CASE REPORT
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Ruptured Aneurysm of the Ophthalmic Artery

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Aneurysms arising from the ophthalmic artery itself are very rare compared with aneurysms originating from the bifurcation of the ophthalmic artery and carotid artery. There was only one reported case of a ruptured aneurysm of the ophthalmic artery itself. We discuss clinical significance of an aneurysm at this site, as well as the role of three dimentional image of multislice computed tomography angiogram(3D-image of MCTA) in determining the cause of subarachnoid hemorrhage(SAH).

KEY WORDS : Ophthalmic artery aneurysm · Subarachnoid hemorrhage(SAH) · Three dimentional image of multislice computed tomography angiogram(3D-image of MCTA).

Introduction

Cerebral saccular aneurysms are most commonly located at the branching points of large arteries of the circle of Willis[5]. However, aneurysms arising from the ophthalmic artery itself are very rare. Furthermore, there has been only one reported ruptured aneurysm at the ophthalmic artery after bifurcation[9]. We present another case finally revealed as a ruptured aneurysm of the ophthalmic artery itself, which confused us in determining the source of SAH due to the trauma history. And we discuss clinical significance of an aneurysm at this site and the usefulness of 3D-image of MCTA for screening test for determining the cause of SAH.

Case Report

A 70-year-old man was found lying beside his bicycle on the road, and was transferred to a local hospital by ambulance. He showed stuporous mentality and had a bruise on the left forehead and scalp swelling on left occiput. Computed tomography demonstrated SAH around the basal cisterns and in the both lateral ventricles. A skull fracture was diagnosed in the left frontal bone. The conservative treatment was done under the impression of traumatic SAH. But, 3 days later, he was transferred to our hospital for further evaluation and treatment of azotemia.

At the time of admission, he still showed stuporous mentality but there was no focal or lateralizing sign and symptom. The cause of azotemia was revealed to be dehydration and treated pertinently. We had interest in the cause of SAH, because the SAH pattern showed even distribution similar to the that of spontaneous SAH (Fig. 1). We performed 3D-image of MCTA searching for a vascular anomaly. The 3D-image of MCTA was performed using Light Speed Plus CT (General Electronic, Milwaukee, WI) and demonstrated a saccular sac-like lesion in the left paraclinoid area (Fig. 2). We performed digital subtraction angiography(DSA) and three-dimentional rotational angiography (Philips Medical System, Netherlands). And we confirmed the lesion as an aneurysm arising from the ophthalmic artery itself. The aneurysm was located at 2mm distal from the origin of the ophthalmic artery aneurysm (Fig. 3).

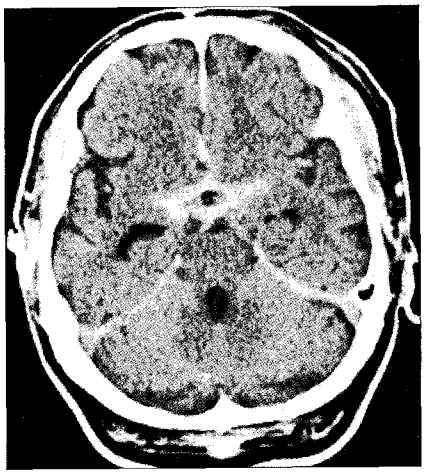

Fig. 1. Brain computed tomography scan, demonstrating diffuse subarachnoid hemorrhage around basal cisterns.

The operation was delayed for 2 weeks to improve his general condi-

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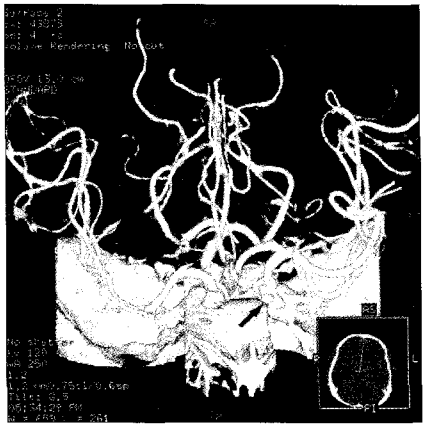

Fig. 2. The three dimentional image of multi-slice computed tomography angiogram, demonstrating a suspicious aneurysmal contour at the left paraclinoid area (arrow).

tion. Prior to operating, his mentality was improved to slightly drowsy mentality. But the visual loss of in left eye was newly confirmed. A left pterional craniotomy was performed with the removal of the left anterior cliniod process and unroofing of the optic canal. The saccular aneurysm underneath the optic nerve was found, the origin and its running course of the ophthalmic artery was not visible due to its extradural location (Fig. 4A).

The bifurcation of ophthalmic artery was hidden below distal dural ring (extra-dural portion), but the aneurysm was located in intracanial space (intra-dural portion). Careful dissection made it possible to clip the aneurysm and the aneurysm was successfully obliterated via microsurgical clipping (Fig. 4B). After the operation, hydrocephalus was developed and a ventriculo-peritoneal shunt was performed. Postoperative angiography showed that the aneurysm was completely obliterated and the ophthalmic artery was patent (Fig. 5). The patient was discharged with no definite neurological deficit.

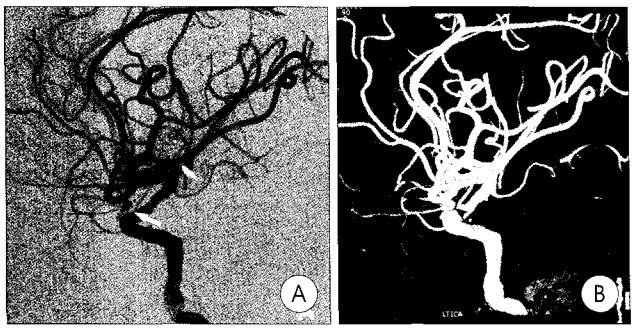

Fig. 3. A preoperative left digital subtraction angiography (A) and three-dimentional rotational angiography (B) show a saccular aneurysm 2mm distal from the origin of the ophthalmic artery (arrow and arrowhead).

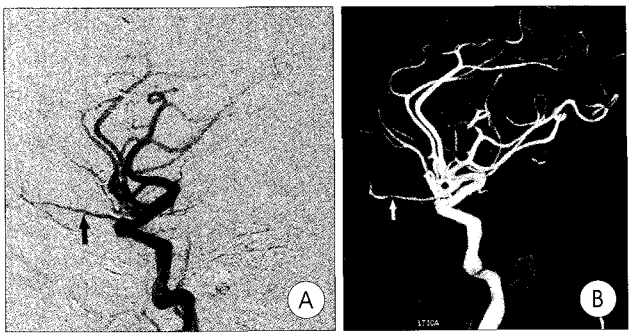

Fig. 5. A postoperative left digital subtraction angiography (A) and three-dimentional rotational angiography (B) show complete obliteration of the aneurysm and a patent ophthalmic artery (arrow).

Discussion

Paraclinoid aneurysms arose from the proximal internal carotid artery between the site of emergence of carotid artery from the roof of the cavernous sinus and posterior communicating artery. Surgery of these aneurysms presents special difficulties because of its complicated osseous, dura, and neurovascular structures;sella turcica, cavernous sinus, optic nerve. Paraclinoid aneurysms were classified into four subgroups according to their branch of origin in this segment[8] ; 1) carotid cave aneurysm, 2) ophthalmic artery aneurysm, 3) superior hypophyseal artery aneurysm, 4) proximal posterior carotid artery wall aneurysm or global type aneurysm.

Among them, aneurysms being located between the origin of the ophthalmic artery and the posterior communicating artery are defined as ophthalmic or carotidophthalmic artery aneurysms[1]. Of course, aneurysms arising from between the bifurcation of the ophthalmic artery and the carotid artery can be called ophthalmic artery aneurysms.

Since Drake's article on carotidophthalmic aneurysms in 1968, several articles on aneurysms arising from this region were reported. But aneurysms arising from the ophthalmic artery itself are very rare. We found only 6 cases of the aneurysm in the intracranial ophthalmic artery itself[2-4,6-7,9]. Furthermore, there has been only one reported ruptured aneurysm at that site[9].

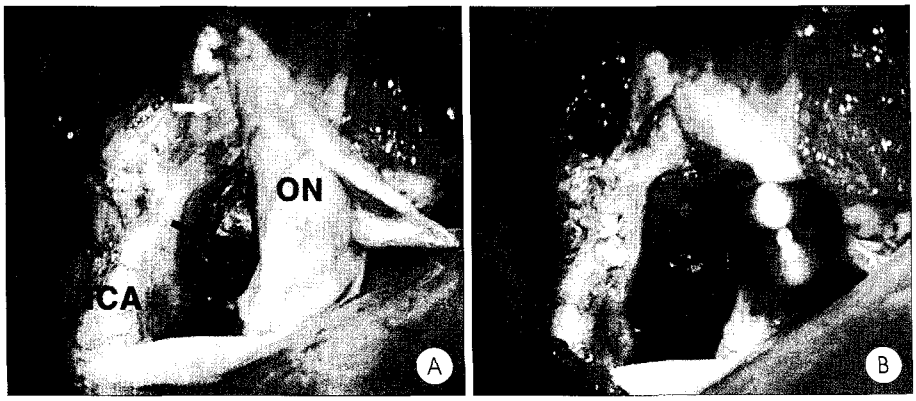

Fig. 4. Intraoperative photograph. A : The bifurcation of ophthalmic artery was hidden below distal dural ring (white arrow) and the aneurysm (black arrow) was located in intracranial space. B : Post clipping state. ON : Optic nerve. ICA : Internal carotid artery.

By this account, the mechanism of aneurysm development was not fully understood. Unusual hemodynamic stress is thought as most possible cause, similar to the general saccular aneurysm. Kawaguchi et al[3] suggested that severe hemodynamic stress was the cause of developing aneurysms at this site. They showed the high velocity in ophthalmic artery by using the color doppler high flow velocity imaging.

Yanaka et al[9] presented that the direction the aneurysm was different from that of the hemodymic stress, but surrounding structures (such as optic canal) might have prevented the aneurysm from growing along the natural course of the hemodynamic stress.

In our case, the bifurcation of ophthalmic artery was hidden below distal dural ring (extra-dural portion) and the aneurysm was located in intracanial space (intra-dural portion). We thought that the tough distal ring influenced the direction of this aneurysm.

S. Sato et al[7] suggested that for this aneurysm originating from an artery but not at the arterial bifurcation, the term "trunk" is more appropriate to express the anatomical origin of the aneurysm than the term "true", which is confusing the histological term of "true" aneurysm, which means the existence of an internal elastic lamina.

We agree with this opinion and it is more proper to call it the aneurysm of the ophthalmic artery "itself."

Conventional angiography was considered as the gold standard for diagnosis of the source of SAH. But, DSA, an invasive procedure, has disadvantages ranging from clinically silent microemboli and to manifest stroke and is not completely without complication, especially in elderly patients or if performed by less experienced practitioners.

For that reason, the invasive conventional angiography is not suitable to all patients with SAH.

The 3D-image of MCTA is a less invasive and a relatively recent method for depicting the intracranial arterial vasculature. Despite 3D-image of MCTA, which is limited by both the reconstruction technique and the operator, can provide more accurate vascular contours and is helpful for screening of an uncertain origin SAH.

In our case, the presence of an ophthalmic aneurysm could have been suspected on the basis of the 3D-image of MCTA and confirmed by the 3D-rotational angiography.

Conclusion

We described a rare case of ruptured aneurysm of the ophthalmic artery itself. Although pathogenesis of aneurysms in this region and clinical features are not fully understood, the trauma may be one of the causes.

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