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Clinical Study

Endovascular treatments for posterior cerebral artery aneurysms and vascular insufficiency of fetal-type circulation after parent artery occlusion

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ABSTRACT

We present a retrospective analysis of endovascular treatments for posterior cerebral artery (PCA) aneurysms and discuss the susceptibility of a fetal-type PCA to vascular insufficiency after parent artery occlusion. Among 1207 aneurysms treated with endovascular therapy between March 1997 and March 2013 in our institution, 10 patients (0.8%) presented PCA aneurysms. The principal strategy was to employ selective coil embolization for the aneurysm. However, in certain cases of fusiform or dissecting aneurysms, we performed parent artery occlusion with coils. Clinical and radiological data were collected from hospital charts and evaluated retrospectively. The mean age was 52.7 ± 15.6 years (range, 12–65 years). Five patients (50%) were admitted with a subarachnoid hemorrhage, and one patient presented with slowly developing paralysis. The remaining four patients were diagnosed incidentally. Five patients underwent selective coil embolization, and five patients underwent parent artery occlusion. All endovascular therapies were successfully performed. However, two patients in the parent artery occlusion group suffered cerebral infarction, and both patients exhibited a fetal-type PCA. The remaining three patients in the parent artery occlusion group exhibited an adult-type PCA and did not suffer a cerebral infarction. Endovascular treatment with either selective coil embolization or parent artery occlusion is safe and effective as the long as the anatomical type of the PCA is considered. Patients with a fetal-type PCA may develop vascular insufficiency upon parent artery occlusion. Neurosurgeons should attempt to preserve the parent artery using a flow-diverting stent or stent-assisted technique for a fetal-type PCA aneurysm.

1. Introduction

Posterior cerebral artery (PCA) aneurysms are rare with an intracranial aneurysm occurrence rate of approximately 1% [1]. Surgical intervention for PCA aneurysms is challenging due to the deep and complex operative field [2]. Alternatively, with modern improvements in device technologies, endovascular treatments for PCA aneurysms are relatively safe and effective and are increasingly used.

Two main endovascular strategies involve selective coil embolization and parent artery occlusion, for which the aneurysm morphology should be considered. Several studies have shown that parent artery occlusion for distal to P2 segment PCA aneurysms is safe with good collateral circulation [3]. However, a risk of periprocedural cerebral infarction has also been reported [4].

Herein, we retrospectively reviewed our 10 PCA aneurysm patients that were treated with endovascular therapy. We also examined the risk for vascular insufficiency with parent artery occlusion for a fetal-type PCA.

2. Methods

At our institute, we use endovascular coiling as the first treatment option for ruptured cerebral aneurysms. Between March 1997 and March 2013, 1207 ruptured and unruptured intracranial aneurysms were treated using endovascular therapy at the Mito Medical Center, Ibaraki, Japan. Of the 1207 aneurysms, 10 (0.8%) aneurysms were located on the posterior cerebral artery (PCA). All PCA aneurysms were treated with endovascular therapy under general anesthesia. The principal strategy for PCA aneurysms at our

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Table 1
Baseline characteristics of patients with posterior cerebral artery aneurysms

Characteristic	
Patients, n	10
Male, n (%)	2 (20)
Mean age, yrs ± standard deviation	52.7 ± 15.6
Ruptured aneurysm, n (%)	5 (50)
Saccular aneurysm, n (%)	7 (70)

institution was to perform selective coil embolization. However, endovascular parent artery occlusion was performed for fusiform aneurysms, large aneurysms, and dissecting aneurysms. Clinical and radiological data were collected from hospital charts and evaluated retrospectively. Informed consent was obtained from all patients. We examined age, sex, Hunt and Kosnik grade, Fisher group, aneurysm morphology and location, and type of PCA.

The PCA area involved was classified into four segments by Zeal and Rhoton [5]. The P1 segment extends from the basilar bifurca-

Table 2
Summary of data in 10 patients with posterior cerebral artery aneurysms

No.	Age (y)	Sex	Presenting symptom	H & K	Fisher grade	Side	Location	Shape	Size (mm)	PCA type	Treatment type	Result[#]
1	51	M	SAH	1	2	Left	P2	Saccular	2.7 × 3.6	Adult	Selective coil occlusion	II
2	49	F	Incidental	0	0	Left	P1	Saccular	2.5 × 2.5	Fetal	Selective coil occlusion	III
3	64	F	SAH	2	3	Left	P2	Fusiform	4.9 × 7.4	Adult	PAO	I
4	63	F	Incidental, AVM	0	0	Left	P1	Saccular	7.0 × 6.0	Adult	Selective coil occlusion	I
5*	53	F	Hemiparesis	0	0	Right	P1/P2	Saccular	24.5 × 20.0	Fetal	PAO	I
6	65	F	SAH	2	3	Right	P4	Saccular	6.5 × 4.1	Adult	Selective coil occlusion	I
7	50	F	Incidental	0	0	Left	P3	Fusiform	12.7 × 10.7	Adult	PAO	I
8*	58	F	SAH	2	2	Left	P2	Saccular	6.1 × 5.3	Fetal	PAO	I
9	62	F	SAH	4	3	Left	P1/2	Saccular	5.6 × 5.0	Adult	Selective coil occlusion	I
10	12	M	Incidental	0	0	Right	P2	Fusiform	6.9 × 7.3	Adult	PAO	I

Case 5* and case 8* suffered cerebral infarction related to the procedure. [#] Results were classified using the Raymond–Roy Occlusion Classification system.
AVM = arteriovenous malformation, F = female, H & K = Hunt and Kosnik grade, M = male, P1/2 = junction of the P1 and P2 segments of the posterior cerebral artery, PAO = parent artery occlusion, PCA = posterior cerebral artery, SAH = subarachnoid hemorrhage.

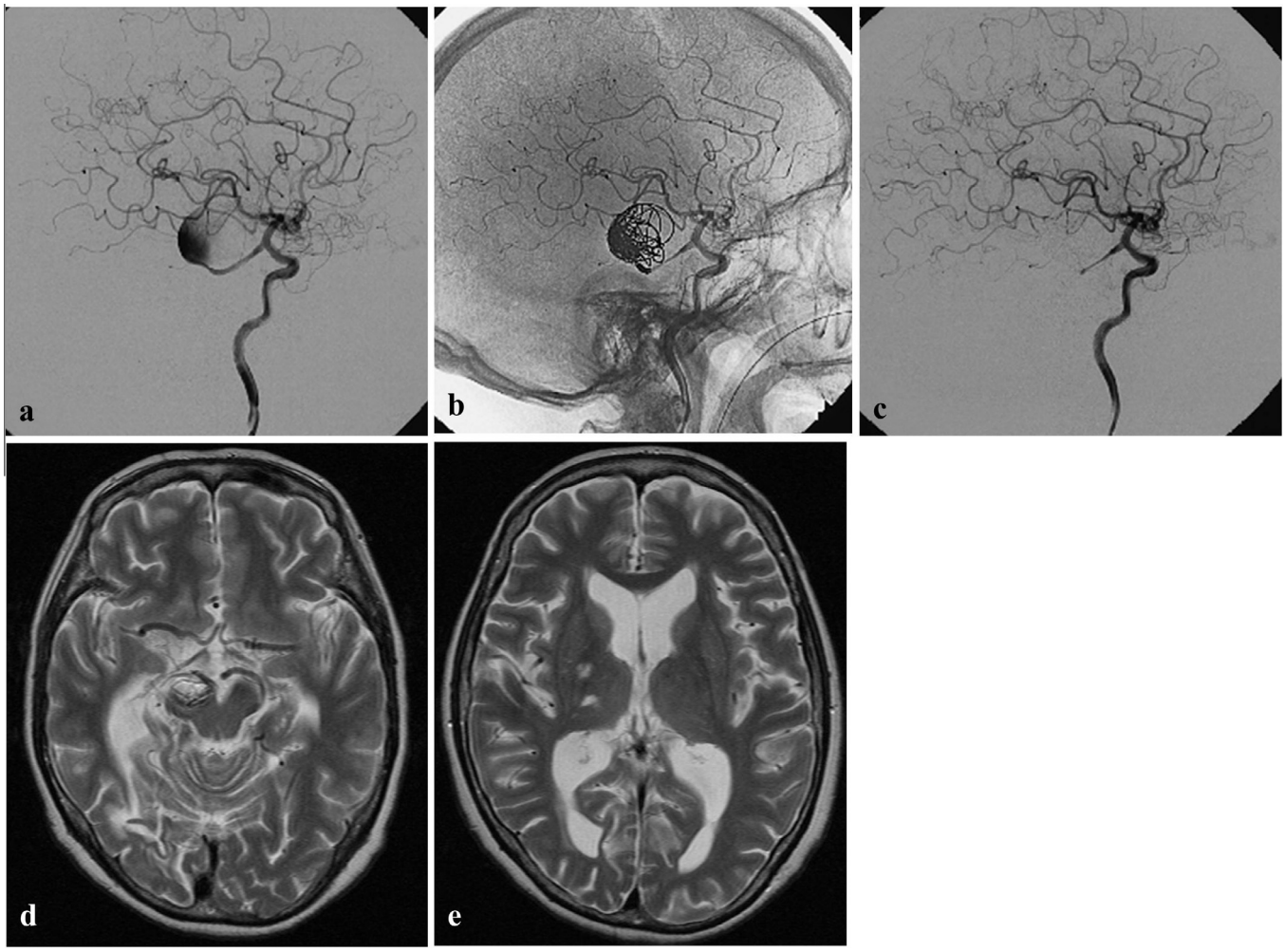

Fig. 1. Patient 5. Lateral internal carotid artery angiogram (a) before and (b, c) after endovascular therapy. A large aneurysm with a fetal-type posterior cerebral artery (PCA) is shown. Several coils were inserted into the aneurysm to occlude the parent artery. (d, e) An axial T2-weighted MRI after parent artery occlusion shows a cerebral infarction in the right PCA territory and right thalamus.