



CASE REPORT

ENDOVASCULAR TREATMENT OF A VERTEBRAL ARTERIOVENOUS FISTULA: CASE REPORT

Feyyaz Baltacıoğlu

Marmara Üniversitesi Tıp Fakültesi, Radyoloji Anabilim Dalı, İstanbul, Türkiye

ABSTRACT

In this report, we present a patient with high flow vertebral arteriovenous fistula and its endovascular treatment. The patient was a 25-year-old female with neurofibromatosis type I, presenting with quadriparesis due to the compression of highly dilated epidural venous pouches to cervical spinal cord, and treated with endovascular stent-graft.

Keywords: Vertebral, Arteriovenous, Fistula, Endovascular

VERTEBRAL ARTERİOVENÖZ FİSTÜLÜ VE ENDOVASKÜLER TEDAVİSİ: VAKA SUNUMU

ÖZET

Bu yazıda yüksek debili bir vertebral arteriovenöz fistülü ve endovasküler tedavisini sunduk. Hasta nörofibromatozis tip-I nedeni ile takip edilen 25 yaşında bayandır. Genişlemiş epidural venlerin yol açtığı servikal spinal kord basısı nedeni ile ortaya çıkan kuadriparezi ile başvurmuştur.

Anahtar Kelimeler: Vertebral, Arteriovenöz, Fistül, Endovasküler

INTRODUCTION

Vertebral arteriovenous (AV) fistulas are defined as abnormal communications between the extracranial vertebral artery and an adjacent vein. Most of these lesions are traumatic in origin, due either to blunt or penetrating trauma or iatrogenic trauma¹. Spontaneous cases may be congenital or may be associated with abnormal vessels. In the treatment, preservation of the parent artery is important, and must be attempted, but it is hardly ever achieved by surgical means. Endovascular treatment is a minimally invasive treatment modality, and does not have the disadvantages of open surgery. Different types of endovascular approaches, via both transvenous and transarterial routes,

with coil or balloon embolization or with stent-graft were reported for treatment^{2,3}.

CASE REPORT

The patient was a 25-year-old female with a neurofibromatosis (NF) type I. She had presented to another hospital with sudden onset of quadriparesis. Her past medical history was uneventful up to two weeks prior to admission. During the last two weeks, she experienced numbness and weakness at all four extremities progressing slowly to quadriparesis. There was no clearly defined trauma in her history. There was a strong thrill over her left neck. Cervical MR examination revealed a left sided mass lesion of 2x4 cm in size at C3 level. The lesion was

İletişim Bilgileri:

Feyyaz Baltacıoğlu, M.D.

*Marmara Üniversitesi Tıp Fakültesi, Radyoloji Anabilim
Dalı, Altunizade, İstanbul, Türkiye*

e-mail: fbaltaci@yahoo.com

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an extradural mass, compressed the spinal cord, and passed through the left neural foramen to outside the spinal canal. It was hypo/isointense with spinal cord on T1W images, hyperintense on T2W images and showed dense contrast enhancement. The lesion was diagnosed as neurinoma. Beside this, there were dilated signal void epidural venous pouches severely compressing the spinal cord and filling the spinal canal at the level of C5-C6. At this level, it communicated with the left vertebral artery through the left intervertebral foramen. The patient underwent a digital subtraction angiography (DSA) examination to clear up the architecture of the arteriovenous fistula, and to plan the treatment. Left vertebral artery injection showed a single high flow side-to-side fistula between the left vertebral artery and an epidural vein. The size of the fistula site was about 15 mm, and immediate post-fistula vein showed aneurysmatic dilatation. The large epidural venous pouch drained further to paravertebral veins bilaterally. Due to the steal of the fistula, the segment of the left

vertebral artery distal to the fistula site did not fill efficiently. Since there was a single hole, the fistula site was clearly defined, and there was no apparent difference between the size of the vertebral artery proximal and distal to the fistula site, endovascular treatment with stent-graft was decided to preserve the patency of the parent artery. Under local anesthesia, a balloon expandable Jomed coronary stent graft (Jomed International AB, Helsingborg, Sweden) of 4x25 mm in size was placed across the fistula site. Control angiography revealed that the fistula was fully filled with contrast material. After that, the proximal part of the stent was overdilated with a 5x20 mm balloon. The last control angiogram showed no residual filling of the fistula. The distal filling of the vertebral artery became normal. The neck thrill disappeared immediately after the procedure. The patient was discharged with aspirin 300 mg (life-long) and clopidogrel 75 mg (1 month) the next day. She underwent a surgery for cervical neurinoma about one month later.

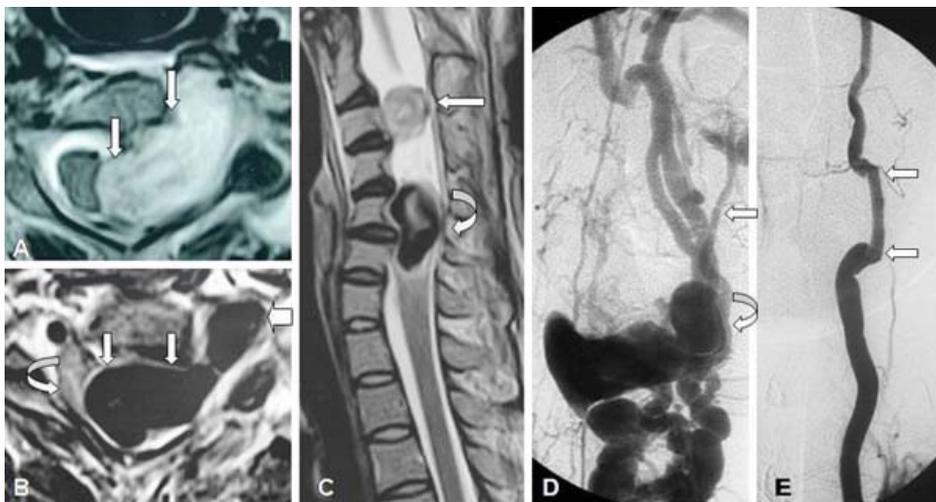


Figure 1: A. Axial T1W, contrast enhanced cervical MR imaging. An extradural, highly contrast enhanced mass lesion (white arrows) compressing the spinal cord, and passing through the left neural foramen to outside the spinal canal. B. Axial T2W, cervical MR imaging. A dilated signal void epidural venous pouch (white arrows) that severely compressing the spinal cord (curved arrow) is seen. It passes through the left foramina and communicates with the left vertebral artery (large arrow). C. Sagittal T2W, cervical MR imaging. Note the hyperintense neurinoma at C2 level (white arrow) and, signal void venous pouch at C5-6 level (curved arrow). D. Left vertebral artery DSA examination. A-P view. A single high flow side-to-side fistula between the left vertebral artery and an epidural vein is seen (curved arrow). The large epidural venous pouch drains further to bilateral paravertebral veins. Distal left vertebral artery does not fill efficiently (white arrow). E. Post-embolization control DSA examination after placement of stent graft (between white arrows). No residual filling of the fistula is seen. Distal filling of the vertebral artery becomes normal.



DISCUSSION

Extracranial vertebral arteriovenous fistulas are rare lesions and they are usually traumatic in origin. Traumatic fistulas are most commonly of iatrogenic cause, secondary to internal jugular vein puncture or to neck surgery. Beaujeux et al reported that, most of the traumatic fistulas affect the lower portion of the vertebral artery (below C5), while spontaneous ones involve the upper portion (at or above C2), which is contrary to both of our patients⁴. Non-traumatic fistulas can be congenital or spontaneous. Spontaneous ones can complicate primary vascular pathologies like neurofibromatosis type I, fibromuscular dysplasia, Marfan's syndrome or Ehler-Danlos syndrome type IV^{5,6}. There has been an increasing awareness of vascular lesions in patients with NF I. Dysplastic smooth muscle or neurofibromatosis proliferation in the vessel wall lead to vasculopathy, aneurysm formation, leakage, and ultimately rupture into the adjacent vein⁷. The AVF's in NF type I were reported to be more common in women more often left-sided, as in our case⁸.

Symptomatology differs according to the site of the fistula and the flow patterns. Sometimes a neck bruit may be the only presenting sign. In the case of a proximal fistula, due to the effects on cardiac function, cardiac failure is seen. In cases with central venous occlusion of the superior vena cava, reversal of increased internal jugular vein flow causes increase in cerebral venous pressure, which in turn, causes cerebral edema and headache. Severe life-threatening neck hematoma is another important sequela, due to the rupture of a pseudoaneurysm. Finally, with the enlargement of the fistula, dilated epidural venous pouches cause neuronal compression syndrome, which in turn cause motor and sensory deficits, as in our case.

In the evaluation of the vertebral fistulas, all possible vascular pedicles should be angiographically assessed, including both carotid, costo-cervical, and thyro-cervical arteries which probably supply the fistula. Knowledge of the hemodynamics of the contralateral vertebral artery circulation is

essential during the treatment procedure. The fistula site must be well visualized. Sometimes, contralateral vertebral artery injection with or without ipsilateral proximal vertebral artery occlusion with balloon is better for detecting the exact fistula site. The bilateral carotis system should also, be studied in order to reveal the probable concomitant injuries, which are important in the planning of the therapy.

The goal of treatment should be occlusion of the fistula site, and preservation of the patency of the vertebral artery. These lesions are difficult to treat by surgical means, because of the anatomic location, the critical condition of the patient especially in the cases with hematoma, and the difficulty in localizing the exact site of the fistula. Endovascular intervention has been increasingly used to treat AV fistulas. If the contralateral vertebral artery can supply sufficient vertebrobasilar circulation despite the steal effect, transarterial occlusion of the affected vertebral artery with detachable balloons or coils can be an effective way of treatment. For the complete elimination of the fistula, the embolic material should be placed both proximal and distal to the fistula site, in order to prevent the retrograde filling of the fistula. To preserve the vertebral artery perfusion, not the parent artery, but the fistula site itself can also be selectively embolized with coils or balloons. On the other hand, both coils and balloons have some disadvantages. Coils may not produce occlusion of the fistula, because of their poor thrombogenicity and the difficulty in achieving dense coil packing. Also they may migrate intracranially causing inadvertent arterial occlusion, or flow through the draining veins, because of the high flow fistula. In such cases, balloon aided coil embolization can be applied, in order to prevent coil migration and achieve a dense coil packing⁹. Sometimes it is impossible to pass a balloon through the narrow orifice of the fistula. The balloon, on the other hand, is a flow guided device and, in the case of a large bore high flow fistula, it is hard to pass



the balloon distal to the fistula site for the parent artery occlusion.

Sealing of the fistula with a stent graft is the treatment of choice to preserve the vertebral artery. Stent grafts are of two types: balloon expandable and self-expandable. Both of them have advantages and disadvantages. Self expandable stent grafts have thick shafts of 8-10 French in size, and they are stiff. That is why, it is hard to propagate them to the distal segments of the vertebral artery. They are more suitable for the proximal lesions. They are also better in cases at where the vessel diameter is different at the proximal and distal end of the fistula. Balloon expandable stent grafts, on the other hand, have thinner catheter shafts. Jomed coronary stent graft is premounted on a monorail balloon system of 4 French catheter size. It is easier to navigate distal vasculature. The main disadvantages is that, it is not firmly fixed in the vessel at where the proximal and distal end of the fistula show great mismatch in diameter. Generally the proximal diameter is larger than the distal one. If any leak is observed after the deployment of the stent-graft, the proximal half of the stent may be overdilated with a balloon of larger diameter, as in our case.

In conclusion, endovascular treatment of the vertebral arteriovenous fistulas is safe and efficacious. Different types of endovascular means, like coils, balloons or stent-grafts can be used for this purpose. Preservation of the parent artery should be aimed for when possible.

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