

Increased Risk for Unfavorable Outcome in Patients with Pre-Existing Disability Undergoing Endovascular Therapy

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Introduction: Most studies evaluating endovascular therapy (EVT) for stroke only included patients without pre-existing disabilities. However, in real life many patients have pre-existing disabilities, and whether they can benefit from EVT remains unknown. *Methods:* Patients with emergent large vessel occlusions undergoing EVT were prospectively enrolled. Patients with no or mild pre-existing disabilities (modified Rankin Scale [mRS], 0-2) were compared with patients presenting with pre-existing moderate disability (mRS ≥ 3). Baseline demographics and risk factors, stroke severity (studied with the National Institutes of Health Stroke Scale [NIHSS]), imaging data including pretreatment Alberta Stroke Program Early Computerized Tomography Score (ASPECTS) and ASPECTS collateral scores, as well as procedure-related variables were accrued. Unfavorable outcome was defined as mRS ≥ 4 at day 90. *Results:* Of 131 enrolled patients, 108 had a baseline mRS of 2 or lower, and 23 had a prestroke mRS score of 3 or higher. Patients with pre-existing mRS scores of 3 or higher were significantly older (80.3 ± 10 versus 66.9 ± 13.7 ; $P = .001$) and more often had previous strokes (39% versus 16%; $P = .02$). Patients with mRS scores of 3 or higher were more likely to have poor outcomes or death (odds ratio [OR], 4.4; 95% confidence interval [CI], 1.3-15.0). Of the 23 patients with pre-existing moderate disability, 8 (35%) maintained their previous degree of disability. On multivariate analysis, age (OR, .92; 95% CI, .88-.97; $P = .001$), admission NIHSS (OR, .92; 95% CI, .85-.99; $P = .042$) and pretreatment ASPECTS (OR, 6.4; 95% CI, 1.4-29.5; $P = .017$) remained significant modifiers of favorable outcome. *Discussion and Conclusions:* Patients with pre-existing moderate disabilities have higher chances of sustaining unfavorable outcomes despite EVT. Nevertheless, some patients maintain the same level of moderate disabilities, and therefore, patients with pre-existing moderate disabilities should not be excluded from EVT. **Key Words:** Stroke—endovascular therapy—disability—outcome. © 2018 National Stroke Association. Published by Elsevier Inc. All rights reserved.

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Introduction

Large hemispheric ischemic stroke, secondary to internal carotid or proximal middle cerebral artery occlusions, carries a mortality rate close to 80% if left untreated.^{1,2} Systemic thrombolysis is of limited benefit in these patients,³⁻⁶ but endovascular therapy (EVT) has recently proved effective in several prospective studies⁷⁻¹² that used rigorous selection criteria. However, many patients presenting with large hemispheric strokes have had a prior stroke, and the frequency of moderate disabilities is relatively high.¹³⁻¹⁷ Furthermore, another group of patients have pre-existing non-neurological disabilities that may render them ineligible for EVT based on the criteria used

in recent studies. Therefore, we sought to explore whether EVT is efficacious in patients with pre-existing moderate disabilities.

Patients and Methods

We prospectively recruited consecutive patients presenting with emergent large vessel occlusions leading to a large hemispheric stroke that underwent EVT into our stroke registry, and the data were retrospectively analyzed. The institutional review board (Hadassah Medical Organization) authorized the anonymous inclusion of patients into the consecutive database without getting informed consent.

To be eligible for EVT, patients had to have an initial National Institutes of Health Stroke Scale (NIHSS) score higher than 10 and to be treated within 8 hours of stroke onset. The diagnosis of emergent large vessel occlusion had to be proven on computed tomography (CT) angiography, magnetic resonance angiography (MRA), or digital subtraction angiography in all patients. Exclusion criteria included existing disease with limited life expectancy (e.g., terminal cancer), stroke secondary to small vessel disease, patients presenting in deep coma, and patients with primary intracerebral or subarachnoid hemorrhage.

Functional disability was graded with the modified Rankin Scale (mRS).¹⁸ For the current study, we compared patients who had little or no disability prior to the qualifying event (mRS ≤ 2) with those who had moderate pre-existing disabilities (mRS, 3) from all causes. Because premorbid disability is often not clear at the emergency department acute evaluation, it was determined from medical records and direct information obtained from the patients, their families, and caregivers and was ascertained by an experienced stroke neurologist (R.R.L.) as soon as possible after EVT.

Clinical and demographic characteristics accrued included cerebrovascular risk profile, concomitant medications, time from symptom onset to initiation of EVT, and time from onset to reperfusion. Infarct etiology was classified according to the Trial of ORG 10172 in Acute Stroke (TOAST) criteria as cardioembolic, large-artery atherothrombotic, other classified (e.g., dissection), or unclassified.¹⁹

All patients were admitted to the intensive care unit for at least 24 hours postprocedure. Neurological deficits were determined with the NIHSS,²⁰ and functional deficits before admission and at 90 days after infarct were evaluated with the mRS. Unfavorable outcome was defined as an mRS score of 4 or higher.

Radiological parameters were evaluated on entry CT/magnetic resonance imaging and on the diagnostic and therapeutic angiography and follow-up CT/CTA. All patients had a noncontrast CT that was used to calculate the Alberta Stroke Program Early Computerized Tomography Score (ASPECTS) score.²¹ Patients were dichotomized into favorable (≥ 7) or unfavorable (< 7) ASPECTS. Flow

was classified with the thrombolysis in cerebral infarction (TICI) scale,²² and TICI 2b-3 was considered as favorable recanalization and reperfusion. Collateral flow was classified with the ASPECTS collateral score.²³ The score was dichotomized into poor or favorable (grades 0-3 versus 4-5, respectively).

Our standard treatment protocol in patients with large-vessel occlusions included in the study suggests going directly to EVT if the treatment is immediately available and to use bridging with tPA if the EVT is not immediately available.

All patients underwent EVT with the Solitaire device (Medtronic, Minneapolis, MN). Failure to achieve recanalization led to use of further devices such as the pREset LITE Thrombectomy Device (Phenox GMBH, Bochum, Germany) or thrombus aspiration.

Treatment complications, including postprocedure hemorrhage and clinical deterioration without hemorrhage, were also documented. Symptomatic hemorrhage was classified according to published criteria.²⁴

Statistical evaluations were performed using SPSS PASW 22 (IBM, Armonk, NY, USA). For univariate analysis, patients were compared using Student's *t*-test for continuous variables or the chi-square test or the Cochran-Mantel-Haenzel test for categorical variables. Bivariate logistic regression models were then used to test the effects of pre-existing moderate disability on unfavorable outcome and survival. The models incorporated age, pre-existing mRS, admission NIHSS, ASPECTS side of injury, and presence of ischemic heart disease.

Results

One hundred thirty-one consecutive patients fulfilling entry criteria were recruited into this preliminary study. Of those, 23 had a baseline mRS score of 3 or higher and 108 had a pre-existing mRS score of 2 or lower. The baseline clinical and radiological characteristics are presented in [Tables 1 and 2](#). Patients with pre-existing mRS scores of 3 or higher were significantly older (80.3 ± 10 versus 66.9 ± 13.7 ; $P < .0001$) and more often had previous strokes (39% versus 17%; $P = .02$). Ischemic heart disease was less frequent in patients with pre-existing disabilities (26% versus 40%; $P = .04$). Other variables did not differ between the groups. Of note, procedure-related variables including type and site of vessel occlusion, onset to treatment time and time to vessel recanalization, number and types of procedural modalities used, and lesion length did not differ between the groups ([Tables 1 and 2](#)). Optimal target vessel recanalization (TICI 2b-3) also did not differ between the groups ([Table 2](#)).

Of the 131 included patients, 121 had day 90 mRS status available (23 of 23 of patients with pre-existing disability and 98 of 108 of those without; [Fig 1](#)). The main reason for loss to follow-up was residency outside of the catchment area.

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