Intracranial artery stenosis is an important cause of ischemic stroke among Asians, Hispanics, and blacks, especially in Chinese populations and accounts for 8% to 10% of all ischemic strokes. The annual risk of recurrent stroke in patients with intracranial artery stenosis varies from 10% to 50%. Despite medical therapy, symptomatic intracranial stenosis carried a 10% to 24% annual risk of stroke. Patients with severe middle cerebral artery (MCA) stenosis had the worse outcome. The traditional medical treatments are antiplatelet or anticoagulation therapy and risk factor control. Anticoagulation had been regarded as superior to antiplatelet therapy for patients with symptomatic intracranial artery stenosis. However, the recent prospective Warfarin-Aspirin Symptomatic Intracranial Disease (WASID) trial was prematurely terminated owing to safety concerns associated with significantly higher rates of adverse events in the warfarin group, and warfarin provided no benefit over aspirin for preventing stroke and vascular death. Ischemic stroke, brain hemorrhage, or death from vascular causes other than stroke occurred within 2 years in ≈22% of the patients, whether they were treated with high-dose aspirin (1300 mg per day) or warfarin. This showed that symptomatic intracranial atherosclerotic stenosis is a marker of aggressive vascular disease, for which the current medical treatment is far from satisfactory. Therefore, alternative therapies, such as aggressive management of risk factors, alternative antiplatelet regimens, and intracranial angioplasty with or without stenting might be desired.

The earliest reports of balloon angioplasty for intracranial atherosclerotic stenosis were reported in 1980s. Recently, percutaneous transluminal angioplasty has been proposed as a promising treatment for patients with cerebral ischemic events despite maximal medical therapy. The procedure of intracranial angioplasty can be performed with a high degree of technical success, usually resulting in immediate improvement in the observed stenosis and improved blood flow. Other benefits include reduced stroke risk as a result of normalization of oxygen extraction fraction and increased cerebral blood flow. However, percutaneous transluminal angioplasty has complications such as intimal dissection, recoiling, thrombus formation, and vessel rupture. Stent placement can diminish vessel dissection and recoil of the stenosis after angioplasty, but intraluminal thrombus and vessel rupture remain. The overall rate of perioperative stroke or death was 9.5%.

A few cases of selective stenting of MCA stenosis have been reported since Gomez first introduced it in 2000. Two recent studies examined elective stenting for symptomatic MCA stenosis with different results for technical success and the rate of total complication. The rate of technical success was 97.6% for Jiang et al, and 85.7% for Kim et al. Morbidity and mortality rates were 10% and 2.5% for Jiang et al, whereas 33.3% and 8.3% for Kim et al. Published in 2004, the SSYLVIA study (Stenting of SYmptomatic atherosclerotic Lesions in the Vertebral or Intracranial Arteries) was a multicenter, nonrandomized, prospective study (no control group) that evaluated a new stent (Neurolink, Guidant) specifically designed for the treatment of intracranial atherosclerotic stenosis. Sixty-one patients (5 with MCA stenosis) were included. Technical and procedural success was 95%. The stroke rate at 30-day and 1 year was 6.6% and 13.1%, respectively, but no death was reported. Although restenosis occurred in 35% of patients, 61% were asymptomatic. Based on the probable benefit-to-risk ratio, the US FDA granted a humanitarian device exemption to treat high-risk patients with significant intracranial or extracranial atherosclerotic disease who have failed medical therapy using balloon angioplasty and stent placement. In 2005, Henkes and coworkers reported the initial WingSpan trial data that assessed the safety and device performance of a new family of self-expanding stents specifically designed for the treatment of atherosclerotic lesions, followed by additional trial data presented to the US FDA. Forty-five patients have been enrolled in the study with 98% (44/45) technical and procedural success. The composite 30-day death or ipsilateral stroke rate was 4.4% (2/44), and the 6-month death or ipsilateral stroke rate was 7.1% (3/44), with an all-cause stroke rate of 9.5% (4/42). Based on this study, the US FDA granted an humanitarian device exemption approval for the WingSpan stent system in 2005 to treat symptomatic patients with an intracranial stenosis of >50%, refractory to medical
therapy. Approval for this stent system was also obtained in Europe.

To our knowledge, although the current data are encouraging, they come from predominantly retrospective case series, and only 2 studies are prospective without control group. Up to now there have been 16 studies including only 125 patients with MCA stenosis treated with stents and none of them was randomized controlled trial or controlled trial. Therefore, the current available evidence for stenting in MCA stenosis is very weak compared with that of many medical therapies. Randomized controlled trials are definitely needed to assess the safety of stenting of MCA stenosis and its effectiveness in preventing recurrent stroke, particularly comparing stenting with the best medical treatment. However, considering the high annual risk (10% to 50%) of recurrent stroke in patients with intracranial artery stenosis and the poor prognosis of patients with symptomatic MCA stenosis, such patients with a severe (>60% to 80%) stenosis of MCA should be considered to be at high risk of stroke or death. These individual patients can be allowed to decide whether they wish to be considered for intracranial angioplasty and stenting as a potential treatment option when best medical treatment fails. Because of the technically demanding and high neurological periprocedural complication rate, patient selection, careful periprocedural medical management, experienced neurologist and neurointerventionalist are all needed in order to perform the procedure with acceptable risk. There have been significant advances in both fields with better medical treatments such as the use of statins, angiotensin-converting enzyme inhibitors, control of blood pressure and optimizing antiplatelet treatment, and improved devices for neurointerventional therapy. Hopefully, all these advancements can help to reduce the periprocedural complication rates related to endovascular interventions.

In conclusion, highly selective stenting placement for MCA stenosis patients who have failed best medical therapy might be a reasonable option although there is insufficient supportive evidence. This needs careful patient selection, strict procedural and periprocedural management to reduce mortality and morbidity. More importantly, randomized controlled trials are needed to assess its real benefit-to-risk ratio.

Disclosures

None.

References


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