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Sports Science

THE TREATMENT OF "TENNIS LEG" USING SPORT ACUPUNCTURE A MIXED METHODS APPROACH

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ABSTRACT Tennis Leg is a common repetitive stress injury of the calf. It is often seen with athletes, particularly with tennis players, endurance runners, and cyclists. It is also common with active people over the age of 40, who partake in strenuous exercise, have weak core muscles, do not warm-up prior to play, and/or who have short, tight, inflexible muscles of the posterior lower leg (Nsitem, 2013; Stinson, 2018). If not treated properly this condition can often reoccur, leading to compensatory issues and arthrokinematic dysfunction above and/or below the lesion. This is a case of a professional tennis player with reoccurring calf pain, who was originally diagnosed with a grade 2 soleus strain five months prior. An effective way of treating these types of muscle strains is by using a mixed methods approach to treatment. Using both a conventional Western treatment model and integrating Chinese medicine has been a particularly successful approach for treating this reoccurring condition.

KEYWORDS : Acupuncture, Athlete, Tennis-leg, Calf, Sprain

INTRODUCTION

Injuries most typically strains or tears in calf muscles, of the lower leg, are relatively common sport-associated conditions, and are also referred to as "tennis leg" (Nsitem, 2013). This can happen and is rather common with many athletes, particularly tennis players (Harwin, & Richardson, 2017). People also susceptible to this strain are usually over the age of 40, who partake in strenuous exercise, who are over trained, have weak core muscles, do not warm-up prior to play, and/or who have short, tight, inflexible muscles of the posterior lower leg (Nsitem, 2013; Stinson, 2018). The muscles involved are usually the gastrocnemius, soleus, and/or plantaris (Dixon, 2009). The medial head of the gastrocnemius being the most common and the plantaris as being the least common (Harwin, & Richardson, 2017). The strain is usually incurred with extension of the knee and forced dorsiflexion of the ankle (Harwin, & Richardson, 2017).

CASE REPORT

CHIEF COMPLAINT (CC)

The patient is a 28-year-old healthy female, professional tennis player presented with a chief complaint of recurring right posterior calf pain. She had an MRI and was diagnosed with a grade two soleus strain five months prior. Second complaint: Loss of left forearm pronation due to wrist surgery.

HISTORY OF PRESENT ILLNESS

October 13, 2018 patient requested to have acupuncture therapy for reoccurring calf pain. The patient had an MRI of her right calf and it revealed a grade two muscle strain located on the medial aspect of the soleus just below the lower border of the medial head of the gastrocnemius. She sought out a sport acupuncturist because she was not satisfied with the physical therapy (PT) she was receiving for her calf. In May of 2018, both the wrist fracture and soleus strain happened in a fall while playing tennis. The patient has had 2 surgeries and PT to treat her left wrist. The patient has made good progress and is currently in PT to regain full range of motion with wrist pronation. However, she was not making progress with PT for her soleus strain. The patient expressed her frustration and was desperate since she has not been able to play tennis or train since the accident, and had a tournament scheduled in Tunisia for November 6th, 2018. She explained that during the initial experience she felt a sudden and sharp "tearing" sensation at the back of her right calf during a lateral push-off or side-step where the left leg abducted and extended, and the foot dorsiflexed in the toe-off phase of gait. She contributes the fall and consequent wrist fracture to the soleus strain. The patient had been in PT for months and thought her calf would have healed. She reported that she kept re-straining her calf because she was feeling better, without pain, and over time thought it healed. Feeling better gave her the confidence to start training again only to restrain it. This cycle kept happening and consequently she would feel the "tearing" sensation again and again.

PHYSICAL EXAMINATION

Examination revealed an antalgic gait, favoring the left leg. Patient exhibited pain and limited ROM with passive dorsiflexion of involved leg, 17 degrees as compared to 21 degrees. Ankle plantar flexion, foot eversion and inversion were symmetrical when comparing both sides. The patient's ankles, feet, arches, and toes were symmetrical and showed no deformation. The patient's gait did not reveal ankle overpronation. The patient had difficulty balancing on her right foot unassisted. Even though the MRI specified the injured muscle as being the soleus, a copy of the report was not obtained therefore manual testing was conducted to confirm. The soleus muscle strain was differentiated and confirmed to be the involved muscle, as compared to the plantaris and gastrocnemius muscles. The strength test conducted to differentiate the soleus from the gastrocnemius was by having the patient vary the degree of knee flexion. When the knee was in maximal flexion the patient felt more pain when generating resisted plantar flexion. The soleus becomes the primary generator of force when the knee is in maximal flexion (Dixon, 2009). Conversely with the knee in full extension the gastrocnemius provides the greater contribution and did not reveal as much pain when the patient generated resisted plantar flexion (Dixon, 2009). Also, while the knee was in maximal flexion the patient felt more pain when the ankle was passively placed in dorsiflexion to isolate a stretch as compared to when the knee was in full extension (Dixon, 2009).

The pain was located along the medial aspect of the posterior calf and extended upwards toward the knee and distally toward the ankle. The epicenter of the strain was located on the medial aspect of the soleus just below the lower border of the medial head of the gastrocnemius. Palpation revealed tenderness and a hard lesion. The pain would diminish with time and would only be felt upon deep palpation, with terminal plantar flexion or when the muscle was in a deep stretch with ankle dorsiflexion. When the patient jogged or played light tennis, she would feel a "tearing" sensation and a dull aching pain would return.

Traditional Chinese Medical Disease Category, Diagnosis, and Etiology:

齐 Qí Energy/(movement)	血液 Xiěyè blood	停滞 Tíngzhì stagnation

In Traditional Chinese Medicine (TCM) the calf injury or muscle trauma is considered qi and blood stagnation. There are other underlying patterns or conditions that could make an athlete more susceptible to muscle injury. The TCM diagnosed pattern would be called the root condition, where the actual calf injury would be considered the branch condition. This particular patient had an underlying root condition of Kidney-yin Deficiency. This TCM pattern diagnosis has an etiology of dehydration and overtraining with anxiety and frustration exacerbating the condition. The signs and symptoms that differentiate it from other possible patterns are seen with the tongue and pulse, constipation, dry and itchy skin, dandruff, dizziness, craving salty foods/snacks, night sweating, insomnia, feeling warm with bouts of flushing, sore back and knees, tinnitus, itchy and dry eyes. The TCM theory in this case is that root Kidney-yin deficiency will act on the Spleens function to create the blood and nourish the muscle. The patient is therefore susceptible to injury. This root pattern (overtraining and dehydration) lead to the subsequent branch

condition of muscle injury or qi and blood stagnation.

TREATMENT STRATEGY: A MIXED METHODS APPROACH

The treatment principle is to move qi and blood, to facilitate healing, improve flexibility and range of motion (ROM). Also, to treat the root pattern by nourishing Kidney-yin.

The Chinese theoretical assessment or pattern-diagnosis is more designed to help guide with herbal treatment and TCM style acupuncture. The treatment for this case is an eclectic mix of traditional and progressive acupuncture styles based on historical information, personal experience, evidence-based research, and from the knowledge and experience of leading authorities in the industry. It consisted of motor point acupuncture, mirror & image (Master Tung Style), trigger point/ashi (tender) point, deep tissue needling, auricular acupuncture, and TCM acupuncture to address the root pattern. Other modalities used where: deep tissue massage (myofascial shearing), guasha (with the use of CBD, copaiba, and castor oil), and cupping.

TREATMENT TIMELINE:

Date	Intervention	Results
10/16/18	Initial visit: Exam, consultation on home therapy, and treatment. Root acupuncture: Bilateral K3,6; SP6. Electro-acupuncture @ 2 Hz on right soleus: 3 common TrP locations, 2 motor points & UB57. The medial motor point was the same location as the lesion (strong mechanical stimulation). 3 Contralateral & distal tender points of the left forearm: PC4, ashi on HT channel, and SI7. Ear: Lower leg or Calf C. & Calf E. Deep calf massage with CBD balm while patient plantar and dorsiflexes the foot back and forth. Also included: Non-retention local needling to ashi points or tight hypertonic muscle tissue.	Pain VAS: from 2/10 non-weight bearing and relaxed. Pain VAS: 5/10 Patient reported it felt better but a little sore directly after treatment. VAS was not reported.
10/19/18	Repeated acupuncture treatment. Infrared heat lamp. Guasha with a mix of CBD, copaiba, and castor oil. Patient was diligent with home therapy that consists of RICE & heat, flossing, stretching, and exercises between 4-8 times throughout the day.	Pain VAS: 1/10 non-weight bearing and relaxed. Pain VAS: 3/10 weight bearing or in a stretched position. Remained relatively sore due to aggressive home therapy.
10/23/18	Repeated acupuncture treatment. Infrared heat lamp.Shearing massage with cross friction, using CBD balm. Adding castor oil and cupping right calf while patient repeatedly plantar flexed and dorsiflexed the foot, back and forth.	Oct.20th email report: “Sorry to bother you, but my calf feels awesome today! Do you think it would be wise to start jogging a little, or would it be better to just continue the strengthening and stretching exercises you've given me? I just don't want to risk a re-injury.”
10/26/18	Repeated acupuncture treatment. Infrared heat lamp. Light massage with CBD balm. Adding castor oil and cupping right calf while patient repeatedly plantar flexed and dorsiflexed the foot, back and forth. 10 minutes low level infrared light.	Patient went for light jog and started to feel slight tenderness and tension. Lesion feels smaller and less dense.
10/30/18	Repeated acupuncture treatment. Infrared heat lamp. Gentle massage with CBD. 15 minutes low level infrared light.	Lesion feels smaller and less dense. Patient was been able to jog without pulling sensation
11/2/18	Repeated acupuncture treatment. Infrared heat lamp. Gentle massage with CBD. 15 minutes low level infrared laser.	Patient reports no pain, demonstrates full ROM, and is able to play tennis

During the treatment the patient laid in the prone position with a bolster under her ankles. The TCM acupuncture to help treat the patient's underlying root pattern of Kidney-yin deficiency consisted of six points needled bilaterally: K3 & 6, and SP6. One-inch Dong Bang (DB) 36-gauge needles where used on these points to tonify yin (fluid) and blood but to also have local effects. Electric stimulation of two Hz at a tolerable intensity was applied to the following points of the right lower leg: three soleus trigger points (TrP), two soleus motor points (MP) and UB57. All points were palpable and tender. The location of the three soleus TrP's is as follows: The lower TrP (is the most common) was found along the inside aspect of the muscle just above where the Achilles tendon becomes palpable (Perry, 2015). The upper TrP was found in the upper, lateral quadrant of the muscle, a few inches below where it attaches to the head of the fibula bone (Perry, 2015). The lateral TrP is rare, but was present, and was found a few inches superior to the lower TrP, and along the lateral edge of the muscle (Perry, 2015). The location of the two MPs is as follows: the medial soleus motor point was directly below the border of the medial belly of the gastrocnemius (Warfel, 1993). This motor point happened to be in the same location as the soleus lesion. The lateral motor point was located directly below the border of the lateral belly of the gastrocnemius on the soleus muscle (Warfel, 1993). UB 57 was added for local effect including the electric stimulation. Before leaving the patient with the 20 minutes of electric stimulation, the TrP's and any ashi points were first needled with an inch and a half, 32 gage DB needles using strong stimulation of twirling and thrusting until a twitch response was received. The twitch response is when the underlying muscle will fasciculate in response to the needle stimulation. The TrP needles were retained and given the electric stimulation along with the MPs and UB57. The ashi point needles were not retained. Acupuncture to these MP's seems to “reset” the dysfunction of the muscle spindle, help heal the damaged tissue, and restore muscle function (Callison, 2000). Additional points used were three points the patient reported as tender and located on the left forearm. They were PC4, SI7, and an ashi/tender point located 2 cun or finger breadths lateral and 2 cun superior to PC4 on the Heart channel.

A soft tissue injury caused by repetitive stress or acute trauma will produce inflammation from the injured tissues (Watson, 2019). The site of damage and surrounding muscle will become hypertonic or go into a state of contracture to protect and guard the limb against further damage (Gullota, 2010). This inhibits microcirculation, limiting oxygen to the site and waste removal from the site (Gullota, 2010). Fibroblastic activity is stimulated by this hypoxia and fibrotic scar tissue adhesion is formed (Watson, 2019). The adhesion will build up around the surrounding muscle and fascia limiting the elastic properties of the tissue (Watson, 2019). This fibrotic tissue can also compress and irritate the surrounding nerves causing pain (Gullota, 2010). This all leads to biomechanical and proprioceptive disturbances in gait function (Gullota, 2010).

Local TrP and ashi needling of the hypertonic, tender, and knotted muscle is used to elicit a local twitch reflex as the first step in breaking the pain cycle. Research shows this will decrease muscle contraction, reduce chemical irritation, improve flexibility, and decrease pain (Cannie, Dewitte, Barbe, Timmermans, Delrue & Meeus, 2013). When a needle is inserted into muscle it will also produce a controlled lesion that will split between three to fifteen thousand individual myofibrils depending on the guage of the needle and the depth of penetration (Dommerholt & Fernández-De-Las-Peñas, 2013). The body perceives this micro trauma and the needle itself as a foreign invader and will activate the immune system as a response (Cannie et al. 2013; Dommerholt & Fernández-De-Las-Peñas, 2013). This in-turn produces an inflammatory reaction that the body will respond to not just locally but throughout the body to reduce inflammation systemically (Cannie et al. 2013; Dommerholt & Fernández-De-Las-Peñas, 2013).

Orthopedic Massage techniques and gua sha were employed to contribute to the healing process by increasing circulation, lymph drainage, help release hypertonic muscle, breakup and remodel adhesive scar tissue. This will regain the elastic properties of the tissues and release the fascia, restoring the “slide and glide” of the tissues (Hendrickson, 2003). Massage is to be avoided 48 to 72 hours of an acute muscle strain or if there is significant swelling and inflammation. The chief techniques used were: Contract-Relax-

Antagonist-Contract Muscle Energy Technique for the soleus and Muscle Energy Technique to increase ankle dorsiflexion (Hendrickson, 2003), myofascial release techniques, and transverse friction. The CBD (cannabidiol) oil was used in the massage and gua sha for its anti-inflammatory and pain modulating effect (Izzo et al. 2012; Russo, 2008). Low level infrared light was used for the last 2 treatments to facilitate tissue repair (Ferraresi, Hamblin & Parizotto, 2012).

The patient was given instruction on home therapy during the consultation and was to continue with the RICE (rest, ice, compression and elevation) standard of care but was also instructed to alternate the ice with heat ("Our knowledge of orthopaedics," 2015). The patient was instructed to perform resistance exercises, stretching, and self-massage 3 to 6 times daily, between the days of acupuncture therapy:

Self-massage techniques were with the use of a lacrosse ball, for cross (transverse)-friction massage, and floss bands to improve joint ROM by reducing soft-tissue stiffness and releasing fascial adhesions (Schroeder & Best, 2015). The patient would lie on the floor with the lacrosse ball on a chair. The patient puts her calf up onto the chair and onto the ball. She would then let the ball sink into her muscle while work the ball side to side, creating an action of cross fiber friction to all areas of the calf. The patient was instructed to wrap many layers of the vinyl floss band around her calf at 70% band resistance and then to proceed with actively contracting and relaxing her calf.

Exercise: Toe ups/calf drop: standing on the edge of a step, one foot at a time, lowering body weight with a controlled and eccentric lowering of the heal. Three sets of ten repetitions of this exercise was to be done after self-massage. This establishes that the scar tissue will develop in a linear matrix along with the grain of the surrounding muscle. It improves muscle strength, joint flexibility, balance, and reduces the chance of the reinjury.

Stretching consisted of the standard static calf stretch with stretching-leg knee locked for 30 seconds and then with her stretching-leg, knee bent for 30 seconds to better isolate the Achilles and soleus. *The Richard Simons stretch*: bending over with knees locked, grabbing her hands to her lower leg or ankle, putting a stretch on her calves and alternately locking and unlocking the knees back and forth rhythmically. *Seated sciatic stretch*: seated on the ground with one leg straight forward with knee locked and either grabbing the balls of the feet or using a towel to wrap around the balls of the feet, pulling the foot rhythmically in and out of dorsiflexion, putting a stretch on the calf.

COMMUNITY RECOURSES

The most common recourse available for Tennis Leg care and treatment is through the PT model of treatment. This consists of some of the elements discussed in this paper. The conventional treatment regimen is to identify the injury and its location then proceed to treat the calf using RICE, exercise, mobilization, massage, ultrasound, and on lesser scale dry needling style acupuncture.

PROGNOSIS AND CONCLUSION

I advised the patient to not participate in the tournament because she was susceptible to reinjury, not physically prepared, nor had the strength to compete at such high levels. The possible reasons for the strain to begin with is due to repetitive overload, lack of preparation and recovery. She explained that it was a big investment and promised to withdraw from the competition if she felt vulnerable to injury. After the tournament, January 2019, the patient reported that she in fact was not ready for the Singles Tournament but did play well and placed in the Doubles Tournament. She further explained that her calf held up without any issue but lacked in strength. Also, her quadricep muscles of her right upper leg, the same side as the involved calf went into spasm.

I often see this injury. It is very common with athletes who participate in sports that require long, consistent and repetitive movements involving impact of the foot and lower leg. I have utilized this same treatment model on similar grade one and two calf strains for long distance runners and cyclists and having good success. Grade 3 strains need more invasive medical treatment, and possibly surgical intervention. The calf due to its function and location on the body is one area that is susceptible to restrain. It can often become a stubborn, chronic, and reoccurring issue if not treated properly.

When treating sport injuries in general, I have always found that the mixed methods approach of integrating standard biomedical protocols along with TCM interventions have consistently produced above satisfactory treatment outcomes.

REFERENCES

1. Callison (2000) Motor Point Manual. Raymert Press, Inc, California, USA.
2. Cannie, B., Dewitte, V., Barbe, T., Timmermans, F., Delrue, N., & Meeus, M. (2013). Physiologic effects of dry needling. Current Pain and Headache Reports,8(348). doi:10.1007/s11916-013-0348-5
3. Dixon, J. B. (2009). Gastrocnemius vs. soleus strain: How to differentiate and deal with calf muscle injuries. Current Reviews in Musculoskeletal Medicine,2(2), 74-77. doi: 10.1007/s12178-009-9045-8
4. Dommerholt, J., & Fernández-De-Las-Peñas, C. (2013). Proposed mechanisms and effects of trigger point dry needling. Trigger Point Dry Needling,21-27. doi:10.1016/b978-0-7020-4601-8.00002-5
5. Ferraresi, C., Hamblin, M. R., & Parizotto, N. A. (2012). Low-level laser (light) therapy (LLLT) on muscle tissue: Performance, fatigue and repair benefited by the power of light. Photonics & Lasers in Medicine,1(4). doi:10.1515/plm-2012-0032
6. Grefte, S., Kuijpers-Jagtman, A. M., Torensma, R., & Hoff, J. W. (2010). Model for Muscle Regeneration around Fibrotic Lesions in Recurrent Strain Injuries. Medicine & Science in Sports & Exercise,42(4), 813-819. doi:10.1249/mss.0b013e3181beeb52
7. Gullota, L. (2010). Muscle Injuries: An Overview. Retrieved February 12, 2019, from a.https://www.hss.edu/conditions_muscle-injuries-overview.asp
8. Harwin, J. R., & Richardson, M. L. (2017). "Tennis leg": Gastrocnemius injury is a far more common cause than plantaris rupture. Radiology Case Reports,12(1), 120-123. doi:10.1016/j.radcr.2016.10.012
9. Hendrickson, T. (2003). Massage for orthopedic conditions. Philadelphia, Penns.: Lippincott Williams & Wilkins.
10. Izzo, A. A., Capasso, R., Aviello, G., Borrelli, F., Romano, B., Piscitelli, F., . . . Marzo, V. D. (2012). Inhibitory effect of cannabichromene, a major non-psychotropic cannabinoid extracted from Cannabis sativa, on inflammation-induced hypermotility in mice. British Journal of Pharmacology,166(4), 1444-1460. doi:10.1111/j.1476-5381.2012.01879.x
11. Nsitem, V. (2013). Diagnosis and rehabilitation of gastrocnemius muscle tear: A case report. The Journal of the Canadian Chiropractic Association,57(4), 327-333. Retrieved February 4, 2019, from https://www.ncbi.nlm.nih.gov/pubmed/24302780.
12. Our knowledge of orthopaedics. Your best health. (2015, July). Retrieved from https://orthoinfo.aaos.org/en/diseases--conditions/sprains-strains-and-other-soft-tissue-injuries
13. Perry, L. (2015, February 19). Blog. Retrieved February 12, 2019, from http://www.triggerpointtherapist.com/blog/soleus-pain/soleus-trigger-points-heel-pain/
14. Russo, E. (2008). Cannabinoids in the management of difficult to treat pain. Therapeutics and =Clinical Risk Management,Volume 4, 245-259. doi:10.2147/tcrm.s1928
15. Schroeder, A., & Best, T. (2015). Is Self Myofascial Release an Effective Preexercise and Recovery Strategy? A Literature Review. Current Sports Medicine Reports,14(5), 352. doi:10.1249/jsr.0000000000000182
16. Stilhano RS, Samoto VY, Silva LM, Pereira GJ, Erustes AG, Smaili SS, et al. (2017) Reduction in skeletal muscle fibrosis of spontaneously hypertensive rats after laceration by microRNA targeting angiotensin II receptor. PLoS ONE 12(10): e0186719. https://doi.org/10.1371/journal.pone.0186719
17. Stinson, A. (2018, August). Soleus strain: Calf strains and other injuries. Retrieved February 4, 2019, from https://www.medicalnewstoday.com/articles/322809.php
18. Warfel, J. H. (1993). The extremities: Muscles and motor points. Philadelphia: Lea & Febiger.
19. Watson, T. (2019). Soft Tissue Repair and Healing Review. Retrieved February 13, 2019, from http://www.electrotherapy.org/modality/soft-tissue-repair-and-healing-review