

Solitary Benign Schwannoma of the Foot Presenting Clinically as a Ganglion Cyst

A Case Study

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An unusual case of solitary benign schwannoma of the foot is presented. Clinical examination, magnetic resonance imaging, and intraoperative findings all confirm the suspicion of a ganglion cyst. After attempted aspiration failed to produce any aspirate, excisional biopsy was performed. The pathology report confirms schwannoma with hematoxylin and eosin stain and subsequently reaffirmed with positive S100 protein stain. Even though schwannoma of the foot had been reported in the literature, this was an unusual case, as the lesion was presented as a superficial, ganglion cyst–like lesion on the bottom of the foot. (*J Am Podiatr Med Assoc* 108(4): 340-343, 2018)

Schwannomas are soft-tissue tumors of nerve sheath origin, with relatively infrequent occurrence in the foot, and almost never in the malignant form.¹ Several cases have been reported in the literature with the excised schwannoma arising from the posterior tibial nerve causing tarsal tunnel syndrome,²⁻⁴ from the medial plantar nerve,⁵ and from a digital proper nerve.⁶ Although almost all cases reported in the literature were small, solitary lesions, large, multiple plexiform schwannomas^{7,8} and schwannomatosis, multiple lesions along a single nerve,⁹ had also been reported in the plantar aspect of the foot. Although very rare, schwannoma had been reported with an intraosseous invasion in the foot,¹⁰ and bilateral involvement on both feet in symmetrical locations.¹¹ Because of its origin, most schwannomas were found deep within the dermal layer. Only a few instances have been reported in the literature where the schwannoma was noted as a raised, palpable, and visible soft-tissue mass on top of the digit.^{6,12,13}

Case Study

A 29-year-old healthy man presented to the clinic with a main concern of a tender, palpable soft-tissue mass on the plantar aspect of his left foot. He noticed it a few years before his visit. There was no history of foreign body, puncture wound, or trauma reported. He did not notice any visible enlargement

of the soft-tissue mass over the years. However, it had recently become more uncomfortable during walking, regardless of the types of shoes being worn at the time.

Clinical examination revealed a healthy white man in no apparent distress. The patient's medical history was unremarkable, and his family history was unremarkable for similar soft-tissue growth. Review of systems was noncontributory to his main concern. Vascular examination showed normal pedal pulses. Neurologic examination revealed normal cutaneous responses and reflexes as tested. Mulder's sign was negative in all interdigital spaces as tested on both feet. Biomechanical examination demonstrated a flexible pes planus deformity on both feet, with no hallux valgus or hammertoe deformity observed in stance. Normal gait was observed without any limping, abductory twist, or compensatory pattern.

Dermatologic examination revealed a visible, palpable, superficial soft-tissue mass that was located between the plantar aspect of the second and third metatarsophalangeal joints of the left foot. The mass was soft, immobile, and seemingly not associated with any of the flexor tendons of the digits or extensions of the plantar fascial bands. There was no callus formation or trophic changes noted over the soft-tissue mass. There was no visible association with superficial vessels observed. It was tender on palpation. With dorsiflexion of the digits, the entirety of the mass could be well appreciated clinically because of its superficial anatomical location.

Radiographs were taken of his left foot during the

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initial visit (Fig. 1). There was no soft-tissue calcification, subdermal lucency, or periosteal reaction noted in the vicinity of the soft-tissue mass. Differential diagnoses discussed were ganglion cyst, fibroma, neuroma, lipoma, and, rarely, soft-tissue tumor. Magnetic resonance imaging (MRI) was scheduled with contrast; however, it was not performed because of difficulty in obtaining intravenous access. T1- and T2-weighted images (Figs. 2 and 3) revealed a $1.0 \times 0.8 \times 1.2$ -cm fluid attenuation collection, found in the superficial soft tissues, on the plantar surface between the second and third metatarsophalangeal joints, most suggestive of a ganglion cyst. The impression from MRI was a probable ganglion cyst, concurring with clinical findings.

Treatment options were discussed. The patient opted to undergo an attempt at aspiration, with the understanding that if the soft-tissue mass recurs or if the attempt fails, excisional biopsy would be performed. Under local anesthesia, infiltrating proximal to the soft-tissue mass, an attempt at aspiration was performed, but it was deemed unsuccessful, as no aspirate was produced.

An excisional biopsy of the soft-tissue mass was scheduled and performed in the operating room under local anesthesia with intravenous sedation. A 2-cm linear longitudinal incision was made, between the second and third metatarsophalangeal joints on the plantar aspect of his left foot. Immediately on entrance of the subcuticular layer, the mass was noted. It was well encapsulated, had no visible association with any vascular or tendinous structure, and had no traceable extension deep into or horizontally spread out into the surrounding



Figure 1. Preoperative radiograph of the left foot, showing no soft-tissue calcification, density, or periosteal involvement.

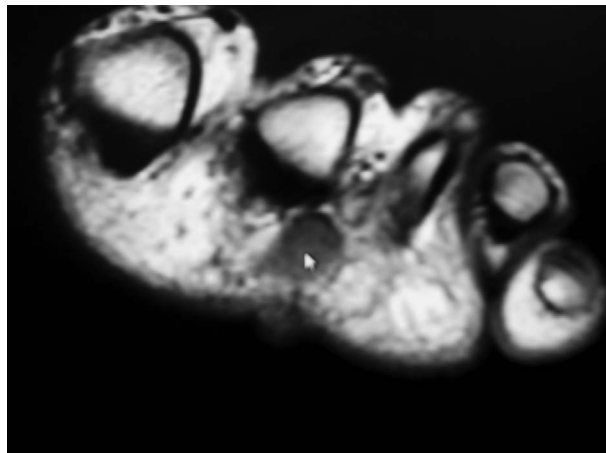


Figure 2. Preoperative magnetic resonance imaging scan. Axial T1-weighted image showing the size and superficial location of the soft-tissue lesion (arrow).

tissue. It was dissected meticulously, removed in its entirety, and submitted for pathologic evaluation in formalin. Intraoperatively, the lesion confirmed the appearance of a ganglion cyst.

The pathology report indicated gross examination of a 1.5×1.0 -cm, oval, white to tan soft-tissue mass. On cross-sections, the tissue was homogenous and solid throughout. Histologic examination was performed (Figs. 4 and 5), which showed the biphasic Antoni A and B patterns typically seen in schwannoma. The slides and specimen were subsequently forwarded to another facility for interdepartmental review and immunohistochemistry. A well-controlled immunostain for S100 was performed that positively supported the diagnosis of a schwannoma, negative for any malignancy (Fig. 6).

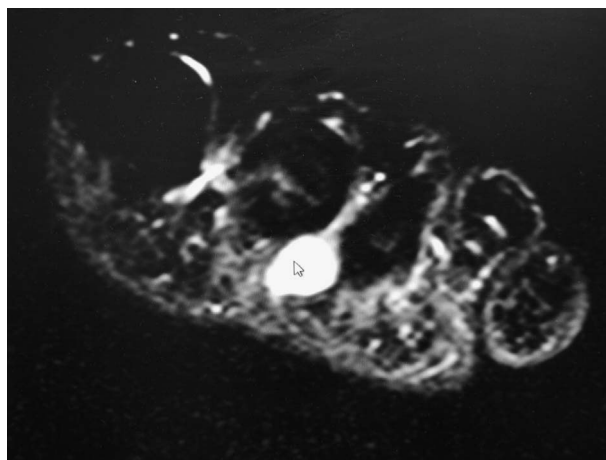


Figure 3. Axial T2-weighted image showing the same lesion (arrow).

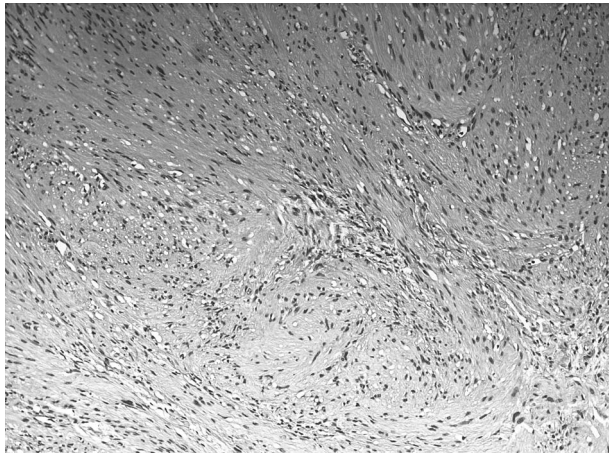


Figure 4. Cross-section showing alternating area of Antoni A (compact, cellular area composed of spindle cells in fascicular pattern) and Antoni B (myxoid matrix background) patterns (H&E $\times 20$).

Postoperatively, the patient had unremarkable healing and recovery. He was able to walk immediately postoperatively without any pain or discomfort in a postoperative shoe. The incision healed without any residual paresthesia or anesthesia in a flat scar. He was seen for regular follow-up, and finally discharged to home 4 months after surgery, with no evidence of recurrence of the soft-tissue mass noted clinically. Because of its superficial location, it would be difficult to trace the exact origin of the tiny branch of nerve where the schwannoma originated.

Discussion

Solitary schwannoma had been reported in the literature in very rare instances where it was located superficial to (rather than within) the deep dermal or compartment layer, to be visibly noted as a soft-tissue mass. Fisher and Stone⁶ reported a large, tumorous, nodular lesion, approximately 2 cm in height and width, on the dorsolateral aspect of the hallux, proximal to the nail, extending and overhanging onto the second toe. Ishida et al¹² reported a solitary erythematous tumor, 25 $\times$ 20 mm in diameter and 10 mm in thickness, on the dorsal aspect of the distal interphalangeal joint of the second toe. Wolpa and Johnson¹³ reported a palpable mass, 1 cm in diameter, freely moveable and appearing to be adjacent to the extensor longus tendon to the fifth toe. All of these reported lesions were on the extensor surface of the foot and clinically visible as a raised soft-tissue indurated

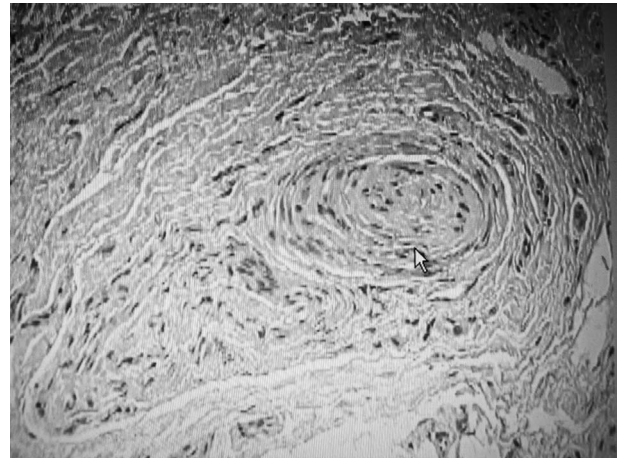


Figure 5. Cross-section of a nerve fiber (arrow) under H&E ($\times 20$) within the same lesion.

mass. Only one other case has been reported in the literature where the mass was palpated between heads of metatarsal bones on the plantar aspect of the foot. In this case, clinical examination, ultrasonographic images, and MRI examinations showed a clearly defined round mass with radiating pain that led to a preoperative diagnosis of neuroma. Intraoperatively, a 2-cm mass was found to adhere to the interdigital nerve.²

The current case reported is unique in its location and its clinical presentation. The lesion is located in the subdermal layer on the plantar aspect of the foot. Clinically, it presented as a palpable ganglion cyst, with no radiating symptom and negative Mulder's sign to suggest that it may be a neuroma. Magnetic resonance images confirmed a fluid-attenuated mass, rather than a soft-tissue mass. On reviewing the literature, in the few cases where

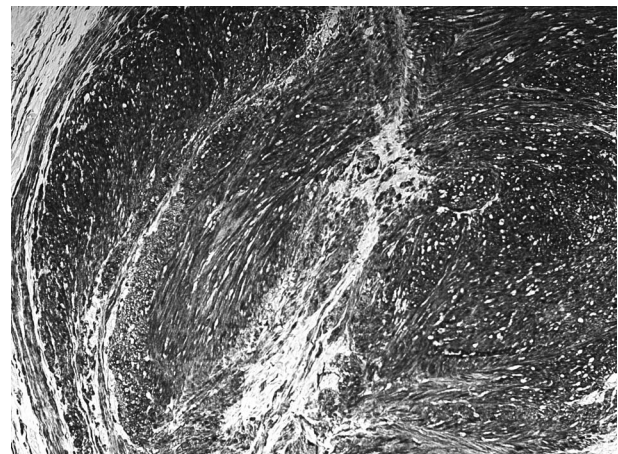


Figure 6. Strong and diffuse positivity for S100 protein stain ($\times 20$).

MRI had been performed, it was reported to present homogeneously isointense to muscle on T1-weighted images and hyperintense on T2-weighted images.^{2,7} In retrospect, the MRI scans in this case also exhibit the findings that are consistent with these parameters of a schwannoma. Perhaps because of the location, the MRI scans were read as being consistent with a ganglion cyst instead of a schwannoma or neuroma. Although it was not observed intraoperatively, histologic examination did confirm the involvement of a nerve ending (Fig. 5). It is probable that the nerve involved in this case may have been a tiny cutaneous branch within the dermal layer, rather than a digital branch per se, which may explain the absence of paresthesia during examination.

Conclusions

The author has presented a rarely seen and previously unreported case of schwannoma of the foot that clinically mimics a fluid-filled soft-tissue mass such as a ganglion cyst located superficially on the plantar aspect of the foot. Although ganglion cysts are fairly commonly seen, accurately diagnosed, and successfully treated, schwannoma may not be on most practitioners' list of differential diagnoses when a solitary soft-tissue mass is encountered in the foot. In reporting this rarely encountered entity, the author hopes to raise the awareness of schwannoma and its variable forms of clinical presentation.

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