

# Acute limb-threatening ischemia following rupture of a brachial A-V fistula pseudoaneurysm

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**Abstract** We present a case of acute limb-threatening ischemia following contained rupture of a pseudoaneurysm at brachial arterio-venous fistula site. The rapid progression of the clinical ischemia with impending external rupture of the pseudoaneurysm made the presentation unique. Emergent salvage surgery was performed with autogenous saphenous vein reconstruction of the brachial artery. We believe that emergent surgery with autogenous reconstruction of the artery would give the best results considering the strong probability of infection as the etiology.

**Keywords** A-V fistula · Pseudoaneurysm · Rupture

## Introduction

The reported incidence of aneurysmal disease associated with hemodialysis access sites vary between 5–60 % [1]. The complications are more frequent with proximal access sites like brachial arterio-venous (A-V) fistulae using cephalic vein than the distal radial arterio-venous fistulae (AVF) [2]. The repeated puncture of the A-V fistula site often results in fibrotic scarring, areas of weakness, and aneurysmal transformation. Infection is also a major risk factor for the aneurysmal disease

of AVF [3]. Ruptures of the aneurysms either free or contained have been seldom documented. Here we report a pseudoaneurysm of the left brachial A-V fistula complicated by rupture into the forearm causing early compartment syndrome, acute limb ischemia, and potential fatality.

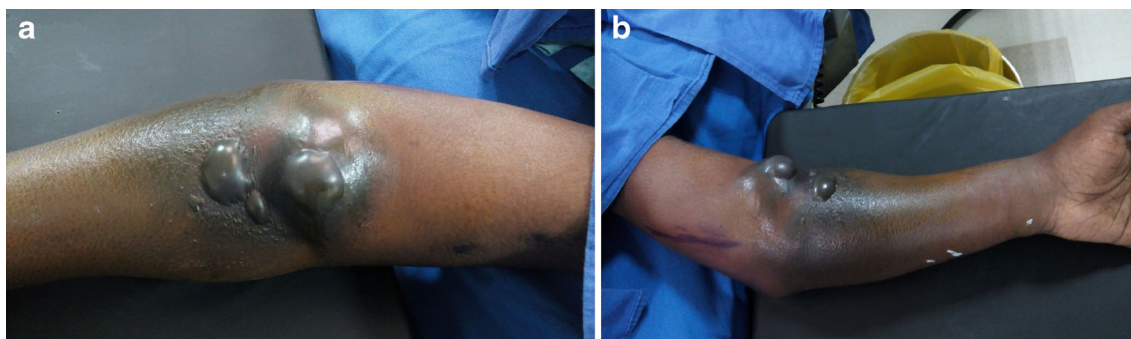
## Case report

A forty-year-old dialysis dependent lady, presented with history of swelling at the left brachial A-V fistula site for the past 1 week. The A-V fistula had been redundant and not used for over 6 months. She had a right subclavian permacath dialysis catheter in situ. The pulsatile swelling at the fistula site had rapidly increased in size over a day following her last dialysis and was associated with numbness, severe pain, and swelling of the left forearm. On examination, a 6 × 6 cm pulsatile swelling was noted at the left A-V fistula site with bleb formation and blackish discoloration of skin over the fistula site (Fig. 1a, b). Distal forearm was cooler when compared to the contralateral side. The limb was in fixed extension posture and swollen, tense and tender to touch with painful restriction of finger movements. The distal pulses were not palpable. Upon urgent doppler evaluation of the affected limb, the entire forearm muscular compartment was filled with blood and arterial flow in the ulnar artery could not be demonstrated. There were faint monophasic flow signals in the radial artery. Doppler evaluation showed pulsatile pseudoaneurysm at the fistula site with a diagnosis of possible contained rupture into the forearm. Patient was taken up for an urgent surgical exploration. After systemic heparinization, a lazy S incision adjusting for the skin creases at the cubital fossa was used and the brachial artery was exposed proximally. Torrential bleeding from the fistula site was initially controlled with finger. An anastomotic site pseudoaneurysm involving the

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**Fig. 1** a, b Threatened limb with contained rupture and vascular compromise. Skin discoloration with bleb formation at the A-V fistula site

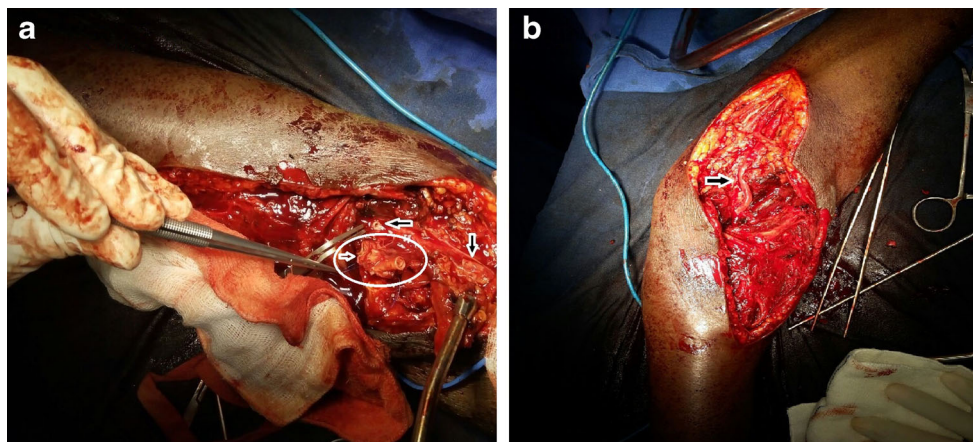
suture line was noted. After achieving proximal control with vascular clamp, the distal forearm was exposed. Approximately 400 ml of fresh blood without any clots was evacuated from the left forearm, and distal control of the brachial artery proximal to bifurcation was secured. Complete disruption of the A-V fistula was noted. The fistula site was opened and the pseudoaneurysm wall excised which involved the anastomotic line and a part of brachial artery segment distal to fistula site. The cephalic vein was ligated. Part of the brachial artery forming the wall of the pseudoaneurysm was excised (Fig. 2a—white circle, white arrow shows the pseudoaneurysm wall). An interposition graft using a reversed saphenous vein was used to reconstruct the left brachial artery (Fig. 2b). The distal flow was reestablished with intraoperative doppler confirmation of triphasic signals in both the left ulnar and radial arteries. The forearm was closed over suction drains. She had an uneventful recovery after the procedure barring the superficial skin necrosis at the site of bleb formation which was managed conservatively. She was discharged with a normal functional limb with no signs of ischemia 10 days after the procedure on antiplatelet therapy. At 6 weeks follow-up, her wound has healed well with normal distal pulses (Fig. 3).

## Discussion

Although repeated puncture is a documented cause for pseudoaneurysm formation of AVF, infection of the fistula site appears to be the more common etiology [1]. This we believe is the case in this particular instance considering the symptoms of pain and rapid deterioration of clinical course.

Early diagnosis of small and uncomplicated AVF pseudoaneurysms makes them amenable for conservative treatment modalities like thrombin injections or ultrasound-guided compression [4]. The success rates with ultrasound-guided compression therapy vary between 60–90%. Superior results are often quoted with the use of percutaneous thrombin injections. Endovascular techniques with the deployment of covered stents across the aneurysm mouth have also been described for the treatment of early uncomplicated aneurysms with poor surgical candidacy [5]. However a surgical intervention (either salvage or ligation) is always warranted when there is a rupture or imminent rupture of the aneurysm often complicated by infection [6]. In this particular case, the pseudoaneurysm wall had given away and the fistula was non-functional with an alternate dialysis access site already in place. Hence no consideration was given for the

**Fig. 2** a Excised segment of brachial artery (site of fistula) with proximal and distal ends (arrows). White circle shows excised pseudoaneurysm wall (white arrow) with the segment of brachial artery. b Reconstructed brachial artery with reversed saphenous vein graft (arrow)



**Fig. 3** Limb at 6 weeks follow-up



salvage of the fistula. The limb was threatened with contained rupture and compartment syndrome added to which was the imminent risk of free rupture with fatality.

Often the distal arterial segment requires Fogarty embolectomy after the aneurysm repair owing to the presence of thrombus in the aneurysm wall [7]. However this was not performed in this case as there was good back bleed from the distal end of the divided brachial artery. The reestablishment of both ulnar and radial arterial flow following the procedure confirmed the patency of distal arterial tree.

Nambiar et al. had reported a venous side aneurysm at the A-V fistula site which was managed with fistula take down and ligation [8]. In contrast, the present case had a pseudoaneurysm involving the anastomotic line and distal brachial artery segment with disruption of the wall leading to a contained rupture into the forearm with an ischemic limb. A simple ligation of the fistula could not have sufficed in this particular case considering the involvement of arterial segment which warranted an excision and reconstruction.

The reconstruction of brachial artery can be accomplished either by an end to end anastomosis, reversed saphenous vein interposition graft, or polytetrafluoroethylene (PTFE) interposition graft [6, 7]. Georgiadis et al. have reported superior patency rates and results with the use of autogenous than prosthetic repair of complicated hemodialysis access site aneurysms [6]. Autogenous grafts like reversed saphenous veins are reported to have better patency rates especially in the setting of infections. In the present case, a segment of the brachial artery at the fistula site was excised (approximately 5 cm). Yetkin et al. had reported 100 % patency with saphenous vein graft at brachial position at 3.4 years follow-up in post-traumatic pseudoaneurysms of the brachial artery [9]. As it was impossible to achieve a tension free end to end anastomosis, we preferred the use of a reversed saphenous vein

interposition graft considering the possibility of an infectious etiology which precluded the use of PTFE.

To conclude, the rupture of AVF pseudoaneurysms is a rare but potentially life- or limb-threatening complication which warrants early surgical intervention. Early identification and intervention holds the key to limb salvage.

#### Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

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