Case Report

Endovascular treatment of ruptured subclavian artery aneurysm presented with hemoptysis

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A B S T R A C T
Ruptured subclavian artery aneurysm (SAA) is extremely rare and it can cause a life-threatening condition. We described an elderly patient with ruptured SAA who underwent endovascular treatment successfully. Our case showed that endovascular repair may be one of the options for the treatment of ruptured SAA when surgical repair is impossible or not indicated for its difficulty.
<Learning objective: How to manage ruptured subclavian artery aneurysm by endovascular therapy.>
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Introduction

Subclavian artery aneurysm (SAA) is a rare disease. Moreover, ruptured SAA is extremely rare and it can cause life-threatening condition. Yet there is no general guideline for management of ruptured SAA excluding open surgical repair. We described an elderly patient with ruptured SAA who underwent endovascular treatment successfully.

Case

A 76-year-old male patient visited the emergency room of our hospital because of suspected hemoptysis. He had diabetes mellitus and hypertension on medication. Three years ago, he was diagnosed with a 2.8-cm-sized left SAA on chest routine CT scan during routine check-up and was recommended surgical repair for SAA but refused. After then, we lost track of this patient. His blood pressure was 130/90 mmHg and pulse rate was 76 beats per minute. Diffuse haziness was noted at the left upper lung field on chest X-ray. Compared to previous study, thoracic CT angiography revealed increased size of left SAA from 28 mm to 41 mm with mural thrombus, extravasation of contrast media to posterior aspect of aneurysm resulting in pseudoaneurysm and formation of hematoma (Fig. 1A and B). For management of ruptured SAA, we discussed with a cardiothoracic surgeon. Aneurysm was noted from proximal segment of left subclavian artery (LSCA). The cardiothoracic surgeon explained the surgical procedure, its efficacy and risks. But the patient refused open surgical repair. For endovascular treatment, however, the length of proximal landing zone was too short to deploy the stent-graft (Fig. 1A, arrow). The chance of endoleak after implantation of stent-graft was high. Fortunately, there was a short narrow portion of proximal LSCA just before SAA. Our idea was that if we choose larger stent-graft than the usual case, proximal part might be sealed completely.

Under local anesthesia, left brachial artery and right femoral artery were punctured and each 6 and 8F sheaths were inserted. Angiography showed huge ruptured SAA with extravasation. The diameter of the narrowed portion of LSCA was 7 cm. After passing the lesion with 035 inch 300 cm terumo wire (Terumo medical corporation, Japan), 12 mm × 100 mm stent-graft (S & G, Korea) was delivered via left brachial artery and deployed. Follow-up angiography noted type la endoleak from proximal portion of stent-graft. Additional ballooning with coda 10 mm × 2 mm balloon (Cook Medical, USA) was performed. Final angiography showed well-positioned stent-graft without evidence of contrast media extravasation (Fig. 1C). Follow-up CT angiography performed immediately and at 4 months after procedure showed good...
patency of stent-graft without evidence of any endoleak, stent thrombosis or occlusion and amount of hemorrhage was decreased (Fig. 1D). The patient was doing well without any clinical symptoms or signs.

Discussion

SAA is a rarely reported disease; Dent et al. reported only two SAA (0.13%) among 1488 cases of aneurysms [1,2] and Paiolero et al. reported 32 cases of subclavian-axillary artery aneurysm between 1960 and 1980 at the Mayo Clinic. Out of them, 14 were located primarily in the subclavian artery [3].

SAA arise from variable causes like atherosclerosis, trauma, thoracic out syndrome (TOS), collagen disorder, infection and iatrogenic cause. Before 1980, most SAs were related to TOS, infection or atherosclerosis. After 1980 traumatic and iatrogenic causes were more frequently reported [4].

Up to one third of the patients with SAA are asymptomatic. Especially, intrathoracic aneurysms tend to be asymptomatic and they are very difficult to be detected on a physical examination [5]. In symptomatic patients with SAA, they are mainly present with a pulsating mass, shoulder pain and non-specific chest pain. Local compression, embolization, thrombosis and rupture can also be found. Local compression symptoms include Horner syndrome, facial anhydrosis, hoarseness, dysphagia and dyspnea.

SAA with hemoptyosis is rarely reported. Hilary et al. reviewed 12 cases of a SAA presenting with massive hemoptyosis in the literature. Three cases of them involved the right subclavian and 9 involved the left subclavian artery. Three cases were fatal before receiving treatment. Other cases were managed with open repair, endovascular repair, hybrid repair, and embolization. These cases were mainly associated with documented infection, lung abscess, or immunosuppression due to chemotherapy and/or malignancy [6].

Rupture of SAA is a life-threatening and limb-threatening condition. According to Vierhout et al., rupture was reported in 32 (9%) of 381 SAA patients and six of them underwent a fatal course. Especially nine survivors have a symptom of hemoptyosis, which was regarded as an early sign of rupture like in our case [4].

Due to the rarity of SAA, treatment guideline of SAA is not established. Treatment modality is decided by thrombosis, embolic event and rupture risk accompanied by location and etiology of SAA. Open surgical repair was the only way to exclude SAA before endovascular repair was introduced. But, patients present with SAA are usually critically ill or have severe comorbidity. Since open surgical repair of the SAA undergoes sternotomy or thoracotomy according to the need, it is a highly invasive procedure. Therefore it is favorable that patients receive a minimally invasive treatment such as an endovascular repair like in our case [7]. Ever since the mid-1990s, the endovascular repair of SAA-related papers have been published and they added up to 63 cases until 2010. From these cases, the notable point is that the endovascular repair not only had a high rate of immediate success, but also had a high incidence of thrombosis. Overall complication rate of open and

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**Fig. 1.** Thoracic CT angiography revealed increased size of left SAA which is starting just above the origin of left subclavian artery (arrow, A) with mural thrombus, extravasation of contrast media to posterior aspect of aneurysm resulting in pseudoaneurysm and formation of hematoma (asterisk, B). After implantation of stent-graft, angiography showed well-positioned stent-graft without evidence of contrast media extravasation (C). Follow-up CT angiography performed at 4 months (D) after procedure showed good patency of stent-graft without evidence of any endoleak, stent thrombosis or occlusion.
endovascular repair was in a similar range. But complication following endovascular repair seems less severe [4].

In this case, the patient could not receive proper treatment at the right time because we could not differentiate between hemoptysis and hematemesis at first. It was possible to proceed on an elective endovascular repair because his vital sign was stable and there was no active bleeding on CT angiography. From the fact that this patient showed no special symptom other than hemoptysis, it is possible to suspect SAA rupture when encountering any patient with history of SAA presenting with hemoptysis.

This patient had no comorbidity other than diabetes mellitus and hypertension, but considering the SAA’s proximal location and invasiveness of open surgery, we proceeded on the endovascular repair. His left vertebral artery had been occluded at the time of SAA diagnosis and right vertebral artery was patent. So a bypass operation was unnecessary. In the aspect of endovascular treatment, proximal landing zone in this case was relatively short compared to the usual case, but there was narrowed portion between aorta and SAA. In this situation it might be possible to achieve sealing off at landing zone using relatively large-sized stent-graft like in our case.

In conclusion, our patient was successfully treated with endovascular repair showing favorable results at follow-up CT scan. Our case showed that endovascular repair may be one of the options for the treatment of ruptured SAA when surgical repair is impossible or not indicated for its difficulty.

**Conflict of interest**

There was no conflict of interest.

**References**