Images Diagnosis and Emergent Endovascular Treatment of Acute Hemorrhagic Basilar Artery Dissection: A Case Report

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Abstract:

Purpose: Basilar artery dissection (BAD) is a rare but possibly fatal disease with specific neuroimage findings. The management of BAD varies. This report describes a case with hemorrhagic BAD treated by endovascular stent-assisted coil embolization.

Case Report: We report an 82-year-old case of acute mid basilar artery dissection complicated with acute subarachnoid hemorrhage (SAH), intraventricular hemorrhage (IVH) and hydrocephalus, which was diagnosed by complete neuroimage surveys including computed tomography angiography (CTA), magnetic resonance angiography (MRA), and digital subtraction angiography (DSA). She was then successfully treated by endovascular stent-assisted coil embolization.

Conclusion: By modern sophisticated neuroimages, BAD could be diagnosed. Endovascular treatment with stent-assisted coil embolization can be a safe and efficacious choice for relatively poor surgical indicated patients with hemorrhagic BAD.

Key Words: acute hemorrhagic dissection, basilar artery dissection, images diagnosis, endovascular treatments, stent-assisted coil embolization

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INTRODUCTION

With estimated incidence of 0.25 per 100,000 person-years[(1)], basilar artery dissection (BAD) is a rare but potentially dangerous disease which presents brain subarachnoid hemorrhage (SAH), brain stem compression, or ischemia[(2)]. Roughly 1.0% of all SAH events were constituted by BAD. Rebleeding, which is more frequent in patients with BAD along with pseudoaneurysm formation in acute phase[(1,3)], accounts for poor prognosis. Given the risk of life-threatening hemorrhage, further treatment is necessary to prevent subsequent bleeding. While higher failure rate of open surgery[(4,5)], endovascular therapy become widely used for hemorrhagic BAD.

CASE REPORT

An 82-year-old woman presented with dizziness for one week. She complained severe thunderclap headache then was found unconscious the day before admission.

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Small amount of acute posterior fossa subarachnoid hemorrhage (SAH), bilateral intraventricular hemorrhage (IVH) and hydrocephalus were diagnosed via emergent brain computed tomography (CT) at the first aid hospital (Figure 1). Her initial Glasgow Coma Scale (GCS) was 6 (E1M4V1). Under the impression of acute hemorrhagic stroke, she was transferred to our hospital for further brain image study and treatment. The only contributing medical risk factor for acute cerebral hemorrhage is hypertension.

After arrival at our hospital, the three-dimensional cerebral CT angiography revealed acute mid basilar artery dissection with one 4.9 mm wide neck pseudoaneurysm formation (Figure 2). The dissection segment showed focal stenosis but still preserved blood flow of basilar artery.

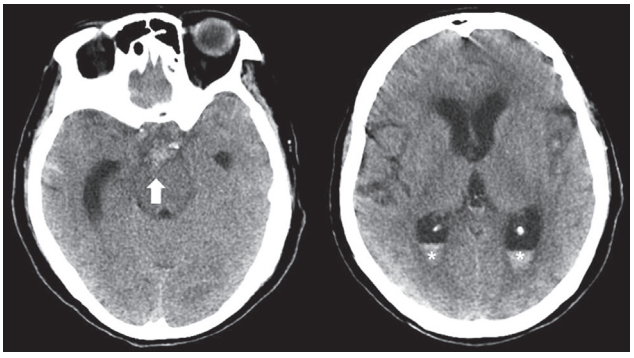

Figure 1. Brain computed tomography (CT) showed acute intraventricular hemorrhage (IVH) retention within bilateral lateral ventricles (stars) with some acute subarachnoid hemorrhage (SAH) within the prepontine cistern (arrow).

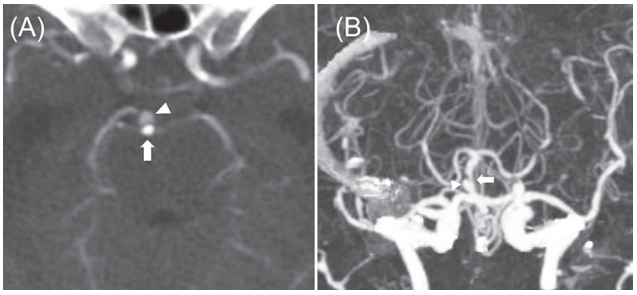

Figure 2. Computed tomography angiography (CTA) shows a true lumen (arrow) and a false lumen (arrowhead) with an intimal flap (or double lumen sign) (A). A wide neck pseudoaneurysm formation (arrowhead) in middle one-third portion of basilar artery, anterior superior orientation, with distal focal stenosis (arrow) (B).

Her brain magnetic resonance image (MRI) and magnetic resonance angiography (MRA) further confirmed this BAD diagnosis and showed both true and false lumens (Figure 3). Endovascular intervention was suggested by neurosurgeon. The cerebral digital subtraction angiography (DSA) showed this basilar artery dissecting pseudoaneurysm and distal basilar artery stenosis more clearly (Figure 4). She then received emergent stent-assisted coils embolization. One 4.5 mm × 22 mm self-

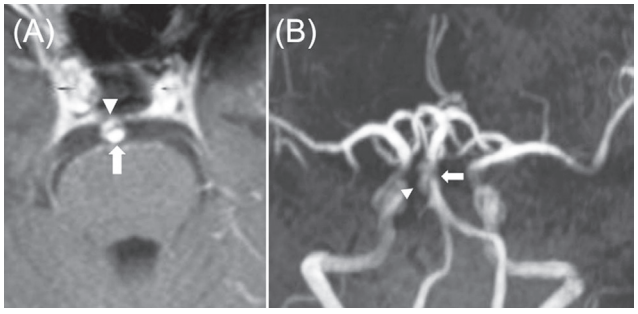

Figure 3. Magnetic resonance image (MRI) and magnetic resonance angiography (MRA) show dissection intimal flap with both true lumen (arrow) and false lumen (arrowhead) (A). A focal out-pouch pseudoaneurysm (arrowhead) and distal stenosis (arrow) (B).

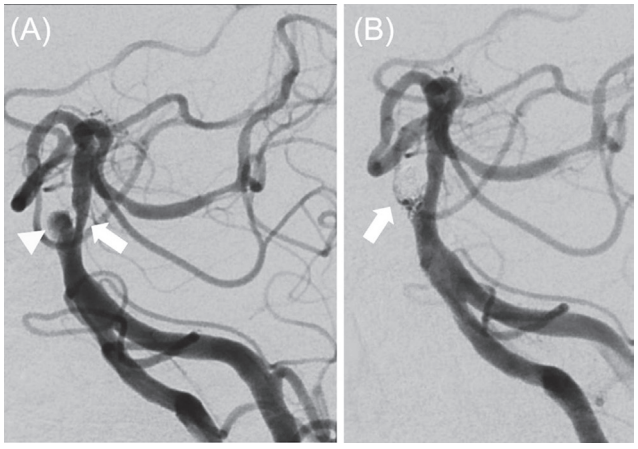

Figure 4. Three-dimensional digital subtraction angiography (DSA) shows an irregular protrusion pseudoaneurysm sac (arrowhead) and focal distal basilar artery stenosis (arrow) before treatment (A). The residual basilar artery lumen caliber improved after stent deployment, complete occlusion of the pseudoaneurysm by small detachable coils (arrow) (B).

expandable intracranial Enterprise stent (Codman, Miami Lakes, FL, USA) was deployed to cover both dissecting pseudoaneurysm and the basilar artery stenosis segment and subsequently increase the diameter of true lumen. Subsequently six small short detachable Target platinum bare coils (Stryker Neurovascular, Fremont, CA, USA) were put into the pseudoaneurysm sac, total occlusion of its sac and preserved normal basilar artery flow.

After the procedure, she was admitted to surgical intensive care unit (SICU). Nimodipine and Nicardipine were administered for preventing vasospasm and blood pressure control respectively. Dual antiplatelet regiment with Aspirin 100 mg once daily and Clopidogrel 75 mg once daily were also prescribed. She stayed in ICU for 16 days and did not have additional neurological symptoms afterward. Her neurological condition was stable and GCS improved to 9 point (E4M4Ve). However, because of recurrent aspiration pneumonia, extubation failed in SICU and she was then transferred to respiratory care center for further care.

DISCUSSION

The radiological evidence of BAD including the following features: intramural hematoma, intimal flap (or double-lumen sign), pearl-and-string sign, localized dilation with proximal or distal stenosis, or contrast media stasis found by digital subtraction angiography (DSA), magnetic resonance angiography (MRA), or computed tomography angiography (CTA)[6]. Since the rarity of BAD, studies for comparison of radiographic techniques in diagnosis of BAD are insufficient. A systemic review published in 2009 comparing those two noninvasive methods (MRA and CTA) in diagnosis of cervicocephalic arterial dissection revealed relatively similar results[7]. However, another systemic review published in 2012 found probable greater sensitivity of CTA for symptomatic vertebral artery dissection than MRA or ultrasound[8].

In our case, initial CT scan helped to detect the acute SAH. For diagnosis of BAD, either CTA or MRA showed double lumen sign and distal stenosis clearly. The role of DSA was not only for confirming diagnosis but also for endovascular treatment planning.

There are three main considerable treatment options when dealing with BAD: conservative method, surgical intervention and endovascular therapy. In BAD patients with SAH, conservative method like blood pressure control only was less recommended due to high rebleeding rates[1,3]. For surgical intervention, many methods were applied for treating dissecting aneurysms, such as wrapping, arterial reconstruction, and proximal ligation. However, non-optimal complication rates and higher failure rates were revealed according to previous studies[4,5,9]. Endovascular therapy, which is relatively less invasive, is used widely at present. These procedures can be classified as artery sacrificing or artery preserving. The former one would occlude the involved parent arteries to lower the rebleeding risk by relieving the flow pressure on the aneurysm wall. A higher risk of neurological sequelae or progressive lesion may occur with the procedure of vertebral artery occlusion. In contrast, stenting and coiling as a artery-preserving method for BAD can lower the impact of flow on dissection and preserves the parent artery flow. A single-center experience in China indicated a promising result of this method for treating BAD[10].

In the case reported here, the stent-assisted coil embolization was chosen for the following reasons. This procedure is relative less invasive compared to surgical intervention, esecially for our old-aged patient. Other potential advantages include promotion of aneurysm thrombosis, restoration of vessel lumen and facilitate endothelialization. First, the disruptive inflow caused by redirection blood flow of stents promotes thrombosis. Additional coil embolization lowers the impact of flow significantly and leads decreased rebleeding risk. The combined use of the two devices also prevents migration of coil loops from aneurysms. Second, the stent redirects blood flow that ensureds the diameter of true lumen. Reduced wall stress of the pseudoaneurysm contributes the prevention of recurrent bleeding. The self-expanding stent we used may provide safer procedures than balloon-expanding stents as low pressure during deployment[11]. Finally, the stent provides a matrix for the formation of neointima layer. Remodeling of the endothelial growth on the surface of stent may protect the dissecting aneurysm from rupture[12]. The stent placement accompanied with an initial complete occlusion was a favorable factor for long-term outcome in a pervious study[10].

However, caution must be taken when considering the use of endovascular treatment. For one thing, stents are

intravascular implanted metallic devices that may provoke thrombogenic response when blood contacts the foreign material[13]. Stents, to preserve the artery caliber, may contrarily end in vessel stenosis. Anticoagulant agents use during the procedure and long-term antiplatelet agents use for prophylaxis are necessary; the risk of worsened dissection should also be considered. For another, the contrast medium related complications may occur both in diagnosis or treatment procedures. The contrast-induced nephropathy or allergic reactions are often unpredictable. Implantation multiple devices means longer procedure time, more contrast medium use and more radiation exposure. Therefore, the risks of contrast-induced nephropathy or the risks of radiation-induced cancer increase[14].

Newly developed devices or endovascular techniques may provide better outcome and less safety issue concerns. For example, over-lapping stents have superior results of preventing rebleeding than a single stent[15]. Endovascular treatment is likely to having a promising role in BAD treatment as more clinical experience and study results reveal in the future.

CONCLUSION

Hemorrhagic BAD could be diagnosed by modern sophisticated CTA, MRA and DSA neuroimages due to its specific imagines findings. For relatively poor surgical indicated patients with hemorrhagic BAD, endovascular treatment with stent-assisted coil embolization can be a safe and efficacious choice.

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