

## Case Report

# Stent-assisted mechanical recanalization for symptomatic subacute or chronic middle cerebral artery occlusion

Dong Guo, Ji Ma, Teng-Fei Li, Ming Zhu, Xin-Wei Han, Shao-Feng Shui

Department of Interventional Radiology, The First Affiliated Hospital of Zhengzhou University, Zhengzhou 450052, China

Received July 9, 2015; Accepted September 10, 2015; Epub November 15, 2015; Published November 30, 2015

**Abstract:** To assess the feasibility and short-term effects of treating patients with subacute or chronic middle cerebral artery (M1) occlusion by stent-assisted mechanical recanalization. Six patients with cerebral arteries occlusion underwent surgery. Six cerebral arteries occlusion in 5 patients were successfully recanalized. On postoperative day 1, four patients' symptoms were relieved and two patients' symptoms were exacerbated, of which one was significantly improved after 3 days, the other one's symptoms were recovered to preoperative levels in 2 weeks. No patients died after surgery. No stroke or transient ischemic attack occurred. The average follow-up of was 4.2 months, no worsening of condition, recurrence or death occurred. The results indicate that for patients with subacute or chronic middle cerebral artery (M1) occlusion, mechanical recanalization was technically feasible under the premise of strict case screening. Mechanical recanalization is able to improve ischemic symptoms and promote dysfunction restoration. But its long-term effect remains to be evaluated by further large samples, long-term follow-up studies.

**Keywords:** Middle cerebral artery, mechanical recanalization, occlusion, stent

## Introduction

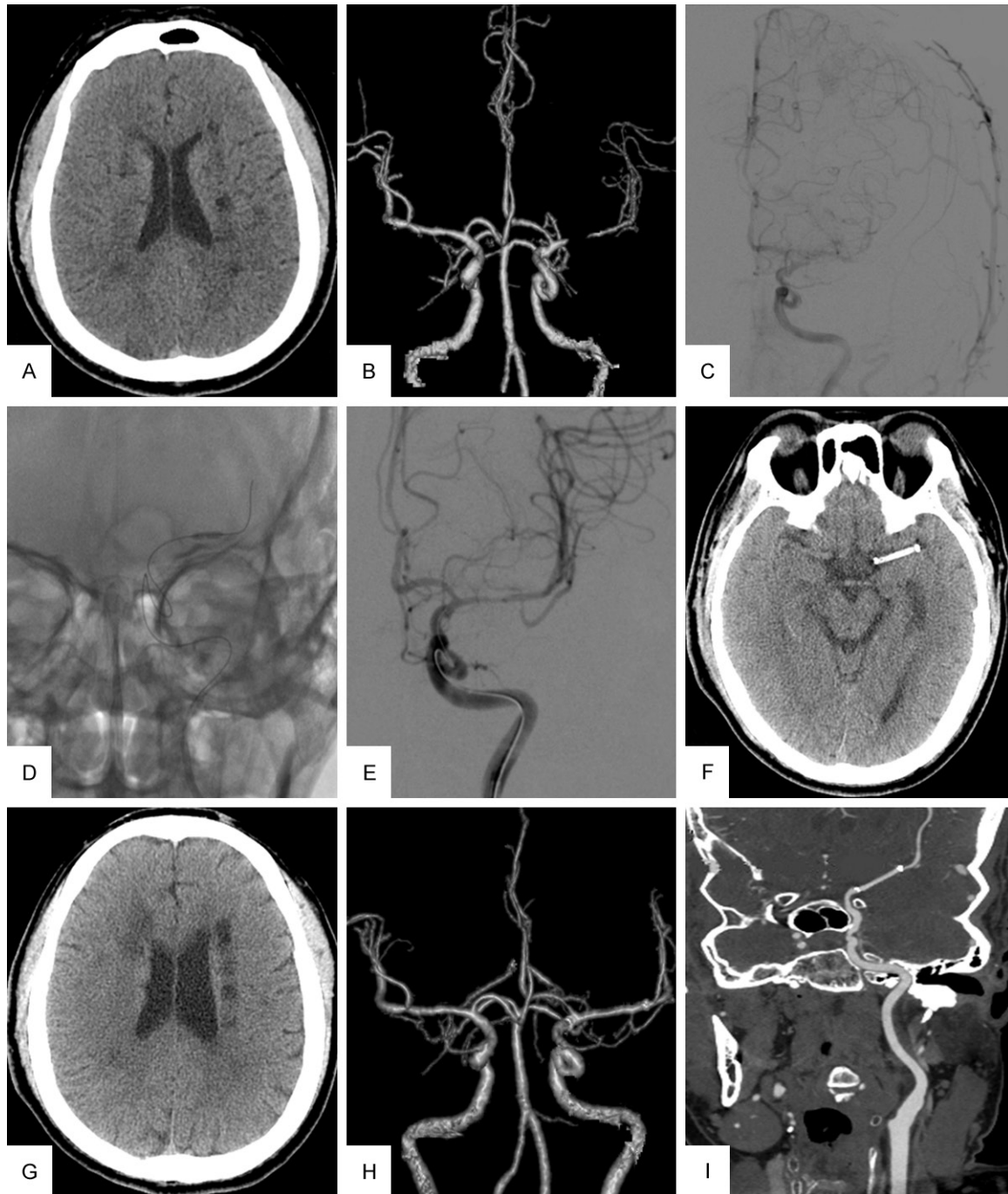
In subacute or chronic middle cerebral artery (MCA) occlusion patients, clinical symptoms or infarction could show up because of decreased blood supply. Mechanical recanalization and stenting have higher risks due to lack of experience, occlusive vascular lumen cannot be displayed under digital subtraction angiography (DSA), and the uncertainty of distal vascular bed. Based on the experiences of mechanical emergency thrombectomy of acute middle cerebral artery thrombosis and mechanical recanalization and stenting of subtotal internal carotid artery occlusions, under the premise of rigorous evaluation and selection of cases, we try to recanalize the M1 segment of the middle cerebral artery of patients with subacute or chronic middle cerebral artery occlusion, evaluate its feasibility and short-term effect.

## Material and methods

### Material

6 patients (4 males and 2 females) with a mean age of 54.7 years (range 45-67 years) were included. The average past medical history was 1.2 years (range 3 months to 5 years). Three patients had left middle cerebral artery occlusion, two patients had right middle cerebral artery occlusion, and 1 patient had bilateral middle cerebral artery occlusion. When seeking medical advices, dizziness was found in all 6 patients, paroxysmal decline of muscle strength in contralateral limb was found in 4 patients, persistent decline of muscle strength in contralateral limb was found in 1 patient, persistent motility language impairment was found in 2 patients, no sensory language impairment or mixed language impairment was found. Pre-operative history, magnetic resonance imaging

## Mechanical recanalization of middle cerebral artery occlusion



**Figure 1.** A typical case: Male, 45 years old, hospitalized because of episodic slurred speech, weakness of the right side of the body for six months, and sustained worsening for two days. Mechanical recanalization was performed 15 days after hospitalization. Post-operative check-up after three months showed that limb symptoms had completely remitted, there was a mild language dysfunction with slowed down speed but it's able to meet the communication needs of a normal life. A: Preoperative plain non-contrast CT scan showed the left middle cerebral artery (M1) occlusion. B: Preoperative CTA scan showed the left middle cerebral artery (M1) occlusion. C: Preoperative angiography. D: Angiography after balloon dilatation. E: Angiography after stent placement. F: Stent position showed in post-operative check-up. G: Plain non-contrast CT scan image in post-operative check-up. H: CTA scan image in post-operative check-up. I: Curved image showed that left middle cerebral artery (M1) had a good patency, no in-stent restenosis happened.

(MRI) or computed tomography (CT) scan showed newly infarct in two cases, old infarction in

three cases, and no obvious infarct in one case. This study has been approved by the ethics

committee of Zhengzhou University and has been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. All patients were given informed consents prior to their inclusion in the study.

### *Preoperative preparation*

Clopidogrel (Plavix) was taken 75 mg qd once daily orally for 5 days, and aspirin tablets was taken 100 mg qd once daily orally for 5 days before surgery. Nimodipine solution (0.2 mg/ml) was intravenously infused at a rate 4.2 ml/h 4 hours before surgery. Fasting and water deprivation were performed 6 hours before surgery (a small amount of water was allowed to deliver the medicine).

### *Surgical operations*

Angiography was used to detail the occlusion, the proximal vessel path, and the proximal stump of occlusive middle cerebral artery, and to select the appropriate guiding catheter, micro-catheter, and micro-guidewire. The lengths of proximal stump of occlusive middle cerebral artery were larger than 2 mm in all 6 patients. With the help of micro-catheter probe and micro-guidewire probe, micro-catheter was sent to pass the occlusion segment along micro-guidewire. Micro-catheter angiography was used to confirm that the micro-catheter was in the distal vascular bed of occlusive middle cerebral artery. After consideration of the middle cerebral artery stump, diameters of contralateral middle cerebral artery and the distal vascular bed, and the shape and length of occluded segment, appropriate balloon catheter was sent to the occluded segment to do the expansion. After confirmation of restored blood flow by angiography, self-expanding stent was used at the narrowest part.

### *Postoperative management and follow-up*

Systolic blood pressure was controlled to 90~110 mmHg for at least 48 hours. Clopidogrel (Plavix) was taken 75 mg qd once daily orally for 2-3 months, and enteric-coated aspirin and lipid-lowering statins were long-term used. Patients were abstained from tobacco, alcohol, and controlled of the risk factors for hypertension and high blood sugar. Phone follow-up was applied. The first time review (CTA or DSA) was did 2 months post operation.

## **Results**

Six patients with seven middle cerebral arteries (M1) occlusion underwent the surgery (**Figure 1**). Six cerebral arteries occlusion in 5 patients were successfully recanalized. Four patients' symptoms were relieved on postoperative day 1. Two patients' symptoms were exacerbated, of which one showed irritability and slurred speech but was significantly improved after 3 days, language function was recovered and other symptoms were significantly relieved compared to that of preoperation; the other one's (the unsuccessful case) symptoms were recovered to preoperative levels in 2 weeks. Symptom improvement rate and symptom complete remission rate was 100% and 80%, respectively in patients whose middle cerebral artery occlusion was successfully recanalized. The average follow-up time was 4.2 months (range 1-7 months). No patients died after surgery. No stroke or transient ischemic attack occurred. No in-stent restenosis was found.

## **Discussion**

Atherosclerotic stenosis is one of the most important risk factors for ischemic cerebrovascular disease. It has been shown that 30%-70% of ischemic stroke is related to intracranial atherosclerotic stenosis [1]. MCA is the most prone to stenosis or occlusion among the intracranial blood-vessels [2, 3]. MCA is the largest branch of the internal carotid artery, and it provides about 80% of the blood supply for the cerebral hemispheres [4]. Once MCA occlusion happened, it cannot be directly compensated through the circle of Willis, therefore, it has very high morbidity.

Clinical data also showed that different patients with MCA occlusion had significant different clinical manifestations, including large area of infarction, transient ischemic attack, dizziness and mild head discomfort, even no symptoms. The reasons for these differences are chronic middle cerebral artery occlusion can be compensated by establishment of collateral circulation between anterior cerebral artery and posterior cerebral artery through leptomeningeal anastomosis. The anterior cerebral artery and posterior cerebral artery can provide blood to middle cerebral artery occlusion region through leptomeningeal anastomosis [5]. The establishment of collateral circulation is affected by a

number of factors such as the degree of stenosis and the procession of the occlusion [6].

For asymptomatic patients, conservative treatment is advisable, however, for those with obvious symptoms and conservative treatment has little effect, the corresponding treatment is limited. Due to lack of experience, occlusive vascular lumen cannot be displayed under DSA, and the uncertainty of distal vascular bed, mechanical recanalization is less considered clinically.

Based on the experiences of mechanical emergency thrombectomy of acute middle cerebral artery thrombosis and mechanical recanalization and stenting of subtotal internal carotid artery occlusions, under the premise of rigorous evaluation and selection of cases, we tried to recanalize middle cerebral artery occlusion. Recanalization success rate was 85.7%, and symptom improvement rate was 100%. The average follow-up time was 4.2 months (range 1-7 months). No patients died after surgery, no stroke or transient ischemic attack occurred, and no in-stent restenosis was found in the follow-up. Taking together, mechanical recanalization treatment for subacute and chronic middle cerebral artery occlusion is feasible and it is effective in the short term. Under the premise of strict case screening and good perioperative nursing, the safety of mechanical recanalization is in the controllable range. But its long-term effect remains to be evaluated by further large samples, long-term follow-up studies.

### Disclosure of conflict of interest

None.

**Address correspondence to:** Shao-Feng Shui, Department of Interventional Radiology, The First Affiliated Hospital of Zhengzhou University, Jianshe Dong Road #1, Zhengzhou 450052, Henan, China. Tel: 86-371-66912161; E-mail: shui\_shaofeng@126.com

### References

- [1] Wang Y, Wang C and Wang Y. Epidemiology of Intracranial atherosclerotic stenosis. Foreign Medical Cerebrovascular Diseases Volumes 2005; 13: 418-421.
- [2] Gonzalez RG, Hirsch JA, Koroshetz WJ, Lev HM and Schaefer PW. Acute ischemic stroke. Berlin: Springer Berlin Heidelberg; 2006. pp. 79-86.
- [3] Huang YN, Gao S and Li SW. Vascular lesions in Chinese patients with transient ischemic attacks. Neurology 1997; 448: 524-525.
- [4] Vergouwen MD, Silveb FL, Mandell DM, Mikulis DJ and Swartz RH. Eccentric narrowing and enhancement of symptomatic middle cerebral artery stenoses in patients with recent ischemic stroke. Arch Neurol 2011; 68: 338-342.
- [5] Rong Y and Zhou G. Mechanism of reconstruction of collateral circulation in middle cerebral artery occlusion. Int J Cerebrovasc Dis 2007; 15: 129-132.
- [6] Wang Y. Cerebral collateral circulation and the effect of oxidative stress on cerebral collateral circulation. Chinese Journal of Stroke 2008; 3: 198-199.