Rupture Basilar Artery Dissection: Successful Treatment with Neuroform Stent Placement and Coil Embolization

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We report a case of basilar artery dissection presenting with subarachnoid hemorrhage, which was successfully treated with self-expandable stent placement and coil embolization, achieving excellent clinical and anatomical outcome. This method can provide protection of the rupture point, collapse of dissected space within the vessel wall, and prevention of further dissection although long-term outcome needs to be seen.

Key Words: Basilar artery; Coil embolization; Dissection; Stent

Basilar artery (BA) dissections are rare lesions associated with significant morbidity and mortality (1). The treatment options for BA dissections would differ significantly from those for vertebral artery (VA) dissections, and thus management is still controversial and difficult. We report a case of BA dissection presenting with subarachnoid hemorrhage (SAH), which was successfully treated with stent placement and coil embolization, achieving excellent clinical and anatomical outcome.

CASE REPORT

This 50-year-old woman presented with sudden severe headache and drowsy mentality. Computed tomography exhibited diffuse thick SAH which was denser at the pre- and lateral medullary, prepontine and interpeduncular cisterns, and moderate hydrocephalus (Fig. 1). Cerebral angiography performed on the same day revealed irregular fusiform enlargement of BA (Fig. 2). An eccentric pouch and the intimal flap separating it from the true lumen were also noted at the middle of the BA. Diagnosis of the BA dissection was made and the eccentric pouch was considered to be the rupture point causing the SAH. To achieve obliteration of the rupture point and to preserve the blood flow through the BA, stent-assisted coil embolization was performed on the same day under general anesthesia.

A 6F guiding catheter was placed at the VA. Initial attempts to deploy a balloon expandable stent (Multi-Link Vision stent 3.0/18; Guidant, Santa Clara, CA) through the left VA, followed by through the right VA, were not successful because of the tortuous courses of the arteries. Then, a self expandable stent (Neuroform stent 3.5/20; Boston Scientific, Freemont, CA) could be successfully deployed at the segment from the vertebrobasilar junction to the distal BA proximal to the origin of the superior cerebellar arteries (Fig. 3). The eccentric saccular part, the presumed rupture point, was selected with a microcatheter (Excelsior SL-10, Boston Scientific) through the struts of the stent, and a detachable coil (MicroPlex helical coil 2mm/6cm; MicroVention Inc, Aliso Viejo, CA) was deployed. During deployment of the last part of the coil, a coil
loop was extruded beyond the original boundary of the aneurysmal sac, and at the instant there was a transient cardiac standstill and elevation of systolic blood pressure up to 170 mmHg. There was a contrast leakage through the point of the coil loop extrusion. Protamine sulfate and mannitol were infused immediately, and we detached the coil and prepared another detachable coil. However, there was no further leakage with complete obliteration of the dissection and her vital signs become normalized. Another stent (Neuroform stent 3.5/15) of the shorter length was deployed within the previously deployed stent with an intent to provide further support and thus to prevent recurrence of the dissection.

The patient was transferred to the operating theater after CT scanning, and external ventricular drainage was done at the right Kocher point. The opening pressure was 8 cm H2O. Postembolization CT showed leaked contrast media at the left lateral medullary cistern. After awakening from the anesthesia, she showed no focal neurologic deficit. Control angiography a week after the operation demonstrated stable occlusion of the dissecting aneurysm. On the fifteenth postoperative day, the patient discharged home with no neurologic deficit. Follow-up magnetic resonance angiography performed 6 weeks later showed the well-reconstructed BA and no residual flow within the aneurysmal part (Fig. 4). Plain radiography at 3 months postprocedure showed stable configuration of stents and the coil. Oral antiplatelet medication including enteric-coated aspirin 300 mg and clopidogrel 75 mg was continued until 6 weeks after embolization and clopidogrel was discontinued thereafter. She is maintaining a normal life as a housewife at 6 months after discharge.

Fig. 1. Computed tomography at admission shows diffuse thick subarachnoid hemorrhage at the pre- and lateral medullary, preponine and interpeduncular cisterns.
Fig. 2. Cerebral angiography reveals an fusiform enlargement of middle basilar artery (BA) in the anteroposterior (A) and lateral oblique (B) projections. An eccentric pouch and an intimal flap separating it from the true lumen is also noted (arrows).

Fig. 3. After placement of a self expandable stent (Neuroform stent 3.5/20) from the vertebrobasilar junction to the distal BA proximal to the origin of the superior cerebellar arteries, the eccentric saccular part, the presumed rupture point, is occluded with a detachable coil (MicroPlex helical coil 2 mm/6 cm). Then, another stent (Neuroform stent 3.5/15) of the shorter length is deployed within the previously deployed stent with an intent to provide further support and thus to prevent recurrence of the dissection. Post procedure cerebral angiography demonstrates complete occlusion of the saccular part and preserved blood flow through the BA in the anteroposterior (A) and lateral oblique (B) projections. Plain radiography shows stents and the coil (C and D).
DISCUSSION

It is said that basilar artery (BA) dissection was first reported by Scholefield in 1924 (2). Some important facts regarding BA dissection, revealed in the literature, are summarized in Table 1. According to a review of 44 cases of BA dissections (11), the patients' ages ranged from 15 to 74, with a median of 39. Male to female ratio was 1.2 to 1. Half of the patients suffered SAH, and 19% of them experienced fatal rebleeding. Most of them were treated conservatively. Overall outcome showed death in 53%, severe disability in 7%, mild to moderate disability in 14%, and good recovery in 26%. The major causes of death were rebleeding and progressive decline from ischemic injury.

Ruptured BA dissection is not amenable to treatment since trapping or segmental occlusion of the basilar trunk would result in profound neurologic deficit or mortality. Various treatment options for BA dissection have been described with variable outcomes, including conservative treatment (6, 7, 9, 10), vertebral artery or proximal basilar artery occlusion (11, 13), and stenting.
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(14-16). The patients treated with stent placement presented with acute ischemic stroke or iatrogenic dissection, not with SAH.

In a case report by Kim et al. (17), three balloon-expandable coronary stents were deployed to treat a dissecting aneurysm on the dominant VA. Control angiography at 8 months postprocedure revealed progressive obliteration of the dissected lumen. Ahn et al. (18) reported treatment results in 13 cases of VA dissections treated with stent placement with or without coil embolization. Anatomical outcome at follow-up angiography was better in cases of double stent placement or stent-assisted coil embolization than in those of stent placement alone. Uhl et al. (19) reported stent-assisted coil embolization in a case of BA dissection with a coronary stent and detachable coils although detailed information about the case was not available. In wide-necked saccular aneurysms, stent serves as a buttress to hold coils within aneurysms. In dissecting aneurysms, stents have another role of keeping the dissected intimal flap closed until healing. In our case, we could achieve an excellent clinical and anatomical outcome by preserving BA blood flow, protecting the weak point, and preventing progression of the dissection with placement of self-expandable stents and coil embolization. Ideal stents for intracranial arterial dissection still remains to be elucidated. In our case, self-expandable Neuroform stents were deployed because initial attempt to deliver a balloon-expandable stent through the tortuous vertebral arteries was failed. Two oversized stents were used to bolster radial expansile force. For example, a 4.0 mm Neuroform stent will exert twice the radial force when constrained at 3.5 mm vessel as compared to within 4.0 mm, and 40% of the nominal radial force when deployed into 4.5 mm. Nominal radial force of Neuroform stent is known to be 10 mmHg (20). Protection of the rupture point with a coil enabled us to give her antiplatelet agents (to prevent thrombotic complications related to stent placement) without increasing the risk of rebleeding. Mackay et al. (21) reported a case showing recurrence of VA dissecting aneurysm 6 weeks after stent-assisted coil embolization. They had deployed two self-expandable coronary stents (with a radial force of 36 mmHg) in tandem fashion with a 5-mm overlap, followed by coil embolization.

Long-term follow-up result is anticipated in our case although follow-up magnetic resonance angiography performed 6 weeks after the procedure showed the well-reconstructed BA and no residual flow within the aneurysmal part.

References


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