

# Older Women Benefit from Thrombolysis as Much as Older Men

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*Background:* Although the incidence of stroke among older people increases, the use of intravenous thrombolysis has initially been restricted in the elderly. However, more people aged more than 80 years, a majority of them women, may benefit from thrombolysis. Therefore characteristics, outcome, and complications in older women (aged more than 80 years) undergoing thrombolysis are studied and compared to older men and to younger women (aged less than 80 years) to detect any gender and age differences. *Methods:* Retrospective study of stroke patients treated with thrombolysis based on data collected from medical records. Outcome and complications were analyzed in 3 groups in relation to age and gender. *Results:* From a total of 108 patients treated with thrombolysis, 94 could be included in the study (36 women  $\geq 80$  years, 23 men  $\geq 80$  years, and 35 women  $< 80$  years). Improvement over the first 24 hours and at 3 months, and mortality were comparable between older women and men. Older women had more major strokes, a higher mortality, and 3-month morbidity than younger women. There was no significant difference in intracranial hemorrhage between the groups. *Conclusions:* We found no significant difference between older women and men in outcome and mortality after thrombolysis. Older women suffered from more severe strokes, and had a higher mortality and worse outcome than younger women. The frequency of intracranial hemorrhage was comparable. Given the higher percentage of older women suffering from more severe strokes, our results emphasize that thrombolysis should not be withheld exclusively based on age. **Key Words:** Age—alteplase—elderly—gender—ischemia—stroke—thrombolysis—women.  
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Received December 9, 2015; revision received February 17, 2016; accepted March 2, 2016.

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1052-3057/\$ - see front matter

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<http://dx.doi.org/10.1016/j.jstrokecerebrovasdis.2016.03.001>

## Background

The proportion of older people in the world population is increasing, and stroke is one of the leading contributors to the overall disease burden among the elderly.<sup>1</sup> Acute stroke can be treated successfully with intravenous (IV) recombinant tissue plasminogen activator (rt-PA) thrombolysis.<sup>2</sup> A feared complication is fatal intracranial hemorrhage (ICH).<sup>3</sup> Thrombolysis has been restricted because of a high complication rate.<sup>4</sup> One of the restrictions has been an upper age limit of 80 years. But in the 2008 Guidelines for Management of Ischemic Stroke, the European Stroke Organization recommends thrombolysis in selected patients aged more than 80 years and encourages further research on possible gender differences in outcome,<sup>5</sup> especially because women live longer than men and tend to suffer from stroke later in life.<sup>6,7</sup>

Most experienced centers already treat stroke patients beyond 80 years of age, with IV rt-PA, if there are no identified unacceptable contraindications. However, stroke patients aged more than 80 years have often been excluded from studies on thrombolytic therapy because of increased risk of complications.<sup>3</sup>

Interestingly, it has been shown that fewer women than men are admitted to the hospital within 4 hours after stroke onset, and consequently women are less often treated with thrombolysis.<sup>8</sup> This may be due to the older age of women and that they are more often living alone.<sup>8</sup> One study showed that IV thrombolysis in women after stroke is associated with a greater and faster improvement in comparison with men and that long-term prognosis was improved with no gender-related differences regarding the safety of IV thrombolytic therapy.<sup>9</sup>

Because more and older women than men suffer from ischemic stroke and are potentially eligible for IV thrombolysis, we investigated the outcome and safety after thrombolysis according to gender and older age (≥80 years).

**Methods**

This retrospective study was based on data collected from medical records over 2 years at the Skåne University Hospital in Malmö. Acute ischemic stroke patients (men and women ≥80 years, and women <80 years) who were treated with IV rt-PA were included. A total of 108

patients met the inclusion criteria, but 14 patients had to be excluded; 1 woman aged less than 80 years denied access to her medical record; 6 patients aged 80 years or older (5 women; 1 man) did not receive the full dose of thrombolytic therapy, and in 7 patients (2 men ≥80 years; 5 women <80 years) bridging therapy (IV + endovascular treatment) was performed. Of the remaining 94 patients, 59 were aged 80 years or older.

*Baseline Characteristics*

Neurological status was assessed using the National Institutes of Health Stroke Scale (NIHSS) at admission and at 24 hours after thrombolysis. Stroke severity was considered as follows: *mild*, NIHSS score less than or equal to 7; *moderate*, NIHSS greater than or equal to 8 less than or equal to 15; and *severe*, NIHSS greater than or equal to 16. Subtypes of acute ischemic stroke were classified according to the TOAST (Trial of Org 10172 in Acute Stroke Treatment) criteria (Table 1).<sup>10</sup>

*Outcome and Complications*

Time from stroke onset to thrombolysis, mortality (within 24 hours, in-hospital, and after 3 months), and ICH (native computed tomography (CT) at 24 hours) were registered. Complications after thrombolysis were divided into intracerebral or extracerebral hemorrhage and analyzed

**Table 1.** Baseline characteristics

	Women aged <80 years n = 35	Women aged ≥80 years n = 36	Men aged ≥80 years n = 23	P value*	P value†
Age, mean (SD)	68.3 (8.8)	87.1 (4.9)	85.2 (3.4)	.112	
Range	44-79	80-97	80-95		
More than 90 years		12 (33%)	2 (9%)	.057¶	
Subtype of IS‡				.752#	.29#
Cardioembolism	12 (34%)	20 (56%)	11 (48%)		
Small-artery occlusion	9 (26%)	4 (11%)	3 (13%)		
Large-artery atherosclerosis	5 (14%)	5 (14%)	4 (17%)		
Defined etiology	1 (3%)	0	1 (4%)		
Undefined etiology	8 (23%)	7 (19%)	4 (17%)		
NIHSS§ score, mean (SD)	6.69 (4.14)	12.03 (6.79)	9.48 (6.41)	.156	<.001
Stroke severity, NIHSS				.036#	.001#
Mild: less than or equal to 7	24 (69%)	14 (39%)	12 (52%)		
Moderate: 8-15	10 (29%)	8 (22%)	9 (39%)		
Severe: greater than or equal to 16	1 (3%)	14 (39%)	2 (9%)		
Time to thrombolysis					
Hours: minutes, mean	2:11	2:02	2:40	.062	.49

Abbreviations: IS, ischemic stroke; NIHSS, National Institutes of Health Stroke Scale; SD, standard deviation.

\*Women aged ≥80 years compared to men aged ≥80 years.

†Women aged ≥80 years compared to women aged <80 years.

‡Ischemic stroke = cerebral infarction

§NIHSS = score range 0-42.

||t-test.

¶Fisher's exact test.

#Pearson's chi-square test.

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