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Case Report

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Coil Embolization of Aneurysm Followed by Stereotactic Aspiration of Hematoma in a Patient with Anterior Communicating Artery Aneurysm Presenting with SAH and ICH

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Even though intracerebral hematoma (ICH) due to ruptured cerebral aneurysm has been treated by aneurysm clipping at the same time of removal of ICH through craniotomy, such management strategy is controversial in an aged patients with poor clinical grade. In this regards, stereotactic aspiration of hematoma following coil embolization can be an alternative treatment modality. Thus, the authors report a case of an aged patient who underwent stereotactic aspiration of ICH following coil embolization for the ruptured aneurysm with a brief review of literature.

KEY WORDS : Aneurysm · Coil embolization · Stereotactic aspiration · Intracerebral hematoma.

INTRODUCTION

The current standard treatment for the patients who have significant amount of intracerebral hematoma (ICH) caused by aneurysm rupture is early aneurysmal clipping and hematoma evacuation at the same operation. But, it has been still reported to have high mortality rates of 21-85% with favorable outcomes of 13-48%[4,9,10]. Since the coil embolization of cerebral aneurysm has become an alternative treatment modality, there has been reports of coil embolization and hematoma evacuation through open craniotomy with improved outcome reducing the mortality rate to 21%[9]. However, there are still risks of surgical morbidity of open craniotomy for hematoma evacuation. We report a case of ICH caused by aneurysm rupture, which was successfully managed with aneurysm coiling followed by stereotactic guided aspiration of hematoma to reduce the risk of brain damage which might have occurred when open craniotomy was contemplated to evacuate the hematoma in a swollen brain.

CASE REPORT

A seventy-six-year old woman presented with sudden mental deterioration, which was developed one hour prior to admission. She was semicomatose and respiration was shallow. Neurological examination showed pupillary anisocoria and decerebrate rigidity. Computed tomography (CT) demonstrated thick SAH on basal cistern, both sylvian and ambient cisterns suggesting aneurysm rupture. Approximately 50cc of ICH was accompanied on right basal ganglia. Contrast enhanced axial CT scan showed multiple enhancing lesions along the medial margin of ICH mimicking dilated vessels such as AVM with increased amount of hematoma, which was an extravasating contrast due to aneurysmal rebleeding during angiography. Computed tomographic angiography (CTA) demonstrated anterior communicating artery aneurysm arising from left A1-ACoA junction and an abnormal oval mass with an irregular contour on the aneurysm and a curvilinear structure originating from it running into ICH (Fig. 1).

Digital subtraction angiograms and three dimensional rotational angiograms (RA) demonstrated anterior directing anterior communicating artery (ACoA) aneurysm. The aneurysm had two domes measuring 6.5×3 mm and 4×3 mm with 2.7 mm common neck (Fig. 2). To reduce surgical morbidity which might occur when swollen brain is dissected to clip the aneurysm and

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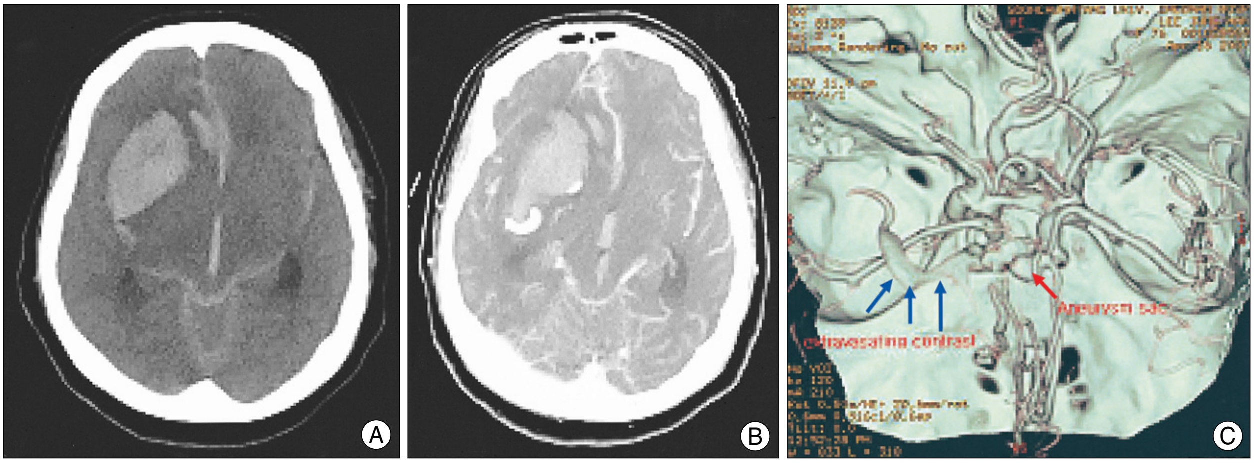

Fig. 1. Brain computed tomography (CT) and CT angiograms of the patient. Initial CT scan showing thick subarachnoid hemorrhage (SAH) on basal, both sylvian and perimesencephalic cisterns with intracerebral hemorrhage (ICH) on right basal ganglia displacing the midline to left (A). Contrast enhanced brain CT during CT angiogram showing increased amount of ICH and multiple enhancing lesions along the medial posterior margin of hematoma mimicking dilated vessels (B). CTA demonstrates anterior communicating artery aneurysm directing anteriorly with extravasating contrast (arrows) (C).

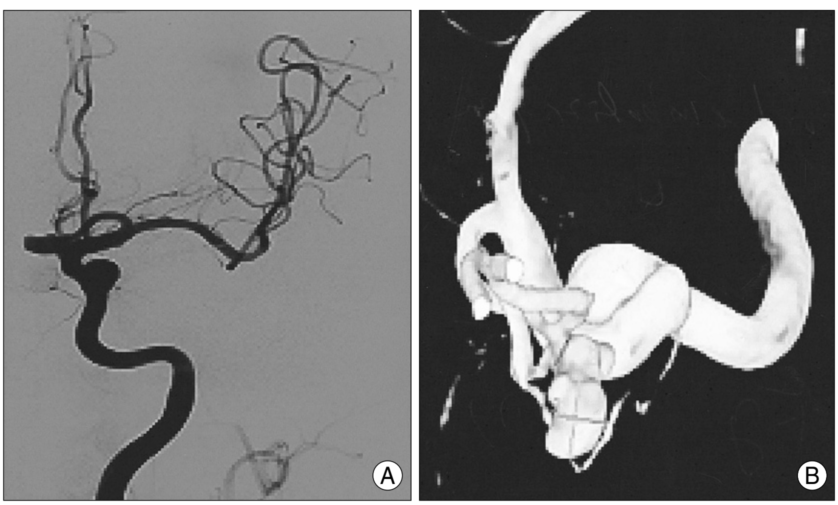

Fig. 2. Angiogram (A) and three dimensional rotational angiograms (B) showing anterior directing anterior communicating artery aneurysm. The aneurysm has 2 domes measuring 6.5×3 mm and 4×3 mm with 2.7 mm common neck.

Fig. 3. Postembolization angiograms showing complete obliteration of aneurysmal sac without compromise of parent artery and distal anterior cerebral artery (ACA) flow.

evacuate the hematoma, coil embolization of aneurysm followed by stereotactic aspiration hematoma were performed. Embolization procedure was performed without general anesthesia because the patient didn't move spontaneously. Proper working angle was decided based on the 3D RA. A 6 French guiding catheter (Envoy, Cordis Neurovascular, Miami Lakes, FL) was placed on the right cervical internal carotid artery using exchange technique. Under roadmap guidance, superselection of aneurysm was done using a microcatheter (Excelsior SL-10 preshaped 45 degree, Boston scientific, CA) with a microwire (Synchro-14, Boston Scientific, CA). Microvention 1D complex-10 5 mm×12 cm was used as an initial framing coil because the aneurysm had two sacs. Stable frame was obtained using this coil covering two sacs of aneurysm. Abrupt aneurysm rupture occurred during second coil packing with GDC 4 mm ×8 cm. Sudden elevation of blood pressure to 180 mmHg and intracranial circulatory arrest were noted. Continued coil packing was done to stop the bleeding after reversal of heparin using protamine sulfate and infusion of 250 cc of 15% mannitol. Subsequent coil packing of aneurysm with multiple coils (GDC 3×6, 4×8, 3×8, 3×6, 3×8, 2×4 mm serially) resulted in complete obliteration of aneurysm without compromise of distal ACA flow (Fig. 3).

To evacuate the ICH, stereotactic frame was applied on the patient head at the angiography room. After obtaining stereotactic brain CT images, which showed increased amount of ICH and intraventricular hemorrhage, the patient was transferred to operating room (Fig. 4). Heamatoma evacuation was done through the burr hole on right frontal bone and instillation of catheter into the hematoma was done under local anesthesia. Additional EVD catheter was

Fig. 4. Stereotactic brain computed tomography (CT) just before hematoma aspiration showing enlarged hematoma and intraventricular hemorrhage possibly due to intra-procedural aneurysm rupture.

Fig. 5. Brain computed tomography (CT) images obtained at 2 weeks following coil embolization of aneurysm showing coil artifact and completely resolved intracerebral hematoma.

inserted into the left frontal horn of lateral ventricle to drain the ventricular hemorrhage. Thirty two mililiter of hematoma was evacuated at operation room and additional hematoma was aspirated following urokinase irrigation at neurosurgical intensive care unit. Brain CT at two weeks after surgery demonstrated complete removal of hematoma with a porencephalic change (Fig. 5). The patient was transferred to local hospital with severe disabled state at one month post-embolization.

DISCUSSION

The reported incidence of ICH by aneurysm rupture is 4 to 42.6%[4,9,10] and it is a major poor prognostic factor. Results of previous study show a mortality rate of more than 80% in patients with only conservative treatment and 75 to 100% in patients with evacuation of ICH without securing aneurysm[4,9,10].

There still are controversies for the treatment modality of poor grade aneurysm patients. A widely accepted management option is to use ventricular drainage and reassess the patient's neurological condition and plan surgery in those patients whose clinical grade have improved. However, several authors reported better outcome with aggressive early direct surgery[5,6].

In poor grade patients with significant amount of ICH, early surgery during which both aneurysm clipping and clot evacuation has been advocated[4,9,10]. However, it still has high mortality rates of 21-85%, and favorable outcomes of 13-48%[4,9,10].

Jeong et al.[4] has reported several reasons for the high mortality. First, excessive retraction is often required to dissect the severely swollen brain during hematoma evacuation and aneurysm clipping which may result in additional brain damage. Second, there is a higher chance of intraoperative aneurysmal rupture during aneurysm dissection because it requires hematoma removal around the aneurysm. Third, a temporary clipping can make the edematous brain in ischemic condition ever worse. Fourth, the operation time may be prolonged due to the difficulty of operation, which may increase the surgical morbidity.

Instead of surgical clipping there are several reports of early endovascular treatment for poor grade aneurysmal patients with good outcome[1,2,6,10,12-14].

Also, the advantage of endovascular treatment compared with direct surgical treatment is that the procedure can avoid direct mechanical trauma to the brain and can be performed at any time, even during the acute phase or vasospasm period[6,10,12].

In contrast to surgical clipping, the endovascular approach does not allow removal of the cisternal clot, which increases the risk of vasospasm. However, several studies comparing surgical and endovascular treatment of aneurysmal SAH has failed to demonstrate significant difference between the two treatment modalities with regard to the incidence of clinically symptomatic vasospasm[13]. Moreover, Kohkichi et al.[3] has reported the effect of reduction in vasospasm by clot removal could be masked by brain retraction so they emphasized to perform brain retraction as gently as possible, that can be difficult in severely swollen brain patients with SAH accompanied by ICH.

It seems that the territory of endovascular treatment will be enlarged and there has been reports of managing poor grade aneurysm patients with significant amount of ICH using this treatment modality to secure the aneurysm and then through surgical approach to evacuate the ICH with good outcome representing mortality rate of 21% and favorable outcome of 48%[9].

In our institution, we were supportive of the initial endovascular approach, but we looked for less minimally invasive option for hematoma removal than open surgical approach. SAH results in decreased cerebral blood flow (CBF) and impairs autoregulatory function, which makes the brain more sensitive to retraction and to fluctuations in blood pressure and cardiac output[7], we decided to perform stereotactic guided hematoma aspiration under local anesthesia and achieved a tolerable outcome.

There are several reports on extravasation of contrast material by active bleeding of aneurysm on CTA as in our case. Nakatsuka et al.[8] has reported extravasation of contrast as a "cap sign" and a "corkscrew sign". The cap sign is the contrast around the aneurysmal sac and the corkscrew sign is the contrast spreading around the aneurysm. Ryu et al.[11] reported it as a ribbon-like structure originating from the aneurysmal dome mimicking a vascular structure.

Understanding of this finding on CTA is critical to manage the SAH patients properly without delay.

CONCLUSION

Coil embolization of aneurysm followed by stereotactic aspiration of hematoma can be an alternative treatment option for selected SAH patient who requires emergent hematoma evacuation.

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