Use of thrombolysis for acute myocardial infarction by general practitioners

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Summary: The early administration of thrombolytic agents significantly reduces mortality following a myocardial infarct and ideally they could be given by general practitioners when the patient is first seen. However, the diagnosis of myocardial infarction in the early stages can be very difficult especially if an electrocardiogram is not available. This may limit the use of thrombolytic drugs by general practitioners. We assessed the accuracy of diagnosis in general practice by asking general practitioners referring patients with chest pain, the likelihood that the event was due to a myocardial infarction and if they would use thrombolysis if it were available. Diagnostic accuracy and appropriate use of thrombolysis was analysed retrospectively, comparing the general practitioner with the admitting hospital doctor. One hundred consecutive patients were studied. The general practitioners accurately diagnosed myocardial infarctions in approximately 45% of cases and would have given thrombolysis inappropriately on 67% of occasions mainly because the final diagnosis in most of these patients was unstable angina rather than infarction. The hospital doctors administered streptokinase inappropriately to 33% of the patients and four had complications during treatment. Of those patients receiving thrombolysis, the average time delay from the general practitioner referring the patient to hospital to the patient being treated was 107 minutes.

This study confirms that the diagnosis of myocardial infarction in the early stages is difficult and that thrombolytic therapy may be given inappropriately (mainly to patients with unstable angina). We conclude that until the accuracy of diagnosis of myocardial infarction can be improved in general practice it would seem inappropriate for thrombolysis to be given in the community at the moment.

Introduction

The administration of thrombolysis significantly reduces mortality following a myocardial infarction and it is well established that the earlier this treatment is given, the greater the benefit.1

With the advent of thrombolytic agents which can be administered over a short period of time,2 potential exists for these drugs to be given at the point of first contact with the patient having a myocardial infarction, usually the general practitioner (GP). However, with the increasing awareness of the dangers of thrombolysis,34 the accuracy of diagnosis is of paramount importance. The aim of this study was to ascertain whether general practitioners would have been prepared to administer thrombolytic therapy if it were available to them, and the extent to which this would have been appropriate.

Patients and methods

One hundred consecutive patients referred by GPs to hospital with a diagnosis of possible myocardial infarction were studied. At the time of referral, GPs were asked a series of questions over the telephone by the admitting medical officer. The GP was asked to predict whether the episode of chest pain requiring admission was due to a myocardial infarction on a scale of 1–10, with 1 representing very unlikely and 10 definite. They were then asked if thrombolysis was available, would they give it. The time was noted. All patients were admitted regardless of the answers received.

The notes of the patients admitted were then analysed retrospectively. A total of 78 patients were male, average age 59 (range 39–83) and 22 were female, average age 66 (range 46–81). Streptokinase was the thrombolytic agent used in all patients.

Whether streptokinase was administered was noted as were the time it was given, contraindications and complications of treatment. The subsequent discharge diagnosis was sought.

The serial cardiac enzymes and electrocardio-
grams (ECGs) following admission for each patient were evaluated independently and 'blind' by a cardiologist, using the standard WHO criteria, to determine whether a myocardial infarction had occurred or not. 'Appropriate' treatment was therefore defined as those patients to whom the GPs would have given streptokinase or who actually received it (hospital doctors) and who were judged to have had definite myocardial infarctions by the above criteria, and where there were no recognized contraindications to thrombolytic therapy. 'Inappropriate' treatment was defined as when a GP would have given streptokinase or when a patient actually received it (hospital doctors) when the final diagnosis was not myocardial infarction or where there were recognized contraindications to thrombolytic therapy.

Results

Accuracy of diagnosis

Figure 1 illustrates the individual chest pain scores given by GPs for the 100 patients, and the number who subsequently had confirmed myocardial infarctions (shaded area). Considering those patients with a score greater than five (that is, where the GP feels there is a greater than 50% chance of this episode being due to a myocardial infarction), the accuracy is 45% (35/81). With a score of 10, where the diagnosis was thought to be definite, accuracy was 46% (6/13).

Figure 2 illustrates patient chest pain scores with the shaded areas representing those patients who would have been given thrombolysis. This shows a potential discrepancy in prescribing practice amongst GPs, with some prepared to offer thrombolysis with a 50–60% likelihood of having infarction compared with others who would not prescribe even when certain of the diagnosis.

Of the 100 patients, 36 were independently assessed to have had an acute myocardial infarction. One patient died in the ambulance on route to hospital and a diagnosis could not be made. Four patients required external cardiac massage on arrival, or shortly after arrival in hospital, and were unable subsequently to receive thrombolysis. Three of these patients died within the next 24 hours.

Appropriate thrombolysis

General practitioners The GPs would have given thrombolysis to a total of 43 patients, including 18 of the 36 who had proven myocardial infarctions. This included two of the patients who required external cardiac massage. Of these 18 patients there was a relative contraindication to thrombolysis in four instances. Two patients had had the episode of chest pain for over 24 hours and two had received thrombolytic therapy in the previous 6 months unbeknown to the GP. Thrombolysis therefore would have been given appropriately in 14 of 43 occasions (33%).

Admitting hospital doctor The hospital doctor who admitted the patients and made the decision to give thrombolysis had 28 opportunities to give it appropriately, of which 22 patients received treatment. Of the six patients who had had myocardial infarctions and did not receive thrombolysis, all had classic cardiac enzyme patterns but none had...
ST elevation on their presenting ECG. Five had T wave inversion on presentation which persisted, and the final patient had normal ECGs throughout admission.

Thrombolysis was given to 33 patients further, 22 of whom had myocardial infarction for which it was appropriate (66%).

Of the 33 patients treated, four had complications requiring intervention whilst receiving thrombolysis. Two patients developed hypotension with systolic blood pressure < 70 mmHg, one patient had a sustained episode of ventricular tachycardia and one patient went into ventricular fibrillation. One of the patients developing hypotension had not had a myocardial infarction.

Inappropriate thrombolysis

Thrombolysis would have been administered inappropriately on 25 occasions by GPs, and was given inappropriately 11 times by the admitting hospital doctor. The details of these patients are shown in Table I. The majority of these patients had angina or unstable angina, conditions for which thrombolysis is at the moment not of proven benefit.\(^5\)

Of the 25 patients where the GP would have given thrombolysis, there was a relative contraindication to therapy in two of the patients with angina, one had had recent thrombolysis and one had proliferative retinopathy.

Time lag

On 20 occasions both GP and hospital doctor agreed that thrombolysis was warranted. For these patients the average time lag from GP referring the patient to hospital to the patient receiving thrombolysis was 107 minutes (range 30–285 minutes).

### Table I Diagnosis of patients receiving thrombolysis inappropriately

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>No. of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>General practitioners</td>
<td></td>
</tr>
<tr>
<td>Angina</td>
<td>13</td>
</tr>
<tr>
<td>Unstable angina</td>
<td>3</td>
</tr>
<tr>
<td>Dyspepsia/oesophagitis</td>
<td>4</td>
</tr>
<tr>
<td>Musculoskeletal</td>
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</tr>
<tr>
<td>Arrhythmia induced</td>
<td>1</td>
</tr>
<tr>
<td>Acute asthma</td>
<td>1</td>
</tr>
<tr>
<td>Non-cardiac chest pain</td>
<td>2</td>
</tr>
<tr>
<td>Admitting physician</td>
<td></td>
</tr>
<tr>
<td>Angina</td>
<td>6</td>
</tr>
<tr>
<td>Unstable angina</td>
<td>3</td>
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<tr>
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<td>1</td>
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<tr>
<td>Non-cardiac chest pain</td>
<td>1</td>
</tr>
</tbody>
</table>

Discussion

Taunton is in the middle of a very large rural area in which it is generally regarded that the standard of general practice is high. It is in such an environment, where the journey time to hospital may be prolonged, where the GP administration of thrombolysis would seem appropriate.

This study has illustrated how difficult it is to make the diagnosis of an acute myocardial infarction when a patient with chest pain is first seen. Of the 13 patients in whom the GPs considered the diagnosis to be definite (Grade 10/10), it was only correct in 46%. With this degree of accuracy thrombolysis would have been given inappropriately on 25 occasions. The implications of this are serious, both financially and medically. A number of patients could have had dangerous complications of treatment, particularly those with upper gastrointestinal pathology or recent administration of thrombolysis.

However, many of the GPs were correct in diagnosing the chest pain as cardiac: 16 of the patients did have angina although not an infarction. Of course, in the early stages of acute myocardial infarction it can be difficult to make this distinction. Only a few of the GPs used an ECG to help with the diagnosis but it was clear that on these occasions the ECG was not helpful or was misinterpreted. It can be argued that since in the ISIS-2 trial ECG changes were not required for entry and mortality was shown to be reduced, then doing an ECG is not absolutely necessary before giving thrombolysis, although most of the other major thrombolytic trials have required ST elevation to be present. But the proportion of patients presenting with ST elevation during myocardial infarction varies from 18%\(^6\) to 81%\(^7\), and thus relying on ECG criteria alone would deny some patients thrombolytic therapy. However, it would seem sensible that an ECG accurately interpreted is an absolute minimum before embarking on out-of-hospital thrombolysis, and access to an ECG probably explains why the hospital doctors scored better.

Not only is the diagnosis difficult but GPs will need to be able to deal with complications arising from thrombolytic therapy. In our series there was a high incidence of complications occurring during treatment (4/33), all of which required intervention.

On average there are 660 patients with chest pains admitted to our coronary care unit per year from an area served by 250 GPs and about 450 of these have myocardial infarction. Consequently, it is a relatively rare condition presenting in general practice (approximately 2/GP/year) but commonly seen as an admission to hospital. The admitting physician will in general be more experienced and
better placed (with good quality ECGs) to make the diagnosis of myocardial infarction and to handle thrombolytic drugs and their potential problems.

Until the techniques are available to GPs to make a quick and accurate diagnosis of a myocardial infarction, it would seem inappropriate and potentially dangerous for thrombolysis to be given in the community. The most striking statistic in our study was the average time delay from referral to administration of thrombolysis (107 minutes). Perhaps at the moment the emphasis should be on getting patients to hospital as quickly as possible.

Acknowledgements

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References