

Timing of Hospital Presentation After Acute Cerebral Infarction and Patients' Acceptance of Intravenous Thrombolysis

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Abstract

Introduction: Intravenous thrombolysis has been shown to improve outcome after acute cerebral infarction if given within 3 hours of symptom onset. There are no data in Singapore on the timing of hospital presentation after acute cerebral infarction as well as factors and reasons for delayed presentation. **Materials and Methods:** As intravenous thrombolysis has recently been licensed for use in acute cerebral infarction in Singapore, we studied 100 consecutive acute cerebral infarction admitted to the Singapore General Hospital for timing of hospital presentation, reasons associated with delay in presentation and hypothetical acceptance of intravenous thrombolysis. **Results:** Only 9% of patients presented to hospital within 2 hours of symptom onset. Factors associated with hospital presentation within 2 hours were a large stroke and lack of pre-hospital consultation. Failure to recognise the severity of symptoms and inability to seek medical attention unaided were the 2 most common reasons for delayed presentation. One-third of patients or their relatives hypothetically would accept intravenous thrombolysis, suggesting that a thrombolysis service is feasible at the Singapore General Hospital. However, it would be hindered by the low proportion of patients who present early to hospital after symptom onset. **Conclusion:** Our results support the need for a public education programme to highlight the identification of stroke symptoms and the need to present to hospital as soon as possible after the onset of stroke symptoms.

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Introduction

Intravenous thrombolysis in acute cerebral infarction has been proven to be efficacious in improving functional outcome if given within 3 hours from stroke onset.¹ Singapore recently received national licensing for the use of intravenous thrombolysis for this indication. Delay in hospital presentation is an important hindrance to the administration of intravenous thrombolysis. Whilst there are several studies conducted in other countries investigating factors associated with delay in presentation after acute stroke,²⁻⁵ there has been no similar study carried out in Singapore.

The Singapore General Hospital is a 1400-bed teaching hospital whose neurology department has specialised stroke teams. All patients with acute cerebral infarction who present to the Singapore General Hospital emergency department are admitted to these specialised stroke teams.

Our hospital is about to embark on the use of intravenous thrombolysis in acute cerebral infarction as a clinical service.

We studied the timing of hospital presentation, factors and reasons associated with delay to hospital presentation among patients with acute cerebral infarction. As intravenous thrombolysis is associated with an increased risk of haemorrhage,^{1,6} patients may choose to decline the administration of thrombolysis. Therefore we also studied the hypothetical acceptance of thrombolysis.

Results from this study will allow us to anticipate the number of patients who will agree to thrombolysis, which may influence how the thrombolysis service is developed. In addition, it will help to identify potential target areas for public education to encourage early hospital presentation of acute cerebral infarction.

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Materials and Methods

In this prospective study, we recruited 100 consecutive patients with acute cerebral infarction admitted to the Singapore General Hospital neurology department over one month in June 2004. Acute cerebral infarction was diagnosed as first presentation to hospital with stroke symptoms attributed to cerebral infarction by a neurology consultant based on clinical findings and brain imaging. There were no exclusion criteria.

Patients or their relatives were interviewed with standardised questions. Data collected included time of stroke symptom onset, patient demographics and stroke subtype using the Oxfordshire Community Stroke Project classification.⁷ The time of stroke symptom onset was defined as time of symptom onset attributable to stroke or time the patient was last well. The time of arrival in hospital was taken as the time the patient arrived at the emergency department as noted in the emergency department notes. The duration after stroke symptom onset to hospital presentation was calculated from the time of stroke symptom onset to the time of arrival at the emergency department. Large stroke was defined as total anterior circulation and partial anterior circulation infarction and non-large stroke was defined as lacunar infarction and posterior circulation infarction. Patients were asked to choose the main reason for delay in hospital presentation from a list of options: did not recognise gravity of symptoms, financial concerns, unable to seek medical care unaided, unable to communicate need for help, fear of hospitalisation, waiting for spontaneous resolution and trial of self-medication. After the risks and benefits were explained to the patient by one of three neurology medical officers quoting standardised benefits and risk rates as well as the cost of thrombolysis, we asked if they would agree to intravenous thrombolysis if hypothetically offered.

Univariate analyses were carried out using chi-square, Fisher’s exact and ANOVA tests for nominal data and *t*-test for numerical data. Multivariate analysis was used to look for independent associations. This study was approved by the Singapore General Hospital ethics committee.

Results

Of the 100 patients, 53% were male and 27% had large stroke. The median age was 66 years. The ethnic distribution was 73% Chinese, 12% Malays, 14% Indians and 1% of other ethnicity.

The median time of arrival to hospital from stroke onset was 965 minutes (16 hours and 5 minutes). We found that among patients with acute cerebral infarction, 9% presented to the hospital emergency department within 2 hours of symptoms onset, 3% between 2 to 3 hours, 15% between 3 to 6 hours, 37% between 6 to 24 hours and 36% after 24

hours of symptom onset.

Table 1 shows univariate analyses of factors associated with timing of hospital presentation. Large stroke and lack of pre-hospital medical consultation were significantly associated with hospital presentation within 2 hours. Multivariate regression analyses revealed that both large stroke (*P* < 0.001) and lack of pre-hospital medical consultation (*P* = 0.011) were independently associated with hospital presentation within 2 hours.

The most common reason for delayed presentation was that the patient or relative did not recognise the gravity of the symptoms (50). The next most common reason cited was the inability to seek medical attention unaided (12). Among the other reasons, 4 cited difficulty with communicating need for medical attention, 4 waiting for spontaneous resolution, 4 trial of self-medication, 1 financial concern and 1 fear of hospitalisation. Twenty-five patients did not cite a reason for delay.

When hypothetically asked if they would agree to thrombolysis after the benefits and risks were outlined, 34% of patients or relatives indicated they would agree to intravenous thrombolysis. Table 2 shows the association of factors with acceptance of thrombolysis. A significantly higher proportion of patients who did not live alone hypothetically agreed to intravenous thrombolysis. Of note, none of the patients who lived alone hypothetically agreed to intravenous thrombolysis. There was a tendency (though

Table 1. Associations of Hospital Presentation Within 2 Hours of Symptom Onset

	Hospital presentation within 2 hours of symptoms onset	Hospital presentation after 2 hours of symptoms onset	<i>P</i>
Age (y)	63	66	0.573
Chinese	6 (8%)	46 (92%)	0.264
Malay	0 (0%)	12 (100%)	
Indian	3 (21%)	11 (79%)	
Others	0 (0%)	1 (100%)	
Male	5 (9%)	48 (91%)	1.00
Female	4 (9%)	43 (91%)	
Large stroke	7 (26%)	20 (74%)	0.001
Non-large stroke	2 (3%)	71 (97%)	
Single	2 (6%)	33 (94%)	0.488
Married	7 (11%)	58 (89%)	
Pre-hospital consultation	0 (0%)	38 (100%)	0.012
No pre-hospital consultation	9 (15%)	53 (85%)	

Numbers given with percentage in brackets

Table 2. Univariate Analyses for Association with Acceptance of Intravenous Thrombolysis

	Hypothetically would accept intravenous thrombolysis	Hypothetically would not accept thrombolysis	<i>P</i> value
Not living alone	0 (0%)	10 (100%)	0.015
Living alone	34 (38%)	56 (62%)	
Hospital presentation:			
• within 2 hours	4 (44%)	5 (56%)	0.485
• after 2 hours	30 (33%)	61 (67%)	
Large stroke	13 (48%)	14 (52%)	0.069
Small stroke	21 (29%)	52 (71%)	
Married	26 (40%)	39 (60%)	0.084
Single	8 (23%)	27 (77%)	

Numbers given with percentage in brackets

not statistically significant) for patients with large stroke and married patients to hypothetically agree to intravenous thrombolysis.

Discussion

This sample of 100 patients admitted over one month in June 2004 was representative of ischaemic stroke patients admitted to the Singapore General Hospital. We compared our study patients to all ischaemic stroke patients admitted to the Singapore General Hospital in 2004, and found they were similar in terms of median age (66 vs 67 years), gender distribution (53% vs 54% male), ethnic distribution (73% Chinese, 12% Malay, 14% Indian and 1% of other ethnicity vs 79% Chinese, 11% Malay, 9% Indian and 1% of other ethnicity) and stroke subtype distribution (27% vs 23% large stroke).

The majority (91%) of our patients failed to arrive within 2 hours of stroke onset. As patients need brain imaging and basic laboratory tests before thrombolysis can be considered, it is likely that only patients who come to hospital before 2 hours will meet the 3-hour window for administration of intravenous thrombolysis. Therefore, most of our patients could not have been considered for intravenous thrombolysis due to delayed hospital presentation. This suggests the need for a public education programme in Singapore to promote awareness of the need to present to hospital immediately once stroke symptoms occur.

Large stroke was associated with hospital presentation within 2 hours, probably because of the severity of symptoms. Pre-hospital medical consultation such as with a primary care physician delayed hospital presentation. The lack of awareness of stroke symptoms and the inability to seek medical help unaided were identified as the main

subjective reason for delayed presentation.

Public education should therefore emphasise identification of stroke symptoms and highlight that stroke is an emergency that requires immediate presentation to hospital. The public should be educated to present to a hospital emergency department as soon as possible and that the public ambulance service should be contacted for transport purposes. This is particularly important in view of the potential administration of intravenous thrombolysis and its benefits.

There are limitations in the manner we asked patients/relatives about thrombolysis acceptance. Thrombolysis was not available at that time and it was a hypothetical acceptance that was sought. The rate of acceptance may be lowered if patients/relatives were asked at a longer duration from stroke onset as the patient may have improved. The higher hypothetical acceptance among patients not living alone may be due to the possible greater availability of relatives to agree to thrombolysis as a surrogate for the patient, compared to patients living alone.

Our results support the feasibility of a thrombolysis service in our unit in terms of patients' acceptance (34%) of intravenous thrombolysis. However, the low proportion of patients presenting within 2 hours to hospital (9%) will exclude most patients with acute cerebral infarction from being considered for intravenous thrombolysis. Our findings suggest the need for a public stroke education programme. Future studies after public education will be useful to note any changes in hospital presentation times.

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