Successful Percutaneous Intervention for Subclavian Arterial Aneurysm

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ABSTRACT: Aneurysms of the subclavian artery are rare, but when diagnosed they must be treated. We describe a case of a 25-year-old female with a pulsating supraclavicular bulge on the left side above the clavicle and painful left arm movements, neck pain, and headache. Doppler ultrasound scanning and computed tomographic angiography confirmed the diagnosis of aneurysm of the left subclavian artery. The patient underwent successful percutaneous stenting of the aneurysm.

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Arterial aneurysms can affect any of the arteries of the human body, but aneurysm of the subclavian-axillary segment is uncommon.1 A literature review conducted by Hobson et al identified 195 cases of aneurysms in this topography, accounting for 1% of all peripheral aneurysms, 88% of which were in the subclavian artery.3

True aneurysms of the subclavian artery are atherosclerotic in etiology.3 When these aneurysms involve the more distal segments of the subclavian artery or the axillary artery, they cause thoracic outlet syndrome.1,4,5 Aneurysms in this arterial segment can also be posttraumatic, infectious, associated with coarctation of the aorta, congenital, or related to Marfan syndrome and cystic necrosis of the tunica media.1,6,7

When diagnosed, it is recommended in the literature that aneurysms of the subclavian artery should be treated surgically, because of the risk of ischemic complications secondary to thromboembolic phenomena in upper extremities and in the carotid-vertebral territory, due to the possibility of retrograde embolization.1,5,8 Furthermore, peripheral neurologic symptoms such as chest pain caused by compression of the brachial plexus, dysphagia, and rupture are also possible elements in the clinical presentation, depending on the location and diameter of the aneurysm.1,5

In this article, we describe a case of aneurysm of the subclavian artery treated percutaneously in our hospital. This is the first reported case treated percutaneously not only in our hospital but also in our country.

CASE PRESENTATION

The patient was a 25-year-old female with no co-morbidities. There was no history of trauma. She presented with complaints of a pulsating mass in the left supraclavicular region with onset more than 1 year
previously; painful left arm movements, neck pain, and headache for 6 months. Physical examination of the patient confirmed the presence of a pulsating mass in the left supraclavicular region and revealed normal pulses and perfusion in the ipsilateral extremity and no neurologic deficits.

Doppler ultrasound scan showed a fusiform aneurysm of the right subclavian artery. Computed tomographic (CT) angiography was done to confirm the aneurysm and plan surgery. The aneurysm was seen in the distal third of the artery as it crossed the first rib (Figure 1). A diagnostic angiographic image can be seen in Figure 2A.

The patient was referred for surgery to the vascular surgeon, but the surgeon refused surgery because of a high risk of mortality. The patient was given the option for percutaneous stenting, which she accepted. With a right femoral arterial approach, we stented the subclavian artery aneurysm with a Wallgraft Endoprosthesis self-expanding stent (Boston Scientific). We deployed a 30 mm stent, but the stent slipped distally, which required deployment of a second stent. A 40 mm Wallgraft stent was deployed due to the unavailability of smaller sizes. The stent was successfully deployed to seal the aneurysm (Figure 2B). Doppler ultrasound performed after 1 week confirmed no flow in the an-

Figure 1. Computed tomographic angiography showing aneurysm of the left subclavian artery (red arrow). White arrow shows venous system of the right upper limb.
eurysmal sac (Figure 3). At 6-month follow-up, the patient was free from symptoms and pulses were present and normal. Doppler ultrasound at 6 months showed a patent stent in subclavian artery with no flow signals beyond the arterial lumen. Diagnostic angiogram performed at 9 months after stenting confirmed a patent stent in the subclavian artery with no flow in the aneurysmal sac (Figure 4).

**DISCUSSION**

Subclavian artery aneurysms are rare compared to peripheral arterial aneurysms, but their exact incidence is unknown.\(^1\) Subclavian artery aneurysms are generally classified as intrathoracic or extrathoracic, because their presentation and the treatment approach chosen can differ between the two types.\(^1\)\(^5\)

The patient may be asymptomatic but may also pres-
ent with a wide range of ischemic symptoms, signs secondary to compression of the brachial plexus, and mediastinal symptoms.1,5,10 The presence of a pulsating mass, with or without a palpable thrill, is one of the most often reported signs of extrathoracic aneurysms of the subclavian artery.11,12 The patient in the case described here presented with a pulsating mass above the clavicle over the aneurysm that was observed on physical examination, which led to the diagnosis by ultrasonography.

In cases of asymptomatic patients, a suspicion of aneurysm of the intrathoracic subclavian artery may be aroused by a chest x-ray, on which it will appear as a mediastinal mass, but they may be confused with tumors of the lung upper lobe.6,13 Cases of subclavian aneurysms have been described in which patients suffered hoarseness, diplopia and hemoptysis.14,15 Besides this, cases of respiratory insufficiency and upper GI obstructions secondary to aneurysms of the subclavian artery have also been described.16,17 Intrathoracic aneurysms may occur in subclavian arteries with aberrant origins leading to symptoms of dysphagia.

Diagnostic imaging methods for these cases depend both upon the aneurysm site and on the imaging modality. Doppler ultrasound scans are one method of initial diagnosis for extrathoracic aneurysms5,10 Patient series and case reports describe angiography playing a fundamental role in diagnosis, particularly when planning surgery for these patients, especially when aneurysms are extrathoracic.1,3,5,8 Computed tomography is also considered necessary for diagnostic examination, particularly for intrathoracic aneurysms.5,18 While the greater part of the literature recommends angiography for planning surgery, we used CT angiography to plan management after a Doppler ultrasound scan had diagnosed the aneurysm.

In the literature, surgical treatment is recommended for subclavian arterial aneurysms, although the details of incidence rates of complications are unknown.1,5 Surgical access to intrathoracic aneurysms of the subclavian artery depends on which side the aneurysm is on. In aneurysms of the left subclavian artery, a left-side thoracotomy is used, whereas for aneurysms of the right subclavian, the need for better control of the ascending aorta and of the aneurysm’s necks means that sternotomy is recommended, with or without a supraclavicular incision, and the sternoclavicular joint may or may not be disarticulated.1,5,6 The incision most often described in relation to cases of extrathoracic aneurysms of the subclavian artery is a supraclavicular access, although there are also reports of combination supraclavicular and infraclavicular incisions or cervicotomy, depending on the patient.1,4,5

Interposition of Dacron, polytetrafluoroethylene (PTFE), or saphenous vein grafts are also described in the literature on treatment of these patients.1,5 However, because there is always a fear of infectious complications with synthetic prostheses, and because it was possible to draw the arterial stumps together without creating tension, we employed end-to-end anastomosis in both cases, with good long-term results.

In the literature, there are reports of endovascular treatment of aneurysms in the subclavian-axillary segment,7,10,16,20,21 whether as a first option or for patients in which the clinical conditions for major conventional surgical procedures are poor. Despite the existence of reports of endovascular treatment in this area,7,10 the low incidence rate of true aneurysms in this topogra-
phy makes it difficult to compare the long-term results of this option in relation to conventional surgery, which remains the standard treatment recommended in the literature. Additionally, the fact that the upper extremity has extensive collateral circulation has been considered a potential source of leakage when endoluminal treatment is chosen.\(^9\) Hybrid treatment has also been described for a complex case involving a patient with Marfan syndrome and an aneurysm of the right subclavian artery, with previous surgery for type A dissection of the aorta.\(^{10}\)

The patient described above underwent percutaneous stenting because the vascular surgery team thought it would be a complicated case with high risk of mortality. This was our first experience and we await long-term results. In terms of etiologies, the majority of aneurysms of the subclavian artery are atherosclerotic (around 60%), and other causes are related to Marfan syndrome or another connective tissue disease in around 10% of cases.\(^{1,5,13}\) In young patients, aneurysms of the subclavian artery may be traumatic, infectious, congenital, or linked with thoracic outlet syndrome or with repetitive rotational movements of the shoulder in athletes.\(^{1,4,5,8,19}\) Two case reports of congenital aneurysms of the subclavian artery in young patients, one 21 years old and the other 22 years old, have been described.\(^{13}\)

**CONCLUSION**

Aneurysms of the subclavian artery are rare, and when they are diagnosed, treatment is indicated to prevent complications. The approach should be chosen on a case-by-case basis, depending on the topography of the aneurysm and the patient’s characteristics.

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