

Large-Vessel Occlusion Is Associated with Poor Outcome in Stroke Patients Aged 80 Years or Older Who Underwent Intravenous Thrombolysis

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Objective: We aimed to investigate the association between large-vessel occlusion (LVO) and functional outcome in elderly stroke patients treated with intravenous (IV) tissue plasminogen activator (tPA). *Methods:* This was a retrospective study of acute ischemic stroke patients who received IV tPA within 4.5 hours after stroke onset between 2007 and 2013. Patients were categorized into 2 groups based on age (≥ 80 or < 80 years). LVO was evaluated by computed tomography angiography (CTA) before thrombolysis. Favorable outcome was defined as a modified Rankin Scale (mRS) score of 2 or lower at 3 months, or equal to the prestroke mRS score. *Results:* Of 359 thrombolysis patients, 175 patients with CTA before a standard dose of IV tPA therapy (0.9 mg/kg body weight; maximum 90 mg) were included. Sixty-five patients were in the group aged 80 years or above with a median age of 84 (interquartile range: 82.5, 86) years. LVO was observed more often in the group with unfavorable outcome compared with the group with favorable outcome in older stroke patients (60.6% versus 21.9%, $P = .002$). The baseline National Institutes of Health Stroke Scale (NIHSS) score (odds ratio .864; 95% confidence interval [CI], .779-.959; $P = .006$) and LVO (odds ratio .233; 95% CI, .059-.930; $P = .039$) were independent associative factors for the unfavorable outcome in older patients treated with IV tPA after adjustment for patient characteristics. *Conclusions:* The baseline NIHSS score and LVO were independent predictors for functional outcome in elderly stroke patients received IV tPA. **Key Words:** Stroke—elderly—intravenous thrombolysis—CT angiography—modified Rankin scale. © 2016 National Stroke Association. Published by Elsevier Inc. All rights reserved.

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Introduction

A recent meta-analysis of individual patient data from randomized trials showed that alteplase significantly improves the overall good outcome when stroke patients received alteplase within 4.5 hours of stroke onset.¹ Elderly patients have been accounted for 30% of all acute ischemic stroke patients.² However, there is no consensus regarding thrombolysis for stroke patients over 80 years.³ Although some large-scale randomized controlled clinical trials exclude acute stroke patients aged 80 years or older from intravenous (IV) thrombolysis for its under-representation,^{4,5} there has been an increase in the proportion of elderly patients who underwent IV thrombolysis in recent years.⁶⁻⁹ Moreover, it is becoming clear that a proportion of stroke patients aged 80 years or older derive significant benefit from IV thrombolysis,⁹⁻¹² even in patients aged 90 years or older.^{7,9,10} It is critical to clarify outcome predictors for this group of patients.

The baseline National Institutes of Health Stroke Scale (NIHSS) score has been validated as the predictor of mortality and unfavorable outcome in stroke patients aged 80 years or older who underwent thrombolysis,¹³ but vascular imaging predictors remain uncertain. Large-vessel occlusion (LVO) is a predictor of poor outcome in acute ischemic stroke.¹⁴ Computed tomography angiography (CTA) is an accurate tool for the assessment of LVO; however, CTA may be more risky in patients aged 80 years or older because of higher prevalence of renal failure. Therefore, it is important to establish the utility of CTA prior to recommending its routine use in 80-year-old patients.

The aim of the present study was to investigate the association between LVO and outcome in acute ischemic stroke patients aged 80 years or older who underwent IV tissue plasminogen activator (tPA) therapy, to test the hypothesis that LVO is associated with poor outcomes in these patients.

Methods

Patients

We analyzed the medical records of 359 acute ischemic stroke patients admitted to the Royal Melbourne Hospital who were treated with IV tPA within 4.5 hours of stroke onset, between December 2007 and February 2013.¹⁵ Eligibility criteria included patients with computed tomography (CT)-confirmed acute ischemic stroke who were administered .9 mg/kg of IV tPA within 4.5 hours of onset of symptoms. The following characteristics were included: age, sex, prestroke modified Rankin Scale (mRS) score, onset-to-treatment time, vascular risk factors (hypertension, diabetes, hypercholesterolemia, atrial fibrillation, smoking, ischemic heart disease, and previous stroke), baseline NIHSS score, CTA before IV tPA, CT or magnetic resonance imaging after IV tPA, and

3-month mRS score. The patients were divided into 2 groups by age: older group (aged ≥ 80 years) and younger group (aged < 80 years). Patients diagnosed with stroke mimics,¹⁶ or patients who received IV tPA plus intra-arterial (IA) therapy were excluded from our study.

Imaging

CTA was routinely performed in acute ischemic stroke patients before thrombolysis at the Royal Melbourne Hospital from December 2007, unless contraindicated (e.g., known contrast allergy or renal impairment). LVO was identified as proximal vessel occlusion as follows¹⁴: internal carotid artery, middle cerebral artery (M1 and M2 segments), anterior cerebral artery (A1 segment), V4 segment of vertebral artery, basilar artery, and posterior cerebral artery (P1 segment). CT or magnetic resonance imaging scans were performed approximately within 24 hours of IV tPA to identify the hemorrhagic transformation and the extent of infarction. Symptomatic intracerebral hemorrhage was defined as blood at any site in the brain associated with a worsening of the NIHSS score by 4 points or higher within 24 hours.⁴

The presence of LVO was assessed on CTA image by 2 independent experienced stroke neurologists (W.Z. and B.Y.). The symptoms of the acute ischemic stroke patients were consistent with LVO.

Outcome

The primary outcome was the 3-month mRS score. Favorable outcome was defined as an mRS score of 2 or lower at 3 months, or equal to the prestroke mRS score.^{6,17} Secondary outcomes were symptomatic intracerebral hemorrhage after IV tPA and mortality at 3 months post stroke.

Statistical Analysis

Statistical analysis was performed using the SPSS (version 19; SPSS Inc., Chicago, IL). Between-group differences were made using the Student *t*-test or the Mann-Whitney *U*-test for continuous variables, chi-square test, or the Fisher exact test for categorical variables. Logistic regression was used to test predictors of unfavorable outcome in elderly stroke patients (aged ≥ 80 years) who received IV tPA. The model was adjusted for patient characteristics (diabetes, hypertension, smoking, atrial fibrillation, prior stroke history, hypercholesterolemia, LVO, and NIHSS score on admission). All statistical tests were 2-sided, and *P* values less than .05 were considered to be statistically significant.

Results

Baseline Characteristics

In our tPA database, 243 acute ischemic stroke patients who underwent CTA before IV tPA therapy were screened (243 of 359 thrombolysis patients, 67.7%).

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