Letter to the Editor

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Letter by Plas et al Regarding Article, “Smoking-Thrombolysis Paradox: Recanalization and Reperfusion Rates After Intravenous Tissue Plasminogen Activator in Smokers With Ischemic Stroke”

To the Editor:

With interest we read the article by Kufner et al1 in which they investigated whether smoking is independently associated with recanalization and better functional outcome in patients treated with tissue-type plasminogen activator. They concluded that smokers had a better response to tissue-type plasminogen activator than nonsmokers. In the past decade, several studies have been published regarding this smoking–thrombolysis paradox.2–7 These studies reveal conflicting results. We performed a meta-analysis of studies that investigated this smoking–thrombolysis paradox.

We searched PubMed with combinations of the following terms: outcome, smoking, stroke, and thrombolysis. We selected only studies from which we could extract data for an unadjusted meta-analysis. On the basis of the abstracts, we included relevant studies. References of the included studies were searched to find relevant citation.

We collected unadjusted data, such as current smokers, nonsmokers, and modified Rankin Scale scores at 3 months. Favorable functional outcome was defined as modified Rankin Scale score ≤2. Odds ratios were calculated using the Mantel–Haenszel method with fixed-effect models. The statistical analysis was performed with Review Manager 5.2 (Copenhagen, The Nordic Cochrane Centre, The Cochrane Collaboration, 2011).

With our search strategy we found 27 studies, of which 9 were relevant. Three were excluded because data for smokers versus nonsmokers could not be extracted. In total, 7 studies were included, and of these, 4 were in favor of smoking.

A total of 7494 patients were included, of whom 2156 (28.8%) were smokers. In total, 4184 patients (55.8%) had a modified Rankin Scale score ≤2 at 3 months, of which 31.7% were smokers. The overall unadjusted odds ratio was 1.38 (95% confidence interval, 1.24–1.53; P=0.02) in favor of smokers.

This suggests that smoking is associated with a better functional outcome at 3 months in patients who received tissue-type plasminogen activator. This smoking–thrombolysis paradox also has been seen in patients with myocardial ischemia.

This meta-analysis has some limitations. First, the analysis is unadjusted. In earlier studies, there was no better functional outcome in smokers after adjusting for possible confounders. Second, there is a heterogeneous group of data extracted from studies with different inclusion criteria with possible selection bias, various definitions of smoking, and data collection. Third, we split the patient group into current smokers versus nonsmokers. In the non-smokers group, ex-smokers were included because of records of pack-years smoking were not available in all articles. This is a heterogeneous group, unfortunately a specific analysis of pack-years and functional outcome was not possible.

In summary, this meta-analysis suggests that smokers who receive tissue-type plasminogen activator with acute stroke had a better functional outcome versus nonsmokers. However, we agree with Kufner et al1 that smoking is an important risk factor for stroke and that no stroke is always better than a recanalized stroke.

Disclosures

None.

Gerben J.J. Plas, MD
Maarten Uyttenboogaart, MD, PhD
Gert-Jan Luijckx, MD, PhD

Department of Neurology
University Medical Center Groningen
Groningen, The Netherlands


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Gerben J.J. Plas, Maarten Uyttenboogaart and Gert-Jan Luijckx

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