

“Point of entry” treatment gives best time to thrombolysis for acute myocardial infarction.

MICHAEL BRYANT AND ANNE-MAREE KELLY

Michael Bryant is Deputy Director of Emergency Medicine at Western Hospital, Footscray, Victoria and Anne-Maree Kelly is Professor and Director of the Department of Emergency Medicine, Western Hospital.

Abstract

The aim was to compare time to thrombolysis for patients treated via three treatment pathways: thrombolysis in the emergency department (ED), thrombolysis following direct admission by ambulance officers to coronary care (CCU) and thrombolysis after transfer from ED to CCU. We used a retrospective study of time to thrombolysis for all patients receiving thrombolysis for acute myocardial infarction (AMI) at Western Hospital during 1999.

The median time to thrombolysis in the ED group was 30 minutes (mean 40 minutes), compared with 60 minutes for the CCU group (mean 63 minutes) and 40 minutes (mean 43 minutes) for the direct CCU admission group. Eighty-five percent of patients treated in ED received thrombolysis in less than 60 minutes compared with 21% of those transferred from the ED for treatment in CCU and 52% of those directly admitted to CCU. We conclude that point of entry thrombolysis, be it in ED or in CCU after direct admission, gives shorter times to thrombolysis than processes that require transfer of patients between departments.

Introduction

The earlier patients having an acute myocardial infarction (MI) receive thrombolysis the better the outcome in terms of reduced mortality (ISIS 2, 1998; The GUSTO investigators, 1993). “Door to needle time” (DTN), the time taken from arrival at hospital until thrombolysis is commenced, has been widely accepted as a performance indicator for the treatment of MI.

Unfortunately, debate persists about the location in which thrombolysis should be given. In some centres, policies dictate that thrombolysis should be given in coronary care units (CCU) (Lambrew et al, 1996). However it has been recognised that delays in admission to CCU may delay treatment (Chan et al, 1998; Edhouse et al, 1999; Pell and Miller, 1990). Several strategies have been proposed to minimise DTN times including direct admission of patients with suspected MI by ambulance services to CCU and administration of thrombolysis in emergency departments (ED) (Chan et al, 1998; Edhouse et al, 1999).

At Western Hospital at the time of the study, processes allowed for several locations of thrombolysis. Direct admission by the ambulance service to CCU was possible for patients who were picked up from a local doctor’s surgery with ECG changes diagnostic of MI or where ECG monitoring in the ambulance showed ST segment elevation in limb leads. For patients presenting to the ED with a MI requiring thrombolysis, if a CCU bed was immediately available, patients were transferred to CCU for treatment. When a CCU bed was not immediately accessible, thrombolysis was administered in the ED. Mechanisms were in place to expedite transfer from ED to CCU in appropriate cases.

The aim of this study is to compare DTN times between groups treated according to these three pathways.

Methods

The study design was explicit, retrospective chart review. The participants were all patients receiving thrombolysis at Western Hospital for the period January 1999 to January 2000 whose initial ECG and duration of symptoms met ECG and pain duration criteria for thrombolysis according to the Western Hospital thrombolysis policy.

Patients were identified from the ED computer system and crosschecked with the CCU patient log. The ECG criteria consisted of 1 mm or more ST elevation in two or more contiguous limb leads or 2 mm or more elevation in two or more contiguous precordial leads or new LBBB. In accordance with Western Hospital Thrombolysis Policy, pain duration of less than six hours was used as a cut off. Patients who received thrombolysis at the discretion of treating physicians but who did not meet the policy criteria were excluded from analysis.

The data collected for the study comprised arrival time, ECG time, time that thrombolysis was commenced, DTN time, type of thrombolysis used and location of administration. For data analysis, we used the Student t test for comparison of means, and Fisher's exact test for comparison of proportions.

Results

One hundred and forty-five patients received thrombolysis for MI at Western Hospital in 1999. One hundred and seventeen met criteria for analysis. Eight patients treated did not meet the duration of symptoms criteria, 16 did not meet ECG criteria and four patients did not meet either criteria.

Table 1 shows the comparison for the 1999 year of DTN times for patients treated in ED, transferred from ED to CCU for thrombolysis and those patients transported directly to CCU by ambulance (CCU-DA).

Table 1: Comparison of DTN times for various locations of thrombolysis

	ED	CCU	CCU-DA
Number of patients	83	15	19
Mean	40 *	63 *	43
Median	30	60	40
% thrombolysis less than or equal to 30 minutes	54%#	0%#	21%#
% thrombolysis less than or equal to 60 minutes	85%#	21%#	52%#

* $p < 0.02$; # $p < 0.01$

Discussion

It has been clearly shown that the earlier thrombolysis is commenced after MI the better the outcome, both in terms of morbidity and mortality (ISIS 2, 1998; The GUSTO investigators, 1993). Patients with MI have been traditionally managed in CCU. However, the delays in getting patients from the ED to the CCU and consequent delays in time to thrombolysis were not initially appreciated. As the phrase 'time is muscle' came into use, awareness of factors causing delays increased. Some of those factors, including ED triage category assigned, seniority of staff assessing the patient, atypical history or borderline ECG, have been elaborated elsewhere (Palmer et al, 1998)

The finding that DTN time varies significantly with location of thrombolysis is an important one. The findings of this study strongly suggest that 'point of entry' thrombolysis - be it in ED or CCU-gives the best DTN times.

Further, the finding that expedited transfers from ED to CCU for thrombolysis added of the order of 30 minutes to DTN time is very concerning. Rawles (1996) found that, for patients presenting two hours after symptom onset, each hour's delay in thrombolysis led to the loss of 21 lives per 1000 within 30 days. Similarly, the European Myocardial Infarction project Group (1993), in a large meta-analysis, found the mortality benefit of treatment given one hour earlier to be 17%. In light of this evidence, the additional 30-minute delay found in this study is unacceptable and the practice of transfer from ED to CCU for thrombolysis should be discontinued.

The approach supported by this data is for the delivery of thrombolysis in the department that first recognises the MI and is capable of appropriate monitoring and resuscitation. The majority of Australasian EDs are staffed by specialist critical care nurses with qualifications similar to CCU nurses. Similarly, there are usually senior registrars or specialists immediately available to assist in the assessment and treatment of these patients. Thus EDs have the resources and skills necessary for this role.

Direct admission from ambulance to CCU has been shown in this study to give comparable results in terms of mean DTN times to treatment in ED, and to give shorter DTN times than for patients assessed in ED and transferred to CCU for thrombolysis (Banerjee and Rhoden, 1998). However a small number of patients in the current study were treated by this pathway and the proportion receiving thrombolysis within 30 minutes was low. This suggests that CCU bed availability, immediate availability of medical in CCU or other process problems may challenge the usefulness of this pathway in practice.

This study has some limitations that should be considered when interpreting the results. The patients were not randomised to treatment group. Additionally, the data is subject to the documentation problems common to retrospective studies. It is also possible that the delays demonstrated may not be generalisable to other hospitals. However, the more than 20 minute difference in mean time to thrombolysis for patients transferred from ED to CCU is considerable and, based on available data, would be expected to have an impact on patient outcome. The result is even more concerning given that Western Hospital had undertaken a detailed process review aimed at minimising the delays associated with these transfers.

Conclusion

Significant delays occur when patients are assessed in ED and then transferred to CCU for thrombolysis, even if processes are in place to expedite this transfer. Shorter times to thrombolysis occur when thrombolysis is initiated at point of entry, be it CCU or ED. Policies that facilitate thrombolysis in the first department to which the patient presents that is capable of appropriate patient assessment, monitoring and resuscitation should be developed.

References

ISIS-2 1998, 'Second International Study of Infarct Survival Collaborative Group: randomised trial of intravenous streptokinase, oral aspirin, both, or neither among 17,187 cases of suspected acute myocardial infarction', *Lancet*, vol 2, pp349-360.

The GUSTO Investigators 1993, 'Global Utilization of Streptokinase and Tissue Plasminogen Activator for Occluded Coronary Arteries: an international randomized trial comparing four thrombolytic strategies for acute myocardial infarction', *N Engl J Med*, vol 329, pp673-682.

Lambrew CT, Weaver WD, Rogers WJ, Bowlby LJ, Rubison RM & French WJ 1996, 'Hospital protocols and policies that may delay early identification and thrombolytic therapy of acute myocardial infarction patients', *J Thromb Thrombolysis*, vol 3, pp301-306.

Chan WK, Lam KN, Lau FL & Tang HM 1998, 'Starting thrombolytic therapy for patients with acute myocardial infarction in accident and emergency department: from implementation to evaluation', *Chin Med J*, vol 111, pp291-294.

Edhouse JA, Sakr M, Wardrope J & Morris FP 1999, 'Thrombolysis in acute myocardial infarction: the safety and efficiency of treatment in the accident and emergency department', *J Accid Emerg Med*, vol 16, pp325-330.

Pell AC & Miller HC 1990, 'Delays in admission of patients with acute myocardial infarction to coronary care: implications for thrombolysis', *Health Bull (Edinb)*, vol 48, pp225-231.

Palmer DJ, Cox KL, Dear K & Leitch JW 1998, 'Factors associated with delay in giving thrombolytic therapy after arrival at hospital', *Med J Aust*, vol 168, pp101-102.

Rawles J 1996, 'Magnitude of benefit from earlier thrombolytic therapy in acute myocardial infarction: new evidence from Grampian region early anistreplase trial (GREAT)', *BMJ*, vol 312, pp212-5.

The European Myocardial Infarction project Group 1993, 'Prehospital thrombolytic therapy in patients with suspected acute myocardial infarction', *N Engl J Med*, vol 329, pp383-9.

Banerjee S & Rhoden WE 1998, 'Fast-tracking of myocardial infarction by paramedics', *J R Coll Physicians Lond*, vol 32, pp36-8.