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Stent-assisted coiling versus coiling alone of ruptured anterior communicating artery aneurysms: A single-center experience

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ABSTRACT

Objective: Endovascular coiling of anterior communicating artery (ACoA) aneurysms has evolved; however, stent-assisted coiling of ruptured aneurysms remains controversial. We aimed to compare periprocedural complications, angiographic and clinical outcomes after stent-assisted coiling with coiling alone of ruptured ACoA aneurysms.

Methods: We performed a retrospective review of consecutive 222 patients with ruptured ACoA aneurysms treated with endovascular coiling within 7 days after ictus. Patients were grouped into stent-assisted coiling and coiling alone groups. Baseline characteristics, periprocedural complications, clinical outcomes, and angiographic results were compared between the two groups.

Results: 63 (28.4%) patients underwent stent-assisted coiling and 159 (71.6%) underwent coiling alone. There were no statistically significant differences in age, sex, clinical grading and Fisher grade. Larger aneurysms ($P = 0.002$) and wider-neck aneurysms ($P < 0.001$) were more often treated with stent-assisted coiling within 72 h ($P = 0.025$). Intraprocedural aneurysm rupture occurred in 6 (9.5%) patients treated with stent-assisted coiling compared with in 5 (3.1%) treated with coiling alone ($P < 0.048$). Thrombus formation occurred in 10 (15.9%) patients after stent-assisted coiling compared with 6 (3.8%) after coiling alone ($P = 0.002$). Stent-assisted coiling achieved a lower rate of immediate occlusion than coiling alone ($P = 0.045$). Postoperative complications, clinical outcomes, and follow-up aneurysm occlusion did not significantly differ.

Conclusions: Stent-assisted coiling of ruptured ACoA aneurysms was associated with a higher rate of intraprocedural complications and associated with a lower immediate occlusion rate. However, Postoperative complications and clinical outcomes did not differ. Long-term angiographic results require further study.

1. Introduction

Anterior communicating artery (ACoA) aneurysms are very common in ruptured intracranial aneurysms. Traditionally ruptured ACoA aneurysms are treated with surgical clipping because of complex morphological features [1,2]. Currently, with advances of endovascular technology, endovascular coiling of ACoA aneurysms has evolved dramatically and has been a safe and effective treatment option for ruptured ACoA aneurysms [3–6]. Recently stent-assisted coiling has been reported to be used in the treatment of ACoA aneurysms [7–10]. However, the majority of ACoA aneurysms included in these studies are unruptured.

Although stent-assisted coiling of ruptured intracranial aneurysms remains controversial [11–14], several studies have reported that stent-assisted coiling of ruptured ACoA aneurysms is feasible and safe [8,12,14].We hypothesized that stent-assisted coiling of ruptured ACoA aneurysms could achieve similar complications, angiographic and clinical results compared with coiling alone. In the report, we presented a single institution series of patients with ruptured ACoA aneurysms treated with endovascular coiling. We aimed to compare periprocedural complications,

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Table 1
Baseline characteristics.

Characteristics	All (n = 222)	Sent-assisted coiling (n = 63)	Coiling alone (n = 159)	*P* value
Age (years)	53.8 (11.2)	53.7 (10.9)	53.9 (11.4)	0.914
Women	108 (48.6%)	29 (46.0%)	79 (49.6%)	0.623
Smoking	76 (34.2%)	25 (39.7%)	51 (32.1%)	0.282
Hypertension	112 (50.5%)	34 (54.0%)	78 (49.1%)	0.509
Coronary artery disease	3 (1.4%)	1 (1.6%)	2 (1.3%)	1.000
Stroke history	6 (2.7%)	1 (1.6%)	5 (3.1%)	0.852
WFNS grade				
WFNS I	172 (77.5%)	45 (71.4%)	127 (79.9%)	0.174
WFNS II	14 (6.3%)	5 (7.9%)	9 (5.7%)	0.529
WFNS III	3 (1.4%)	2 (3.2%)	1 (0.6%)	0.403
WFNS IV	24 (10.8%)	7 (11.1%)	17 (10.7%)	0.928
WFNS V	8 (3.6%)	3 (4.8%)	5 (3.1%)	0.854
Unavailable	1 (0.4%)	1 (1.6%)	0	0.284
Fisher grade				
Fisher I	4 (1.8%)	2 (3.2%)	2 (1.3%)	0.683
Fisher II	17 (7.7%)	3 (4.8%)	14 (8.8%)	0.458
Fisher III	70 (31.5%)	23 (36.5%)	47 (29.6%)	0.315
Fisher IV	117 (52.7%)	31 (49.2%)	86 (54.1%)	0.511
Unavailable	14 (6.3%)	4 (6.3%)	10 (6.2%)	1.000
Aneurysm size (mm)	5.5 (2.3)	6.2 (2.2)	5.2 (2.2)	0.002
Aneurysm neck (mm)	3.0 (1.2)	3.8 (1.3)	2.7 (1.0)	<0.001
Dome-to-neck ratio	1.9 (0.9)	1.8 (0.7)	2.0 (0.9)	0.088
Timing of treatment				0.025
≤72hours	97 (43.7%)	35(55.6%)	62(39.0%)	
73hours–7 days	125 (56.3%)	28(44.4%)	97(61.0%)	

WFNS, World Federation of Neurological Societies.

angiographic results and clinical outcomes after stent-assisted coiling with coiling alone of ruptured ACoA aneurysms.

2. Methods

2.1. Study design

The institution review committee approved the study and we retrospectively reviewed data on ACoA aneurysms treated with endovascular coiling from January 2008 to February 2015. 254 consecutive patients with ACoA aneurysms underwent endovascular coiling. Patients were included if they presented with subarachnoid hemorrhage secondary to a ruptured ACoA aneurysm and were treated with stent-assisted coiling or coiling alone within 7 days after ictus. Of the 254 patients, 3 patients presenting with unruptured ACoA aneurysms and 27 patients undergoing coiling over 7 days were excluded. 224 patients with 224 ruptured ACoA aneurysms were included in this study. Patients were then grouped into sent-assisted coiling and coiling alone groups.

2.2. Endovascular procedure protocol

All patients were treated under general anesthesia and systemic heparinization. A bolus of 50–75 IU/kg of heparin was given after femoral sheath placement, and intermittent boluses of 1250 IU per hour were given during the procedure. Activated clotting time was maintained at 2–3 times baseline level. Stent-assisted coiling was considered in ruptured aneurysms with an unfavorable morphology (aneurysm neck ≥ 4.0 mm or dome/neck ≤2.0). Balloon-assisted coiling was not routinely used for ACoA aneurysms because of complex morphologies of ACoA and perforators. The Neuroform stent (Stryker Neurovascular, Fremont, California), the Enterprise stent (Cordis Neurovascular, Miami, Florida) and the Solitaire AB stent (Covidien, Irvine, California) were used. Most patients were treated with the Solitaire AB stent because of its retrievability. Stent-assisted coiling was often performed using microcatheter jailing technique in which stent was deployed after the aneurysm was microcatheterized or semi-jailing technique in which stent was partially deployed to cover the aneurysm neck. Standard technique was not used in our patients because of small vessel size and complex morphologies of surrounding arteries associated AcoA aneurysms.

2.3. Antiplatelet therapy in stent-assisted coiling

For stent-assisted coiling, 100 mg of aspirin and 75 mg of clopidogrel were administered daily for 3 days before the procedure. For emergency stent-assisted coiling, a loading dose of 450 mg clopidogrel was used either by a nasogastric tube or rectally before 2 h of stent deployment. The individual response to antiplatelet agents was not routinely measured during the study. After stent-assisted coiling, 100 mg of aspirin and 75 mg of clopidogrel were administrated daily for 12 weeks, and 100 mg of aspirin was given for 12 months.

2.4. Outcomes measures

The primary outcomes were intraprocedural complications (introprocedural rupture and thrombus formation), postoperative complications (early rebleeding and ischemia) and clinical outcomes. Postoperative ischemia was defined as symptomatic ischemia or a new hypo-density located in a vessel distribution on CT scan. Clinical outcomes at discharge were recorded with Glasgow coma score and those at the latest follow-up were measured with modified Rankin Scale (mRS).The secondary outcomes were immediate and follow-up angiographic results. Angiographic follow-ups were performed by digital subtraction angiography. Aneurysm occlusion was assessed using the Raymond occlusion scale. Complete occlusion was defined as a Raymond grade of I. Aneurysm recurrence was defined as aneurysm occlusion grade decreasing from initial Raymond grade on follow-up angiography. Periprocedural complications, clinical outcomes, and angiographic results were reviewed by both interventionalist and neurosurgeon who were independent of the treatment.