Case Report

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Confronting a Vascular Giant: A Case Report and Review of a Postoperative Brachial Artery Pseudoaneurysm

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Background: A pseudoaneurysm (PSA) is a focal arterial dilation caused by blood leakage from a vessel, forming a localized hematoma enclosed by a fibrin wall. Unlike true aneurysms, PSAs lack involvement of all vessel wall layers. Rare in peripheral arteries, they cause life-threatening complications if untreated.
Case Report: We report a case of a 42-year-old male who developed a left brachial artery PSA following surgical removal of a titanium elastic nail. The patient presented with a 6-month history of a pulsatile swelling. Imaging revealed a fusiform PSA with partial thrombotic occlusion. Surgical excision was performed, and the brachial artery reconstructed with a great saphenous vein interposition graft.
Conclusions: Brachial artery PSAs are uncommon and result from trauma or surgical intervention. Treatment involves open surgical repair with vein grafting. Alternative approaches, including endovascular stent grafting and coil embolization, may be viable. Early diagnosis and tailored management are essential to prevent complications.

Keywords: *Pseudoaneurysm; Brachial Artery Pseudoaneurysm; Vascular Surgery; Traumatic Pseudoaneurysm*

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INTRODUCTION

An aneurysm is an abnormal focal arterial dilation, with an increase in diameter by at least 50% compared with the adjacent non-affected arterial segment. This may result from vessel wall weakness due to proteolytic pathways, inflammation, or loss of the arterial matrix. A pseudoaneurysm (PSA), or a false aneurysm, forms when blood leaks from the vessel and creates a localized hematoma. PSAs usually occur secondary to arterial punctures or trauma, and mimic a true aneurysm in morphological presentation, but they lack involvement of all three vessel layers. Instead, they are enclosed by a clot-derived fibrin wall, which is weaker than the wall formed by a true aneurysm [1,2].

PSAs are a rare entity, and in peripheral locations such as the brachial artery, even more so. They can be limb and life threatening, often leading to thromboembolic complications, hemorrhage, edema, ischemia, and nerve compression, if left untreated, and warrant early diagnosis and management. In the absence of distal neurovascular compression, brachial artery PSAs measuring 2 cm or less may be asymptomatic. When symptomatic, the initial presentation is that of a tender, pulsating mass with possible nerve injury or compression, requiring emergency investigation and appropriate treatment to prevent complications [3].

We present here a case of a 42-year-old male patient who presented with a massive left brachial artery PSA that developed following left upper limb surgery. We managed it by successful surgical excision of the PSA.

Ethical Approval and Informed Consent

Ethical approval for the retrospective case report was given by the Institutional Ethics Committee of Bhaikaka University. Written informed consent was obtained from the patient for the use of clinical images and publication

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of the case report without revealing any personal information or identification.

CASE REPORT

A 42-year-old male, with no known comorbidities or addictions, presented with complaint of a painless, slow-growing swelling over the lower end of the left arm for 6 months. The patient had a history of surgery of the left arm for a fracture of the left humerus for which the patient underwent humeral titanium elastic nailing (TENS). The TENS was removed surgically 1 year ago, following which the patient developed his complaints. Initially, the patient complained of a small nodular swelling, which had started to significantly grow in size over the past 6 months. Upon examination, there was a solitary, irregularly shaped, non-tender, pulsatile swelling over the anteromedial aspect of the left arm, measuring 15 cm x 10 cm in size, with a palpable thrill, with no distal neurovascular deficit or restriction of mobility in the left upper limb (Figure 1).

Radiograph of the left upper limb depicted an old-healed fracture of the left humerus with a soft tissue mass arising in close relation to the humerus. The patient underwent a computed tomography angiography (CTA) of the left upper limb. The results were suggestive of a contrast-enhanced fusiform outpouching arising from the brachial artery, with a surrounding mixed density non-enhancing area, suggestive of a brachial artery PSA with surrounding hematoma formation (Figure 2), along with partial thrombotic occlusion of the brachial artery distal to the PSA and proximal part of the ulnar artery.

Based on the clinical findings and the CTA report, the patient was taken up for surgical excision of the PSA. The left brachial artery was exposed superior and inferior to the swelling, and proximal and distal controls of the brachial artery were taken. The incision was extended along the anterior margin of the swelling; the PSA was exposed completely and thereafter excised. A long segment of calcified thrombus was evacuated from the distal segment of the brachial artery and proximal ulnar artery. Brachial artery repair was done with a great saphenous vein interposition graft, with an end-to-end anastomosis using a 6-0 polypropylene suture. Normal distal circulation was ensured (Figure 3).

Figure 1 Clinical image showing a massive swelling over the left arm. (**a**) Medial aspect. (**b**) Anterior aspect.

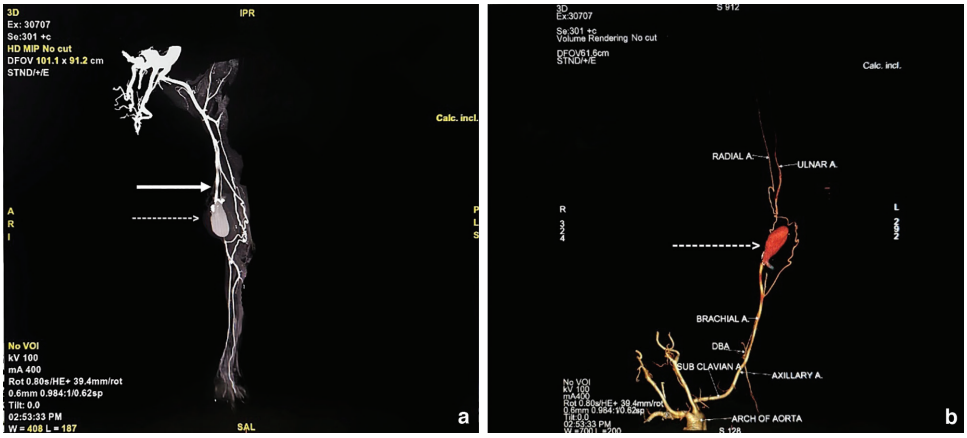

Figure 2 Computed tomography angiography (CTA) of the left upper limb. (**a**) CTA of the left upper limb showing enhancing aneurysmal dilatation (dashed white arrow) arising from the left brachial artery (solid white arrow). (**b**) CTA of the left upper limb – Virtual Reality image showing fusiform aneurysmal dilation (dashed white arrow) arising from the left brachial artery.

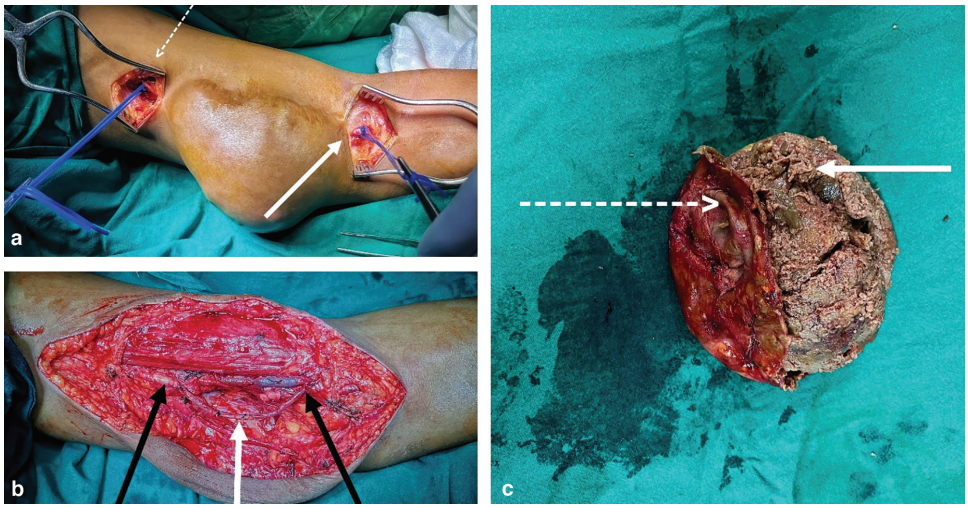

Figure 3 Intraoperative images. **(a)** Intraoperative image showing proximal control of the brachial artery at the superior edge of the pseudoaneurysm (dashed arrow) and distal control of the brachial artery at the inferior edge of pseudoaneurysm (solid arrow). **(b)** The left great saphenous vein placed as interposition graft (solid white arrow) with end-to-end anastomosis proximally and distally (solid black arrows) to the left brachial artery. **(c)** Excised specimen showing a chronic organized hematoma (solid white arrow) with a thick pseudoaneurysm wall (dashed white arrow).

Following the procedure, the patient made an uneventful recovery and was discharged two days later. Subsequent Doppler scanning upon follow-up revealed no residual abnormalities and good flow in the left upper limb, and no evidence of leakage or vascular insufficiency, as well as no neurovascular deficits.

DISCUSSION

A PSA is defined as a collection of blood secondary to leakage of blood from an artery into the surrounding tissue, resulting in a pulsatile hematoma encapsulated by fibrous tissue. It commonly results from arterial puncture, trauma, or infection. Unlike true aneurysms, which involve all layers of the vessel wall, PSAs involve only two of the three. PSAs can be iatrogenic or non-iatrogenic, caused by arterial access during endovascular procedures, open surgery, blunt or penetrating trauma, infection, degenerative lesions, or catheter-based interventions [4].

Brachial artery PSAs, like the other peripheral PSAs, can be caused by blunt or penetrating trauma, or can be iatrogenic, occurring owing to surgical trauma. Imaging plays a crucial role in evaluating PSAs, and several modalities including Doppler ultrasonography, magnetic resonance angiography, and CTA are routinely used. The choice of imaging technique depends on the location of the PSA. For cases of a suspected brachial artery PSA, Doppler ultrasound is preferred. While Duplex ultrasound confirms the diagnosis and provides details on the size, anatomy, and origin of the PSA, arteriography helps assess the aneurysm's extent, the location of extravasation with respect to the relation with surrounding tissue, and the evaluation of landing zones if an endovascular intervention is considered [5].

The treatment approach for PSAs is guided by their size, location, and ensuing complications. The most employed technique is open surgical repair, which yields the best long-term results. Kemp et al. conducted an open repair in a case of brachial artery PSA secondary to a mid-humeral fracture and had an uneventful recovery post op [6]. Yetkin and Gurbuz reported a series of nine cases of post-traumatic brachial artery PSAs wherein they performed successful aneurysmal resection followed by saphenous vein interposition graft in all [3]. Similarly, Shi et al. described a case of brachial artery PSA formation after vaccination in an infant, in whom resection of the PSA with vein interposition grafting was successful with return of peak systolic velocity to normal at 5 months post op [7]. In our case as well, the PSA was excised via open surgery and reconstruction was done using a great saphenous vein interposition graft.

Alternatives to open surgery have also been reported in the literature for high-risk cases and minimally invasive management. Klonaris et al. described a series of five cases, adopting a novel hybrid repair consisting of primary endovascular stent grafting and subsequent surgical opening and evacuation of the PSA for decompression of adjacent structures [8]. Centola et al. described a successful endovascular treatment using a percutaneous implantation of a polytetrafluoroethylene-covered stent in a patient on hemodialysis presenting with a large iatrogenic brachial artery PSA [9]. Yuksel et al. performed a percutaneous coil embolization, as an alternative to

open surgical repair, in a 2-year-old patient presenting with a giant brachial artery PSA [10].

Owing to the limited number of cases, there is little evidence to suggest the best management strategy for a PSA. The onus must be on rapid diagnosis of the condition and defining a plan of management dictated by clinical and radiological findings, with an intent to cure and prevent complications.

Ethics Statement

(1) All the authors mentioned in the manuscript have agreed to authorship, read and approved the manuscript, and given consent for submission and subsequent publication of the manuscript.
(2) The authors declare that they have read and abided by the JEVTM statement of ethical standards including rules of informed consent and ethical committee approval as stated in the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Declaration of the Use of Generative AI and AI-assisted technologies in the writing process

No generative AI or AI-assisted technologies were used during the writing process of this manuscript.

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