Anterior tibial artery pseudoaneurysm

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SUMMARY

A pseudoaneurysm, or false aneurysm, is a haematoma that is formed secondary to a leaking hole in an artery. This haematoma is contained by surrounding fascia. In contrast, a true aneurysm contains all three layers of vessel wall, namely intima. Pseudoaneurysms are scarce and can arise consequential of numerous iatrogenic influences, including but not limited to, blunt or penetrating trauma, orthopedic procedures like tibial nailing or ankle arthroscopy, and sports injury.

A thorough history taking focusing on the recent history of trauma or instrumentation and clinical examination should raise the suspicion of a pseudoaneurysm. In doubtful cases, imaging modalities such as an ultrasound and doppler examination of the lower limb can be utilized to confirm the diagnosis.

Our case was a 37-year-old gentleman presented with progressive swelling in the anterior aspect of his left leg for the past two weeks. The patient had a atypical presentation, with absence of classic signs of a pseudoaneurysm such as a pulsatile mass, absence distal pulses or a thrill or bruit. However, these injuries albeit rare can be sinister and prompt diagnosis is critical, so that pertinent treatment can be delivered. Our case highlights the importance of sonographic approaches for suspected vascular injuries.

INTRODUCTION

A pseudoaneurysm arises when there is a break in the vessel wall, leading to leakage of blood through its wall. This leakage is occasionally contained by the adventitia or neighboring perivascular soft tissue. There is a direct connection of blood flow between the aneurysmal sac and vessel lumen through a gap in the vessel wall. The possibility of an aneurysmal rupture is greater than a true aneurysm of similar size due to low support. Therefore, a pseudoaneurysm typically needs treatment.

A pseudoaneurysm can arise from almost any vessel in our body. In the lower limb, the commonest vessel involved is the popliteal artery, followed by superficial femoral, then anterior tibial artery. The anterior tibial artery is the most commonly involved vessel in a pseudoaneurysm of the foot and ankle.[1] Vascular injuries ensuing trauma are unusual. The reported rate of pseudoaneurysm in access sites ranges from 0.88% to 8%.[2] In our case presentation we report a case involving the anterior tibial artery secondary to penetrating trauma.

CASE REPORT

A 37-year-old gentleman presented at Hospital Teluk Intan, Perak, Malaysia with progressive swelling in the anterior aspect of his left leg for the past two weeks. He had no significant past medical history. He suffered a penetrating injury 2 weeks earlier when he was pierced by a tree branch at the left distal lower limb while working. He did not seek medical attention.

On physical examination, there was a diffused swelling on the anterior and distal part of left lower leg. The swelling was firm. No obvious pulsation was noted. No overlying skin changes. There were no erythema or discolouration of the leg. The peripheral pulses of the foot were detectable and capillary filling of all toes were normal. No neurovascular deficit was detected. All vital signs and laboratory parameters were within the normal range.

On the second day of admission an urgent ultrasound doppler was requested. A few differential diagnosis was proposed by the orthopaedic team, which included a post traumatic haematoma, arteriovenous fistula or a soft tissue tumour. On ultrasound, B-mode imaging showed the pseudoaneurysm measuring approximately 2.2cm x 3.3cm (Fig. 1a). Colour Doppler scan in axial displayed the characteristic 'yin yang sign' (Fig. 1b), while longitudinal scan showed communication with the proximal normal calibre anterior tibial artery (Fig. 2). The imaging findings and ultrasound report were updated to the primary team. A CT angiography was offered but did not proceed as patient was already planned for surgical intervention. He was subsequently brought in for wound debridement, wound exploration, and ligation of the left anterior tibial artery. An incision was made over the anterolateral aspect of the lower leg.

The sloughy tibia and fibular periosteum were debrided. Noted was a 1 cm laceration of the left anterior tibial artery with a loss of 30% circumference. The pseudoaneurysm was noted and this followed the ligation of the left anterior tibial artery. Postoperatively the patient was able to ambulate and there was no recurrence of the swelling. He was then discharged and in his latest follow-up, he was ambulating normally with no active complaints.

DISCUSSION

The goal of this case presentation is to review the common causes and diagnostic imaging features of an anterior tibial artery pseudoaneurysm and briefly the available treatment options.

This article was accepted: 03 March 2021
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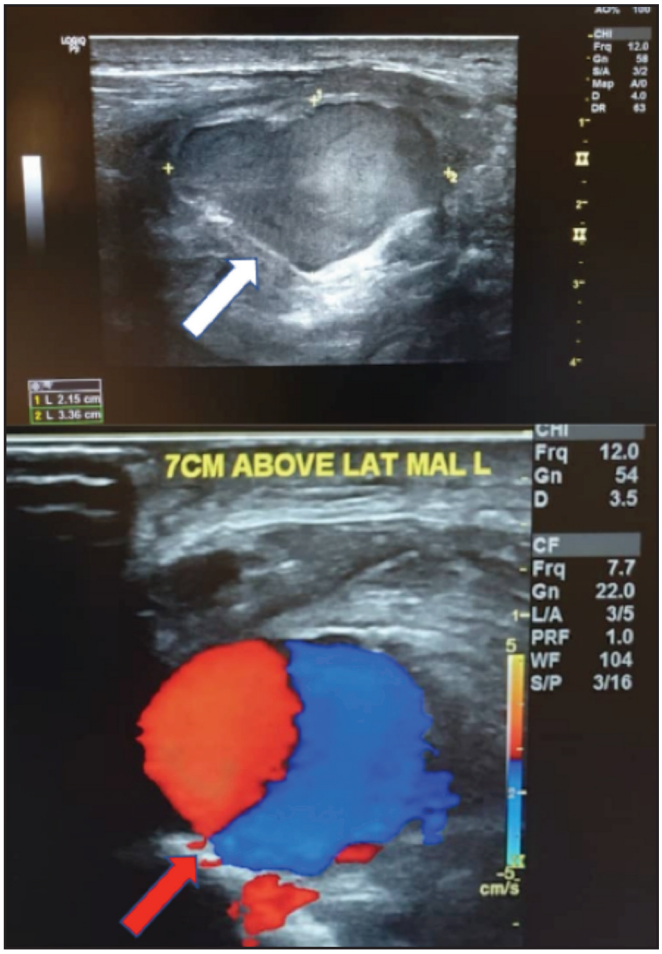

Fig. 1: White arrow shows the ultrasound image the pseudoaneurysm as an encapsulated, hypoechoic, irregular collection with internal echoes. Red arrow shows the ultrasound doppler (axial) image depicting the yin-yang sign secondary to turbulent flow within the aneurysmal sac.

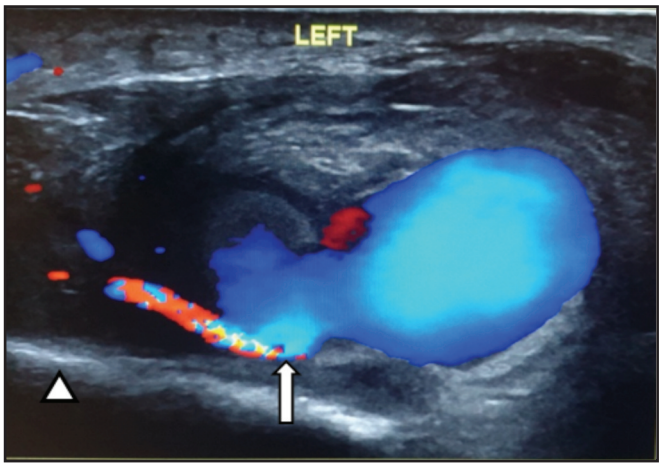

Fig. 2: Ultrasound doppler (longitudinal) image shows the pseudoaneurysm and its parent artery, the left anterior tibial artery. White arrow: communication between aneurysmal sac and its normal parent artery. White arrowhead: Tibia bone.

Traumatic aneurysms are frequently a consequence of penetrating vascular injuries. However, it may also follow a blunt injury. In our case, the patient developed a pseudoaneurysm following penetrating trauma to the lower limb. Traumatic aneurysm of an anterior tibial artery is a known but very rare complication of trauma to the vessels.[3]

A high degree of clinical suspicion is required to diagnose a vessel injury. Features that should raise suspicion include the presence of a growing pulsatile mass, unexplained swelling, and vascular insufficiency leading to absence of a palpable distal pulse. Uncommonly a systolic bruit or a thrill maybe present. In our case, an ultrasound and Doppler examination was performed on the day of admission, hence confirming the diagnosis and allowing for quick surgical intervention. Postponement in the diagnosis of these vascular injuries is the most frequent cause of complications. The consequent complications differ from severe pain, pulmonary embolism, rupture of the aneurysm, and hemorrhage to ulcer formation and potential amputation.[4]

Differential diagnoses of a pseudoaneurysm include deep vein thrombosis, haematoma, arteriovenous fistula, or a tumor of soft tissue or osseous origin. The role of imaging in these patients is to rule out other causes and confirm the diagnosis of a pseudoaneurysm.

Currently, ultrasound is the best imaging modality for initial assessment and diagnosis. This is because it is cost-efficient, widely, and easily available, and easy to learn. Ultrasound and doppler imaging both have high sensitivity and specificity in diagnosing a pseudoaneurysm. On ultrasound, an encapsulated, most commonly hypoechoic lesion is seen with internal echoes (Fig. 1) and shows communication with the proximal normal size artery. Colour doppler demonstrates a mosaic color signal pattern secondary to turbulent blood flow within the aneurysmal sac, displaying the characteristic 'yin yang sign'. Pulsed doppler shows a to and from wave pattern. Overall, sonography has a high sensitivity and specificity in diagnosing a pseudoaneurysm, ranging between 90-100% and 99-100% respectively.[5] A downfall to keep in mind is that the accuracy mentioned above is operator dependent, and ultrasound is limited in

certain anatomical regions such as the subclavian and iliac arteries. Ultrasound is also very useful to rule out other differential diagnoses. A haematoma is usually heterogeneous in appearance, with lesser internal vascularity compared to a pseudoaneurysm. A deep vein thrombosis usually shows an echogenic thrombus in the proximal deep vein with no color signal within. A soft tissue tumour can show a well or ill-defined margin depending on benignity, minimal vascularity, and occasionally infiltration into the underlying muscle.

Magnetic resonance imaging shows pseudoaneurysm as a heterogeneous low-intensity to iso-intensity signal on T2-weighted imaging and a high-intensity signal on T2*-weighted imaging. Transfemoral arteriogram has remained the gold standard investigation, as it allows treatment to be initiated.[4] To increase the probability of a successful outcome in these patients, prompt diagnosis and appropriate intervention and treatment are fundamental.

A computed tomography (CT) scan shows the aneurysm as a hypoattenuating (non-contrasted scan) or hyperattenuating (contrast-enhanced scan) sac, with this sac usually adjacent to an artery, usually with a communication to the parent vessel.

Internal appearance varies, depending on the degree of thrombosis. Partial rupture of the aneurysmal sac leads to complex multilobed composition, with multiple interconnected sacs. Complete rupture can show a more diffusely infiltrative haematoma. If an intermediate or high attenuation (haemorrhage) is visualized adjacent to the pseudoaneurysm, this could suggest a rupture, which differs in attenuation depending on it being chronic or acute. The pseudoaneurysm wall is usually smooth and well-defined except in a mycotic pseudoaneurysm, where the wall can be thickened, irregular, or ill-defined. While angiography is still the gold standard for evaluation of vascular injury, CT angiography has many advantages, such as being less invasive compared to catheter angiography, shorter examination time, lower rate of complication, with a high sensitivity and specificity, ranging from 98.7-100% and 90-95% respectively.[5]

Treatment options for a pseudoaneurysm of the anterior tibial artery include coil embolization, ultrasound-guided compression, percutaneous injection of thrombin, and open surgery. Percutaneous treatment using thrombin, although originally successful, does have associated risks, including distal embolization necrosis and, and when treatment is not successful, there is a potential delay in healing. Few distinct surgical or endovascular interventions are available such as artery ligation, direct primary repair with or without interposition grafting, coils or thrombin embolization, and covered stent graft. A multimodality treatment method using coil embolization, thrombin injection, and surgical approach is currently being described.

A special lesson that the authors would like to share from the case would be in presence of clinical diagnostic uncertainty, for example in our case where characteristic clinical symptoms were not present, imaging may be able to provide assistance in diagnosis and aid further management and intervention. Therefore, the authors would like to recommend ultrasound as a first line imaging modality in all suspected pseudoaneurysm cases, as it is widely available, cost effective and has a high sensitivity and specificity.

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