

Conservative Management of Peroneal Nerve Entrapment: A Case Report

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Published: December 2022

Journal of the International Academy of Neuromusculoskeletal Medicine

Volume 19, Issue 2

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ABSTRACT

Background

The peroneal nerve is the most common compressive nerve entrapment in the lower extremity. Symptoms of peroneal nerve entrapment include foot drop, weakness of the ankle and toe dorsiflexion and eversion, and paresthesia over the lateral leg below the knee and dorsum of the foot. The purpose of this case report is to discuss the treatment and outcome of peroneal nerve entrapment utilizing manipulation, kinesiology tape, and manual therapy.

Methods

A 23-year-old female patient presented for chiropractic care for a chief complaint of numbness and tingling over the anterior aspect of her left foot. After a history and exam, the patient was diagnosed with peroneal nerve entrapment. The patient completed 12 visits over two months using manipulation, manual therapy, and kinesiology tape.

Results

The patient had a complete resolution of symptoms after the seventh visit. The patient reported that after being discharged from care, she could complete all her normal activities of daily living without reproducing the symptoms.

Conclusion

A 23-year-old female patient was successfully treated by manipulation, manual therapy, and kinesiology tape for the diagnosis of peroneal nerve entrapment.

Keywords

Peroneal nerve entrapment, kinesiology tape, manipulation, manual therapy

INTRODUCTION

The peroneal nerve is the most common compressive nerve entrapment in the lower extremity.¹ The primary cause of peroneal nerve entrapment is a traumatic injury such as knee dislocation, fibular fractures, or a direct blow to the area.¹ Nontraumatic risk factors include behavior issues related to sitting for long periods with crossed legs and repetitive stretches from squatting.¹ Interestingly, weight loss may also produce acute peroneal nerve entrapment in some patients.¹ Knee arthroplasty is a surgical risk factor for developing peroneal nerve entrapment.¹

The common symptoms of peroneal nerve entrapment are foot drop, ankle and toe dorsiflexion and foot eversion weakness, along with paresthesia over the lateral leg below the knee and dorsum of the foot.¹⁻² Individuals with peroneal nerve entrapment may also experience a distinctive steppage gait.² The common peroneal nerve branches off the sciatic nerve proximal to the popliteal fossa.² The common peroneal nerve winds around the fibular head, making it vulnerable to compression injuries or excessive stretching injuries against the fibular head.² Distal to the fibular head, the common peroneal nerve branches out to the superficial and deep peroneal nerves.² The superficial peroneal nerve provides sensation to the dorsum of the foot and the outside portion of the lower extremity.² The superficial nerve also provides motor function to the peroneus longus muscle.² The deep peroneal nerve provides sensory information to the first digit of the lower extremity as well as the webbing of the foot.² The motor function of the tibialis anterior, extensor hallucis longus and extensor hallucis brevis is provided by the deep peroneal nerve.²

Conservative treatment for peroneal nerve entrapment is based on removing anything that may be compressing the area, stabilizing unstable joints, and reducing inflammation.¹ Many patients that experience peroneal nerve entrapment will have relief with conservative treatment; however, surgical intervention is often necessary when conservative treatment fails to resolve the symptoms.¹

Villafane et al³ discussed a case involving a 24-year-old male patient and the use of spinal manipulation, fibular head manipulation, and neurodynamic mobilization, including soft

tissue treatment to the psoas and hamstrings. The treatment outcome was an increase in patient function and a decrease in symptoms. Villafane et al³ is one of only a few case reports that utilized manipulation as part of the treatment plan. The purpose of the case report is to discuss the treatment and outcome of peroneal nerve entrapment utilizing manipulation, kinesiology tape, and manual therapy.

CASE PRESENTATION

A 23-year-old female patient presented for chiropractic care for a chief complaint of numbness and tingling over the anterior aspect of her left foot. The patient reported that the pain had come on over the previous two weeks and had been a relatively constant sensation since the onset. The patient explained that she felt most of the numbness over the anterior aspect of her left talus. When she would walk, it would occasionally radiate into the medial aspect of her left foot. The patient was instructed to walk down the hallway a few times to establish when the pain radiated the most in her gait. It was established that the radiating numbness and tingling to the medial foot would occur during the "pre-swing" and "toe off" phases of the gait cycle. The patient also noted numbness and tingling when she wore heels, so it was concluded that the radiating numbness and tingling sensation would occur when the patient's left foot was in plantar flexion. It was also noted that when the patient first noticed the numbness and tingling, she felt some slight numbness in her shin, but that has since diminished, and she has not experienced that sensation since the initial onset. The patient rated the severity of the numbness and tingling sensation at rest as 3/10 and when she was walking or in heels as 5/10 on a VAS pain scale. There is no known mechanism of injury, but the patient first acknowledged the pain when she was walking on the treadmill at the gym, and the pain has remained since that day, two weeks before her initial visit for the issue. The patient's prior history reveals corrective scoliosis surgery and spinal fusion surgery five years prior for correcting a 72-degree levoscoliosis in her thoracic spine. The patient has no other significant surgeries, traumas, or complaints in her accompanying history.

Upon examination of the left foot, the range of motion in dorsiflexion, plantar flexion, eversion, inversion, abduction, and adduction were all within normal limits; however, the patient's complaint of numbness and tingling over the anterior and medial aspect of the left foot was elicited with active and passive plantar flexion of the right foot. Tenderness, numbness, and tingling were elicited with direct palpation of the left talus, along with a slight referral to the medial aspect of the foot. Palpation of the lower left leg also revealed trigger points which are hypertonic spots or a somewhat palpable nodule found in taut bands of skeletal muscle, as well as muscle spasms throughout the patient's anterior tibialis muscle, peroneus longus, and peroneus brevis muscles. The patient's numbness and tingling on the anterior part of the foot were also elicited when the peroneus longus and brevis muscles were palpated. The patient reported feeling it in the profound plantar aspect of her left foot. Anterior and posterior drawer tests of the left ankle were negative, along with the Thompson and Tinel's Tarsal Tunnel tests. Duchenne's sign was positive on the left foot and negative on the right, indicative of peroneal nerve entrapment on the left. The patient's lumbar spine and hip were also examined and revealed no significant findings, positive orthopedic tests, or diminished motor, sensory, or deep tendon reflex neurological deficits.

Initial chiropractic treatment began with a review of the patient's findings. It explained the different aspects where the peroneal nerve could become entrapped and cause the paresthesia she was experiencing on the anterior and medial aspects of her left foot. Initial patient treatment began with myofascial release and trigger point therapy of the left anterior tibialis muscle, peroneus longus, and peroneus brevis muscles. The myofascial release of the patient's peroneus longus and brevis muscles consisted of first shortening the muscle by plantar-flexing and everting the left foot, then taking a thumb contact on the distal aspect of the muscle belly and passively dorsi-flexing and inverting the left foot with the other hand while the thumb pins the muscle. This process was repeated, working proximally up both muscle bellies until the furthestmost proximal end of the muscle belly was reached. The same process was repeated for the left anterior tibialis muscle except the foot was first dorsi-flexed and inverted to shorten the muscle and was plantar-flexed and everted to lengthen the muscle after the thumb contact in the muscle belly was taken. Trigger point therapy consisted of applying constant ischemic pressure with a reinforced thumb contact over the previously palpated trigger points in each of the peroneus longus, brevis, and anterior tibialis muscles until the trigger point was released.

Treatment continued with a high-velocity low amplitude (HVLA) chiropractic adjustment of the patient's left talus when palpation findings indicated the need. For the talus adjustment, in this case, the patient is positioned supine with the right leg on the table and the left leg hanging off the side of the table. The doctor stands at the foot of the table facing the head of the table on the side of the patient's left leg. The segmental contact point is the anterior dome of the talus; the doctor's contact point is the left and right middle fingers overlapped on the anterior dome of the talus, with the left middle finger being the most superior of the two. The thumbs stabilize on the foot's plantar side, and the ring and pinky fingers stabilize on the posterior aspect of the Achilles tendon. The left foot is first tractioned superior to inferior. Then, a short, quick thrust is applied anterior to posterior by the middle fingers on the anterior dome of the talus. Further into the treatment plan, a low force-impulse adjustment was performed on the patient's left fibular head with a chiropractic instrument assisted adjustment. It was added to the patient's care plan going forward. For this adjustment, the patient is lying prone with both legs on the table. The doctor is positioned in a scissored stance facing the head of the table on the patient's left side. The posterior aspect of the patient's left fibular head is contacted with the instrument and a thrust is administered with the instrument in a posterior to anterior line of correction.

Treatment also included decompression strips of kinesiology tape, which were applied to the anterior dome of the left talus and the posterior aspect of the left fibular head. The kinesiology tape was applied in a bandage-like fashion where the backing of the tape is first ripped in the middle to expose the adhesive side of the kinesiology tape. The backing is then slightly peeled back and roughly an inch of the tape is exposed. Once the adhesive side of the tape is exposed, it is stretched to about 25% of the tape's total stretch ability and the center of the one inch of tape that is exposed is applied to the head of the left fibula and to the anterior dome of the left talus individually. The rest of the backing is then removed from the remainder of one side of the tape strand and applied to the skin as an anchor strip, with no stretch involved. This is then repeated for the other side of the tape with the backing still on.

The patient's treatment plan consisted of ten visits over eight weeks. The patient did miss weeks three and four due to traveling and work but returned to a consistent treatment schedule after her travel. The patient no longer experienced numbness and tingling throughout the last three visits. At the conclusion of the patient's care plan, she no longer had any symptoms from her original chief complaint and could walk on a treadmill and wear high heels without the symptoms being elicited at any time.

DISCUSSION

Peroneal nerve palsy is the most common entrapment neuropathy in the lower extremity, and the presentation of foot drop is a frequent initial manifestation of this disorder.⁴ This condition can have a marked influence on the patient's activities of daily living. In a referenced case study, a similar treatment approach to ours utilizing chiropractic manipulation of the lower extremity was chosen for a 14-year-old female with an insidious onset of foot drop.⁵

After the history and examination, clinical reasoning suggested that the lesion exclusively involved temporary compression of the peroneal nerve at the fibular head, as evidenced by weak dorsiflexion and spared plantar flexion, inversion, and intact sensation of the lower leg, with no suspicion of higher sources of neuropathy based upon exam.⁵ Other etiologies such as synovial cysts, diabetic mononeuropathy, infection, tumor, and aneurysm were discounted due to the patient's lack of associated symptoms, pain, relevant clinical history, and negative examination and imaging findings.⁵ There was no indication of other associated pathologies; therefore, clinical rationale led the chiropractor to an association between tibiofibular joint dysfunction secondary to a sports sprain injury and residual post-menisectomy scar tissue at the knee joint affecting the peroneal nerve at the level of the fibular head.⁵ Strictly a mechanical etiology was considered based on lack of foot dorsiflexion, moderate posterior and lateral proximal tibiofibular joint restriction on active and passive range of motion, and essentially negative history, examination, and imaging findings to consider more complex or higher source etiologies.⁵

The chiropractic physician assessed the knee joint and identified a lateral to medial fixation compatible with segmental joint dysfunction (restriction) at the right proximal tibiofibular joint.⁵ A manipulative procedure was performed with the metacarpophalangeal joint of the index finger in contact with the fibular head and stabilization on the opposite side of the joint.⁵ A lateral to medial HVLA thrust was delivered, addressing the tibiofibular joint restriction.⁵ Immediately after, the patient could dorsiflex her right foot approximately 1 to 1½ inches with noticeably increased strength.⁵ It is possible that the joint addressed had residual scar tissue irritating the nerve, which was released after the manipulation. The patient was released from care following a reexamination two weeks after her initial presentation, where she presented asymptomatic with no significant findings on examination.⁵ She was advised to avoid leg-crossing habits, continue self-directed lower extremity rehabilitative exercises for re-conditioning and muscle strengthening, and consider follow-up with physical therapy.⁵

Tibiofibular joint manipulation has been shown to improve ankle dorsiflexion, decrease joint pain, and improve balance.⁵ HVLA manipulation of joint dysfunctions may break down adhesions from previous micro-traumatic injuries and scar tissue, which is known to be one cause of temporary peroneal nerve palsy.⁵ Thus, manual manipulation may release these fibrous entrapments and restore functionality.⁵ This study is unique regarding foot drop and utilization of CMT. There are few to no published similar cases in the current literature. This emphasizes the importance of differential diagnosis and management of peroneal nerve palsy.⁵

Another research study was found that demonstrates the use of instrument-assisted manipulation to improve symptoms of lower leg neuropathy.⁶ Based on the study's results, a course of chiropractic care using Torque Release Technique (TRT) and Activator Methods Chiropractic Technique (AMCT) to correct segmental dysfunction was associated with the resolution of chronic lower limb neuropathy and improvements in physical functioning and quality of life.⁶

Additional research was found utilizing Kinesio taping (KT) and proprioceptive neuromuscular facilitation (PNF) interventions for patients with reduced ankle dorsiflexion range of motion due to foot drop and stroke.⁷ The study concluded that PNF-KT applied to the affected side improved ankle dorsiflexion range of motion and gait parameters in hemiplegic stroke patients better than no taping.⁷ Thus, lower-leg PNF-KT may be a helpful intervention in a rehabilitation program to improve ankle dorsiflexion range of motion and gait parameters in chronic stroke patients with foot drop in clinical settings.⁷

Similarly, another study aimed to determine the effect of a proprioceptive neuromuscular facilitation (PNF) pattern Kinesio taping (KT) application on the ankle dorsiflexion range of motion (DF-ROM) and balance ability in patients with chronic stroke.⁸ This study demonstrates the application of PNF-KT may be a feasible therapeutic method for improving ankle movement and balance in patients with chronic stroke.⁸ Additional research is recommended to identify the long-term effects of PNF-KT.⁸

Lastly, a referenced case report describes a 40-year-old male who presented with complaints of pain in the left lower lateral one-third of the leg.⁹ Physical diagnosis for entrapment of the superficial peroneal nerve at the site of the peroneal tunnel was entertained based on clinical examination and three positive provocation tests. Conventionally, treatment for this type of entrapment has been surgical decompression by splitting the crural fascia, with successful outcomes. This study demonstrates physical therapy management of peroneal nerve entrapment with pain modalities, soft tissue mobilization, and neural mobilization. Reduction of pain was noted in this patient with complete pain resolution maintained at a six-month follow-up.⁹

The prior referenced studies demonstrate the clinical rationale and effectiveness of the treatments utilized in this case. The patient was managed successfully by conservative care consisting of manual and instrument-assisted manipulations, manual therapy, and kinesiology tape. However, one limitation of this study is the patient did not receive a diagnostic ultrasound to confirm the diagnosis of peroneal nerve entrapment due to the fact that the patient's symptoms improved with conservative management prior to the need for

further advanced testing. The utilization of diagnostic ultrasound has become increasingly popular in diagnosing nerve entrapment. Jung et al. reported that the diagnostic ultrasound was cost-effective and reliable for the diagnosis of nerve entrapment.¹⁰ Chang & Kim demonstrated that the diagnostic ultrasound is reliable for large peripheral nerves of the extremities; however, there are inconsistencies with the smaller peripheral nerves.¹¹

CONCLUSION

This case report describes the resolution of peroneal nerve entrapment by utilizing manipulation, manual therapy, and kinesiology tape. It describes conservative treatment without adverse reactions to treat the condition, and suggests the application of kinesiology tape may be beneficial to patients with peroneal nerve entrapment.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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