external rotation may be required for TrP1 &/or some adduction may be required for TrP3. Minor adjustments are made with respect to traction/compression, internal/external rotation & ad/abduction until the TP dissipates.

Gluteus Medius Counterstrain

The patient's leg is extended, externally rotated & abducted. Minor adjustments are made with respect to traction/compression, internal/external rotation & ad/abduction until the TP dissipates.

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Homework: Deep Pressure

* This is exactly what it looks like!

Hamstrings

Semitendinosus Muscle

Origin: from the ischial tuberosity with a common tendon of the long head of the biceps femoris.

Insertion: the medial surface of the superior part of the tibia, posterior to the insertion of the sartorius & gracilis muscles

Semimembranosus Muscle

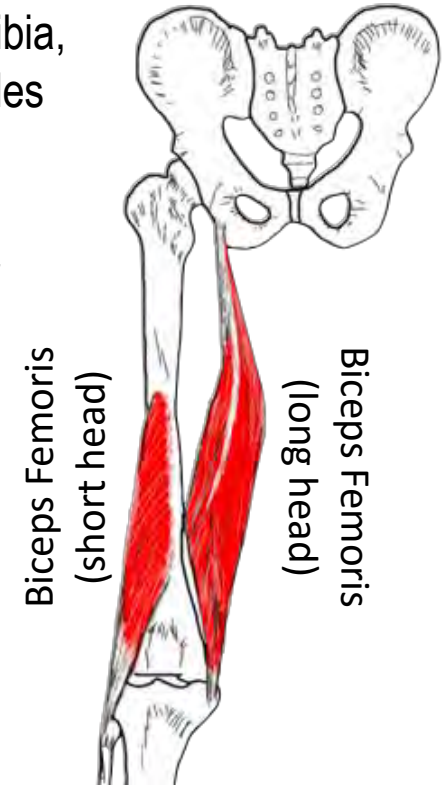
Origin: from the ischial tuberosity.

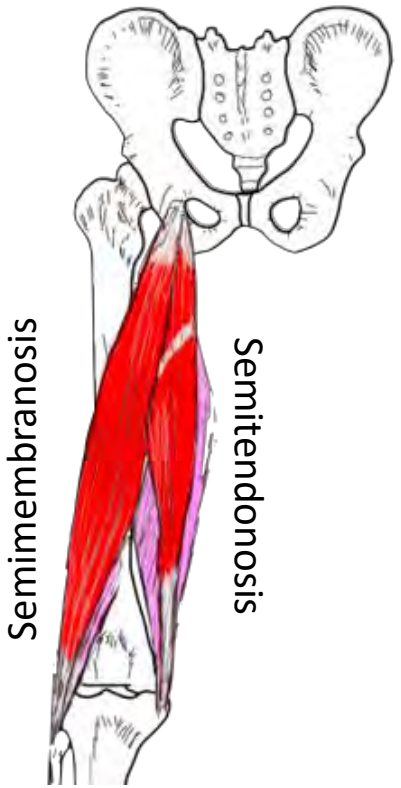
Insertion: into the posterior part of the medial condyle of the tibia

Biceps Femoris

Origin: the *long head* originates from the ischial tuberosity with a common tendon of the semitendinosus *(figure B)*; the *short head* originates from the lateral of the linea aspera & lateral supracondylar line of the femur *(figure A)*.

Insertion: into the head of the fibula, *its tendon is split by the lateral collateral ligament of the knee.*





Sciatica Pain

The patient may experience pain on walking…They may even limp.

Sitting will often provoke the pain.

Patients will often experience pain when getting up from the seated position, especially if the have been sitting with their legs crossed.

- *They tend to use the armrests or their thighs to push themselves up to the standing position from being seated.*

Hamstring TrPs will activate quadratus femoris TrPs.

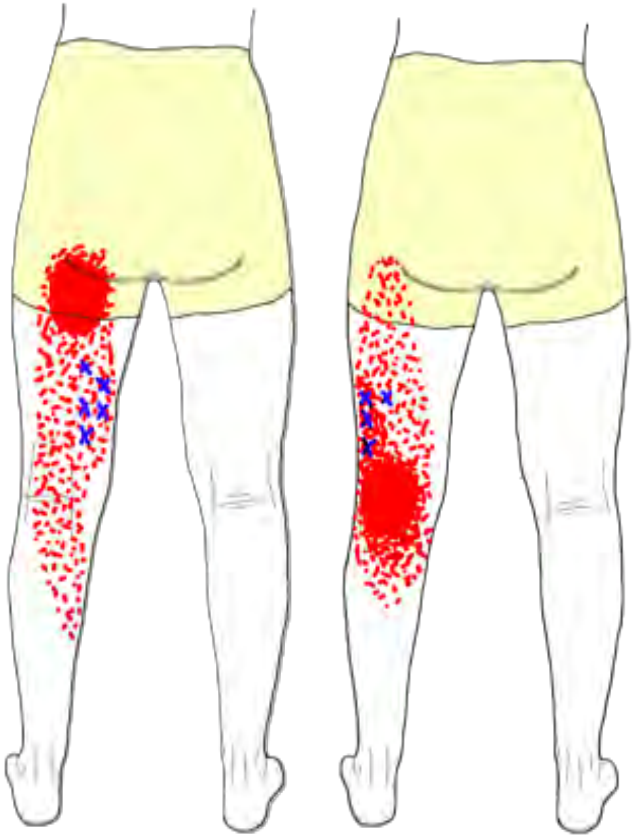
- *The hamstring TrPs must be treated during the same treatment as the quadriceps TrPs or this could result in an unbalanced tension between leg flexors & extensors that results in worse pain, especially in the hamstrings*

Tight hamstrings cause a posterior pelvic tilt, flattening of the lumbar curve & a forward head posture…which can cause & aggravate problems in the upper body musculature.

Tight hamstrings cause a posterior translation of the tibia, which results in laxity of the ACL & increased tension on the PCL.

Because a tight adductor magnus will cause limitation of full hamstring lengthening, the adductors need to be released first!

"Growing Pains": *it is the 4th most common mu*



Supine Medial Hamstring - ACL

TrP Identification: the TP is located near the insertion of the medial hamstring, at the level of the widest part of the popliteal space

Treatment: The physician places a rolled towel or a small pillow beneath the distal femur, monitors the TP with one finger & with the other hand applies a force (maybe as great as 40 lbs) just inferior to the knee cap that is directed downward toward the table.

Proximal Medial Hamstring TPs

TrP Identification: the TP/s is/are located anywhere from the lateral margin of the ischial tuberosity to the bellies of the medial hamstring muscles

Treatment: The patient's leg is internally rotated & flexed at the hip 30-45 degrees & at the knee about 75 degrees (a knee or pillow can be used to accomplish this). Minor adjustments are made with respect to these positions until the TP dissipates.

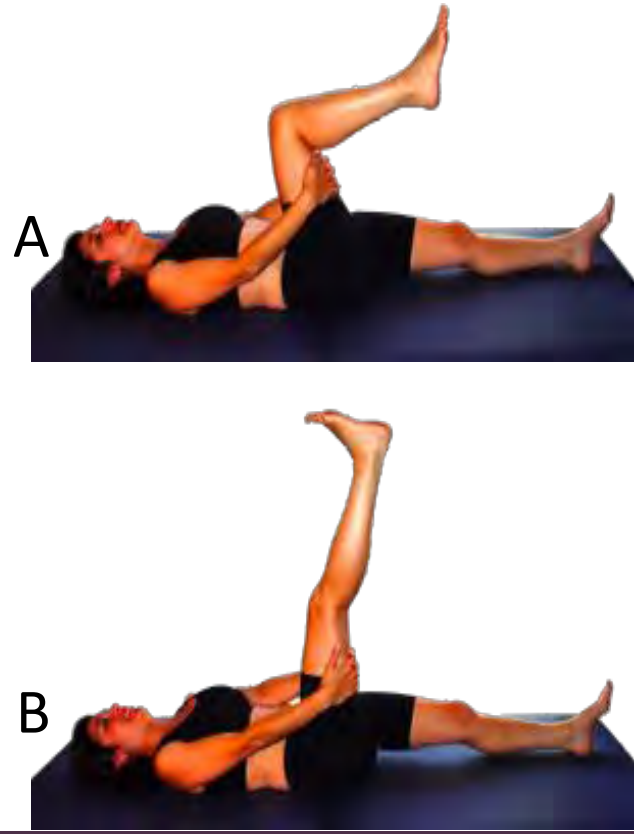
Prone Biceps Femoris

TrP Identification: the TP/s is/are located anywhere from the insertion of the biceps femoris to its belly

Treatment: The patient's leg is extended at the hip 30 degrees (a knee or pillow can be used to accomplish this) & at the knee about 75-90 degrees with external rotation at the knee. Minor adjustments are made with respect to these positions until the TP dissipates.

Hamstring Stretch

Lay down upon your back with a rolled towel underneath your lower spine for support. Grasp the back of one of your thighs with both hands & pull your leg so that it is at a near right-angle at your hip (figure A). Straighten your knee to the best of your ability & then point your toes to your face (figure B). Try to press your heel toward the ceiling. Hold this position for 20-30 seconds. Repeat this exercise 3 times and then 3 times a day on both sides.



Standing Hamstring Stretch

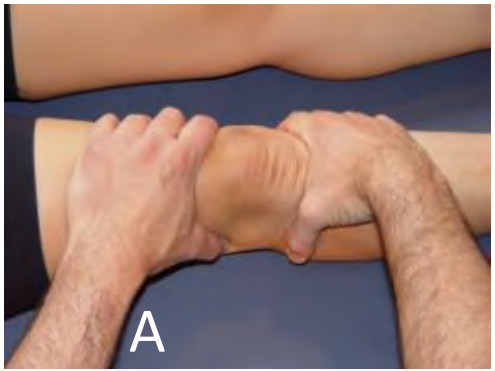
Using a wall or flat table, place your hands upon it. Your feet should be about 6 inches apart. The goal is to keep your neck, upper & lower back relatively flat & elongated putting your feet beneath your lower abdomen & trying to straighten your legs so that your buttocks goes toward the ceiling. Hold this position for 20-30 seconds. Then, relax and, while keeping your spine straight, bend your knees as if you were going to sit down on something. Repeat this exercise 3 times.

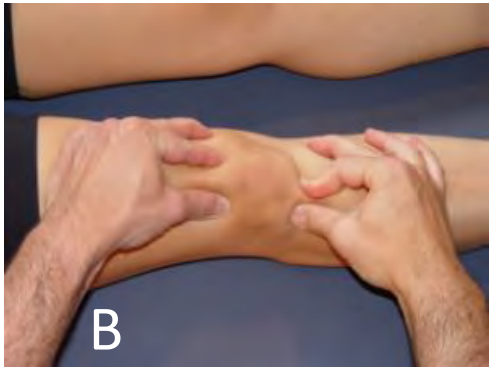
Deep Pressure

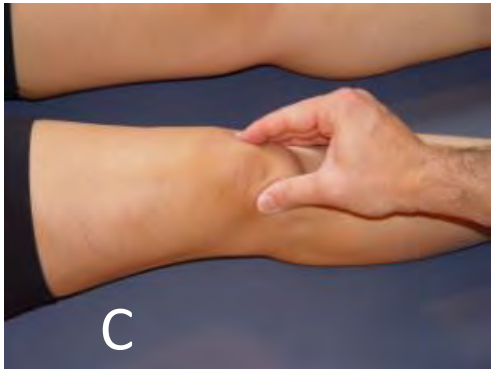
Lay upon your back. A tennis ball can be used to create pressure on the tender points. Allow your thigh to dwell upon or to roll the ball beneath the tender points, like a massage, until they disappear or until you think you've had enough! I always recommend a good stretch after this self-massage!

Knee Tests

- Knee Rotation Test (figure A)
- Suprapatellar & Infrapatellar location Test (figure B)
- Patellar Mobility Test (figure C)







Quadriceps Test w/MET

The physician uses one hand to flex the leg to the patient's buttocks. The physician should be able to flex the patient's leg so that the patient's heel touches their buttorcks. *A patient with osteoarthritis of the knee may not be able to perform this test.*

positive

negative

Rectus Femoris CS

The physician stands on the same side of the patient & **flexes** her thigh while keeping the knee extended, as shown in figure C. Minor adjustments are made with respect to these motions *and the physician should* ***push the knee cap toward the TP*** until it dissipates.

Vastus Medialis CS

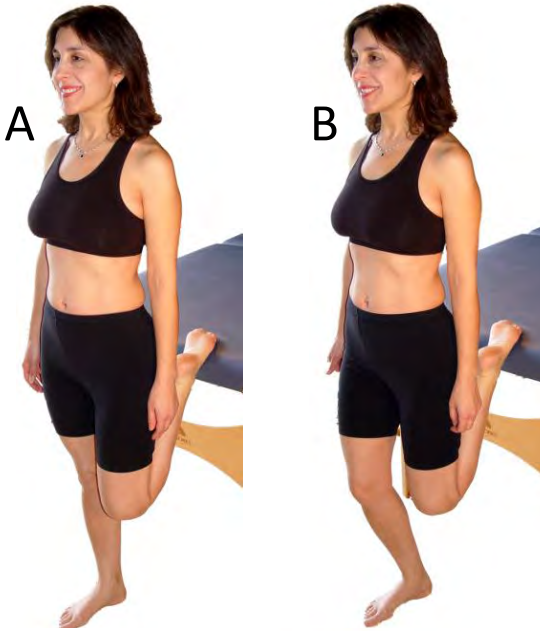
The physician stands on the same side of the patient, **flexes** & **adducts** her thigh while keeping the knee extended, as shown in figure A. Minor adjustments are made with respect to these motions *and the physician should* ***push the knee cap toward the TP*** until it dissipates.

Vastus Lateralis CS

The physician stands on the same side of the patient, **flexes** & **abducts** her thigh while keeping the knee extended, as shown in figure A. Minor adjustments are made with respect to these motions *and the physician should* ***push the knee cap toward the TP*** until it dissipates.

Rectus Femoris Stretch

Place your foot on a table or upon a pillow on your bed so that your knee is bent & your hip is relatively straight, figure A. Bend the knee upon which you are standing until you begin to feel some tension in your thigh, as shown in figure B. Then, tighten your buttock muscles. The feeling of tension should increase on the side being stretched. Hold this position for 20 seconds. Repeat this exercise 3 times and then 3 times a day on both sides.



Calf Muscles

Gastrocnemius Muscle

Origin: the larger *medial head* originates from the popliteal surface of the femur, superior to the medial condyle; the *lateral head* originates from the lateral surface of the lateral condyle of the femur & often contains a sesamoid bone, called a fabella.

Insertion: upon the posterior surface of the calcaneus via the Achilles tendon

Soleus Muscle

Origin: from the posterior aspect of the head & superior ¼ of the fibula, soleal line, & middle 1/3rd of the medial border of the tibia.

Insertion: the tendon has a 90 degree twist before finally inserting upon the posterior surface of the calcaneus via the Achilles tendon

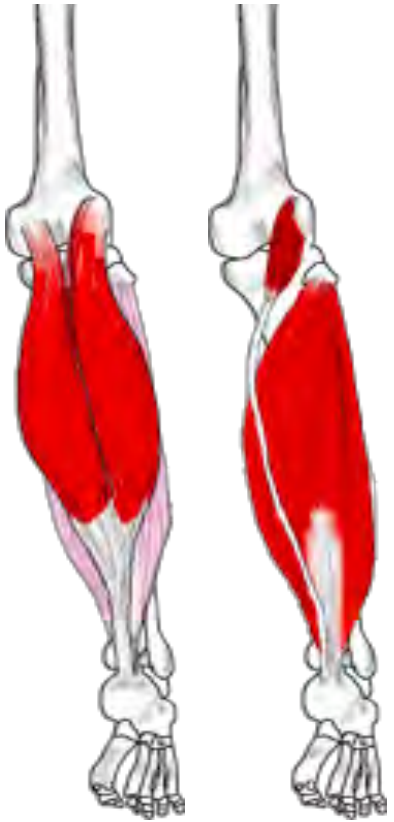
Plantaris Muscle

Origin: from the inferior end of the lateral supracondular line & the oblique popliteal ligament.

Insertion: upon the posterior surface of the calcaneus via the Achilles tendon, or separately just medial to it.

Gastrocnemius

Soleus & Plantaris



Activating/Aggravating Factors

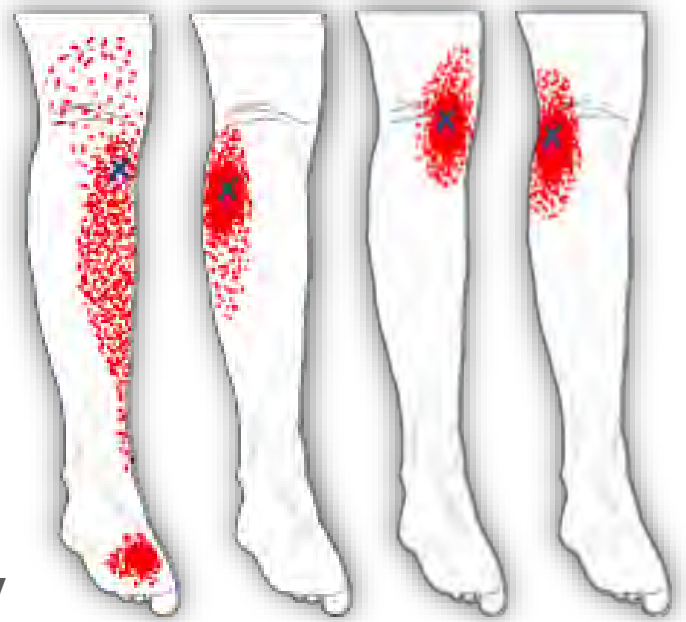
Calf Muscle Pain/Injury

&

Life

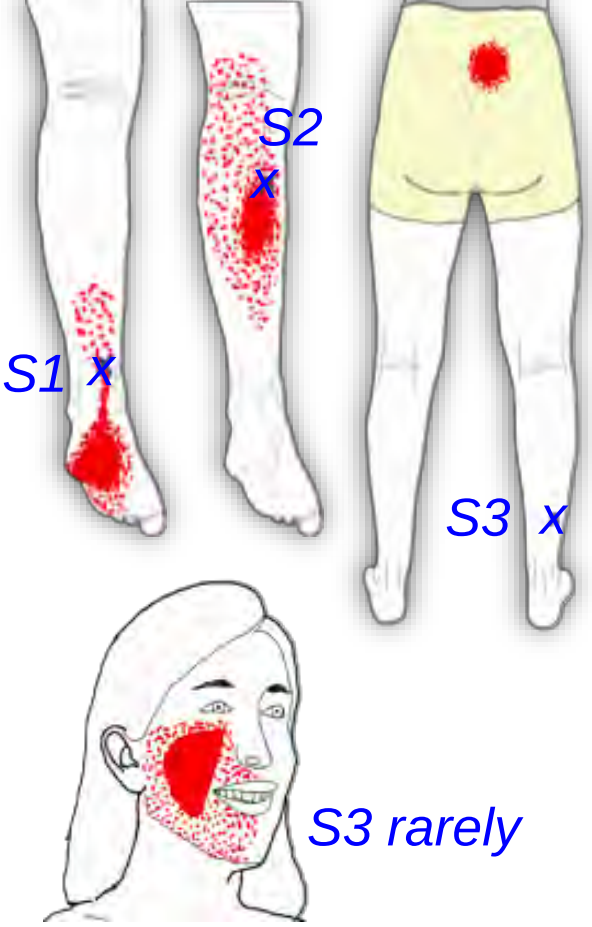
Sx: Gastrocnemius

- **Both G1 & G2 are likely to be associated with *nocturnal calf cramps*:**
  - *Occasionally, patients discover the **stretch which results in full relief of pain: The combined position of hip extension & knee flexion required to stretch the rectus**.*
- **Latent TrPs result mainly in calf cramps.**
- **Active TrPs result pain as described.**
- **Pain in the back of the knee with use:** *when climbing inclines, over rocks or when walking on the beach, or on the slope of a domed road.*
- **If standing flat footed, the patient cannot usually fully extend the knee.**



Sx: Soleus

- *Upper soleus TrPs may interfere with the musculovenous pump, resulting in symptoms of calf & foot pain with edema of the foot & ankle.*
- ***Soleus TrPs** restrict ankle dorsiflexion.*
  - *The restriction of ankle dorsiflexion results in difficulty lifting properly. Patients with this restriction have to bend more at the waist to compensate for the poor flexibility in their ankles.*
  - ***Patients cannot squat unless on their toes.***
- *Very active soleus TrPs results in **difficulty walking & even immobilization**.*



S3 rarely

Calf Counterstrain

- The patient's leg is flexed at the knee and the dorsum of the foot rests on the physician's thigh.
- The physician directs a force through the foot accentuating plantar flexion & through the leg axially compressing towards the knee joint.
- ***The medial gastrocnemius is treated with internal rotation of the leg added & the lateral gastrocnemius is treated with external rotation added.***
- Minor adjustments are made with these motions until the TP dissipates.
- This position of ease is held for at least *90 seconds*.
- The patient is slowly *returned to neutral* and the point is retested.

Holding Up the Wall-stretch

- The patient leans against the wall with one foot forward & the other back, but she keeps both feet flat on the floor.
- The forward leg should be bent at the knee & the back leg should have the knee straight to stretch the gastrocnemius (figure A).
- The back leg can be bent as long as the heel doesn't leave the floor to stretch the soleus (figure B).
- This position is held for 15-30 seconds & then repeat on the other side.
- This exercise is repeated on both sides for 3-5 times & then 3 times a day.

Soleus Kneeling Stretch

- Shoeless, the patient kneels upon her knees with her toes tucked underneath, figure A.
- Placing her hands in the prayer position corrects upper postural imbalances, figure B.
- The patient should place just enough weight upon her toes as she sits back so that she is at “the feather’s edge of discomfort” & hold this position for 15 seconds.
- The next part of this exercise brings her forward onto her elbows, taking the weight off of her heels, figure C. Hold this position for 3 deep breaths. Then return to the start position.
- This exercise is repeated 3-5 times & then 3 times a day.

Peroneal Muscles

Peroneus Longus Muscle *(illustrated in red)*

Origin: from the lateral aspect of the head & proximal 2/3rds of the fibula.

Insertion: via a route curving posterior around the lateral malleolus, which it uses as a pulley, through a groove on the anteroinferior aspect of the cuboid & crossing the sole of the foot to insert ***upon the base of the 1st metatarsal & cuneiform bones***.

Peroneus Brevis Muscle *(illustrated in pink)*

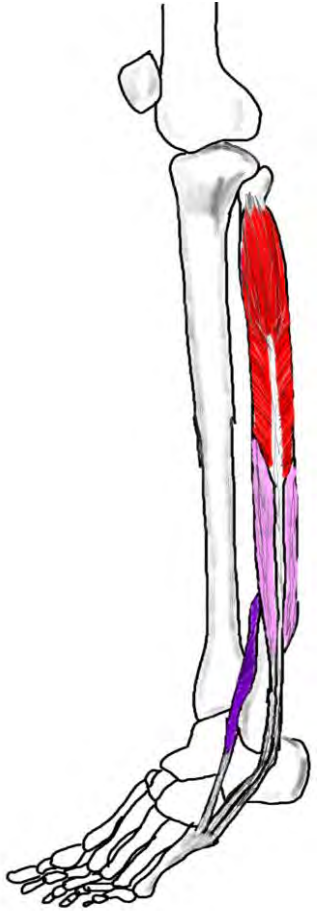
Origin: from the lateral aspect of the inferior 2/3rds of the fibula.

Insertion: into the dorsolateral surface of the base of the 5th metatarsal.

Peroneus Tertius Muscle *(illustrated in purple)*

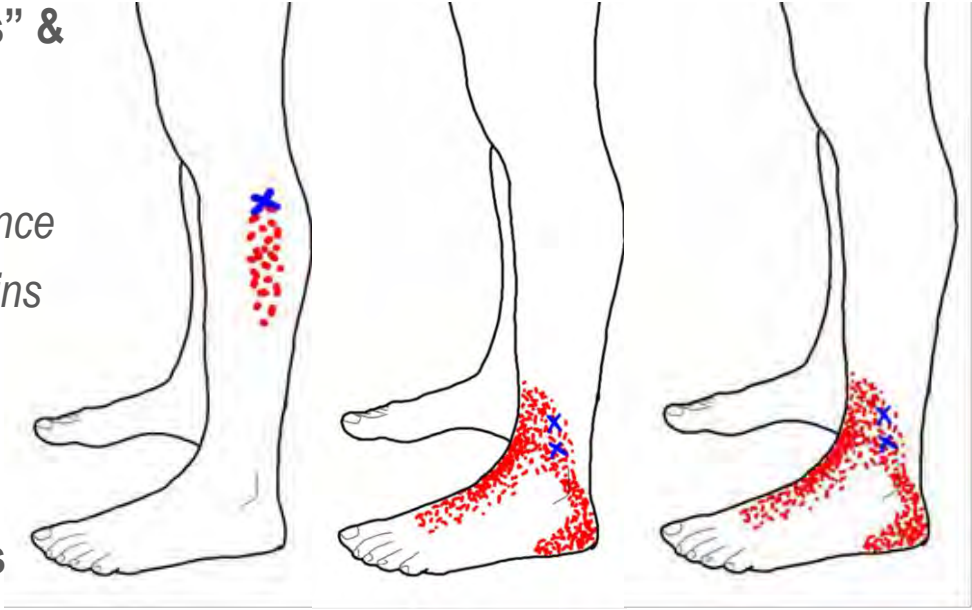
Origin: from the anterior surface of the inferior 1/3rd of the fibula & interosseous membrane.

Insertion: into dorsum of the base of the 5th metatarsal bone & often along the body of the bone.



Peroneal S/Sx's

- **The patient may complain of "weak ankles" & "frequent ankle sprains".**
- **Difficulty with balance.**
  - *Suddenly, experience difficulty with balance*
  - *Makes people more prone to ankle sprains &/or fractures.*
- **Morton's foot .**
- **Note excessive pronation in gait & stance.**
- **The muscle that most commonly develops secondary TrPs is the extensor digitorum longus.**



Peroneal Counterstrain

Peroneus Longus & Brevis: The patient's leg is flexed 90 degrees at the knee. The physician uses his hand on the patient's heel to stabilize his fore.arm along the long axis of the patient's foot. A dorsiflexion and eversion force can be introduced in this manner. Minor adjustments are made with these motions until the TP dissipates.

Peroneus Tertius: The patient's leg is flexed 90 degrees at the knee. The physician uses his hand on the patient's heel to stabilize his forearm along the long axis of the patient's foot. A dorsiflexion and eversion force can be introduced in this manner. Minor adjustments are made with these motions until the TP dissipates

Peroneal Muscle Self-massage

Rub you leg from your outer ankle to your outer knee. If you find any tender points you can apply pressure to the feather's edge of discomfort on that point with your thumbs or fingers (figure A). You can also slides your thumb or fingers along the muscle keeping the pressure the same. This is repeated several times until the tenderness disappears. *Hand lotion or a homeopathic lotion work well to facilitate the release of tension in this muscle.*

Pedal Retraining Exercise

1. The patient is sitting comfortably with her feet flat on the floor
2. She press her toes into the ground for 5 seconds & then return to the starting position for 5 seconds.
3. She then lifts her toes off the ground rocking her feet onto her heels for 5 seconds & then return to the starting position for 5 seconds.
4. She should repeat steps 2-3 for 6-15 repetitions.

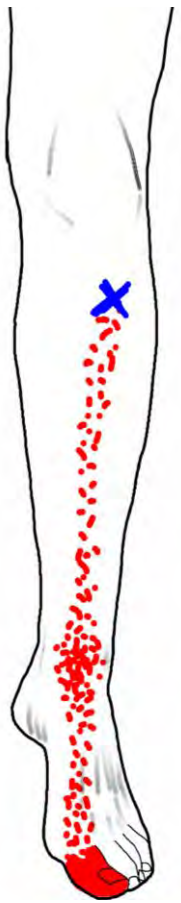
Perform this balancing exercise every ½ hour when sitting for extended periods.

Tibialis Anterior

Origin: from the lateral condyle & the superior ½ of the lateral surface of the tibia; also some fibers arise from the deep fascia of the leg & the interosseous membrane.

Insertion: upon the medial & inferior surfaces of the medial cuneiform & the base of the 1st metatarsal bone.

- ***Painful motion of the ankle may be present in the absence of joint injury.***
- ***Most likely involves additional muscles.***
- The **muscle is most active at toe off & at heel strike (which when weakened results in a foot slap).**
- ***Aggravated by excessive standing, long walks, not warming up properly snow-shoes***
- ***This is a cause of "shin splints".***
- ***In men, the use of a heel lift will aggravate this muscle & in women it may relieve TrPs in this muscle (because they are accustomed to high heels).***
- It **doesn't contribute much to arch support, *except* in those with flat feet**.



Tibialis Anterior Counterstrain

The patient's leg is flexed 90 degrees at the knee. The physician uses his hand to stabilize his forearm along the long axis of the patient's foot with the radius aligned just medial to the 1st phalanx. A dorsiflexion and inversion force can be introduced in this manner. Minor adjustments are made with these motions until the TP dissipates.

Tibialis Anterior Seated Self-stretch

Sit down comfortably & reach your foot back under the chair so that the back of your foot is on the floor (see figure A). Press down with the back of your toes into the floor for 15 seconds. Relax your contraction see if you can point your toe more & twist your foot even more inwards. Repeat this exercise 3 times and then 3 times a day.

Heel Pain & the Quadratus Plantae

Origin: the *medial head* originates from the medial surface of the calcaneous; the *lateral head* originates from the lateral margin of the plantar surface of the calcaneous & long plantar ligament.

Insertion: upon the posterolateral margin of the tendon of the flexor digitorum longus.

Primary complaint: ***Patients may complain of:***

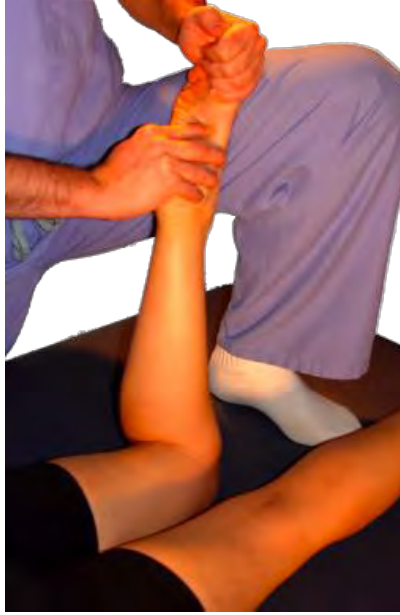
- ***Inability to walk very long***
- ***Numbness or a feeling of swelling of the feet.***
- ***Usually have tried various sorts of shoes & orthotic inserts without success & these often aggravate the TrPs.***
  - *Appropriate arch supports are usually well tolerated & helpful once the TrPs are eliminated.*

Muscular imbalances & articular dysfunctions in the foot may lead to problems in any proximal segment of the body, including knee, hip, pelvis & spine.

Hyperpronated feet are prone to TrP activation of these muscles.

Quadratus Plantae Counterstrain

Prone: The patient's forefoot is supported by the physician's thigh, which he uses to help maintain the foot in plantar flexion. The physician monitors the TP and applies an pressure to the posterior part of the heel while plantarflexing the forefoot through the toes with the other hand. Minor adjustments are made with this motion until the TP dissipates.



Supine: The physician, using the palm & heel of his hand, applies a force in the direction of plantarflexion over the toes to approximate the forefoot and the heel. Usually, a hand is placed between the heel and the table to monitor with 1 finger on the TP. Minor adjustments are made with this motion until the TP dissipates.

Deep Pressure

In the seated position you can use a golf ball, roller pin or foot massage device to apply a deep pressure to a sore spot. Simply roll the object around the bottom of your foot looking for areas of discomfort. Once found allow your foot to dwell there with pressure on it to the feather's edge of discomfort. As the discomfort goes away allow yourself to increase the pressure until your full weight is on it & you no longer experience the discomfort. Repeat this exercise 1-3 times a day until you no longer have foot discomfort.

Self-Stretch

Sit in a chair with one leg crossed over the other & grasp your toes pulling them back towards you (figure A & close-up in figure B). Gently push your toes into your fingers for 15 seconds. Relax your push & see if you your toes extend further. Repeat this exercise 3 times and then 3 times a day.

This stretch can also be performed in a nice warm bath or hot tub to maximize the stretch!