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CASE REPORT

Medial calcaneal neuropathy: A rare cause of prolonged heel pain

Medial kalkaneal nöropati: Uzamış topuk ağrısının nadir bir nedeni

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Summary

Pain heel constitutes 15% of foot pain. Pain may be caused by plantar fasciitis, calcaneal fractures, calcaneal apophysitis, heel pad atrophy, inflammatory diseases or related with nerve involvement. Tibial, plantar and/or medial nerve entrapment are the neural causes of pain. Most of the heel soft tissue sensation is provided by medial calcaneal nerve. Diagnosis of heel pain due to neural causes depends on history and a careful examination. Surgery should not be undertaken before excluding other causes of heel pain. Diagnosis should be reconsidered following conservative therapy.

Keywords: Heel pain; medial calcaneal nerve.

Özet

Topuk ağrısı ayak ağrılarının %15'ini oluşturur. Ağrı, plantar fasiit, kalkaneal kırık, kalkaneal apofizit, topuk yastığının atrofisi, enflamatuar hastalıklar gibi nedenlere bağlı olabildiği gibi sinir kökenli de olabilir. Tibial, plantar ve/veya medial kalkaneal sinir sıkışması ağrının nöral nedenlerindendir. Medial kalkaneal sinir topuktaki yumuşak dokuların çoğunun duysal innervasyonunu sağlar. Topuk ağrısının nöral kaynaklı olduğunu teşhis etmek için öykü ve dikkatli bir fizik muayene gerekir. Topuk ağrısının diğer nedenleri dışlanmadan önce cerrahi girişim için acele edilmemeli, konservatif tedavi sonrasında tanı yeniden gözden geçirilmelidir.

Anahtar sözcükler: Topuk ağrısı; medial kalkaneal sinir.

Introduction

Plantar heel pain consists 15% of all foot pain. It may be classifed as plantar, midfoot (medial and lateral) and posterior heel pain according to its location or sharp or burning (with electrical like feeling) according to the type of pain or adult or childhood pain according to age.[1] Pain maybe related to mechanical causes like abnormal pronation, plantar fasciitis, plantar fasciosis, calcaneal bone fracture, calcaneal apophysitis, atrophic or damaged heel pad or to inflammatory conditions presenting with arthritis. It may also be induced by nerve compression or entrapment.[2] While pain upon stepping immediately after a period of rest is mostly related with plantar fasiitis, pain following prolonged standing is usually associated with fat pad syndrome. Neurological causes include tarsal tunnel syndrome, entrapment of plantar nerve (medial or lateral), medial calcaneal branch of tibia nerve or sural nerve. In cases with unilateral heel pain, lumbar disc disease with radiculopathy should also be considered as one of the reasons. In bilateral pain, neuropathic pain associated with sysytemic causes like diabetes, alcoholism or vitamin deficiency may be the etiological factor.[3] In case of insufficient treatment of local or nociceptive pain, pain becomes chronic. In chronic pain stimulation of nociceptive resecptors with mechanical and inflammatory mediators increase the sensitivity of the somotosensorial system. Resprouting of the free nerve endings also play an important role in the chronicity of pain.[4,5] Hence heel pain may become a form of central pain in cases with a long disease duration.

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Case Report

A 40-year-old woman with a 2-year history of lumbar disc disease presented to the clinic with ongoing left foot pain. She was operated 1.5 months ago with the diagnosis of plantar fasciitis and lateral plantar nerve entrapment by an orthopedist. She has reported that preoperative EMG findings were not significant. She has received five sessions of physical therapy before the surgery. Following surgery local steroid injection was delivered without any significant relief. Amitriptyline 25 mg was also prescribed. The patient reported severe first step pain that may be termed as poststatic dyskinesia and pain with prolonged standing. She also had severe discomfort in wearing shoes. On physical examination no deformities, sweellling or redness was observed. There was neither muscle atrophy or limited joint motion. Sensory examination showed severe allodynia over the vertical incision on the medial side. MRİ (Magnetic Resonance Imaging) revaled postoperative changes of the plantar fascia and tarsal tunnel. She was reoperated and neurolysis of the lateral plantar nerve was done followed by local streoid injection. Scar masassage, sensory reeducation, mild resistive exercises and hydrotherapy were advised as complementary treatments. Pregabalin was interchanged with amitriptyline and increased to 450 mg/day. Pregabalin was stopped after 1 month due to the persistent pain while standing and walking. 2 months later the patient has referred to an algologist for ongoing left heel pain. Sympathetic blockage at L4, dorsal root ganglion blockage by radiofrequency at L4 and L5 were applied by the algologist who diagnosed the patient as complex regional pain syndrome. The patient reported no pain relief 8 months later and visited another orthopedist who asked for a second EMG investigation. The EMG result was compression of medial calcaneal branch of the left posterior tibial nerve. Due to the diminished sensory conduction velocities,the patient was diagnosed as having a medial calcaneal neuropathy and neurolysis of this branch was undertaken. The patient attended physical medicine and rehabilitation sessions consisting of superficial heat, analgesic currents, therapeutic ultrasound, soft tissue massage and various therapeutic exercises. Two months later, she reported that she could spend more time in the standing position. Her physical examination revealed no allodynia. Sensory testing by monofilament was unresponsive to 6.65 at the heel and 3.61 on the lateral and medial sides of the foot. 2 point discrimination test was also negative at the heel and more than 20 mm's at the neighborhood of the heel. The patient was discharged from physical therapy to be followed up in 3 months.

Discussion

Plantar fasiitis and heel spur are the most common causes of mechanical heel pain.[1] If there is a sensation of burning, tingling or numbness in the plantar region than medial or lateral plantar nerve entrapment may be the responsible cause. Tibial nerve divides in the distal third of the leg into medial calcaneal nerve (MCN), medial plantar nerve (MPN) and lateral plantar nerve (LPN). The bifurcation of medial and plantar nerves may take place inside,proximal or distal to the osteofibrous tunnel (tarsal tunnel). 73–100% of the bifurcations are located inside the tarsal tunnel. Dellon and Mackinnon have further described a reference line called malleolar- calcaneal axis to better define the limits of tarsal tunnel.[6] Lateral plantar nerve further gives its first branch or inferior calcaneal nerve which is called as Baxter's nerve.[7] Entrapment of the 1st branch of LPN occur in 15–20% of the patients with chronic pain.[2] In 1940 entrapment of this branch was considered as one of the neural causes of heel pain.[8] It does not supply the sensory branches to skin but when entrapped, gives a burning sensation on the plantar side of the heel.[2,9] Initailly the most significant complaint of the patient was heel pain that was worse with prolonged standing and walking. She also had first step pain which could be defined as poststatic diskinesia. Neither her complaints nor her first EMG didn't suggest any kind of nerve entrapment. Yet she has been operated and neurolysis has been done to the 1st branch of LPN. The surgical intervention has exacerbated her complaints and neuropathic pain has become the most significant source of pain. MRI of the left foot was undertaken to make a differential diagnosis. Diffrential diagnosis includes trauma, avascular necrosis, reganglion cyst, rheumatological involvement, lipoma and nerve sheath tumour.[10–12] In this case, no spesific patohology of the bone or soft tissues was found with MRI. The reason why MRI investigation of the patient was not helpful may be the numerous anatomic variations that medial calcaneal nerve demonstrates. It has been found by Didia et al. that it may originate from tibial nerve (62.5%),

from the medial plantar and tibial nerves, from the lateral plantar and tibial nerves (18.75%) or from the tibial and medial calcaneal and lateral plantar nerves. It may also consists of one, two, three or four major branches.[13,14] Hence MRI is the method of choice in depicting space occupying lesions of the tarsal tunnel rather than examining the nerve itself.[11]

The allodynia has been so severe that examination by the pyhsiatrist was only possible by observing and comparing with the other side the active joint ranges and by testing the muscle strength by asking the patient to walk on toes and her heels. No sensory testing related with light touch or vibration could be accomplished.

In our case we do not know whether heel pain was either present originally or caused secondarily by a neuroma or by the fibrotic scar tissue caused by the previous operation in this area. If heel pain was due to inferior calcaneal branch of plantar nerve than the sensibility of the medial heel would be normal. Abnormal sensibility of the heel suggests the nerve is compressed proximal to the origin of Baxter's nerve.[15] Monofilament test and two point discrimination test are the two practical tests to test the loss of sensibility.[16] The patient couldn't sense 6.65 monofilament which corresponds to a force of 300 mg. The sensory evaluation will be repeated 6 and 12 months after surgery to record the improvement compared to immediate postoperative values. During the first visit which was 3 months after the first operation, hyperalgesia and allodynia were the major sources of dysfunction. The intensity, quality and duration of pain were so severe and devastating that tricyclic antidepressants and antiepileptics were used for pharmacological treatment. It was not possible at the initial visit to identify the positive and negative sensory signs that accompanies neuropathic pain. It has been shown that thermal or mechanical hypoesthesia (41%) was more frequent than hypoalgesia (18%), mechanical hyperalgesia (36%) was more frequent than thermal hyperalgesia (19–24%) and mechanical allodynia was present in 20% of 1236 patients with different neuropathic pain syndromes.[17,18]

Although electrodiagnostic studies are usually requested to confirm nerve involvement, they carry a 50% false-negative result for large nerve compression syndrome.[19] They are even less accurate for smaller nerve fibers.[2] In our case, electrodiagnostic tests were useful to rule out lumbosacral nerve root compression which the patient has experienced two years ago. While the first EMG was not significant, the second EMG investigation, showed latency to sensory response in the MCN area.

Since the etiology of plantar heel pain is multifactorial, there are different tretments offered by different healthcare providers. In this case the patient visited three orthopedic surgeon, two algologists and two physiatrists. Conservative measures like physical therapy including ultrasound, laser, heat or cold therapy, analgesic currents, iontophoresis with dexamethasone, extracorporeal shock wave therapy, stretching exercises, night splints, taping, soft tissue or nerve mobilisation (in case of heel pain of neural origin), local anesthetic or corticosteroid injections may be applied for a positive outcome.[20] According to APTA (American Physical Therapy Association) guideline surgery is not recommended for the first 6 months of treatment.[21] They also advice to evaluate the improvements at the 6th week, 6th month and after 1 year. Alshami et al. stated that treatment of heel pain due to nerve entrapment was similar to other types also emphasize that surgery should be considered if at least 6–12 months of conservative treatment has failed.[2]

As in our case, correct diagnosis of heel pain is not easy. Since heel pain that aggravated by standing and walking was the major complaint, appropriate treatment of the mechanically induced plantar fasciitis sould have been considered first. Five sessions of phyisotherapy wouldn't be enough to rule out other causes of heel pain. Medial calcaneal nerve entrapment could be a reason of heel pain or a result of of the scar tissue following surgey. Careful physical, radiological and electrophysiological investigation should be undertaken to understand if there is nerve involvement or if pain is caused by non neurological reasons. To our opinion, due to limited reliability of tests, a well constructed conservative treatment of heel pain for at least 6 weeks should be the first choice before considering surgery.

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References

1. Tu P, Bytomski JR. Diagnosis of heel pain. Am Fam Physician 2011;84(8):909–16.
2. Alshami AM, Souvlis T, Coppieters MW. A review of plantar heel pain of neural origin: differential diagnosis and management. Man Ther 2008;13(2):103–11. Crossref
3. Thomas JL, Christensen JC, Kravitz SR, Mendicino RW, Schuberth JM, Vanore JV, et al. The diagnosis and treatment of heel pain: a clinical practice guideline-revision 2010. J Foot Ankle Surg 2010;49(3 Suppl):1–19. Crossref
4. Shaygan M, Böger A, Kröner-Herwig B. Neuropathic sensory symptoms: association with pain and psychological factors. Neuropsychiatr Dis Treat 2014;10:897–906. Crossref
5. Treede RD, Jensen TS, Campbell JN, Cruccu G, Dostrovsky JO, Griffin JW, et al. Neuropathic pain: redefinition and a grading system for clinical and research purposes. Neurology 2008;70(18):1630–5. Crossref
6. Torres AL, Ferreira MC. Study of the anatomy of the tibial nerve and its branches in the distal medial leg. Acta Ortop Bras 2012;20(3):157–64. Crossref
7. Pla ME, Dillingham TR, Spellman NT, Colon E, Jabbari B. Painful legs and moving toes associates with tarsal tunnel syndrome and accessory soleus muscle. Mov Disord 1996;11(1):82–6. Crossref
8. Louisia S, Masquelet AC. The medial and inferior calcaneal nerves: an anatomic study. Surg Radiol Anat 1999;21(3):169–73. Crossref
9. Barrett SJ, O'Malley R. Plantar fasciitis and other causes of heel pain. Am Fam Physician 1999;59(8):2200–6.
10. Hudes K. Conservative management of a case of tarsal tunnel syndrome. J Can Chiropr Assoc 2010;54(2):100–6.
11. Kim S, Choi JY, Huh YM, Song HT, Lee SA, Kim SM, et al. Role of magnetic resonance imaging in entrapment and compressive neuropathy - what, where, and how to see the peripheral nerves on the musculoskeletal magnetic resonance image: part 1. Overview and lower extremity. Eur Radiol 2007;17(1):139–49. Crossref
12. Diers DJ. Medial calcaneal nerve entrapment as a cause for chronic heel pain. Physiother Theory Pract 2008;24(4):291–8. Crossref
13. Govsa F, Bilge O, Ozer MA. Variations in the origin of the medial and inferior calcaneal nerves. Arch Orthop Trauma Surg 2006;126(1):6–14. Crossref
14. Didia BC, Horsefall AU. Medial calcaneal nerve. An anatomical study. J Am Podiatr Med Assoc 1990;80(3):115–9. Crossref
15. Dellon AL. Technique for determining when plantar heel pain can be neural in origin. Microsurgery 2008;28(6):403–6.
16. Gondring WH, Shields B. A touch pressure sensory assessment of the surgical treatment of the tarsal tunnel syndrome. Foot Ankle Surg 2011;17(4):266–9. Crossref
17. Maier C, Baron R, Tölle TR, Binder A, Birbaumer N, Birklein F, et al. Quantitative sensory testing in the German Research Network on Neuropathic Pain (DFNS): somatosensory abnormalities in 1236 patients with different neuropathic pain syndromes. Pain 2010;150(3):439–50. Crossref
18. Konopka KH, Harbers M, Houghton A, Kortekaas R, van Vliet A, Timmerman W, et al. Bilateral sensory abnormalities in patients with unilateral neuropathic pain; a quantitative sensory testing (QST) study. PLoS One 2012;7:e37524.
19. Rose JD, Malay DS, Sorrento DL. Neurosensory testing of the medial calcaneal and medial plantar nerves in patients with plantar heel pain. J Foot Ankle Surg 2003;42(4):173–7.
20. McClinton SM, Flynn TW, Heiderscheit BC, McPoil TG, Pinto D, Duffy PA, et al. Comparison of usual podiatric care and early physical therapy intervention for plantar heel pain: study protocol for a parallel-group randomized clinical trial. Trials 2013;14:414. Crossref
21. Goff JD, Crawford R. Diagnosis and treatment of plantar fasciitis. Am Fam Physician 2011;84(6):676–82.