

## CASE REPORT

## Post-Traumatic Dorsalis Pedis Pseudo-aneurysm Caused by Crush Injury

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**Introduction:** This is the report of an unusual case of a dorsalis pedis artery pseudo-aneurysm resulting from trauma in a 61 year old farmer.

**Report:** One year previously, the patient's right foot had been crushed under a tractor wheel. The patient complained of pain and pulsatile swelling on his right foot which he noticed two months before presentation. Radiological examinations revealed a pseudo-aneurysm of the dorsalis pedis artery. Resection of the aneurysm was completed without complications. Pathological findings confirmed an aneurysm of traumatic rather than atherosclerotic aetiology.

**Discussion:** The patient remains under follow up without ischaemia. False aneurysms should be treated by surgical or endovascular intervention when they are detected.

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Article history: Received 6 April 2019, Revised 12 July 2019, Accepted 17 July 2019,

**Keywords:** Dorsalis pedis artery, Peripheral artery, Pseudoaneurysm, Surgery

### INTRODUCTION

Peripheral aneurysms in the extremities, including the dorsalis pedis artery (DPA), are extremely rare, and nearly always involve the popliteal artery with a low incidence in the general population (incidence <1%). The vast majority of DPA aneurysms reported in the literature are pseudo-aneurysms and are often secondary to trauma. Because of the risk of rupture and microembolisation, surgical management and removal are recommended. Treatment modalities include ultrasound guided thrombin injection, endovascular stenting, external compression, coil embolisation, and operative ligation or repair.<sup>1–4</sup> Surgical options may vary from ligation with or without excision to aneurysmectomy and reconstruction.<sup>1,3</sup>

This report describes the unusual presentation of a swollen foot caused by a large false aneurysm of DPA, for which a surgical repair was carried out successfully. Clinical presentation, aetiology, investigation modalities, and treatment options are used to discuss and summarise the differences in this rare condition from previously reported cases.

### CASE PRESENTATION

A 61 year old farmer presented with a painful pulsatile swelling on the dorsum of the right foot. There was no

history of rheumatic heart disease, infective endocarditis, intermittent claudication, local infection, or previous surgery. He had been in an accident a year previously, in which his right foot was crushed under a tractor wheel. He was taken to the hospital, but there was no evidence of fracture or vascular damage.

A painful swelling on the dorsum of the right foot about the size of a small hazelnut was noted two months before presentation. The mass had increased in size rapidly over the previous weeks. At presentation there was a 2 cm pulsatile mass over the DPA (Fig. 1), with no thrill or bruit. The posterior tibial artery was palpable at the ankle, and there was no digital ischaemia. No other vascular abnormalities were detected elsewhere. Duplex ultrasound scanning and magnetic resonance images showed a 20×18 mm right DPA aneurysm (Fig. 2A). Lower limb angiography confirmed the diagnosis (Fig. 2B). The decision was taken to remove the aneurysm by surgical intervention. Under general anaesthesia, a vertical incision was made over the dorsum of the foot. The DPA aneurysm was dissected free and controlled proximally and distally with vessel loops (Fig. 3A).

After administration of heparin, the aneurysm was opened. There was no thrombus. An arterial defect of approximately 5 mm was detected as the cause of the pseudo-aneurysm (Fig. 3B). Peripheral oxygen saturation (SpO<sub>2</sub>) values were measured by pulse oximetry using the patient's toe, to decide whether to perform ligation or reconstruction. The SpO<sub>2</sub> values were 60–70%, while in the opposite lower extremity they were 97–98%. With the possibility of inadequate arterial supply, stump pressure was measured from the distal pseudoaneurysm, as in a previously published article.<sup>2</sup> The stump pressure was

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<https://doi.org/10.1016/j.ejvssr.2019.07.003>



**Figure 1.** Pseudo-aneurysm of the dorsalis pedis artery resulting from trauma.

<50 mmHg (approximately 30–32 mmHg). Five minute clamping of the DPA led to ischaemic changes in the toes with coldness and colour change. These findings suggested that there was a need for arterial reconstruction. After aneurysm resection, there was sufficient length to enable end to end anastomosis with a 7-0 prolene continuous

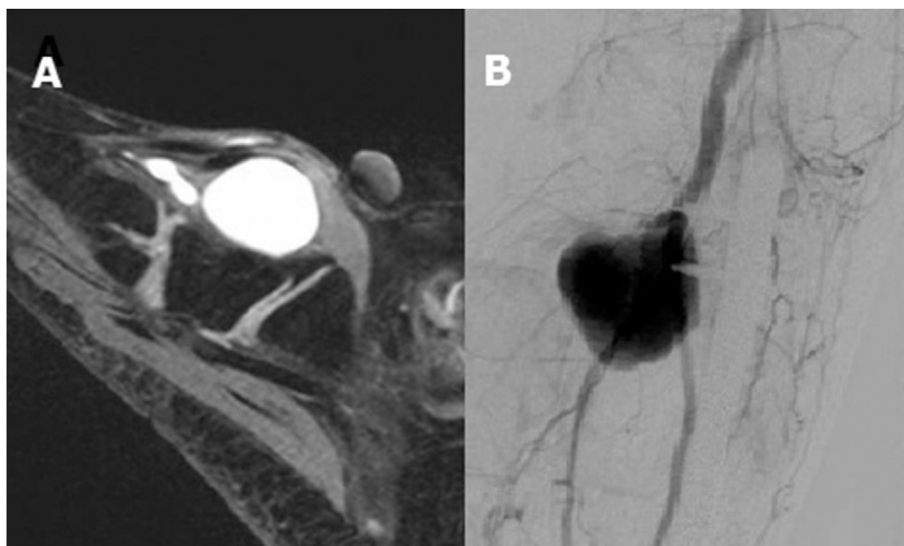
suture between the proximal and distal ends of the remaining DPA (Fig. 4).

No ischaemic signs were observed intra- or post-operatively. The post-operative course was uneventful, and the patient was discharged home on the third post-operative day. On discharge, acetylsalicylic acid (aspirin 300 mg) was started as a platelet inhibitor. Microscopy showed the wall to be densely fibrous and devoid of arterial elements. No inflammation was present. The appearances were those of a false aneurysm of long standing. All three layers of the arterial wall were evident. Neither digital paralysis nor ischaemia were observed in the six months after the operation, and pedal and DPA pulses were palpable. Arterial patency was documented by duplex ultrasound examination, and there was total exclusion of the aneurysmal sac.

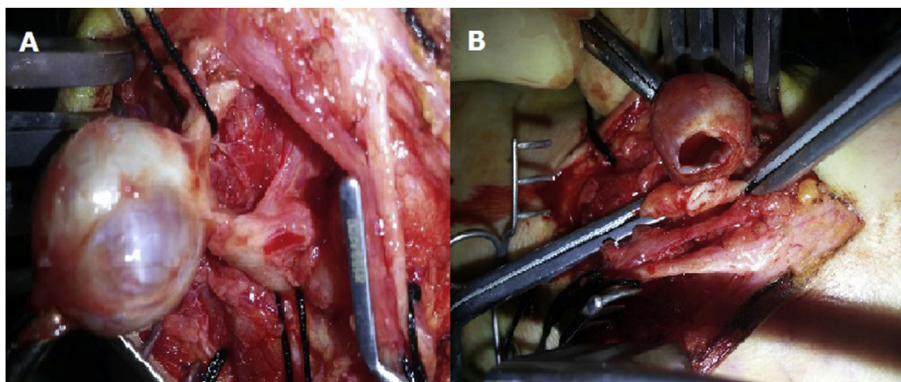
### DISCUSSION

Although uncommon, DPA aneurysms have been reported in the literature as either false or true aneurysms.<sup>1,3,4</sup> False peripheral artery aneurysms have an incidence of <1%, and most are located in the lower extremity. False peripheral artery aneurysms, also known as pseudo-aneurysms, are rare lesions secondary to blunt or penetrating trauma such as minor repetitive or iatrogenic causes.<sup>3</sup> In addition to the fact that recurrent traumas of the foot can cause pseudoaneurysms from injury to the arterial wall, it is thought that atherosclerotic changes may cause the process to accelerate. In the present case, no risk factors other than trauma were present. It was thought that the tendency to age related atherosclerosis and the trauma may have caused the false aneurysm.

Clinical complaints are generally similar in both true and pseudo-aneurysms. Pulsating or increasing mass, pain, paraesthesia and itching in the dorsum of the foot are the most common clinical manifestations. In addition to these



**Figure 2.** (A) Magnetic resonance imaging shows a pseudo-aneurysm arising from the dorsalis pedis artery. (B) Angiographic image of a pseudo-aneurysm occurring after trauma in the dorsalis pedis artery.



**Figure 3.** (A) The per-operative image shows a pseudo-aneurysm of approximately 2 cm in diameter originating from the dorsalis pedis artery. (B) The arterial defect causing the false aneurysm.

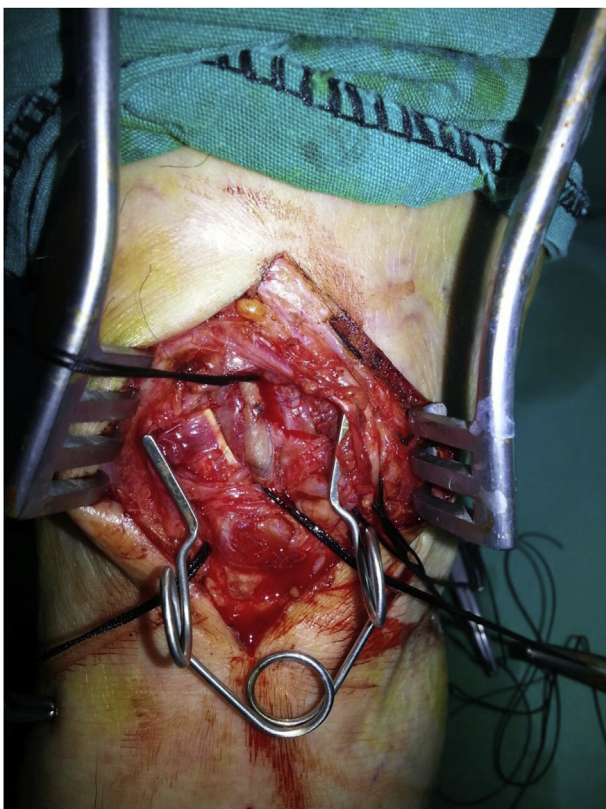
findings, limb threatening thrombosis or embolic complications and rupture may also appear.<sup>4,5</sup> Duplex ultrasonography, specific imaging modalities such as CT scans, and conventional and magnetic resonance angiography may be required in doubtful cases. The patient was first diagnosed by duplex ultrasound, followed by magnetic resonance and conventional arteriography. To investigate the presence of atherosclerosis, demonstrate the arterial arch, and better assess other vascular structures, angiography was performed.

As a treatment option, it is believed that small and asymptomatic aneurysms should be followed by ultrasonography and endovascular or surgical treatment should be performed for large and symptomatic aneurysms. However,

treatment of DPA false aneurysms should not be based on the presence of symptoms, because foot ischaemia, rupture or thrombo-embolic complications can occur without warning signs.<sup>6</sup> Treatment of a pseudo-aneurysm includes ultrasound guided compression repair, percutaneous embolisation (thrombin injection, microcoil, Amplatzer vascular plug),<sup>7,8</sup> endovascular stenting (covered stent graft),<sup>9,10</sup> or open surgical repair. Open methods include ligation with or without resection or reconstruction of the artery with primary anastomosis, vein patch angioplasty, or vein graft interposition.<sup>11,12</sup> If there is narrowing or inadequacy of the arterial diameter in the pedal arch, inadequate collateral circulation on the distal pedal arch, or an atherosclerotic distal vasculature on pre-operative angiography or magnetic resonance imaging, an endovascular or open surgical approach is mandatory for the treatment of infrapopliteal pseudoaneurysms.<sup>13,14</sup> In such cases, distal tissue may not be adequately perfused after surgical ligation or ultrasound guided compression alone, which can cause partial or total ischaemia of the foot. If there are intra-operative signs of ischaemia in the distal extremity after excision of the infrapopliteal pseudo-aneurysm, or if low stump pressure is detected,<sup>2</sup> arterial reconstruction should be performed to ensure adequate distal blood supply. In this case, although magnetic resonance imaging and arteriography showed adequate perfusion of the distal pedal arch, the decision was taken to perform reconstruction in addition to resection because of low SpO<sub>2</sub> and stump pressure. The hospital charges extra for endovascular intervention or embolisation, and consequently the patient denied these procedures. Instead, open surgery was performed. Although endovascular intervention is a safe and effective option for managing arterial pseudo-aneurysm, some hospitals cannot apply this solution because of supply shortages.

### CONCLUSIONS

The present authors believe that, if endovascular interventional procedures cannot be performed, all DPA false aneurysms should be considered for surgical repair, including arterial reconstruction before complications appear. Even if not symptomatic and/or very large, DPA aneurysms carry embolic and ischaemic risks.



**Figure 4.** Reconstruction of the arterial defect with end to end repair.



## ACKNOWLEDGMENTS

The authors would like to thank Ozgur Dag for the design and creation of the pictures.

## CONFLICTS OF INTEREST

None.

## FUNDING

None.

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