

Superficial Femoral Artery Pseudoaneurysm Following Blast Injury in a Child: A Case Report

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ABSTRACT

Background: Pseudoaneurysms are vascular abnormalities due to disruption of the arterial wall. Pseudoaneurysm of the superficial femoral artery following bomb-blast injury is extremely rare. We report a case of 9-year-old girl who presented with one-month history of painful progressive swelling in the left thigh with previous history of improvised explosive device trauma. Doppler ultrasound scan confirmed the diagnosis of pseudoaneurysm of the superficial femoral artery and the patient had an uneventful surgical repair. High index of suspicion following penetrating trauma of the limb and Doppler ultrasound (US) scan are important for accurate diagnosis of pseudoaneurysm. Prompt treatment is also warranted to prevent life threatening complications such as rupture and thromboembolism. The classical findings of 'ying-yang' sign on colour Doppler US and 'to and fro' spectral waveform on pulse Doppler US for diagnosis of pseudoaneurysm were demonstrated.

Keywords: Superficial Femoral Artery, Pseudoaneurysm, Bomb-Blast Injury, Penetrating Injury, Duplex Ultrasound Scan, Child

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Introduction

Pseudoaneurysm (PA), also known as false aneurysm, is a collection of blood formed as a result of a partial or complete vascular injury and retained in the surrounding tissues of the breached vessel or by the intact layer of the tunica media or adventitia. The PA consists of a perfused sac, the false lumen, connected to the femoral artery by a neck^{1, 2}. Although isolated post-traumatic PAs of the peripheral arteries are common during wartime, few studies on vascular trauma and its complications have been reported in Africa³. The most common causes of penetrating injuries to the peripheral arteries are knife stab and gunshot-related trauma⁴. Therefore, superficial femoral artery (SFA) PA following bomb-blast injury is relatively rare especially in children. Post-traumatic peripheral PAs are mostly seen in young adults with male preponderance and commonly involve upper limb arteries with

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a blunt trauma dominating the mechanism of injury⁵. The PAs of the thigh are rare compared to those of the groin, because of increasing rate of percutaneous access in interventional procedures recently^{2,4,6}.

We report the case of a 9-year-old girl who presented with painful thigh swelling following one-month history of bomb-blast injury. A diagnosis of PA of mid-portion of the SFA was confirmed using Doppler ultrasound (US) scan.

Case Report

A 9-year-old girl was referred to the surgical outpatient department of the University of Maiduguri Teaching Hospital, Maiduguri, Nigeria with one-month history of painful left thigh swelling which was associated with limping gait of the affected limb. The pain and limping were said to have progressively worsened during the period. The incident happened when a 'suicide bomber' exploded an improvised explosive device (IED) close to the patient and many others in Konduga, Borno State, North-Eastern Nigeria where she sustained injury on her left thigh which was initially managed conservatively at the nearby hospital before referral for expert management. There was no injury/swelling to the other parts of the body.

On examination, she was in painful distress but not pale. The vital signs were within normal limits. A huge oval swelling, measuring 14 cm x 10 cm, was seen at the mid-portion of the left thigh on the medial aspect; a healed sub-centimetre scar was noted slightly postero-medial to the swelling (which represented the point of entry of the shrapnel) as shown in Figure 1. It was pulsatile, soft and tender with restriction of

movement of the adjacent joints. The distal pulses were present but faint. The other systems were essentially normal.

Left thigh radiograph (Figure 2) showed opacity of metallic density within the soft tissue adjacent the mid-portion of the left femoral shaft which represented shrapnel with a huge soft tissue swelling on the medial aspect of the mid-thigh.

Grey scale ultrasound scan (USS) of the left thigh (Figure 3) showed an eccentric oval anechoic mass, measuring 8 cm x 6 cm, communicating with the mid-portion of the SFA through a wide neck measuring 1.5 cm in diameter. The colour duplex USS of the thigh (Figure 4) demonstrated mixed colour pattern within the mass giving the so called 'yin yang' sign due to turbulent blood flow and was communicating with the SFA.

Pulsed Doppler USS showed bidirectional 'to and fro' spectral flow pattern. Laboratory investigations including full blood count and electrolytes, urea and creatinine were essentially normal.

The diagnosis of PSA of the left SFA following blast injury was made and the patient had surgical repair of the SFA using a patch synthetic graft. The intraoperative findings were thin walled PSA of the mid-third of the left SFA with a 1.4 cm defect on its medial aspect and large amount of clotted blood within it. The post-operative period was uneventful and she was discharged from the hospital 8 days later.

The histology of the excised tissues confirmed the diagnosis. The patient came for 1- and 3-month follow-ups, where both clinical and Doppler examinations of the affected limb were normal.





Figure 1: Huge swelling (M) involving antero-medial part of the middle portion of the left thigh. Entry wound (S) was also noted adjacent the swelling postero-medially.



Figure 2: Left thigh radiographs showing opacity of metallic density which represents a shrapnel (S) and mass of soft tissue density (M) noted at the medial aspect of the mid-portion of the left thigh.

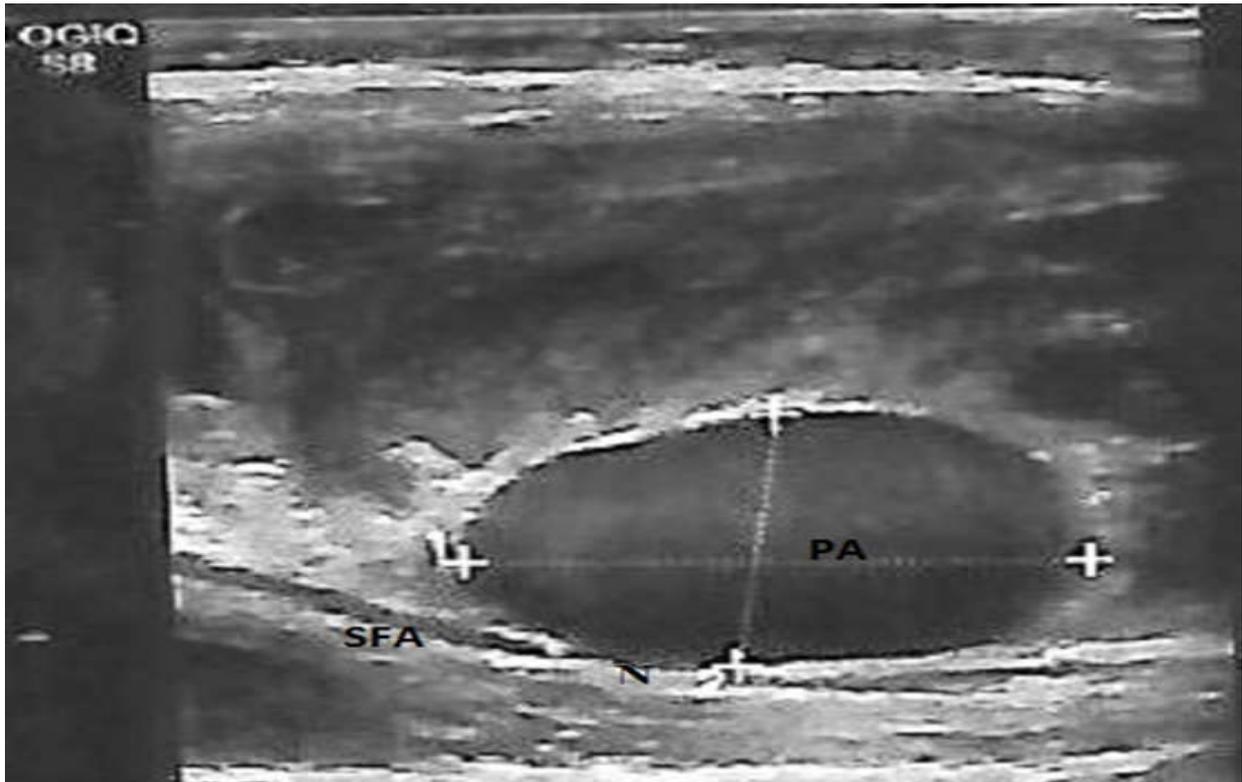


Figure 3: Grey scale USS of the left thigh showing eccentric oval anechoic (PA) mass communicating with the middle third portion of the superficial femoral artery (SFA) through a wide neck (N).

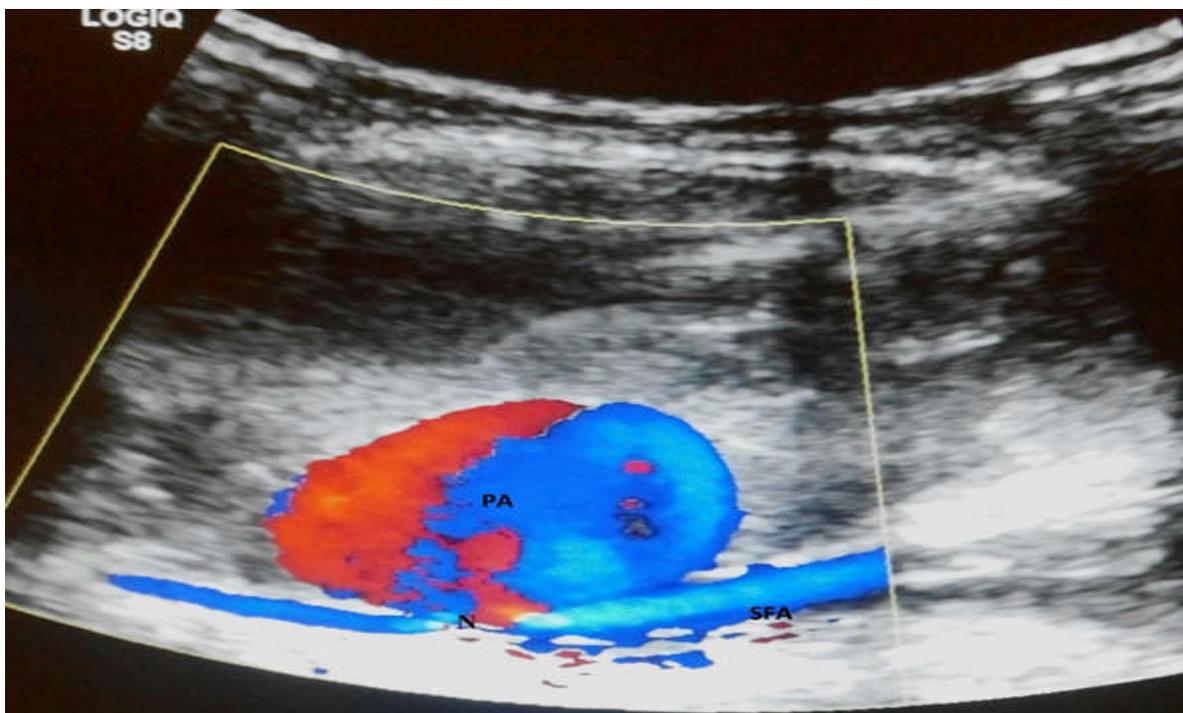


Figure 4: Colour duplex US scan demonstrating mixed colour pattern within the mass (PA) representing the 'yin-yang' sign communicating with the superficial femoral artery (SFA) through a wide neck (N).

Discussion

Pseudoaneurysms of SFA due to penetrating non-iatrogenic injury are rare entities especially in children and blast trauma as its aetiology. Raheerantenaina *et al.* reported that the SFA accounted for only 9% of all post-traumatic PA of the peripheral arteries in a review of 161 cases and also found that blunt trauma was the major mechanism of injury⁵. Penetrating non-iatrogenic injuries to the SFA can lead to PA and may be due to the following: knife, fork, pieces of glass or gunshot.^{4, 7-9} It can also follow post-traumatic femoral fracture which was reported by previous authors.^{6, 10}

Iatrogenic causes of femoral artery PA are the major aetiology and the incidence is increasing recently due to increased rate of diagnostic and therapeutic femoral artery puncture procedures.^{2, 11} Few authors reported spontaneous PA of SFA.^{1, 12} While in index case, it was due to blast injury from explosion of IED involving a girl. Raheerantenaina *et al.* also reported that only 17% of all the cases were children which signified that it is rare condition in this age group.⁵ Most of the reported cases of PAs of the SFA were seen in adults.^{1-3, 6-10} However, Sayit *et al.* reported a case of delayed SFA PA following penetrating trauma in a boy.⁴

The time of presentation of post-traumatic PA varies from hours to years depending on the involved regions and the symptoms and signs manifested. Clinical features include progressive or pulsatile swelling, audible bruit, palpable thrill, pain, oedema, peripheral ischaemia and compressive neuropathy.^{3, 4, 10} The possible complications of femoral artery PA are: life threatening rupture, thrombus formation, distal embolization and arteriovenous fistula.^{1-4, 6, 7} The patient had none of these complications

because the presentation was one month after injury.

Duplex USS is the first and preferred imaging modality to evaluate the PA of femoral arteries and has high sensitivity (94%) and specificity (97%).^{4, 8, 10} It is also a non-invasive, relatively affordable, available and safe imaging modality.^{4, 9} Duplex USS is the gold standard for diagnosis of PA.⁴ However, the disadvantage is that it is operator dependent. The classical 'ying-yang' sign and 'to and fro' spectral waveform at the neck are reliable features for diagnosis of PA.^{2, 4} Formerly angiography was the recommended technique for evaluation of vascular lesions.¹⁰ Computed tomography angiography (CTA) and magnetic resonance imaging (MRA) are also used for diagnoses of PAs especially in regions of complex anatomy. However, angiography and CTA use ionising radiation which has more effect in children⁴ and MRA is not readily available in developing countries and expensive. They can be used when duplex USS findings are non-specific, or the anatomy is complex.⁴ In our case, the patient had duplex USS which demonstrated the classical features.

The treatment options for PA of peripheral arteries often depend on the size and location of the lesion.^{4, 10} Asymptomatic small lesions may undergo spontaneous resolution. Otherwise, current treatment options for symptomatic PAs include US-guided compression (USGC), US-thrombin injection (USTI), endovascular stent graft insertion and coil embolization and open surgical repair.^{2, 4, 10} Interventions are generally indicated in the large (> 3 cm) symptomatic lesions.¹⁰ The USGC is recommended for slow growing small (< 3 cm) PA with narrow neck (< 1.0 cm) PA.^{1, 8} The USTI is the treatment of choice for iatrogenic femoral artery PA and also narrow



neck.^{1, 7, 10} Endovascular repairs are traditionally recommended for high risk patients like elderly.^{8,9} Open surgical repair is traditionally recommended for large lesions because of high risk of complications such as thromboembolism and rupture.^{1, 9} The preferred method of treatment of PA for young patients is surgery with angioplasty or graft repair.⁴ Raherinantenaina *et al.* also reported that surgical repair is the most common treatment of the 161 reviewed cases of PA of the peripheral arteries.⁵ The index patient had surgery with synthetic graft repair because she was young and the lesion was large (6 cm in diameter) and had wide neck (1.4 cm).

Conclusion

This may be the first reported case of pseudoaneurysm of superficial femoral artery following blast injury involving a child. Vascular injuries are on the increase due to rising rate of violence in our environment. High index of suspicion with Doppler USS plays an important role in the diagnosis of pseudoaneurysms. Prompt surgical treatment may prevent life threatening complication.

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