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Dorsal Internal Carotid Artery Aneurysm Treated by Coil Embolization

—Case Report—

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Abstract

A 50-year-old male presented with an extremely rare dorsal wall aneurysm of the internal carotid artery manifesting as intracerebral hemorrhage. Computed tomography demonstrated intracerebral hemorrhage on the frontal base. Magnetic resonance imaging clearly showed the hemorrhage was related to an aneurysm of the internal carotid artery. Cerebral angiography disclosed an elongated aneurysm of the dorsal wall of the internal carotid artery. The aneurysm was packed as fully as possible with Guglielmi detachable coils to achieve complete obliteration. The patient was discharged without neurological deficits. Dorsal internal carotid artery aneurysms have a high risk of premature rupture due to their unusual shape and position, adhesion to the brain tissue, and fragile neck. Direct clipping requires careful brain retraction, necessary exposure of the aneurysm, and gentle neck manipulation. Endovascular treatment is an alternative method for obliteration of the aneurysmal sac.

Key words: cerebral aneurysm, embolization, internal carotid artery, hemorrhage

Introduction

Aneurysms of the dorsal wall of the internal carotid artery (ICA) are rare, but are important to recognize because of the difficulty of clipping due to their shape and their location. These aneurysms are usually detected as an incidental finding or after subarachnoid hemorrhage. The dome of the aneurysm is rarely contiguous with the pia of the frontal or temporal lobe, so intracerebral rupture can develop in the dorsal wall aneurysm of the ICA. These aneurysms are usually small and fragile, and require special care to prevent premature rupture. We report a case of dorsal wall aneurysm treated by endovascular coil embolization.

Case Report

A 50-year-old man was admitted to the CHA Hospital after onset of severe headache and altered mental status followed by loss of consciousness. On admission he was hypertensive and drowsy but responded to commands. He had no focal neurological deficit and no neck stiffness. There was no relevant past medical history.

Computed tomography demonstrated intracerebral hemorrhage at the frontal base and slight enhancement around the hemorrhage, but no subarachnoid hemorrhage (Fig. 1). Magnetic resonance imaging showed a vascular lesion protruding from the ICA and extending into the base of the hemorrhage (Fig. 2A). Cerebral angiography disclosed a vertically elongated aneurysmal dilatation of the dorsal wall portion of the ICA, which projected upwards with the ruptured tip (Fig. 2B). We selected endovascular embolization with Guglielmi detachable coils (GDCs) rather than direct clipping because of the risk of intraoperative aneurysmal rupture during frontal retraction and the presentation with intracerebral hematoma without subarachnoid hemorrhage.

On the day after the occurrence of bleeding, endovascular treatment was performed under the general anesthesia. The aneurysm was packed as fully as possible with GDCs (Boston Scientific, Natick, Mass., U.S.A.) to achieve complete obliteration via a Prowler-10 microcatheter (Fig. 3). Twelve coils were used: two soft 4 mm × 10 cm GDC-10, two soft 4 mm × 8 cm GDC-10, two soft 4 mm ×

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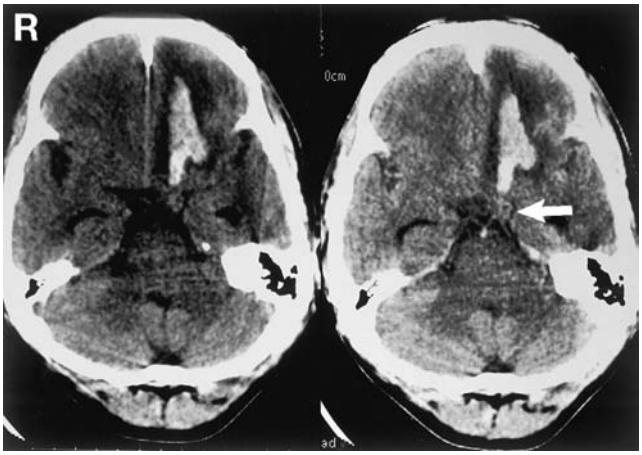

Fig. 1 Computed tomography scans demonstrating intracerebral hemorrhage on the frontal base and slight enhancement (*arrow*) around the hemorrhage.

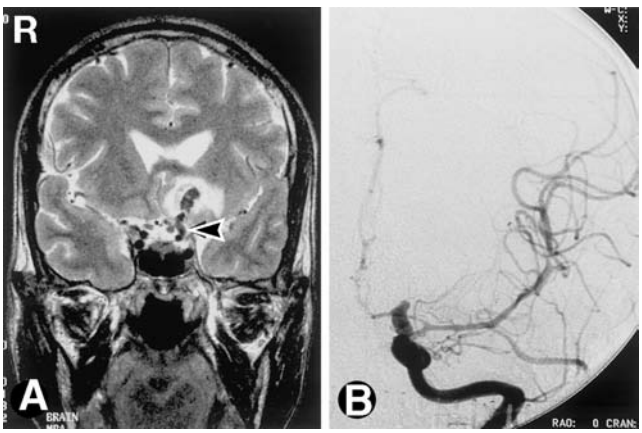

Fig. 2 A: Magnetic resonance image revealing a vascular lesion (*arrowhead*) protruding from the internal carotid artery and extending into the base of the hemorrhage. B: Left internal carotid angiogram disclosing a vertically elongated aneurysmal dilatation of the dorsal wall portion of the internal carotid artery.

6 cm GDC-10, one soft 3 mm × 12 cm GDC-10, one soft 5 mm × 15 cm GDC-10, one soft 2 mm × 6 cm GDC-10, two soft 2 mm × 4 cm GDC-10, and one soft 2 mm × 2 cm GDC-10.

The patient made an uneventful postoperative recovery. Postoperative angiography at 10 days showed no residual lumen in the aneurysm. The patient is being followed up in the outpatient clinic.

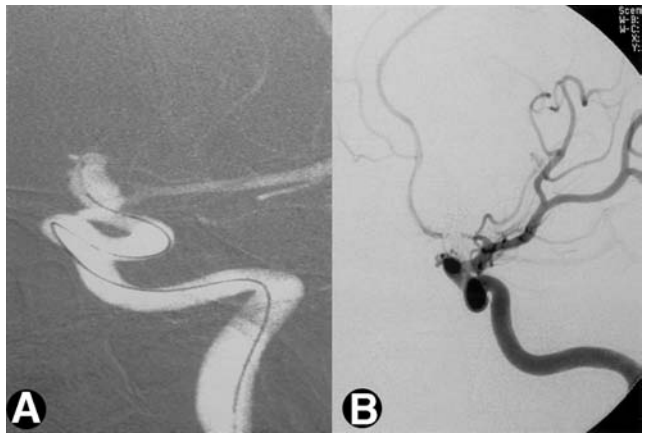

Fig. 3 A: Superselective angiogram showing the Guglielmi detachable coils in the aneurysm. B: Oblique left internal carotid angiogram, obtained 10 days after treatment, showing that the aneurysm is completely occluded.

Discussion

Different classifications of ICA aneurysms have been reported.[8,11,12] However, aneurysms of the ICA should probably be classified according to the affected arterial wall, i.e. medial, lateral, ventral, or dorsal.[2] Aneurysms arising from the dorsal wall of the ICA are rare.[1–3,5,7,9] Dorsal ICA aneurysms usually manifest as subarachnoid hemorrhage after rupture.[1,7,9] Subarachnoid hemorrhage tends to diffuse quickly throughout the cisterns, but more focal cisternal or parenchymal hematomas may occur and are helpful in localizing the bleeding source. Blood in the sylvian fissure may be due to an aneurysm on the ipsilateral ICA, posterior communicating artery, or middle cerebral artery, whereas focal interhemispheric blood is usually due to an anterior communicating artery aneurysm. Blood in the frontal base, especially the rectus gyrus as in our case, frequently originates from ruptured anterior communicating artery aneurysm. Our case was unusual as the origin was a dorsal ICA aneurysm. This unique hemorrhagic pattern was closely related to the direction and pial adhesion of the dorsal ICA aneurysm. Preoperative angiographic findings can be classified into three types: Type 1 aneurysms projecting superiorly on the lateral angiogram and adhering to the base of the frontal lobe; Type 2 aneurysms superimposed on the ICA on the lateral angiogram and adhering to the medial surface of the temporal lobe; and Type 3 aneurysms not seen on the angiogram and with no adhesion.[9] Therefore, intracerebral hemorrhage can occur in the frontal or temporal lobe with elongated

aneurysms. Our case is a typical manifestation of Type 1 without subarachnoid hemorrhage.

Dorsal ICA aneurysms have high risk of premature rupture due to their unusual shape and position, adhesion to the brain tissue, and fragile neck and are difficult to clip.[1,9] Dissection of the sylvian fissure and exposure of the aneurysm should be performed more carefully than for other aneurysms. Wide opening of the sylvian fissure is important to obtain the necessary exposure of the aneurysm complex when either the frontal or temporal lobe cannot be retracted because of the adhesion.[1,3,5,7,9] Subpial dissection and/or resection at both the frontal and temporal regions in contact with the sac is a technical key point for surgery. Additionally, the clip is best placed on the neck parallel to the parent artery, including the neck and part of the parent artery within the clip blades for blister aneurysms.[9] Preliminary exposure of the cervical ICA is advisable, especially when the aneurysm is located proximally. The mortality due to dorsal ICA aneurysms with rupture is 57%.[3] The overall mortality of dorsal ICA aneurysms is about 20%.[3]

Endovascular treatment is an alternative method for obliteration of the aneurysmal sac because of the relatively high mortality for surgery. The recent morbidity and mortality of the endovascular approach have been equal to or better than published surgical series of paraclinoid aneurysms.[4,10] ''Blister-like'' dorsal ICA aneurysms are important to recognize and are difficult to manage using traditional surgical approaches, but can be treated by the endovascular approach.[6] Endovascular treatment may also be difficult due to the presence of a wide neck. Timing of angiography is important and recognizing progression of the blister-like aneurysm to a saccular form should prompt consideration of endovascular therapy.[6] Furthermore, the fragile nature of blister-like aneurysms carries the risk of aneurysmal rupture during embolization with GDCs. Tight and dense packing with coils seems to be very dangerous, especially when the wall of the aneurysmal neck is fragile. Soft coils are better than regular coils to reduce the likelihood of aneurysmal rupture during embolization. We used shorter coils in the framework, longer coils for the filling of aneurysmal sac, and the shortest coils for the filling of the residual lumen. The present case of a dorsal ICA aneurysm manifesting as intracerebral hemorrhage on the frontal base was successfully treated with embolization by GDCs. Endovascular treatment should be considered for the management of dorsal ICA aneurysms.

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Commentary on this paper appears on the next page.

Commentary

The authors used the term ''dorsal internal carotid artery aneurysm.'' Nomenclature of this unique internal carotid aneurysm has been controversial.[2]

Nakagawa et al. (ref. 7 of this article) first called attention to this type of aneurysms and described it as an aneurysm protruding from the ''dorsal'' wall of internal carotid (IC) artery. The term IC dorsal (wall) aneurysm became to be widely used, at least in Japan. However, these unique aneurysm arises at the ''anterior'' or ''superior'' wall of the IC artery as seen on arteriography. The case of this report is exactly same in its origin and shape of the lesion with those reported. The surgical view may have given a wrong impression to the surgeon.

Sano[1] *pointed this out and proposed the nomenclature of the IC ''anterior'' wall aneurysm.*

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There have been several classifications for ICA aneurysms. These ICA aneurysms were classified according to the location of aneurysms in relation to the cross section of the ICA as either lateral, medial, ventral, or dorsal type. Also according to the their location in relation to the long axis of the ICA, another set of classification was made as either proximal, middle, or distal in type (ref. 5 of this article). The term IC dorsal wall aneurysm became to be widely used in Korea. The term of ''anterior'' or ''superior'' IC aneurysm is not frequently used in Korea, which terminology may be classified according to their origins and projections on angiography. We agree with that the old classifications may give wrong impression to the surgeons. We think that the schematic classification for ICA aneurysm is necessary with the common consensus.

Thank you for kind comment.

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