

# Open repair of a plantar artery pseudoaneurysm after Morton's neurectomy

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## ABSTRACT

A 65-year-old woman presented to our institution with 4 months of severe pain on the plantar aspect of her foot. She had chronic foot pain secondary to Morton's neuroma and had recently undergone neurectomy. She was found to have a large pseudoaneurysm on the plantar aspect of her foot. She was taken to the operating room for an open repair from a plantar approach. We obtained the patient's consent to publish this case. (*J Vasc Surg Cases and Innovative Techniques* 2020;6:259-61.)

We report a unique presentation following podiatric intervention for a Morton's neuroma. A 65-year-old woman presented to our institution with 4 months of debilitating right foot pain after undergoing neurectomy for a Morton's neuroma. She was found to have a large pseudoaneurysm (PSA) of a plantar artery. Although rare, plantar artery PSAs can occur after trauma or surgical intervention as with our patient. She was taken to the operating room for open repair from a plantar approach.

## CASE REPORT

A 65-year-old woman with a medical history notable for congenital atrial septal defect, atrial fibrillation on anticoagulation, chronic obstructive pulmonary disease, and coronary artery disease developed severe pain in her right foot after Morton's neurectomy. Postoperatively, she noticed bleeding from her incision while weight-bearing and excruciating pain. For this reason, she was referred to a pain management center. She has been unable to bear weight on her foot and she was unable to drive. She subsequently developed swelling of the plantar surface and eventually diffuse swelling of the right foot (Fig 1). She presented to our institution 4 months postoperatively from her neurectomy and, on examination, a plantar fullness with a pulsation was noted. She had palpable dorsalis pedis and posterior tibial pulses bilaterally. A lower extremity arterial duplex demonstrated a PSA between the third and fourth metatarsals on the plantar aspect of the foot. The PSA measured 4.0 × 2.8 × 2.4 cm with a classic spectral waveform tracing with continuous flow and laminated thrombus noted. The



**Fig 1.** Diffuse swelling of the patient's right foot noted preoperatively. Incisions from prior podiatric surgery are marked on the dorsum and in between the second and third digits and the third and fourth digits, respectively.

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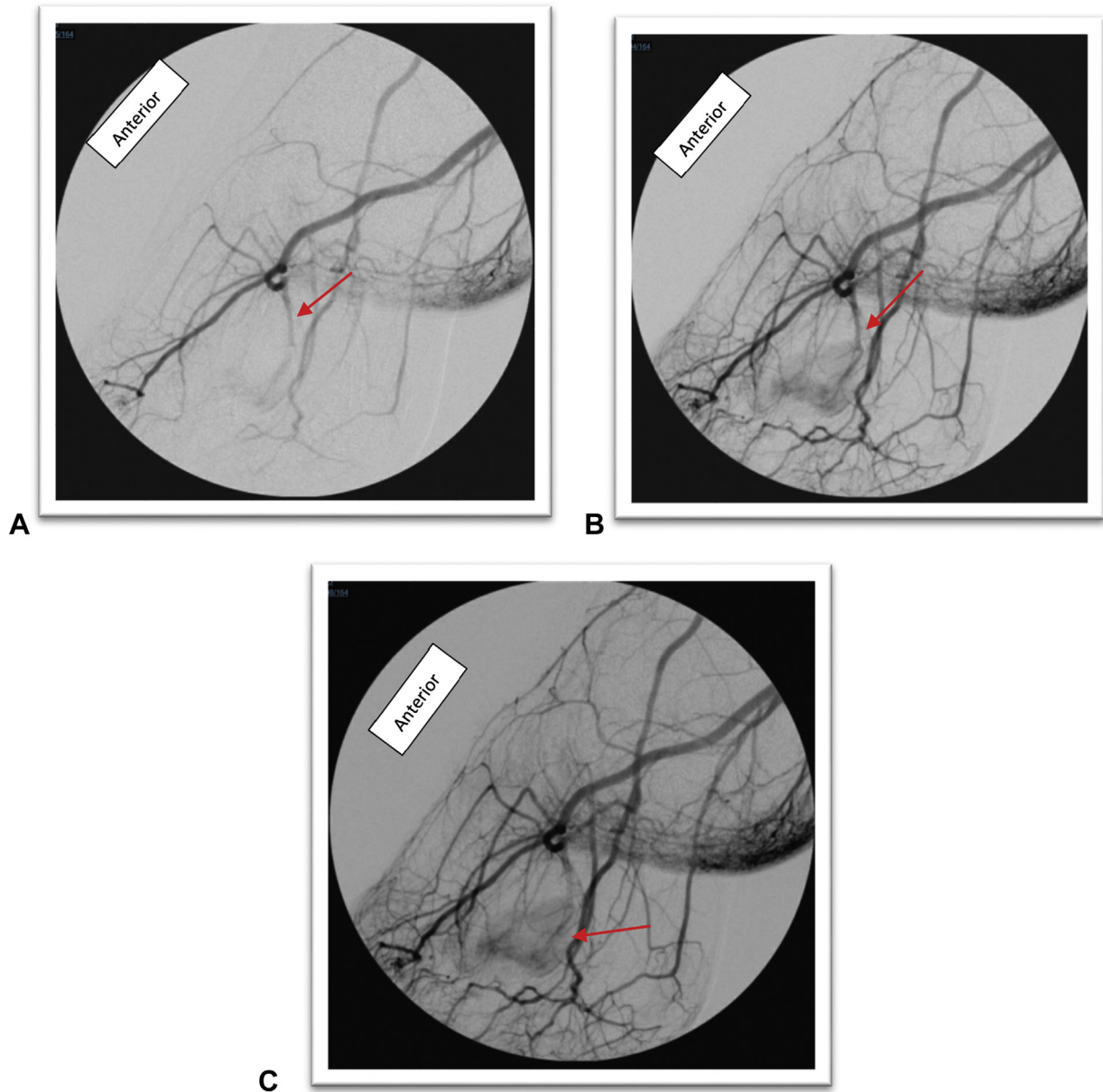
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neck measured 1.7 mm in diameter and 8.0 mm in length. She was taken to the operating room for surgical repair.

The patient was positioned supine for the procedure and the most proximal superficial right femoral artery was accessed under ultrasound guidance with a micropuncture catheter. An angiogram of the right leg was obtained. The angiogram revealed widely patent posterior tibial and dorsalis pedis arteries. The PSA was identified and appeared to come off a perforating branch of the lateral plantar vessel (Fig 2). The PSA was localized with ultrasound examination and longitudinal incision was made over the area of concern on the plantar aspect of the



**Fig 2.** Sequential images from an intraoperative angiogram showing filling of plantar pseudoaneurysm.

foot. Dissection was carried through soft tissue and fascia and the PSA cavity was identified and entered. There was active arterial bleeding coming from a punctate defect. A tourniquet was inflated and this allowed for placement of a 5-0 Prolene suture ligature at the orifice. When the tourniquet was let down, there was excellent hemostasis in the area. The PSA was evacuated of the clot and it was pulse lavaged and good hemostasis was again obtained. The fascia was then closed with interrupted Vicryl sutures and the skin was closed with interrupted Prolene sutures. All toes were adequately perfused as confirmed via physical examination using capillary refill.

Postoperatively, she was maintained on strict nonweightbearing precautions for her right lower extremity for 6 weeks. She was discharged home on postoperative day 2 and has since

been seen in the office with a postoperative duplex ultrasound examination at 2 weeks showing resolution of the PSA and improvement of her pain and swelling.

## DISCUSSION

PSA represent persistent blood outside of a vessel wall that is contained by the surrounding tissue. They can originate from a number of different causes including iatrogenic, traumatic, anastomotic, or infectious.<sup>1</sup> Most commonly, PSAs occur in the region of the common femoral artery owing to endovascular access obtained in this region; however, they can occur at any vessel. One of the less common areas to find a PSA is in the distal lower extremity. PSAs in this region traditionally

occur secondary to iatrogenic or traumatic injury and most commonly affect the anterior tibial or dorsalis pedis arteries.<sup>2,3</sup> Much of the literature reviewing PSAs of the lower leg comes from orthopedics as PSA are a rare but well-described complication of traumatic ankle injuries and ankle arthroscopy; however, these predominantly affect the anterior tibial and dorsalis pedis arteries.<sup>2-4</sup>

Although several cases have been reported, it is extremely rare to find a PSA of the lateral plantar artery. Although rare, it is believed that the lateral plantar artery is more susceptible to injury than the medial plantar artery owing to its superficial course under the fascia across the plantar aspect of the foot. The medial plantar artery is protected from injury by the quadratus plantae, flexor hallucis longus, and abductor hallucis muscles.<sup>3</sup>

Lateral plantar artery PSA has been seen in both adults and children, with children usually presenting after traumatic injury or retained foreign body.<sup>5,6</sup> Of note, PSA in reported cases has been delayed in nature after the initial insult or presentation as similarly seen in our patient. In adults, lateral plantar artery PSAs tend to occur after trauma or surgical procedures, including orthopedic surgery for plantar fasciitis. Presentation typically can be asymptomatic or with a pulsatile mass that may or may not enlarge over time.<sup>7</sup> Diagnosis is made clinically and duplex ultrasound examinations can be confirmatory.<sup>2,8</sup> Management of foot PSAs includes open primary repair or thrombin injection, depending on the anatomic location. Although endovascular techniques such as percutaneous coil embolization may be used for PSAs of the distal extremity, there are no endovascular techniques used for the plantar arteries given their anatomic location and size. We opted for an open repair over a thrombin injection because thrombin injection has the risk of compromising digital vessels secondary to digital embolization and the potential of failure. We also felt an open repair was a better option for our patient, given her compressive neuropathy and the ability to remove the laminated clot would result in a quicker return to function. Ultrasound-guided thrombin injections are more commonly used in larger peripheral vessels such as the femoral artery, with reports of success in 60% and up to 98% of patients.<sup>9</sup> Its use in the distal arteries around the foot and ankle are less efficaciously supported, with some reports demonstrating positive results. However, in one of the described cases, this failed with recurrence at 24 hours.<sup>10</sup>

This case demonstrates a unique presentation following podiatric intervention for a Morton's neuroma. Morton's neuroma causes a debilitating pain usually in the third interdigital space owing to a compressive neuropathy.<sup>11,12</sup> There are multiple different approaches to patients with Morton's neuroma, including symptom management, corticosteroids, and surgery. Surgery can use a plantar or dorsal approach with most studies

noting an increased rate of complications following plantar approach.<sup>11-13</sup> Although a dorsal approach was taken in our patient, the use of a nerve hook to excise the neuroma resulted in damage to the adjacent vasculature. Complications are uncommon after surgical intervention, and PSA is reported rarely.

## CONCLUSIONS

Although there have been case reports of lateral plantar artery PSAs, we present a unique case after surgery for a Morton's neuroma. The majority of PSA in the foot present after trauma or surgery, although we have not found another reported case after neurectomy. As with most PSAs of the foot, our patient presented in a delayed fashion. She was managed with operative closure of the arterial defect and had an excellent outcome.

## REFERENCES

1. Kalapatapu VR, Shelton KR, Ali AT, Moursi MM, Eidt JF. Pseudoaneurysm: a review. *Curr Treat Options Cardiovasc Med* 2008;10:173-83.
2. Yu JL, Ho E, Wines AP. Pseudoaneurysms around the foot and ankle: case report and literature review. *Foot Ankle Surg* 2013;19:194-8.
3. Sundararajan SR, Rajagopalakrishnan R, Rajasekaran S. Ruptured pseudoaneurysm of the lateral plantar artery after tibiotalar calcaneal fusion with retrograde nail—a rare complication. *J Foot Ankle Surg* 2018;57:393-5.
4. Yammine K, Kheir N, Daher J, Naoum J, Assi C. Pseudoaneurysm following ankle arthroscopy: a systematic review of case series. *Eur J Orthop Surg Traumatol* 2019;29:689-96.
5. Crankson S, Giebala M, Al Kohlani H. Profuse bleeding from traumatic lateral plantar artery pseudoaneurysm after glass foot injury diagnosed by CT angiography: a case report. *J Pediatr Surg Case Rep* 2015;3:1-3.
6. Thornton BP, Minion DJ, Quick R, Vasconez HC, Endean ED. Pseudoaneurysm of the lateral plantar artery after foot laceration. *J Vasc Surg* 2003;37:672-5.
7. Alhaizaey A, Hussain MA, Aljabri B, Al-Omran M. Aneurysms of the foot arteries. *Vascular* 2016;24:109-12.
8. Arriagada Irazazaval C, Sonneborn Gross R, Sauré Maritano A, Soto Diez C. Posttraumatic pedal artery pseudoaneurysm: a case report. *Case Rep Vasc* 2012;2012:234351.
9. Kang SS, Labropoulos N, Mansour MA, Michelini M, Fillingim D, Baubly MP, et al. Expanded indications for ultrasound-guided thrombin injection of pseudoaneurysms. *J Vasc Surg* 2000;31:289-90.
10. Haber LL, Thompson G, DiDomenic L, Groner T, Glaser J. Pseudoaneurysm of the perforating peroneal artery after subtalar joint injury: a case report. *Foot Ankle Int* 2008;29:627-9.
11. Habashy A, Sumarriva G, Treuting RJ. Neurectomy outcomes in patients with Morton neuroma: comparison of plantar vs dorsal approaches. *Ochsner J* 2016;16:471-4.
12. Coughlin MJ, Pinsonneault T. Operative treatment of interdigital neuroma. A long-term follow-up study. *J Bone Joint Surg Am* 2001;83:1321-8.
13. Thomson CE, Gibson JA, Martin D. Interventions for the treatment of Morton's neuroma. *Cochrane Database Syst Rev* 2004;3:CD003118.