Successful nonoperative management of mycotic radial artery pseudoaneurysm in patient with absent superficial palmar arch

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ABSTRACT

We present the case of a patient in whom a mycotic radial artery false aneurysm developed after removal of a radial arterial line; anatomic constraints precluded simple resection and ligation of the infected artery. The patient was successfully treated nonoperatively by compression bandaging, intravenous antifungals, and serial imaging. This case represents an alternative to standard management of a mycotic aneurysm and demonstrates the importance of an individualized approach to patient care. (J Vasc Surg Cases and Innovative Techniques 2020;6:409-12.)

Keywords: Mycotic aneurysm; Radial artery; Incomplete palmar arch

Mycotic aneurysm was first defined in 1884 by Osler, who used the term to describe multiple aortic aneurysms laden with fungal vegetations in a patient with bacterial endocarditis.[1] Left untreated, mycotic aneurysms can lead to rupture, embolization, limb loss, or death.[2,3] Traditional management has been ligation or resection with or without extra-anatomic bypass.[2,3] We present a case in which nonoperative management of a mycotic aneurysm led to complete resolution. The patient agreed to publication of the case details and images.

CASE REPORT

The patient, a 60-year-old man with antiphospholipid antibody syndrome (APS) receiving chronic anticoagulation, initially presented to the hospital with a large, spontaneous right psoas hematoma. The patient's anticoagulation, initially therapeutic low-molecular-weight heparin, was transitioned to unfractionated heparin. However, on hospital day 3, repeated computed tomography scan demonstrated a worsening retroperitoneal hematoma, and anticoagulation was stopped. After 3 days without anticoagulation, an iliofemoral venous thrombus developed, causing phlegmasia cerulea dolens and compartment syndrome, requiring a four-compartment fasciotomy, thrombectomy, and iliac vein stenting. The patient had an arterial line placed for close hemodynamic monitoring at this time.

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During treatment of the APS with immunosuppressants including high-dose steroids and >40 plasmapheresis exchanges, two large, deep ulcerating wounds developed in the patient's right leg (Fig 1). One of the ulcerated wounds incorporated the fasciotomy wound, and the other appeared spontaneously. Both were found to be positive by culture and biopsy for invasive *Aspergillus* with angioinvasion. The patient was treated with intravenous amphotericin B to combat the fungal infection.

Two days after the diagnosis of fungal infection to the right leg ulcers, a pulsatile mass with pinpoint black necrotic center spontaneously developed where the radial arterial line had been removed 1 week previously without consequence (Fig 2). There had been no physical findings at the arterial line site before development of the pulsatile mass. Ultrasound imaging (Fig 3) demonstrated a pseudoaneurysm. In the context of skin changes and known invasive fungal infection, a mycotic aneurysm was clinically diagnosed. Blood cultures were negative for bacteria; fungal culture specimens were not obtained as the patient was already taking amphotericin, and the infectious disease service deemed further culture unnecessary. The patient was evaluated for palmar arch patency as plans were made for possible resection and reconstruction. Using digital waveform analysis with compression of the radial artery, it was determined that ligation of the radial artery alone was not safe because of the absence of a complete palmar arch. Computed tomography angiography of the right upper extremity confirmed a lack of communicating branches between the ulnar and radial arteries. Because of bilateral lower limb infections, right leg phlegmasia, and prior instrumentation of the femoral veins bilaterally, the patient had poor venous bypass options. If revascularization with resection of the radial artery pseudoaneurysm was performed, there would be risk for partial or entire loss of the hand if in-line reconstruction was not feasible or if the radial artery bypass were to fail.

The decision was made to pursue nonoperative management of the mycotic aneurysm as operative risk was prohibitive. This decision was multifactorial; because of acute exacerbation of

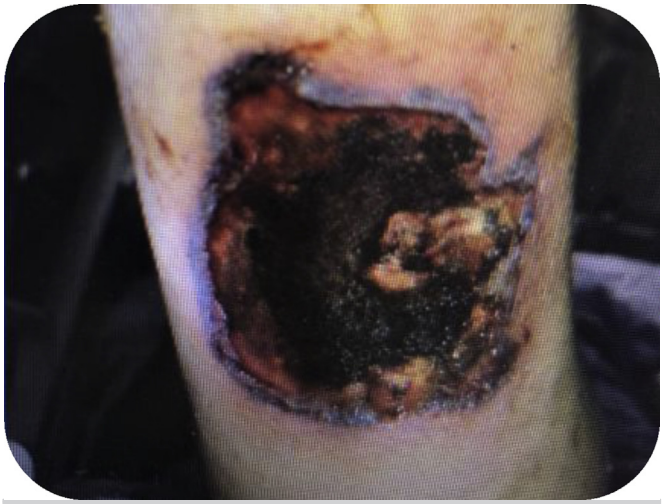

Fig 1. Leg ulcer with invasive fungal infection.

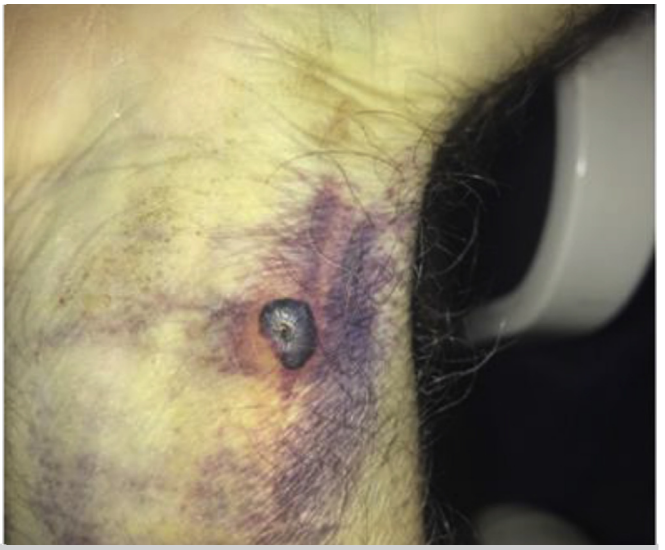

Fig 2. Right radial pseudoaneurysm, seen on day of diagnosis.

the APS, significantly immunocompromised state from infection and medications, lack of palmar arch, and poor venous conduit, the patient was deemed at extremely high risk for operative failure. The patient had pulse checks every 2 hours along with daily compression dressing changes consisting of folded gauze and stretch tape; he remained on intravenous amphotericin B. The patient had serial examinations and was closely monitored for continued growth of the aneurysm or signs of loss of perfusion to the hand. Seven days after initiation of amphotericin, repeated duplex ultrasound examination demonstrated partial thrombosis of the mycotic aneurysm. The patient remained on intravenous antifungal medication for 4 weeks and then transitioned to oral isavuconazole for a 6-month course per the recommendation of the infectious disease specialist. The pseudoaneurysm continued to regress until it clinically resolved on examination (Fig 4). A final duplex ultrasound examination performed 5 weeks after initial diagnosis demonstrated complete resolution of the mycotic aneurysm (Fig 5).

DISCUSSION

Mycotic aneurysm has been described in the medical literature for >100 years. Since the initial description of mycotic aneurysm by Osler in 1884 regarding a fungal infection of aortic aneurysms, the term has been applied to aneurysms that develop secondary to any infectious cause.[1] Traditionally, bacterial endocarditis and syphilis were the most common cause of mycotic aneurysms, but the increased use of antibiotics has decreased the incidence of these complications.[1] The advent of improved antibiotics and diagnostic testing has led to faster diagnosis and targeted treatment of mycotic aneurysm and associated organisms. Penetrating arterial trauma is now considered the most common cause of mycotic aneurysm.[1] Whereas *Staphylococcus aureus* and *Salmonella* spp are the bacteria most frequently associated with mycotic aneurysm, viridans streptococci are the most common bacteria involved in mycotic aneurysm in patients with concurrent bacterial endocarditis.[3-5]

Management of mycotic aneurysm has traditionally been resection of the aneurysm and bypass to restore distal flow. DeBakey and Simone in 1946 demonstrated a high rate of limb amputation after mycotic aneurysm resection without revascularization; however, some authors advocate for selective revascularization.[3] Regardless of surgical approach, long-term antibiotics are considered a mainstay of treatment. A literature review recommended 6 weeks of antibiotic treatment for intracranial vascular mycotic aneurysm and selective intervention based on lack of response to antibiotics.[6]

The patient's anatomy must always be assessed and used for surgical plans; radial artery intervention requires adequate perfusion to the hand. Superficial palmar arch anatomy has multiple variations; a complete superficial palmar arch was present in 81.3% of cases in a recent meta-analysis.[7] Research has reported seven different types of complete superficial palmar arch and five different types of incomplete superficial palmar arch.[7] The Allen test is typically used to assess for ulnar artery patency and a complete palmar arch; however, some studies suggest that further imaging may be needed before proceeding with radial artery catheterization in borderline cases, including duplex ultrasound as a next step.[8] Although rare, complications can occur during radial artery catheterization, including pseudoaneurysm and hand ischemia, which can ultimately lead to amputation.[9] The risks of these complications increase in patients with an incomplete superficial volar arch.

Taking into account all of these factors, the decision was made to attempt intravenous antifungal treatment along with compression of the pseudoaneurysm, which

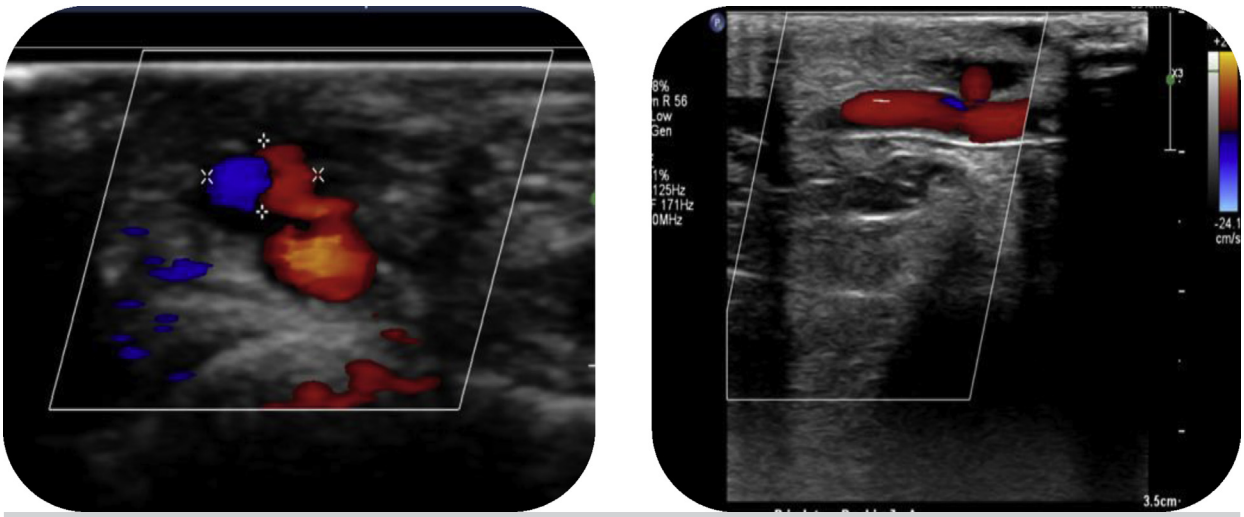

Fig 3. Doppler ultrasound image of pseudoaneurysm.

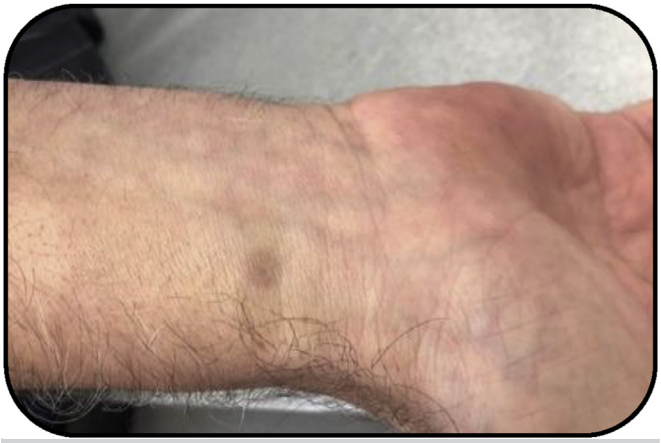

Fig 4. Right radial pseudoaneurysm, seen in clinic after resolution.

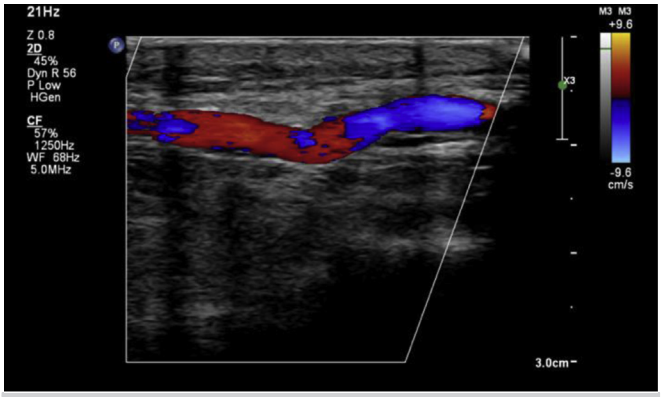

Fig 5. Resolution of right radial artery pseudoaneurysm on duplex ultrasound.

ultimately led to resolution of the mycotic aneurysm. The patient was recently seen in clinic and continues to recover from his prolonged hospitalization. His radial artery pseudoaneurysm has not recurred; his wound has completely healed (Fig 5), and his pulse is intact. He will continue to be seen intermittently in clinic to ensure that he continues to recover appropriately.

CONCLUSIONS

We present the case of a patient with a mycotic pseudoaneurysm of the radial artery after arterial line removal in the clinical setting of more than one invasive fungal site, who recovered completely with antifungal treatment and local compression. He had multiple risk factors including high-dose steroid therapy and plasmapheresis to treat the APS that led to the fungal infections. Given that the patient had an incomplete superficial palmar arch and was undergoing continued high-dose steroid therapy with potential for poor wound healing, he was managed conservatively with intravenous antifungals and compression bandaging with serial imaging, which ultimately led to resolution of the mycotic aneurysm. This case represents an alternative to standard management of a mycotic aneurysm and demonstrates the importance of an individualized approach to patient care.

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