

Current Status of Endovascular Procedures in Management of Ischemic Stroke in China

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Stroke is the leading cause of death in China. Intracranial atherosclerotic disease (ICAS) causes about 33% to 54% of all ischemic strokes in Asia [1,2]. Stroke treatment and prevention has become a national agenda for the Chinese government over the past 10 years. As effective ways of diagnosing, treating or preventing strokes, the practice of endovascular procedures such as intra-arterial thrombolysis, thrombectomy, intracranial and extracranial large vessel angioplasty, and stenting has grown rapidly in China. Unlike in the US, Chinese neurologists play a dominant role in providing interventional therapies. There are about 1–1.5 interventional neurologists per hospital in major medical centers in China. They provide interventional therapies to patients with ICAS, carotid disease, and intra-arterial thrombectomy or thrombolysis for patients with acute ischemic stroke.

Intracranial atherosclerotic disease is a common cause of ischemic stroke in China. Despite the publication of Stenting versus Aggressive Medical Therapy for Intracranial Arterial Stenosis (SAMMPRIS) trial [3], middle cerebral artery (MCA) stenting continues to be performed routinely in some centers in China. Several reasons may explain this phenomenon. First, Chinese interventionalists felt that the SAMMPRIS trial had design flaws. For example, operator experience was not accounted when selecting sites; patients were treated too soon (within 2 weeks) after their stroke; basilar artery disease was included; some patients were too old (>70); the loading dose of clopidogrel was too high (600 mg) in the stenting group. Second, the Chinese State Food and Drug Administration (SFDA) has granted the permission to both Wingspan and Apollo stents (manufactured in Shanghai) for ICAS. While the Wingspan stent maybe self-expandable once deployed, the Apollo stent is balloon-assisted. Some interventionalists feel that balloon-assisted stent is easier to

deploy and less likely to collapse [4]. Third, although no large randomized clinical trials on intracranial stenting has been conducted in China, several cohort studies, case report series, and comparative studies showed positive results. Jiang et al. [5] reported their experience of using the Wingspan stent to treat 100 consecutive patients with ICAS of >70% within 90 days of symptom onset. In this trial that enrolled mostly younger male patients (average 53.2 years old), the 1-year risk of the outcome events was lower than that in similar Warfarin–Aspirin Symptomatic Intracranial Disease trial (WASID) patients: 7.3% (95% CI, 2–12.5%) versus 18% (95% CI, 13–24%; $P < 0.05$). The stent placement successful rate was 99%.

Carotid artery disease is also common in China. Compared with carotid artery angioplasty and stenting (CAS), carotid artery endarterectomy (CEA) is a much less performed procedure in China. Chinese patients and physicians prefer CAS over CEA. As CAS is not considered an operation, it has been perceived as easier and much safer to CEA. Survey conducted by the Chinese Commission of Health and Family showed that there were <1000 cases of CEA but >30,000 cases of CAS performed in 2009 [6]. The publication of Carotid Revascularization Endarterectomy versus Stenting Trial (CREST) has certainly facilitated the practice of CAS in China. Stenting is not cheap in China. The price ranges from RMB 10,000 (US\$ 1232) to RMB 65,000 (US\$ 10,483). Such price tag is very high for the majority of stroke patients in China. China's GDP per capita, which closely mirrors the purchasing power parity (PPP) of a country, was only around US\$ 5000 in 2010.

The development of intra-arterial (IA) thrombolysis or thrombectomy therapy for treatment of acute large arterial ischemic strokes has made progress in China. IA thrombolysis has been approved by Chinese SFDA, and thrombectomy devices

are gaining market quickly. According to the national medical resource survey, about 31.3% of the hospitals are now offering IA thrombolysis or thrombectomy [7]. Intravenous urokinase has only been approved by Chinese SFDA, but not by other countries, it is therefore being widely used throughout China. A recent survey of 500 hospitals showed that Chinese interventionists have performed 530 cases of IA thrombolysis and 220 cases of mechanical thrombectomy (Miao ZR, Wang YL, Liu LP, et al. (Beijing Tiantan Hospital, Capital Medical University)).

A Neurovascular Intervention Group has been formed under the Stroke Prevention and Control Society, Chinese Preventive Medicine Association. Chinese Military Medical Academy has also formed a group to provide guidelines and data registry services to their affiliates. Sanctioned by the Commission of Health and Family Planning, there are several interventional fellowship programs providing 5-year training at mostly tertiary healthcare institutions. There is no national level regulatory organization on neuro-interventional practices in China. The issue of potential overutilization of these procedures was raised by Chinese government recently, which prompted the funding of China Angioplasty and Stenting for Symptomatic Intracranial Severe Stenosis trial. Being conducted at 12 centers, the aim of the trial is to compare the outcome of stent plus best medical care versus best medical care in TIA or stroke patients with 70–99% stenosis of a major intracranial artery [8]. With a 1:1 randomization, self-expandable stent (Gateway-Wingspan Stent System, Stryker Inc.) will be used. Best medical care consists of aspirin 300 mg plus clopidogrel 75 mg per day for 90 days along with intensive control of other stroke risk factors.

In 2011, the Writing Group for the Interventional Medicine of the Cerebrovascular Disease Ischemic Stroke Branch of the Chinese Medical Association Neurology Division published a Guideline of Endovascular Therapies for Ischemic Stroke [9]. Similar to the guidelines published in the west, it described in detail on the indications and contraindications for digital subtraction angiogra-

phy, its preprocedural preparation and treatment of common complications. It also described the evaluation, indications and contraindications of angioplasty and stenting of intra and extra cranial vessels in both anterior and posterior circulation. In this guideline, CAS is recommended (Class II level C) only for patient with asymptomatic carotid stenosis of >70% who is not a candidate for CEA.

In conclusion, endovascular treatment is a rapidly growing specialty in China. China may have the most practicing interventional neurologists in the world. Establishing professional oversight societies and guidelines will ensure the quality of practicing endovascular procedures. Chinese investigators are conducting pivotal trials that will answer questions on effectiveness, safety, and outcome of endovascular therapies for conditions such as ICAS. With a large stroke patient population, Chinese interventionists will soon become the most experienced in this field.

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Conflict of Interest

The authors declare no conflict of interest.

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