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Case report

Traumatic neuroma of the posterior tibial nerve due to previous surgery presenting as a massive tumor in the midfoot: A case report

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ABSTRACT

A case report of traumatic neuroma, a benign non-neoplastic tumor of the posterior tibial nerve is presented. The soft tissue mass in the midfoot region was likely a sequela of previous nerve decompression surgery that the patient underwent five years previously in the same region and on the same nerve. Physical examination and history taking, along with an MRI, were important steps in reaching a definitive diagnosis of traumatic neuroma based on the findings of an interventional radiologist and histopathological evaluation of the biopsy by a pathologist. The lesion was subsequently surgically removed utilizing a multidisciplinary management approach. The patient recovered uneventfully and no symptom recurrence was noted at the 30-month follow-up. The tumor was the largest reported in the literature at the time. This case was also unique in that the patient was relieved of pronation and regained tactile sensation in the midfoot.

1. Introduction

A traumatic neuroma is a benign tumor of unknown etiology, suspected by some authors to be caused by trauma, injury or surgery [1]. Normally, a nerve attempts to repair itself by proliferation of Schwann cells in the proximal and distal stumps of the nerve. However, if proliferation is prevented or does not occur in an orderly fashion, nerve proliferation becomes disorganized [1]. Furthermore, as the wound heals, the myofibroblasts that lay the collagen fibers compress the adjacent nerve fibers and further stimulate perineurial cell growth as a protective response. This leads to slow mass growth leading to the typical traumatic neuroma, in which multiple fascicles of nerve fibers are encased in condensed fibrous scar tissue [1]. Such conditions are frequently reported after an amputation and degeneration of nerve fibers, with some occurring in the head, neck and oral cavity [2,3]. The differential diagnoses for traumatic neuroma are palisaded encapsulated neuroma, mucosal neuroma, and neurofibroma. Traumatic neuroma is associated with distinct histopathological findings, i.e., nerve twigs encased in fibrosis [4–6], which could be painful. Treatment involves lesion removal, re-approximation of the isolated nerve ends away from the scar tissue, or removal of external factors leading to such tissue formation [5,6]. Our case involved this pathology in the posterior tibial nerve (PTN).

2. Case

2.1. Clinical history

A 55-year-old female patient arrived at the clinic presenting with a palpable mass in the medial aspect of the flexor retinaculum that extended to the plantar midfoot. She claimed to feel no burning, tingling, or other abnormal sensations in the region, but found walking and putting on shoes painful due to pressure in the affected area. She first noticed the mass two years previously and believed that it had since grown in size. While she did not recall any acute trauma preceding the mass emergence, she reported having chronic ankle instability and a feeling that the foot was “giving out”. Past medical history was significant for tarsal tunnel syndrome, as well as compression neuropathy of the medial calcaneal nerve and the medial and lateral plantar nerve. Her surgical history relevant to this case included a right tarsal tunnel release procedure, neurolysis of the posterior tibial nerve, the medial and lateral plantar nerve, and the medial calcaneal nerve surgery performed five years previously by another practitioner. Her family history was unremarkable.

2.2. Examination

Clinical examination revealed a healthy white woman in no acute

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distress. The review of systems was noncontributory to the mass on her foot, while vascular examination revealed pedal pulses. A normal cutaneous response along the dermatomes in patient's foot was noted during neurological examination, which however also revealed a slight loss of tactile sensation along the area where the mass was present. Patient's deep tendon reflexes were normal. Tinel Sign and Valleix Sign were negative, with loss of tactile sensation along the entire lesion length. A visible, palpable, bulging soft tissue mass measuring approximately 7.0 × 4.0 cm on the medial aspect of the right foot was noted during dermatological examination. The lesion coursed from the inferior aspect of the fibular and extended to the plantar midfoot region, but it was not tender to palpation. In addition, no ulceration or infection of the skin was noted and a good range of motion in all pedal joints was confirmed. On standing, the right heel appeared to be in slight valgus alignment compared with the forefoot, and the skin on the medial aspect of the lesion clearly touched the floor when the patient was in standing position. When walking, the patient did not show any limping and had no antalgic gait.

2.3. Investigations

Radiographs taken during the initial visit revealed no soft tissue calcification, lucency, or periosteal reaction. Consequently, the working diagnosis was a probable ganglion cyst, fibroma, lipoma, or neuroma. MRI with contrast revealed a mild diffuse subcutaneous edema, along with an ill-defined soft tissue mass at the medial ankle and distal lower leg, showing a fusiform mass along the course of the posterior tibial nerve extending into the tarsal tunnel and midfoot. The mass had heterogeneous areas of a bright low T2 signal with a low T1 signal measuring approximately 21 × 6.9 × 2.0 cm. No other tendon or ligament pathology was seen on the MRI. These findings were indicative of either a benign or malignant tumor of the posterior tibial nerve. Thus, an interventional radiologist specializing in detecting malignant tumors was consulted and she subsequently performed ultrasound-guided needle aspiration and core biopsy of the lesion under local anesthesia to rule out malignancy. However, the aspiration was unsuccessful and no fluid was collected for analysis due to the solid nature of the lesion. Hence, the radiologist opted to perform image-guided core needle biopsy of various parts of the lesion to obtain tissue and cell samples for histopathological and microbiological studies, based on which benign traumatic neuroma was diagnosed, probably due to the prior surgery in the area. The interventional radiologist and pathologists concurred that it was safe to remove the mass surgically either in one single piece or as separate pieces, which was the recommended option.

2.4. Management

All available treatment options were discussed with the patient, including a careful surgical resection that might prevent recurrence. The patient agreed to proceed with this option, as she wanted to fit into a normal pair of shoes and walk without discomfort.

The soft tissue was excised under general anesthesia. A curvilinear expansile incision was made to include the entire tumor. The incision extended from the proximal ankle to the porta pedis. Blunt dissection was performed and all vital structures were preserved. The soft tissue mass was well encapsulated and extended into the plantar midfoot. The entire lesion remained within the subcutaneous fatty layer of the skin (Fig. 1). It had no visible association with any vascular and tendinous structures. The posterior tibial nerve that is present in the area was not found. The mass appeared pink to reddish in color; it was homogeneous and of a soft texture. It was carefully excised in three parts and the specimens were sent for histopathological analysis (Fig. 2). The histological examination further revealed the presence of a nerve with neural fibrosis, along with some myxoid changes in the stroma (Fig. 3). There were no signs of malignancy.

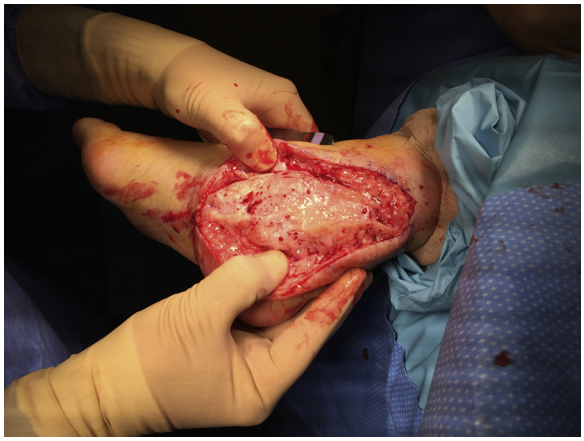

Fig. 1. Intraoperative traumatic neuroma of the right foot extending from the inferior medial ankle to the plantar midfoot.

The patient had an uneventful recovery. She remained non-weight-bearing in a Jones compression dressing for two weeks, after which the stitches were removed. At this visit, the incision appeared to have healed well but there was some residual anesthesia in the area that subsequently improved. She was capable of walking in a normal shoe without any discomfort. No evidence of recurrence was noted during the final follow-up visit.

3. Discussion

Morton's neuroma of the forefoot is frequently reported in pertinent literature, along with neurolemma and schwannoma of the posterior tibial nerve, which are other types of benign tumor that affect the nerve [7,8]. One case of a superficial peroneal nerve neuroma secondary to suspected trauma during ankle arthroscopy has been previously reported [9]. Another case of sural nerve neuroma was also discussed by Jones and colleagues, who noted that the patient showed limb length discrepancy, forefoot varus, and heel eversion [10]. Such biomechanical faults are known to cause repetitive stress and trauma to the lateral foot, giving rise to a neuroma [10]. No isolated traumatic neuroma of the posterior tibial nerve has been reported in academic literature focusing on foot and ankle disorders. However, there are numerous reports of head, neck and oral surgical cases of traumatic neuroma, giving rise to pain and discomfort.

Kim and colleagues described a case of post-traumatic neuroma of the medial plantar nerve that was treated successfully after resection and reconstruction of the nerve with bioabsorbable material [11]. This innovative approach allowed the nerve to be easily isolated during surgery. This was unfortunately not possible in our case due to which nerve repair could not be attempted.

It is important to highlight that our patient had no first-degree relatives with NF-1 and did not exhibit any physical signs associated with neurofibroma, such as the presence of Café au lait spots, freckling of the axillary region, Lisch nodules, visual complaints, seizures, or hypertension. Genetic testing was not performed because it is only recommended as a means of confirming a diagnosis when the relevant physical findings are present. In suspected cases based on clinical findings, the patient would be referred to a neurofibromatosis clinic for further follow-up. Thus, in this particular case, neurofibromatosis was ruled out.

Our case is unique because the patient presented with a posterior tibial neuroma of the foot that occurred as a result of prior surgical trauma. Moreover, it was probably the largest soft tissue tumor of the foot at that time. The specimen weighed 132.2 g and was removed in three pieces measuring 7.5 × 2.1 × 2.0 cm, 9.0 × 4.9 × 3.1 cm, and 12.4 × 7.2 × 2.0 cm, respectively (Fig. 2). We believe that this

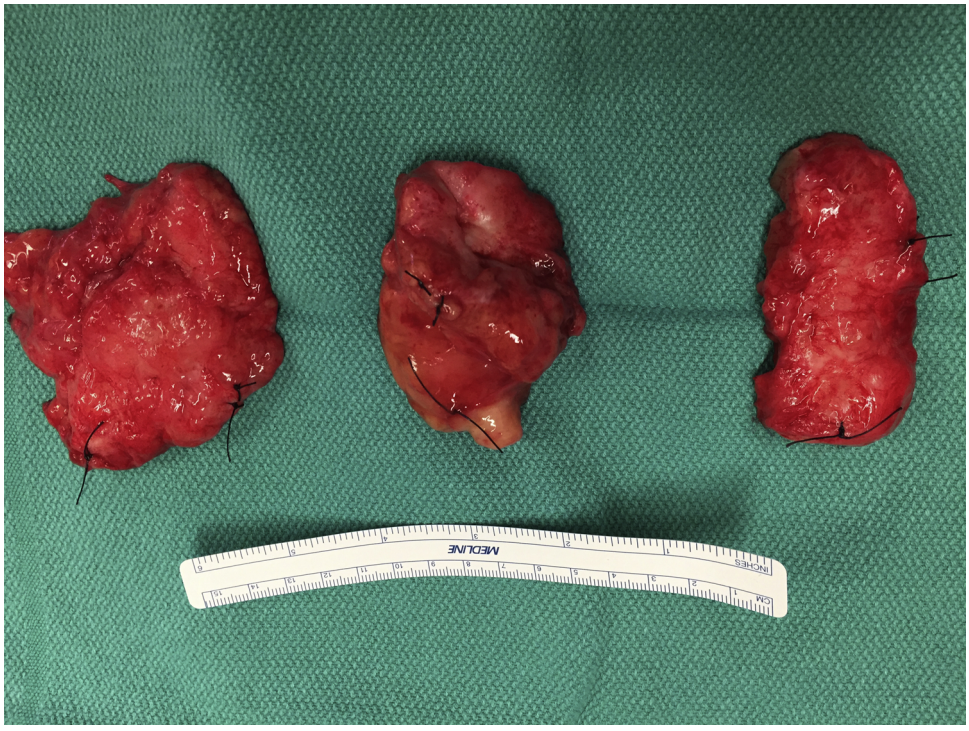

Fig. 2. Intraoperative specimens.

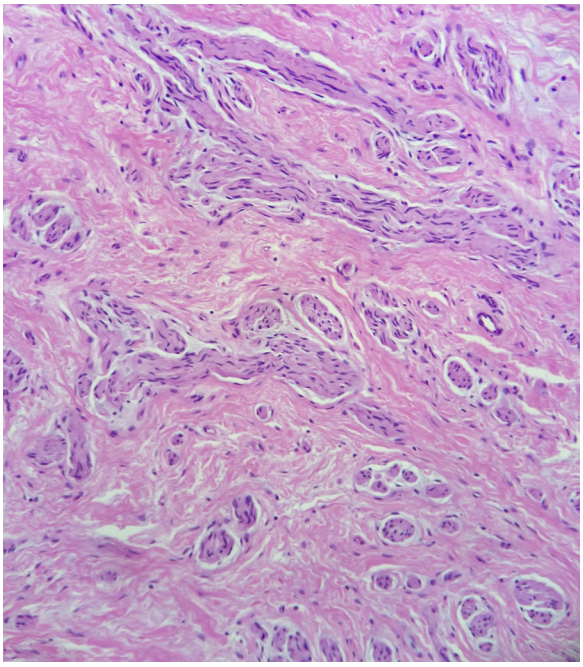

Fig. 3. Haphazard regeneration of the nerves with connective tissue (H&E stain, 40 × magnification).

condition is a direct result of the nerve decompression and neurolysis surgery the patient underwent five years previously. It is highly likely that the stump nerve endings subsequently regenerated, leading to slow growth of the mass over time.

Another unique feature of this case is that the patient's prior valgus position of the heel showed a rectus alignment after surgery and she no longer displayed pronation of the foot when walking. Moreover, she did not complain of any pain or tenderness along the medial collateral ligaments or in the posterior tibial tendon region. It is our believe that the removal of the expansible soft tissue mass relieved the tension on the medial arch of patient's foot and corrected most of the biomechanical abnormalities.

Another unique aspect of this case is that the patient regained some tactile sensation in the midfoot, which she lacked prior to her last surgery. This is a significant improvement in light of her surgery. Intraoperatively, it was difficult to identify and isolate the posterior tibial nerve, possibly because most of the nerve was embedded in the soft tissue mass. Despite our attempts to remove the soft tissue mass, it is possible that the entire nerve encompassing the tumor was not completely removed. Consequently, it is likely that some remnants of the nerve regenerated, allowing our patient to regain some tactile sensation at the last follow-up.

Although our treatment resulted in patient satisfaction, we felt extremely fortunate not to have performed a biopsy at our office. If the lesion had been malignant, biopsy in the clinical setting would have led to poor outcome, as we were unaware of any guidelines stipulating that specific biopsy technique must be adopted to prevent seeding of the malignant cells into the surrounding tissues. Our patient was thus referred for biopsy, which was performed by an interventional radiologist, as this is standard practice at our hospital in lesion cases. The pathological findings yielded by the biopsy confirmed those obtained when we submitted the intraoperative sample for pathological testing. We also found that it is important to gather all prior medical records. For example, the histopathological findings from the patient's index surgery 5 years ago identified the lesion as a neuroma.

This case presented a learning curve that it is vital to seek an expert opinion and input regarding the treatment plan from specialists at a sarcoma treatment center, as it is often impossible to distinguish a sarcoma from a benign tumor based on clinical presentation and using the assessment options available in the primary care setting [12]. Early diagnosis is vital for optimal patient outcomes, even if the likelihood of malignancy is very small. Given that this patient had already undergone a resection of a soft tissue tumor by another healthcare provider, and that the recurrence was indicative of soft tissue sarcoma, such as gradual enlargement of a painful mass confined to the deeper tissue planes, clinicians must suspect sarcoma until it is ruled out. Further, National Institute for Health and Care Excellence (NICE) guidelines indicate that

any lesion greater than 5 cm in diameter that is painful and growing in size should be treated as a sarcoma [12]. NICE guidelines further stipulate that all such patients be referred to a sarcoma diagnostic center for biopsy [12]. Such biopsy should be planned carefully so that the percutaneous core biopsy tract can be safely removed later if a surgical resection is warranted [12]. This approach would ensure that the risk of seeding the surrounding tissues with malignant cells or contaminants is minimized. Most importantly, we realized that the procedure should be performed by a specialist radiologist or a sarcoma surgeon [12].

Another lesson learnt from this case is that when suspecting tumors of the foot, diagnosis should not be based simply on clinical presentation. It is crucial to consider the possibility of malignancy in all such cases and to consult relevant experts to obtain a definitive diagnosis prior to surgical removal of the lesion. The most optimal approach to the diagnosis and management of such patients involves a multidisciplinary team, whereby all involved must follow appropriate guidelines and evidence-based medicine.

4. Conclusion

Traumatic neuroma of the posterior tibial nerve should be considered in the differential diagnosis for slowly growing, palpable masses taking into consideration previous surgery or decompression of the somatic and/or visceral nerves [13]. Proper history-taking is essential, and malignancy should be suspected until it can be ruled out based on valid evidence. Advanced imaging and consultation with interventional radiologists, sarcoma surgeons and pathologists are important steps that should be undertaken prior to surgical planning. Careful biopsy technique should be adopted to ensure safe removal of core samples and prevent seeding of malignant components into the adjacent tissue. The tumors could be small, present with compressive neuropathy, and with anesthesia or paresthesia symptoms, as they become larger and mimic signs of a soft tissue sarcoma. Histopathological findings of the traumatic neuroma would exhibit haphazard arrangement of regenerating axons against a background of Schwann cells, perineurial cells and connective tissue elements. Surgical resection is thus expected to relieve pain and discomfort.

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Conflict of interest

None of the authors have any conflict of interest or financial disclosures to report.

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