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Resection of a giant mycotic left subclavian pseudoaneurysm

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ABSTRACT

Subclavian artery pseudoaneurysm due to intravenous drug use is a rare pathologic entity. A 6.6-cm left subclavian artery pseudoaneurysm immediately distal to the origin of the vertebral artery was discovered in a 39-year-old man with neck swelling, bacteremia, and a history of intravenous drug use. The pseudoaneurysm was resected through a median sternotomy and left supraclavicular incision, without reconstruction. This operative approach was opted for given the presence of infection and the ongoing intravenous drug use. (J Vasc Surg Cases Innov Tech 2022;8:85-8.)

Keywords: Intravenous drug use; Pseudoaneurysm; Sternotomy; Subclavian artery

Subclavian pseudoaneurysms are uncommon, and the most common etiology is trauma. Intravenous drug use (IVDU) is a rare etiology leading to pseudoaneurysms in this location.[1] The ideal treatment must consider the urgency of the intervention, causative organism (if mycotic), and location of the pseudoaneurysm relative to the aortic arch and vertebral artery.

In the present case report, we have described a giant left subclavian pseudoaneurysm resulting from to IVDU that was surgically managed with sternotomy and primary resection. The patient provided written informed consent for the report of his case and associated imaging studies.

CASE REPORT

A 39-year-old man with a history of opioid use disorder, IVDU, and chronic kidney disease had initially presented to the hospital with cellulitis of the right foot. He reported IVDU into his left neck the day before admission. The initial evaluation up demonstrated leukocytosis of 16,900 cells/mm^3 with 86.8% neutrophils, creatinine 6.1 mg/dL, and blood cultures that grew methicillin-resistant *Staphylococcus aureus* (MRSA). A chest computed tomography (CT) scan demonstrated cavitary pulmonary nodules concerning for septic emboli. An ultrasound of his neck demonstrated two well-defined collections measuring 1.4 and 2.2 cm that were lateral to the left common carotid artery and were suspected to be hematomas. He was treated with vancomycin, and his hospital course was otherwise notable for acute kidney injury requiring initiation of hemodialysis. He left against medical advice on hospital day 16 before returning the next day.

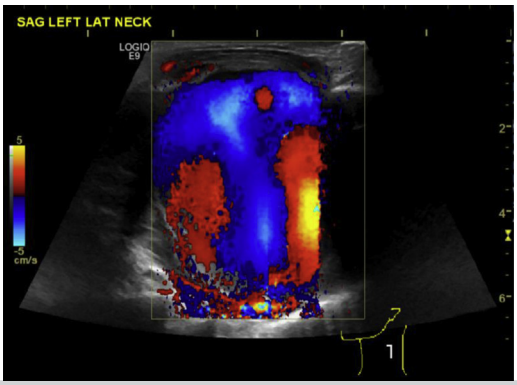

Fig 1. Ultrasound of the left neck demonstrating a pseudoaneurysm measuring 5.4 cm in the greatest diameter, with the "yin-yang" sign, which indicates bidirectional flow due to swirling within the false and true lumens of the pseudoaneurysm.

On hospital day 23, he was noted to have left neck swelling. Duplex ultrasound demonstrated a pseudoaneurysm measuring 5.4 cm in the greatest dimension (Fig 1), thought to be arising from the left common carotid artery. However, CT angiography of the neck and chest demonstrated a 6.6-cm left subclavian pseudoaneurysm with a surrounding hematoma in the left supraclavicular region, arising just distal to the origin of the left vertebral artery, which appeared smaller than the right vertebral artery (Fig 2). He was hemodynamically stable and had no focal neurological deficits and strong distal pulses.

Given the size of the pseudoaneurysm and its rapid interval appearance, the patient was urgently taken to the operating room for resection of the left subclavian artery pseudoaneurysm,

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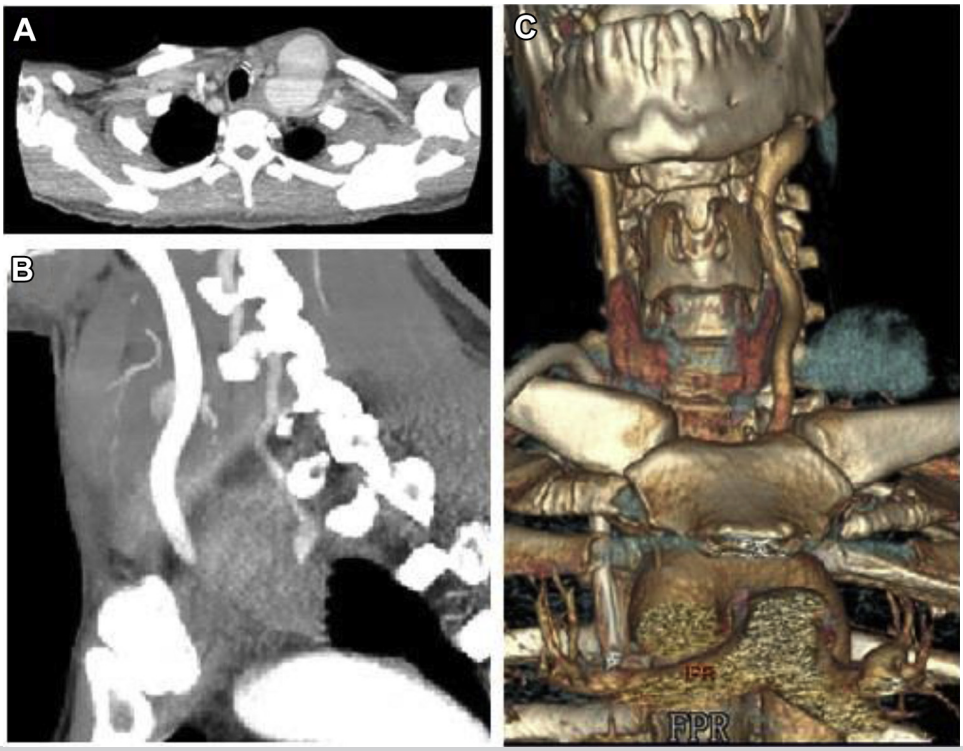

Fig 2. A, Computed tomography (CT) angiography of the neck and chest showing a left subclavian pseudoaneurysm measuring 6.6 cm. **B,** Sagittal image of the CT scan demonstrating the origin of the left vertebral artery, which was proximal to the subclavian pseudoaneurysm. **C,** Three-dimensional reconstruction of the CT scan demonstrating a left subclavian pseudoaneurysm superior and deep to the left clavicle.

with exposure through a median sternotomy with left supraclavicular extension. The median sternotomy was performed first and, after division of the thymus and left brachiocephalic vein and systemic heparinization, proximal control of the left subclavian artery was obtained at the level of the aortic arch with a Henley clamp. The sternotomy was then extended above the left clavicle, dividing the strap muscles and sternocleidomastoid. Because the pseudoaneurysm was friable and anterior to the distal subclavian artery, it was entered during manipulation. Hemorrhage was initially controlled with digital manual pressure inside the pseudoaneurysm neck. Subsequently, distal control of the subclavian artery and vertebral artery were obtained, taking care to identify and protect the phrenic nerve. The pseudoaneurysm sac and ~2 cm of friable left subclavian artery were resected to healthy tissue, leaving a 2-mm stump distal to the origin of the left vertebral artery (Fig 3). The ends were closed with running two-layer 5-0 polypropylene suture. Mediastinal and left neck drains were left in place, and the incisions were closed. He had monophasic left radial and ulnar Doppler ultrasound signals at the end of the case. The estimated blood loss was 1 L. Although an infected field is a relative contraindication to a cell saver procedure, he had had negative blood culture findings before surgery, and, owing to a system-wide blood shortage, the cell saver was used.

Postoperatively, he had a 20 mm Hg blood pressure gradient between his two arms but he remained asymptomatic. He had no symptoms of limb ischemia or stroke and was discharged with outpatient follow-up visits scheduled. Cultures taken from the pseudoaneurysm wall grew coagulase-negative Staphylococci, and he completed a 2-week course of vancomycin with negative blood cultures after completion of therapy. He has since had >1 year of follow-up with no reports of stroke, claudication, or ischemia. No additional follow-up imaging studies were obtained, because the artery had been ligated and not reconstructed.

DISCUSSION

Although the true incidence is unknown, a subclavian pseudoaneurysm is an uncommon pathologic entity, with most of the described cases related to trauma or iatrogenic related to central catheter placement.[2] A search of the reported data revealed only seven cases of subclavian pseudoaneurysm related to IVDU.[3-8] Subclavian pseudoaneurysms can present as a pulsatile neck mass, chest or shoulder pain, hoarseness, hemoptysis, brachial plexus palsy (Pancoast syndrome), or venous stasis and have been associated with limb ischemia, stroke, and rupture. The clinical suspicion for a subclavian pseudoaneurysm should prompt a CT angiogram, which can confirm the diagnosis and provide anatomic information to guide surgery.

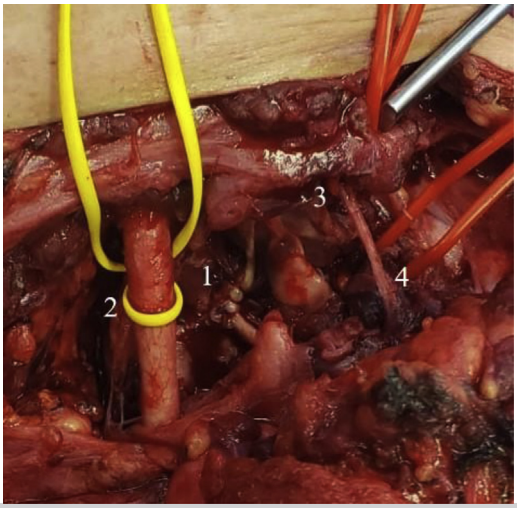

Fig 3. Intraoperative image after ligation and excision of the left subclavian pseudoaneurysm. *1,* Stump of the ligated proximal left subclavian artery, with preserved left vertebral artery; *2,* left common carotid artery with yellow vessel loop; *3,* left phrenic nerve; and *4,* distal left subclavian artery with red vessel loop.

Several treatment options for subclavian pseudoaneurysm have been described, including percutaneous thrombin injection,[9-11] endovascular covered stent placement with or without carotid-subclavian bypass depending on involvement of the vertebral artery origin,[12-14] open surgical primary repair, and open surgical excision with or without reconstruction. Given the presence of infection with an aggressive organism (ie, MRSA) and the size of the pseudoaneurysm with a mass effect, percutaneous thrombin injection was thought to be unlikely to be a durable solution. Also, we were concerned for potential graft infection with endovascular approaches. Observation was not considered an option, given the patient's young age, the size of the lesion, and the long-term risk of rupture.

We, therefore, favored excision. All the previously reported cases of subclavian pseudoaneurysms due to IVDU had been treated with ligation and excision of the involved portion of the vessel. However, open surgery of the proximal left subclavian artery can be challenging owing to its retroclavicular and posterior location and the surrounding anatomic structures. A median sternotomy with supraclavicular extension,[15] trap door, and anterolateral thoracotomy are well-described exposures. Endovascular placement of a balloon catheter could potentially have avoided sternotomy.[4] However, we opted for sternotomy, given the distorted, infected field, lack of availability of a hybrid room, and the proximity of the pseudoaneurysm to the aortic arch. Stenting across the pseudoaneurysm was also considered. However, given the presence of infection, explantation of the stent and, therefore, sternotomy would likely have been necessary. The performance of a median sternotomy achieved wide proximal exposure of the left subclavian artery, and the supraclavicular extension allowed for distal control.

The decision to revascularize during the index operation must balance operative morbidity, anatomic considerations, and the availability of an autogenous conduit. The reconstruction options included end-to-end anastomosis, direct graft replacement, and bypass (carotid–subclavian or carotid–axillary), preferably with a native vein, autograft, or xenograft in the setting of infection.[16] In the case of our patient, we did not consider performing reconstruction owing to the patient's ongoing intravenous drug use and concerns for graft compromise from MRSA. He had no baseline atherosclerotic disease, and we believed his risk of limb ischemia to be low with this approach. We were also confident that we could preserve the vertebral artery flow. However, in cases of subclavian pseudoaneurysm involving the vertebral artery, the posterior cerebral circulation can be preserved via transposition of the proximal vertebral artery to the common carotid.[17,18]

At present, no evidence-based recommendations have been reported regarding the management of a subclavian pseudoaneurysm in the setting of possible infection, because this clinical entity has only been described in case reports and small case series. Our literature search found no comparative studies or definitive evidence that favored a specific surgical approach. For the reasons described, we have preferred open surgical ligation and excision without reconstruction using the broad exposure afforded by median sternotomy with supraclavicular extension.

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