

Conservative management of a case of tarsal tunnel syndrome

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Objective: *This case study was conducted to evaluate the treatment and management of a patient presenting with chronic foot pain, diagnosed as tarsal tunnel syndrome.*

Case: *61 year old female presenting with plantar and dorsal foot pain and burning sensation of 6 months duration.*

Treatment: *Treatment was initiated using custom orthotics only for the first ten weeks of care as the patient did not follow up or initially respond to follow up calls placed by the practitioner. A course of high-velocity, low-amplitude adjustments using a toggle board to the cuboid and the talonavicular joint and fascial stripping was added upon report from the patient that the orthotic therapy alone did not resolve the symptoms. Improvement of pain reported on the Verbal Rating Scale was noted with a complete resolution of the condition at the conclusion of treatment. No pain was reported on a ten month follow up with the patient.*

Conclusion: *Conservative management, including orthotics, manipulation, and fascial stripping may be beneficial in the treatment of tarsal tunnel syndrome. (JCCA 2010; 54(2):100-106)*

KEY WORDS: tarsal, foot, pain, syndrome.

Objectif : *Cette étude de cas a été effectuée afin d'évaluer le traitement et la gestion d'un patient qui présentait de la douleur chronique au pied, avec un diagnostic de syndrome du tunnel tarsien.*

Cas : *femme de 61 ans qui présente de la douleur plantaire et dorsale au niveau du pied, ainsi qu'une sensation de brûlure qui dure depuis 6 mois.*

Traitement : *Le traitement initial consistait d'orthèses uniquement pour les dix premières semaines puisque la patiente ne s'est pas présentée pour un suivi et ne rappelait pas le praticien. Une série d'ajustements à haute vitesse et basse amplitude effectuée à l'aide d'une planche à bascule au niveau de l'articulation cuboïde et talo-naviculaire et du décollement fascial a été rajouté lorsque la patiente a relaté que la thérapie orthétique ne suffisait pas à traiter les symptômes. La douleur s'est amenuisée selon des notes effectuées sur une échelle d'appréciation verbale, et, au terme du traitement, le problème était complètement résolu. Aucune douleur n'a été rapportée lors d'un suivi avec la patiente dix mois plus tard.*

Conclusion : *Une gestion conservatrice comprenant orthèses, manipulation et décollement fascial, peut être bénéfique dans le traitement du syndrome du tunnel tarsien. (JCCA 2010; 54(2):100-106)*

MOTS CLÉS : tarsien, pied, douleur, syndrome

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Introduction

Pes planus and hyperpronation of the foot are common observable signs that are often associated with foot pain.^{1,2} Foot pain is a common complaint of patients and although it is difficult to determine the prevalence, one study reported rates in women between 32% and 80%¹ while another study reported rates of 52% among elderly patients.² Plantar fasciitis, metatarsalgia, hallux valgus, and posterior tibial tendon dysfunction are common problems associated with hyperpronation of the foot.¹ Hyperpronation of the foot is also associated with tarsal tunnel syndrome, though the condition is less common in the general population.

The cause of tarsal tunnel syndrome can be identified in 60–80% of cases, the most common causes being trauma (17%), varicosities (13%), heel varus (11%), fibrosis (9%), and heel valgus (8%). However the exact incidence of tarsal tunnel syndrome is not known.³ There is a slightly higher incidence of tarsal tunnel syndrome in females compared to males.³ Tarsal tunnel syndrome may be difficult to identify and manage conservatively, and surgical intervention may be required.

According to the National Board of Chiropractic Examiners 2005 Job Analysis of Chiropractic, in general the chief presenting complaint on initial visit of 8.9% of chiropractic patients in 2003 was a lower extremity complaint. "Survey participants were asked to provide information regarding their management of 121 conditions that they might have seen in their practices during the previous year."⁴ It was reported on a scale of 0 to 4, where 0 meant the practitioners never treated the condition and 4 meant that the practitioners routinely treated the condition, that carpal and tarsal tunnel syndrome earned a rating of 2.1. Additionally the respondents indicated that 57.1 % of the respondents were the sole managers of the condition and 40.9% of the respondents co-managed the condition.⁴ There were few case study reports of tarsal tunnel syndrome found in the chiropractic or other conservative care literature. The purpose of this article is to report a case of tarsal tunnel syndrome and its management using conservative treatment methods.

Case report

A 61 year old female presented for treatment of intermittent left foot pain of 6 months duration. The patient presented to the clinic in January and reported that she had

been wearing winter boots outdoors for one to two months that she described as 'fairly unsupportive,' over which time the pain in her foot had worsened. The patient reported discomfort and burning pain in the left foot on the plantar and dorsal aspect of the foot, over the distal metatarsal region. She was not able to pinpoint the location of pain but rather referred to the general area of the forefoot. She denied paresthesias, and/or lack of sensation in the area. She rated the pain as a 9/10 in intensity on a Verbal Rating Scale where 0 is no pain and 10 is the worst pain that she had ever experienced. She reported that she had a pair of custom orthotic insoles made for her by a podiatrist a few months prior that did not seem to help reduce her pain and that she had felt the need to alter herself by way of gluing material padding around the metatarsal area of the orthotics with adhesive. The orthotics were three quarter length, hard in nature and lacked any type of top cover or intrinsic padding. Although they seemed appropriately worn for the age of the orthotic, the patient reported that the orthotics were not comfortable. She showed the clinician that she had built herself a makeshift pad that she would insert above the orthotic that she placed under her metatarsals which helped temporarily relieve the symptoms. Walking for any length of time, standing in one place for a few minutes, sitting for a few hours on an airplane, and wearing certain shoes such as boots increased the pain; however, she reported that these increases in pain were highly variable whereas taking off her shoes and/or boots tended to decrease the pain. She reported that while on vacation in a warm climate, she had been unable to wear a pair of sandals that she had previously found comfortable and that she had similar pain in her right foot when wearing certain shoes, to a much lesser degree.

Range of motion testing of the cervical and lumbar spines were found to be full and pain free in all directions tested. Range of motion of the ankles was full and pain free bilaterally. Resisted range of motion testing including resisted dorsiflexion, plantarflexion, inversion, and eversion of the ankle was found to be pain free and of equal strength bilaterally. Neurological testing of the upper and lower extremities was found to be within normal limits with respect to sensation, motor strength, and reflexes bilaterally. Non weight bearing examination of the feet uncovered 'medium' and approximately equal plantar longitudinal arch height bilaterally. Toe and heel walking were unremarkable bilaterally. Hallux valgus was noted

on the left foot only. A separation between the 2nd and 3rd digits was noted on the right foot. The patient reported that this was due to an injury that she had suffered 2–3 years prior in which she reports that she tore the ligament between the metatarsals. Deep palpation and pressure in this location did not reveal any pain. Morton's test (grasp the foot around the transverse metatarsal arch and squeeze the heads of the metatarsals together⁵ to rule out Morton's neuroma), and Tinel's sign (tap over the posterior tibial nerve inferior and posterior to the medial malleolus⁵) were negative bilaterally. No hallux rigidus was noted bilaterally. Lower back evaluation was conducted to ensure the symptoms were not referred and was found to be unremarkable, including the following orthopaedic tests (bilaterally where applicable): active and passive straight leg raise, Patrick's test (passive flexion, abduction, and external rotation of the hip placing the lateral malleolus of the involved leg over the knee of the uninvolved leg⁵), sacral thrust test (posterior to anterior pressure on the sacrum while the patient is prone), Hibb's test (while the patient is prone bend the knee passively to 90 degrees and internally rotate the hip by moving the lower leg away from the midline), and the thigh thrust test (passively flexing the hip and knee to 90 degrees while putting an anterior to posterior pressure through the sacroiliac joint). Upon weight bearing, the height of the plantar longitudinal arches diminished bilaterally but noticeably more on the right side. Gait analysis revealed toeing out bilaterally and over-pronation of the forefoot bilaterally. Rearfoot valgus deformity was noted bilaterally on standing. Loss of the transverse tarsal arch was noted bilaterally with increased severity on the left. No calluses were noted on the plantar surface of the feet. A diagnosis of tarsal tunnel syndrome was made based on physical findings including over pronation of the rear foot, loss of transverse arch height with standing as well as reported symptoms and location of pain.

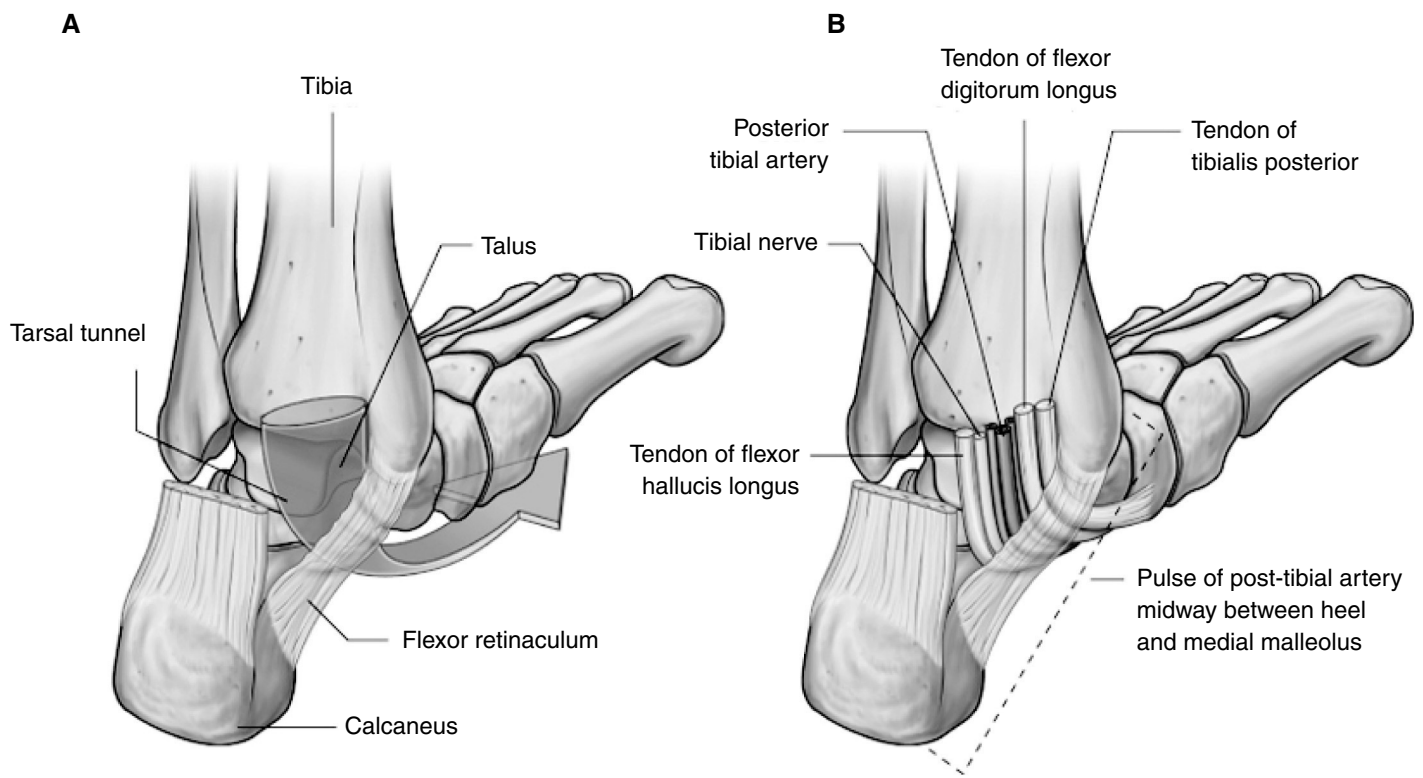
As the patient reported some relief with the makeshift metatarsal pad that she had placed in her shoe, she expressed discomfort and dissatisfaction with her current custom orthotics and was cast in non weight-bearing subtalar neutral for a new pair of custom fit orthotics. The new orthotics were made with a metatarsal pad built in to the top cover bilaterally and were dispensed to her 10 days after the initial visit. The patient was given the following instructions on the use of her orthotics: wear the

orthotics for one hour the first day, two hours the second day after which time doubling the length of time the orthotics are worn each day up to eight hours. She was told to discontinue use if she found the orthotics uncomfortable and contact the practitioner. She was then discharged from care as she stated that she was leaving for vacation out of the country within the week and did not desire further treatment. The patient was given instructions to return for further care and to call the clinic if her pain did not diminish or if she had any further questions. A follow up call was placed approximately 1 month after dispensing the orthotics with no response. A further follow up call was placed 10 weeks after the initial visit at which time the patient reported very little change in her condition and a VRS of 8/10 in intensity. She reported that she had been wearing her orthotics as instructed. A treatment plan using fascial stripping techniques including cross friction massage and instrument assisted fascial stripping to the lateral heel over the tarsal tunnel, and over the plantar and dorsal surfaces of the forefoot, and high velocity low amplitude (HVLA) toggle board adjustments of the talonavicular joint and mobilizations of the cuboid as well were initiated based on motion palpation. Treatment was given twice per week for two weeks, followed by a break in treatment of two weeks due to the patient leaving on holiday. Upon her return, she reported that her symptoms had decreased to 2/10 in intensity and that she did not have any pain while flying, or while walking in the aforementioned sandals. Treatment was resumed at a frequency of once per week for 2 weeks at which time the patient reported that the pain had decreased to 0/10 in intensity with intermittent recurrences of a low level sensation over the dorsal and plantar surfaces of the forefoot that she could no longer classify as burning. Treatment was decreased to once every 2 weeks for the following 6 weeks during which time the patient reported that she did not have any recurrences of pain. The patient was subsequently discharged from active care and advised to return as needed for supportive care.

Discussion

Foot pain is a common complaint in a chiropractic practice. Common causes of foot pain include arthritic changes, plantar fasciitis, stress fractures, and Morton's neuroma, while less common causes may include painful accessory bones, complex regional pain syndrome

Figures A and B



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(CRPS), Baxter's nerve entrapment, and tarsal tunnel syndrome.⁶ Even more rare causes include Freiberg's disease (avascular necrosis of the metatarsal head) and tarsal coalition,⁵ as well as Sever's Disease (calcaneal apophysitis). With the presentation of foot pain of 6 months duration, all of the aforementioned conditions should be on a list of differential diagnoses.

Tarsal tunnel syndrome is associated with complaints of tingling and/or numbness around the medial ankle and on the plantar surface of the foot extending towards the toes,^{7,8,9} caused by stretching or compression of the posterior tibial nerve in the tarsal tunnel. The tarsal tunnel is bordered by the calcaneus, medial malleolus, talus, and flexor retinaculum, and houses the posterior tibial nerve, artery and vein, the tibialis posterior and the tendons and muscles of the flexor digitorum longus and flexor hallucis longus.^{3,7} It is illustrated in figures A and B (reprinted with permission).¹⁰

The pain is often worse with activity, certain shoes that

the patient may find aggravating or standing, and can be relieved by rest (with permission).^{3,8} Symptoms can occur suddenly as a result of direct trauma or related to an inversion sprain of the ankle but may also be a result of overuse as in the case of excessive standing, walking, or exercise. Symptoms are often diffuse and poorly localized. The physical findings may vary,³ and in 43% of cases the pain is worse at night.¹¹ The patient may report significant or relatively minor trauma to the foot.³ The symptoms can be misinterpreted as plantar fasciitis or even radicular pain from the lumbar spine.⁵ Proximal radiation of tingling and numbness is seen in approximately one third of cases and is called the Valleix phenomenon.³

As the tarsal tunnel has limited space available, any compromise to the space in the tunnel can put pressure on the structures within, and may cause symptoms. It is important to recall that this may include systemic diseases which cause edema such as arthritis and diabetes. Direct injuries and hyperpronation, may compromise the struc-

tures within the tunnel by physically decreasing its cross sectional area, highlighting the need to record valgus or varus deformities of the foot.⁹ Plain film radiography, bone scan or CT is useful for identifying causes of tarsal tunnel syndrome such as fractures or osteophytes, whereas MRI is more appropriate for other causes of tarsal tunnel syndrome including: varicosities, trauma, fibrosis, accessory muscles, ganglion cysts, lipoma, and nerve sheath tumours.⁶ Two point discrimination on the plantar surface of the foot is the first sign of sensory loss, which may progress to pinprick hypoesthesia.³ Sensory testing should therefore be repeated periodically throughout the course of treatment in order to appropriately monitor the condition. Percussion of the posterior tibial nerve (Tinel's sign) may cause paresthesias along the course of the nerve,^{3,8,9} with one study reporting that Tinel's sign is positive in only 67% of cases.¹¹ The Dorsiflexion-eversion test for tarsal tunnel syndrome (dorsiflexion and eversion of the foot with extension of the metatarsophalangeal (MTP) joints) may also be positive and create pain in the heel or reproduce the patient's pain.¹² This test has been shown to increase the tension on the structures of the tarsal tunnel, though it is not specific enough to differentiate between tarsal tunnel syndrome and plantar fasciitis.¹²

Severe presentations of tarsal tunnel syndrome may exhibit weakness of intrinsic foot muscles.¹¹ Weakened plantar muscles may cause the patient to have difficulty spreading their toes.¹³ Atrophy may develop in the intrinsic and plantar muscles if the condition runs unchecked.¹³ Detection of minor weaknesses in the intrinsic foot musculature is difficult in the clinical setting and referral for a nerve conduction study should be made if compromise to the motor nerves is suspected.¹⁰ Signs of muscle atrophy may warrant a surgical consult.

Tarsal tunnel syndrome that is not complicated by muscle atrophy may be managed conservatively. Treatment may include: reassurance, custom orthotics, taping, bracing, stretching, strengthening, icing, soft tissue manipulation, chiropractic adjustments, massage, fascial stripping, non steroidal anti-inflammatory medication, corticosteroid injection, analgesic medication, or opioid medication.^{13,14,15,16} If conservative intervention fails to relieve symptoms, surgical approaches may be explored, such as microsurgical decompression of the tibial nerve with splitting of the flexor retinaculum.^{13,15}

As with other chronic conditions, beneficial effects of

manipulation and soft tissue treatment such as massage and stretching done with the intent to relieve pain and restore normal myofascial movement have been noted for plantar fasciitis and other foot disorders.¹⁶ Manipulation and mobilization of hypomobile foot joints has been recommended in treatment of foot disorders such as plantar fasciitis.¹⁷ Other foot conditions such as Morton's neuroma may also derive short term relief after manipulation and mobilization of the foot.¹⁸ Manual therapy such as Graston technique, an instrument assisted soft tissue mobilization, Active Release Therapy and other soft tissue mobilization techniques administered with the clinicians hands have been used to treat a wide variety of conditions including, but not limited to, relieving the signs and symptoms of sprains, strains, muscular adhesions and entrapment syndromes such as carpal tunnel syndrome.^{19,20} One study outlined the efficiency of both instrument assisted techniques as well as soft tissue mobilization done with the clinician's hands noting that while the clinical improvements were not different between the therapy groups, improvement in both groups was maintained on a 3 month follow up.¹⁹

Orthotic therapy using semi-rigid orthotics cast in non weight-bearing subtalar neutral has also been widely used to treat a variety of chronic foot conditions and are found to be beneficial in the management of plantar fasciitis.¹⁷ A randomized controlled trial of chiropractic manipulation and Achilles stretching versus orthotics found that both treatments appeared successful when used individually for treatment of plantar fasciitis.²¹ In a clinical setting, a practitioner will often use several of the tools available simultaneously to shorten the course of a complaint.

While the symptom presentation and history in this case ruled out CPRS, and a negative Morton's test decreased the likelihood of Morton's neuroma, the remaining 7 conditions remained on the differential. Tarsal tunnel syndrome may be under-diagnosed as it can be difficult to diagnose due to the ease of confusing symptoms with plantar fasciitis and other foot conditions. Additionally, it was found while researching this topic that two clinical tests for plantar heel pain, the dorsiflexion-eversion test for tarsal tunnel syndrome and the Windlass test for plantar fasciitis ("passive extension of the first MTP joint or all MTP joints with the ankle in neutral {90 degrees}"¹²), "seem unable to differentiate between conditions that lead to plantar heel pain."¹² Although the dorsiflexion-ever-

sion test may not be specific to tarsal tunnel syndrome, if performed it may have provided further support for the diagnosis. Tinel's test, which has been traditionally used to determine if an entrapment neuropathy is present, is positive in 67% of cases of tarsal tunnel syndrome, but was not present in this case. If the patient did not respond to conservative management, radiographs and/or a bone scan could have been performed to help to rule out rheumatologic causes as well as stress fracture and the rare possibility of infiltration by tumour. Unless there are signs of muscle atrophy or motor involvement, a conservative approach to treating tarsal tunnel syndrome should be attempted before referral for a nerve conduction study and prior to considering a surgical referral.

Previous studies have reported successful management of tarsal tunnel syndrome with: custom orthotics,^{3,14,15,16} taping, bracing, stretching, icing, soft tissue manipulation, chiropractic adjustments, massage, fascial stripping, non steroidal anti-inflammatory medication, corticosteroid injection, analgesic medication, or opioid medication.^{13,14,15,16} The patient in this case was prescribed a pair of custom orthotics but reported little change in her condition after wearing the orthotic devices for 10 weeks. A course of fascial stripping techniques to the lateral heel over the tarsal tunnel, and over the plantar and dorsal surfaces of the forefoot, and HVLA toggle board adjustments of the talonavicular joint and mobilizations of the cuboid were initiated as restrictions of joint motion were noted when evaluated for joint play. As significant improvement was reported by the patient after 4 treatments; the same treatment was continued throughout the course of therapy.

There are several factors that may have influenced the favourable outcome of this case. HVLA adjustments were used to attempt to re-establish normal motion of the cuboid and the talonavicular joint. Although orthotics alone did not ease the symptoms, orthotics were used to attempt to correct faulty biomechanics and to address dysfunctional foot mechanics, which play a role in influencing changes along the kinetic chain. Soft tissue techniques including fascial stripping were used to attempt to break down scar tissue that may have accumulated in the area.²² With the onset of manual therapy, the patient seemed to have a rapid reduction of subjective symptoms, but it is important to note other factors that may have produced a favourable outcome in this case such as the use of orthotics prior to manual intervention.

Further study is needed to identify other possible treatment avenues such as specific rehabilitative exercises. Exercises that influence the strength and stability of the intrinsic musculature of the foot may prove a useful tool in the treatment of tarsal tunnel syndrome. This research might take the form of other case reports or a small scale clinical trial to compare the effectiveness of treatment with and without specific exercise prescription.

Conclusion

Although favourable results were obtained, it is important to remember that the nature of this investigation was that of a case study, and therefore treatment was applied to only one patient. Limited as it may be, this case does demonstrate the conservative management using custom orthotics, manipulation, and fascial stripping of one case of tarsal tunnel syndrome. Conservative management of tarsal tunnel syndrome should be explored prior to more invasive procedures such as injection of corticosteroids or surgery.

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