Welcome to Beyond Trigger Point Seminars Legs and Arms Unit Module 2 on the Peroneal muscles, Tibialis anterior, Gastrocnemius and Soleus. In this lesson we will be discussing ankle and foot problems. The ankle like the knee is a hinge joint. This allows for a pure one directional line of movement fore and aft. We will see shortly how the geometric design and construction of the foot creates a beautiful vehicle to propel us forward in life. Conversely a leg and foot plagued with fascial imbalances and trigger points (TrPs) creates all sorts of biomechanical havoc.

When the ankle connects the foot to the earth, the foot economically lifts and balances the body’s mass with every weight bearing move we make. So our body weight is being transmitted and distributed across the foot’s surface. No wonder imbalances and chronic holding positions of our legs and feet cause imbalances to the whole body and, like a tattle teller; imbalances at higher levels in our structure will unmistakable show in our ankles and feet as well. When problems in the feet are corrected, then problems in the upper body are, and I quote, “understood”. By standing on a firmer base of understanding it’s my hope you will more regularly identify and correct some primary perpetuating factors affecting the entire human structure.

The foot contains 26 bones, 20 intrinsic muscles and 31 joints. The ankle joint, also called the talocrural joint, is formed where the talus bone of the heel and the tibia and fibula bones of the leg meet. This articulation allows for the pure forward and back movements. On page 11 of the study guide, the articulation between the talus bone of the heel and the calcaneus bone underneath it forms the subtalar joint. The subtalar joint also allows for the same fore and aft movement of the ankle and, because of the articulating bones concave and convex shape, it secondly allows for lateral and medial movement. What I want you to remember is together, the ankle and subtalar joints fulfill the foot’s function of receiving the body’s weight and balancing it on uneven surfaces like a sandy beach.

The remaining boney components of the foot can be viewed as two units. The picture on the upper right of page 11 shows how the foot is divided into a lateral and medial foot. The lateral foot, containing toes four and five along with the lateral arch, is involved with receiving and supporting the body’s weight. The medial foot, containing the big toe through toe three along with the medial arch, is involved with pushing the foot forward. In the words of
Ida Rolf, "A confident foot integrates these two relatively independent units." Each segment meets its demands by being arched in form. Do you see on the left hand picture how the bones, ligaments and muscles form arches? Functionally they are inseparable. The arches make the foot flexible, adaptable to surfaces, shock absorbable and capable of distributing the weight of the body. Customarily, the longitudinal curvature is divided into medial and lateral arches. The lateral arch is formed by a number of bones, ligaments and two muscles: the peroneus brevis and peroneus longus. As you have observed when walking the beach, the lateral edge of the foot is lower and contacts the ground making the lateral arch more involved in weight bearing. The height and flexibility of the medial longitudinal arch is more variable and is involved in propulsion. For example, as Gray’s Anatomy, the book not the TV show, states, “… muscular insufficiency is the commonest cause of flat feet, in which ligaments elongate and bones in consequence alter in shape.” Lastly, a transverse arch, not shown on your study guide, wraps around the foot from left to right like rubber bands around the long metatarsal bones. The pull and relaxation of the transverse arch comes from the muscular support of the adductor hallucis, the peroneus longus, tibialis posterior and the small interossei. On the aside, there are no quiz questions about the arches.

Trigger points in the legs and feet can be activated and perpetuated when structure is struggling to maintain equipoise. The value of understanding foot configuration as it relates to treating myofascial pain syndromes is in helping you identify which muscles are compensating. During walking or running, the weight of our body is ideally distributed onto a strong triangular base. Like a coin rolling around its rim on a countertop, weight transmits from the heel to the lateral foot around to the ball of the big toe. Soon you will be able to identify and correct a commonly found variation to this weight transfer. During our workshop we will also develop treatment strategies to structurally restore balance to the arches, feet and ankles.

We begin our study of the muscles by looking at two actions of the tibialis anterior.
1. It strongly dorsiflexes and less strongly inverts. Because it inserts on the big toe’s metatarsal base, it pulls the toes up- dorsiflexion, to clear the floor when walking.
2. Maintains standing balance. When leaning backwards the tibialis anterior becomes active to control excessive posterior sway.
On page 12 of the study guide or page 356 of the textbook you see the one commonly occurring trigger point and pain pattern associated with the tibialis anterior. You will from this day forth, impress your clients by knowing just where to press to reproduce their big toe pain. Also draw the spillover pattern down the shin and into the anterior ankle. This TrP often occurs in association with TrPs in other leg muscles as we will understand soon. Dr. Travell nicknamed this muscle *Foot-Drop Muscle*. On the top of page 13, the following three symptoms caused from this TrP are:

1. Dragging of the toes or ankle weakness that can lead to tripping, falling and ankle injuries.

2. Painful ankle range of motion.

3. Referred pain that you just drew.

A counter indication to consider when someone presents with anterior leg pain is an anterior compartment syndrome. A physician’s immediate attention is needed when the area over the tibialis anterior has, and the fill-in is; diffuse tightness and tenderness. In other words, if the area is hot and red and it looks like the skin is ready to pop and the patient is telling you how painful it is to point or flex their foot, then refer them to a physician immediately. When the anterior compartment’s soft tissue becomes so tight and adhered that circulation is impaired, nerve and muscle necrosis can occur. Immediate medical attention is required. A surgeon might need to slit through the unyielding fascial wrapping to release the restriction.

Both the tibialis anterior TrP and anterior compartment syndromes develop from squatting too long. Athletes can predispose themselves to anterior compartment syndromes and TrPs when tight shortened calf muscles overpower the four weaker anterior compartment muscles: tibialis anterior, extensor digitorum longus, extensor hallucis longus and peroneus longus. Like every other part of our body a balance is being maintained between stronger and weaker muscles. Our job is to maintain this delicate balance before a serious problem arises. According to our text, once postnecrotic scarring of the muscles and nerves within the compartment occur, massage and injection are poorly tolerated. Remind your clients how lucky they are having you do preventative work on them.
The primary answer for the next question- What are the corrective actions for the tibialis anterior? - release calf tightness. Show me a tight tibialis anterior and I will show you a tight calf muscle.

For example, a cowboy boot wearing gentleman presented to my office with a long history of calf tightness, pain in his big toe, 9 or 10 sprained ankles he could recall from his youth and a posterior sway when I asked him to stand tall for a postural assessment. He also presented with a long second toe configuration which we will discuss later, and TrPs in other leg muscles. The corrective actions for him were to stop wearing boots with heels, to stretch his calf, strengthen his other ankle muscles and to sleep with his feet in an anatomical neutral position. Using his truck’s cruise control freed his foot from the immobility of pressing on the accelerator. I also corrected the long second toe by placing an insert in his shoes; an easy correction you’ll be able to make with powerful effects on the ankles, knees and hips. So the corrective actions are:

- Stretch the calf and strengthen the ankle. During the workshop, you will receive hand-outs on patient homecare. You might also check the resource tab at www.beyondtriggerpoints.com for free patient handouts.
- Sleep with the foot in an anatomical neutral position
- Use cruise control when driving long distances

Now let’s review the actions of the three peroneal muscles.

1. All three control movement of the foot. In other words, through lengthening contraction the position of the foot is controlled during standing and walking especially when pushing off the great toe.
2. All three evert the foot.

There are four documented TrPs: one in the proximal peroneus longus, another in the brevis and two TrPs more distally in the peroneus tertius. On page 12 or page 372 of the text, the primary pain pattern for the longus and brevis is shown on the lateral malleolus of the ankle and along the lateral foot. The peroneus tertius refers pain and tenderness along the front of the ankle and has a spillover pattern behind the lateral malleolus into the lateral aspect of the heel. The nickname of the peroneal muscles is Weak Ankle Muscle. If you are jotting the name down on the space provided on page 12, the name again for the peroneal muscles is Weak Ankle Muscle and the
nickname again of the tibialis anterior is the Foot Drop Muscle. Because the peroneus longus and tibialis anterior muscles attach on opposite sides of the same bone, the first metatarsal, together they act as a sling for control of inversion and eversion of the foot.

On page 15, “How are the peroneal muscles activated and perpetuated?”

1. Ankle injuries and the subsequent immobility. Fortunately the soft ankle casts used today allow for more movement of the ankle and less loss of strength then did the hard plaster casts.
2. Wearing high heels or keeping the foot pointed at night.
3. Having flat feet. Fallen arches can cause the peroneal muscles to be more active.
4. A Morton’s foot configuration as shown on page 15 or 381 of the text. This brings us to the commonly found foot variation I mentioned earlier. In 1935 Dr. Dudley Morton described a foot variation whereby the second metatarsal head is longer than the first metatarsal head. Or depending how you view it, I could have said the first metatarsal head is shorter than the second. Either way when the toes are flexed at the metatarsophalangeal joints as shown in picture A, the head of the second metatarsal bone is more distal than the first. On picture B you can see how the second toe is longer than the first. I know, if you have this foot configuration, your mother may have told you it’s a sign of intelligence! Or you may have heard it referred to as a Classic Greek Foot because of its prevalence in Greek statues. In Picture D the long web shown between the second and third toe is also characteristic of the Morton foot structure. On picture C, the middle finger of the examiner is pointing to where calluses form underneath the second metatarsal head. Shoes will also show uneven wear. The calluses and uneven wear are indicative of the strain caused from walking on a long second toe structure. Instead of walking on a strong triangular base, weight bearing progresses from the heel to the protruding head of the second metatarsal. It’s like walking on an ice skate blade. The individual compensates by everting the foot. This pronation of the foot can lead to TrP formation in the peroneal longus and brevis. It also leads to compensatory corrections up the kinetic line. Chiefly the vastus medialis and gluteus medius above are involved with the peroneal muscles below attempting to compensate for the foot’s unstable rocking movements.
The global structural picture is this; pronation of the ankles causes the entire body to bio-implode. Over time, when the ankles roll-in the knees begin to knock, the shoulders medially rotate, the chest collapses and the head juts forward.

Answering the question now- What are the corrective actions? I will mention six.

1. Correct the long second toe. If you aren’t joining us for the hands-on seminar, I encourage you to visit www.posturedynamics.com. It’s a wonderful site on how to measure and correct pronation through an inexpensive insole placed in the shoes that reeducate the foot to walk on a triangular base instead of a knife-edge. The pictures at the bottom of page 15 show how to build your own insole. And for years I built plenty of these. But more recently, I use the product found at posture dynamics because it saves me time and the insole is more permanent than the one I built with a Dr Scholl’s Air Cushion and moles skin felt.
2. Get off the high heels.
3. Sleep in anatomical neutral. If they are a back sleeper, then loosen the sheets at the foot of the bed. We do not want their toes pointed at night.
4. Walk on flat surfaces. If they really love walking on a slanted surface like a beach, turn around and walk back the other way. When they train horses they turn the race horse around and run them both ways.
5. Discard shoes that hinder dynamic balance and socks with tight elastic at the top that restrict blood flow.
6. Alternatingly stretch by edging the foot in the same way you learn to roll the foot from the lateral to the medial edge when skiing.

If there was more time I would talk about the other anterior compartment muscle, the extensor digitorum. In a sentence, these long extensors of the toes are commonly associated with hammer or claw toes caused by muscular imbalances.

Let's go around to the back of the leg and look at the more superficial gastrocnemius. The gastrocnemius crosses two joints. So its two actions are to flex the knee and plantar flex the ankle. Interestingly, unless balance is disturbed as when the body weight is leaning forward, this muscle is
electrically quiet when standing erect. This is why when we see a forward head posture; we typically see tight calves along with an overly tense gluteus maximus, a tight pec major and tight posterior cervicals.

The four documented trigger points shown on page 17 or page 399 create pain patterns in the posterior calf, behind the knee and, in the case of the medial head-TrP1, to the arch of the foot. Go ahead now and draw those pain patterns.

The nickname for this muscle is Calf Cramp Muscle. Why? Because the most frequent symptom associated with trigger points in the gastrocnemius is nocturnal calf cramps.

On page 18, in one review sited in our text beginning on page 407, calf cramps are associated with:

- Dehydration and electrolyte imbalance. Sweating, persistent vomiting or diarrhea can cause dehydration and electrolyte imbalance.
- Low calcium and potassium levels associated with pregnancy
- Low serum magnesium can also cause calf cramps
- Parkinson Disease and possibly diabetes
- Lumbar disc disease- In 20 to 30% of 1500 patients, L5 compression produced cramps in the anterior compartment of the leg and S1 compression produced cramps in the calf.
- Certain drugs- lithium being one has the side effect of calf cramps.
- Sleep apnea, fatigue, forceful contraction and chilling

This is an incomplete list. There are many other reasons for why a person develops night cramps. Night cramps are not fully understood. But many of these factors can also activate and perpetuate TrPs in the gastrocnemius muscle.

You can spot someone with tight calves by the way they walk into your office. You tend to hear them first because they walk flat footed. Their gait is also stiff because it’s difficult to extend the knee, walk fast or on uneven surfaces. I have thought Dr Phil might have tight calf muscles. I know he is an avid tennis player. He has that flat footed, stiff gait typical of someone with tight calves and hamstrings. That’s just a guess.
A seasoned therapist knows when a client develops a calf cramp on your table; the best thing to do is... nothing. Just a little bit of action or movement can worsen the cramp. So, just let that cramp ease up by itself. If the client asks for help, then gently flex the ankle. Answering the question,” What is a remedy for relieving a calf cramp”, again, do nothing or if asked to help, passively stretch the calf.

Fortunately for you a check list of gastrocnemius corrective actions is already printed on the study guide. So we will now move on to the last muscle of this module-the soleus.

Because the soleus muscle only crosses one joint, it is:

1. The workhorse of ankle flexion
2. A venous pump- Strong contractions of the soleus muscle returns blood from the lower limb towards the heart.

Its nicknamed after it primary pain complaint shown back on page 17, Joggers Heel. Recreational runners site it as their most frequent complaint.

The soleus muscle does not cause calf cramps. Pain and tenderness to the heel and to the distal end of the Achilles tendon is the most common referral from TrP1. Less commonly found is TrP2 with it’s referral into the calf. TrP3 is rare. You see how it refers into the sacroiliac joint. Honestly I have never found that trigger point on somebody. But, Dr. Simon has and you might have someone present tomorrow with TrP3.

On page 20, four other sources of heel pain we commonly encounter as massage therapists are:

- Plantar fasciitis- we will be learning some treatment strategies for dealing with the myofascial tissue on the plantar surface of the foot during our workshop.
- Heel spurs occurring on the plantar surface of the calcaneus bone. You might ask though if an X-ray was taken of both feet to determine if they have the same spur growth on the contralateral pain-free heel.
- Achilles tendonitis- inflammation around the heel cord.
- Stress fractures from sports activity.
Along with heel pain, the soleus is involved with shin splints. There are three conditions leading to painful shin splints in the medial region of the leg where the soleus merges into the tibia and the bone’s surrounding membrane.

1. Chronic periostalgia-In English that means micro-tears along the attachment sites of the soleus into the periosteal membrane surrounding the tibia. Micro-tears are likely to occur with repetitive rhythmic exercise like running.
2. Stress fractures of the tibia. Athletes are unable to “run through” the pain. Stress fractures require six to ten weeks of complete rest and then a period of reconditioning.
3. Compartment syndrome. Although an anterior compartment syndrome is recognized more often, the superficial posterior compartment, containing the soleus and gastrocnemius, can gradually develop increased pressure. There will be a sense of tightness and a dull ache deep into the calf muscles that doesn’t respond well to your work. This requires a doctor’s attention.

Factors activating and perpetuating trigger points in the soleus muscle are due to a number of mechanical stresses.

- One is running on the toes.
- Another is hiking uphill or walking on uneven surfaces. Muscles on the downward side work harder.
- Overload occurs when wearing inflexible shoes that don’t allow for toe movement like in the platform shoes some ladies wear.
- Finally a leg length inequality can activate and perpetuate a soleus TrP. The body weight is shifted more heavily to the short leg and more likely to overload the short side’s soleus.

One of my very first clients was an adorable Greek woman who ran a deli down the road. She was a stout, short, strong woman. Her job was to stand behind the refrigerated deli case and take orders. She stood on her toes to peak over the countertop. When she had time to sit she wrapped her toes around the wrung of the stool. She came in with a pain in her heel. The doctor had diagnosed plantar fasciitis. What she really had though was a soleus trigger point that reproduced her heel pain. I set a telephone book by her stool to keep her feet flat. Then she learned to keep her calves warm by
wearing socks instead of tight knee high stockings. That made her doubly
cute because she only wore dresses. She responded real well.

The corrective actions for the soleus are similar to the gastrocnemius. How
easy is that?

In the next two modules we will study the arms. Until then, stay in touch.