Balloon-Mounted versus Self-Expanding Stent Outcomes in Symptomatic Middle Cerebral Artery Stenosis Combined with Poor Collaterals in China: A Multicenter Registry Study

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■ OBJECTIVE: **To compare the technical and 1-year clinical outcome in balloon-mounted versus self-expanding stenting for symptomatic severe stenosis of the middle cerebral artery combined with poor collaterals in China.**

■ METHODS: **Ninety-one patients with severe middle cerebral artery atherosclerotic stenosis combined with poor collaterals were recruited in the study. Balloon-mounted stent or self-expanding stent were selected to treat patients following a guideline. The baseline characteristics, cerebral angiography, and outcomes were compared between the patients treated with balloon-mounted stent and self-expanding stent.**

■ RESULTS: **The mean degree of stenosis was 85.5% ± 6.37% in the balloon-mounted stenting group and 85.4% ± 7.73% in the self-expanding stenting group before treatment ($P = 0.930$). A longer operative time occurred in patients treated with self-expanding stent than in those treated with balloon-mounted stent (96.7 vs. 68.6 minutes, respectively; $P = 0.002$). Patients with self-expanding stent had a higher rate of residual stenosis than those with balloon-mounted stent (67.3% vs. 38.9%, respectively; $P = 0.014$). The patients in balloon-mounted stenting group was less likely to have restenosis (6.1% vs. 26.5%, $P = 0.019$) and had a lower degree of stenosis (5.0% ± 0.0% vs. 26.9% ± 29.2%, $P = 0.019$) compared with patients in the self-expanding stenting group. During the 1-year follow-up, the recurrence rate of ischemic stroke, transient ischemic attack, hemorrhage stroke, and death was not significantly different between the 2 groups (1/33 vs. 2/49, $P = 0.804$; 1/33 vs. 1/49, $P = 0.776$; 0/33 vs. 2/49, $P = 0.240$; 1/33 vs. 0/49, $P = 0.220$, respectively).**

■ CONCLUSIONS: **Balloon-mounted stents may have a shorter operative time and lower restenosis occurrence than self-expanding stents. No significant difference in 1-year outcome was observed between the 2 groups.**

INTRODUCTION

Symptomatic intracranial atherosclerotic stenosis (ICAS) is a common cause of ischemic stroke with a high risk of recurrent stroke.[1,2] In the United States, intracranial arterial stenosis causes 8%–10% of all ischemic strokes, whereas in Asia nearly 33% of ischemic strokes are attributed to ICAS.[3,4] Previous studies have shown that patients with intracranial stenosis of 70%–99% had a recurrence stroke rate of 15%–23% per year.[5] Currently, antithrombotic agents and endovascular treatment are the primary treatments for ICAS.[6] The Warfarin-Aspirin Symptomatic Intracranial Disease Study revealed that medical therapy for intracranial atherosclerotic stenosis (≥50%) did not show effectiveness for ischemic stroke in the territory of the symptomatic artery, which remaining the recurrence rate as high as 22.0% within 2 years.[7] For those patients, medical

Key words
- Atherosclerosis
- Middle cerebral artery
- Stent
- Stroke

Abbreviations and Acronyms
CT: Computed tomography
CTA: Computed tomography angiography
DSA: Digital subtraction angiography
ICAS: Intracranial atherosclerotic stenosis
MCA: Middle cerebral artery
MRI: Magnetic resonance imaging
NIHSS: National Institutes of Health Stroke Scale
SAMMPRIS: Stenting and Aggressive Medical Management for Preventing Recurrent Stroke in Intracranial Stenosis
TIA: Transient ischemic attack
VISSIT: the Vitesse Intracranial Stent Study for Ischemic Stroke Therapy

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Citation: World Neurosurg. (2019). https://doi.org/10.1016/j.wneu.2018.12.189

*Journal homepage: **www.journals.elsevier.com/world-neurosurgery***

*Available online: **www.sciencedirect.com***

management alone is insufficient for the prevention of recurrent ischemic events.

Currently, endovascular approaches are limited to balloon angioplasty only, self-expanding stent, balloon-expanding stent, or a combination of these therapies. Endovascular therapy was considered to be an effective method to improve clinical outcomes of patients with ICAS before 2011. However, 2 randomized trials, the Stenting and Aggressive Medical Management for Preventing Recurrent Stroke in Intracranial Stenosis (SAMMPRIS) trial and the Vitesse Intracranial Stent Study for Ischemic Stroke Therapy (VISSIT) trial, showed that aggressive medical therapy alone was superior to the Wingspan self-expanding stent (Boston Scientific, Natick, MA) or balloon-expandable stent placement.[8,9] However, our previous study found fewer events of stroke, transient ischemic attack (TIA), and death in patients with endovascular therapy for ICAS, which were lower than those reported in the SAMMPRIS and VISSIT trials.[10] A study pool also revealed that fewer adverse events occurred in patients with ICAS treated with endovascular therapy with a long follow-up.[11] A subanalysis of the SAMMPRIS trial showed that the most common periprocedural ischemic strokes were caused by occlusion of perforator arteries, which also showed the patients with middle cerebral artery (MCA) stenting have a lower rate of perforator stroke than patients with basilar arteries stenosis.[12] The first possible explanation for the low rate of perforator stroke is the larger mean diameter of the perforating arteries of the MCA.[13] Furthermore, most patients had stenotic lesions in the proximal and middle segments of the M1 segment of the MCA, but the perforator artery mainly originated from the distal third of the M1 segment or starting portion of the superior M2 segment.[14] A large number of studies have revealed the periprocedural and long-term symptomatic stroke rates were low in the treatment of MCA stenosis with a stent.[15,16]

To understand the efficacy and safety of interventional treatment on MCA stenosis, we analyze whether the stent placement provided benefit for patients with severe intracranial MCA stenosis. We also studied which type of stent, the balloon-mounted stent or self-expanding stent, will lead to a better outcome for patients with severe MCA stenosis.

MATERIALS AND METHODS

Overall Study Design

Details of the study population, recommended treatment protocol, and stenting procedure have been published previously.[17] This study was designed as a prospective single-arm registry study with 20 participating sites in China. Each participating site was required to obtain institutional review board or ethics committee approval for the registry data collection, performed in accordance with the Health Insurance Portability and Accountability Privacy Act of 1996. Written and oral informed consent was obtained from patients or legally authorized representatives. The diagnosis and therapy were confirmed by a central adjudication committee composed of designated neurologists, neurosurgeons, and radiologists. An independent data and safety monitoring board oversaw the conduction, safety, and efficacy of the study.

Enrollment of Patients

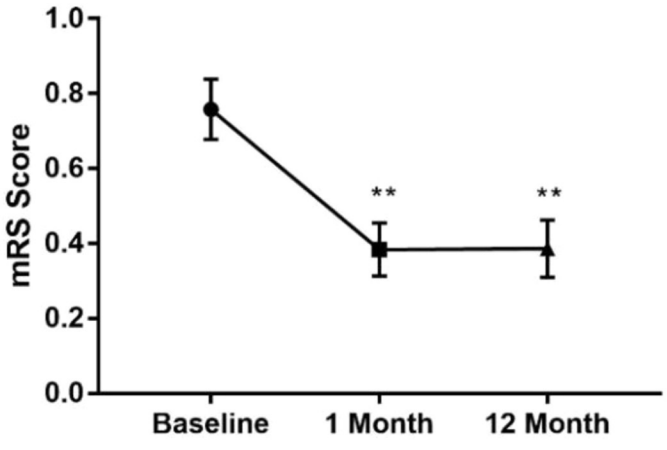
We recruited and analyzed all the patients with intracranial atherosclerotic lesions from 20 sites in China who received balloon-mounted stent or self-expanding stent from September 2013 to January 2015. The inclusion criteria consisted of the following items: patients who were 18–85 years of age, patients with a stenosis rate of the M1 segment of the MCA of 70%–99%, patients with a lesion length <15 mm and target vessel diameter of >2.0 mm, and patients who had measurements of stenosis made on digital subtraction angiography (DSA) according to the warfarin-aspirin symptomatic intracranial disease method with normal distal vessels as the reference. Patient symptoms could be related to TIA or ischemic stroke, and the final symptoms happened within 90 days. Patients also had a hypoperfusion area in the territory of the target lesion. Moreover, hemodynamic impairment in the territory of the artery was evaluated on imaging within 14 days before endovascular therapy, according to any method as follows: 1) cerebral blood flow decrease of ≥30% at the hypoperfusion area when compared with the contralateral side on perfusion computer tomography (CT) scan, 2) an American Society of Interventional and Therapeutic Neuroradiology/Society of Interventional Radiology Collateral Flow Grading System score of <3 on DSA, 3) hypoperfusion by single-photon emission CT scan or hemodynamic ischemic lesion by magnetic resonance imaging (MRI), and 4) a peak systolic velocity of ≥200 cm/s and ≤1 collateral vessel that could be insonated on transcranial Doppler examination. The images were reviewed by at least 2 physicians who were allowed to resolve disagreement through discussion. The patients were excluded from the trial if the raters could not agree on the classification.

The exclusion criteria are as follows: patients with acute infarcts within 3 weeks; patients with severe vessel tortuosity precluding the deployment of endovascular devices as determined by the executive committee; patients with a nonatherosclerotic lesion confirmed by high-resolution MRI; patients with presence of an intracranial tumor, aneurysms, or arteriovenous malformation; patients with emergency arterial occlusion by embolism; or patients with baseline modified Rankin scale score of >3. High-resolution MRI was performed under the following conditions: patients without risk factors for intracranial atherosclerosis, or with lesion suspected to be nonatherosclerotic by regular CT scan, MRI, or DSA. All clinical and imaging data were reviewed centrally by the executive committee to decide whether patients were eligible for enrollment.

Device Selection and Stenting Procedure

The choice of stent was based on the experience and preference of operators, to ultimately select what they thought was best suited for the patient. The Apollo balloon-mounted stent (MicroPort Neuro Tech, Shanghai, China) was used on patients with smooth arterial access and Mori A lesion. The self-expanding stent (Wingspan [Boston Scientific]) might be used for patients with tortuous arterial access, or a Mori C lesion, or a lesion with a significant mismatch in the diameter between the proximal and distal segments.

Patients in this study received aspirin (100 mg/d) and clopidogrel (75 mg/d) for at least 5 days before the operation, or a loading dose of 300 mg clopidogrel if the procedure was thought urgent. All angiographic procedures and angioplasties were



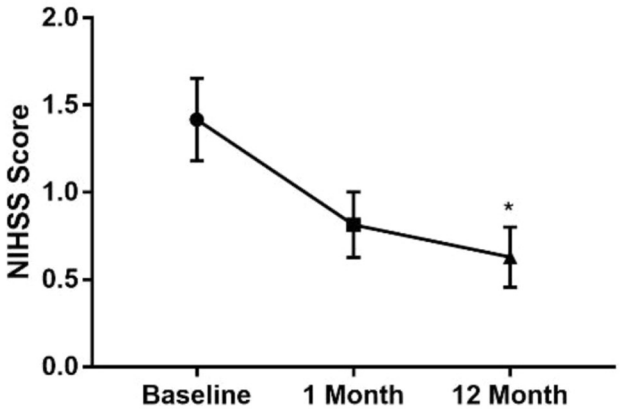


Figure 1. Modified Rankin scale score and National Institutes of Health Stroke Scale score of the patients receiving endovascular therapy. mRS, Modified Rankin scale; NIHSS, National Institutes of Health Stroke Scale.

performed by experienced neurointerventionists at all 20 sites. Either general anesthesia or local anesthesia was chosen according to the operators' experience and patients' status. A bolus of 75 U/kg of heparin was administered intravenously at the beginning of the procedure followed by half the dose 1 hour later. A 7- or 8-F guiding catheter was advanced into the internal carotid artery as high as the vessel tortuosity allowed. With the help of road mapping, stenosis in the MCA was traversed with a 0.014-inch microguidewire, and an angioplasty catheter was introduced across the stenosis. After the operation, a head CT scan was performed to exclude potential intracranial hemorrhage. All patients were given a weight-based dose of 0.4- to 0.6-mL low molecular weight heparin every 12 hours subcutaneously for 3 days and monitored closely until discharge.

Postprocedural Management

All patients took aspirin (100 mg/d) combined with clopidogrel (75 mg/d) for 3 months after stenting. Aggressive medical therapy was implemented to achieve the following goals: systolic blood pressure of <140 mm Hg (or <130 mm Hg in patients with diabetes mellitus), low-density lipoprotein of <70 mg/dL (1.81 mmol/L) or a decrease by 50%, smoking cessation, and lifestyle adjustments for obesity and sedentary state.

Outcome Measure

Follow-up data on clinical outcomes were collected and reviewed by 1 or 2 trained neurologists blindly. The information included treatment assignment at study entry, day of discharge, and 1-month follow-up and a face-to-face or telephone interview every 3 months after the first month of follow-up. If necessary, brain imaging including magnetic resonance angiography and computed tomography angiography (CTA) was obtained in patients who had developed neurologic symptoms. DSA or CTA was recommended to be performed at 1-year follow-up after the procedure.

Statistical Analysis

Continuous variables are expressed as mean with SD or median with interquartile range, as appropriate. Categorical data are presented as proportions. Differences of continuous variables between groups were tested with t test or Kruskal-Wallis test depending on if the data were normally distributed or not, respectively. The χ^2 test (or Fisher exact test with frequencies <5) was used for categorical variables. The exact *P* value was calculated and recorded, and $P < 0.05$ was considered as statistically significant. Statistical analysis was performed using SPSS Version 17.0 software (SPSS Inc., Chicago, Illinois, USA).

RESULTS

Patient Characteristics and Stenting Procedure

From September 2013 to January 2015, a total of 354 intracranial atherosclerotic lesions received balloon-mounted stent or self-expanding stent placement. Sixty-six men and 25 women (mean age, 54.6 ± 10.1 years) who had the target lesion in the MCA were enrolled into this study from 20 sites in China. Ischemic stroke occurred in 38 patients (41.8%), and TIA occurred in 53 patients (58.2%), with a mean time of 25.8 ± 11.9 days from the qualifying event to endovascular treatment. The hemodynamic impairment in the culprit territory was confirmed by radiologic imaging, including CT perfusion in 49 patients (53.8%), DSA in 34 patients (37.4%), and MRI in 8 patients (8.79%). Success in revascularization was observed for all patients. The mean stenosis degree was reduced from prestenting (85.4% ± 7.19%) to poststenting (6.82% ± 7.51%). Endovascular therapy was associated with more favorite disability scores on the modified Rankin scale at 1 month and 1 year compared with before treatment. Similarly, the National Institutes of Health Stroke Scale (NIHSS) score had a good outcome at 1 year compared with before treatment (Figure 1).

Baseline Characteristics of the 2 Groups of Endovascular Treatment

Of the patients, 36 were treated with balloon-mounted stent and 55 were treated with self-expanding stent. Baseline characteristics are shown in Table 1. There were no statistically significant differences between the 2 groups with respect to the clinical

Table 1. Comparison of Baseline Characteristics Between Patients Treated With Balloon-Mounted Stents and Self-Expanding Stents

Variables	Patients Treated with Balloon-Mounted Stent (n = 36)	Patients Treated with Self-Expanding Stent (n = 55)	*P* Value
Age (years)	55.0 ± 9.9	54.4 ± 10.4	0.787
Male sex	27 (75.0)	39 (70.9)	0.851
Risk factors			
Hypertension	21 (58.3)	32 (58.2)	>0.99
Hyperlipidemia	17 (47.2)	20 (36.4)	0.416
Diabetes mellitus	7 (19.4)	9 (16.4)	0.924
Smoking history			
Current	12 (33.3)	18 (32.7)	>0.99
Former	9 (25.0)	11 (20.0)	0.761
Never	15 (41.7)	26 (47.3)	0.943
Obesity	6 (16.7)	9 (16.4)	>0.99
BMI (kg/m^2)	26.1 ± 3.10	24.8 ± 2.90	0.051
Blood pressure (mm Hg)			
Systolic	138.7 ± 17.6	138.9 ± 19.8	0.934
Diastolic	81.4 ± 10.1	82.9 ± 10.0	0.321
Cholesterol (mg/dL)			
Low-density lipoprotein	2.13 ± 1.03	2.40 ± 0.97	0.083
High-density lipoprotein	1.02 ± 0.36	1.07 ± 0.67	0.539
Diabetes	5.93 ± 2.02	6.15 ± 2.41	0.522
Qualifying ischemic events			
TIA	16 (44.4)	22 (40.0)	0.839
Stroke	20 (55.6)	33 (60.0)	
Time from qualifying event to endovascular treatment (days)	27.17 ± 11.6	23.89 ± 12.1	0.232
Cases with loading dose of clopidogrel	4 (11.1)	4 (7.3)	0.800
Mori type			
Mori A	13 (36.1)	18 (32.7)	0.915
Mori B	16 (44.4)	28 (50.9)	0.697
Mori C	4 (11.1)	9 (16.4)	0.694
Arterial stenosis	85.5 ± 6.37	85.4 ± 7.73	0.930
Length of stenosis (mm)	7.88 ± 2.95	9.26 ± 2.09	0.021

Values are mean ± SD, number of patients (%), or as otherwise indicated.
BMI, body mass index; TIA, transient ischemic attack.

Table 2. Operative Features Between Patients Treated With Balloon-Mounted Stents and Self-Expanding Stents

Variables	Patients Treated with Balloon-Mounted Stent (n = 36)	Patients Treated with Self-Expanding Stent (n = 55)	*P* Value
Anesthesia			
Local anesthesia	18 (50)	10 (18.2)	0.003
General anesthesia	18 (50)	45 (81.8)	
Operative time (minutes)	68.6 ± 15.7	96.7 ± 22.8	0.002
Length of stent (mm)	9.78 ± 2.84	13.75 ± 2.87	<0.001
Diameter of stent (mm)	2.54 ± 0.14	2.79 ± 0.31	<0.001
Residual stenosis after stenting (%)	4.04 ± 6.09	8.82 ± 7.76	0.002

Values are mean ± SD, number of patients (%), or as otherwise indicated.

baseline characteristics of the patients, including age, sex, distribution of vascular risk factors, and Mori type ($P > 0.05$). The mean time from the qualifying event to stenting was 27.17 ± 11.6 days in patients treated with balloon-mounted stents, whereas the time for patients treated with self-expanding stents was 23.89 ± 12.1 days ($P = 0.232$). The mean degree of stenosis was 85.5% ± 6.37% in the balloon-mounted stenting group and 85.4% ± 7.73% in the self-expanding stenting group ($P = 0.930$). Patients treated with self-expanding stent had a significantly longer stenosis compare with patients treated with balloon-mounted stent (7.88 ± 2.95 vs. 9.26 ± 2.09 mm, $P = 0.021$).

Technical Outcome Between the 2 Groups

Of the 91 patients in this analysis, patients treated with self-expanding stent were more likely to undergo general anesthesia than those treated with balloon-mounted stent (81.8% vs. 50%, respectively; $P = 0.003$). Patients treated with self-expanding stent needed a longer operative time than those treated with balloon-mounted stent (96.7 ± 22.8 vs. 68.6 ± 15.7 minutes, respectively; $P = 0.002$). Furthermore, patients treated with self-expanding stent were more likely to require a longer and bigger diameter stent than those treated with balloon-mounted stent (13.75 ± 2.87 vs. 9.78 ± 2.84 mm, $P < 0.001$; 2.79 ± 0.31 vs. 2.54 ± 0.14 mm, $P < 0.001$, respectively). Residual stenosis was more likely in the self-expanding stent group than the balloon-mounted stent group (38.9% vs. 67.3%, $P = 0.014$). The degree of residual stenosis in the self-expanding stenting group was 8.82% ± 7.76%, which is higher than

Table 3. One-Year Follow-Up Features Between Patients Treated With Balloon-Mounted Stents and Self-Expanding Stents

	Patients Treated with Balloon-Mounted Stent (n = 33)		Patients Treated with Self-Expanding Stent (n = 49)		
Variables	Number of Patients	Mean ± SD or %	Number of Patients	Mean ± SD or %	*P* Value
Restenosis features after 1 year	2	6.06	13	26.5	0.019
Degree of restenosis (%)	2	5.00 ± 0.00	13	26.9 ± 29.2	0.019
Restenosis ≥50%	0	0.00	3	6.12	0.148
Restenosis ≥70%	0	0.00	2	4.08	0.240
NIHSS score					
Baseline	36	1.27 ± 2.09	55	1.51 ± 2.36	0.634
30 days	36	0.61 ± 1.23	54	0.90 ± 1.92	0.434
1 year	33	0.52 ± 1.20	49	0.44 ± 1.15	0.775

NIHSS, National Institutes of Health Stroke Scale.

patients treated with the balloon-mounted stent (4.04% ± 6.09%, P = 0.002) (Table 2).

One-Year Outcomes After Endovascular Treatment

A total of 82 patients (90.1%) were followed-up at 1 year after treatment (Table 3). Restenosis occurred in 18.3% of patients (15/83) who had CTA or DSA again 1 year after treatment. Two patients (6.06%) in the balloon-mounted stenting group and 13 patients (26.9%) in the self-expanding stenting group had restenosis (P = 0.019). The restenosis degree in the balloon-mounted stenting group was 5.00% ± 0.00%, and the restenosis degree in the self-expanding stenting group was 26.9% ± 29.2% (P = 0.019). Besides, restenosis ≥50% was found in 3 patients (3/49) and restenosis ≥70% was found in 2 patients (2/49) in the self-expanding stenting group; no patients treated with a balloon-mounted stent had restenosis ≥50%. Although the restenosis degree in the balloon-mounted stenting group is lower, the NIHSS score is not better than patients in the self-expanding stenting group at 1 month and 1 year after treatment (P = 0.434 and P = 0.775, respectively).

Adverse Events in the 2 Groups

Table 4 shows the major adverse events during the follow-up period in each group. The individual rates of any ischemic stroke, TIA, any hemorrhage stroke, and death were not significantly different between the groups (1/33 vs. 2/49, P = 0.804; 1/33 vs. 1/49, P = 0.776; 0/33 vs. 2/49, P = 0.240; 1/33 vs. 0/49, P = 0.220). The difference between the 2 groups in the total rate of death and any stroke was not significant (3/33 vs. 5/49, P = 0.868). The other adverse effects included 3 patients: 1 with groin hematoma, 1 with angina pectoris, and 1 with myocardial infarction. The difference between the 2 groups was not significant (1/33 vs. 2/49, P = 0.804).

DISCUSSION

In our study, angioplasty and stent placement were successfully performed in all patients. Patients had a more favorite modified Rankin scale score and NIHSS score at 1-year follow-up than those at admission. In addition, 8 patients (8.79%) in our study had ischemic stroke, TIA, hemorrhage stroke, and death attributed to MCA stenting during 1-year follow-up, which compared favorably with the 20.0% in the stenting arm of the SAMMPRIS study or the 36.2% of the VISSIT study.[8,9] We found the balloon-mounted stent may have a shorter operative time, lower degree of residual stenosis, and lower degree of restenosis than the self-expanding stent.

There are several factors contributing to the lower event rate in our recruited patients for 1-year follow-up. First, aggressive risk factor such as blood pressure, blood glucose, and blood lipid were controlled in an acceptable level, which is helpful to reduce the rate of recurrent ischemic events. The SAMMPRIS study has shown patients who controlled risk factors better had a lower rate

Table 4. Comparison of Adverse Events Between Patients Treated With Balloon-Mounted Stents and Self-Expanding Stents at 1-Year Follow-Up

Events	Total Patients (%)	Patients Treated with Balloon-Mounted Stent, Number of Patients (%)	Patients Treated with Self-Expanding Stent, Number of Patients (%)	*P* Value
Ischemic stroke	3 (3.66)	1 (3.03)	2 (4.08)	0.804
TIA	2 (2.44)	1 (3.03)	1 (2.04)	0.776
Hemorrhagic stroke	2 (2.44)	0 (0.00)	2 (4.08)	0.240
Death	1 (1.22)	1 (3.03)	0 (0.00)	0.220
Nonstroke hemorrhage	1 (1.22)	0 (0.00)	1 (2.04)	0.409
Angina pectoris or myocardial infarction	2 (2.44)	1 (3.03)	1 (2.04)	0.776

TIA, transient ischemic attack.

than those not well controlled.[18] Second, patients enrolled in our study had a hypoperfusion area and poor collaterals. Patients with poor collateral circulation were less likely to benefit from medical therapy, but from the endovascular therapy.[19] In this study, cerebral blood flow decreased >40% at the stenotic arterial territory compared with the contralateral hemisphere or an American Society of Interventional and Therapeutic Neuroradiology/Society of Intervention collateral flow grading system score <3 by DSA. Third, we had a choice of using either the balloon-mounted stent or self-expanding stent to treat the leisure. Individualized devices for different lesions might play a pivotal role in stroke prevention. Finally, the time from qualifying event to stent placement in our study is longer than that in the SAMMPRIS and VISSIT trial, which allowed for better medical preparation of patients for the procedure to reduce thromboembolic events in the periprocedural period.

Our study showed that approximately 14.0% of the self-expanding stent group had adverse events during the 1-year follow-up, which is lower than the data reported in the SAMMPRIS trial. Similarly, the 1-year rate of adverse events in the balloon-mounted stent group was about 12.0%, which is also significantly lower than that reported in the VISSIT trial. The plausible explanation for the difference was that the operators in our study can choose either balloon-mounted stent or self-expanding stent to therapy the leisure. However, one approach for operators was to use the Wingspan self-expanding stent in the SAMMPRIS trial and the balloon-expandable stent in the VISSIT trial. Therefore, the tailored endovascular therapy strategy used in our study may contribute to the lower rate of subsequent events at 1 year after qualifying events compared with the SAMMPRIS and VISSIT trials in which the operators were forced to use a single device.

Our data also demonstrated that patient treated with self-expanding stents were inclined to receive general anesthesia. The reason may be associated with patients with self-expanding stents required a longer operation time. Besides, a longer and bigger diameter stent was more likely to be used in the self-expanding stent group, but residual stenosis was larger than that in the balloon-mounted stent group, which might be because of the lower radial force of the self-expanding stent than the balloon-mounted stent. Additionally, the balloon-mounted stent group has a low rate of restenosis at 1-year follow-up.

A previous study reported that the rate of restenosis after intracranial stenting in patients with symptomatic MCA stenosis was lower in the balloon-mounted stent group than the self-expanding stent group, but the clinical outcome at 1-year follow-up was not different between the 2 groups.[20] Our study revealed that there was no difference in stroke recurrence between the 2 groups. Both balloon-mounted and self-expanding stents have their pros and cons. Balloon-mounted stents are more rigid, less flexible, and have higher radial force than self-expanding stents. It is usually suitable for calcified lesions and Mori A lesions, but difficult to navigate along tortuous vessels.[21] Self-expanding stents are more flexible than balloon-mounted stents, but they have lower radial force,[22] which would be suitable in tortuous vessels and Mori C lesions. Furthermore, implantation of a self-expanding stent usually needs a 2-step procedure previously reported, which needs a longer procedure time than the balloon-mounted stent placement.[23] Therefore, it would be very vital for interventionists to use the tailored strategy of self-expanding or balloon-mounted stents for individualized vascular access and lesion morphology.

Some limitations also exist in this study. First, the study was not a randomized, double-blind trial, which might cause some bias, such as procedure experience and device preference. Second, the study was performed in China; therefore, the findings could not be generalized to other ethnic groups. Third, the sample size was relatively small in our study, and the number of participants from sites is quite different.

CONCLUSIONS

Stenting for patients who had severe symptomatic MCA stenosis combined with poor collaterals had a good prognosis, but there was no significant difference in the 1-year adverse event rate between the self-expanding and balloon-mounted stent groups. Balloon-mounted stents may have shorter operative time and lower restenosis rate than self-expanding stents. Device selection should be based on vascular access and lesion morphology.

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Conflict of interest statement: This project was supported by the National Natural Science Foundation of China (81371290) and Beijing High-level Personnel Funds (2013-2-019).

Received 29 August 2018; accepted 23 December 2018

Citation: World Neurosurg. (2019). https://doi.org/10.1016/j.wneu.2018.12.189

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