Case Studies

Endovascular Therapy for Infectious Intracranial Aneurysm: A Report of Four Cases

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Background: Infectious intracranial aneurysms (IIAs) are rare but can cause substantial morbidity and mortality. We aimed to re-evaluate the role of endovascular therapy for the treatment of IIAs. *Methods:* This study is a retrospective review of patients diagnosed with IIAs and treated by endovascular therapy in our institutions over the past 13 years. *Results:* Four patients were diagnosed with infectious endocarditis with a total of 5 IIAs. Three of the 4 patients had ruptured IIAs. Two presented with intracerebral hemorrhage, one with subarachnoid hemorrhage, and one with cerebral infarction. The distal middle cerebral artery (MCA) was the most common site, followed by the distal segment of the posterior cerebral artery. Three patients were treated by parent artery occlusion and one by direct aneurysm obliteration. There were no periprocedural complications. One IIA treated by direct aneurysm occlusion was recanalized within 1 year and required a second embolization. Outcomes were measured by the modified Rankin Scale on discharge: 2 patients scored 0, 1 patient scored 1, and 1 patient scored 3. *Conclusion:* IIAs located deep in the brain or on the peripheral MCA can be safely treated with endovascular therapy even when they are lying in the eloquent cortex.
Key Words: Infectious intracranial aneurysm—bacterial endocarditis—coil embolization—modified Rankin Scale.

Introduction

Infectious intracranial aneurysm (IIA) is a rare complication of infectious endocarditis. It is estimated to comprise .7%-5.4% of all the aneurysms arising on the cerebral vessels, and classically has been considered as mycotic aneurysm.[1] The most common location of IIAs is on the peripheral branches of the middle cerebral artery (MCA).[1,2] Most IIAs present with a rupture, and the outcome is frequently dismal.[1,3] A variety of treatment strategies for IIAs have been reported, including conservative treatment with antibiotics, endovascular therapy, microsurgical neck clipping, excision of the aneurysm, and trapping with or without bypass surgery.[1,4-9] However, there are no standardized treatment protocols. Endovascular therapy has been used to treat a small number of IIAs using a variety of materials and techniques.[1,4,5,8,9]

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Here we present a series of 4 cases of IIAs managed by coil embolization, with a brief discussion on the indications for endovascular therapy in the treatment of IIAs.

Materials and Methods

We retrieved the medical records of patients with IIAs who were treated by endovascular therapy at our institution and at 2 affiliated university hospitals between 2001 and 2014. Diagnoses were made on the basis of the unusually distal location of the aneurysm on neuroimages, concurrent systemic infection, and symptoms of cardiac failure and documented echocardiographic findings. All the patients underwent endovascular therapy under general anesthesia after the treatment of endocarditis. During the endovascular procedure, intravenous heparin was administered to maintain an activated clotting time approximately twice the control value. A 6- or 7-Fr guiding catheter was placed via the right femoral artery through which a microcatheter was advanced until it reached the neck of the aneurysm. Treatment outcomes were evaluated 6 months after the procedure using the modified Rankin Scale (mRS).

Results

Four patients comprising 3 men and 1 woman were retrieved with a total of 5 IIAs (Table 1). All the patients were immunocompetent. The mean age was 42.8 years ranging 24-63 years. The presenting symptoms included headache, fever, hemiparesis, hemianopia, and acute heart failure. Three patients had a ruptured IIA, and the remaining one had both ruptured and nonruptured IIAs. The most common site was the distal MCA and was found in 3 cases, followed by the distal segment of the posterior cerebral artery, which was found in 2 cases. Two patients presented with intracerebral hemorrhage, one with subarachnoid hemorrhage and one with cerebral infarction. The causative organisms were identified in two out of the 4 cases. All the patients were treated by coil embolization with a mean anesthetic time of 78 minutes (range 72-84 minutes). Three patients were treated by parent artery occlusion with embolization of the IIA, and one by direct aneurysm obliteration. Guglielmi detachable coils were used for embolization (Stryker, Kalamazoo, MI). Onyx, *n*-butyl 2-cyanoacrylate, or stents were not used. All endovascular procedures were uneventful and there were no complications. Outcomes were favorable in 3 patients; the mRS score at 6 months was 0 in 2 patients, 1 in 1 patient, and 3 in 1 patient. One patient with an mRS score of 3 presented with Hunt and Hess grade IV subarachnoid hemorrhage and did not improve during the period. In 1 case, an IIA treated by direct aneurysm occlusion required a second embolization 1 year later due to recanalization.

Illustrative Cases

Case 1

A 24-year-old, previously healthy man presented to our hospital with a 1-month history of headache and low-grade fever. On presentation there was no neurological deficit. Computed tomography of his head showed a 1.5×1.0 cm intracerebral hemorrhage in the left parietal lobe (Fig 1, A,B). Cerebral angiography revealed a 4.5×4.0 mm saccular aneurysm lying distally on the angular branch of the left MCA (Fig 2, A,B). Echocardiography showed an impaired left ventricular ejection fraction of 50%, with mitral valve regurgitation and vegetations. Blood culture grew *Streptococcus sanguis*. A diagnosis of bacterial endocarditis was made, and the patient was administered a 3-week course of intravenous

Table 1. *Demographic and clinical characteristics of 4 patients presenting with infectious cerebral aneurysm*

Patient no.	Age/sex	Presentation	Location	Preceding fever and BE	Procedure	Complications	Outcome (mRS)
1	63 M	SAH, H-H grade IV, headache	Distal MCA	Fever (+) BE: undefined	Direct AN embolization	None	3
	Rec.	asymptomatic	Distal MCA		PAO	None	3
2	37 F	① ICH hemiparesis	Distal MCA	Fever (+) BE: undefined	PAO	None	1
		② asymptomatic	Distal PCA nonruptured		PAO	None	1
3	47 M	AN growth, CI, hemianopia	Distal PCA nonruptured	Fever (+) BE: defined	PAO	None	0
4	24 M	ICH headache, heart failure	Distal MCA	Fever (+) BE: defined	PAO	None	0

Abbreviations: AN, aneurysm; BE, bacterial endocarditis; CI, cerebral infarction; F, female; H-H, Hunt and Hess; ICH, intracerebral hemorrhage; M, male; MCA, middle cerebral artery; PAO, parent artery occlusion; PCA, posterior cerebral artery; Rec., recurrence; SAH, subarachnoid hemorrhage.