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Application of endovascular coiling and subsequent Onyx 34 embolization in anterior communicating artery aneurysms with adjacent hematoma☆

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ABSTRACT

Objective: Small anterior communicating artery aneurysms with recurrent bleeding and adjacent hematoma may have a high risk of post-operative rebleeding. This clinical study summarizes our preliminary experience with this subset of aneurysms, which were treated with endovascular coiling and subsequent Onyx 34 embolization.

Methods: We retrospectively reviewed the data of 9 patients suffering from small anterior communicating artery aneurysms treated with the combination of coils and Onyx. The clinical characteristics, angiographic outcomes, and follow-up results are reviewed.

Results: Endovascular coiling and Onyx embolization were successfully accomplished in all 9 cases. The Raymond scale ratings of the treatments are all class I with the parent arteries kept patent. One patient died of severe brain edema on the 5th post-operative day. The modified Rankin scale (mRS) score for the other 8 patients at follow-ups (6 m to 26 m, 15.8 m on average) was 0 in 5 cases, 1 in 2 cases, and 3 in 1 case. Seven of 8 patients (87.5%) underwent angiographic follow-up that demonstrated persistent durable occlusion with no recanalization.

Conclusions: Endovascular coiling and subsequent Onyx 34 embolization may be effective in treating anterior communicating artery aneurysms with adjacent hematoma. Further studies with larger sample size and adequate follow-up are required to verify its safety and efficacy as well as to evaluate the long-term outcome.

1. Introduction

The International Subarachnoid Aneurysm Trial (ISAT) confirmed better outcomes of patients with intracranial aneurysms treated by endovascular coiling than by neurosurgical clipping [1–3]. However, early rebleeding after endovascular coiling is not uncommon [4]. It is reported that the location of an anterior communicating artery (ACoA) aneurysm, presence of an adjacent hematoma, and small aneurysm size are independent risk factors for rebleeding [4]. A possible explanation for the high risk of rebleeding for aneurysms expressing all the risk factors may be the formation of pseudoaneurysms after the rupture of saccular aneurysms [5–7]. This is the technical challenge for endovascular therapy. We report the successful application of endovascular coiling and subsequent Onyx embolization in 9 cases of small ACoA aneurysms with recurrent bleeding and adjacent hematoma.

2. Materials and methods

The institutional review board of Changhai Hospital, Second Military Medical University approved this retrospective study, and the requirement for informed consent was waived.

Abbreviations: ACoA, anterior communicating artery; SAH, subarachnoid hemorrhage; mRS, modified Rankin scale score.

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Table 1
Data for eight patients diagnosed ACoA aneurysmswith adjacent hematoma treated by combination of coils and Onyx.

Case no.	Age/ sex	H & H grade	Hematoma		Aneurysm		Embolic Materials	Onyx Extravasation	Agiographic Outcome		mRS score	
			Vol[a](ml)	Evolution	Shape	Neck /Max (mm)			PE	FU (mos)	At discharge	FU (mos)
1	54/F	2	9	Enlarged	Saccular, irregular	1.9/3.2	Onyx 34; Hydrosoft 2/6	Hematoma[a]	TO	TO (12)	1	0(26)
2	61/F	3	6	Enlarged	Saccular, irregular	2.1/4.2	Onyx 34; Hydrosoft 3/8 2/2	None	TO	TO (6)	1	0(22)
3	51/M	4	13	Enlarged	Saccular, irregular	1.7/2.7	Onyx 34; Microplex 2/4	Subarachnoid space[b]	TO	NA[c]	6	NA[c]
4	31/F	2	5	NA[d]	Lobulated	2.8/4.5	Onyx 34; Hydrosoft 3/8 2/4	None	TO	TO (7)	1	0(21)
5	53/M	3	3	Delayed absorption	Lobulated	2.6/8.9	Onyx 34; Hydrosoft 4/10 3/10	None	TO	TO (8)	1	1(19)
6	41/F	1	5	Enlarged	Saccular, irregular	2.3/3.2	Onyx 34; Hydrosoft 3/6 2/2	Hematoma[a]	TO	TO (6)	2	1(12)
7	45/M	1	10	Enlarged	Lobulated	2.3/2.5	Onyx 34; Hydrosoft 2/4; Hypersoft 1.5/2	Hematoma[a]	TO	TO (4)	2	0(11)
8	53/M	2	6	NA[d]	Saccular, irregular	1.9/3.0	Onyx 34; Hydrosoft 2/4; Hypersoft 1.5/2	None	TO	NA[e]	1	0(9)
9	29/F	4	5	Enlarged	Saccular, irregular	1.9/3.2	Onyx 34; Hydrosoft 2/4; Hypersoft 1.5/2	None	TO	TO(4)	4	3(6)

Vol: volume; Max: max diameter; PE: post-embolization; FU: follow-up; TO: total occlusion; NA: not available.
[a] Onxy extravasation into the hematoma adjacent to the aneurysm.
[b] Onxy extravasation into the subarachnoid space which may be caused by intraoperative rupture when injecting Onyx.
[c] The patient died at the 5th post-operative day.
[d] Only one CT scanning was performed before the treatment.
[e] Not available, angiographic follow-up has been scheduled.

2.1. Patient population

From the aneurysm database between February 2010 and August 2012 in our institution, 9 patients with small ACoA aneurysms were identified, all were with adjacent hematoma and treated with a combination of coils and Onyx. Clinical characteristics, procedural data, angiographic and follow-up results were reviewed, and are shown in Table 1.

The studied population included 5 males and 4 females. The age of onset ranged from 29 to 61 years old (46.4 on average). The preoperative Hunt and Hess grade was I in 2, II in 3, III in 2, and IV in 2 patients.

2.2. Radiographic features

Subarachnoid hemorrhage was confirmed on CT scanning with a Fisher scale of 3 in all patients. Rebleeding was detected clinically in all patients, and formation ($n=3$) or enlargement ($n=6$) of hematomas were confirmed by CT scanning prior to the treatment (Table 1 and Fig. 1). The hematomas were located in the anterior longitudinal fissure or in the frontal lobe, and the volume of the hematoma ranged from 3 mL to 13 mL (6.9 mL on average).

The aneurysms were revealed on admission through CT angiography or conventional angiography. The sizes ranged from 2.5 mm to 8.9 mm (3.9 mm on average). The configuration was irregular saccular (Figs. 1 and 2)or lobulated (Fig. 3). Moderate to severe vasospasm was revealed in 2 cases (Cases 3 and 5) (Fig. 3).

2.3. Endovascular treatment procedure

All cases accepted endovascular treatment within 72 h except one transferred to our center 12 days after onset. The procedures were performed under general anesthesia.

A 6-French MPC Envoy guide catheter (Cordis Neurovascular, Miami, FL) was placed in the internal carotid artery (ICA) as distal as possible, and was connected to a double hemostasis valve Y connector. A HyperForm balloon microcatheter (Micro Therapeutics, Irvine, CA) was navigated with its Xpedion guidewire (Micro Therapeutics, Irvine, CA) to the aneurysm neck under road mapping. Then an Echelon-10 (Micro Therapeutics, Irvine, CA)

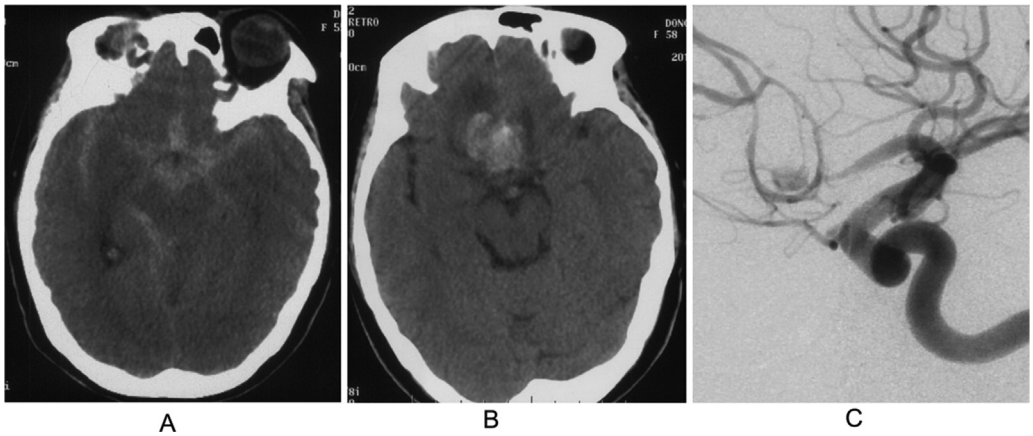

Fig. 1. Case 1. (A) Axial CT scan at onset showing subarachnoid hemorrhage. (B) CT scan at presentation in our center showing a new derived hematoma. (C) Left internal carotid artery angiogram showing an irregular-bordered ACoA aneurysm.