



OPEN ACCESS

## CASE REPORT

## Successful endovascular coil embolisation of a ruptured V1-segment vertebral artery dissecting aneurysm making a fistula with the adjacent vein

Sajjad Muhammad,<sup>1</sup> Rahul Raj, Jussi Numminen, Mika Niemelä

Department of Neurosurgery,  
University of Helsinki and  
Helsinki University Hospital,  
Helsinki, Finland

**Correspondence to**

Associate Professor Sajjad  
Muhammad,  
[ext-sajjad.muhammad@hus.fi](mailto:ext-sajjad.muhammad@hus.fi)

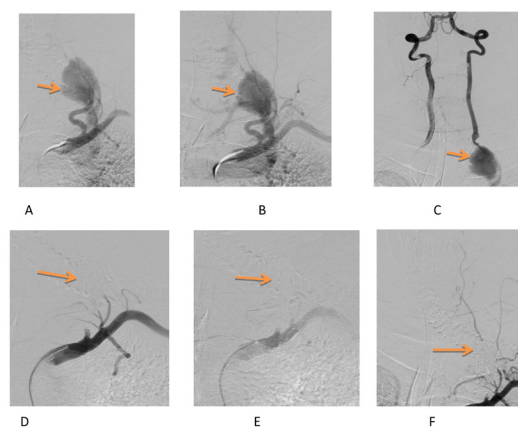
Accepted 27 April 2019

**SUMMARY**

Sudden supraclavicular pain is often associated with myocardial infarction but seldom due to a rupture of V1-segment vertebral artery aneurysm. A ruptured V1 segment of vertebral artery dissecting aneurysm making a fistula with the adjacent vein has rarely been described in literature. Here we present a case of a 29-year-old healthy woman with sudden supraclavicular pain and palpable mass that developed after pain. Initial ultrasound showed suspicion of large haematoma. CT angiogram showed a left-sided dissecting V1-segment vertebral artery ruptured aneurysm. Angiography showed an additional fistula between the aneurysm and the adjacent vein. The patient was treated successfully with coil embolisation. The vertebral artery occlusion was well tolerated without any complications. Endovascular coiling is a fast and effective treatment modality. However, a parent vessel occlusion can be sometimes dangerous if the contralateral vertebral artery supply is not sufficient. Surgical possibilities to reconstruct the parent vessel should also be considered in complex cases.

**BACKGROUND**

Sudden onset of severe supraclavicular pain is often associated with myocardial infarction. Rarely, it could be due to an extracranial V1-segment vertebral artery aneurysm rupture. Extracranial vertebral artery aneurysms in the V1 segment are extremely rare<sup>1</sup> and the formation of a fistula of a ruptured aneurysm is even rarer.<sup>2</sup> These aneurysms are difficult to manage because of the high risk of



**Figure 2** (A–F) DSA images showing different steps of intervention, including coil embolisation of the V1-segment vertebral artery aneurysm.

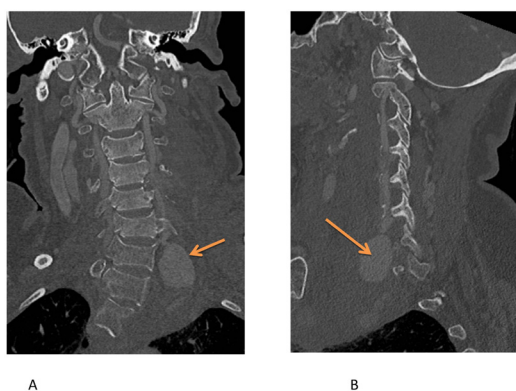
ischaemic complications to the posterior circulation. Both surgical and endovascular treatments carry potential risks and technical difficulties. The best treatment options are still controversial in such aneurysms.<sup>3–6</sup> Here we present a case of a successfully treated ruptured dissecting V1 vertebral artery aneurysm making a fistula with the adjacent vein using endovascular coils and placement of a distal plug to close the fistula and proximally occlude the parent artery. This method was well tolerated by the patient.

**CASE PRESENTATION**

A 29-year-old woman presented with sudden supraclavicular pain and palpable mass above the supraclavicular region. She was otherwise healthy without any remarkable medical history. On examination the patient was alert, cranial nerves were intact, and no sensorimotor neurological deficits were present.

**INVESTIGATIONS**

Initial ultrasound showed suspicion of haematoma. CT angiogram showed a left-sided (3×2.8 cm) dissecting V1-segment vertebral artery ruptured aneurysm (figure 1A,B). Angiography showed an additional fistula between the aneurysm and the adjacent vein (figure 2A–C). A CT angiography of head and neck and a digital subtraction angiography (DSA) of neck vessels did not show any obvious signs of fibromuscular dysplasia. The patient was

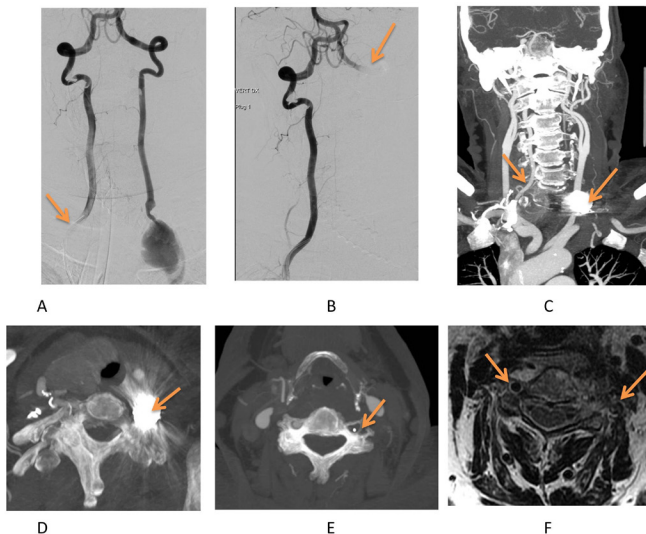


**Figure 1** (A,B) CT angiography showing location and radiological anatomy of ruptured dissecting V1 vertebral artery aneurysm.



© BMJ Publishing Group Limited 2019. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

**To cite:** Muhammad S, Raj R, Numminen J, et al. *BMJ Case Rep* 2019;**12**:e229108. doi:10.1136/bcr-2018-229108



**Figure 3** (A–F) DSA before (A) and after placement of a distal plug and filling from contralateral side (B) showing no more filling of right vertebral artery and aneurysm. Postinterventional CT-angiography (C,D,E) and MRI (F) showing complete occlusion and no more filling of the aneurysm.

admitted to our hospital for coil embolisation of the dissecting aneurysm as described above.

### TREATMENT

After interdisciplinary discussion we decided on the endovascular treatment of choice. The contralateral vertebral artery was normal and the probability of tolerating an ipsilateral vertebral artery occlusion was high in this patient. An endovascular procedure with deposition of coils and placement of a distal plug to close the arteriovenous fistula (figure 3). We used two-microvascular plug (Reverse Medical), target XL coils (Stryker), and finally the proximal occlusion of vertebral artery was performed with the aim of interrupting the flow to the aneurysm and fistula point.

### OUTCOME AND FOLLOW-UP

The patient tolerated the proximal vertebral artery occlusion very well. Postintervention images show a complete occlusion of the fistula and the parent vessel (figure 2A–F). No postinterventional neurological deficit was noted. The patient was discharged from hospital after 3 days. The patient was completely symptom-free after a follow-up of 4 weeks.

### DISCUSSION

Extracranial vertebral artery aneurysms are extremely rare and account only for 0.5% of all aneurysms. Most extracranial vertebral artery aneurysms are located in the V3 segment followed by the V1 segment.<sup>7</sup> These aneurysms are diagnosed secondary to an embolic infarct or incidentally as a palpable mass. Patients with connective tissue disorders, including Ehlers-Danlos syndrome, Marfan syndrome and neurofibromatosis type I are at higher risk of developing extracranial vertebral artery aneurysms. A ruptured vertebral artery aneurysm with local pain and haematoma are often found in this particular group of patients.<sup>3 4 8</sup> In contrast, our case report presents a young patient without any trauma who presented with sudden onset of severe supraclavicular pain. CT angiography and DSA are the standard tools to diagnose and reveal the anatomy of vasculature and to plan

### Learning points

- ▶ Endovascular coiling is a fast and effective treatment modality. However, a parent vessel occlusion can be sometimes dangerous if the contralateral vertebral artery supply is not sufficient.
- ▶ Surgical possibilities to reconstruct the parent vessel should also be considered in complex cases.

treatment. Treatment options include ligation, isolation, balloon embolisation, onyx embolisation and coil embolisation.<sup>6 9–11</sup> There is no single standardised treatment option for V1-segment vertebral artery aneurysms with a fistula. The anatomical location at C7–Th1 level might be difficult for end-to-side anastomosis with the carotid artery. The contralateral vertebral artery was slightly dominant, which supported the possibility to take the risk of endovascular proximal occlusion if needed. Hence, we decided on coil embolisation of the fistula. We could not reconstruct the parent vessel and thus we performed a proximal occlusion of the ipsilateral vertebral artery. Although endovascular modalities have a risk of embolic stroke, our patient tolerated the procedure well. The fistula (including dissecting aneurysm) was completely occluded and the patient had no adverse events.

**Acknowledgements** The authors are thankful to Ehrnrooth Foundation for the Funding to first author (SM) for a clinical vascular and skull base fellowship at the Department of Neurosurgery in Helsinki.

**Contributors** SM: manuscript drafting, patient care. MN: critical reviewed manuscript. JN: performed coiling. RR: performed coiling.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None declared.

**Patient consent for publication** Obtained.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>

### REFERENCES

- 1 Schievink WI. Spontaneous dissection of the carotid and vertebral arteries. *N Engl J Med Overseas Ed* 2001;344:898–906.
- 2 Ushikoshi S, Goto K, Uda K, et al. Vertebral arteriovenous fistula that developed in the same place as a previous ruptured aneurysm: a case report. *Surg Neurol* 1999;51:168–73.
- 3 Hiramatsu H, Matsui S, Yamashita S, et al. Ruptured extracranial vertebral artery aneurysm associated with neurofibromatosis type 1. Case report. *Neurol Med Chir* 2012;52:446–9.
- 4 Oderich GS, Sullivan TM, Bower TC, et al. Vascular abnormalities in patients with neurofibromatosis syndrome type I: clinical spectrum, management, and results. *J Vasc Surg* 2007;46:475–84.
- 5 Shang EK, Fairman RM, Foley PJ, et al. Endovascular treatment of a symptomatic extracranial vertebral artery aneurysm. *J Vasc Surg* 2013;58:1391–3.
- 6 Strambo D, Peruzzotti-Jametti L, Semerano A, et al. Treatment Challenges of a Primary Vertebral Artery Aneurysm Causing Recurrent Ischemic Strokes. *Case Rep Neurol Med* 2017;2017:1–3.
- 7 Ronchey S, Serrao E, Kasemi H, et al. Endovascular treatment of extracranial vertebral artery aneurysm and aberrant right subclavian artery aneurysm. *J Cardiovasc Surg* 2014;55:265–9.
- 8 Sumimura J, Nakao K, Miyata M, et al. Vertebral aneurysm of the neck. *J Cardiovasc Surg (Torino)* 1988;29:63–5.
- 9 Ishimitsu H, Namba S, Tsuboi M. Unilateral extracranial ligation of the vertebral artery as a treatment for a vertebral aneurysm (author's transl). *No Shinkei Geka* 1978;6:815–20.

- 10 Kollmann D, Kinstner C, Teleky K, *et al.* Successful Treatment of a Ruptured Extracranial Vertebral Artery Aneurysm with Onyx Instillation. *Ann Vasc Surg* 2016;36:290.e7–290.e10.
- 11 Ullery BW, Foley PJ, Brinster CJ, *et al.* A novel two-stage surgical approach for the treatment of symptomatic supra-aortic artery aneurysms. *Vascular* 2012;20–236–40.

Copyright 2019 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <https://www.bmj.com/company/products-services/rights-and-licensing/permissions/>  
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

#### Customer Service

If you have any further queries about your subscription, please contact our customer services team on +44 (0) 207111 1105 or via email at [support@bmj.com](mailto:support@bmj.com).

Visit [casereports.bmj.com](http://casereports.bmj.com) for more articles like this and to become a Fellow