Ruptured Distal Anterior Cerebral Artery Aneurysm shows like a traumatic intracranial hemorrhage; case report.

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Introduction

A ruptured cerebral aneurysm in the base of the brain is highly likely to cause a subarachnoid hemorrhage (SAH). Therefore, endogenous SAH is suspected when a computed tomography (CT) scan shows high density in the basal cistern. On the other hand, exogenous intracranial hemorrhage is likely suspected when subdural hematoma (SDH) is accompanied with SAH. However, endogenous SDH due to raptured aneurysms of the distal branch is rare, and the origin of the bleeding is difficult to detect on postmortem plain CT or autopsy. Here, we report a case of suspected traumatic death due to SAH, in which intraventricular hemorrhage and SDH revealed an aneurysm rupture at the distal part of the anterior cerebral artery (ACA) on selective head contrast-enhanced CT.

Case Information

A 72-year-old woman was found dead on the floor of her house in December 2018. She had lived alone and worked 4 days a week in a nursing home. She was found dead by her colleague who visited her because she did not report for work and respond to calls. No evidence of mobile phone use was found for the 2 days before she was reported to dead.

She underwent a surgery for breast cancer in July 2014, which was followed by an anticancer treatment. No cancer recurrencewas observed since September 2018. In addition, she had high blood pressure, cystitis, and central retinal vein occlusion.

Materials and Methods

We performed a selective cerebral CT angiography by injecting contrast medium through a catheter inserted in the left internal carotid artery to perfuse the anterior brain and right vertebral artery in the posterior brain. On autopsy, prior to opening the skull, a 6-Fr catheter was inserted in the left internal carotid artery. The other catheter was inserted in the right vertebral artery on the contralateral side, and both were tightly ligated. Water was then injected in each artery to confirm that the catheters were correctly inserted in the target arteries and to expel any air in the vasculature before the contralateral end was clamped. After preparation in the autopsy room, the body was moved to the CT room. CT scans were performed using a 16-slice multi-detectore CT scanner (ECLOS, Hitachi Medical Systems, Tokyo, Japan). Raw data acquisition was performed at 120 kV, 200 mAs, and a collimation of 1.25 x 16 mm, and image reconstruction was performed at a 1.25-mm slice thickness. The scanning range was set to 275 mm to cover the entry site of the vertebral artery into the vertebral column and the blood vessels at the top of the skull. Non-contrast angiography was performed.. Then, a total of five scans were performed at 2, 25, 48, 71, and 117 s during contrast medium injection. By using two injectors, 25 ml of the same contrast medium was injected in the catheter of the internal carotid artery at a rate of 0.2 ml/s, and 12.5 ml of contrast medium was injected into the catheter of the vertebral artery at a rate of 0.1 ml/s. Therefore, the amounts of contrast medium injected in the body at the aforementioned scan times were 0.6, 7.5, 14.4, 21.3, and 35.1 mL, respectively. The nonionic water-soluble contrast medium iohexol (Omnipaque 300; Daiichi Sankyo Co., Tokyo, Japan) was prepared by dilution in water and polyethylene glycol (contrast medium-to-water-to-polyethylene glycol ratio, 1:5:10). Immediately after scanning, planar and volume-rendering images, which were generated by the CT workstation software, were interpreted by the operator. Image findings were then compared with the corresponding autopsy findings by the dissector. After autopsy, volume renderings were generated again using imaging analysis software (SYNAPSE VINCENT 3D image analysis system; Fujifilm Medical, Tokyo, Japan). The subtraction method was used to visualize blood vessels. In this method, only blood vessels are presented by subtracting the bone information by performing pre- and post-contrast imaging in the same position. The bleeding sites were determined on autopsy, and the brain was removed while injecting milk through the catheters used in the angiography to identify the site of the milk leakage as the bleeding site.

Results

The pre-autopsy CT revealed a high density area throughout the basal cistern. A small hematoma was found in the fourth ventricle, with an intrathecal hemorrhage combined with SAH. It also showed a left-dominant bilateral SDH (Fig. 1). Selective cerebral CT angiography revealed anextravasation from a small aneurysm of the distal ACA (Fig. 2).

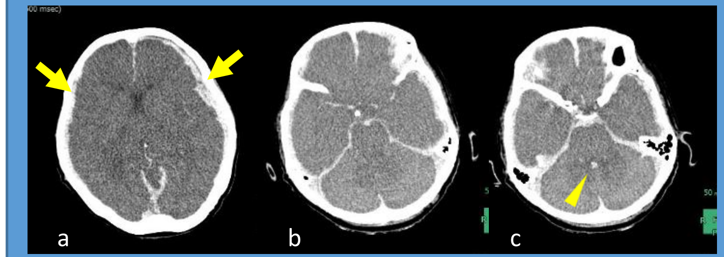

Fig. 1 Pre-autopsy computed tomography image. a) Bilateral subdural hematoma (arrow). b) Subarachtoid hemorrhage throughout the basal cistern. c) A small hematoma in the fourth ventricle (arrow head).

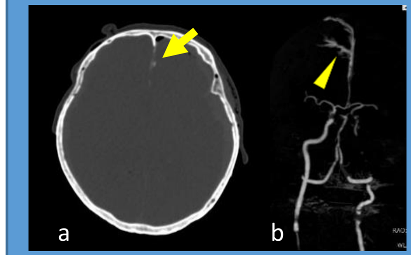

Fig. 2 Selective cerebral computed tomography angiography image. a) Extravasation at the longituidinal cerebral fissure between the frontal lobes (arrow). b) Reconstructed angiography image showing an extravasation from the small aneurysm of the left distalanteriar cerebral artery (arrow head).

In the anatomy, a vascular bulge was found at the peripheral bifurcation of the left ACA, corresponding to the leakage of the contrast medium confirmed using CT. The apex of the ACA aneurysm ruptured, and the milk injected into the blood vessel leaked from that point (Fig. 3). Approximately 83.8 g of hematoma attached under the dura, centering on the surface of the left cerebral hemisphere (Fig. 4a). The brain was slightly swollen, but no obvious cerebral hernia was observed. The patient was thought to have died relatively rapidly on the basis of the autopsy findings of cardiac blood fluidity, mild congestion in various organs, and patechiae. In addition, the findings showed no evidence of external force being applied to the head (Fig. 4b,c). Therefore, the cause of death was considered to be internal SAH due to left ACA aneurysm rupture.

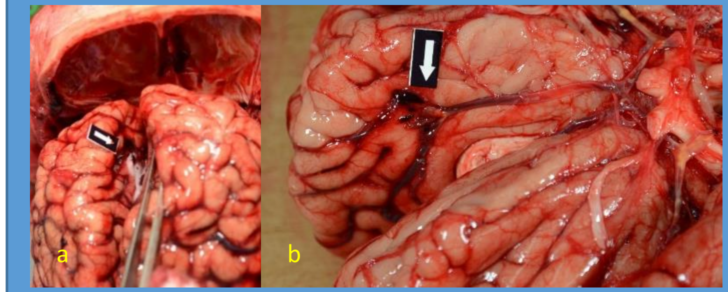

Fig. 3 Autopsy findings of aneurysm. a) Milk leakage from the ruptured distal branch of the anterior cerebral artery (ACA; black arrow). b) Small aneurysm of the ACA (black arrow).

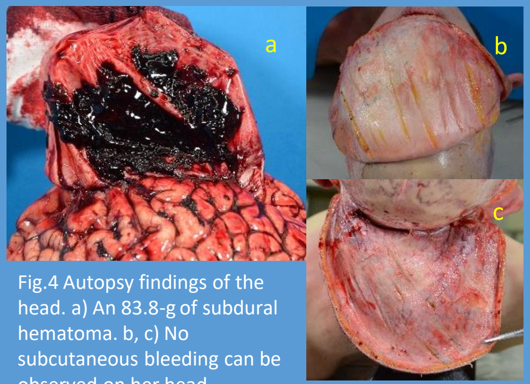

Fig.4 Autopsy findings of the head. a) An 83.8-g of subdural hematoma. b, c) No subcutaneous bleeding can be observed on her head.

Discussion

In general, traumatic causes are considered in cases of SDH on the surface of the hemisphere ditected on CT. Especially in Japan, the cause of death may be clinically investigated using non-contrast CT before or after death in the emergency department. Therefore, in such cases, traumatic SDH can be diagnosed on the basis of such findings. However, SAH due to an intrinsic aneurysm rupture may be missed, as the clinical incidence of SDH complications is reported to be only 0.5-7.9%.[*1]

Even in autopsy, forensic pathologists may miss microaneurysms on the distal side of arteries without pre-autopsy information from CT images for bleeding from the subdural cavity and small fissure of the vessel and make a wrong diagnosis of traumatic SDH or SAH.

Therefore, selective cerebral CT angiography is useful detecting the causative lesion of intracranial hemorrhage and easier investigation of the origin of bleeding in cases of small distal aneurysm rupture.

*1. Kamiya K, Inagawa T, Yamamoto M, Monden S. Subdural hematoma due to ruptured intracranial aneurysm. Neurol Med Chir (Tokyo). 1991 Feb;31(2):82-6.