

Detailed Methods

Study design

The CRTICAS study was a prospective, real-world registry with 26 participating centers, which were further divided into three groups according to the annual volume of intracranial angioplasty and stent placement procedures in the recent 2 years: 1) high volume if they performed ≥ 25 cases/year; 2) middle volume for 10 - 25 cases/year; and 3) low volume for < 10 cases/year. All reported end points were evaluated and confirmed by a central adjudication committee composed of designated neurologists, neurosurgeons, and radiologists, blinded to the treatment choices. This study was registered at [BLINDED FOR PEER-REVIEW] and approved by the ethics committee of every participating center.

Patient enrollment

Inclusion criteria: 1) 30 to 80 years of age; 2) 70% to 99% stenosis of a major intracranial artery (carotid artery, middle cerebral artery stem (M1 segment), vertebral artery, or basilar artery) measured by digital subtraction angiography (DSA) using the WASID method; 3) the target vessel was 2.00 - 4.50 mm in diameter with the lesion ≤ 14 mm in length; 4) the symptoms included transient ischemic attack (TIA) or minor ischemic stroke within the past 90 days.

Exclusion criteria: 1) acute infarcts within 3 weeks; 2) intracranial hemorrhage in the territory of the stenotic artery or sufficient ischemic stroke (size > 5 cm on CT or MRI) within 15 days, or previous spontaneous intracranial hemorrhage within 30 days to place patient at risk of hemorrhage during the procedure; 3) baseline modified Rankin Scale (mRS) score > 3 ; 4) stenosis caused by nonatherosclerotic lesions or concurrent intracranial tumors, aneurysms, or arteriovenous malformations.

Device selection

Operators followed the guideline combined with their experience and preference in order to ultimately select what they thought were best suited for the patients to choose one of the three endovascular therapy approaches, namely balloon-mounted stent (BMS), self-expandable stent (SES) or balloon angioplasty alone (BA). The Apollo balloon-mounted stent was preferred for patients with straight arterial access and Mori A lesions, while the self-expandable stent (Gateway balloon plus the Wingspan stent system, Solitaire AB stent system or Enterprise stent system) was used for patients with tortuous arterial access and Mori B or C lesions or lesions featuring a significant mismatch between the diameters of the proximal and distal stent's landing segments. If perforator arteries originated near the stenotic site or with tortuous access, primary submaximal angioplasty without stenting (Gateway balloon) was preferred.

Procedures and medical management

All patients received aspirin (100 mg/d) and clopidogrel (75 mg/d) for at least 5 days before the procedure. General anesthesia was used unless the access was straight, the procedure time was expected to be short and upon operator's request, where local anesthesia was used. Perioperative systolic blood pressure was kept between 100 and 120 mmHg. Non-contrast head CT was obtained to exclude potential hemorrhage after the procedure. Dual anti-platelet therapy continued for 3 months after endovascular intervention.

Outcomes

The primary outcome was the composite of any stroke (including ischemic or hemorrhagic stroke), TIA, or death within 30 days after endovascular therapy. Ischemic stroke is further defined as a new focal neurological deficit of sudden onset, lasting at least 24 hours, unassociated with a hemorrhage which confirmed on brain CT or MRI.

Secondary outcomes were ischemic stroke, hemorrhagic stroke, or death within 30 days after endovascular therapy. For patients with

ischemic stroke, perforators occlusion and in-stent thrombosis were assessed. Similarly, subarachnoid hemorrhage (SAH) and severe intracranial hemorrhage (SICH) were assessed in patients with hemorrhagic stroke. Perforator occlusions was defined as the infarct(s) could be localized to the distribution supplied by perforating vessels arising within the margins of the stent. In-stent thrombosis was diagnosed if there was imaging or other presumptive evidence of thrombus in the stent.¹⁶

Follow-up

Follow-up information of the following data were reviewed and collected consecutively at 30 days according to the prespecified protocol: baseline demographics, comorbidities, risk factors of cardiovascular disease such as blood pressure, blood glucose, blood lipid, smoking and drinking, complications, diagnosis, procedures, and endpoint events.

Statistical analysis

Prespecified intention-to-treat analysis was used to analyze the results. Continuous variables were presented as the mean \pm standard deviation (SD) and compared with ANOVA tests. Categorical variables were presented as numbers and frequencies and compared with χ^2 tests or Fisher's exact test. For the primary outcome, multiple logistic regression analysis was additionally performed. All demographic and clinical characteristics of the patients were included in this stepwise regression analysis. A p-value < 0.05 was considered statistically significant. All analyses were performed using SAS 9.2 software (SAS Institute, Inc., Cary, NC, USA).