Stent Placement for Complex Middle Cerebral Artery Aneurysms

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Background: To evaluate the safety and effectiveness of stent placement for ruptured or unruptured middle cerebral artery (MCA) aneurysms in a larger number. *Methods:* Between October 2003 and December 2012, data for 70 patients with 72 complex MCA aneurysms treated with stents at our institution were retrospectively collected and analyzed. *Results:* Eighty-five stents were successfully deployed in this series. However, failure of followed coiling was encountered in 2 (2.8%) tiny aneurysms of them. Of the 63 aneurysms treated with stent-assisted coiling, complete occlusion was achieved in 22 (34.9%), neck remnant in 15 (23.8%), and residual sac in 26 (36.5%). Of the 9 aneurysms treated with stent alone, the results were contrast stasis in 3 aneurysms and no change in 6. Procedure-related complications occurred in 9 (12.5%) procedures, including 7 of 27 (25.9%) with ruptured aneurysms and 2 of 45 (4.4%) with unruptured aneurysms, which resulted in 1 death and 5 disabilities. Univariate and multivariate analyses show that ruptured aneurysm is an independent factor for the outcome of these patients (odds ratio, 7.35; 95% confidence interval, 1.35-40.0). Angiographic follow-up results (mean, 10.5 ± 8.8 months) showed that 72.1% (44 of 61) were completely occluded, 4.9% (3 of 61) recurred, and others were stable or had improved. Intrastent stenosis was observed in 1 (1.6%) patient, which was managed conservatively. During a clinical follow-up period ranging from 7 to 113 months (mean, 33.0 ± 22.4 months), 1 disabled patient died from severe pneumonia, whereas the clinical status of the others had improved or was stable. Procedure-related morbidity/mortality during the follow-up for the ruptured and unruptured groups were 3.7%/3.7% and 0/0, respectively. *Conclusions:* Our study shows that stent placement for the treatment of certain wide-neck MCA aneurysms is feasible, safe, and effective. However, stent placement for acutely ruptured MCA aneurysms harbors a much higher complication rate. **Key Words:** Stent—middle cerebral artery—aneurysms—unruptured—ruptured.

Introduction

Because International Subarachnoid Aneurysm Trial investigators published their results, more and more intracranial aneurysms are treated via an endovascular approach.[1] However, controversies still exist about endovascular treatment for middle cerebral artery (MCA) aneurysms. Although various articles have demonstrated

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that endovascular treatment for MCA aneurysms is safe, effective, and equivalent to surgical clipping,[2-4] the complex anatomies, including wide necks, fusiform morphology, and incorporation of important branches, are still the obstacles for these aneurysms.[5] Intracranial stent is one of the most widely used tools in treating these complex lesions and is proved to be safe and effective. But the data are still limited for MCA aneurysms, especially for ruptured aneurysms.[6-8]

In the previous article, we have published our preliminary experience about stent placement for 16 wide-necked MCA aneurysms and demonstrated the feasibility of this technique.[9] In this article, we retrospectively analyzed 70 patients with 72 complex MCA aneurysms treated from October 2003 to December 2012. We aimed to evaluate the safety and effectiveness of stent placement for these complex MCA aneurysms in a larger number; possible influence factors of those procedure-related complications were also analyzed.

Patients and Methods

Between October 2003 and December 2012, 233 patients with MCA aneurysms were admitted to our institution, treatment decision was based on the following indications: (1) ruptured aneurysm; (2) unruptured aneurysm of 5 mm or more; and (3) unruptured aneurysm of less than 5 mm, but with at least one of the risk factors such as symptomatic presentation, personal history of subarachnoid hemorrhage (SAH) from another intracranial aneurysm, increased size during follow-up, familial history of SAH, recanalization from previous treated aneurysms, and heavy psychological stress. As a result, 187 were treated via an endovascular approach, 22 were clipped because of compressive hematoma requiring immediate surgical evacuation or patient's preference to clipping, whereas the others were not treated because of the following reasons: (1) the aneurysms were small and asymptomatic and (2) the patients refused treatment because of old age, poor general conditions, or economic problems. Of the 187 patients treated via an endovascular approach, 70 patients with 72 aneurysms, who were treated with stent-assisted coiling or stent alone, were included in this series to evaluate the safety and effectiveness of stent placement for complex MCA aneurysms, whereas all others were treated with coiling alone because of simpler morphologies except for 2 patients treated with balloon remodeling. The Institutional Review Board at our institution approved the retrospective review of all the data in this series.

As shown in Table 1, there were 35 men and 35 women with a mean age of 55.8 ± 9.8 years (range, 31-78 years). Of these 70 patients, 27 were admitted because of SAH or intracranial hemorrhage (ICH) caused by MCA aneurysm rupture, whereas the rest were presented with SAH from other concurrent aneurysm bleeding (n = 3), headache (n = 9), recanalization after previous treatment (n = 6), transient ischemic attack/ischemia (n = 4), or incidental aneurysm finding (n = 21). Hunt and Hess (HH) grade scales for these 27 patients with ruptured MCA aneurysms when admitted to hospital were grade I in 5 patients, grade II in 12, grade III in 5, grade IV in 3, and grade V in 2 patients.

Table 1. *Clinical and angiographic data of 70 patients with 72 MCA aneurysms treated with stent-assisted coiling or stent alone*

Patients (aneurysms)	70 (72)
Mean age (range)	55.8 ± 9.9 (31-78)
Male:female	35:35
Hunt and Hess scale	
0	43
I	5
II	12
III	5
IV	3
V	2
Side (left/right)	36/36
Location	
M1 segment	21
MCA bifurcation	51
Type	
Saccular	66
Fusiform	6
Size	
Tiny (≤3 mm)	19
Small (3-10 mm)	40
Large (10-25 mm)	9
Giant (>25 mm)	2
Stenting strategy	
Stenting before coiling	7
Stenting after coiling	51
Waffle cone	1
Y-configuration	4
Stent alone	9
Type of stent (n = 85)	
Enterprise	60
Neuroform	15
Solitaire	6
Leo	4

Abbreviation: MCA, middle cerebral artery.

Endovascular treatments were performed by several authors (J.L., Y.X., B.H., Q.H., and W.Z., who had more than 5 years of experience) of this article. All patients with recently ruptured (≤1 month) aneurysms were treated emergently after admission. However, because transfer of these patients might have been delayed, the time of treatment varied. Of them, 19 patients were treated within 3 days of the rupture of the aneurysm, 5 patients were treated at an interval of 14-30 days, and 3 patients at an interval of 3-14 days.

Aneurysm Morphology

Of these 72 aneurysms, 21 were located at M1 segment (main trunk from MCA origin to where it divides) and 51