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Endovascular treatment for left innominate vein aneurysm: Case report and literature review

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ABSTRACT

Innominate vein aneurysms originating from the mediastinum are very rare. Previous treatments for this condition often required thoracotomy. We report a case of a 43-year-old male who presented a mediastinal mass by chest radiography. Contrast-enhanced CT and venography confirmed the diagnosis of left innominate vein aneurysm. The patient underwent endovascular treatment with stent placement and coil embolization of the left innominate vein. The patient remains well 18 months after surgery. The objective of this report is to discuss the diagnosis and endovascular treatment results of innominate vein aneurysm and to review the relevant literature to enhance and expand the pool of knowledge for this abnormality.

1. Introduction

Saccular left innominate vein aneurysm is an extremely rare condition. Only a few cases of this abnormality have been reported, with most consisting of thoracic venous aneurysms involving the superior vena cava.[1] This type of aneurysm may be completely asymptomatic, presenting either as an incidental finding or as the result of associated complications. Herein, we present a case of saccular left innominate vein aneurysm and discuss a new treatment for this condition.

2. Case report

A 43-year-old male was admitted to our hospital for the treatment of an anterior mediastinal mass found fortuitously by chest radiograph 1 day after physical examination. The patient had no symptoms of chest tightness, chest pain, cough, shortness of breath, dizziness, or headache. There was no past history of hypertension or heart disease and no history of central venous puncture. He did have a history of smoking for 20 years. No abnormalities were found in laboratory tests, and congenital diseases such as Marfan syndrome and K-T syndrome were excluded. Further evaluation with chest contrast-enhanced computed tomography (CT) was performed, which showed a giant saccular vein aneurysm of the left innominate vein, 109.5 × 61.2 × 105.9 mm in size. The filling of the contrast agent was uniform in the aneurysm at the delayed stage; no definite filling defect was found. Punctate calcification was seen in the aneurysm wall, and the adjacent structures were compressed and displaced (Fig. 1).

The patient underwent endovascular treatment to prevent complications. Venography revealed a saccular venous aneurysm just proximal to the junction between the left internal jugular and subclavian veins (Fig. 2). Three WALLSTENT self-expanding stents (Boston Scientific, USA), 24 × 70 mm proximal, 24 × 70 mm intermediate, and 20 × 55 mm distal, were placed across the aneurysm. Two interlock coils (Boston Scientific), 20 mm × 40 cm, were inserted in order to embolize the left internal jugular vein. With the stents in place, significant blood flow did not reappear in the lumen of the aneurysm (Fig. 2a). Anticoagulation therapy with warfarin was commenced following stent implantation and the patient was discharged 7 days after admission (see Fig. 3).

The patient was followed up closely via imaging tests performed at regular intervals. Contrast-enhanced CT performed 1 month post-endovascular treatment showed a complete thrombus within the aneurysm sac (Fig. 2b). Blood flow in the aneurysm sac had increased 3–6 months post-surgery (Fig. 2c and d), and the patient discontinued anticoagulant therapy during this period. Twelve months post-treatment, a complete thrombus had formed within the aneurysm sac as well as an intraluminal thrombus around the stents (Fig. 2e). After 18 months, the size of the aneurysm had decreased dramatically; however, the intraluminal thrombus had increased (Fig. 2f). During the follow-up

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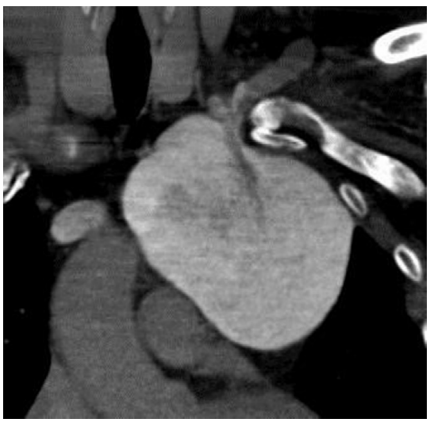

Fig. 1. CT scan showing a giant vein aneurysm of the left innominate vein.

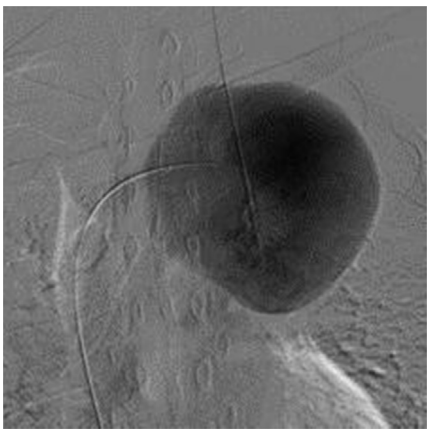

Fig. 2. Venography showing a saccular venous aneurysm just proximal to the junction between the left internal jugular and subclavian veins.

examination, the patient exhibited no cough, chest tightness, or other symptoms, and pulmonary CT angiography confirmed no pulmonary embolism.

3. Discussion

Innominate vein aneurysm is very rare. In recent years, with the improvement of diagnostic technology, the number of venous aneurysms reported in the literature has been increasing, with the majority of these cases consisting of superior vena aneurysms.[1,2] The exact etiology of innominate venous aneurysms remains undetermined. Possible etiologies include congenital malformation, trauma, inflammation, infection, and degenerative changes of the vascular wall and secondary venous fistulae.[3,4] An association between cystic hygroma of the neck and thoracic venous aneurysms has been reported in some studies (among 15 cases of cystic lymphangioma, 8 were found to have cervical and thoracic venous dilation), possibly reflecting the common embryonic origin of the lymphoid and venous systems.[5] Tadashi[3] has reported that thymic cavernous hemangioma could cause left innominate vein expansion.

Most innominate venous aneurysms are asymptomatic; in the majority of patients lesions are discovered incidentally either by chest X-ray or CT. If the aneurysm compresses surrounding tissue, it may lead to chest pain, dyspnea, cough, and hoarseness.[4] Due to the low pressure of the aneurysm wall, the pressure symptoms associated with early expansion rarely occur. These symptoms may occasionally be associated with rupture or pulmonary embolism. Diagnosis is easily confirmed by either contrast-enhanced CT or MRI. Angiography is still the diagnostic standard. Without a clear diagnosis, the mistaken biopsy of incidental thoracic masses may lead to rupture, bleeding, and other serious complications.[6]

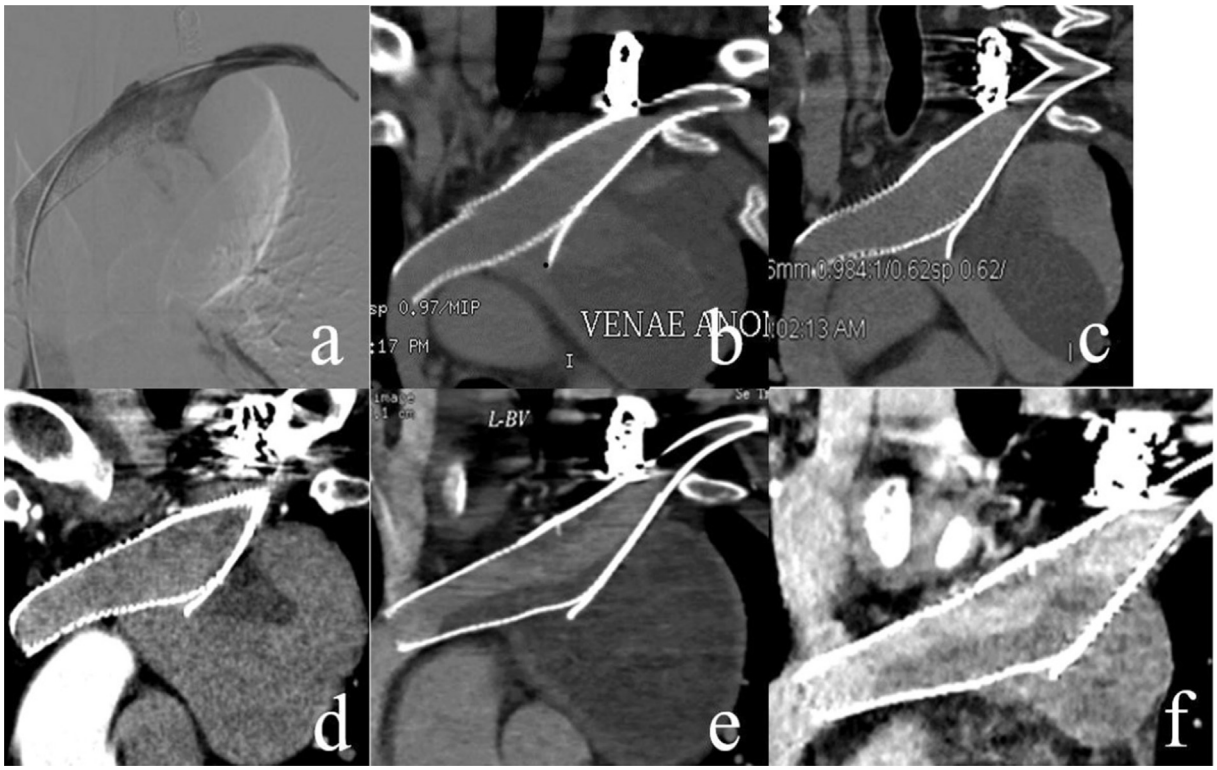

Fig. 3. Post-stent placement angiogram showing that significant blood flow did not reappear in the lumen of the aneurysm (a); CT scan obtained 1 month post-treatment showing a complete thrombus within the aneurysm sac (b); CT scan obtained 3–6 months post-treatment showing an additional increase of blood flow in the aneurysm sac (c and d); complete thrombosis within the aneurysm and intraluminal thrombus around the stents found at 12 months (e); significant reduction of the aneurysm and a further increase in the intraluminal thrombus were observed at 18 months.

At present, there is no unified standard for treatment. The purpose of clinical intervention is to prevent and treat complications, such as pulmonary embolism and rupture. Conservative observation or surgical resection have previously served as the main therapeutic approaches. For small fusiform vein aneurysms showing no increase in size, conservative observation is warranted. Akihiro[4] reported a case of left innominate venous aneurysm having a diameter of 4 cm that had decreased in size 8 months after oral administration of warfarin sodium for anticoagulation. Mikroulis[7] reported a patient who was followed up for 15 years while taking antiplatelet drugs, during which no enlargement of the aneurysm was observed. Saccular and giant venous aneurysms, especially those with intraluminal thrombus, require early intervention due to the risk of pulmonary embolism and rupture. Aneurysmectomy and reconstruction of the innominate vein is a possible option for saccular venous aneurysm, although this procedure has the shortcoming of significant trauma.[8,9]

Endovascular intervention involving stent implantation and coil embolization in the parent vessel has recently been introduced as a safe treatment option for this condition.[9,10] Although our patient was asymptomatic, we opted for endovascular treatment involving placement of an uncovered stent followed by embolization of the venous reflux, taking into consideration the complications associated with giant aneurysms. Since no special venous covered stent exists in China, the WALLSTENT stent was selected in this case, which is primarily used for iliac vein stenosis. This stent has excellent radial expansible strength and is very flexible, allowing adaptation to the venous system. The stent mesh, however, is large. Therefore, in this giant aneurysm, 2 stents were bridged on either side of the aneurysm, and an intermediate stent was positioned in order to overlap the stents and minimize the stent mesh leakage. Unexpectedly, the aneurysm showed remarkable shrinkage at 18 months, and the stent seems to have played an important role in this shrinkage. Stent thrombosis occurred 12–18 months post-surgery, which may be related to termination of the long-term anticoagulant therapy or the difficulty of fully covering the bare stent with a new inner membrane.

Despite the poor long-term outcomes of the embolization and stent placement in this case, the therapeutic trend has been toward minimally invasive interventions. The case described here suggests that endovascular treatment with aneurysm sac embolization and stent implantation may be an alternative therapeutic approach for venous aneurysms.

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