Endovascular Treatment of Ruptured Vertebral Dissecting Aneurysms with Electrodetachable Coils

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Background: Ruptured intradural vertebral dissecting aneurysm (VDA) is associated with a high risk of rebleeding and a high incidence of mortality if left untreated because of its natural history. We report our experience of endovascular treatment of ruptured VDAs using electrodetachable coils.

Methods: Over 7 years, 10 patients with spontaneously ruptured intradural VDAs were managed by endovascular embolization in our institute. All patients received endovascular trapping of the dissecting aneurysm and proximal occlusion by electrodetachable coils.

Results: There were 5 men and 5 women, with a mean age of 48 years. Of the 10 VDAs, 8 were located in the supra-posterior inferior cerebellar artery (PICA) area, and 2 were in the infra-PICA area. Six affected vertebral arteries were dominant (n = 3) or co-dominant (n = 3) in the vertebrobasilar system. Nine ruptured VDAs and their parent arteries were successfully occluded by a single session of endovascular embolization by electrodetachable coils. In the tenth patient, the dissecting aneurysm showed subtotal occlusion because of involvement of the vertebrobasilar junction. The mean number and coil length were 7 and 58 cm, respectively. There were no significant periprocedural complications or recurrent bleeding. All patients demonstrated good clinical recovery (n = 9) or improvement (n = 1) after embolization over a mean follow-up of 15 months (range, 6–24 months).

Conclusion: Endovascular embolization is a useful and safe method in the treatment of ruptured VDAs even when the affected vertebral arteries are dominant or co-dominant in vertebrobasilar flow. Trapping procedures and direct occlusion of the dissecting segment with preservation of the PICA by detachable coils should be performed as early as possible in the management of VDAs. [*J Chin Med Assoc* 2005;68(12):578–584]

Key Words: dissecting aneurysm, embolization, vertebral artery

Introduction

Dissecting aneurysms of the vertebrobasilar system are an uncommon but important cause of nontraumatic subarachnoid hemorrhage (SAH), representing 3% of all intracranial aneurysms,[1,2] and accounting for 28% of vertebral artery aneurysms.[3] These aneurysms are difficult to treat because of their location and morphology. The lack of a defined neck limits the therapeutic options available for endovascular or surgical occlusion. The deconstructive procedure sacrificing the parent artery from which the aneurysm arises has become a widely accepted approach for treating vertebral dissecting aneurysms (VDAs), but carries a potential risk of ischemic events in the posterior circulation when the vertebral artery is suddenly closed, particularly in patients who have a hypoplastic contralateral vertebral artery. As the majority of VDAs arise distal to the origin of the posterior inferior cerebellar artery (PICA) and are located near the

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midline, surgical treatment occasionally becomes difficult and may be associated with serious morbidity.[4,5] The introduction of electrodetachable coils has made it possible to treat aneurysms safely by endovascular means, especially for aneurysms that are less suitable for surgical clipping and in patients with poor clinical condition.[6]

We present our experience of endovascular embolization of spontaneously ruptured VDAs with the trapping technique using electrodetachable coils, and evaluate the periprocedural and follow-up outcome of patients.

Methods

From August 1998 to February 2005, 216 intradural aneurysms were treated in our institute using electrodetachable coils via an endovascular approach. Of these, 10 patients had spontaneously ruptured VDAs. They were treated within 15 days of the SAH (mean, 6 days). At the time of treatment, 9 patients manifested Hunt and Hess grades 1–3, while 1 patient presented with grade 4.

Since craniotomy with clipping of the VDA is technically challenging due to difficult access, and may be associated with a high rate of lower cranial palsy and respiratory problems, an endovascular approach was selected for treating the ruptured VDAs.[4,5,7] All endovascular procedures were performed under local (n = 3) or general (n = 7) anesthesia using a femoral approach. Diagnostic, high-magnification and rotational cerebral angiograms were obtained to determine the aneurysm size, shape and location as well as the relationship of the VDA to the PICA. Test occlusion was performed in 3 patients because the affected vertebral artery significantly dominated the blood flow of the vertebrobasilar system (Figure 1A). Endovascular embolization was initiated by introducing a 6F guiding catheter into the affected vertebral artery, followed by navigating a microcatheter to a position just distal to the VDA. Care was taken not to enter the pseudolumen of the aneurysm and rupture the VDA. Occlusion of the aneurysms distal to proximal dissecting sites and small segments of proximal vertebral arteries was performed by selecting the proper soft electrodetachable coils. It is important to adequately embolize the proximal site and keep the nearby PICA patent. When trapping was complete, the microcatheter was carefully pulled out. Trapping was considered to be complete when angiography of the ipsilateral vertebral artery confirmed complete obstruction of the afferent vertebral arterial flow, and angiography of the contralateral vertebral artery demonstrated cessation of retrograde filling of the VDA (Figures 1 and 2).

At the end of the procedure, systemic anticoagulation was achieved by administering an intravenous continuous injection of an anticoagulative agent to prevent embolic events, and the active coagulation time was maintained at 2 times baseline for 24 hours. All patients were placed under close neurologic evaluation in the intensive care unit for at least 2 days.

Results

The clinical data of the 10 patients are summarized in Table 1. There were 5 men and 5 women, with a mean age of 48 years (range, 33–61 years). Of the 10 VDAs, 6 were on the right and 4 on the left side; 8 were distal to the PICA (Figure 1) and 2 were proximal to the PICA (Figure 2). One dissecting segment extended upwards to involve the vertebrobasilar junction. In 3 patients, the affected vertebral artery was the dominant flow for the vertebrobasilar system (Figure 1A), while in 3, it was co-dominant with the contralateral vertebral artery (Figure 2A). In the remaining 4 patients, the vertebral artery contralateral to the affected one was dominant. In 9 cases, the endovascular technique consisted of trapping of the dissecting site and a small proximal vertebral artery (Figures 1C and 2C); complete obliteration of the dissecting aneurysm was angiographically confirmed. In 1 patient, the VDA was subtotally occluded because of the potential risk of occluding the basilar artery while coiling the dissecting segment of the vertebrobasilar junction.

No patients showed distal embolism or coil migration. The number of coils used for embolization varied from 4 to 11 (mean, 7), while coil length varied from 20 to 130 cm (mean, 58 cm). One patient experienced temporary impairment of the ipsilateral facial nerve, possibly because of coil mass compression of the facial nerve or compromise of the arterial branch supplying the facial nerve, which resolved completely within 6 months. No significant procedure-related neurologic complication or rebleeding was observed. Nine patients had good clinical recovery, ensuring an independent lifestyle. One patient showed improvement but had residual neurologic deficit after embolization necessitating a dependent lifestyle. All patients were followed-up clinically for a mean of 15 months (range, 6–24 months), while 7 had follow-up angiographies from 7 days to 6 months after embolization.

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