A Case of Good Outcome in Endovascular Treatment against an Undecided in True or Pseudo Aneurysm

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Objective: We report a case in which coil embolization was selected for an aneurysm that caused subarachnoid hemorrhage but was difficult to judge whether it was true or false.

Case Presentations: A 78-year-old woman presented with severe subarachnoid hemorrhage. A wide-necked aneurysm was observed in the dilated internal carotid artery. We suspected senile atherosclerotic change, but blood blister-like aneurysm was also considered possible from the aneurysm morphology and dilation of the parent artery. Conservative treatment was initially selected, but as enlargement was noted in part of the aneurysm, coil embolization was performed as an emergency procedure, resulting in a stable postoperative course.

Conclusion: In case of urgency, endovascular treatment may be a permissible option when the judgment of whether the aneurysm is true or false is difficult.

Keywords: arteriosclerosis, blood blister-like aneurysm, coil embolization, internal carotid artery, subarachnoid hemorrhage

Introduction

Patients who do not tolerate highly invasive treatments for reasons including old age but tolerate endovascular treatment are increasing with improvements in devices and techniques. However, a weak point of endovascular treatment is that the treatment is carried out without checking the lesion under direct vision.

Treatment of cerebral aneurysms markedly differs according to whether they are true or false. If the judgment of whether an aneurysm is true or false is difficult by preoperative examination, it is usually considered optimal to examine the lesion under direct vision by craniotomy and select the appropriate treatment.

We, however, performed coil embolization of a ruptured cerebral aneurysm difficult to judge whether it was true or false as an emergency safety measure in consideration of the clinical condition and course of the patient.

Case Presentations

Patient background: The patient was a 78-year-old woman who suddenly developed headache. She had a history of hospitalization due to heart failure. Twenty years before the present episode, she underwent clipping for ruptured aneurysm of the right posterior communicating and internal carotid arteries.

History of the present illness: She suddenly developed headache and was transported to our hospital by ambulance. She was stuporous and showed mild left hemiplegia and moderate respiratory insufficiency associated with heart failure.

Imaging findings on admission: Cranial CT scans showed marked calcification of the wall of the bilateral internal carotid arteries and left-sided diffuse subarachnoid hemorrhage as well as findings of right craniotomy (Fig. 1A). Cranial 3D-CTA showed dilation of the left intracranial internal carotid artery and a wide-necked aneurysm with a small protrusion on its dorsal wall (Figs. 1B and 2A). CT scans of the trunk showed calcification and meandering of the abdominal aorta (Fig. 1C).

Treatment plan on admission: A diagnosis of Hunt & Hess grade IV subarachnoid hemorrhage was made. The source of hemorrhage was judged to be the aneurysm on the dorsal side.
of the left internal carotid artery. This aneurysm was considered to be a true aneurysm associated with atherosclerotic change, but its site and shape also suggested the possibility that it was part of a fusiform aneurysm of the internal carotid artery, that is, an unusual aneurysm such as a false aneurysm. Conservative treatment was selected because of the general condition including heart failure in addition to the vagueness of the pathology of the source of hemorrhage.

Course after admission: Management of heart failure was performed along with strict blood pressure control using sedation for the prevention of re-bleeding. On cerebral angiography performed on the 14th hospital day, part of the aneurysm was enlarged (Fig. 2B), and re-bleeding was judged to be imminent. Since emergency treatment for the prevention of re-rupture was considered necessary, coil embolization was performed after relief of heart failure (on the 24th hospital day).

Endovascular treatment: Marked meandering of the abdominal aorta was observed, and the common carotid artery was punctured under direct vision. Under general

Fig. 1  (A) Brain CT scan on admission, showing a thick and diffuse subarachnoid clot predominantly on the left side, and there are multiple calcifications on the bilateral ICA. (B) Body CT scan, demonstrating severe tortuosity and calcification of abdominal aorta. (C) 3D-CTA of intracranial arteries anteroposterior view, revealing broad-based aneurysm arising from the ectatic ICA. ICA: internal carotid artery
aneurysm was wide-necked, time was needed for framing. Throughout the procedure, attention was paid to the escape of the coil into the parent artery, Ultra, which is another Target coil, was placed for filling in consideration of the possibility of a false aneurysm, and the remaining cavity was packed with a flexible ED coil-10 Extra Soft (Kaneka, Osaka, Japan). As tight packing of the aneurysm cavity was obtained, the procedure was ended (Figs. 3A and 3B).

Course after embolization: Rehabilitation was performed while strict blood pressure control was maintained, and the condition improved to a level at which oral feeding was possible. The patient was discharged in a state of modified Rankin Scale grade 4 to a recuperation facility. Cerebral anesthesia, an incision was made in the cervical region, a 6 Fr sheath was placed in the left common carotid artery under direct vision, and systemic heparinization was initiated. A 6 Fr FUBUKI (Asahi Intecc, Aichi, Japan) was placed in the left internal carotid artery. Since the parent artery was dilated, a stent- or balloon-assist technique was judged to be difficult to perform, and the double catheter technique was planned. However, the attempt was abandoned because of strong interference by the two catheters, and coil embolization was carried out by the simple technique using Excelsior SL-10 45° (Stryker, Kalamazoo, MI, USA). Framing was performed using a Target 360 soft 6 mm × 10 cm (Stryker, Kalamazoo, MI, USA). Since the aneurysm was wide-necked, time was needed for framing. Throughout the procedure, attention was paid to the escape of the coil into the parent artery, Ultra, which is another Target coil, was placed for filling in consideration of the possibility of a false aneurysm, and the remaining cavity was packed with a flexible ED coil-10 Extra Soft (Kaneka, Osaka, Japan). As tight packing of the aneurysm cavity was obtained, the procedure was ended (Figs. 3A and 3B).

Course after embolization: Rehabilitation was performed while strict blood pressure control was maintained, and the condition improved to a level at which oral feeding was possible. The patient was discharged in a state of modified Rankin Scale grade 4 to a recuperation facility. Cerebral
angiography performed three months after the onset (Fig. 3C) showed no re-enlargement, and there is no sign of re-bleeding at present 6 months after the onset.

## Discussion

The aneurysm of this patient is characterized as a wide-necked aneurysm occurring at a nonbranching site. Moreover, calcification and dilation of the internal carotid artery, which was the parent artery, were important findings for treatment designing. The patient was aged and had markedly tortuous aorta, and the presence of advanced atherosclerosis was suspected in the background. Therefore, it is appropriate to consider that atherosclerotic change is the essence of the aneurysm and the lesion in the internal carotid artery, which was the parent artery, in this patient. Although calcification and dilation of the internal carotid artery in elderly patients are features frequently encountered in daily clinical practice, there has been no report of the occurrence of subarachnoid hemorrhage concurrent with aneurysm-like vascular dilation.

In this patient, however, the site and shape of the aneurysm suggest the necessity of considering the possibility of a blood blister-like aneurysm (BBA). BBA of the internal carotid artery is a rare lesion arising in the anterior or dorsal wall of a nonbranching segment of the internal carotid artery. In images, it is characterized by a small size, semi-spherical shape, wide-necked swelling, and irregular protrusion, and is classified pathologically as a type of false aneurysm. Common saccular aneurysms that cause subarachnoid hemorrhage are so-called true aneurysms, and as their wall consists of one to two layers of the normal blood vessel, they can be treated by clipping and coil embolization. However, as false aneurysms are lesions in which the defect of the vascular wall is covered by thin fibrous tissue alone, the risk of intraoperative bleeding and re-bleeding is high if they are treated similarly to true aneurysms. Therefore, highly invasive treatments involving a sophisticated technique, such as trapping and bypass, are necessary for the treatment of false aneurysms such as BBA. Since the treatment strategy differs greatly depending on whether the lesion is a true or false aneurysm, the preoperative diagnosis is vital, but it is considered difficult to exclude BBA by preoperative diagnostic imaging. Indeed, there have been reports of lesions that were preoperatively diagnosed as BBA but were confirmed to be true aneurysms under direct vision by craniotomy and treated by clipping. Such cases were reportedly characterized by the relatively old age of the patient and a large size of the lesion compared with BBA despite the appearance suggestive of BBA. These features are consistent with the findings in our patient, who was old and had a relatively large aneurysm. Thus, the supposition of the aneurysm in our patient to be BBA may not be justified.

The validity of treating the aneurysm in our patient by coil embolization on the assumption is that the BBA is examined. Park et al. reported that re-bleeding or re-enlargement occurred in all patients treated by coil embolization for BBA and maintained that the procedure is a palliative measure to allow the patient to survive the acute period rather than a radical treatment. On the other hand, there have also been reports that emergency coil embolization performed for saccular aneurysms that were apparently BBA resulted in a favorable long-term course without re-enlargement, similar to our patient. However, our patient differed from other reports in that change by clipping. These reports suggest the validity of coil embolization for patients with BBA lesions.

Three cases in which coil embolization was performed for BBA in elderly patients aged 60 years and above have been reported (Table 1). These cases resemble ours in that they were treated in the chronic period and had no recurrence, and these are considered to be characteristics of elderly patients. However, the functional outcome was not necessarily favorable except in one patient, probably reflecting the severity at the onset.

### Table 1

<table>
<thead>
<tr>
<th>Case</th>
<th>Age</th>
<th>Sex</th>
<th>H &amp; H grade</th>
<th>Assist technique</th>
<th>Treatment period</th>
<th>Recurrence</th>
<th>Clinical outcome</th>
</tr>
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<td>1</td>
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<td>F</td>
<td>IV</td>
<td>Balloon</td>
<td>Chronic</td>
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<td>GR</td>
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<tr>
<td>2</td>
<td>76</td>
<td>F</td>
<td>III</td>
<td>Balloon</td>
<td>Chronic</td>
<td>None</td>
<td>MD</td>
</tr>
<tr>
<td>3</td>
<td>63</td>
<td>F</td>
<td>IV</td>
<td>Simple</td>
<td>Chronic</td>
<td>None</td>
<td>MD</td>
</tr>
<tr>
<td>Present</td>
<td>78</td>
<td>F</td>
<td>IV</td>
<td>Simple</td>
<td>Chronic</td>
<td>None</td>
<td>MD</td>
</tr>
</tbody>
</table>

BBA: blood blister-like aneurysm; Chronic: after 14 days after onset; GR: good recovery; H & H: Hunt and Hess; ICA: internal carotid artery; MD: moderate disability
When whether an aneurysm is true or false cannot be determined, it is considered optimal to make preparations for surgery that can cope with either situation and to check the condition under direct vision. However, since this patient was aged and had severe generalized atherosclerosis in addition to heart failure accompanied by respiratory failure, appropriate management was expected to be difficult for patients with a false aneurysm. Therefore, palliative therapy was initially selected, but as part of the aneurysm enlarged, emergency endovascular treatment was performed. Since the definitive diagnosis of aneurysm is made under direct vision by craniotomy, the discussion about the category of the aneurysm in this patient can only be speculative. However, with the development of endovascular treatment of the brain, successfully treated cases are expected to increase even if the preoperative judgment of whether the lesion is a true or false aneurysm is difficult. Under such circumstances, treatment may not be performed as expected in some patients, and discussion about similar cases will continue to be necessary.

Disclosure Statement

There are no conflicts of interest to disclose concerning this paper.

References


