Mycotic right subclavian artery aneurysm: a rare and challenging pathology

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ABSTRACT

Mycotic subclavian artery aneurysms are rare but challenging pathology. We report a 67-year-old woman who presented with recurrent bacteremia secondary to chronic clavicular osteomyelitis. Imaging demonstrated a right subclavian artery aneurysm near the innominate artery bifurcation and in close proximity to the infected clavicle. Owing to the anatomic location, among other factors, she underwent open repair using a rifampin-soaked Dacron conduit. Analysis of the aneurysm wall identified bacteria consistent with intraoperative bone and blood cultures. Contributions from multiple surgical and medical specialties provided a favorable, long-term outcome for the patient. (J Vasc Surg Cases and Innovative Techniques 2020;6:547-9.)

Keywords: Mycotic aneurysm; Subclavian artery; End stage renal disease; Central stenosis

Arterial wall infections—and specifically infected aneurysms—have an array of etiologies, and their classification provokes confusion amongst physician and surgeon alike. Traditionally, the arterial wall infections included (1) mycotic aneurysm, (2) infection of a previously formed aneurysm, (3) microbial arteritis, and (4) a traumatic infected pseudoaneurysm.1 The term mycotic aneurysm was initially attributed to aneurysmal degeneration of any artery that was infected by septic emboli of cardiac origin.[1,2] Mycotic in this context refers to the saccular, mushroom-like shape these aneurysms form secondary to an inflammatory response to infection. However, many practitioners misinterpret this nomenclature and attribute these aneurysms to fungal (and ultimately all microbial) infections. Further, in many instances it is difficult to ascertain if bacteria promoted aneurysm formation or, alternatively, was a preexisting, asymptomatic aneurysm seeded with microbes. Thus, many label all many true and false aneurysms with microbial involvement as mycotic or infected interchangeably. We define mycotic aneurysms as all arterial infection infections related to true arterial aneurysms.

Mycotic subclavian artery aneurysms (mSAA) are exceedingly uncommon. Although less than 400 noninfectious SAAs have been reported as of 2010, less than 4% have been attributed to mycotic aneurysms in the last 30 years.[3] And yet, the anatomy, disease-related infection, and concomitant patient conditions create a challenging pathology for the vascular surgeon. This case report highlights not only the complex nature of these rare entities, but also underscores the importance of multidisciplinary teams in obtaining successful outcomes. Consent for publication including all related imaging was obtained directly from the patient.

CASE REPORT

A 67-year-old woman with a past medical history of sternoclavicular septic arthritis, recurrent bacteremia, previous bacterial endocarditis, and end-stage renal disease on hemodialysis presented with a persistent cough and dysphagia to solid foods. A chest radiograph and subsequent computed tomography angiogram identified a large, true aneurysm of the proximal right subclavian artery (Figs 1 and 2).

Given the aneurysm's proximity to the clavicular infection (previously diagnosed by percutaneous bone biopsy) and recurrent bacteremia despite appropriate treatment, the patient was diagnosed with mSAA. Cardiac clearance was obtained secondary to history of endocarditis, and the patient was consented for open repair.

Operative exposure was made with a partial median sternotomy and right infraclavicular extension performed with assistance from the cardiothoracic surgical team. To facilitate further exposure and remove a possible source of reinfection, a

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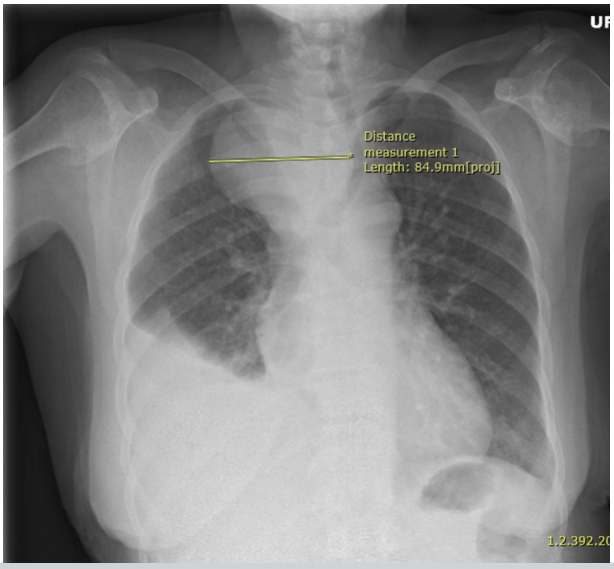

Fig 1. Presenting chest radiograph showing a paratracheal mass.

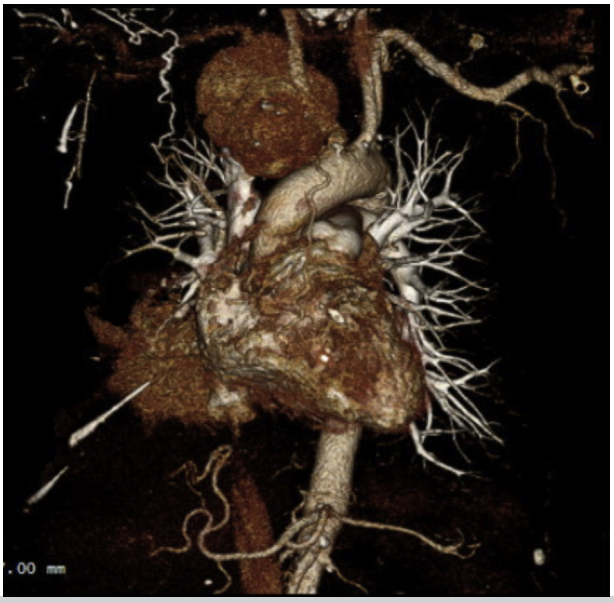

Fig 2. Reconstituted imaging using volume-rendered computed tomography angiogram of the chest revealing a large aneurysm that measured at 7.1 × 5.7 × 6.1 cm and beginning just distal to the right subclavian artery origin.

partial right claviculectomy was performed. Clavicle reconstruction was deferred secondary to the patient's poor overall functional status and microbial colonization risk.

While dissecting the aneurysm, highly inflamed and fibrous mediastinal/periclavicular tissue was noted. The right internal jugular vein—having previous scarring from multiple catheterizations—was ligated and divided to allow adequate retraction of the right brachiocephalic vein. Multiple enlarged

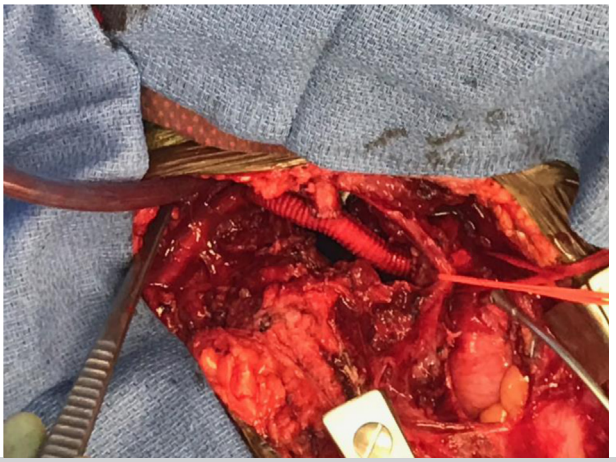

Fig 3. Intraoperative imaging of repair with 8-mm Dacron graft interposition bypass of innominate to right subclavian artery and reimplantation of the right common carotid artery. Note the extensive venous collaterals.

collateral veins were also ligated and divided to provide complete access to the aneurysm, as well as proximal and distal control.

Excision of the aneurysm incorporated the entirety of the right subclavian artery origin. The right phrenic nerve was identified and protected. The right vertebral artery was identified distal to the aneurysm and was not manipulated. After excision of all infected surrounding tissue, an innominate-to-right subclavian arterial bypass was constructed with reimplantation of the right common carotid artery (Fig 3). Rifampin-soaked, Dacron graft (DuPont, Wilmington, Del) was used as conduit because the patient did not have usable lower extremity veins secondary to prior arteriovenous access procedures bilaterally. Specimens of the right clavicular head and right subclavian artery were sent for pathologic analysis.

Postoperatively, the patient acquired moderate head and neck edema and remained on endotracheal ventilation with head elevation. She was extubated on postoperative day (POD) 7 after a sufficient decrease in swelling had occurred. She was transferred out of the intensive care unit on POD 9 and discharged to a rehabilitation facility on POD 20.

The final pathology demonstrated chronic osteomyelitis of the clavicular head. The right subclavian artery specimen revealed partial wall necrosis and organized thrombus consistent with infectious arterial degeneration. Microbiologic analysis confirmed methicillin-sensitive *Staphylococcus aureus* within both the bone and vessel wall specimens, accordant with multiple previous blood cultures. With support from infectious disease and nephrology consultations, the patient was placed on a 6-week course of intravenous cefazolin during hemodialysis. She then was converted to cephalexin for life-long suppressive therapy. She remains free from recurrent bacteremia and has no residual head or neck edema. She has minimal change in her upper extremity functioning and denies any vasculogenic symptoms (upper extremity, cerebrovascular, coronary, or otherwise).

DISCUSSION

This case report highlights many of the complexities of arterial wall infections with formation of true aneurysms. First, it is difficult to say with certainty if this was a traditional mycotic aneurysm vs an infection of a previously unknown SAA aneurysm. However, strong evidence points toward a septic emboli (and thus a mycotic aneurysm) rather than seeding of a preexisting asymptomatic SAA. The history of bacterial endocarditis and the aneurysm location near an arterial branch points toward the former. Further, previous studies show a strong majority of infections of preexisting aneurysms occurring in the aorta and rarely in the peripheral systems.[4]

In many cases of noninfectious SAA, the patient remains asymptomatic. However, as with our patient, typical symptoms include upper thoracic compressive symptoms including tussis and dyspnea. Other symptoms present for infectious and noninfectious SAA include supraclavicular pulsatile mass, upper extremity paresthesias, and hemoptysis.[5] Systemic signs and symptoms of infection including leukocytosis, septicemia findings (eg, hypotension, fever), and overall malaise may be present in mSAA.[3]

All mSAA should be treated to prevent worsening septicemia, arteriovenous fistula creation,[4] or hemorrhage. All patients should be started on broad-spectrum antibiotics until culture data are available and then de-escalated appropriately. With the assistance of infectious disease and possibly other medicine specialists, intravenous antibiotics should continue for at least six weeks and possibly life-long if prosthetic material was used.

Open surgical repair remains the standard for the most definitive treatment. However, the surgeon must consider anatomic location, adjacent structures, level of comfort, and access to adequate surgical assistance (including other surgical specialties) before intervention. The acuity of the disease process guides interventional timing and methods. If the patient is not in extremis or impending danger (eg, hemorrhaging, septic shock), a thorough review of the patient's past history should occur to ensure optimization before open repair. As with our patient, her only symptoms were dysphagia of solid foods and persistent cough. She had positive blood cultures, but did not have any evidence of a systemic inflammatory response. Given her history of endocarditis and hemodialysis, appropriate consultation and optimization were obtained before surgical intervention.

The essential objective for any open surgical approach is complete aneurysm excision and wide debridement of all tissue showing evidence of infection or nonviability. Unlike in many other peripheral infectious aneurysms, mSAA most likely will require revascularization for reperfusion of the upper extremity or cerebrovascular circulation. The prudent surgeon should determine the surgical course before operating, including whether extra-anatomic bypass is necessary. As with most peripheral mycotic aneurysm repairs, autogenous conduits should be sought either via direct transposition (for small aneurysms) or vein autograft to minimize reinfection and maximize patency. In rare instances, as with our patient who had exhausted all her useable veins secondary to multiple hemodialysis accesses, allograft and prosthetics should be considered. Patency rates tend to be similar comparing allografts and prosthetics. Otherwise, there is debate over the superiority of allograft vs prosthetic conduit, with antibiotic infused prosthetics tending to have slightly worse reinfection rates and allografts having slightly worse noninfection, 30-day complication rates.[6] At our institution, we have had better results with antibiotic-soaked prosthetic conduits regarding complication rates, but with similar reinfection rates when revascularizing arteries larger than 8 mm in diameter. This rationale was used for the choice of conduit in our patient. Lastly, the use of endovascular and hybrid approaches should be reserved only for high-risk surgical cases or those requiring expeditious placement for patient survival.

CONCLUSIONS

We report a case of a right subclavian mycotic aneurysm in the setting of previous septic arthritis of the clavicular joint and endocarditis. She was treated with open repair via a median sternotomy and supraclavicular incision with reimplantation of the right carotid artery.

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