

Case Report

Medial dorsal cutaneous nerve entrapment following inversion ankle sprain

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Received: 17 December 2023

Accepted: 18 January 2024

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ABSTRACT

The medial dorsal cutaneous nerve is one of the terminal branches of the superficial peroneal nerve that provides sensory innervation to the dorsum of the foot. It may be prone to injury by direct blow, iatrogenic surgical lesion or in rare situations secondary to ankle sprains. The authors report a case of persistent ankle pain in a female patient caused by a post-traumatic compressive neuropathy of the medial dorsal cutaneous nerve secondary to an ankle sprain which was successfully surgically treated with complete resolution of the symptoms.

Keywords: Compressive neuropathy, Medial dorsal cutaneous nerve, Ankle sprain complications, Foot nerve decompression

INTRODUCTION

The sensory innervation of the foot is provided by the medial dorsal cutaneous nerve (MDCN), one of the terminal branches of the superficial peroneal nerve.

MDCN branches innervate the dorsal aspect of the hallux and the second and third toes. Exception given to the first web space, which is innervated by the deep peroneal nerve.¹

The anatomic location of the MDCN at the anterior region of the ankle makes it susceptible to injury, being that iatrogenic (during placement of arthroscopic portals for example) or traumatic. In ankle sprains, especially in forced inversion-plantar flexion mechanism, the MDCN can be tethered, and this can result in overstretching and further in perineural fibrosis and chronic pain in the ankle.^{2,3}

To our knowledge, there are few reports in the literature about this condition.

CASE REPORT

The authors present a case of persistent pain and numbness on the right ankle of a 40 years old female patient. The patient had a background history of a severe ankle sprain that happened 4 years before our assessment.

According to her previous history obtained from her hospital records, she had presented to the hospital emergency department following a severe ankle sprain. After physical examination and normal X-rays imaging, she followed conservative treatment.

Over the following four years, despite many treatment modalities including physiotherapy, injections and other treatments, the patient still complained about numbness, tingling and pain over the anterior region of the ankle and dorsum of the foot, which were exaggerated by activities of daily living. Also, she complained about pain in the anterior face of the ankle and in the dorsal region of the foot when wearing boots and was incapable of wearing high heels.

Further investigation showed no abnormalities on plain and weight bearing radiographs. Her attending doctor asked other complementary exams, which included magnetic resonance imaging (MRI), computed tomography (CT) scan and electrodiagnostic studies (EMG/NCV). The MRI elicited a possible incipient extensor tendon tenosynovitis. EMG/NCV and analytical parameters showed no abnormalities. The CT scan imaging findings were negative for acute or chronic bony injuries.

The patient was referred to our department because despite all described conservative treatment the symptoms persisted. We've assessed any previous diseases that could elicit bad results from her initial trauma. No history of obesity, diabetes, smoking and peripheral vascular diseases was noted.

A thorough physical examination of the lower limb was performed, including a comparative contralateral side examination. There was normal range of motion of the ankle and foot. No skin lesions, no evidence of tendinous diseases and no signs of tibial nerve entrapment. We've also assessed the common peroneal nerve at the neck of the fibula and there was no pain at palpation or compression and the Tinel's sign was negative.

We observed that there was pain in the anterior surface of the ankle, on a location two centimetres laterally to the anterior tibial muscle tendon (on the common anatomic location of the medial dorsal cutaneous nerve) and that the pain was worsened with plantar flexion of the ankle and foot and with inversion and supination of the forefoot.

Tinel's sign was positive with the percussion of the nerve location. Pain and paraesthesia with prolonged pressure on this area showed a similarity with a positive Durkan's test, which led us to perform a therapeutic test with local injection of 2% lidocaine upon the painful area; this resulted in a temporary remission of the patient's pain but this lasted only for a few hours.

The patient signed an informed consent and was admitted to surgery. The objective was to decompress the MDCN under regional anaesthesia. In a dorsal decubitus position, the lower limb was exsanguinated and an Esmarch band was applied. The surgical approach was centered over the previous marked painful spot on the anterior surface of the ankle and a lazy "s" incision was performed. With gentle dissection, avoiding damage to other structures, the nerve was exposed and then decompressed.

The area of compression of the nerve is well seen when it passes the anterior aspect of the ankle (Figure 1). We observed the area of compression thinner than the proximal and distal segments of the nerve.

During surgery, we also observed epineurial fibrosis with a pseudo neuroma formation proximal to the zone of compression of the nerve. At the end of the surgery, after

sutures and dressings, the patient was put in a resting suropodal cast. With the use of two crutches, she was informed not to bear weight on her foot.

The patient was followed-up in weekly appointments until the six months post-operative visit. There was complete resolution of the pain in the first post-operative week visit. We removed the cast and slow progressive weight bearing walking was allowed for the next two weeks. At the third post-operative visit, the patient was allowed to walk without crutches.

The patient informed complete remission of her symptoms at the six months post-operative visit. There was no need for physiotherapy and complementary treatments. The patient returned to work after the sixth post-operative visit and informed she was satisfied with the resolution of her symptoms.

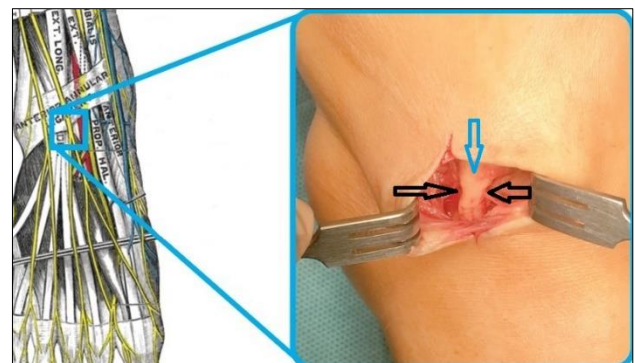


Figure 1: Drawing of the anatomical aspects of the ankle and foot anterior region to the left, displaying in the detail the anatomical position of the medial dorsal cutaneous nerve. On the right, surgical exposure of the medial dorsal cutaneous nerve on the anterior aspect of the ankle; the compression area is well seen, pointed by the black arrows. The proximal pseudoneuroma is also evident (blue arrow).

DISCUSSION

There is a paucity of reports in the literature about medial dorsal cutaneous nerve injury and these are mainly related to lesions at the portals for ankle arthroscopy.¹ To our knowledge, there are only a few reports of entrapment by epineurial fibrosis of the MDCN in consequence of an ankle sprain.

Injury of the superficial peroneal nerve (SPN) and its terminal branches due to an ankle sprain may be not as rare as the literature would suggest. Nitz et al observed electrophysiologic changes in the peroneal nerve in more than 80% of patients with a severe ankle sprain.⁴ In fact, lesions to the MDCN tend to be underappreciated and difficult to diagnose not only because they are frequently masked by the acute pain of the ankle sprain and the longer term morbidity associated with a ligamentous injury but

also because MDCN is small and not easily accessible for electrodiagnostic studies.⁵

The intraneural microcirculation may be impaired by a small elongation of the nerve, incurring in paralysis of the blood flow when the nerve is elongated to 15%.⁴ Further stretch of the nerve leads to epineural rupture and impairment of the vasa nervorum, rupture of nerve fibers and the funiculi thus leading to a disarray of the nerve structure and intraneural hematoma. This disarray leads to an inflammatory reaction and then epineural fibrosis.^{2,3,5} This may be the explanation for the longlasting painful symptoms in our patient.

It is useful emphasize the absolute importance of a thorough physical examination and the obtention of a most complete clinical history when dealing with these difficult patients. And to exhaust all conservative treatments should before a surgery. The lidocaine test is a useful tool to complement the patient's medical workout.

CONCLUSION

In conclusion, this paper shows that the attending orthopaedic surgeon must have in mind the possibility of a post-traumatic compressive neuropathy of the medial dorsal cutaneous nerve in the ankle may be the cause of chronic ankle and foot pain and that surgical decompression of this nerve can result in the resolution of this condition.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

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Cite this article as: Alves MPT, Nobrega JPG, Dourado PFFM. Medial dorsal cutaneous nerve entrapment following inversion ankle sprain. Int J Res Orthop 2024;10:444-6.