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Dorsalis Pedis Aneurysm: A Case Report and Review of the Literature

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A dorsalis pedis aneurysm is a rare entity and due to its location may require surgical intervention and removal. We present an unusual case in which the patient has actively requested surgical excision due to pain from shoe gear irritation and an increasing rate of expansion of the lesion. The diagnosis was made via clinical examination, Magnetic Resonance Imaging (MRI), and Colorflow Duplex Ultrasound (CFDUS) evaluation of the lesion. An angiogram was also performed prior to the procedure in order to determine optimal blood flow to the extremity and to confirm the diagnosis. The dorsalis pedis aneurysm was excised and the artery was repaired without incident.

Key words: Aneurysm, dorsalis pedis artery

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Aneurysm of the dorsalis pedis artery is a rare entity. There are limited case studies reported in the literature. Two types of aneurysms have been described; 1) pseudoaneurysms and 2) true aneurysms. The vast majority of dorsalis pedis aneurysms reported in the literature are pseudoaneurysms and are often secondary to trauma.[5] Surgical options range from excision of the lesion with primary repair to complete excision with ligation of the artery. The patient in this case presentation specifically requested surgical excision because of continued increase in the size of the lesion and pain due to irritation from shoe gear.

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Although approximately 10% of the population does not possess a dorsalis pedis artery[1], some authors postulate as to the potential future complications associated with restricting blood flow to the foot.[11,13]

Case Presentation

A 52 year old male resident of the Cayman Islands initially presented to the emergency room for a complaint of epigastric and right upper quadrant pain. A consultation was placed with the Podiatry Service regarding a mass on the dorsum of his right foot.

During the initial exam, the patient states that the "bump" has been on top of the right foot for more than seven years. The patient relates that when he first noticed the lesion there was sharp, stabbing pain.

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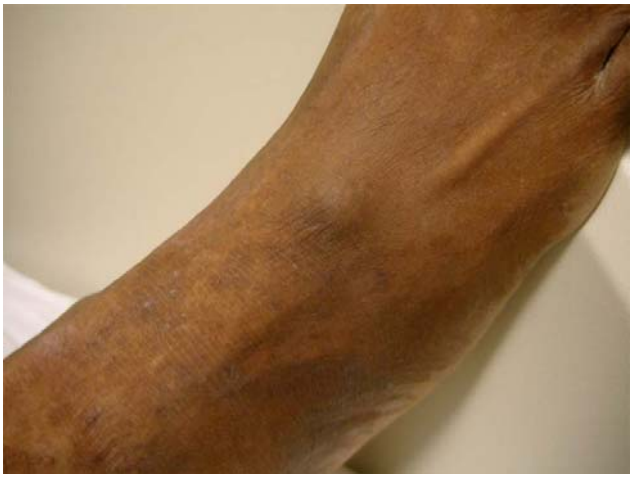

Figure 1 Clinical presentation of a dorsalis pedis aneurysm.

This eventually progressed to an almost constant throbbing pain, increasing in severity at night. He also states that the bump has enlarged, and that his primary pain is secondary to shoe irritation. He denies trauma or any inciting event. He also relates that there has never been intravenous access attempted in this region of the foot, nor has any medical intervention or instrumentation been applied to his foot.

Past medical history is significant for coronary artery disease. The patient had a myocardial infarction in 2004 and underwent cardiac catheterization by percutaneous transluminal coronary angioplasty with stent placement in 2005. Other pertinent history included congestive heart failure with an ejection fraction of 25%, hypertension, and a history of distant gonorrhea eight years ago. The patient's family history was non-contributory. He stopped smoking approximately three years ago after his myocardial infarct.

The physical examination of the foot reveals an elevated, spherical, pulsatile mass approximately 1.5cm in diameter. It is located along the dorsal surface of the midfoot in the anatomical region of the dorsalis pedis artery. (Fig. 1) The remainder of the examination was unremarkable.

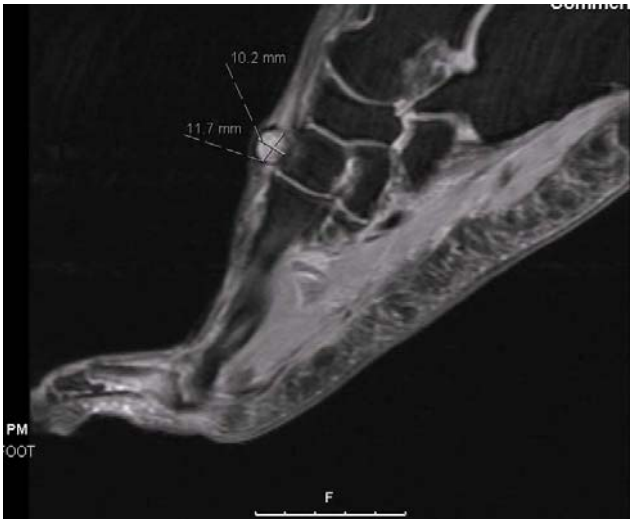

Figure 2 Sagittal MRI T2 weighted image showing location and size of expansile lesion.

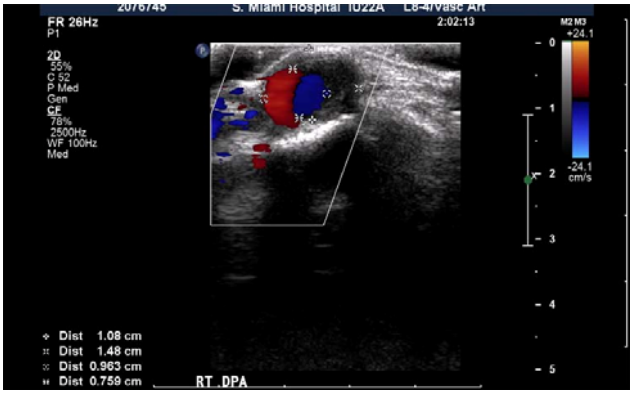

Figure 3 Colorflow Duplex Ultrasound (CFDUS) imaging reveals dorsalis pedis aneurysm with thrombus formation noted within the artery.

Magnetic Resonance Imaging (MRI) confirmed the diagnosis of dorsalis pedis aneurysm and this was further supported by Colorflow Duplex Ultrasound (CFDUS). The MRI report suggested a round pulsatile lesion within the course of the dorsalis pedis artery at the level of the second tarsometatarsal joint. (Figs. 2 and 3)

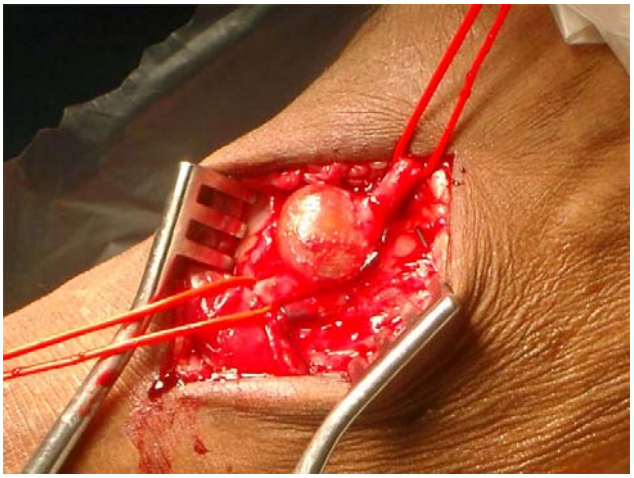

Figure 4 The dorsalis pedis aneurysm is isolated with vessels loops at its proximal and distal ends after careful dissection.

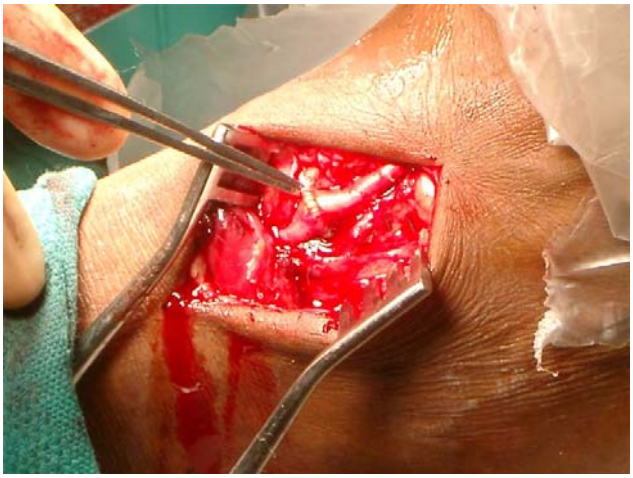

Figure 5 The end to end anastamosis with 6-0 prolene. A small portion of the plantar arterial wall remained intact during the anastamosis.

Operative Technique

For the initial portion of the procedure, the patient underwent an angiogram to identify and map the available blood flow to the right lower extremity. The procedure was initiated via a single wall arterial needle that was inserted into the right common femoral artery and a Wholey guide wire was passed. A number 4 French vascular sheath was placed and angiographic images were obtained verifying correct placement.

Additional images showed patent common femoral, external iliac, profunda femoris, superficial femoral and popliteal arteries. All trifurcation vessels were also shown to be widely patent, with the posterior tibial artery exhibiting minor narrowing at the medial malleolus and the peroneal artery collateralized to help form the plantar arch. Angiography clearly showed a dorsalis pedis aneurysm with intact runoff distally.

The sheath was left in place, and a heparin flush was initiated. The dorsalis pedis aneurysm and artery were then isolated from the surrounding tissues with careful dissection. The aneurysm was noted to be approximately 2.5cm in diameter. (Fig. 4)

5000U of heparin was then administered and clamps were placed proximally and distally on the dorsalis pedis artery, isolating the aneurysm. The dorsum of the aneurysm was then incised revealing thickened walls and remnants of an old organized thrombus. The thickened walls were completely excised, preserving a small portion of the normal appearing arterial wall plantarly to prevent retraction of the arterial ends. The artery was then repaired with 6-0 prolene in an end-to-end fashion. (Fig. 5)

After the clamps were released, an excellent distal pulse was palpated and all digits appeared pink and warm without any immediate signs of embolism. A two layered closure was then performed with vicryl, followed by nylon via interrupted simple sutures. Total blood loss was estimated to be approximately 25ml.

The patient was seen at follow up approximately one week later and the incision was noted to be fully coapted with no signs of infection. The dorsalis pedis pulse remained palpable. Further follow up was not conducted since the patient returned to his residence outside the country.

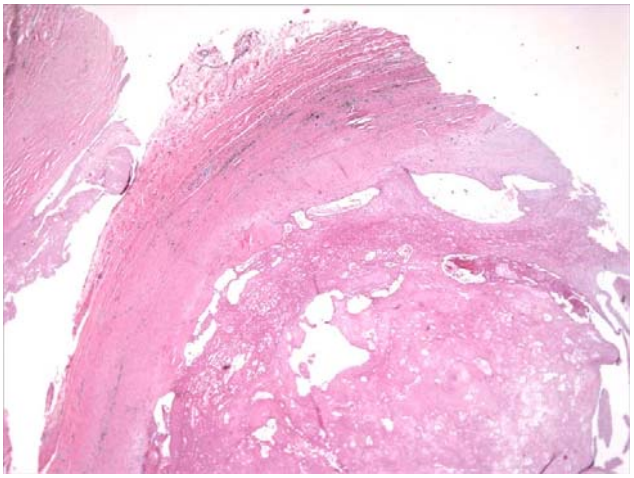

Figure 6 Pathology slide showing an intact arterial wall with perivascular tissue within the tunica adventitia.

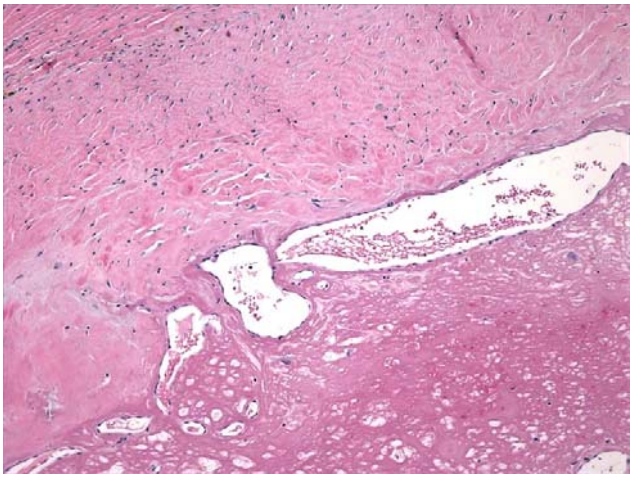

Figure 7 Magnified microscopic view of figure 6 showing the intact tunica media with hemosiderin deposition and laminated fibrous tissue. The endothelial layer is not visible and a large organized thrombus with recannulization is noted within the lumen.

Pathology

The pathology report further supported the diagnosis of a dorsalis pedis aneurysm. Close examination of the submitted tissue revealed elements of the aneurysm that support the finding of a true aneurysm of the dorsalis pedis artery. (Fig. 6) Elements of the arterial wall structure are intact and the perivascular tissue is noted to extend within the tunica adventitia. (Fig. 7) The tunica media is intact. Hemosiderin deposition is also noted and laminated fibrous tissue is present. The striking feature is the presence of a large organized thrombus with concurrent recanulation within the lumen suggestive of an aneurysm.

Discussion

Aneurysms of the dorsalis pedis artery are rare with few cases reported in the most recent literature. Symptoms usually reported include a pulsatile mass on the dorsum of the foot and pain; however some authors have also reported itching.[11] Secondary symptoms as a consequence of the aneurysm have also been demonstrated to produce neurological deficit and localized ischemia of the foot.

Nishi, et al., describe a patient who experienced restricted ankle dorsiflexion as a result of a deep peroneal nerve paralysis from a neighboring dorsalis pedis aneurysm.[14] Tempest and Wilson report a case in which a patient developed secondary localized ischemia and required subsequent forefoot amputation secondary to aneurismal occlusion.[18] The possible complications associated with a dorsalis pedis aneurysm alert the surgeon to act promptly in order to reduce impending patient morbidity.

The diagnosis of a dorsalis pedis aneurysm is primarily made by clinical suspicion and confirmed with the use of such imaging modalities as Computerized Tomography (CT), MRI, color flow duplex scan, and/or angiogram.[9,15,16,17] In this case report, a painful pulsatile mass on the dorsum of the right foot was increasing in size. This is often described by many other authors at initial presentation.[12,13,20] MRI evaluation was specific for a dorsalis pedis aneurysm and the diagnosis was further supported by color flow duplex ultrasound which further elucidated thrombus formation within the arterial lumen.

An intra-operative angiogram also supported the diagnosis of an aneurysm and alluded to the available blood flow within the extremity.

Primary repair of the artery once the aneurysm is resected is important to consider in certain subsets of patients such as diabetics and children. In a child, the lack of a dorsalis pedis artery may contribute to contracture and inhibit normal trophic growth of the foot.[13] Diabetics may develop peripheral vascular disease and ligating the dorsalis pedis could limit the already potentially diminished blood flow to the foot.[11]

The patient in this case report had signs of peripheral vascular disease and limiting the blood flow to the foot may have had implied future implications.

Histologically, a pseudoaneurysm is described as lacking a true arterial wall structure. Fitzpatrick also states that there is an interruption or rupture of the arterial wall with communication to an encapsulated hematoma or aneurysmal sac.[4] Causes have been reported to include sharp and blunt trauma.[2,3,10,20] Iatrogenic causes include aspiration of ganglia, venous puncture for blood collection, vascular surgery, as well as distal forefoot amputation.[8] Few cases have been discussed involving true aneurysms, and of those, only two describe pathologic findings. Kato, et al., describe an aneurysm with attenuation of the arterial wall secondary to arteriosclerosis[5], while Wu describes an organized transluminal blood clot with a greatly attenuated arterial wall.[11]

In this case report, the pathology demonstrate laminated fibrin and dense fibrous tissue within the tunica media, obliteration of the endothelial layer, and an organized thrombus and recannulization within the lumen consistent with a true aneurysm. This most likely represents an attenuation of the arterial wall secondary to arteriosclerosis, which is further supported by the patient's history of coronary artery disease and myocardial infarction.

Many diseases could also potentially lead to attenuation of the arterial wall such as Ehler's-Danlos syndrome, Marfan's syndrome, syphilis, Diabetes Mellitus, bacterial infections and fibrodysplasia.[6]

Some authors have emphasized the value of repairing the dorsalis pedis aneurysm to avoid potential future patient morbidity.[11,13] The incidence of thrombosis and embolism has been reported to be as high as 12.5% for infrapopliteal true aneurysms; however there is a low occurrence of rupture.[5] A major consequence of a thrombus or embolism in the dorsalis pedis artery may involve distal ischemia of the toes and subsequent gangrene.

Symptomatic aneurysms, (those causing pain), are believed to be at risk for rupture[5] therefore necessitating intervention to prevent future complications.

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