

# Unusual Neuroma of A Plantar Proper Digital Nerve: A Case Study



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## Introduction

A neuroma, normally presenting as a benign growth of nerve tissue frequently found between the toes, brings on pain, burning sensations, tingling, or numbness between the toes and in the ball of the foot. The main symptoms associated with a neuroma occur while walking. Often relief from these symptoms is accomplished by cessation of activity and removal tight footwear. Neuromas typically present between the digits however they may occur in any nerve that suffers trauma.<sup>1-3</sup>

Although there is no single, specific cause of a neuroma, many factors can contribute to its formation. Biomechanical deformities lead to the formation of a neuroma as there may be instability around the toe joints, leading to neuroma development. Trauma to the nerve may also damage the nerve fibers resulting in inflammation or swelling of the nerve itself. Additionally, ill fitting footwear causes the toes to be squeezed together or allows for excess forefoot pressure which leads to similar trauma.<sup>2, 4</sup>

Both conservative and surgical treatment options exist for this pathology. Conservative options range from offloading metatarsal pads and shoe modifications to NSAIDs and interdigital sclerosing alcohol or steroid injections in an attempt to ablate the inflamed nerve. Surgically, neurectomy or ablation with cautery are the most common surgical options.<sup>1, 2, 4, 5</sup>

## Statement of Purpose

Interdigital neuromas, or neuromas of common plantar digital nerves, are a pathology commonly encountered by podiatrists. To our knowledge, a neuroma of a plantar proper digital nerve to the second toe in the absence of amputation has not been previously described. We describe a case of a painful soft tissue mass to the plantar lateral second digit with subsequent diagnosis of neuroma. This case brings attention to the fact that the traditional presentation of some pathologies is not always the way such pathologies present and surgeons should be aware of such variations in presentation

## Literature Review

Many neuromas of the foot and ankle have been previously described. Sural, common peroneal, superficial and deep peroneal, saphenous, and common and proper plantar digital neuromas have been identified. Causes of neuroma formation include biomechanical, traumatic, post traumatic, and iatrogenic due to surgical intervention. Interdigital neuromas of the third interspace were originally described by Civinini in 1835, and later by Morton in 1876. Neuromas of the medial and lateral plantar digital proper nerves, referred to as Joplin's neuromas, have been described.<sup>1</sup> These are located at the medial aspect of the hallux and lateral aspect of the fifth digit, respectively. Postsurgical traumatic neuromas following amputation have been previously identified at all levels of lower extremity amputation, including digital.<sup>6</sup> To our knowledge, idiopathic neuromas of the plantar proper digital nerves to the second, third, and fourth digits have not been described.

Any insult or injury to a nerve that causes perineural damage may lead to neuroma formation. When axon fascicles exit the perineurium, there is disorganized proliferation and fibroblasts create scar tissue. The majority of neuromas are asymptomatic, but can become painful in the setting of chronic pressure or irritation. The exact mechanism is poorly understood. Symptoms include burning pain, numbness, or tingling in the distribution of the nerve.<sup>4, 5</sup>

## History and Physical Exam

A 70 year old female with a history of anxiety, GERD, hypertension, and vertigo presented with a painful soft tissue mass at the plantar lateral aspect of the proximal second digit of the left foot. There was an insidious onset over the course of 6 months with increasing pain and discomfort. She also reported pain with ambulation and shoe gear. Pain was relieved with rest. She described the pain as sharp and shooting, with occasional intermittent tingling which always resolved. She rated the pain 5-8/10. She had no history of trauma, open lesions, or foreign body.

Upon physical exam, a mobile, firm mass was identified at the plantar lateral aspect of the left second digit. There was significant tenderness with palpation. The patient was neurovascularly intact, with no neurological abnormality noted at the second digit. The remaining portions of the physical exam and radiographs were unremarkable. (Figure 1) Conservative as well as surgical treatment options were discussed with the patient, and she elected to undergo an excisional biopsy with complete removal of the soft tissue mass.

## Procedure

A small linear incision was made at the plantar lateral aspect of the left second digit at the level of the midshaft of the proximal phalanx directly overlying the mass. The incision was carried deep through subcutaneous tissue using both sharp and blunt dissection. A soft mass was encountered within the subcutaneous tissue. This was fully dissected both distally and proximally, and deeper extension to a tendinous structure or joint was not appreciated. It was noted to be adherent to the artery at this level. It was sharply transected distally and proximally and passed from the surgical field to be sent to pathology as a specimen. (Figure 2) The mass was similar in appearance to that of an interdigital neuroma. The incision was flushed with saline and the skin was closed using 4-0 Prolene. The patient was immediately weight bearing in a postoperative shoe.



Figure 1. Preoperative AP (A), oblique (B) and lateral (C) radiographs of the patient's left foot.



Figure 2. Intraoperative photo of the excised soft tissue mass.

## Results

A grey-tan soft tissue mass measuring 1.4 x 0.5 x 0.2 cm was submitted in formalin for pathology examination. Nerve and fibroadipose tissue was identified, consistent with neuroma.

The patient's postoperative course was complicated by dehiscence of the surgical incision at 18 days postoperatively. She was placed on a 10 day course of cephalexin and the incision then healed uneventfully. She has returned to regular shoe gear with no pain or recurrence after 13 months of follow up.

## Discussion

This case study discusses the presentation, management, and surgical technique for removal of a neuroma of the plantar proper digital nerve to the lateral aspect of the second digit. This was a unique presentation and, to our knowledge, has not been described before. It is unclear what caused a neuroma to form in this area, and this was an unexpected finding. Preoperatively, this was presumed to be a fibroma, ganglion or digital mucoid cyst, and advanced imaging was not performed. An MRI could have also been considered for further workup.



Figure 3. Cadaveric dissection of the plantar proper digital nerve of the plantar lateral second digit.

## References

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