Delay in presentation after myocardial infarction

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Summary

Thrombolytic therapy reduces mortality in acute myocardial infarction (AMI), giving maximal benefit with early treatment. In the UK delayed presentation after AMI may reduce the advantages of thrombolysis. To assess this, 103 patients presenting with AMI to two London Hospitals were interviewed to determine the length and cause of delay from onset of chest pain to arrival at hospital.

Forty-nine per cent of patients took longer than 2 h to arrive at hospital, and 21% took longer than 4 h. Patients who contacted their general practitioner (GP) had a significantly prolonged time delay (160 mins; 65-730: median; range) compared to those who went directly to hospital by ambulance (82 mins; 15-395; $P<0.0005$), or on their own (90 min; 15-855; $P<0.005$). Patients calling their GP took a similar duration to decide to seek help [decision time (30 min versus 25 mins) $P=$NS], but significantly longer to reach hospital once the decision was made (110 min versus 56 min; $P<0.0001$), than those proceeding directly to hospital. Believing the pain was cardiac in origin significantly shortened decision time (15 min versus 45 min; $P<0.05$), as did knowledge of the existence of thrombolysis (15 min versus 50 min; $P<0.05$) and lack of prior cardiac symptoms (18 min versus 42 min; $P<0.05$).

Only 14% were aware of thrombolysis. Rank correlation confirmed that decision and total delay time were age independent. Delays of this magnitude may compromise the efficiency of thrombolysis. Education should encourage patients with chest pain to seek early attention and in urban areas to attend hospital directly.

Introduction

The role of thrombolytic therapy in the management of acute myocardial infarction has been firmly established by a number of studies[1-6] and the benefits of thrombolysis shown to diminish as the time delay between infarction and administration of therapy increases[2,3,7]. Early therapy leads to recanalization and reperfusion of ischaemically jeopardized myocardium thereby reducing the total area infarcted[8-9]. Unfortunately, the majority of patients present more than 2 h after infarction[10-11], thereby failing to obtain the maximum therapeutic effect of thrombolytic therapy. The total delay may be considered to consist of two parts; the time from infarction (defined as the time of major onset of chest pain) to the patient

deciding to seek medical help (decision time); and the time from the decision to seek medical help to arrival at hospital (response time)[12]. Previous studies have shown that the majority of total delay is due to the decision time[11,12-15].

In this study we examine the delay in arrival of patients at hospital after acute myocardial infarction and consider what factors may influence this delay.

Materials and method

From October 1989 to October 1990, 80 patients were interviewed after admission to St Thomas' Hospital via the Accident and Emergency Department having suffered an acute myocardial infarction uncomplicated by cardiac arrest. Twenty-three consecutive patients referred to the London Chest Hospital following thrombolytic therapy for AMI were also interviewed.

Criteria for patient selection was as follows; the age of the patient had to be less than or equal to 75 years; they had to present less than 24 h after the major onset of chest pain; and they must have suffered an acute myocardial infarction uncomplicated by cardiac arrest. Myocardial infarction was diagnosed by a history of characteristic chest pain plus either an electrocardiogram showing acute infarction (ST segment elevation greater than 1 mm in any limb lead of the electrocardiogram and/or greater than 2 mm in any precordial lead) or a rise in cardiac enzyme activities of more than twice the upper limit of normal.

The interview consisted of a standard questionnaire. The decision and response times were estimated through direct questioning and from the time recorded on the casualty card. The source of medical aid used was assessed, either phoning an ambulance, directly travelling to the accident and emergency department, or making contact with their general practitioner.

The patient's assessment of the pain was questioned, along with any reason for delay in seeking help. Knowledge of the existence of thrombolytic therapy and any previous history of ischaemic heart disease were also recorded. The latter was defined as either a previous myocardial infarction or a history of angina which required treatment.

Results

The sample consisted of 103 patients. Forty-nine per cent of patients took longer than 2 h to arrive at hospital having suffered an acute myocardial infarction and 21% took longer than 4 h.

The type of medical aid sought was found to have a definite influence on the total time delay. Patients who contacted their general practitioner were found to have a delay (160 min; 65-730: median; range) which was significantly prolonged compared to those

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who went directly to hospital by ambulance (82 min; 15-395; $P<0.0005$), or by their own transport (90 min; 15-855; $P<0.005$). When the total time was broken down to decision and response times, it was found that though patients calling their general practitioner had a similar decision time to those proceeding directly to hospital (30 min versus 25 min; $P=NS$), however, the response time was significantly prolonged (110 min versus 56 min; $P<0.0001$).

A number of factors significantly shortened the decision time. These included the belief that the pain was cardiac in origin (15 min versus 42 min; $P<0.05$) and lack of prior cardiac symptoms (18 min versus 42 min; $P<0.05$). Knowledge of the existence of thrombolysis also shortened the decision time significantly (15 min versus 50 min; $P<0.05$) though only 14% of the patients interviewed knew of the existence of thrombolytic therapy.

Rank correlation confirmed that age had no effect on decision time, or total delay time.

Discussion

The GISSI and ISIS-2 studies[1-3] demonstrated the value of thrombolytic therapy in management of AMI. The GISSI study demonstrated a reduction in mortality of 47% (15.4% controls, 8.2% streptokinase) when treatment was administered within 1 h of infarction. This was reduced to 23% when streptokinase was administered within 3 h of infarction. In our study, 49% of patients took longer than 2 h to present and 21% took longer than 4 h, a critical time for effective thrombolytic therapy. These figures are a slight improvement on similar data obtained from data acquired in a study in Trent in 1986[16] (Birkhead, personal correspondence) and from a further study in 1988[11]. The delay is shorter than that reported in some countries[17], with recent American studies showing both ends of the spectrum[18,19].

In our study the total delay between onset of symptoms and arrival at hospital was significantly longer in patients who first contacted their GP rather than travelling to hospital directly or calling an emergency ambulance, agreeing with a number of previous studies both in Britain[11,13,20] and abroad[12,21,22]. However, there was no significant difference in the decision time between patients who called their GP and those proceeding directly to hospital. The difference between the two groups can be accounted for solely by the differences in response time.

This could be due to difficulties in actually contacting the GP once the decision to seek help has been made; by the GP delaying in dispatching the patient to hospital; or by the fact that having seen their GP the patient must still travel to hospital. The concept of GP's administering thrombolysis has been considered, and although it has received some support[23], the latest recommendations by a British Heart Foundation Working Group are that thrombolytic treatment should not be given outside of hospital except when trained equipped personnel are in constant attendance[10]. This scenario is uncommon in most general practices. The same report also recommends, regarding acute myocardial infarction, that every general practitioner should have a defined policy to ensure that prompt care that is coordinated among GPs, the ambulance service and local hospitals. In Brighton the use of an advanced life support ambulance means that patients are treated within 2 h

of infarction[24]. A combination of this plus good hospital-GP communication may have a useful role in reducing delay.

One area of delay in the initiation of thrombolysis after infarction that has not been considered yet is that of delay after a patient has reached hospital. In one centre, a change in hospital policy with administration of thrombolytic therapy in casualty rather than the coronary care unit, led to a substantial reduction in delay[25]. Our study was not designed to assess this potential source of delay. However, we recognize that this is an important area to which future efforts in reducing time to thrombolysis could be expected to be effective. A critical review of hospital policy could provide similar benefits. In the USA, the implementation of a protocol-driven prehospital diagnostic strategy, including a prehospital ECG, has been shown to reduce hospital time delays[18]. This could be provided by an advanced life support ambulance, equipped with a battery-powered cellular telephone ECG system, thereby providing a prehospital ECG as well as the availability of defibrillation.

There was no significant difference in decision time between our patients who contacted their GP and those who went directly to hospital. However, other variables were shown to influence the decision time. Belief that the pain was cardiac in origin and a lack of prior cardiac symptoms both significantly reduced the decision time. The former could be explained by patients considering cardiac pain to be a serious symptom, hence the desire to seek medical aid early[17]. The latter often seemed to occur because patients who suffered from angina often mistook the pain of an AMI as a severe attack of angina, attempted to treat the pain with sublingual nitrates and waited for it to disappear. Patients with angina should be encouraged to seek medical aid promptly (i.e. within 15 min) if sublingual nitrates fail to give rapid relief of their chest pain. Age was not found to influence the decision time though advanced age has been found to increase the decision time in a previous study[26]. A recent study has shown individual psychological factors such as somatic and emotional awareness to be significantly predictive of delay time[19]. Knowledge of the existence of thrombolytic therapy also significantly reduced the decision time, but disappointingly only 14% of the patients knew of the existence of thrombolysis.

Improved patient education about both the symptoms of cardiac pain and the existence of thrombolysis could lead to earlier presentation.

In conclusion, delays in presentation to hospital after acute myocardial infarction of the magnitude shown by this study significantly compromise the efficiency of thrombolysis in these patients. Patients with chest pain should be encouraged, through improved education, to avoid delay in seeking medical attention. In an urban environment, patients will obtain greatest benefit from thrombolysis if they proceed directly to hospital, and should be encouraged to do so.

References

1 Gruppo Italiano Per Lo Studio Della Streptochinasi Nell'Infarcto Miocardico (GISSI). Effectiveness of

intravenous thrombolytic treatment in acute myocardial infarction. *Lancet* 1987;i:397-402

2 GISSI. Long-term effects of intravenous thrombolysis in acute myocardial infarction: final report of the GISSI study. *Lancet* 1987;i:871-4

3 ISIS-2 Collaborative Group. Randomised trial of intravenous streptokinase, oral aspirin, both, or neither among 17 187 cases of suspected acute myocardial infarction: ISIS-2. *Lancet* 1988;ii:349-60

4 AIMS Trial Study Group. Effect of intravenous APSAC on mortality after acute myocardial infarction: preliminary report of a placebo controlled trial. *Lancet* 1988; ii:545-9

5 Wilcox RG, von der Lippe G, Olsson CG, Jensen G, Skene AM, Hampton JR. Trial of tissue plasminogen activator for mortality reduction in acute myocardial infarction. Anglo-Scandinavian study of early thrombolysis. *Lancet* 1988;ii:525-30

6 Van de Werf F, Arnold AER. Intravenous tissue plasminogen activator and size of infarct, left ventricular function and survival in acute myocardial infarction. *BMJ* 1988;297:1374-9

7 Koren G, Weiss AT, Ben-David AT, Hasin Y, Luria AH, Gotsman MS. Prevention of myocardial damage in acute myocardial ischaemia by earlier treatment with intravenous streptokinase. *N Engl J Med* 1985; 313:1384-9

8 Reimer KA, Lowe JE, Rasmussen MM, Jennings BB. The wavefront phenomenon of ischaemic cell death. *Circulation* 1977;56:786-94

9 Bergmann SR, Lerch RA, Fox KAA, Ludbrook PA, Welch MJ, Ter-Pognossian MM, et al. Temporal dependence of beneficial effects of thrombolysis characterised by positron tomography. *Am J Med* 1982;73:573-81

11 Rawles JM, Naites NE. Patients and General Practitioner delays in acute myocardial infarction. *BMJ* 1988; 296:882-4

12 Leitch JW, Birbara T, Freedman B, Wilcox I, Harris PS. Factors influencing the time from onset of chest pain to arrive at hospital. *Med J Aust* 1989;150:6-10

13 Armstrong A, Duncan BM, Oliver MF, Julian DG, Donald KW, Fulton M, et al. Natural History of acute coronary heart attacks. A community study. *Br Heart J* 1972;34:67-80

14 Smyllie HC, Taylor MP, Cunningham-Green RA. Acute myocardial infarction in Doncaster II - delays in admission and survival. *BMJ* 1972;i:34-6

15 Colling A, Dellipani AW, Donaldson RJ, MacCormack P. Teeside coronary survey: an epidemiological study of acute attacks of myocardial infarction. *BMJ* 1976; ii:1169-72

16 Trial of early Nifedipine in acute myocardial infarction: The Trent Study. *BMJ* 1986;293:1204-8

17 Wielgosz AT, Nolan RP, Earp JA, Biro E, Wielgosz MB. Reasons for patients' delay in response to symptoms of acute myocardial infarction. *Can Med Assoc J* 1988; 139(9):853-7

18 Time delays in the diagnosis and treatment of acute myocardial infarction: A tale of eight cities. Report from the Pre-Hospital Study Group and the Cincinnati Heart Project. *Am Heart J* 1990;120(4):773-80

19 Kenyon LW, Ketterer MW, Gheorghiade M, Goldstein S. Psychological Factors related to prehospital delay during acute myocardial infarction. *Circulation* 1991;84:1969-76

20 Burns JMA, Hogg KJ, Rae AD, Hillis WS, Dunn FF. Impact of a policy of direct admission to coronary care unit on use of thrombolytic treatment. *Br Heart J* 1989;61:322-5

21 European Myocardial Infarction Project (EMIP) Subcommittee. Potential time saving with pre-hospital intervention in acute myocardial infarction. *Eur Heart J* 1988;9:118-24

22 Castigne AD, Hervé C, Duval-Moulin AM, Gaillard M, Dubois-Rande J-L, Boesch C, et al. Prehospital use of APSAC: results of placebo-controlled study. *Am J Cardiol* 1989;64:30A-33A

23 Wilcox RG. Thrombolysis and the General Practitioner 2. Useful after care evaluation of patients. *BMJ* 1990; 300:869-70

24 Fox KAA. Thrombolysis and the General Practitioner 1. Practicable only under certain circumstances. *BMJ* 1990;300:867-8

25 Dalton H, Chappel D, Climie R. Thrombolysis for acute myocardial infarction in a District General Hospital. *J Roy Soc Med* 1989;82:394-5

26 Schmidt SB, Borsch MA. The prehospital phase of acute myocardial infarction in the era of thrombolysis. *Am J Cardiol* 1990;65(22):1411-5

27 Ho MT, Eisenberg MS, Litwin PE, Schaffer SM, Damon SK. Delay between onset of chest pain and seeking medical care: the effect of public education. *Ann Emerg Med* 1989;18(7):727-31