Case Report

Morphological Change of Cerebral Aneurysm with Possible Pseudoaneurysm at A2/3 of the Anterior Cerebral Artery on Three-dimensional Computed Tomographic Angiography

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Abstract

Intracranial pseudoaneurysm formation due to a ruptured nontraumatic aneurysm is rare. We describe a case of ruptured aneurysm, which showed morphological change on radiological examinations. An 83-year-old woman developed subarachnoid hemorrhage (SAH) with ventricular rupture and intracerebral hematoma in the corpus callosum. Contrast-enhanced computed tomography (CE-CT) demonstrated an aneurysm at the right A2/3 junction of the anterior cerebral artery. CE-CT repeated 17 h after the initial one showed shortening of the lesion on both three-dimensional and raw images. The aneurysm was surgically clipped. In cases of SAH with a hematoma or thick SAH, there is a possibility that a pseudoaneurysm will form at the tip of the true aneurysm in an adjacent thrombus or existence of intraluminal thrombus. The morphology may change during the period between initial radiological evaluation and the operation in these cases. We should be aware that the intraoperative findings or subsequent radiological findings might be different from those observed on preoperative radiological examinations.

Keywords: *Cerebral aneurysm, morphological change, pseudoaneurysm, subarachnoid hemorrhage, three-dimensional computed tomographic angiography*

Introduction

Radiological countenance may change in cases of cerebral aneurysms accompanied with pseudoaneurysm or intraluminal thrombus.

Pseudoaneurysms usually result from trauma, mycotic infection, vessel dissection, or congenital collagen deficiency.[1-3] We previously reported a case of pseudoaneurysm in a thrombus located at the rupture site of a cerebral aneurysm for the first time.[3] Since then, several reports describing pseudoaneurysm formation after aneurysmal rupture have been published.[4-12] However, intracranial pseudoaneurysm formation due to a ruptured nontraumatic aneurysm is still rare and remains to be clarified.[3-12] In cases with subarachnoid hemorrhage (SAH), a pseudoaneurysm sometimes forms at the tip of the ruptured cerebral aneurysm.[3,13]

Recently, we treated a patient presenting with SAH due to a ruptured aneurysm at the A2/3 junction of the anterior cerebral artery (ACA). In this case, morphological change was observed on raw and three-dimensional images of serial contrast-enhanced computed tomography (CE-CT). In this report, we describe the radiological findings and management of a possible pseudoaneurysm showing morphological changes on serial examinations.

Case Report

An 83-year-old woman with a history of hypertension lost consciousness after complaining of vertigo. On arrival, she was unconscious. Computed tomography (CT) demonstrated SAH with ventricular rupture and an intracerebral hematoma in the corpus callosum [Figure 1a]. Three-dimensional computed tomographic angiography (3D-CTA) demonstrated an aneurysm at the right A2/3 junction of the ACA [Figure 1b]. The aneurysm showed an elongated shape of 9.5 mm in length. The aneurysm configuration was composed

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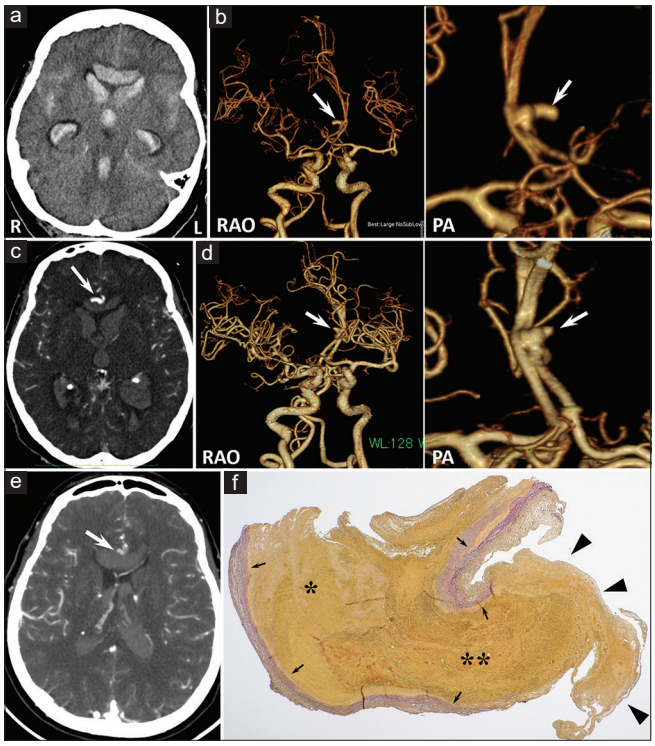

Figure 1: (a) Computed tomography demonstrating subarachnoid hemorrhage and hematoma around A2/3 of the anterior cerebral artery. (b) Three-dimensional computed tomographic angiography showing a cylindrical aneurysm at A2/3 (arrow). The right panel shows enlarged posteroanterior view of the aneurysm. RAO; right anterior oblique view. (c) A raw image of contrast-enhanced computed tomography also demonstrating a long aneurysm (arrow). Computed tomography obtained 17 h after the initial computed tomography showing shortening of the lesion on both three-dimensional computed tomographic angiography (d) and a raw image (e). (f) Microphotograph of the specimen demonstrating the lack of elastic fibers and partial disruption of collagen fibers (arrows). The lesion is composed of fibrous components (asterisk) and a thrombus (double asterisks), being consistent with a ruptured cerebral aneurysm. Arrowheads indicating the rupture point. Elastica van Gieson stain

of a proximal oval portion adjacent to the parent artery and extending the cylindrical portion [Figure 1b]. A raw image of CE-CT also demonstrated a relatively long aneurysm [Figure 1c]. A spinal drainage tube was inserted to control hydrocephalus. Clipping of the aneurysm was planned to be performed on the next day.

CE-CT was conducted to evaluate the aneurysm and the condition of SAH just before the surgery. Repeated CT 17 h after the initial CT showed a shortening of the lesion on both 3D-CTA and raw images [Figure 1d and e]. The proximal oval portion of the aneurysm showed no change in size or shape. On the other hand, the thin distal portion showed shortening. The total length of the aneurysm was approximately 6.0 mm.

Bilateral frontal craniotomy was performed. The aneurysm was found on the right ACA protruding rightward. It was embedded in the right frontal lobe. The aneurysm neck was dissected and exposed, and the aneurysm was clipped. After clipping, the aneurysm was dissected from the brain. The aneurysm dome, demonstrating an oval shape on 3D-CTA, was fully exposed. However, the thin extended distal portion could not be found. The aneurysm was incised and underwent a pathological examination. The cross-section of the aneurysm showed a laminar structure with an intra-aneurysmal thrombus. Pathological examinations revealed a defect of elastic fibers and partial disruption of collagen fibers [Figure 1f]. These findings were consistent with a ruptured cerebral aneurysm.

On the 35th day, the right ventriculoperitoneal shunt was performed. On the 83rd day, she was transferred to another hospital for rehabilitation due to disuse syndrome.

Discussion

We previously reported pseudoaneurysm formation at the tip of a ruptured cerebral aneurysm.[3,13] Regarding radiological findings, it shows delayed opacification, an irregular shape, and retention of contrast medium on angiography and 3D-CTA.[5,13] According to the development of CT, a cerebral aneurysm can be surgically treated based on radiological information from only 3D-CTA. In our case, the shape of the aneurysm demonstrated on CT changed over 17 h. The aneurysm was located adjacent to the hematoma. Therefore, the distal portion of the aneurysm showing morphological change might have been a pseudoaneurysm formed in the hematoma. At the second examination, the pseudoaneurysm cavity was partially occluded. The whole lesion became short. The true portion of the aneurysm might have been the proximal oval part of the aneurysm continuing from the parent artery, and this portion did not show any change in size or shape. In our case, although angiography was not performed, it may have shown the same findings. Although it is not common for radiological evaluations to be repeated during the preoperative period, there is a possibility that the radiological appearance and actual configuration of aneurysms might show a discrepancy in cases with pseudoaneurysms.

The pseudoaneurysm portion does not have a vascular wall and is fragile. Therefore, there is a risk of aneurysm rupture during angiography. Furthermore, manipulation of the pseudoaneurysm portion should be avoided during surgery. In our case, the true aneurysm neck was exposed before manipulation of the aneurysm dome continuing to the pseudoaneurysm. Therefore, premature rupture by manipulation of the pseudoaneurysm could be avoided. However, if the pseudoaneurysm is located closer to the operator than the true portion in the operative field, care should be taken to gently manipulate the fragile pseudoaneurysm. We previously reported the case of a ruptured aneurysm with a pseudoaneurysm at the same location.[13] In that case, preoperative 3D-CTA clearly showed a round-shaped lesion with a proximal stem-like portion. The pseudoaneurysm was located shallow in the operative field and it showed premature rupture. Furthermore, the intraoperative findings were different from the preoperative radiological findings. In the present

case, the aneurysm was completely dissected from the surrounding brain after clipping. The form was not long as shown in radiological examinations. It showed an oval shape with an aneurysmal wall component. Cross-section of the aneurysm showed layered structures and an intramural thrombus. This portion may have been the true aneurysm. Pathological examination of the aneurysm revealed that the lesion was consistent with a ruptured cerebral aneurysm. These findings showed that the pseudoaneurysm portion was not contained in the sample. Only the true portion of the aneurysm was dissected.

Other than a pseudoaneurysm, in a case of the cerebral aneurysm with intraluminal thrombus, it might show morphological changes on preoperative radiological examinations. Intraoperative images are missing due to recorder problem in this case. Therefore, we cannot indicate the aneurysm countenance observed during operation. However, intraoperative observation indicated that proximal portion had definite aneurysm wall and distal portion demonstrated on 3D-CTA did not exist. If the distal portion was true aneurysm, aneurysm wall continuing from the proximal portion could be found. Pathological examinations showed disruption of collagen fibers at the tip of resected specimen. The pseudoaneurysm formed in hematoma has no vascular wall, and it is a cavity in the thrombus. Therefore, we diagnosed this lesion as an aneurysm with pseudoaneurysm. However, there is a possibility that intraluminal thrombus was formed in the aneurysm, and it extended to the proximal side. Whether the aneurysm accompanied with pseudoaneurysm or intraluminal thrombus, the morphological change was induced by the extension of thrombus resulted in shortening of the lesion in our case.

Conclusions

In cases of SAH with a hematoma or thick SAH, there is a possibility of pseudoaneurysm formation at the tip of the true aneurysm in the adjacent hematoma. In such a case, the shape or size might change during the period between initial radiological evaluation and repeated examination or surgery. Therefore, we should be aware that the intraoperative findings might be different from those observed on preoperative radiological examinations.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed

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Conflict of interest

There are no conflicts of interest.

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