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Case Report

Stent-assisted modified coil protection technique for bilobulated aneurysm: technical note

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ABSTRACT

Endovascular treatment of deeply located bilobulated aneurysms in elderly patients is still challenging because of the acute angulation of the carotid siphon and poor microcatheter support. In particular, generating a frame coil to cover each lobe is difficult in bilobulated aneurysms with narrow isthmus in the fused portion. Here, we report a successfully treated bilobulated aneurysm using a modified coil protection technique with stent assistance.

Introduction

Owing to advances in endovascular technologies, coil embolizations of intracranial aneurysms have been increasingly performed. Nevertheless, deeply located bilobulated aneurysms in elderly patients are still challenging to treat because of the acute angulation of the carotid siphon and poor microcatheter support. Generating a frame coil to cover each lobe is particularly difficult in bilobulated aneurysms with narrow isthmus in the fused portion. In this report, we describe a successfully treated bilobulated aneurysm using a modified coil protection technique with stent assistance.

Case report

An 85-year-old female presented with sudden-onset headache. Her past medical history included hypertension, diabetes mellitus, and long-term kidney disease at stage III. Brain computed tomography showed subarachnoid hemorrhage with intraventricular hemorrhage (Fig. 1A). Magnetic resonance imaging showed bilobulated aneurysms at the origin of the posterior communicating artery (Fig. 1B). Magnetic resonance angiography reveals tortuous brachiocephalic and internal carotid arties on the right side. A catheter angiography revealed bilobulated aneurysm of the posterior

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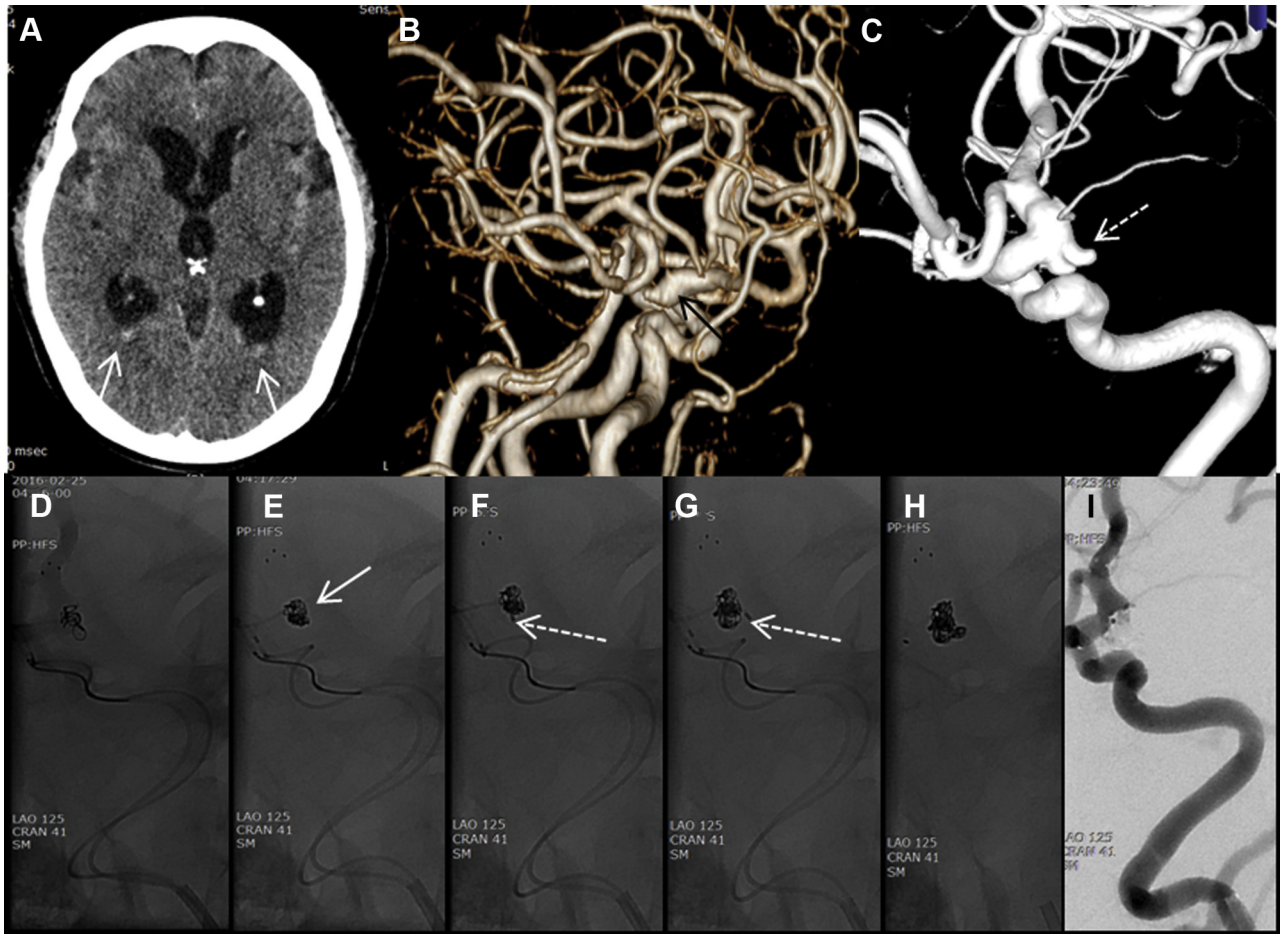

Fig. 1 – (A) Brain computed tomography shows subarachnoid hemorrhage with intraventricular hemorrhage (white arrows). (B) Magnetic resonance angiography showed aneurysmal dilatation of the posterior communicating artery (black arrow). (C) Rotational 3-dimensional angiography reveals bilobulated aneurysm of posterior communicating artery (white dotted arrow). (D) After deployment of a 4 mm × 20 mm solitaire FR stent, jailing or coil through techniques using 2 mm-3 mm sized MICRUSPHERE CERECYTE coils were attempted to fill the upper or lower lobes of the aneurysm, but failed. (E) Instead of deploying a coil in each lobe first, a framing coil was placed at the isthmus of the fused portion of the bilobulated aneurysms using a 2 mm × 2.5 cm MICRUSPHERE CERECYTE coil (white arrow). (F and G) A microcatheter was positioned at the lower lobe and upper lobes sequentially and additional coils were inserted (dotted white arrows). (H and I) Subtotal occlusion was achieved with minimal contrast filling of the aneurysm neck.

communicating artery. The size of each lobe was 4.3 mm × 2.3 mm and 3.3 mm × 2.5 mm, respectively (Fig. 1C). Coil embolization was performed according to the previously reported method [1]. The initial plan was to place the coil in one lobe of the aneurysm. However, because of the acute angulation of the carotid siphon and poor microcatheter support, the first coil protruded into the parent artery. After deployment of a 4 mm × 20 mm Solitaire FR stent (ev3, Irvine, CA), jailing or coil through techniques [2] using 2 mm-3 mm MICRUSPHERE CERECYTE coils (Codman Neuro, MA) were attempted, but failed due to poor catheter support (Fig. 1D). Instead of first deploying a coil in each lobe, we placed a structural frame at the isthmus of the fused portion of the bilobulated aneurysms using a 2 mm×2.5 cm MICRUSPHERE CERECYTE coil (Fig. 1E). Then, the microcatheter was positioned at the lower lobe and upper lobe sequentially and additional coils were inserted (Figs 1F and G). Subtotal occlusion was achieved with minimal contrast filling of the aneurysm neck (Figs 1H and I). The patient was discharged without neurological deficits.

Discussion

Bilobulated aneurysms remain technically challenging for endovascular treatment due to the difficulty in building a frame coil confined to each lob of the aneurysm. For our patient, several techniques can be considered in terms of the number of microcatheters used or balloon remodeling or stent assistance. First, simple coiling using a single microcatheter can be considered. Kwon et al [3] described detailed strategy for deeply bilobulated aneurysms using a single catheter.

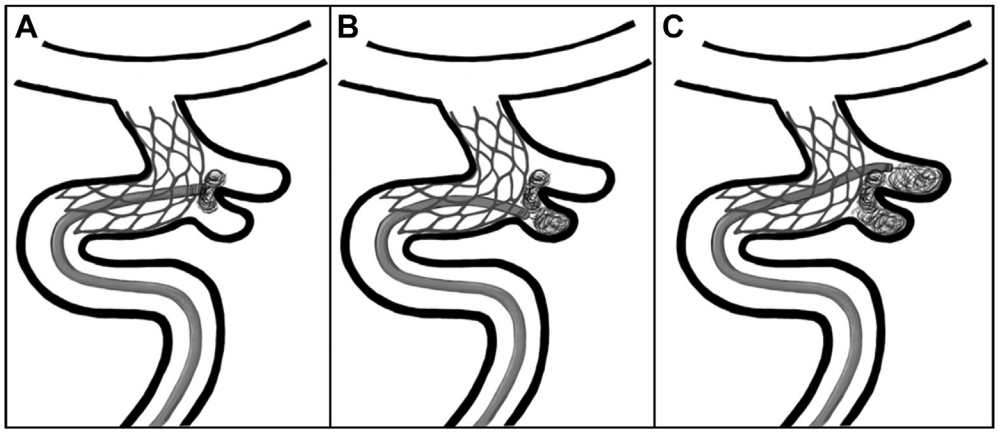

Fig. 2 – Schematic illustration of the stent-assisted modified coil protection technique. (A) A framing coil was made at the isthmus of the fused portion of the bilobulated aneurysms. (B and C) Additional coil embolization was performed through microcatheter positioned at the lower and upper lobes sequentially.

First, they placed the microcatheter 1-2 mm behind the isthmus of the 2 lobes. Second, the first coil loop was positioned within the one lobe. Then, the second coil loop was further positioned in another lobe using a swaying movement of the microcatheter. However, for bilobulated aneurysms with narrow common parts, particularly fused portions like in our patient, such techniques can be inappropriate because of the higher probability of direct tension transmission to the aneurysm wall during coil delivery or catheter movement [3]. Considering the wide neck of the lesion, poor catheter support, and larger parent artery, stent-assisted coil embolization can be more appropriate than a simple coiling or balloon remodeling technique.

Poor navigation through the tortuous arteries is responsible for stent deployment failure. Accordingly, we used a solitaire stent because of its easier repositioning and relatively larger strut size. After deploying a stent, a microcatheter can be placed between the arterial wall and the stent, also known as the jailing technique, or placed though the stent strut [2,4]. First, we tried to place the coil loop into the one lobe using the jailing technique. However, a draw-back of the coil loop from the aneurysm sac to the isthmus was noted, despite use of a smaller coil. The microcatheter was introduced into the lower lobe of the aneurysm through the stent struts. Nevertheless, draw-back of the coil to the isthmus was persistently observed. Accordingly, we decided to fill the coil at the site of isthmus first to prevent coil protrusion from each lobe of the aneurysm. With coil protection, further coil embolization was achieved at each lobe with the placement of a microcatheter. Some physicians recommend the double microcatheter technique after stent deployment. Although the parent artery provided sufficient inner space, placement of two catheters into the each small lobe was technically challenging in our patient because of the acute angulated carotid siphon and poor navigation capabilities of the microwire and microcatheter.

Two types of coil protection techniques have been reported for securing acutely angulated branching vessels in treating wide-neck aneurysms [5,6]. First, transient partial deployment of a small helical coil at angulated arteries can be used as a method of protection before the main coiling for the aneurysm sac [5]. After coiling, the helical coils were retrieved to confirm the stability of the framing coil. Second, a protective coil can be deployed within the sac at the opposing pole of the aneurysms to prevent coil protrusion to the angulated vessels in patients with wide-neck aneurysm [6]. For our patient, we modified the coil protection technique that had been previously reported: coiling at the isthmus of the aneurysms as protection and further coiling at each lobe by repositioning of a microcatheter through the stent struts (Fig. 2).

Conclusions

In summary, we present a successfully treated bilobulated aneurysm using a modified coil protection technique with stent assistance. Certainly, we do not advocate this technique as a routine first-line strategy for the treatment of bilobulated aneurysms. However, when physicians fail to fill the aneurysms with customary methods, in particular, narrow isthmus of the fused portion of bilobulated aneurysms with acute angulation of carotid siphon and poor microcatheter support in elderly patients, stent deployment, and subsequent coil protection techniques may be considered.

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