Enlargement of Asymptomatic VA Dissecting Aneurysm after Initial Treatment with Stent-assisted Coil Embolization with Contra Lateral Ruptured VA Dissecting Aneurysm Treated by Parent Artery Occlusion: A Case Report

Karim Gaber,1,2 Masayuki Ezura,1 Ayumi Narisawa,1 Yusuke Takahashi,1 Takashi Inoue,1 and Hiroshi Uenohara1

Objective: A rare case of enlargement of asymptomatic dissecting aneurysm after its initial treatment with stent-assisted coiling with parent artery occlusion for the ruptured contra lateral side is reported.

Case Presentation: A 52-year-old male patient presented with a subarachnoid hemorrhage resulting from a bilateral vertebral artery dissecting aneurysms. The patient was treated within 24 hours of the hemorrhage to prevent re-rupture by parent artery occlusion of the right vertebral artery and stent-assisted coiling of the left side. A 6-month follow-up showed an enlargement of the left side dissecting aneurysm. A second treatment was done to the left side also using stent-assisted coiling. The patient was discharged with no neurological deficit.

Conclusion: To our knowledge, parent artery occlusion for ruptured vertebral artery dissecting aneurysms (VADA) may cause contra lateral VADA enlargement even after its initial treatment by stent-assisted coil embolization in the same setting.

Keywords: bilateral vertebral artery, dissecting aneurysm, stent-assisted coil embolization, parent artery occlusion

Introduction

Spontaneous dissecting aneurysms of the vertebral artery are more increasingly considered a cause of focal neurological functional deficit because they result in brainstem ischemia and infarction. In a review of 260 cases,13 it was found that the highest occurrence of spontaneous dissecting aneurysms was in the vertebral artery. With spontaneous dissections, 36% of patients have dissections at other sites and 21% of cases have bilateral vertebral artery (VA) dissections.21 The dissection can be presented by neck pain, headache, and disturbance in the level of conscious, ischemic infarctions, cerebellar manifestations and subarachnoid hemorrhage (SAH).3,4 Ruptured dissecting aneurysms presented with subarachnoid hemorrhage have a very strong tendency for rebreeding with high morbidity and mortality rates.5,6

The treatment strategy for bilateral vertebral arteries dissecting aneurysms presents a huge challenge and remains very controversial, as the main goal will be to maintain the vascular flow without compromising the hemodynamic stress effect on the vessels wall.

We will describe an unusual case of re-growth of left vertebral artery dissecting aneurysm (VADA) after being treated initially with stent-assisted coiling embolization in a case of bilateral vertebral artery dissecting aneurysms where the right VADA was treated by parent artery occlusion.
Case Presentation

A 52-year-old male patient presented with a sudden severe headache, vomiting and transient loss of consciousness. On admission to our emergency department, his Glasgow coma scale (GCS) was 14. Non-enhanced CT scan showed diffuse SAH (Fig. 1A). During the prior examination, his consciousness level suddenly deteriorated to GCS 9. Another CT scan was done and it showed an increase in the SAH indicating a second rupture. The patient had no past medical history of diabetes mellitus or hyperlipidemia. He is not a smoker, but frequently drinks alcohol. He has no past family history of SAH. 3D enhanced CTA were done; they showed bilateral vertebral arteries dissecting aneurysms (Fig. 1B).

DSA showed a right side V4 segment fusiform dilation involving the posterior inferior cerebellar artery (PICA). The right PICA showed a fenestrated type with the main trunk distal to the dissecting aneurysm. The left vertebral artery showed a V4 fusiform dissecting aneurysm also including the left PICA. Compared to the right side, the left side had a slight irregularity of the wall (Fig. 2).

It was assumed that the right vertebral dissecting aneurysm is the ruptured one due it its long segment and its irregularity in shape compared to the left side. The treatment strategy was designed to do parent artery occlusion (PAO) of the right side while trying to preserve the main trunk of the right PICA. In addition, stent-assisted coiling was done to the contra lateral left side to prevent any future rupture.
Within 24 hours, the treatment managed to prevent re-rupture which would have been fatal. Under general anesthesia the right side was treated first. A Neuroform Atlas stent (3 x 21 mm, Stryker, Fremont, CA, USA) was deployed to the right PICA and the right distal VA through the left vertebral artery in order to preserve the main trunk of the right PICA. PAO was done using 12 coils with a total length of 139.5 cm (1-GALAXY FILL 4 mm x 12 cm [Codman & Shurtleff, Inc., Raynham, MA, USA], 2-Target 360 soft 4.5 mm x 12 cm [Stryker], 3-ED extrasoft 4 mm x 8 cm [Kaneka Medix Corp., Osaka, Japan], 4-VFC 3–6 mm x 15 cm [MicroVention TERUMO, Tustin, CA, USA], 5-VFC 3–6 mm x 15 cm, 6-ED extrasoft 16 mm x 15 cm [Kaneka Medix Corp.], 7-VFC 3–6 mm x 15 cm, 8-VFC 3–6 mm x 10 cm, 9-VFC 3–6 mm x 10 cm, 10-AXIUM PRIME 3D 3.5 mm x 10 cm [Medtronic, Dublin, Ireland], 11-ORBIT GALAXY extrasoft 3.5 mm x 7.5 cm [Johnson & Johnson, Fremont, CA, USA], 12-AXIUM PRIME 3D 3.5 mm x 10 cm [Medtronic]).

The left VADA was treated using Enterprise stent (40 mm x 30 mm, Codman Neurovascular/Johnson & Johnson, Raynham, MA, USA) and three coils with a total length 10 cm (1-Hypersoft 3D 2.5 mm x 4 cm [MicroVention TERUMO], 2-Target 360 NANO 2 mm x 3 cm, 3-Target 360 NANO 2 mm x 3 cm) using jailing technique (Fig. 3).

During the initial treatment, Heparin was injected 5000 unit with active clotting time (ACT) monitoring, heparin was modified accordingly. 300 mg of clopidogrel was given during the treatment. After surgery, the patient was on triple antiplatelet therapy which was clopidogrel, cilostazol, and aspirin. The patient took dual antiplatelet of clopidogrel and cilostazol after discharge. After the treatment, the patient’s conscious level improved with being discharged on December 2017 with a GCS 15 and modified Rankin Scale (mRS) equal to 1. A DSA was done after the end of the treatment. It showed complete PAO of the right vertebral with preservation of the small trunk of the right PICA, together with occlusion of the left dissecting aneurysm with preservation of the left PICA and the left VA.

A 6-month follow-up using Basi-parallel anatomical scanning (BPAS)-MRI (Fig. 4) showed enlargement and re-growth of the left VADA even after its initial closure using stent-assisted coiling. The DSA also showed enlargement of the left VADA. The stent deployed in the right PICA was occluded but the right PICA was still perfused by the second leg. The patient was asymptomatic and in a very good condition.

Nine months after the initial treatment, a second treatment of another stent-assisted coiling was scheduled for the enlarged dissecting aneurysm. Two micro catheters were introduced to the aneurysm and another micro catheter was introduced to the basilar artery. A low-profile visualized intraluminal support (LVIS) stent (4.5 mm x 18 mm, MicroVention Terumo, Tustin, CA, USA) was placed and coiling was done using 9 coils with a total length of 76 cm (1-VFC 3–6 mm x 6 cm, 2-ED extrasoft 3 mm x 6 cm, 3-GALAXY G3 FILL 3 mm x 8 cm, 4-VFC 3–6 mm x 15 cm, 5-VFC 3–6 mm x 15 cm, 6-AXIUM PRIME Frame 3D 3 mm x 8 cm, 7-Barricade Finish 3 mm x 6 cm [Blockade Medical, CA, USA], 8-SMART extrasoft 3 mm x 6 cm [Medico’s Hirata Inc., Osaka, Japan], 9-Target 360 NANO 3 mm x 6 cm).
Gaber K, et al.

In this report, we described the case of a re-growth of an asymptomatic vertebral artery dissecting aneurysm after its initial treatment in a patient with bilateral intracranial VADAs which were presented with SAH.

Our initial intervention strategy was designed to secure the symptomatic ruptured dissecting aneurysm on the right side to prevent its re-rupture by PAO and to secure the contra lateral asymptomatic dissecting aneurysm together with preservation of the blood flow in the left vertebral artery by stent-assisted coiling embolization.

Various surgical procedures and approaches were adopted to treat bilateral VADAs such as surgical trapping of the symptomatic VADA and endovascular coil occlusion of the symptomatic vertebral artery with conservative management of contralateral asymptomatic lesion.8)

The left PICA and the left VA were preserved in the second treatment (Fig. 5). No neurological deficits were observed after the second treatment.

Discussion

Cases of bilateral VA dissections are rare and pose a real challenge particularly in planning a definitive management strategy. Until now, the treatment possibilities have been controversial with no standardized working plan to handle such critical cases. The natural history of bilateral VADAs is mostly catastrophic with a poor prognosis especially if the presentation is SAH. In a study of 42 patients by Mizutani et al.,7 it was found that the re-rupture rate is 40% within the first 24 hours and almost 57% re-rupture within a week of the first SAH.

In this report, we described the case of a re-growth of an asymptomatic vertebral artery dissecting aneurysm after its initial treatment in a patient with bilateral intracranial VADAs which were presented with SAH.

Our initial intervention strategy was designed to secure the symptomatic ruptured dissecting aneurysm on the right side to prevent its re-rupture by PAO and to secure the contra lateral asymptomatic dissecting aneurysm to prevent its rupture together with preservation of the blood flow in the left vertebral artery by stent-assisted coiling embolization.

Various surgical procedures and approaches were adopted to treat bilateral VADAs such as surgical trapping of the symptomatic VADA and endovascular coil occlusion of the symptomatic vertebral artery with conservative management of contralateral asymptomatic lesion.8)
In our case, we performed a one-stage treatment of a bilateral VADA presented with SAH where the ruptured side was difficult to identify within the first 24 hours of presentation.

We assumed that the right side is the ruptured one due to the nature and the shape of the dissecting aneurysm. It was a long dissecting fusiform shaped aneurysm with pearl and string sign where the left side was regular short fusiform shaped. Also, the density of the subarachnoid hemorrhage is more on the right side of the posterior fossa indicating the rupture site. The patient did not have a specification for the side of the headache or lateralization for any neurological deficit. That is why the right side was assumed to be the rupture site.

It is always important to identify the ruptured side. Plenty of determinates and notes should be taken into consideration such as the side of the headache, the side of the paresis, thicker hematoma on the CT, the shape and irregularity of the aneurysm.9-11

We treated the right side first to prevent it from re-bleeding. Parent artery occlusion was done using coils to the right vertebral artery with preservation of the right PICA as it had a double origin. The left side was treated afterwards using stent-assisted coiling. The patient’s condition improved after the procedure and he was discharged within a few weeks. Six months later, in a follow-up examination, BPAS-MRI showed enlargement and re-growth of the left VADA after its initial closure with stent-assisted coiling. A second treatment was performed with further stent-assisted coiling and the patient was discharged within two weeks in a good condition.

The pathology of the re-growth of the asymptomatic dissecting aneurysm after its initial closure is unclear and indicates a substantial increase in the arterial hemodynamic stress, which may be considered a significant factor even after its initial treatment with a stent to preserve the blood flow.

Three cases of bilateral VADAs with SAH were reported by Otawara et al.10 in which surgical trapping of the ruptured aneurysm was done with no treatments for the contra lateral lesion. Two cases showed rupture of the contra lateral lesion 2 and 6 days after the surgery. There are also two other case reports of bilateral VADAs in which trapping of the ruptured side of VADA alone resulted in death caused by rupture of the contra lateral side of the aneurysm 8 hours and 33 days after the initial treatment.12

Computational fluid dynamics simulations studies were performed on parent artery occlusion on a case of bilateral VADAs as discussed by Kono et al.13 in 2012. This study suggested that trapping of the left side in their case would increase the wall shear stress of the dome surface of the contra lateral right aneurysm 3.4 times at maximum (from 3.6 to 12.5 Pa) which might cause enlargement and rupture of the aneurysm.14-17

In our case, PAO was not done alone; however, stent-assisted coiling was administered in the same setting procedure to avoid increase in hemodynamic stress and rupture of the contra lateral side, yet a re-growth of the un-ruptured dissecting aneurysm was found on the 6-month follow-up examination.

Another theory which may apply to our case is that incomplete coil packing of the dissecting aneurysm may have facilitated the recanalization and the re-growth. Especially in the PICA involved VADA, it is difficult to place the stent-assisted coils together with preservation of PICA which may lead to re-growth of the un-ruptured dissecting aneurysm after its initial treatment.21

### Conclusion

Bilateral dissecting artery aneurysm is a rare case with possibly fatal outcomes. The management strategies are still controversial, but the main concept is to maintain the hemodynamic stress by maintaining the vascular flow as much as possible. We would like to emphasize that parent artery occlusion for ruptured VADA may cause contra lateral VADA enlargement even after the initial treatment by stent-assisted coil embolization.

### Disclosure Statement

Neither the first author nor any of the coauthors have any conflicts of interest.

### References


