CASE REPORT

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Extravasation from the Distal Anterior Choroidal Artery Aneurysm in Moyamoya Patient during Computed Tomographic Angiography

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Three-dimensional computed tomographic angiography (CTA), a representative noninvasive radiologic technique, is being widely used for detecting vascular lesions in specific intracranial bleeding under a certain circumstance (acute nontraumatic subarachnoid hemorrhage). We encountered a case of extravasation of the contrast medium on CTA images that appeared as ribbon-like high-attenuation lesion from an aneurysm at the distal anterior choroidal artery in a young adult moyamoya patient. As CTA is used more frequently, it is imperative to understand such unusual but, potentially lethal image findings to conduct a prompt intervention.

KEY WORDS : Aneurysm · Computed tomographic angiography · Distal anterior choroidal artery · Extravasation · Moyamoya disease.

Introduction

In contrast to the catheter angiography, contrast medium is injected into a peripheral vein during computed tomographic angiography (CTA). Accordingly, extravasation or intra-procedural rupture from an aneurysm is an extremely rare incident during CTA, when compared to that of the intra-arterial catheter angiography[3,10,11]. In moyamoya patients, ruptured aneurysms arising in distal collateral vessels (choroidal arteries) are quite infrequent and cause surgical complexity due to important and delicate anastomotic channels in acute hemorrhagic conditions, mainly because of fragile vascular structures (false aneurysm) and pre-existing transdural collaterals from the external carotids[1,7]. We herein briefly present our case of contrast extravasation from the peripheral aneurysm in a moyamoya patient during CTA with discussion on the meanings of such infrequent radiographic findings in clinical perspectives.

Case Report

A 31-year-old woman previously healthy, unmarried physician, presented with sudden unconsciousness during exertion at restroom. She has been suffering from headache and vomiting for about 1 hour prior to the admission. She was brought to the emergency room with profoundly stuporous, quadriparetic (grade III/grade II) state and showed non-reactive dilated pupils bilaterally. Her blood pressure and pulse rate were both significantly altered, 190/120 mmHg and 115/min respectively. The patient had neither notable past medical history nor specific family history.

A pre-enhanced brain computed tomography (CT) scan showed diffuse hemorrhage within the whole ventricles with resultant ventricular dilatation (Fig. 1A). At that time, she became semicomatous after one more bout of regurgitation and was urgently sent to the operating room for emergency ventriculostomy. Following operation, however, two catheters were immediately plugged with fresh blood clots despite careful repeated flushings and irrigations. A CTA was performed immediately thereafter and showed increased bleeding, an aneurysm (5×4 mm) along the distal anterior choroidal artery (AChA) and a ribbon-like, jet-stream high-density lesion adjacent to the trigone of the right lateral ventricle that was considered as an extravasation (Hounsfield unit; HU 190-280) from the aneurysm (Fig. 1B, C, D). Thus, rebleeding from the aneurysm was strongly suspected.

A second operation was scheduled without hesitation and

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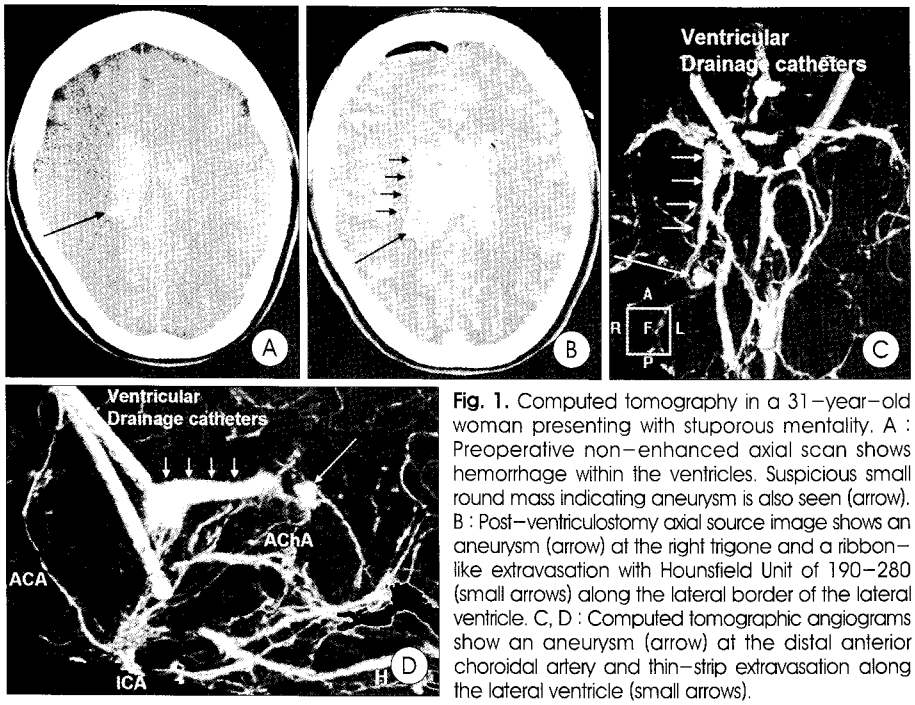

Fig. 1. Computed tomography in a 31-year-old woman presenting with stuporous mentality. A : Preoperative non-enhanced axial scan shows hemorrhage within the ventricles. Suspicious small round mass indicating aneurysm is also seen (arrow). B : Post-ventriculostomy axial source image shows an aneurysm (arrow) at the right trigone and a ribbon-like extravasation with Hounsfield Unit of 190-280 (small arrows) along the lateral border of the lateral ventricle. C, D : Computed tomographic angiograms show an aneurysm (arrow) at the distal anterior choroidal artery and thin-strip extravasation along the lateral ventricle (small arrows).

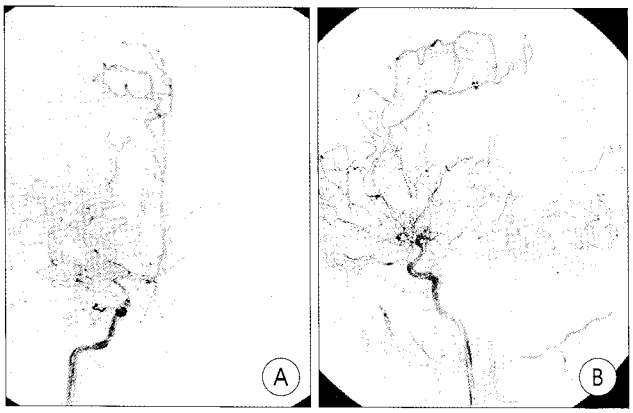

Fig. 2. Right carotid arteriograms, anteroposterior (A) and lateral (B) projections show moyamoya vessels distal to the terminal internal carotid artery and middle cerebral artery. The aneurysm at distal anterior choroidal artery was disappeared.

a wide temporoparietal craniotomy was performed under a general anesthesia. After incising a right fronto-parietal cortex, self retractors were placed on the corresponding cerebral cortices and some hematoma was removed by using gentle suction and irrigation. An aneurysm with bilobular shapes measuring 3×2.5 mm, was discovered at the ventricular entrance of the AChA. With further evacuation of the hematoma, aneurysm was resected after trapping the terminal AChA. Meticulous hemostasis was then followed by closed watertight of operative wound.

The next morning, her vital signs became stable and she showed improved neurological condition. A catheter angiography was done to reveal no residual aneurysm at the right AChA. Additionally, moyamoya vessels were also disclosed bilaterally (Fig. 2). By the 3rd week, she was fully awakened but still had moderate incoordination and gaze paresis. She began to walk at the 8th week postoperatively. After 1 year from the initial presentation, she is now able to walk without other supports, able to talk fluently but still has difficulties in gaze pursuit, delicate finger movement and higher cortical performance.

Discussion

Over the past decade, CTA has been used more often as an initial neurovascular imaging technique owing its rapid acquisition, widespread availability and low risk to patients[12]. This is particularly useful for patients with non-traumatic subarachnoid hemorrhage (SAH) in the acute stage to detect aneurysm and to plan therapeutic interventions[11]. Intra-arterial catheter angiography, however, is still the diagnostic choice because it can provide more useful hemodynamic information and distinguishing vascular trees according to the filling phases, especially if it can be accompanied with three-dimensional reconstruction. In spite of these advantages, catheter angiography has real risk of intra-procedural rupture of the aneurysm ranging from 0.01% to 0.35%[4,9]. Once rebleeding or extravasation happens during catheter angiography, the prognosis is usually poor[9,13]. Such rebleeding occurs most often when angiography is performed within several hours of the onset of the SAH and therefore, a delayed procedure of at least 6 hours after the latest rupture has been recommended to reduce the invasiveness of catheter angiography[4]. Extravasation may be caused by a transient increase in arterial pressure after the injection of contrast media or by intermittent rebleeding at an early phase after the initial rupture of the aneurysm[13]. Catheter angiography causes a transient increase in arterial pressure after contrast injection, whereas CTA is considered unlikely to do so because it is performed with intravenous injection[10]. For this reason, CTA has brought attracted attention as a less invasive technique[5].

We found 3 reports describing intra-procedural rupture of the aneurysm during the CTA and all these cases were involved in acute non-traumatic SAH[3,10,11]. Interestingly, there were several distinct morphological patterns of extravasation; cap sign, corkscrew sign and ribbon-like appearance (nebulous area

of increased attenuation). Unlike to these, there have been no reports of specific patterns of extravasation with regard to the catheter angiography. A "cap sign" is the exact delineation of ruptured fundus, the extravasated contrast medium remains around the aneurysm and accordingly, the ruptured aneurysm appears larger than its actual size such as shown in the current case. But, it should be differentiated with a bleb. A "corkscrew sign" is shown when the extravasated contrast medium spreads around the aneurysm and whorls in the cerebrospinal fluid in the cistern. It is typically seen after intracisternal rupture. And, it also needs to be distinguished from veins of variable thickness[10]. The "ribbon-like appearance" with high attenuation that mimicked vascular structure is seen when aneurysm is ruptured around the ventricles (anterior communicating artery, pericallosal artery). It has a long course traveling through the potential space (subarachnoid cistern and the ventricles). And, the reason why the extravasation of the contrast medium distantly spreads without diffuse spillage may be because the coagulated hematoma and brain parenchyma together comprised a firm tract[11]. Generally, contrast in the vascular lumen or the aneurysm has a value of 150-350 HU, whereas the typical value of acute SAH is about 80 HU. Additionally, blood in the subarachnoid space mixes with cerebrospinal fluid, that further reduces the value in HU[2,3]. In this regard, the ribbon-like appearance of increased attenuation (HU of 190-280) in the present case is comparable to the contrast medium extravasation that spreaded between firm brain parenchyma and the ventricle.

With respect to possible explanations for extravasation in the present case, the most probable one is the extreme fragility of moyamoya vessels at distal collateral vessels (distal AChA). The clinical findings of the distal AChA aneurysms are varying, depending on their locations; periventricular (subependymal) or intraventricular (plexal) rather than in the subarachnoid (cisternal) locations[6,7]. In our case, intraventricular location was considered to be attributable to the current CT findings. Although pathologic specimen was obtained in our case, false aneurysm is deemed responsible when considering clinical features and radiographic findings (size and location)[6,8]. Because of difficult localization and deep location, stereotactic technique is warranted whenever possible and this is further supported that natural anastomotic channels formed by the external carotid systems should be preserved[1,7]. Somewhat aggressive approach in the current case would be justified in the setting of rapidly deteriorating, repeatedly ruptured aneurysm in otherwise young healthy woman.

Conclusion

Although some exceptions exist, patients with the aforementioned CTA findings had grave clinical courses. We, therefore insist that extravasation detected on CTA in the acute stage bleeding may represent the natural progression of a ruptured aneurysm rather than the hemodynamic alteration caused by injection of the contrast medium. It is crucial to properly understand the imaging features of active bleeding on the CTA images and in doing so, prompt intervention should be provided to obtain favorable outcome.

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