

## Thrombolysis Alert in Hassan II University Teaching Hospital of Fez (Morocco): A Prospective Study of 2 Years

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*Background:* Thrombolysis alert (TA) is a procedure triggered every time a patient consults for sudden focal neurological deficit within 4.5 hours. *Objective:* We aimed to determine firstly the etiological profile of TA and secondly to evaluate the delays in the management not only of thrombolyzed patients but also of nonthrombolyzed patients to determine the intrahospital delays to optimize. *Methods:* Patients aged over 18 years who consulted for sudden focal neurological deficit within 4.5 hours for whom a TA has been triggered were included. Patients admitted within 4.5 hours for which a TA has not been triggered were not included. Patients with sudden focal neurological deficit who consulted more than 4.5 hours, but for whom TA has been triggered, were also included. *Results:* We included 313 patients. The average onset-to-door time was  $125.59 \pm 62.78$  minutes with an average National Institutes of Health Stroke Scale scores of  $11.29 \pm 5.98$ . The average door-to-imaging time was  $28.36 \pm 20.62$  minutes. Ischemic stroke (IS) was the most common cause (70.3%), followed by hemorrhagic stroke (11.8%). Other nonstroke causes (stroke mimics) represented 17.9% of cases. They were seizures (46.4%), conversion disorders (26.8%), hypoglycemia (10.7%), brain tumors (10.7%), chronic subdural hematoma (1.8%), carbon monoxide intoxication (1.8%), and cavernoma (1.8%). Forty-six patients had been thrombolyzed. The average door-to-needle time was  $90.89 \pm 34.48$  minutes. After 3 months, 52.1% of thrombolyzed patients were autonomous (modified Rankin scale between 0 and 2). Two patients had died (4.3%), all in the first week after the IS. *Conclusion:* Our study shows that efforts need to be made at the extra-hospital and intra-hospital level to improve delays to increase the proportion of the thrombolyzed patients. **Key Words:** Neurological deficit—cerebral imaging—stroke—stroke mimics.

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Received July 28, 2017; revision received November 5, 2017; accepted November 18, 2017.

Grant support: This study did not receive any specific grant from any funding agency in the public, commercial, or not-for-profit sector.

Conflict of interest: The authors declare that they have no conflicts of interest related to this article.

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1052-3057/\$ - see front matter

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<https://doi.org/10.1016/j.jstrokecerebrovasdis.2017.11.022>

## Introduction

Initiated in April 2010, thrombolysis alert (TA) is a procedure triggered in the emergency department (ED) of Hassan II University Teaching Hospital of Fez (Morocco) every time a patient consults for sudden focal neurological deficit within 4.5 hours. The main symptoms that can lead patients to consult quickly are the sudden weakness or numbness of the arm, leg, or face; a decrease or loss of unilateral or bilateral vision; language disorders; a loss of balance or unexplained walking instability associated or not associated with dizziness or vomiting.<sup>1</sup> Several studies have shown that intravenous thrombolytic treatment of acute ischemic stroke with the recombinant tissue plasminogen activator (rt-PA) reduces long-term disability.<sup>2,3</sup> However, its benefit is highly time dependent.<sup>2,4</sup> In addition, early administration of rt-PA is also associated with lower risks of symptomatic intracranial hemorrhage.<sup>5,6</sup>

The aims of the present study are firstly, to determine the etiological profile of TA, and secondly, to evaluate the delays in the management not only of thrombolized patients but also of nonthrombolized patients in order to determine the intrahospital delays to optimize.

## Methods

Our study is prospective and descriptive, conducted in the ED of Hassan II University Teaching Hospital of Fez (Morocco) over a period of 2 years (from 1 January 2015 to 31 December 2016). The Hassan II University Teaching Hospital serves a population of about 4,200,000 inhabitants (urban: 2,500,000 and rural: 1,700,000). Almost all patients arrive at the ED on their own, apart from some patients transferred from other hospitals of the region. The study included all patients aged over 18 years admitted to the ED for sudden focal neurological deficit within 4.5 hours, for whom a TA has been triggered. The study did not include patients admitted within 4.5 hours for which a TA has not been triggered. Patients with sudden focal neurological deficit who consulted more than 4.5 hours, but for whom TA has been triggered, were also included in the study.

Once the TA is triggered, the neurologist evaluates the patient immediately (using National Institutes of Health Stroke Scale [NIHSS] scores) and confirms whether the deficit is of neurological origin or not. If he decides to maintain TA, the patient will be prioritized for biological examinations and imaging. Except in some cases, the imaging performed in case of TA is the cerebral computed tomography (CT) scan. Thus, in cases of ischemic stroke, the neurologist evaluates the inclusion and exclusion criteria for intravenous thrombolysis and clinically reassesses the patient before deciding to start intravenous administration of rt-PA.

For each patient, we collected the following information: age, sex, day, and month of neurological deficit; onset-to-door time (ODT); NIHSS score, door-to-imaging time (DIT), biological examinations, final diagnosis, performance or nonperformance of thrombolysis, and reasons for nonthrombolysis. For thrombolized patients, we also calculated the following times: onset-to-needle time (OTN), door-to-needle time (DTN), imaging-to-needle time (ITN). For thrombolized patients, we assessed NIHSS score before and after thrombolysis.

Patients for whom a TA was triggered and among whom imaging (CT scan and magnetic resonance imaging) did not show stroke are considered to be stroke mimics.

Our study was approved by the Institutional Review Board of Hassan II University Teaching Hospital of Fez.

In the descriptive analysis of the data, patient characteristics were expressed as percentages for the qualitative variables and mean  $\pm$  standard deviation for the quantitative variables. Baseline characteristics were compared using Student *t*,  $\chi^2$ , and Mann-Whitney *U* tests, where appropriate. *P* values  $<.05$  were considered statistically significant. All statistical analyses were performed with SPSS software version 20 (SPSS Inc., Armonk, New York).

## Results

During the period of study, 1725 patients consulted for suspected stroke, among whom 313 patients had been seen within 4.5 hours and for whom a TA has been triggered with a prevalence of TA of 18.14%. Only 1632 patients had ischemic stroke.

Table 1 summarizes the epidemiological, clinical, and etiological features of the 313 patients. The average age of the patients was 64.54 years. The average ODT was 125.59 minutes. TA was triggered in 19 patients who had an ODT greater than 4.5 hours. In 4 patients, it was a wake-up neurological deficit, and a thorough interrogation of the family revealed an ODT greater than 4.5 hours. In other patients, it was either an error in the calculation of the delay by the physicians of the ED, or an error of precision of the exact time of onset of symptoms by the family's members. The neurologist had decided to maintain the TA in these patients due to doubt about the exact time of onset of symptoms; brain imaging was performed for these patients. The deficit occurred at daytime in 141 patients (45%), at nighttime in 127 patients (40.6%), and on the night in 45 patients (14.4%). The average NIHSS score on admission was 11.29. The average DIT was 28.36 minutes. In 61.7% of cases, brain imaging was performed within less than 25 minutes of arrival at the ED. We did not find any relationship between the severity of the NIHSS score and DIT below 25 minutes (*P* value = 0.718). We also did not find any relationship between the time of stroke onset and DIT (*P* value = 0.513).

Ischemic stroke was the most common cause (70.3%), followed by hemorrhagic stroke in 11.8%. Other causes

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