Successful Treatment of a Ruptured Extracranial Vertebral Artery Aneurysm with Onyx Instillation

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The rupture of an extracranial vertebral artery aneurysm has only been rarely described in the literature and treatment options are therefore not standardized. Here we report the successful endovascular repair of a spontaneously ruptured extracranial left vertebral artery aneurysm using Onyx instillation. A 48-year-old woman was transferred to our clinic after having been intubated due to a massive hematoma of the left neck. A contrast-enhanced computed tomography (CT) showed a rupture of the left extracranial vertebral artery. Several issues complicated the therapeutic decision making in this rare case: first, the patient showed multiple aneurysms in CT angiography; therefore a connective tissue disease could not be excluded. Furthermore, as anamnestic work-up revealed that several episodes of postoperative bleeding and open surgery at this anatomic location are rarely performed, risks for postoperative complications were high. Therefore, the patient was hemodynamically stabilized and the ruptured aneurysm was treated in an endovascular approach with Onyx instillation and coil embolization. Complete exclusion of the aneurysm was achieved without periprocedural or neurological complications. Successful repair was confirmed by CT angiography on the first postoperative day as well as 12 months after the intervention. In conclusion, this case shows that endovascular Onyx embolization of ruptured vertebral aneurysms is a save and feasible method.

Aneurysms of the vertebral artery are rare, and the majority of vertebral artery aneurysms are located intracranially. They comprise up to 15% of all intracranial aneurysms.[1] Even more, aneurysms of the extracranial vertebral arteries are uncommon. These types of aneurysms are usually associated with dissection or trauma. Recently, Morasch et al. published a series of 7 patients with extracranial vertebral artery aneurysms. In their series, all patients suffered from connective tissue or other hereditary disorders and the majority of aneurysms had been managed by open surgery.[2] However, the spontaneous rupture of an extracranial vertebral aneurysm is an uncommon event and according to the literature has so far only been described in case reports.[3–5] We present an interesting case of a patient with a spontaneous rupture of a left vertebral artery aneurysm in the V1 segment.

CASE REPORT

A 48-year-old female patient was transferred from a peripheral hospital to our vascular surgery department after having been intubated due to a massive hematoma of the left neck. A contrast-enhanced computed

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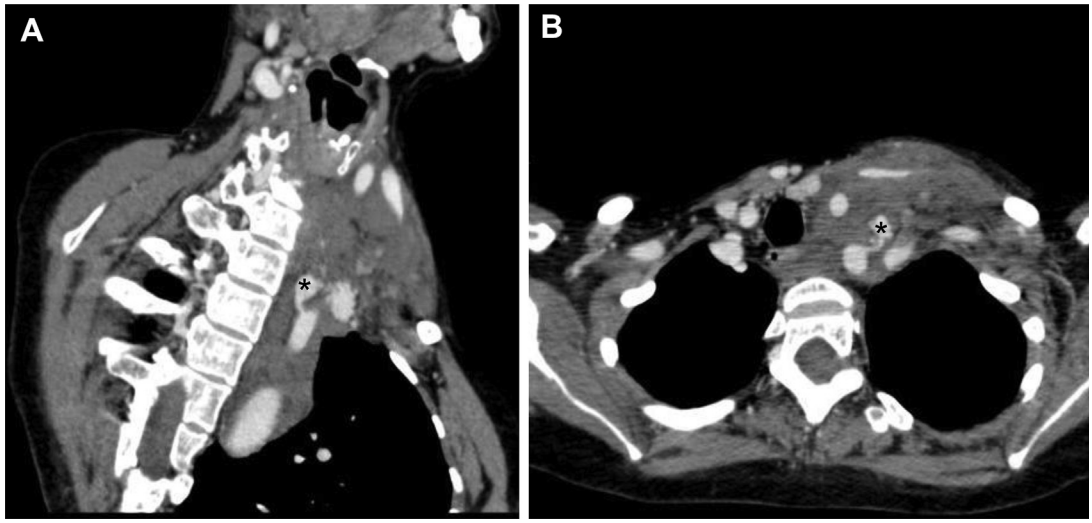

Fig. 1. Computed tomographic angiogram performed directly after submission to the hospital. Massive hematoma of the left neck with a lateral shift of the trachea and a mediastinal hematoma can be seen in **(A)** and **(B)**. Additionally, the leakage of contrast medium from the left vertebral artery is marked (*).

tomography (CT) had already been performed and had shown a ruptured left vertebral artery aneurysm with signs of active bleeding (Fig. 1). For further planning and to decide whether to treat the patient endovascularly or with open surgery, a CT angiography (CTA) was performed. The CTA showed a massive hematoma of the neck, but interestingly, no leakage of contrast agent was found anymore, suggesting a spontaneous closure of the rupture. However, the CT scan showed an aneurysm of the left vertebral artery with 11 × 10 mm axial diameter immediately after the vertebral artery branched off the left subclavian artery (V1 segment). The right vertebral artery was of regular caliber without any relevant stenosis with a complete circulus of Willis. Additionally, there was a short nonflow limiting dissection of the internal carotid artery on both sides. A short dissection of the slightly ectatic left common iliac artery and a long dissection membrane of the left external iliac artery were also found. Additional findings were an ectatic right renal artery as well as multiple cysts of the liver and spleen.

Five days before the rupture, a hysterectomy had been performed. Anamnestic work-up revealed that the patient had already been treated surgically due to a pseudoaneurysm of the right popliteal artery and the right ulnar artery 19 years and 8 years before, respectively. Furthermore, she underwent several curettages due to menometrorrhagia. Anamnesis further revealed recurrent postoperative bleeding necessitating various surgical revisions after previous operations. Laboratory work-up revealed a slightly reduced prothrombin value, which was treated by infusion of 10 mg of vitamin K. A transthoracic echocardiography showed a marginal left ventricular myocardial hypertrophy with no other pathological findings present.

In an interdisciplinary team approach including vascular surgeons, interventional radiologists, and anesthesiologists, an endovascular therapeutic approach was chosen for several reasons: First, open surgical treatment of ruptured vertebral arteries is associated with a significant risk of cerebral thromboembolism. Furthermore, the patient had experienced several episodes of postoperative bleeding with the underlying pathology being not yet identified. In addition, open surgery on vertebral arteries is nowadays rarely performed and therefore surgical experience is limited.

The vertebral artery and the associated aneurysm were embolized from a transfemoral approach by liquid embolization with Onyx and coil embolization, occluding the left vertebral artery from its origin up to the proximal left inferior thyroid artery on a length of 3.5 cm (Fig. 2). A remaining retrograde flow was seen down to the level of the second cervical vertebrae after the intervention. Further postoperative course was uneventful. The patient was extubated 2 days after the procedure without any neurological impairment. She was transferred back to the referring hospital on the third day after the endovascular intervention. Postoperatively, further investigations to exclude connective tissue disease were performed. Genetic analysis of the COL3A1 gene revealed a heterozygote deletion of 4 base pairs at position 4—7 after exon 16, which has not been described up to date. This deletion is in the splice site and most likely leads to aberrant splicing. The patient's father had died from a ruptured abdominal aortic aneurysm some years before, so molecular analysis could not be extended to family members.

One year after the intervention, a follow-up CTA was performed, showing the vertebral artery aneurysm successfully excluded (Fig. 3). The patient will undergo yearly