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Case Report

Coil embolization of recurrent ruptured vertebral artery dissection through a marathon microcatheter: A case report☆,☆☆

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ABSTRACT

A 56-year-old healthy woman presented with subarachnoid hemorrhage caused by ruptured vertebral artery dissecting aneurysm and was treated with internal trapping of the affected site including the aneurysm. She suffered rebleeding due to recanalization of the aneurysm 5 days after the first treatment. Because of the close proximity of the coil mass to the posterior inferior cerebellar artery (PICA) origin at first treatment, additional coil embolization by tight packing of the coil mass was planned. However, navigation of the microcatheter into the coil mass was challenging due to the tightly packed coil mass. Thus, a Marathon microcatheter, which has narrower outer diameter and is designed for liquid embolization, was used and successfully placed into the coil mass in an anterograde fashion. Thereafter, the DAC was advanced just proximal to the coil mass to reduce the kickback of the microcatheter during deployment of the coils and avoid the coil mass expansion toward the PICA origin, resulting in complete obliteration of the aneurysm with PICA preservation. Follow-up angiography performed 6 months after the second treatment showed complete obliteration of the aneurysm. The patient's course was uneventful after 1 year following the second treatment, with a modified Rankin Scale score of 1. Therefore, coil embolization through the tightly packed coil mass using a Marathon microcatheter is feasible. A low-profile DAC is also useful for enabling physicians to push the coil deployed through the flexible Marathon microcatheter.

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Introduction

Internal trapping represents a reliable treatment method for achieving hemostasis in cases of ruptured vertebral artery dissection (VAD) without involvement of posterior cerebellar arteries [1–5]; however, anterograde recanalization of completely obliterated VAD can occur [6–8]. When treatment of recurrent VADs following internal trapping is required, increasing intra-aneurysmal packing density or extending coil mass deployed at the first treatment could be a choice as endovascular treatments [6–8]. However, navigation of the microcatheter into the coil mass can be restricted by the tightly packed coil mass, and extending the coil mass could risk ischemic complications associated with occlusion of the perforating arteries and/or posterior inferior cerebellar artery (PICA), thus leading to recurrent aneurysm. Herein, we present the case of a patient who underwent intra-aneurysmal coil embolization for recurrent ruptured VAD through tightly packed coils using a Marathon microcatheter.

Case report

A 56-year-old healthy woman presented with sudden onset of decreased level of consciousness and was transferred to our institution for emergent treatment. Computed tomography (CT) performed on admission demonstrated diffuse subarachnoid hemorrhage (SAH) classified as grade II on the Hunt and Kosnik scale (Fig. 1A). Emergent digital subtraction angiography performed on admission demonstrated fusiform dilatation of the V4 segment of the right vertebral artery and a stenotic lesion just proximal to the fusiform dilatation which was located just distal to the right PICA, suggesting that the VAD was the bleeding source (Fig. 1B). A 6-French (Fr) FUBUKI guiding sheath (Asahi Intech Co., Ltd, Aichi, Japan) was intro-

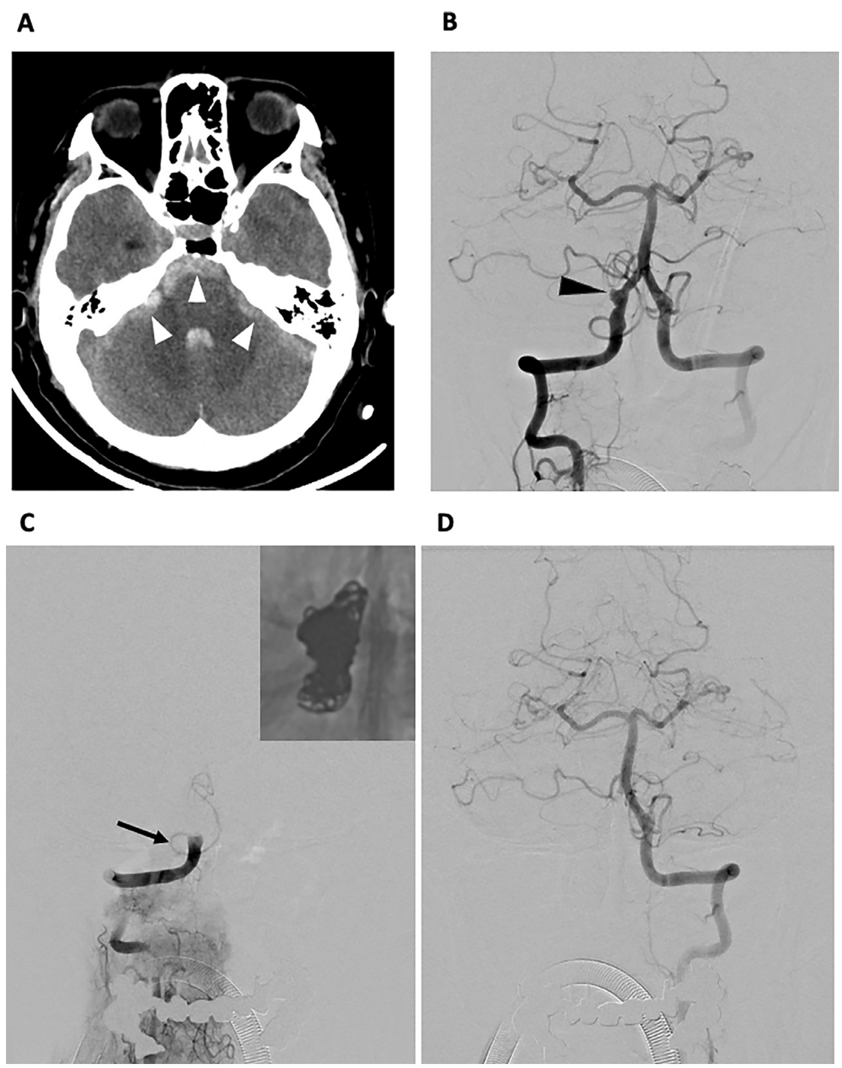

Fig. 1 – (A) Computed tomography on arrival reveals subarachnoid hemorrhage (arrowheads). (B) Right vertebral injection demonstrates fusiform dilatation of the right vertebral artery just distal to the posterior cerebellar artery (arrowhead). (C) Right and (D) left vertebral injection demonstrate complete occlusion of the fusiform dilatation. The coil mass after the first treatment is indicated in the right upper corner in panel C.

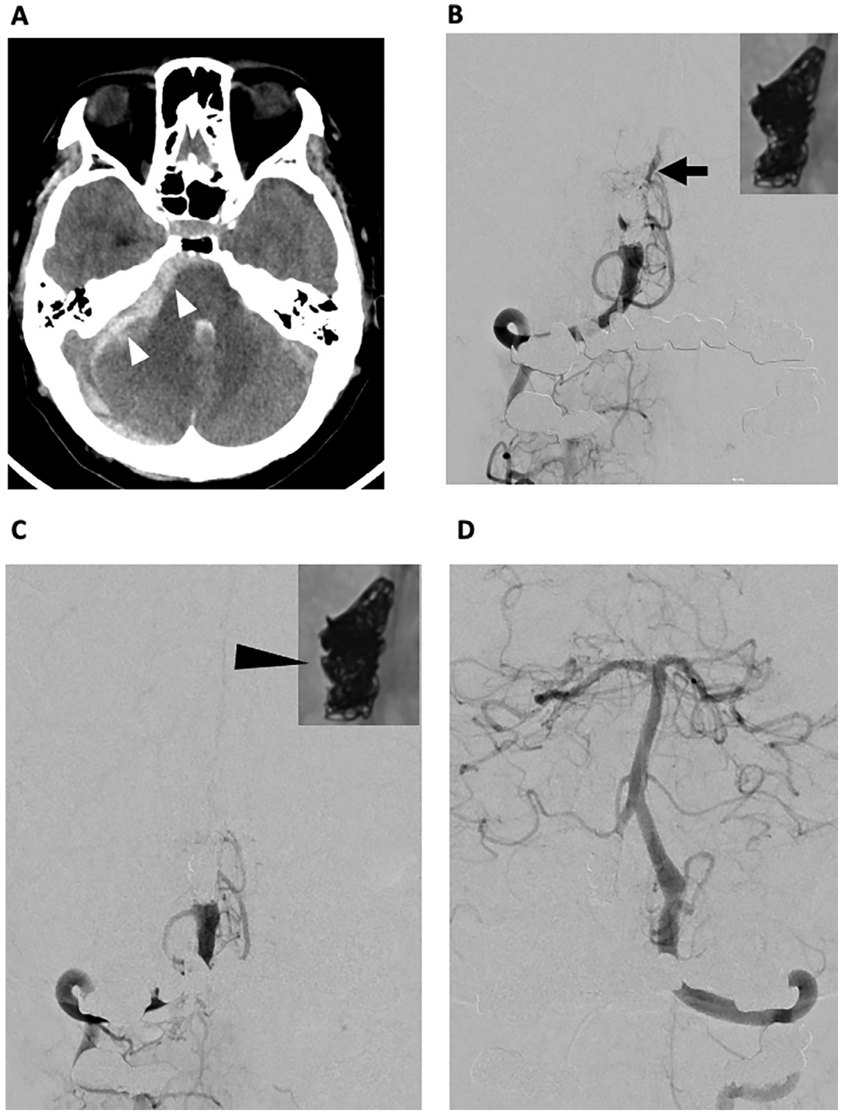

Fig. 2 – (A) Computed tomography performed immediately after neurological deterioration shows recurrence of subarachnoid hemorrhage (arrowheads). (B) Right vertebral injection shows recanalization of the right vertebral artery (arrow). (C) Right and (D) left vertebral injection following retreatment show completion of internal trapping of the fusiform dilatation in the right vertebral artery. The coil mass added after retreatment is shown in the right upper corner in panel C (arrowhead).

duced via the femoral artery under general anesthesia immediately after diagnosis angiography, and systemic heparinization was started. An Excelsior SL-10 microcatheter (Boston Scientific, Natick, MA, USA) and Phenom 17 (Medtronic, Minneapolis, MN, USA) were coaxially placed in the distal and middle part of the VAD, respectively. Multiple coils were placed in the VAD, resulting in successful obliteration of the aneurysmal dilatation and the affected VA without occluding the PICA origin (Figs. 1C and D). After endovascular treatment, the antithrombotic effect of heparin was reversed using protamine. The patient recovered well from general anesthesia and her postoperative course was uneventful until 4 days after the intervention. Five days after the procedure, she suddenly complained of a severe headache. Emergent CT demonstrated recurrent SAH in the posterior fossa (Fig. 2A). Emergent angiography demonstrated recanalization of the right VAD (Fig. 2B). A 6-Fr FUBUKI guiding sheath (Asahi Intech Co., Ltd, Aichi, Japan) was introduced via the femoral artery. As the PICA origin was just proximal to the coil mass, an increase in the intra-aneurysmal packing density using coils was planned. After placement of a 3.4-Fr distal access catheter (DAC) (TACTICS, Technocrat Corporation, Aichi, Japan) at the proximal segment of the right V4, an attempt was made to coaxially navigate a 1.6-Fr Headway Duo (MicroVention, Aliso Viejo, CA, USA), designed for coil embolization with the narrowest outer diameter of the distal tip, into the coil mass in an anterograde and retrograde fashions. However, the microcatheter could not be passed through the tightly packed coil mass (Supplementary material, Video 1). Subsequently, a 1.5-Fr Marathon microcatheter (Medtronic, Minneapolis, MN, USA) designed for liquid embolization was used and successfully navigated into the coil mass. As the Marathon microcatheter was thinner and more flexible and hence not favorable for tight packing, the DAC was navigated to the proximal part of the coil mass over the Marathon microcatheter to enable providers to push the coil. The right vertebral injection obtained after the placement of coils, i-ED silky soft 1 × 2 cm and 1 × 3 cm (Kaneka Medics, Osaka, Japan), revealed residual anterograde flow. Therefore, an additional coil, i-ED silky soft 1 × 2 cm, was deployed through a Marathon microcatheter navigated into the coil mass retrogradely from the left vertebral artery through the DAC (Supplementary material, Video 2), resulting in complete obliteration of the recurrent VAD with preservation of the right PICA (Figs. 2C and D). Follow-up angiography performed 6 months after the second treatment showed persistent obliteration of the VAD. At the 12-month follow-up, the patient was free from new symptoms for 12 months after the intervention and returned to previous work hours and duties, with a modified Rankin Scale score of 1.

Discussion

Herein, we discuss the case of a patient with recurrent ruptured VAD treated with coil embolization with a tightly packed coil mass using a Marathon microcatheter.

In case of recanalization of ruptured VAD after endovascular internal trapping, clip ligation as well as the second endovascular treatment can be considered. However, since close proximity of the coils deployed at the first treatment to the PICA origin could restrict the space for clip application without interfering blood flow of the PICA, direct surgery was reserved in case of the endovascular treatment failure. Therefore, the second embolization has been attempted by placing additional coils in the sparse segment of the coil mass [5,7]. However, navigation into the tightly packed coil mass was challenging using the microcatheter designed for coil embolization. Then, the smaller caliber microcatheter designed for liquid embolization was used as an alternative. The Marathon microcatheter is often used to access small, tortuous, and distal vessels of cerebral arteriovenous fistulas and arteriovenous fistulas. There have been cases in which the Marathon microcatheter was used for coil embolization of the distally located aneurysms or during trans-cell stent-assisted coil embolization through a flow diverter stent as well as a neck bridge stent [9–11]. In the present case, a Marathon microcatheter was used to pass the tightly packed coil mass that was prohibiting navigation of the microcatheter designed for coil embolization. This resulted in successful placement in the coil mass. Several reports have demonstrated the efficacy of injecting N-butyl cyanoacrylate into the coil mass [12]. However, the use of liquid embolic agent was avoided because incidental occlusion of the PICA arising from just proximal to the coil mass could occur.

Regarding the embolization of recurrent aneurysms after coil embolization, the use of a 1.5-Fr Marathon microcatheter has benefit when navigating the microcatheters into tightly packed coil mass. However, the Marathon microcatheter has some limitations. First, the inner lumen at the tip is small (0.013 inches); therefore, in contrast to other 1.6 or 1.7Fr microcatheters designed for coil embolization, compatible coils are limited. Based on previous reports and the present case, ED extrasoft, ED infini extrasoft, ED silky soft, and Barricade (Blockade Medical, Irvine, CA, USA) were successfully deployed through the Marathon microcatheter [9–11,13,14]. Second, when Barricade coils are deployed through the Marathon microcatheter, the Y connector should be detached from the Marathon microcatheter because of its long effective length of 165 cm [9,10]. Third, due to the absence of the second marker, the detachment point of the coil is not visible when the tip of the Marathon microcatheter is covered by the coil, such as in the present case. In such cases, the coils may be detached in the catheter lumen, or the coil can be deployed more deeply than intended; however, this would risk perforation. The ED coil is a bare platinum coil and its detachment point can be easily recognized with an alarm from the generator. Therefore, the coils can be safely detachable even though the catheter tips are invisible, as in the present case. Finally, its flexibility is less tolerable to kicking back during coil deployment and may restrict the tight packing of the aneurysm. In the present case, a low-profile DAC was navigated over the Marathon microcatheter just proximal to the coil mass to reduce kicking back and avoid expansion of the coil mass toward the PICA origin. Although a large-profile DAC can be used instead, the large inner lumen of the large-profile DAC might allow for the use of the Marathon microcatheter for wider twisting. Therefore, we believe that a low-profile DAC is useful for this purpose.

In conclusion, coil embolization of recurrent ruptured VAD through a Marathon microcatheter is an alternative treatment method when a microcatheter originally designed for coil embolization cannot be navigated beyond the tightly packed coil mass. Further studies are needed to evaluate the efficiency and the safety of using Marathon microcatheters for coil embolization of previously coiled aneurysm.

Patient consent

Informed consent was obtained from the patient for the publication of this case report.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.radcr.2024.02.075.

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