Massage Therapists' Association of British Columbia

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Second Place Winner

Edris Safi

Can deep transverse friction massage decrease pain assoicated with peroneal tendinopathy?

P: 604.873.4467
F: 604.873.6211
research@massagetherapy.bc.ca
massagetherapy.bc.ca

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ABSTRACT

Peroneal tendinopathy is frequently an overlooked source of lateral ankle pain. There is a lack of research regarding best treatment for this disorder. Deep transverse friction massage (DTFM) has commonly been used in treating tendinopathies. Reports on these treatments, however, have listed multiple modalities used in adjunct with this technique. The purpose of this case study is to determine whether DTFM, when used alone, is an effective modality in pain management of peroneal tendinopathy. The patient was a 46 year old female who presented with lateral ankle pain consistent with this disorder. A total of six treatments of DTFM were administered over the course of two and a half weeks. The patient reported an immediate reduction in pain, followed by complete exclusion of discomfort 28 days after the first treatment. This study suggests that DTFM is an effective technique for management of pain associated with peroneal tendinopathy.

Keywords: *deep transverse friction massage, cross fiber frictions, peroneal tendinopathy, peroneal tendinitis.*

INTRODUCTION

Injuries to the peroneal tendons are often an overlooked cause of lateral ankle pain. The most common pathology involving these tendons is chronic peroneal tendinopathy (Simpson & Howard, 2009). This condition is most commonly caused by repetitive stress rather than a traumatic injury (Park et al., 2010). Pathologies involving peroneal tendons have seldom been reported, and little scientific evidence has been published on the management of peroneal tendinopathy (Abboud & Okereke, 2008; Hensley & Kavchak, 2011).

Chronic tendon pathologies traditionally have become known as tendonitis. Recent studies, however, have revealed little or no inflammation is actually present in these conditions (Pfefer, Cooper & Uhl, 2009; Yuan, 2003). *Tendinosis*, *tendonitis (tendinitis)*, *peritendinitis, and tendinopathy* are all terms used interchangeably to describe the same clinical condition (Pfefer et al., 2009). Since overuse tendon injuries are not caused by a persistent inflammatory response, the term *tendinopathy* is now commonly used to describe this spectrum of painful conditions (Pfefer et al, 2009; Simpson, 2009). Other terms are used if specific tendon components have been affected. *Tenosynovitis*, for example, is characterized by inflammation of the synovial sheath (Vuilemin, Guerini, & Morvan, 2012). It is difficult, however, to differentiate if tenosynovitis is present by clinical assessment and frequently its presence may only be apparent with surgical examination (Gross, 1992).

Tendon injury initially responds by inflammation (tendinitis) followed by the formation of a collagen matrix and remodelling (tendinosis). The healing response, however, may be severely interrupted due to ongoing mechanical forces on the tendon or a poor blood supply. This results in fibrin deposition, neovascularization, an increase in collagen breakdown and synthesis all of which leads to disorganized, fibrous tissue containing increased amounts of cross-linked collagen (Joseph, Taft, Mokswa & Denegar, 2012; Simpson & Howard, 2009). Studies have also shown higher than normal amounts of the disorganized type-III collagen which has less tensile strength than type-I collagen found in healthy tendons (Huijbregts & Smith, 1999; Joseph et al., 2012). In addition, tendon thickening, increased cellularity and higher nociceptor concentrations were all observed in unhealthy tendon tissue (Andres, 2008; Scott, 2013). The resulting pathologic tendon was shown to contain a disorganized matrix of hypervascular, hypercellular tissue that is weak and painful (Simpson & Howard, 2009).

Pfefer et al. (2009) have described tendinopathy having an insidious onset with localized "sharp" or "stabbing" pain upon activity. Patients usually report a recent increase or change in activity. Pain commonly increases with activity but subsides shortly after a warm-up period. Later in the progression of tendinopathy, however, the pain is described as “dull” or “achy”. Upon provocative palpation the patient’s pain is reproduced in a well-localized pattern (Pfefer et al., 2009). Pain is normally a lot less severe after a prolonged rest period (Simpson & Howard, 2009). Passive stretching or active contraction of a stretched musculotendinous unit will also elicit pain (Gross, 1992).

Peroneus (fibularis) longus and peroneus (fibularis) brevis muscles with their tendons stabilize the ankle and are responsible for eversion and plantarflexion of the foot (Park et al., 2010; Wang, Rosenberg & Michael, 2005). Research of disorders involving peroneal tendons is scarce, and majority of the literature is in the form of case reports (Abboud & Okereke, 2008). These pathologies, which include tenosynovitis, rupture and dislocation of the tendons, are frequently undiagnosed causes of lateral ankle pain. Tenosynovitis in peroneal tendons is commonly caused by stress on the tendons as they travel in the retromalleolar groove, peroneal tubercle, or undersurface of the cuboid bone (Wang et al., 2005). Park et al. (2010) have confirmed using MRI data that tenosynovitis presents with fluid collection within the common peroneal tendon sheath. Location of the peroneus brevis tendon makes it much more susceptible to injury than peroneus longus. It appears that these injuries are caused by the compression of peroneus brevis tendon against the ridge of the lateral malleolus by peroneus longus tendon (Abboud & Okereke, 2008). This commonly occurs during dorsiflexion and causes longitudinal tears in the peroneus brevis tendon resulting in a condition called peroneal split syndrome (Wang et al., 2005). More research has been published on peroneus brevis pathologies, however, recently peroneus longus has started to attract more attention (Abboud & Okereke, 2008).

Initially chronic peroneal tendinopathy is treated with rest, immobilization of the ankle, and anti-inflammatory medication. Steroid injections and local injections of anesthetic compounds have not been shown to be beneficial to the long term repair process (Wang et al., 2005). Other treatments such as eccentric strengthening exercises and lateral heel wedges showed minimal results (Hensley & Kavchak, 2011).

Deep transverse friction massage (DTFM), first introduced by James Cyriax, was one of the earliest interventions indicated for tendinopathy. Cyriax proposed that the technique causes breakdown of adhesions and traumatic hyperemia (Brosseau et al., 2009; Chamberlain 1982; Joseph et. al 2012). Application of DTFM also leads to immediate pain relief by having a numbing effect. It has been proposed that this numbing effect may be due to the modulation of impulses by mechanoreceptor stimulation at the spinal cord level, commonly known as “gate theory”. Cyriax proposed that pain provoking metabolites, such as Lewis’s substance, are destroyed by DTFM. In high concentrations Lewis’s substance was shown to cause ischemia and pain (Stasinopoulous & Johnson, 2004). Eliminationing this metabolite is thus vital in proper tissue healing. Cyriax also suggested that in tendons with a sheath DTFM "smooths out" the scar which subsequently eliminates the source of the synovial irritation (Woodman & Pare, 1982; Cyriax, 1977).

Brosseau et al. reviewed DTFM as a treatment for tendinitis. Their findings indicated that the technique did not show consistent benefit for pain management (Brosseau et al., 2009). This review, however, looked at studies which combined DTFM with other manual therapy techniques. More recently Joseph et al. (2012) supplied valid evidence for the effectiveness of DTFM for treating tendinopathies. In their review authors looked at reports which used pain reduction over time via a visual analog scale (VAS) as the primary outcome of interest. Although conclusive, these studies also combined DTFM with other interventions. Joseph et al. (2012) established that more investigation of DTFM as a single modality of treatment is needed in the future.

The purpose of this case study was to evaluate the efficacy of DTFM in alleviating symptoms caused by chronic peroneal tendinopathy. One conceptual question is raised: Does DTFM, when used as single modality, decrease pain caused by peroneal tendinopathy? This case study looks at answering this question by employing a management plan for a patient suffering from lateral pain caused by this condition.

METHODS

The patient was a 46 year old school teacher complaining of sharp, achy pain 5/10 (VAS, 0 being no pain and 10 worst pain imaginable) in the left lateral ankle posterior to lateral malleolus. Her pain caused her to limp for several meters immediately after waking up in the morning. The pain subsided after initial movement in the morning, but would then return later in the evening. She was suffering from this pain intermittently for approximately 36 months and was diagnosed with peroneal tendinitis by a doctor 10 months prior to start of the study. Her pain stopped 24 months ago but then returned 6 months later after she increased the intensity of her exercises. Her exercises included weight training, kickboxing and interval training 2-3 times per week. |On daily basis, increased activity would aggravate her pain, conversely, prolonged periods of rest would provide pain relief. She was prescribed orthotics 2 years ago but did not wear them due to their discomfort. Her daily footwear included running shoes, flats and flip flops.

About 13 months ago she started receiving physical therapy. Treatments included peroneal strengthening, stripping of the calves, calf strengthening, and massage of the ankle. She stopped seeking physical therapy after 4 months as it did not alleviate her pain. Her history of injury included an inversion ankle sprain on the affected leg 27 years ago. The patient was very motivated to receive treatment for her peroneal tendinopathy for the duration of the study.

A postural assessment showed bilateral pes planus which was determined, with a Feiss line test, to be first degree flatfoot. A large bone spur was visible and palpable on the posterior aspect of the left calcaneus (Fig. 1). This observation was consistent with a radiograph taken 26 months prior which shows numerous bone spurs (ensethophytes) on the calcaneus (Fig. 2). The radiograph also shows a round spur on the posterior aspect of the left calcaneous at the Achilles insertion, and a large spur is observed on the plantar surface of the calcaneus (Fig. 2). There is also a bone growth known as a Haglund's deformity on the superior-posterior aspect of the calcaneus (Jarl, Johansson, Sarimo, Lempainen, Laitala-Leinonen & Orava, 2012).

Figure 1. Presence of a bone spur (ensethophyte) on the posterior surface of the left calcaneus (arrow).

Figure 2. Radiograph of the left foot taken 26 months prior shows numerous calcaneal spurs (ensethophytes) (i) at the Achilles tendon insertion (left arrow) (ii) plantar side of the calcaneus (bottom arrow) (iii) a Haglund's deformity (top arrow).

The patient's peroneii, gastrocnemius and soleus were hypertoned bilaterally. Upon palpation she reported tenderness posterior to the left lateral malleolus and superiorly from that point along the peroneal tendons. Her walking gait displayed slight overpronation in both ankles. Goniometric measurements of her ankle range of motion revealed ranges within normal limits (Table 1).

Table 1. Active range of motion of the ankle measured with a goniometer.

	Right	Left
Dorsiflexion	15º	16º
Plantarflexion	48º	46º
Inversion	34º	29º
Eversion	13º	14º

º - degrees

Range of motion (ROM) testing showed an increase in pain with passive inversion, passive and active dorsiflexion, and resisted eversion. Manual muscle test of her left peroneus longus revealed weakness (grade 4-/5) and elicited pain. The patient did not experience any neurological symptoms. She reported that her pain would occasionally, after strenuous activity, refer superiorly up her lateral leg. Anterior drawer test, dorsiflexion maneuver, and talar tilt tests all yielded negative results. Joint play assessment revealed no hypo- or hyper-mobility in the talocrural or subtalar joints.

The main goal of the treatments was to alleviate signs and symptoms of peroneal tendinopathy, primarily pain. Another key objective was to eliminate the limping caused by the pain when the patient walked every morning after waking up.

A total of six one hour treatment sessions were administered over the course of two and a half weeks. All treatments were nearly identical beginning with bilateral application of longitudinal palmar stroking over hamstrings, calves, peroneii, and feet for a total of two minutes on each side. Point tenderness was then palpated along the left lateral ankle to precisely reveal the lesion site (Cyriax, 1977; Woodman & Pare, 1982). The location of this tender point on the peroneus longus tendon did not change for the duration of the study. This point was measured by travelling 3.5 centimeters posteriorly and 6.6 superiorly relative to the apex of lateral malleolus (Fig. 3). The ankle was then positioned into slight inversion in order to apply tension to the tendon tissue. DTFM was applied directly to the lesion site perpendicular to tendon fibers (Woodman & Pare, 1982). DTFM was administered without interruption for 3 and 7 minutes in first and second treatment sessions, respectively. In third to sixth sessions DTFM was administered for 10 minutes. Previous reports have recommended a minimum interval of 48 hours between treatments (Stasinopoulous & Johnson, 2006). In this study, intervals between treatment sessions were varied at 99, 92, 76, 68 and 76 hours.

Figure 3. Point of tenderness was palpated before every treatment session on the left ankle. The location of lesion on the peroneus longus tendon stayed at a constant 3.5 cm posterior, and 6.6 cm superior relative to the apex of lateral malleolus. Deep transverse friction massage (DTFM) was administered directly to the lesion site perpendicular to tendon fibers.

Immediately following DTFM the patient performed three cycles of active range of motion into eversion and plantar flexion. Ice was then applied to the lesion site for 10 minutes while keeping the ankle in passive inversion. The patient was also instructed to continue this ice application at home with 10 minutes of ice on and 10 minutes off, repeating 2-3 cycles, twice per day. She was also advised to keep the peroneal tendon in a stretched position during that ice application (Woodman & Pare, 1982). The patient was prescribed to refrain from strenuous activity during the course of the study.

The patient filled out a daily log for 32 days beginning on the first day of treatment where she recorded pain levels using visual analog scale (0 being no pain, and 10 being the worst pain imaginable) at 8 am and 6 pm. She also recorded the distance she limped (antalgic gait) in the mornings prior to her pain subsiding. This distance was estimated by the patient by adding the following measured distances: bedroom 3m, bedroom to bathroom 6m, bedroom to kitchen 7m, kitchen to living room 5m, kitchen to the car 7m.

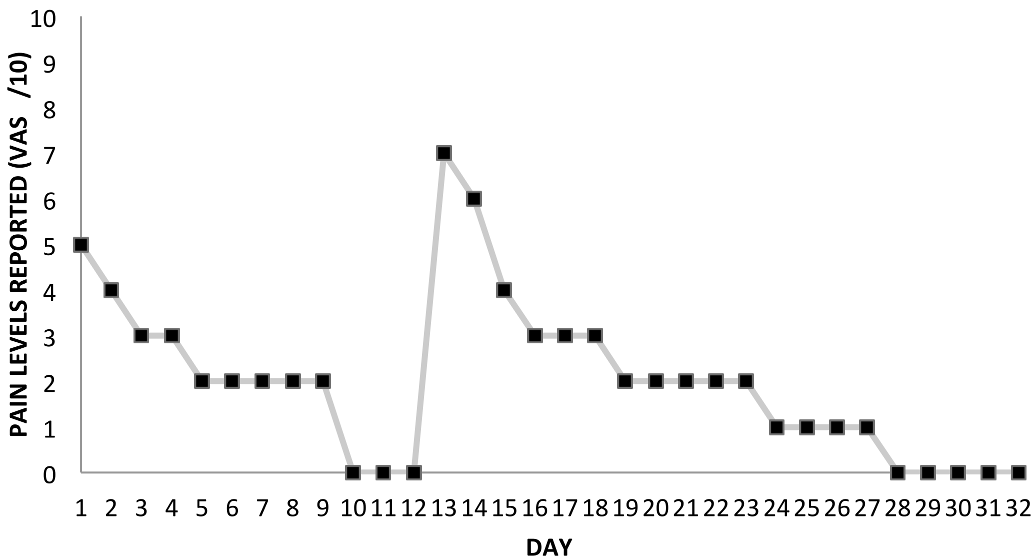
RESULTS

The recorded pain levels were tabulated and charted (Table 2 and Figure 4).

Table 2. Pain scores /10 and distance walked with a limp reported by the patient. The distance was approximated by adding the following distances measured by the patient: bedroom 3m, bedroom to bathroom 6m, bedroom to kitchen 7m, kitchen to living room 5m, kitchen to the car 7m.

Day	Pain severity at 8 am /10	Pain severity at 6 pm /10	Approximate distance walked with antalgic gait (meters)
1*	5	4	18
2	4	4	18
3	3	3	18
4	3	3	13
5*	2	2	13
6	2	2	13
7	2	2	13
8	2	3	13
9*	2	0	6
10	0	0	6
11	0	0	0
12*	0	7	0
13	7	8	25
14	6	5	25
15*	4	4	18
16	3	3	18
17	3	3	18
18*	3	3	13
19	2	2	13
20	2	2	13
21	2	2	13
22	2	2	6
23	2	2	6
24	1	1	6
25	1	1	6
26	1	1	3
27	1	1	3
28	0	0	3
29	0	0	0
30	0	0	0
31	0	0	0
32	0	0	0

Treatment days are marked with an asterisk.



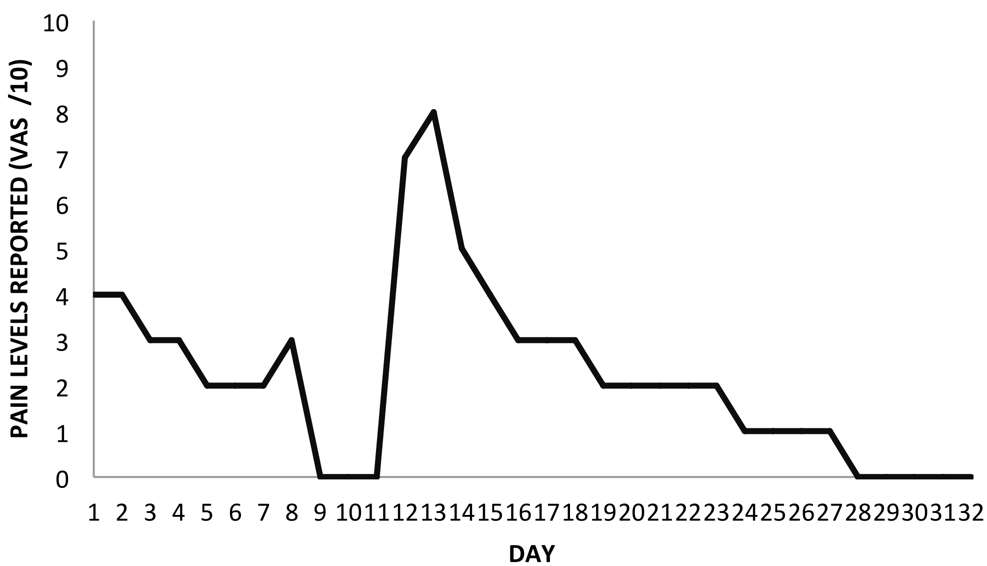


Figure 4. Pain levels reported during the course of the study. Pain levels at 8 am (top) and pain levels at 6 pm (bottom). There is a gradual decrease in pain for the first 9 days, then a sharp increase in pain is observed on the evening of day 12.

Pain levels gradually decreased for the first 9 days of the study with complete elimination of pain on the evening of day nine. These results were observed after a total of three treatment sessions. A sudden increase in pain was noted on the evening of day 12. Days 13 to 27 continued to show a pattern of reduced pain levels.   The pain was eliminated entirely by day 28. The patient was completely pain free on days 28 to 32 (Figure 4).

A graph of the distance limped in the mornings (walk with antalgic gait) shows a similar pattern. Limping distance gradually decreased for the first 11 days and was no longer present on the mornings of day 11 and 12. A sharp spike was recorded on the morning of day 13. The limping distance then gradually fell and was finally eliminated on days 29 to 32 (Figure 5).

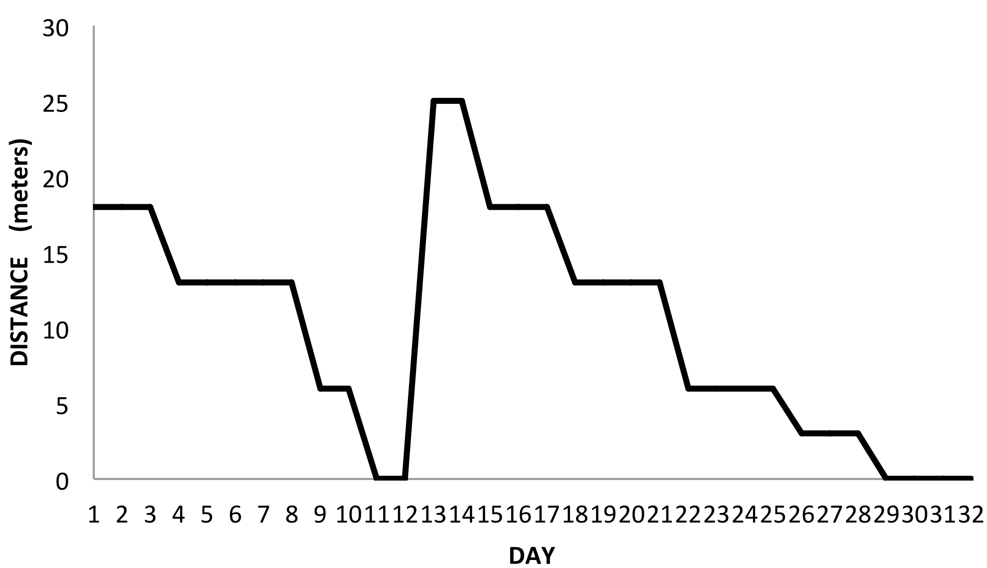


Figure 5. Distance walked with a limp in the morning (antalgic gait). The distance shows a gradual decrease from days 1-11 and 14-29. A significant increase in distance is seen on day 13. No limp was present on days 11,12, 29, 30, 31, 32.

A graph of pre and post treatment pain levels shows a marked decrease in pain after each session. The largest difference is seen after the first treatment (Fig. 6).

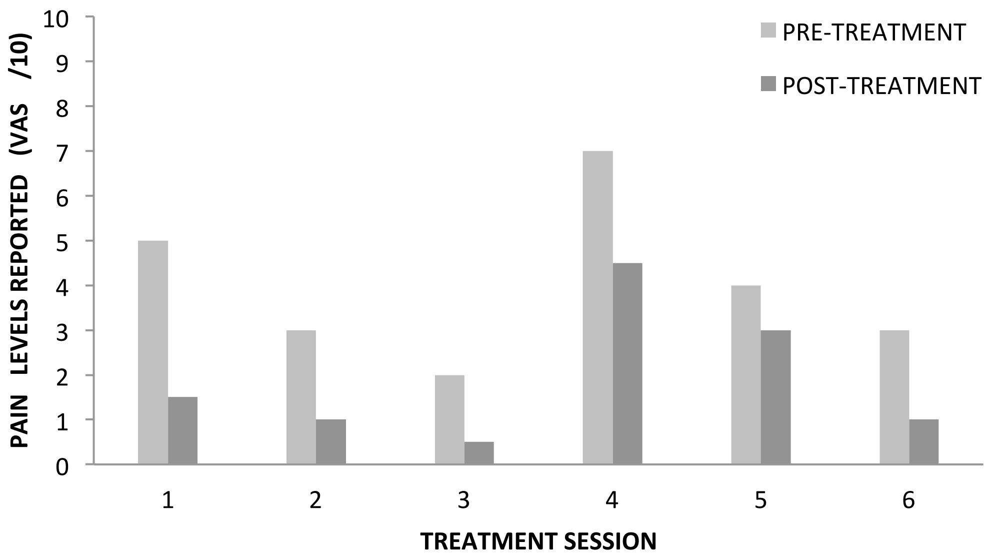


Figure 6. Pain levels pre and post treatment. A decrease in pain is observed following each session. The largest difference between pre and post treatment pain levels is seen during the first treatment session.

DISCUSSION/CONCLUSION

Decreased pain and improvements in function have been demonstrated in this patient with peroneal tendinopathy. The difference in pain levels seen before and after each treatment is consistent with previous data explaining the immediate pain relief following DTFM (Stasinopoulous & Johnson, 2004).

Positive results with DTFM were seen quickly after only three treatments within 9 days. The pain was entirely eliminated on the ninth day. The sudden pain increase observed on day 12 is explained by the patient's increased level of activity that morning when she ran two kilometers. Research shows that strenuous activity should be avoided during intervention with DTFM to achieve optimal recovery results (Stratford, Levy, Gauldie, Miserfi, Levy, 1989).

It was vital to investigate the effectiveness of DTFM as a single modality of treatment. One cannot rule out, however, the effects of longitudinal stroking, and the application of ice in this study. Although kept to a minimum, it is unclear how much these treatments affected the results of this study. In addition, the patient's reduction in activity, with the exception of day 12, might have significantly contributed to the positive results.

Several questions are raised by this case study. It is not well studied whether DTFM, if used as a single modality, has similar outcomes in other tendinopathies involving the synovial sheath. More research is needed to determine DTFM's isolated efficacy on tenosynovitis.

In conclusion DTFM proved to be an effective modality for the purpose of decreasing pain caused by peroneal tendinopathy.

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