

Clinical Outcomes of Patients with Acute Basilar Artery Occlusion in Brazil: An Observational Study

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Background: Intravenous thrombolysis (IVT) and endovascular therapy (EVT) were proven safe and effective for anterior circulation proximal occlusions. However, the most appropriate recanalization strategy in patients with acute basilar artery occlusion (BAO) is still controversial. This study aimed to assess outcomes of patients with BAO at an academic stroke center in Brazil. *Methods:* This is a retrospective analysis of consecutive patients with BAO from a prospective stroke registry at Ribeirão Preto Medical School. Primary outcomes were mortality and favorable outcome (modified Rankin score [mRS] ≤ 3) at 90 days. After univariate analyses, multivariate logistic regressions were used to identify independent predictors of primary outcomes. *Results:* Between August 2004 and December 2015, 63 (65% male) patients with BAO and median National Institutes of Health Stroke Scale (NIHSS) score of 31 (interquartile range: 19-36) were identified. Twenty-nine (46%) patients received no acute recanalization therapy, 15 (24%) received IVT, and 19 (30%) received EVT (68% treated with stent retrievers). Twenty-four (83%) patients treated conservatively died, and only 2 (7%) achieved an mRS less than or equal to 3. Among patients treated with acute recanalization therapies, 15 (44%) died, and 9 (26.5%) had a favorable outcome. On multivariate analysis, baseline systolic blood pressure (odds ratio [OR] = .97; 95% confidence interval [CI]: .95-0.99; $P = .023$), posterior circulation Alberta Stroke Program Early CT score (OR = .62; 95% CI: .41-0.94; $P = .026$), and successful recanalization (OR = .18; 95% CI: .04-0.71; $P = .015$) were independent predictors of lower mortality. Baseline NIHSS (OR = 1.40; 95% CI: 1.08-1.82; $P = .012$), prior use of statins (OR = .003; 95% CI: .001-0.28; $P = .012$), and successful recanalization (OR = .05; 95% CI: .001-0.27; $P = .009$) were independent predictors of favorable outcome. There was no significant

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difference between the IVT group and the EVT group on primary outcomes. *Conclusions:* BAO is associated with high morbidity and mortality in Brazil. Access to acute recanalization therapies may decrease mortality in those patients. **Key Words:** Acute ischemic stroke—basilar artery occlusion—intravenous thrombolysis—endovascular therapy.

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Introduction

Acute basilar artery occlusion (BAO) accounts for approximately 1% of all ischemic stroke, but usually leads to severe neurological deficits—coma and locked-in syndrome—with high morbidity and mortality rates.¹⁻³

Intravenous thrombolysis (IVT) within 4.5 hours was proven safe and effective for acute ischemic stroke (AIS) independently of the involved arterial territory.^{4,5} Nevertheless, patients with BAO have only around 30%-50% of successful recanalization rates after intravenous recombinant tissue plasminogen activator (IV tPA) administration.⁶⁻⁸ In theory, these patients would be candidates for an endovascular approach; however, patients with BAO were not included in the recent positive stroke trials of endovascular recanalization therapy with stent retrievers, which enrolled only patients with anterior circulation occlusions.⁹⁻¹⁴ Among the observational studies on BAO, successful recanalization rates after intra-arterial thrombolysis have been consistently higher than that of IVT, although this has not resulted in improved outcomes.^{8,15} In addition, data about clinical outcomes of patients with acute BAO in developing countries are very limited. In this study, we aimed to evaluate the clinical and functional outcome of patients with acute BAO treated with either endovascular approach or IVT at an academic stroke center in Brazil.

Methods

Participants

Patients were retrospectively selected from a prospective registry of patients with acute cerebrovascular diseases admitted to a public academic stroke center in Brazil. The institutional review board at our center approved this study. An informed consent was required for inclusion in our stroke registry. The study was performed in accordance with the ethical standards of the Declaration of Helsinki and its later amendments. We included all consecutive patients above 18 years old and with posterior circulation AIS due to total occlusion of the basilar artery, which had been diagnosed through clinical suspicion and with 1 of the following criteria: (1) computed tomography angiography (CTA), magnetic resonance angiography (MRA), digital subtraction angiography (DSA), or transcranial color-coded duplex sonography (TCCS); (2) presence of hyperdense basilar artery sign on admission cranial non-contrast computed tomography (NCCT) scan and follow-

up NCCT scan with ischemic signs involving the whole basilar artery territory; or (3) postmortem anatomic examination.

We excluded patients with bilateral vertebral artery occlusion and signs of complete or partial retrograde basilar artery filling on CTA, MRA, or DSA; patients with a previous poor functional status, verified by a modified Rankin score (mRS) more than 3; and also those who died before vascular neuroimaging, when a postmortem evaluation was not performed.

Clinical Assessment

Patients with BAO were evaluated and treated according to our institutional protocol based on the Brazilian guidelines for the treatment of AIS as well as other international guidelines.^{16,17} In this protocol, IVT for patients with AIS, including patients with BAO, had to be initiated within 4.5 hours of symptoms onset, and no concomitant use of antithrombotics or heparins was allowed within the first 24 hours after tPA infusion. Endovascular procedures for posterior circulation AIS had to be initiated within 9 hours of symptoms onset. However, considering the high severity of the disease, patients with BAO may have been treated outside the protocol time windows at the discretion of the neurologist on call. The treating neurologist was also responsible for the decision of which modality of acute recanalization therapy should be used for each patient. According to our prospective stroke registry protocol, upon hospital admission, National Institutes of Health Stroke Scale (NIHSS) score and Glasgow coma scale (GCS) score were assessed and recorded from all patients, and the following demographic data were also systematically obtained: age, gender, cardiovascular risk factors, prior medication use (anti-hypertensive, antithrombotic, and statin drugs), baseline systolic and diastolic blood pressure, and baseline serum glucose. Regarding clinical presentation severity on hospital admission, patients with BAO were classified as having severe symptoms (tetraplegia, coma, or locked-in syndrome), whereas all other presentations were classified as mild-to-moderate symptoms.

Times to events were also prospectively collected on our stroke registry and included onset-to-arrival, onset-to-needle, and onset-to-groin times. We also collected type of recanalization therapy used, successful recanalization rates, and etiological classification of the index stroke according to the Trial of Org 10172 in Acute Stroke Treatment criteria.¹⁸

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