

## Early Recovery of Aphasia through Thrombolysis: The Significance of Spontaneous Speech

Giovanni Furlanis, MD,\* Mariana Ridolfi, MD,\* Paola Polverino, MD,\*  
Alina Menichelli,† Paola Caruso, MD,\* Marcello Naccarato, MD,\*  
Arianna Sartori, MD,\* Lucio Torelli, DSc,‡ Valentina Pesavento, MD,† and  
Paolo Manganotti, MD, PhD\*

*Background:* Aphasia is one of the most devastating stroke-related consequences for social interaction and daily activities. Aphasia recovery in acute stroke depends on the degree of reperfusion after thrombolysis or thrombectomy. As aphasia assessment tests are often time-consuming for patients with acute stroke, physicians have been developing rapid and simple tests. The aim of our study is to evaluate the improvement of language functions in the earliest stage in patients treated with thrombolysis and in nontreated patients using our rapid screening test. *Materials and Methods:* Our study is a single-center prospective observational study conducted at the Stroke Unit of the University Medical Hospital of Trieste (January–December 2016). Patients treated with thrombolysis and nontreated patients underwent 3 aphasia assessments through our rapid screening test (at baseline, 24 hours, and 72 hours). The screening test assesses spontaneous speech, oral comprehension of words, reading aloud and comprehension of written words, oral comprehension of sentences, naming, repetition of words and a sentence, and writing words. *Results:* The study included 40 patients: 18 patients treated with thrombolysis and 22 nontreated patients. Both groups improved over time. Among all language parameters, spontaneous speech was statistically significant between 24 and 72 hours ( $P$  value = .012), and between baseline and 72 hours ( $P$  value = .017). *Conclusions:* Our study demonstrates that patients treated with thrombolysis experience greater improvement in language than the nontreated patients. The difference between the 2 groups is increasingly evident over time. Moreover, spontaneous speech is the parameter marked by the greatest improvement. **Key Words:** Ischemic stroke—aphasia—thrombolysis—spontaneous speech—screening test.

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From the \*Clinical Unit of Neurology; †Rehabilitation Medicine, Department of Medical Sciences, University Hospital and Health Services of Trieste; and ‡Department of Mathematics and Informatics, University of Trieste, Italy.

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Address correspondence to Giovanni Furlanis, MD, Clinical Unit of Neurology, Department of Medical Sciences, University Hospital and Health Services of Trieste, Strada di Fiume 447-34149, Italy. E-mail: [giovannifurlanis@yahoo.it](mailto:giovannifurlanis@yahoo.it).

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### Introduction

Stroke is the third cause of death and is the first cause of disability worldwide.<sup>1</sup> Its prevalence in patients over 65 years of age ranges from 46 to 73 per 1000 persons.<sup>2</sup> Owing to the aging general population, the number of patients with stroke is likely to increase over the next years.

Recombinant tissue plasmin activator (rtPA) is adopted to perform intravenous thrombolysis to facilitate reperfusion in patients with acute ischemic stroke. The total dose administered is .9 mg/kg within 4.5 hours after symptom

onset.<sup>1</sup> Benefits of thrombolysis emerged from a meta-analysis of individual patient data from randomized controlled trials.<sup>3</sup>

Stroke-related disabilities often have a large impact on quality of life and activities of daily living. Aphasia is one of the most devastating consequences of stroke that occurs in 20%-40% of cases.<sup>4,6</sup> It is an acquired language disorder affecting verbal production or verbal comprehension (e.g., spontaneous speech, oral and written naming, repetition, reading aloud and spelling, and oral and written comprehension), whereas cognitive functions remain unaffected.<sup>6</sup>

As language is pivotal for social interaction, patients with stroke-related aphasia experience difficulties in social relations and activities, mood, or return to work, leading to a further decrease in quality of life.<sup>6,7</sup> Aphasia is also related to higher health-care costs due to longer speech therapy interventions and hospitalizations.<sup>8,9</sup> The most significant prognostic factors for language recovery are type of aphasia and initial severity of language impairment.<sup>6,10</sup> For instance, global aphasia (a disorder affecting all components of language processing) often results in worse recovery outcomes.<sup>5,6,11,12</sup> Type of stroke, localization, and size of brain lesion after stroke are all reported to play a pivotal role in language recovery and rehabilitation. Further decisive factors are age, gender, handedness, medical history, years of education, family support, and motivation.<sup>4,6,13</sup>

The National Institutes of Health Stroke Scale (NIHSS) is a well-established bedside tool to rapidly assess the severity of neurologic deficit caused by stroke.<sup>14-16</sup> NIHSS is adopted in emergency settings to assess the severity of stroke, to determine patients' eligibility for specific treatments, such as thrombolysis and thrombectomy, and to evaluate the outcome of interventions.<sup>17,18</sup> It is also a powerful predictor of clinical outcome.<sup>19,20</sup> NIHSS consists of 11 items assessing the main neurologic functions, such as eye movement, visual fields, coordination, motor strength, sensation, neglect, and language. NIHSS score ranges from 0 to 42, with 7 points attributed to language functions (2 points for orientation, 2 points for command execution, 3 points for aphasia). High NIHSS score is associated with unfavorable aphasic outcome. However, this tool is not detailed enough when it comes to language processing evaluation.

Although evidence supports the positive effect of speech therapy on recovery of aphasia,<sup>21</sup> there is an ongoing debate on the right moment to start the intervention. Some authors suggest the benefits of starting it as soon as possible.<sup>9,22</sup> Therefore, testing aphasia in acute stroke phase can be useful to plan a well-timed language therapy.

Only few tests are used to determine the type and severity of aphasia, which often are time-consuming (15-40 minutes) and excessively tiring for patients with acute stroke. Moreover, the administration of most tests requires trained speech therapists, who are usually

unavailable in emergency settings. Physicians agree on the need of a simple and rapid test, ideally only few minutes long. Therefore, these physicians have tried to develop a tool in their own language. However, no Italian version is currently available.<sup>9</sup> The test should consist of naming, comprehension, repetition, word fluency, reading, and writing tasks. The recovery of aphasia in acute stroke also depends on the degree of reperfusion after thrombolysis or thrombectomy.<sup>23,24</sup>

Recombinant tissue plasminogen activator (rtPA) may affect ischemic stroke-related size, pattern, nature of infarcts, and recovery of aphasia.<sup>25,26</sup> However, only few studies have been conducted on aphasia in acute phase since the early thrombolytic era. Therefore, re-evaluating the relevant factors of aphasia recovery is crucial as intravenous thrombolysis has become a standard of care in patients with acute stroke.<sup>27</sup>

The aim of our study is to evaluate the improvement of language functions in the earliest stage in patients with stroke-related aphasia. The study compared patients treated with thrombolysis and nontreated patients using a rapid screening test in an emergency setting.

## Materials and Methods

Any researcher interested in our study is invited to contact the corresponding author per e-mail. The authors will be pleased to share analytical methods and study materials of this study.

### *Study Design and Population*

Our study adopted a single-center prospective observational design and was conducted in the Stroke Unit of the University Medical Hospital of Trieste, Italy, from January to December 2016. The study population was composed of consecutive patients of both genders, above 18 years of age, with aphasia resulted from acute ischemic stroke. Aphasia is defined as the loss of linguistic or communicative skills, marked by difficulties in understanding or producing words, naming objects (anomia) or recalling words during conversation, phonemic distortion, or exchange of words (phonemic or semantic paraphasia).<sup>28</sup> Aphasic patients were divided into 2 groups: patients treated with thrombolysis and nontreated patients.

Patients eligible for thrombolysis were treated with intravenous rtPA (.9 mg/kg of body weight, maximum of 90 mg, infused over 60 minutes with 10% of the total dose administered as an initial intravenous bolus over 1 minute) within 4.5 hours from symptom onset.

We developed a rapid screening test suitable for emergency settings, the ApsAA (Aphasia Post-Stroke Acute Assessment). Both groups underwent 3 aphasia assessments by trained local physicians. Patients were tested at baseline (treated patients before thrombolysis,

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