Thrombolysis in the pre-hospital setting

Recent articles in the journal have reviewed published evidence for the clinical benefits of pre-hospital thrombolysis in acute myocardial infarction and have also discussed unpublished experiences of early thrombolysis in the UK and elsewhere.[1,2] In this article, consultant cardiologist Paul Kelly takes the discussion a stage further; he reviews last autumn's guidance of the National Institute for Clinical Excellence and looks at the likely implications of pre-hospital thrombolysis for hospital cardiology teams.

Abstract

Pre-hospital thrombolysis has proven clinical benefits in the management of acute myocardial infarction (MI). If the targets for administering thrombolysis, in particular call-to-needle time, are to be met, then it seems likely that its use will be more widespread. With appropriate training and support, paramedics can competently perform 12-lead electrocardiograms (ECGs) and administer thrombolysis. Cardiologists should be prepared to undertake paramedic training and play a central role in the development of protocols and pathways for the administration of pre-hospital thrombolytic therapy.

Key words: pre-hospital thrombolysis, care pathways, NICE.

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'Ambulance paramedics have emerged as the best providers of pre-hospital thrombolysis'

Paul Kelly

Introduction

Thrombolytic treatment for acute MI is of greatest benefit – reducing mortality by 20–50%[3-5] – if it is administered within the first hour of symptom onset. The National Service Framework (NSF) for Coronary Heart Disease[6] established – as its first target – that healthcare professionals should aim to initiate thrombolysis in 75% of eligible patients within 30 minutes of hospital arrival. This target was being met by less than one half of hospitals in 2002/2003.[7] A recent MINAP report, however, says that 76% of eligible people with MI are now being treated within 30 minutes of hospital arrival.

It also stated that pre-hospital thrombolysis should be considered where local 'call-to-hospital' times are likely to exceed 30 minutes so that a 'call-to-needle' target time of less than 60 minutes could be achieved. NSF targets are now even tougher and expect emergency care professionals to reduce door-to-needle times further to a new target of 20 minutes.

A recent meta-analysis[8] of randomised, controlled trials of pre-hospital thrombolysis (delivered by paramedics, general practitioners or mobile ICUs) showed that pre-hospital thrombolysis can reduce the relative risk of short-term, all-cause hospital mortality by 17% compared with in-hospital thrombolysis.[8] Based on such evidence, the NHS Plan in England (2000) gave a commitment to a three-year programme to train and equip ambulance paramedics to provide thrombolysis, estimating that "on average, patients will get thrombolysis an hour earlier than if they were taken to hospital first, saving up to 3,000 lives a year once fully implemented".

These aspirations were backed by government funding in May last year when the Department of Health announced the provision of £14 million to equip all front-line ambulances with 12-lead ECG machines, to provide communications equipment for telemetry of ECG diagnosis data from the ambulance to the hospital, to supply thrombolytic drugs to ambulance trusts, and to train paramedics in MI diagnosis and administration of thrombolysis.

Pre-hospital thrombolysis: paramedic competence

It has been demonstrated that general practitioners can safely carry out pre-hospital thrombolysis,[2] but interest, motivation and availability for this role appears largely limited to those working in isolated, rural areas. While there is clearly a place for general practitioner-led thrombolysis in such areas, ambulance paramedics have emerged as the best placed providers of pre-hospital thrombolysis on a wider basis, since they offer rapidity of response, access to a defibrillator and communication with the hospital.[9]

The ability of paramedics to take on such a role has been questioned but there is evidence to demonstrate that, with appropriate training and strict protocols, most paramedics can manage this added responsibility.

Table 1. The role of the cardiologist

- Decide level of training required by paramedics; participate in design of training courses
- Undertake paramedic educational/training sessions and refresher courses
- Participate in design of local pre-thrombolysis protocols and operating procedures
- Agree hospital or ambulance trust personnel authorised to analyse incoming ECG traces from ambulances
- Participate in clinical audit and monitoring of the service
- Provide ad hoc advice/support to paramedic teams

A prospective controlled study undertaken by Derbyshire Ambulance Trust in 1997[10] concluded that trained paramedics can reliably diagnose MI by 12-lead ECG and reduce 'door-to-needle' time by admitting directly to a coronary care unit. These findings were reinforced by a 1998 study,[11] which concluded that 88% of paramedic-delivered patients with suspected MI subsequently had the diagnosis confirmed.

The option of transmitting ECG traces to hospitals or ambulance trusts by telemetry for confirmation of the diagnosis by authorised clinicians seems advisable, at least in the short term. The Myocardial Infarction Triage and Intervention trial (MITI),[12] which involved a fax transmission of ECGs to hospitals using mobile phone networks, showed that, following remote interpretation of the trace, the actual administration of thrombolysis was just as safe in the hands of paramedics as in those of doctors.

Paramedic training

There is a growing consensus among clinicians that the training of UK paramedics should be put back in the hands of consultants to optimise the effectiveness of ambulance crews in dealing with acute MI patients. This was highlighted in the conclusion of the UK Heart Attack Study[13] and becomes even more pertinent if paramedics are to be entrusted with pre-hospital thrombolysis. It seems appropriate that cardiologists should determine the relevant standards for paramedic clinical competence. Discussion with the ambulance service, accident and emergency consultants and coronary care units, is required to ensure that a care pathway is in place within each hospital in an attempt to optimise patient management.

Alongside consultant-led training, confirmation of quality of care by clinical audit will help to maintain and, where necessary, enhance paramedics' skills and competencies for the safe and effective administration of pre-hospital thrombolytic therapy.

Thrombolytic drugs for pre-hospital use: the NICE guidance

The National Institute for Clinical Excellence (NICE) published its guidance, in October 2002, on the selection of thrombolytic drugs for acute MI in both hospital and pre-hospital settings. The guidance stated that streptokinase is currently the only thrombolytic that paramedics are authorised to administer under the Prescriptions Only Medicines (Human Use) Order 1997. But paramedics can administer other thrombolytic drugs under local Patient Group Directions (PGDs). Guidelines on the use of these other drugs by paramedics have been developed by the Joint Royal Colleges Ambulance Liaison Committee (JRCALC) and the Local Area Paramedic Steering Committees (LAPSC).

The NICE appraisal points out the practical difficulties of giving controlled-rate infusions in pre-hospital settings and, for streptokinase, concerns about higher rates of allergic reactions and hypotension which are more difficult to manage away from hospital. For pre-hospital use, NICE therefore recommends the use of a bolus thrombolytic – either reteplase or tenecteplase. There are differences in administration of these two drugs. Tenecteplase requires a single bolus but is weight adjusted – this may cause problems for paramedics. Reteplase does not require this dosage adjustment but has to be given as two separate intravenous injections, 30 minutes apart.

Importance of effective care pathways and protocols

Given the well known risks of thrombolytic treatment, the NICE guidance states that: "Clinicians and organisations delivering pre-hospital thrombolysis should develop clear clinical protocols for the use of thrombolytic drugs, such as those developed by the JRCALC, and adopt robust clinical governance arrangements to monitor the use of – and outcomes – associated with these drugs".

> ***'Cardiologists will need to be prepared to play a pivotal role in the design of protocols'***

Cardiologists will need to be prepared to play a pivotal role in the design of these protocols (see table 1). In many cases of suspected acute MI – e.g. where the diagnosis is uncertain or relative contraindications are present – physicians will routinely exercise clinical judgement. Protocols for paramedics will need to be sufficiently clear to effectively replace this clinical judgement. They will need to include a full set of operating procedures for the recording of ECGs, the transmission of ECG data via telemetry and the administration of thrombolytics (with advice on how to obtain informed consent). Some cardiologists may wish to limit paramedic-administered thrombolysis to 'barn door' MIs, reserving more sub-

Key messages

- Pre-hospital thrombolysis reduces the risk of short-term, all-cause hospital mortality
- Ambulance paramedics can administer pre-hospital thrombolysis with appropriate training and support
- The use of a bolus thrombolytic agent is preferable to controlled-rate infusions
- Cardiologists must play a central role in paramedic training and developing clear protocols

tle cases for the hospital team. However, each patient's suitability for thrombolysis should be confirmed/excluded by the use of ECG telemetry.

It will be essential when developing care pathways for paramedics to ensure that they are well supported by hospital staff to build confidence among all who use them. It also seems advisable to develop a pathway of shared responsibility in the first instance and increase paramedic autonomy in a gradual, stepwise fashion as experience accumulates. Once paramedic thrombolysis is introduced, ongoing monitoring, audit and evaluation will be important.

Conclusions

Paramedics are well placed to expedite the process of MI diagnosis and acute management. At the very least they should be equipped to record – and then interpret or transmit – a 12-lead ECG, which will help to minimise delays in thrombolytic initiation on arrival at the hospital. Consistent achievement of earlier thrombolysis should result in improved survival and outcomes in the post-MI population, which may have an effect on early management. Fewer cases of ST elevation MI may result in more candidates for early angiography, with progression to in-patient angioplasty or cardiac surgery.

Paul Kelly
Consultant Cardiologist
Southend Hospital, Prittlewell Chase, Westcliff-on-Sea, SS0 0RY.
(email: pkelly112@hotmail.com)

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