Is Bridging Necessary? A Pilot Study of Bridging versus Primary Stentriever-Based Endovascular Reperfusion in Large Anterior Circulation Strokes

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Background: We aimed to determine whether bridging provides additional benefits over primary stentriever-based endovascular reperfusion (SER) in patients with proximal middle cerebral artery (pMCA) strokes. *Methods:* Clinical and radiologic data from consecutive stroke patients with large anterior circulation infarcts involving the pMCA were analyzed. Stroke subtypes were categorized according to Trial of ORG 10172 in Acute Stroke Treatment criteria. Neurologic deficits were assessed with the National Institutes of Health Stroke Scale (NIHSS), and vessel recanalization was determined using the Thrombolysis in Cerebral Infarction scale at the end of SER. Good outcome was defined as a modified Rankin Scale (mRS) score of 2 or lesser. *Results:* Fifty-seven patients with a median age of 66 years were included. Of those, 24 received prior systemic tissue plasminogen activator and 33 received primary SER. Atrial fibrillation was more common in patients who underwent SER but there were no other between-group differences in baseline variables, procedure-related variables, or outcome parameters. Six patients died and 27 patients achieved an mRS of 2 or less at 90 days. Patients who were treated with tPA before SER needed less stentriever passes to recanalize the occluded vessel, but bridging did not impact the chances for either survival or favorable outcome. Age (odds ratio [OR], .92; 95% confidence interval [CI], .85-.98) and NIHSS score (OR, .12; 95% CI, .02-.78) were the only variables associated with outcome on multivariate analysis. *Conclusions:* Primary SER and bridging resulted in equally high survival and good outcome rates. Our results suggest that the benefits of primary SER in such critically ill patients may bypass the need for bridging therapy and merit further study. **Key Words:** Reperfusion—stroke—middle cerebral artery—stentriever—endovascular.
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Introduction

Large hemispheric ischemic stroke occurs in about 10% of all strokes and carries a mortality rate of close to 80%.[1] Systemic thrombolysis appears to be of relatively little value in such patients,[2,3] and the chances of recanalizing the occluded vessel and restoring perfusion are somewhat higher with endovascular reperfusion therapy.[4,5] Bridging therapy with systemic full or reduced dose tissue plasminogen activator (tPA) followed by endovascular procedures has gained acceptance as the procedure of choice in many centers.[6-9] However, because early recanalization is of paramount importance in such patients,[10,11] others advocate the use of early primary

endovascular therapy.[12,13] Furthermore, stentriever-based endovascular reperfusion (SER) is characterized by very rapid recanalization times and has become the mainstay of endovascular procedures.[14-16] Given the excellent reperfusion rates and rapid reperfusion achieved with SER, the goal of this preliminary pilot study was to compare outcomes in patients with large anterior circulation stroke treated with bridging to those seen in patients treated with primary SER.

Patients and Methods

We recruited consecutive patients presenting with M1 middle cerebral artery occlusions who underwent SER over the span of 48 months (November 2010-October 2014) into our stroke registry. The institutional review board has granted a general permission to collect routine research data on all stroke patients. The diagnosis of proximal middle cerebral artery occlusions involving the M1 segment was established according to clinical findings and proven on computed tomography (CT) angiography, magnetic resonance (MR) angiography, or digital subtraction angiography in all patients. We did not use any specific radiologic inclusion criteria other than stroke with large-vessel occlusion. Patients with hypodensity larger than 1/3 of the involved territorial supply on noncontrast CT were excluded as were patients who underwent multiparametric stroke MR imaging and had no evidence for diffusion–perfusion mismatch. Patients presenting in deep coma (Glasgow Coma Scale <5) with the absence of brain stem reflexes and those presenting more than 8 hours from symptom onset including those with wake-up strokes were not included. We also excluded patients transferred to our center from other hospitals.

Clinical and demographic characteristics accrued included cerebrovascular risk profile, time from symptom onset to initiation of endovascular procedure, and time of onset to reperfusion. Infarct etiology was classified according to TOAST criteria[17] as cardioembolic, large artery atherothrombotic, and other classified (eg, dissection) or unclassified.

Neurologic deficits were determined with the National Institutes of Health Stroke Scale (NIHSS), and functional deficits before admission and at 90 days after infarct were evaluated with the modified Rankin Scale (mRS) score. Good outcome was defined as an mRS of 2 or lesser.

Radiologic parameters were evaluated on entry CT/MR imaging and on the diagnostic and therapeutic angiography and follow-up CT. The extent of collateral circulation was studied with American Society of Interventional and Therapeutic Neuroradiology/Society of Interventional Radiology scale on angiography criteria[18,19] and divided into poor (grade 0-2), adequate (grade 3), or very good (grade 4).

All included patients received SER with the Solitaire FR device (Covidien, Dublin, Ireland). The patients were divided between those who received systemic tPA before SER (bridging group) and those who had primary SER. All patients presenting within the first 4.5 hours from symptom onset were first considered for tPA, and only those with contraindications to tPA (eg, international normalized ratio >1.7, known bleeding tendency, recent major surgery, and so forth) were referred to primary SER. Patients who failed to show significant improvement on the NIHSS at the end of tPA infusion were transferred to the angio suite for SER. Failure to achieve significant improvement was defined as a drop of less than 8 points on the NIHSS from presentation. Patients with similar stroke syndrome presenting between 4.5 and 8 hours from onset were taken directly for primary SER.

Flow at the end of SER was classified with the Thrombolysis in Cerebral Infarction system.[18] The number of passes and the number and types of additional procedural modalities used (if necessary) in all patients were documented. Treatment complications including postprocedure hemorrhage and clinical deterioration without hemorrhage were documented.

Statistical evaluations were performed with the SigmaStat package (Systat). For univariate analysis, patients were compared using Student t test or chi-square tests. We then used multivariate logistic regression analysis models that included variables that yielded a P value of less than .2 on the univariate analysis and variables that are known to be associated with outcome such as admission NIHSS, age, and the presence of symptomatic hemorrhage to determine the effects of such variables on survival and good outcome.

Results

Over the span of 48 months, we included 57 consecutive patients fulfilling entry criteria. The baseline clinical and radiologic characteristics are presented in Table 1. All patients were independent before the procedure (mRS <2). Patients were divided (Table 1) into those who received tPA before SER (bridging group; n = 24) and those who received primary SER with no previous tPA (n = 33). Age, gender, risk factor profile, stroke etiology, and baseline NIHSS scores did not differ between the groups except for atrial fibrillation, which was more commonly seen in the patients who underwent primary SER (Table 1). Survival rates (87.5% versus 90% for the bridging versus primary SER, respectively), discharge NIHSS scores, as well as the delta between baseline and discharge NIHSS scores and day-90 NIHSS scores did not differ between the groups. Furthermore, the chances for having favorable outcomes (48% versus 59%) did not show statistical significance (Table 1).

Similarly, all procedural variables including time from presentation to the emergency department to beginning of SER and time from symptom onset to recanalization, Thrombolysis in Cerebral Infarction scores, collateral