

Original article:

Evaluation of Door To Needle Time For Fibrinolytic Therapy of ST Elevation Myocardial Infarction (STEMI) Management In Emergency And Traumatology Department (ETD), Hospital Sultan Haji Ahmad Shah (HOSHAS), Temerloh, Pahang, Malaysia.

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Abstract:

Introduction: Acute myocardial infarction is known with high mortality. The benefits of fibrinolytic administration in STEMI are time dependent. The purpose of this study is to evaluate the door-to-needle time for fibrinolytic therapy in STEMI patients. **Methods:** A cross sectional study of all patients who had STEMI was carried out to evaluate the management of STEMI. The duration from door-to-ECG time, door-to-needle time and the factors that contribute to the time frame in receiving treatment was reviewed. The outcomes and complications from fibrinolytic therapy were documented as well. The outcomes of the delayed in administering the treatment were also analyzed in the study. **Result:** Out of 19 patients received fibrinolytics within 30 minutes, 16 patients (84.2%) had good outcome. In 17 patients received fibrinolytics between 30 minutes to 1 hour, 6 patients (35.2%) had good outcome. In 15 patients received fibrinolytics more than 1 hour, 8 patients (53.3%) had good outcome. **Conclusion:** This study showed that a shorter door-to-needle time results in better outcome.

Keywords : ST Elevation Myocardial Infarction; STEMI; Streptokinase; fibrinolytic therapy; ECG.

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Introduction:

Acute myocardial infarction is a major health problem, with relatively high morbidity and mortality¹. ST elevation myocardial infarction (STEMI) is an acute total occlusion of the coronary artery. In Malaysia, fibrinolytic therapy is the most common mode of reperfusion strategy in the treatment of STEMI. Percutaneous coronary intervention (PCI) is now an established method of treating atherosclerotic coronary artery disease². Unfortunately, there are only a small number of hospitals which have the resources and expertise to provide this procedure.

The benefits of fibrinolytic administration in STEMI are time dependent. The earlier the treatment is administered, the more effective and beneficial the treatment will be for the patient. In circumstances

of early presentation of STEMI (within 3 hours of onset), fibrinolytic therapy has been shown to be equally effective^{3,4} as percutaneous coronary intervention (PCI). The time frame recommended to administer perfusion therapy should be within 30 minutes door to needle time^{5,6} for fibrinolytic therapy and 90 minutes door to balloon time⁷ for PCI.

Mortality from acute myocardial infarction is influenced by the speed of which reperfusion therapy is delivered to the patient. Therefore, it is important to identify the variables that can delay the door-to-needle time so that improvement steps can be taken. The purpose of this study is to evaluate the door-to-needle time for fibrinolytic therapy in STEMI patients presented to Hospital Sultan Haji Ahmad Shah, Temerloh, to evaluate whether recommended

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guidelines is fulfilled and to find the causes if there is delay treatment. Early and prompt reperfusion is crucial in patient treatment as time lost is equivalent to myocardium lost. Factors associated with the delaying treatment should be addressed to improve the care of patients with STEMI in HoSHAS.

In general, HoSHAS is the referral centre for 21 health facilities (district hospitals & health clinics) scattered in the western region of Pahang. The numbers of district hospital involved in this study were 3 and health clinics were 10. Fibrinolytic therapy can be administered in the district hospitals unless there is ambiguity with the diagnosis. For instance, in a case of when cerebrovascular accident is queried, Head Computed Topography Scan (CT Scan) need to be done first before treatment is decided to give or not. Therefore, the patient will be transferred to tertiary hospital for further treatment and management.

Methodology:

A cross sectional study of all patients who had STEMI in ETD, HoSHAS from 1st January 2014 till 30th April 2014 was carried out to evaluate the management of STEMI. At the time of patient arrival in the emergency department, patients who were presented with acute coronary syndrome symptoms will undergo history taking, physical examination, Electrocardiogram (ECG), and blood taking for biochemical markers by the medical officers.

The diagnosis of STEMI was based on symptoms, ECG and biochemical markers of myocardial necrosis. Nowadays, echocardiograms also play a role in identifying the areas of infarction of the heart. All patients that were diagnosed with STEMI and those who were eligible for thrombolytic therapy had been included in our study. The duration from door-to-ECG time, door-to-needle time and the factors that contribute to the time frame in receiving treatment was reviewed. The outcomes and complications from fibrinolytic therapy were documented as well. The outcomes of the delayed in administering the treatment were also analyzed in the study. The data used in this study was obtained from the Cardiac Care Unit (CCU) and ETD, HoSHAS.

The data was analyzed using SPSS Version 19. The descriptive and crosstab analysis were used to determine the result

In total, there were 51 patients included in this study. Of the total number of patients, 86.3% (44 patients) of them were male and 13.7% (7 patients) of them were female.

In term of race, the highest percentage was 78.4% (40 patients) were Malay; followed by Indian

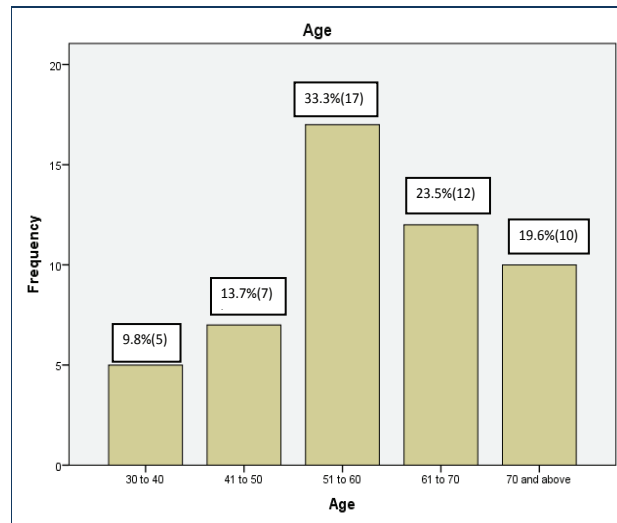


Chart 1: Classification according to age of STEMI patients

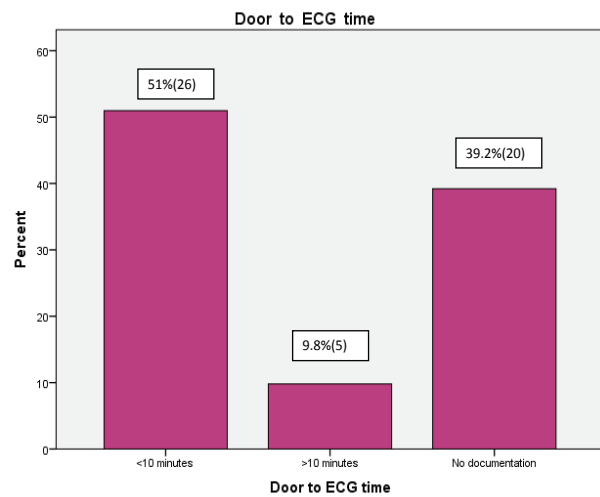


Chart 2: Duration of door-to-ECG-time

The duration of door-to-needle time in STEMI patients seen in ETD HoSHAS (Chart 3)

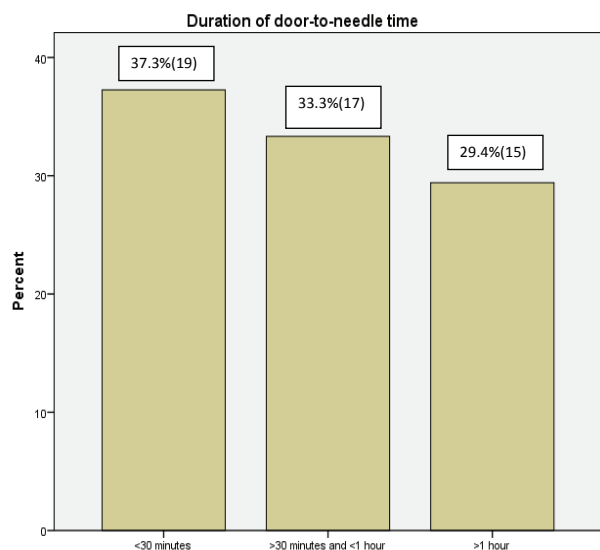


Chart 3: Duration of door-to-needle time

Among patients with STEMI, 37.3% (19 patients) received fibrinolytic agent in less than 30 minutes, 33.3% (17 patients) were thrombolysed within 30 minutes to an hour and 29.4% (15 patients) were thrombolysed only after more than an hour.

There were several factors that had been recognized in causing the delay in door-to-needle time. (Chart 4)

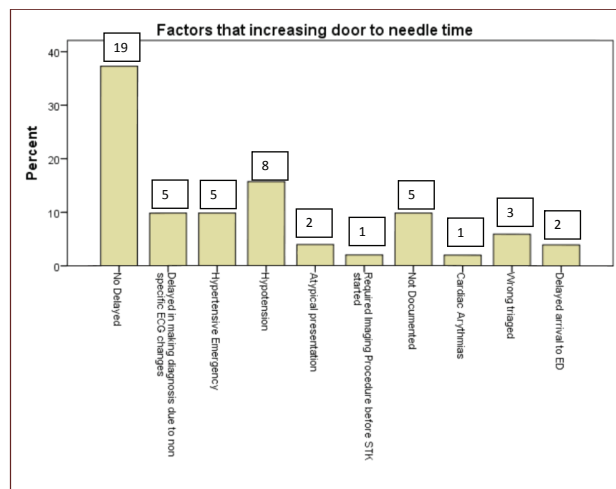


Chart 4: Factors that increasing door-to-needle time patients that made up 11.8% (6 patients) and 9.8% (5 patients) were Chinese.

Among them, 31.4% (16 patients) were already known as a smoker, 25.5% (13 patients) of them had Diabetes Mellitus and 25.5% (13 patients) of them were known case of Hypertension.

The mean age of the patients were 56.9 years, with 19.6% (10 patients) of them being older than 70 years old and 9.8% (5 patients) being younger than 40 yearsold. (Chart 1).

patients

The duration of door-to-ECG time in STEMI patients seen in ETD HoSHAS was 51%(26 patients) less than 10 minutes, 9.8% (5 patients) more than 10

minutes and 39.2% (20 patients) of them were not documented. The duration of door-to-needle time in STEMI patients seen in ETD HoSHAS as in Chart 2.

Out of 51 patients, 62.7% (32 patients) were delayed in receiving thrombolytic therapy. In a majority of the patients, unstable blood pressure had been recognized as the main factor in the delay of initiating treatment with 15.7% (8 patients) delayed due to hypotension and another 9.8% (5 patients) due to hypertensive emergency.

Exactly 9.8% (5 patients) of them had their diagnosis deferred due to non-specific ECG changes. In this cases, the ECG need to be repeated to see the evolving changes especially when patient came in with typical symptoms. Some of the patients with angina pain had delayed their arrival to the ETD which was 3.9% (2 patients), as such the decision to administer the thrombolytic agent would then need to be deliberated further. A more detailed history of the patient should be taken into account to ensure that the decision to provide thrombolytic therapy would benefit the patient.

Another 3.9% (2 patients) were delayed in receiving treatment due to atypical presentation of STEMI such as lethargic and difficulty in breathing. 5.9% (3 patients) of them were also delayed due to incorrect triaged. An additional of 2% (1 patient) of them was developed cardiac arrhythmias on arrival as a complication of STEMI and need to be resuscitated first.

2% (1 patient) of them required a CT scan of the brain before treatment could proceed to exclude cerebrovascular accident when the patient presented with symptoms mimicking stroke. Unfortunately, 9.8% (5 patients) of them delayed in receiving treatment but were not properly documented.

The delay in treating the management of STEMI is

	Doortoneedletime			Total
	<30 minutes	>30 minutes and <1 hour	>1 hour	
1. Cardiogenic Shock.	2	7	4	13
2. Intubated.	0	0	1	1
3. ECG no resolution >50%.	0	0	1	1
4. Death in CCU within 5 days admission.	1	3	1	5
5. Referral to Cardiologist for Rescue PCI	0	1	0	1
Good Outcome				
Total	19	17	15	51

conversely correlated with the prognosis and survival of patients. This study will correlate the association of duration of door-to-needle time and its outcome. (Table 1)

Table 1:

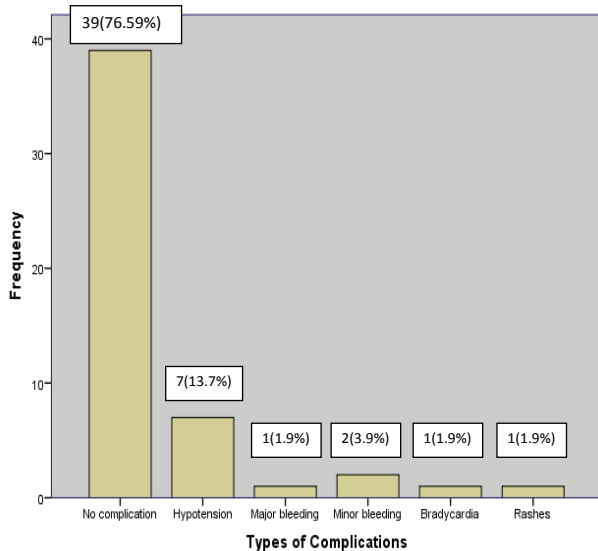


Chart 5: Types of Fibrinolytic Therapy Complications

Association of duration of door-to-needle time and its outcome.

Out of the 19 patients (37%) who had received the fibrinolytic agent within less than 30 minutes as protocol, 16 of them(31%) resulted in a good outcome and 2(3.9%) of them developed cardiogenic shock post treatment and 1(1.9%) death in Cardiac Care Unit (CCU) within 5 days of admission. None of them developed any other complications.

Patient with good outcome is defined as a patient without any complication during and post fibrinolytic therapy given. The patient is also responding well to the treatment within 5 days mainstay in hospital and discharged well to home.

17 patients (33%) had received treatment within 30 minutes to 1 hour. Out of them, 6 patients(11.7%) had a good outcome without any complication, 7 patients (13.7%)had developed cardiogenic shock, 3 patients (5.8%) died in CCU within 5 days of admission and 1 patient(1.9%) had to be transferred out to the cardiac center for rescue PCI due to failed thrombolytic therapy.

15 patients(29.4%) were thrombolysed after more than one hour following presentation to ETD. 4 of them (7.8%) had developed cardiogenic shock, 1 patient (1.9%) had to be intubated, 1 patient (1.9%) died in CCU within 5 days of admission and 1 patient(1.9%) had no resolution of ECG changes >50% post thrombolytic therapy.

The fibrinolytic therapy also has its complication as we can see in **Chart 5** below.

As we can see the above chart, the treatment itself also has its complications. However, once the benefit of the treatment is weighed more important, the

treatment has to be initiated. Out of 51 patients, 39 of them (76.59%) had no complication. 7(13.7%) patients had developed hypotension after treatment initiated. The patients who were already hypotensive and required inotrope during or after treatment were not included as complication of fibrinolytic therapy. 1 patient (1.9%) had developed major bleeding, 2 patients (3.9%) had developed minor bleeding and another 1 patient(1.9%) had bradycardia after thrombolysis started. Another 1 patient(1.9%) developed rashes during treatment.

Discussion:

Coronary artery disease (CAD) is officially the world’s number one killer disease. It is characterized pathophysiologically by progressive occlusive atherosclerosis, acute plaque rupture and atherothrombosis.

Atherothrombosis manifests clinically as acute coronary syndrome (ACS). ACS encompasses a broad spectrum of clinical conditions from unstable angina (UA) to non-ST-segment elevation infarct (NSTEMI) and ST-elevation myocardial infarction (STEMI).

Cardiovascular disease remains an important cause of death in Malaysia accounting for 20-25% of all deaths in government hospitals from 2000-2005. The mortality rate in acute myocardial infarction is about 20% in 2004.

Another report of ACS in Malaysia was collected from 11 hospitals around the country in 2006. The 3422 patients represented only a fraction of the true number of new ACS cases every year. Out of these, there were 1445 patients or 42% of ACS patient with STEMI, 1132 patients or 32% with NSTEMI, and 845 patients or 25% with UA⁸.

The database in this study represents the audit of STEMI management in within 4 months duration in Emergency and Trauma Department, Hospital Sultan Haji Ahmad Shah, Temerloh. The information gathered was from January to April 2013.

A total number of 51 patients of STEMI were involved in this study. There was a big discrepancy in term of gender having STEMI between male and female. Male patients were accounted for 86.3% and female was 13.7%. This study shows that the most predisposing factor for a patient getting STEMI was smoking which accounted for 31.4% and all of them are male patient. Smoking habit is one of the factors that could explain why more men suffered from STEMI compare to women.

In our local setting, the Malays became the largest population followed with Chinese and Indian. The highest percentage in term of race having STEMI in

this study were Malays (78.4%), followed by Indians (11.8%) and Chinese (9.8%).

The mean age was 56.7 years old with the highest percentage to get this disease were aged between 51 to 60 years old (33.3%).

Fibrinolytic therapy is the most common form of reperfusion therapy in STEMI patients in our setting. Although guidelines recommend a door-to-needle time of less than 30 minutes, it was achieved in only 37.3% of patients in this study. Unstable blood pressure has been recognized as a major factor in resulting a considerable delay in this study. 1.9% of patients received late treatment as they developed cardiac arrhythmias on arrival. These 2 groups of patients had to be stabilized first before fibrinolytic therapy could be initiated.

Additional time was needed to stabilize the patient's blood pressure prior to initiating the treatment in view of complications that might occur on a patient that has an unstable blood pressure. A target of door-to-needle time of less than 30 minutes might not be achievable in such complicated STEMI patients and it is more achievable under ideal condition in patients with uncomplicated STEMI.

Delay in initiating treatment has also resulted from atypical presentation. 2 cases were reported in this study. The first patient came with symptoms of lethargy and another patient came in with difficulty in breathing. Both were initially being treated as not as an ACS patient. Then, when the ECG was done, they were treated as STEMI.

A delay in interpreting ECG where the initial ECG shows subtle changes and subsequent ECG shows evolving changes also contributed for 9.8% from all cases. Lack of experience can lead to incorrect ECG interpretation and this creates more delays in establishing diagnosis of STEMI. It is of utmost importance to acquire a detailed history and to perform serial ECGs to facilitate the correct diagnosis of STEMI in a timely manner therefore minimizing delay in initiating fibrinolytic therapy.

5.9% of the patients in this study received delayed treatment as a result of inappropriate triage. The first stage on arrival to ETD is assessment by the triage personnel and they play an important role in determining patients' priority for treatment. It is extremely important for the triage personnel to be trained in evaluating patients with suspected STEMI therefore allowing for patient triage directly to Red Zone where they will receive immediate medical attention.

STEMI patients who are wrongly triaged to a lower priority zone will get delayed treatment, and this

contributes to factors that increase door-to-needle time. Correctly triaging patients with suspected STEMI will decrease intervention time and improve patient survival.

The public also play a role in early recognition of STEMI symptoms and be aware of the importance of early access to emergency medical care that will allow early intervention by emergency-care providers in initiating thrombolytic therapy.

The complications that have been revealed in this study such as cardiogenic shock, haemodynamically unstable that lead to cardiorespiratory dysfunction and intubation, no resolution of ST elevation >50% in ECG post treatment and death in CCU within 5 days of admission. The patient who failed fibrinolytic therapy need to be transferred to cardiac centre for Percutaneous Coronary Intervention (PCI).

Patient with STEMI which has good outcome usually presented earlier, no delayed in treatment, has good resolution in ECG post fibrinolytic therapy, responding well to the treatment in CCU within 5 days of admission and can be discharged well to home with early follow up under cardiologist.

Therefore, it is crucial to establish the diagnosis of myocardial infarction as soon as possible from the door (triage) to needle time (thrombolytic agent) to reduce the risk of incurring a bad outcome.

Improving time to fibrinolytic therapy improves survival rate for patients presenting with STEMI, however achieving target door-to-needle time remains challenging. Factors that have been recognized to prolong door-to-needle time in this study should be looked into and corrected to maximize clinical benefit.

Conclusion:

This study has clearly showed that a shorter door-to-needle time results in better outcome. Only a small percentage of patients had developed complications post thrombolytic therapy when the treatment is initiated early (<30 minutes). 16% (3 out of 19) patients had developed complications. However, if the treatment was initiated >30 minutes, risk of patient developing complications is higher. Data shows that 65% (11 out of 17) of the patients who had received treatment within 30 minutes to 1 hour as well as the 47% of the patients (7 out of 15) who received treatment after more than 1 hour had developed complication.

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