Door to needle time in administering thrombolytic therapy for acute myocardial infarction

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ABSTRACT

Objectives: Thrombolytic therapy is a standard treatment for patients presenting with acute myocardial infarction (MI). Early administration of these agents is crucial for the outcome of management. This audit was conducted to evaluate the time between arrival to emergency department (ED) and the administration of thrombolysis (door to needle time).

Methods: Data was collected from patients admitted to the Coronary Care Unit of Riyadh Medical Complex (RMC), Riyadh, Kingdom of Saudi Arabia, a 1500-bed community hospital, with a diagnosis of acute MI and received thrombolytic therapy over a one-year period (April 1999 to April 2000). The time between arrival to the ED to the time of administration of thrombolytic therapy was obtained as well as the time of onset of chest pain up to presentation to the hospital, and the outcome (all cause mortality) post treatment.

Results: A total of 271 patients (256 males) admitted to RMC with a diagnosis of acute MI received thrombolytic therapy over a one-year duration. The median door to needle time was 95 minutes. The median time of onset of chest pain to arrival to ED was 5 hours (300 minutes). The outcome of these patients obtained either alive was 260 (96%) or dead was 11 (4%) ($P < 0.00001$).

Conclusion: The door to needle time was relatively similar to other centers. The delay in administering thrombolytic therapy should be reduced to a target of <70 minutes from onset of symptoms. Delay in presentation to the hospital was more important and factors contributing to this delay should be looked for and corrected. Another audit is needed to evaluate the implementation of these recommendations.

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The use of thrombolytic therapy in the treatment of acute myocardial infarction (MI) has been shown by several studies to improve survival.[1-3] Early administration is crucial in determining the outcome of patients in terms of survival, infarct size, and left ventricular function.[4] The maximum benefit of thrombolytic therapy to salvage the myocardium in a patient developing acute MI is when given within the first 60 minutes (one hour) of symptoms appearance.[5,6] This study was carried out to determine whether this is the current practice in Riyadh Medical Complex (RMC), the biggest community hospital in the Kingdom of Saudi Arabia (KSA). To our knowledge, this is the first study looking at door to needle time in a community hospital in KSA.

Methods. Data was collected from the charts of patients who were admitted to the coronary care unit in RMC, with a diagnosis of acute MI over duration of one year from April 1999 to April 2000. Time of arrival, time of administration of thrombolysis, and time of

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onset of chest pain as well as outcome of patients was collected. Other data obtained was the electrocardiographic findings, cardiac enzyme elevation, risk factors for coronary artery disease, complications post MI, and discharge medications.

Statistical analysis. The analysis of collected data was performed using Stat Pack Gold. Student's T-test was used; testing whether mean differs from zero.

Results. The median duration from time of arrival to emergency department (ED) to time of administration of thrombolytic therapy was 95 minutes only. Twenty-six patients (9.6%) received thrombolysis within the first 60 minutes of arrival, while 113 patients (41.7%) were given thrombolysis between 60 and 120 minutes of arrival (**Table 1**). Other parameters observed in this audit that males were 256 (94.5%), non-Saudis accounted for 202 patients (74.5%), current smoking was reported by 165 patient (60.9%), whereas diabetes mellitus were identified risk factors among 80 (29.5%), hypertension among 63 (23.2%), and hypercholestrolemia among 9 patients (3.3%). The median duration from the onset of chest pain to arrival to the ED was 5 hours (300 minutes). Anterior MI was shown by electrocardiogram (ECG) in 113 (41.7%) patients, and 112 (41.3%) had inferior MI. Post MI complications were arrhythmia in 41 patients (15.1%), pericarditis in 9 patients (3.3%), cardiogenic shock in 21 patients (7.7%), ventricular septal defect in one patient (0.4%), and heart blocks in 9 patients (3.3%). Patients who were discharged alive were 260 (96%) and 11 patients (4%) died. Discharge medications were ß-blocker in 201 (74.2%), angiotensin converting enzyme (ACE) inhibitors in 165 (60.9%), nitrates in 231 (85.2%), hypolipedimic agents in 13 patients (4.8%), and aspirin in all patients (**Table 2**).

Discussion. Our data shows that thrombolytic therapy was administered to the majority of patients presenting with acute MI within 2 hours of their hospital arrival. Another 5 hours were added to the delay in thrombolysis from the onset of symptoms until arrival to the hospital. Despite a comparable duration of the door to needle time with other centers; however, the delay in arrival to the ED was rather marked. Reduction in mortality by 1% occurs for each hour of time saved within the first 6 hours.[7] One should remember the longer the delay in thrombolysis the less the myocardial salvage and functional benefit. This concept has to be emphasized not only to health care workers but also to the public to reduce the delay in presenting to the hospital after the onset of chest pain. Our data showed that many patients presented late to the hospital after the onset of their symptoms. One study reported as many as 40% of patients had a delay of more than 6 hours before they presented to the hospital.[8] In another study from Finland, only 38% of patients received thrombolysis within 2 hours of onset of symptoms.[9] Factors associated with prolonged delay included advanced age and female sex, having symptoms during the evening and early morning hours (6:00 p.m. to 6:00 a.m.), and patients with a history of hypertension. Our patients were relatively of younger age group with a mean age of 49.1 years (range 25-90), and the majority were males, mostly were non-Saudis (74.5%). Most of the non-Saudis in KSA are young bachelors, of lower educational and socioeconomic backgrounds, explaining the disparity in factors leading to delay in arrival to hospital. Moreover, the onset of symptoms was reported between 7:00 a.m. and 9:00 a.m. by most of our patients, nonetheless, there was a delay in arrival to the ED. Deficiencies in knowledge of symptoms may contribute to the delay and could be a target for intervention. Therefore, educational interventions that encourage the prompt use of emergency medical transport services and target specific patient populations, such as elderly persons, women, young bachelors, persons with cardiac risk factors, and persons with lower educational level may be most successful in reducing the length of delay

Table 1 - Door to needle time in minutes.

Door to needle time (minutes)	Patients n (%)
<30	4 (1.5)
31-60	26 (9.6)
61-120	113 (41.7)
121-240	113 (41.7)
241-360	11 (4.1)
361-480	3 (1.1)
>480	1 (0.4)

Table 2 - Medications post acute myocardial infarction..

Medication	Patients n (%)
Aspirin	271 (100)
ß-blockers	201 (74.2)
ACE I	165 (60.9)
Nitrates	231 (85.2)
Hypolipidemic agent	13 (4.8)

ACE I - angiotensin converting enzyme inhibitors

and improving the outcomes of patients with acute MI.[10] Delay of thrombolysis maybe due to time elapsed between evaluations of patients in the ED until referral to coronary care unit (CCU) where thrombolysis can be administered. In hospital factors accounted for 59% of the time delay from the onset of symptoms to thrombolytic treatment. After arrival in the emergency room, an average of 20 minutes was required to obtain an ECG and an additional 70 minutes delay before the administration of tissue plasminogen activator (TPA).[11] One study evaluated the effectiveness of initiating thrombolysis in the ED; this resulted in reduction of door to needle time from 81 minutes in CCU to 25 minutes in ED.[12] Another study looked at employing an aggressive policy to reduce the door to needle time and investigated whether this approach is safe, it has reduced door to needle time from 70 to 20 minutes. However, greater pressure on medical staff to make rapid management decisions increased the proportion of patients being thrombolyse inappropriately.[13] The safety and efficacy of prehospital thrombolysis in order to reduce the time between the onset of symptoms and therapy with a thrombolytic agent has been evaluated. Treatment with thrombolysis by a physician in a mobile CCU within 1.5 hours of symptom onset was associated with smaller infarcts, preservation of left ventricular function, and a lower 21-day mortality rate.[4] Prehospital thrombolysis has resulted in aborting an acute MI in some patients.[14] The results of Grampian Region Early Anistreplase Trial (GREAT trial) comparing prehospital to hospital thrombolysis showed that patients in the prehospital group received thrombolytic treatment more than 2 hours earlier (101 versus 240 minutes after the onset of symptoms), and it was correlated with a 50% risk reduction in mortality at one year.[15] The benefit of earlier treatment was maintained after a 5-year follow-up; the mortality in the prehospital treated group was 25% compared to 36% in the hospital treated patients.[16] Nonetheless, this concept was not consistent with the result of the MI triage and intervention (MITI trial). Despite significant reduction of total time to treatment from 110 to 77 minutes, there were no significant differences between the prehospital and hospital treatment groups in left ventricular ejection fraction, infarction size, or all-cause mortality.[17] A meta-analysis of 6 randomized trials involving 6,434 patients found that prehospital thrombolysis significantly reduced all-cause hospital mortality compared to in-hospital thrombolysis.[18] Another approach to shorten the delay in thrombolysis is to provide a specialist cardiac nurse "thrombolysis nurse" for rapid assessment before thrombolysis. The effectiveness of this approach was evaluated and it was found that the presence of thrombolysis nurse produced a dramatic improvement in median door to needle and pain to needle times in patients presenting with definite MI.[19]

In conclusion, although our data is in keeping with other centers in administering thrombolytic therapy for patients with acute MI, it is still not reaching the "golden hour" target for maximum effectiveness of thrombolysis. To achieve improvement in door to needle time; aggressive policy to shorten time consumed until thrombolytics are administered should be adopted at the expense of some patients receiving thrombolysis inappropriately, alternatively, utilizing a thrombolysis nurse, in evaluating patients with chest pain, may be employed. The delay taken by patients from onset of symptoms prior to arrival to ED can be dealt with by either education with emphasis on certain risk groups and promoting awareness of symptoms suggestive of MI, or providing prehospital thrombolysis. Studies have shown that prehospital thrombolytic therapy is possible and that, when treatment is given shortly after the onset of pain, there is a reduction of infarct size and an improvement in ejection fraction following acute MI. Further study auditing the implementation of the international recommendation in the treatment of acute MI with thrombolysis is needed to ensure accurate management and improvement in the outcome.

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Title: How safe is thrombolytic therapy in acute myocardial infarction

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Abstract

The most feared deterrent for initiation of thrombolytic therapy for acute myocardial infarction is bleeding complications. The most dreaded complication is intracerebral hemorrhage. We studied the incidence of both major and minor bleeding in 268 sessions of thrombolytic therapy following acute myocardial infarction. Of this, 142 received tissue plasminogen activator (T-PA) and 126 received streptokinase. There were 4 strokes in the streptokinase group and 2 strokes in the T-PA group. Also, 11 patients in the T-PA group had minor bleeding as compared to 4 in the streptokinase group. However, these differences are not statistically significant. We conclude that thrombolytic therapy can be administered with relative safety if proper precautions are taken. In this study, there was no statistically significant difference in the incidence of bleeding streptokinase and T-PA.