Endovascular Treatment of Acute Basilar Artery Occlusion: Registro Endovascolare Lombardo Occlusione Basilar Artery (RELOBA) Study Group Experience

Andrea Giorgianni, MD,* Francesco Biraschi, MD,† Mariangela Piano, MD,‡ Dikran Mardighian, MD,§ Roberto Gasparotti, MD,§ Michele Frigerio, MD,§ Guglielmo Pero, MD,‡ Luca Quilici, MD,‡ Mario Crispino, MD,‖ Carlo Pellegrino, MD,* Marco Pavia, MD,¶ Roberto Peroni, MD,** Marco Longoni, MD,‡,†† Martino Cellerini, MD,‡‡ Elvis Lafe, MD,§§ Paolo Remida, MD,‖‖ Giuseppe Faragò, MD,¶¶ Paolo Reganati, MD,*** Sabina Strocchi, MD,* and Luca Valvassori, MD‡

Background: Acute basilar artery occlusion (BAO) is considered among the most severe medical emergencies, with very high morbidity and mortality. The aims of this study are to present 5 years experience of 12 centers in Lombardy region on BAO endovascular treatment and to evaluate prognostic factors that may improve clinical outcomes and recanalization rates. *Materials and Methods:* Registro Endovascolare Lombardo Occlusione Basilar Artery (RELOBA) registry is a retrospective multicentric collection of patients with acute BAO who underwent endovascular treatment between 2010 and 2015. A total of 102 patients (mean age 65 years) were included. Clinical, procedural, and neuroradiological data were collected. Angiographic results (Treatment in Cerebral Ischemia scale [TICI] score 2b-3) were assessed by each center's interventional neuroradiologist. Good clinical outcome was considered as a modified Rankin Scale score ranging between 0 and 2 in a 3-month follow-up. *Results:* Thirty-nine percent of patients showed good clinical outcome at 3 months. Mortality rate was 30%. TICI 2b-3 was achieved in 62% of patients. Univariate analysis showed that age, National Institutes of Health Stroke Scale (NIHSS) at onset, time to recanalization, and TICI score were all statistically significant clinical outcome predictors ($P < .05$). Multivariate logistic regression showed that time to recanalization, age, and NIHSS at onset were significant independent predictors of good outcome. *Conclusions:* BAO treatment needs more efforts to assure patients better clinical outcomes. Mechanical thrombectomy is feasible and effective in patients with acute BAO. These results must be confirmed by further prospective studies within randomized controlled settings.
Key Words: Stroke—thrombectomy—basilar artery occlusion—posterior circulation—thrombolysis.

From the *Ospedale di Circolo e Fondazione Macchi-Varese; †Policlinico Umberto I Roma, Dipartimento Neuroscienze Umane Università Sapienza; ‡Ospedale Niguarda Cà Granda Milano; §Azienda Socio Sanitaria Territoriale degli Spedali Civili di Brescia; ‖Azienda Ospedaliera di Cremona; ¶Fondazione Poliambulanza Istituto Ospedaliero Brescia; **Azienda Ospedaliera Sant'Anna di Como; ††Azienda Ospedaliera della Provincia di Lecco; ‡‡ASST Papa Giovanni XXIII Bergamo; §§Fondazione IRCCS Policlinico San Matteo Pavia; ‖‖Azienda Ospedaliera San Gerardo Monza; ¶¶Fondazione IRCCS Istituto Neurologico Carlo Besta Milano; and ***Ospedale San Carlo Borromeo Milano.
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Address correspondence to Mariangela Piano, MD, Niguarda Neuroradiology Department, Piazza Ospedale Maggiore 3, Milan, 20162, Italy. E-mail: mariangela.piano@gmail.com, mariangela.piano@ospedaleniguarda.it.
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Introduction

Acute Basilar Artery Occlusion (BAO) is a rare but severe emergency accounting for 1% of all ischemic strokes and is characterized by a high morbidity and mortality rate.[1-3] Early vascular recanalization has been proven to be one of the most important predictors of a favorable clinical outcome in patients affected by acute posterior circulation ischemic stroke.[4,5] In the past decades several recanalization treatments have been proposed, such as intravenous thrombolysis (IVT), intra-arterial thrombolysis (IAT), endovascular therapy (EVT), or bridging therapies. Although intravenous recombinant tissue plasminogen activator (rt-PA) remains the first-line treatment for acute ischemic stroke, low recanalization rates are actually observed in BAO.[6] Recently, the growing interest into EVT has led to the improvement of endovascular devices and, consequently, to an increase in their utilization. Subject to extensive testing on anterior circulation large vessels occlusions,[7-9] they have been proven to be effective also in vertebrobasilar occlusions.[10-12] The RELOBA (Registro Endovascolare Lombardo Occlusione Basilar Artery) study group has been acquiring experience for over 6 years in the endovascular treatment of posterior circulation occlusions, performed in 12 centers in the region of Lombardy (Italy). The objective of this study is to analyze the results obtained from the registry to identify those prognostic factors that may influence clinical outcomes and recanalization rates in patients affected by BAO and treated with EVT.

Materials and Methods

Patient Selection

We retrospectively analyzed data collected from 12 centers in the region of Lombardy (Italy). The complete list of centers is shown in the result section.

We included all patients affected by BAO who referred to the listed centers between January 2010 and December 2015. BAO was confirmed by angiography and all patients were subject to endovascular treatment. Patients affected by BAO that had been treated with rt-PA only and those who did not receive any acute treatment were excluded from the study.

Upon admission, each patient was examined by an experienced neurologist and the severity of the stroke was assessed by the NIHSS score. Successively, nonenhanced contrast tomography (NECT) was performed, followed by either a computed tomography angiography (CTA) or cerebral magnetic resonance imaging with magnetic resonance angiography, to confirm the presence of BAO and to exclude both large brainstem infarction and intracranial bleeding.

EVT was performed within the 24 hours from symptoms onset in patients lacking evidence of early signs of infarction on neuroimages and presenting a previous modified Rankin scale (mRS) score of less than 2. Contraindications for EVT included evidence of hemorrhage or extended brainstem infarction on baseline NECT, symptom onset after 24 hours, and the presence of a terminal illness of any origin.

A NECT was always performed within the next 24 hours after the EVT, with the aim of ruling out any postprocedure hemorrhagic complication and evaluating the progression of the ischemic lesion overtime.

Clinical Data

Clinical data were collected as follows: age, sex, baseline NIHSS, and Glasgow coma scale scores on admission. Clinical outcome (mRS) score and mortality rates at 90 days were obtained from the medical records data and by telephonic interview. Favorable outcome was defined as mRS of 2 or lower at 90 days.

Administration of intravenous (IV) treatment (0.9 mg/kg of IV-tPA) in accordance with European Medicines Agency and Agenzia italiana del farmaco criteria preceded EVT, and patients receiving IV-tPA had a BAO confirmed by neuroimaging and a symptom onset within 4.5 hours.[13] Primary endovascular treatment was performed when IVT was contraindicated but EVT was not.

Radiological Findings

To better classify the site of occlusion, the basilar artery (BA) has been theoretically divided into 3 segments: proximal BA (from the vertebral artery junction to the origins of the anterior inferior cerebellar artery), middle BA (from the anterior inferior cerebellar artery to the origins of the superior cerebellar artery), and distal BA (above the origins of the superior cerebellar artery) including P1 segment.

The recanalization rates were assessed in each center by an experienced interventional neuroradiologist using the modified Treatment in Cerebral Ischemia scale (TICI) on digital subtraction angiography.[14] Depending on the peculiar anatomy of the vertebrobasilar system, we assign a TICI score of 2a when a BA is completely recanalized but 1 or more of the main branches (posterior inferior cerebellar artery, anterior inferior cerebellar artery, superior cerebellar artery, or posterior cerebral artery) are still occluded. Successful recanalization was defined as a TICI score of 2b-3.

According to European Cooperative Acute Stroke Study II (ECASS II), symptomatic intracerebral hemorrhage was defined as any intracerebral hemorrhages developed after EVT, evidenced by noncontrast cerebral CT and associated with an increase of the NIHSS score above 4 points compared to baseline NIHSS score.[15] Further procedure-related complications such as distal embolization, arterial perforation, or arterial dissection were also documented.