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Axillary artery aneurysm associated with Arteriovenous malformations of the upper extremity: A case report

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ABSTRACT

INTRODUCTION AND IMPORTANCE: Axillary artery aneurysms are an uncommon upper extremity pathology. While trauma is the most common cause, degenerative aneurysms may occur in high-flow vascular conditions, such as upper extremity arteriovenous fistulas. Arteriovenous malformations (AVMs) are a rare cause.

CASE PRESENTATION AND DISCUSSION: We herein describe a 41-year-old male with multiple congenital high-flow AVMs in the left upper extremity who presented with an asymptomatic axillary artery aneurysm. The aneurysm was successfully treated with open resection and revascularization using a reversed basilic vein interposition graft.

CONCLUSION: Clinicians should be aware of the possibility of an axillary artery aneurysm in patients with upper extremity AVMs.

1. Introduction

Axillary artery aneurysms are a rare upper extremity pathology. They are most frequently caused by trauma [1] but may also be associated with atherosclerosis, infection, Marfan's syndrome, fibromuscular dysplasia, tuberous sclerosis, sarcoidosis, Kawasaki's disease, Behçet's disease, Ehlers-Danlos syndrome, or thoracic outlet syndrome [1–10]. Repetitive trauma from chronic crutch use or athletic activities involving repeated abduction and external rotation of the shoulder (e.g., baseball pitching) may lead to aneurysmal degeneration of the axillary artery [11–13]. Congenital axillary aneurysms may occur, alone or in association with rare orthopedic syndromes like melorheostosis [14].

We herein describe a man with an asymptomatic left axillary artery aneurysm associated with multiple congenital high-flow arteriovenous malformations (AVMs) of the left upper extremity. He consented in writing to the publication of his case details and images. The work has been reported in line with SCARE 2020 guidelines [15].

2. Case presentation

A 41-year-old male presented with asymptomatic enlargement of his entire left upper extremity, accompanied by dilated superficial veins, which were present since early childhood. He reported no symptoms of arterial insufficiency. He had type 2 diabetes mellitus treated with metformin and a heavy smoking history but no symptoms suggestive of vasculitis, no previous trauma to the axilla, and no recent crutch use. Both family and psychosocial histories are noncontributory. Multiple unsuccessful AVM embolization procedures had been performed in the past.

On examination, the man appeared generally well. His left upper limb was larger than the right and exhibited prominent superficial veins. The brachial, radial, and ulnar arterial pulses were stronger on the left than on the right, and a thrill was palpated over the enlarged left upper extremity veins. An approximately 5-cm diameter pulsatile swelling was present at the level of the distal axillary artery. The third, fourth, and fifth fingers had normal motor and sensory function but exhibited partial wasting, which was a complication of a previous trial of endovascular AVM embolization. Examination of the right upper limb was normal, as was the remaining physical examination.

Duplex ultrasonography revealed ectatic left axillary, brachial, ulnar, and radial arteries, plus focal aneurysmal dilatation of the distal axillary artery. The right upper limb was unremarkable. Computed tomography angiography (CTA) showed ectatic left subclavian and axillary arteries; an aneurysm at the distal left axillary artery measuring 5.1 cm in maximum diameter; ectatic and tortuous brachial, radial, and ulnar arteries; and global left hand, forearm, and upper arm early venous enhancement, with multiple AVMs (Fig. 1). CTA of the chest, abdomen, and pelvis revealed no other pathology. Angiographic evaluation of the left upper limb confirmed the presence of the aneurysm and demonstrated ectatic

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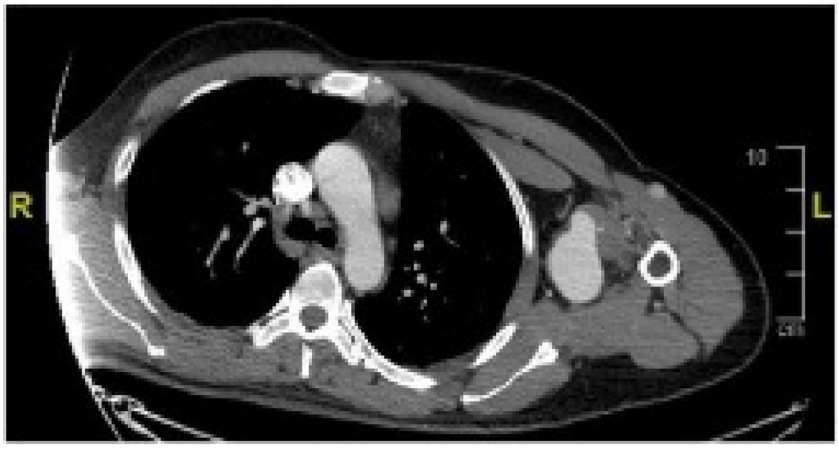

Fig. 1. Computed tomography angiogram showing the axillary artery aneurysm with a maximum diameter of 5.1 cm.

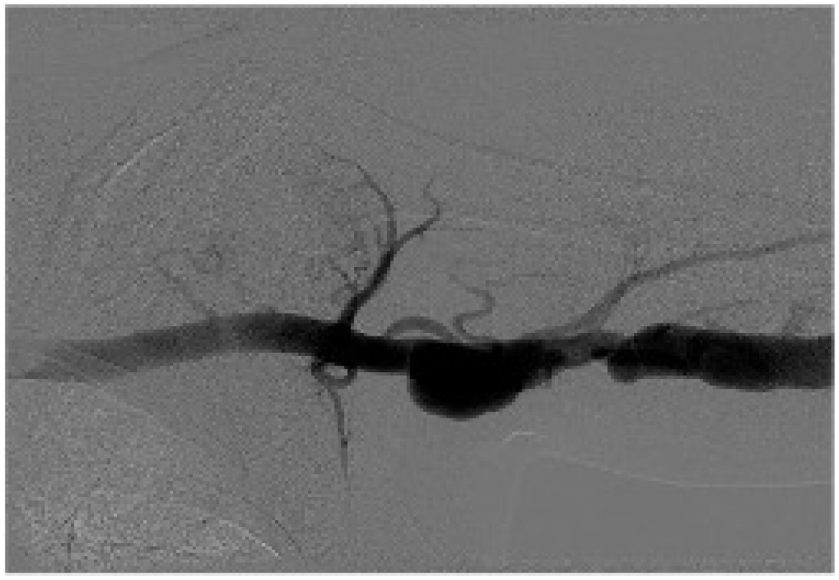

Fig. 2. Angiogram of the left axilla showing generalized arterial dilatation with a focal aneurysm.

arteries with multiple high-flow AVMs: one at the shoulder, one around the elbow, and one on the dorsum of the hand (Fig. 2).

We performed open axillary aneurysm repair through a transaxillary incision (Fig. 3). The artery was reconstructed with a reversed basilic vein interposition graft (Fig. 4). The procedure was performed by a certified vascular surgery consultant and his team in a university hospital. Histopathology of the aneurysm wall revealed attenuated and disrupted elastica and muscular layers, with wall fibrosis and thickening. Postoperatively, the patient had an uneventful course, with no complications, follow up duplex after three months showed patent graft with no complications, the next phase of the patient's treatment plan will be directed towards the existing AVMs intervention.

3. Discussion

Axillary artery aneurysms can be asymptomatic or present with pain or signs of compression of adjacent structures, such as the brachial plexus. Less commonly, they present with evidence of distal embolization and limb ischemia or potentially life-threatening hemorrhage from aneurysm rupture.

The pathogenesis of axillary artery aneurysms often involves structural weakness of the arterial wall, compounded by hemodynamic factors. Abnormalities in both collagen and elastin components can lead to structural weakness. In conditions with increased blood flow into the artery, the vessel dilates to accommodate the increased flow. The trigger(s) responsible for shifting this physiologic response to pathologic aneurysmal degeneration remain unclear.

A well-established example of aneurysms secondary to altered hemodynamics is the development of axillary and brachial aneurysms in patients with AVFs. Teixeira et al. [16] reported 10 patients with brachial artery aneurysms at a mean of 137 months after AVF construction, all of which were treated with aneurysmectomy and venous or prosthetic interposition grafts. Aneurysm development does not appear to be prevented by AVF ligation or thrombosis. Sultana et al. [17] described a patient with a symptomatic axillary artery aneurysm diagnosed 10 years after closure of a brachio-cephalic AVF, which was treated with a reversed interposition saphenous vein graft.

Another example of aneurysm formation secondary to hemodynamic factors involves high-flow AVMs. AVMs have been reported extremely rarely in association with aneurysms. Sai Chandran et al. [18] described a 54-year-old woman with serial left brachial artery aneurysms associated with multiple AVMs, who presented with arm claudication, multiple swellings of the forearm, and

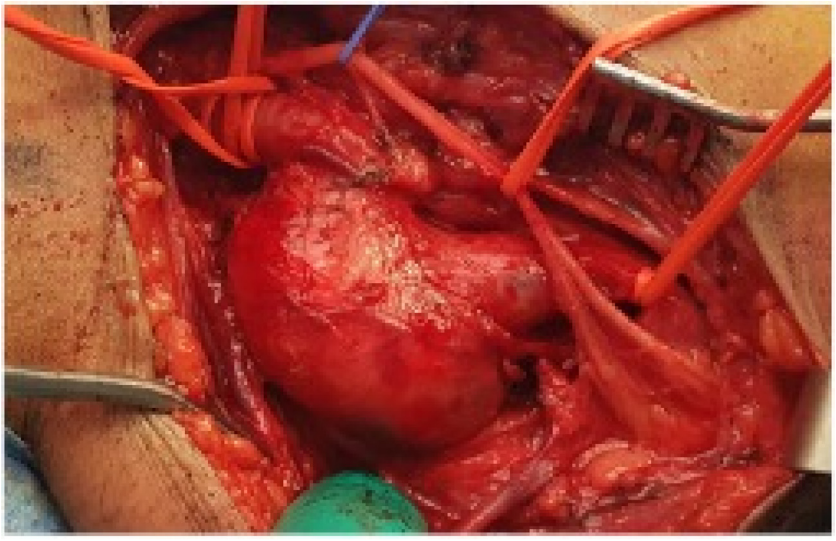

Fig. 3. Intraoperative view of the axilla showing the axillary artery aneurysm before repair.

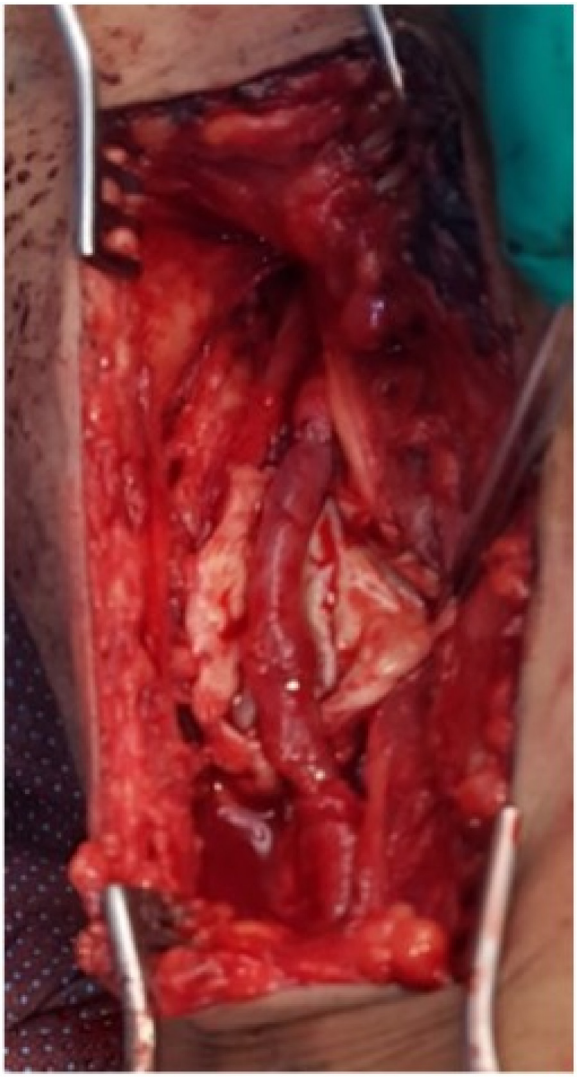

Fig. 4. Intraoperative view of the axilla showing the axillary artery after aneurysm repair and reconstruction with a reversed basilic vein interposition graft.

pulse deficit at the wrist. Angiography showed dilated axillary and brachial arteries with multiple AVMs between the elbow and distal forearm. She was treated with total brachial artery resection and reconstruction using an interposition graft (expanded polytetrafluoroethylene) and resection of two AVMs at the elbow.

Our patient had no symptoms, but surgery was indicated because of the size of the aneurysm. We used a vein graft instead of a synthetic graft because the aneurysm was located close to the shoulder joint. Vein grafts may provide better long-term patency than prosthetic grafts for axillary artery reconstruction [1]. We chose the left basilic vein because it was of good quality and size, and its use avoided the need for an additional incision. The AVMs, which had failed embolic treatment in the past, remained intact, and the patient will require further intervention and follow-up monitoring for aneurysm recurrence.

Although open aneurysmectomy with interposition grafting is the standard treatment for axillary aneurysms [1,19], endovascular exclusion with a covered stent may be considered in patients with a high surgical risk or those with high-risk anatomy, such as previous surgery or radiation therapy in the area. Sullivan et al. [20] reported the use of endovascular exclusion in a patient with a ruptured axillary aneurysm who had previous axillary radiation therapy. The patient died of pulmonary complications approximately 52 days later, at which time the autopsy revealed a patent stent. Mohan et al. [19] described a patient with radiation-induced subclavian and axillary artery aneurysms and a brachial artery embolus, who underwent embolectomy, followed by next-day endovascular exclusion using covered stents. The stents were patent at 9-month follow-up. The potential for stent-related complications (particularly stent deformation and fracture) [21] currently limit widespread use of this therapeutic approach in the axillary and brachial arteries. Until well-conducted, long-term studies are performed, surgery remains the first-line treatment for most upper limb aneurysms.

4. Conclusions

We described a patient with an asymptomatic axillary artery aneurysm associated with multiple AVMs. Duplex ultrasonography helped establish the diagnosis, and angiography confirmed the diagnosis and allowed assessment of outflow, in preparation for revascularization. We performed standard treatment via open resection and revascularization with interposition vein grafting,

although endovascular exclusion could be considered in patients with distorted anatomy or in poor general health. Despite the rarity of axillary artery aneurysmal degeneration in the presence of high-flow AVMs, clinicians should be aware of the possibility of this potentially limb- or life-threatening condition.

Declaration of Competing Interest

The authors report no declarations of interest.

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Ethical approval

"He consented in writing to the publication of his case details and images." King Saud University, College of Medicine Institutional Review Board do not issue ethical approvals for case reports. Patient was informed and consented to the publication of both the case and images.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Study conception: all authors.
Data collection: TA, WB, KI.
Analysis: None.
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