

AKADÉMIAI KIADÓ

# Transradial occlusion of giant true aneurysms of the secondary supraaortic branches

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## IMAGING

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## CASE REPORT



### ABSTRACT

True aneurysms involving the branches of the subclavian arteries are rare clinical entities and often manifest with vague symptoms or incidental findings. Early diagnosis and treatment are imperative to prevent aneurysm rupture, which could result in life-threatening bleeding. Definitive diagnosis is established through computed tomography angiography or magnetic resonance angiography. In this case report, we present two cases: a right internal thoracic artery aneurysm and a right costocervical trunk aneurysm, both of which were successfully treated with endovascular procedures using vascular plugs via transradial access. Transradial access is notable for its lower rate of access-site complications compared to the traditionally used transfemoral access. Consequently, it allows for quicker patient mobilization and discharge. These cases underscore the feasibility and efficacy of endovascular treatment for such aneurysms, providing a safe alternative to surgical intervention. Individualized therapy and adequate follow-up are essential due to the rarity of these conditions.

### KEYWORDS

aneurysm, internal thoracic artery, endovascular embolization, radial artery occlusion

## Introduction

True aneurysms involving the branches of the subclavian arteries are rare clinical entities that typically present with nonspecific symptoms such as a supra- or infraclavicular mass, hoarseness, dyspnea, or dysphagia. Hemothorax or hemoptysis may be the first manifestations in ruptured aneurysms [1, 2].

Ultrasound or chest x-ray can incidentally raise suspicion of an aneurysm, which can be confirmed by computed tomography angiography (CTA) or magnetic resonance angiography (MRA). Endovascular occlusion is often indicated to prevent aneurysm rupture, which could result in life-threatening bleeding [1].

We present two distinct cases: a right internal thoracic artery (ITA) aneurysm and a giant right costocervical trunk aneurysm, both of which were successfully managed by endovascular means.

## Case presentations

### Case one

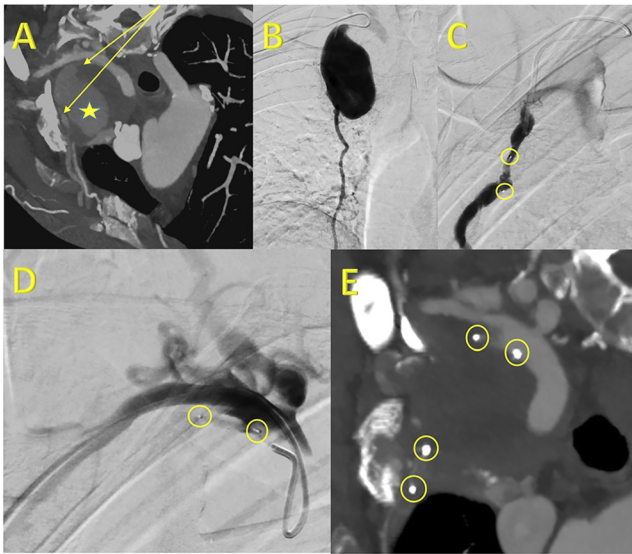
A 67-year-old female with a history of hypertension, diabetes insipidus, uterine myoma, and gastroesophageal reflux disease was referred with hoarseness, dyspnea, and dysphagia. CTA revealed a 65 mm saccular aneurysm of the right ITA Fig. 1A and B. A mild dilation in a similar position was confirmed on the opposite side, confirming this dilation to be a true aneurysm. Based on multidisciplinary consideration, the risk of an open surgical procedure

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*Fig. 1.* A large, slow-flow, symptomatic, spontaneous right internal thoracic artery aneurysm (yellow star) with feeding arteries (yellow arrows) is shown on a curved reformation of a contrast-enhanced arterial phase computed tomography (A) and DSA image (B). Intraoperative DSA shows the backdoor (C) and frontdoor (D) closure with MVP 5Q plugs (yellow circles). Total occlusion confirmed on the three-months follow-up computed tomography image (E) with the markers of the MVP 5Q plugs (yellow circles)

was deemed high; therefore, an endovascular procedure was planned to exclude the aneurysm.

A transradial approach was used to perform a front-door and back-door embolization by placing two 6.5 mm microvascular plugs (MVP-5Q, Medtronic Inc., Dublin, Ireland) in the afferent and efferent arteries of the aneurysm *Fig. 1C and D*.

At the end of the intervention, the flow in both the afferent and efferent arteries was restricted.

The patient was discharged without any complications. Three months later, a complete thrombosis of the aneurysm sac was confirmed on follow-up CTA *Fig. 1E*.

### Case two

A pulsating mass was discovered in the right subclavian area of an 85-year-old female. Ultrasonography revealed a giant arterial aneurysm, identified as a 46 mm true aneurysm of the right costocervical artery on subsequent CTA *Fig. 2A*. No iatrogenic cause could be identified after a thorough search in the patient's medical history.

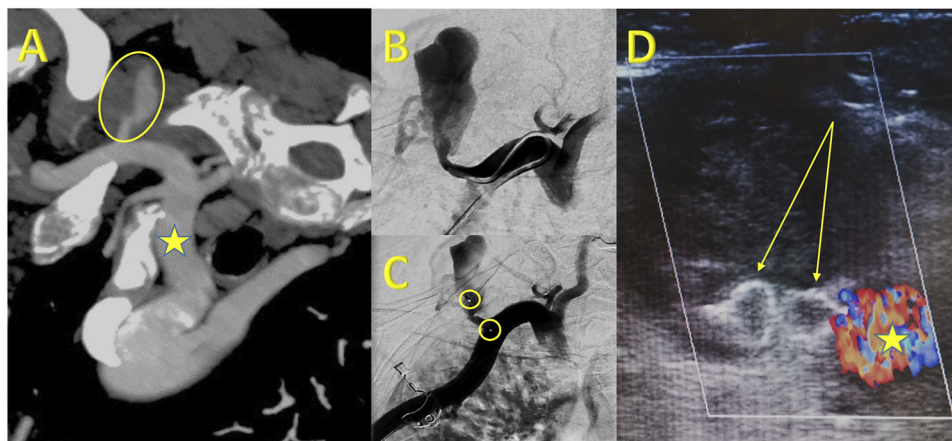
Due to the patient's comorbidities, including hypertension, atrial fibrillation, and prior breast cancer, careful consideration was given to choosing the optimal type of intervention. Based on the multidisciplinary cardiovascular team's decision, endovascular embolization was performed via transradial access (TRA) by deploying a 6 mm Amplatzer vascular plug (AVP4, Abbott Laboratories, Chicago, IL, USA), positioned in the proximal segment of the right costocervical artery *Fig. 2B and C*. Complete thrombosis was confirmed with ultrasonography prior to discharge on the following day *Fig. 2D*.

## Discussion

Aneurysms involving the branches of the subclavian arteries represent rare clinical entities. The existing literature related to this topic mainly consists of case reports. Consequently, our understanding of treatment options and prognosis is limited.

The first case of an ITA aneurysm was reported in 1973 by Martin A et al. [3].

Approximately two-thirds of ITA aneurysms can be attributed to iatrogenic causes, such as sternotomy, central venous catheterization, or pacemaker lead implantation [3].



*Fig. 2.* An arterial-phase contrast-enhanced computed tomography shows (A) the right subclavian artery (yellow star) and a large aneurysm of the costocervical artery (yellow oval). DSA image from radial approach shows the same lesion (B). DSA immediately after the procedure shows (C) reduced flow within the aneurysmal sac and the presence of the markers of Amplatzer vascular plug (yellow circles). Complete thrombosis of the aneurysm was confirmed on Doppler ultrasonography (D) on the day following the intervention (yellow arrows show the typical shape of the plug, yellow star: subclavian artery)

Non-iatrogenic etiologies include trauma, vasculitis (e.g., Kawasaki disease), and connective tissue disorders. Idiopathic etiology, though exceedingly rare, might potentially be associated with atherosclerosis [1, 4].

Aneurysms of the costocervical trunk are exceptionally rare, with only a few cases reported in the literature [5].

In our cases, no underlying conditions were identified to elucidate the etiology. As a result, these cases were classified as idiopathic.

Due to reduced surgical burden and lower complication rates, percutaneous endovascular arterial interventions have emerged as the primary treatment approach for peripheral arterial diseases (PAD). The common femoral artery (CFA) is the traditionally used access site [6]. However, transfemoral access (TFA) can be associated with serious complications such as local or retroperitoneal hematoma, pseudoaneurysms, arteriovenous fistulas, dissections, and distal embolizations. Some of these complications can be effectively managed by percutaneous techniques [7].

Nowadays, the radial artery is the preferred access site for coronary artery interventions. TRA is also increasingly being used in PAD interventions due to its significantly lower access-site related complication rate, shorter procedure time, earlier patient mobilization, and quicker discharge compared to TFA [6]. The most common complication of TRA is radial artery occlusion (RAO). Due to dual blood supply to the hand, RAO typically presents with poor symptoms such as pain, paresthesia, or decreased limb function. Symptoms can be more serious in patient with insufficient collateral circulation of the limb. According to the literature, RAO suggesting to be treated with anticoagulation only in symptomatic cases [8].

Commonly used endovascular techniques are covered stent implantation, coil embolization, and vascular plugs. Chemelli et al. reported several cases of ITA aneurysms with iatrogenic etiology and demonstrated the feasibility and promising outcomes of coil embolization [4].

During supra-aortic interventions, the most concerning complications are cerebrovascular ischemic events. This risk can be reduced with the use of a TRA, which eliminates the need of wire manipulation in the aortic arch [9, 10].

Large size peripheral arterial aneurysms are rare clinical entities; therefore, the optimal follow-up depends on the location of the aneurysms and the performed endovascular procedures. Ultrasonography would be an optimal modality for follow-up in numerous cases; however, we have to consider its limitations, such as spatial resolution and the repeatability of the examination. CTA or MRA would be excellent options for follow-up, but we must take into account the limited availability of these modalities. Furthermore, careful consideration is needed due to the contrast agent administration [1, 4].

## Conclusion

Recent technical advancements allow the safe and effective endovascular occlusion of giant aneurysms of the branches

of the subclavian artery via a transradial access. Being a rare disease, true aneurysms of the secondary supraaortic branches need individualized therapy.

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