Acute reperfusion strategies for ST-segment elevation myocardial infarction

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This editorial refers to ‘Trends in acute reperfusion therapy for ST-segment elevation myocardial infarction from 1999 to 2006: we are getting better but we have got a long way to go’ by K.A. Eagle et al.,† on page 609

The overall aim of reperfusion therapy for patients presenting with an ST-segment elevation myocardial infarction (STEMI) is to restore normal blood flow in the infarct-related artery as rapidly and completely as possible, and thus myocardial perfusion. This can be achieved by the administration of thrombolytic therapy (either pre-hospital or in hospital) or by primary percutaneous coronary intervention (PPCI). Guidelines suggest that thrombolytic therapy should be administered within a door to needle time (or medical contact to needle time) of <30 min and a door to balloon time of <90 min for PPCI.1

Eagle et al.2 report the trends in acute reperfusion therapy from the GRACE registry for patients presenting with a STEMI from 1999 to 2006.2 There was an increase in primary PCI (from 15 to 44%) and a decline in thrombolytic therapy (from 41 to 16%). In addition, 32–40% of patients received no reperfusion therapy and a significant number of patients received reperfusion outside of the time guidelines (52% door to needle time >30 min; 42% door to balloon time >90 min).

The ACC/AHA guidelines for the management of patients presenting with a STEMI indicate that the reperfusion strategy should be based on the time from onset of symptoms, patient-based risk factors, and the ability of the centre to provide rapid and effective PPCI.1 Although PPCI achieves higher TIMI III flow rates compared with thrombolytic therapy, door to balloon times are often longer in clinical studies, resulting in delayed reperfusion.3 There is evidence from randomized control trials that lower mortality rates, reinfarction, intracranial haemorrhage, and stroke occur in patients undergoing PPCI within the recommended guidelines compared with thrombolytic therapy.4 Additionally, in patients at increased risk of bleeding or in cardiogenic shock, PPCI is superior.1 However, if thrombolytic therapy can be given within 60 min of presentation, this may be more advantageous than delaying for PPCI.5 The ACC/AHA guidelines state that STEMI patients presenting within 90 min of first medical contact to a unit without the facilities for prompt PPCI should receive thrombolytic therapy.1

Several studies have shown that in patients who present very early, i.e. within 2–3 h after onset of symptoms, there is no difference in in-hospital or 30 day mortality between patients who receive thrombolytic therapy or PPCI, with a trend in favour of thrombolytic therapy.6–8 Furthermore, the ASSENT-3 study (Assessment of the Safety and Efficacy of a New Thrombolytic Regimen) reported that if patients received very rapid thrombolytic therapy, the frequency of aborted myocardial infarction [defined as maximal creatine kinase ≤2 times the upper limit of normal with typical evolutionary changes on the electrocardiogram (ECG)] was 13.3%.9 The majority of aborted myocardial infarctions occurred within the first hour from symptom onset, with a sharp reduction in incidence after 3 h.

In the study by Eagle et al.,2 the pre-hospital delay was unchanged from 1999 to 2006 (median 120–133 min). In order to have a significant impact on reducing reperfusion times this issue needs to be addressed. In a comparison of pre-hospital thrombolytic therapy with PPCI in the CAPTIM study (Comparison of Angioplasty and Prehospital Thrombolysis in Acute Myocardial Infarction), the time to treatment for patients receiving pre-hospital thrombolytic therapy was 130 min compared with 190 min for those undergoing PPCI.6 This resulted in a 30 day mortality rate of 3.8% in the pre-hospital thrombolytic therapy group vs. 4.8% in the PPCI group. It is therefore fundamental that paramedics are trained in recording and analysing ECGs with facilities to transmit to a cardiology centre for interpretation and immediate advice. The decision can then be made pre-hospital to administer thrombolytic therapy or not. In the Vienna Ambulance Service, physicians diagnosed and triaged patients with acute STEMI to the fastest available reperfusion strategy for those with short duration (2–3 h) from symptom onset. The results from this study showed an increase in patients receiving reperfusion therapy from 66 to 86.6%, resulting in a reduction in in-hospital mortality from 16 to 9.5%, with a trend in favour of thrombolytic therapy within the first 2 h of treatment.7 If patients present to a hospital without PPCI facilities it may also be more favourable to administer
early thrombolytic therapy rather than transfer for PPCI, particularly if a significant time delay in transfer is expected. The Prague-2 study showed that if a patient presents within 3 h of onset of pain it is only preferable to transfer them to an interventional centre if PPCI can be performed within 60 min of the initial ECG diagnosis. Thus if the expected time delay was greater than 60 min and patients presented within 3 h, it was preferable for them to receive thrombolytic therapy.

Other methods for reducing pre-hospital delays such as education of the public to understand the symptoms of a myocardial infarction and calling early for help need to be a near continuous process as most public education systems have not resulted in patients calling earlier.

The report by Eagle et al. further highlights a significant percentage of patients who did not receive reperfusion therapy. Four strongly predictive factors were prior heart failure, age >75 years, previous coronary artery bypass surgery, and a prior myocardial infarction. Other additional patient factors were female gender, diabetes mellitus, and patient delay. Patients with heart failure or diabetes mellitus may not have had a typical presentation, resulting in lack of attention to the ECG. It is therefore extremely important that the ECG be repeated at frequent intervals after admission, and there should be increased education of doctors regarding early diagnosis and management of these patients. The authors state that there may have been uncertainties by physicians regarding the benefits and risks of reperfusion in patients older than 75 years. Reperfusion in the elderly is complicated by an atypical presentation, a higher occurrence of left bundle branch block on ECG, and an increased risk of complications. There are fewer clinical data from randomized control trials for reperfusion therapy in patients over the age of 75 years. Also although there is less evidence of benefit for reperfusion in the elderly, availability and time to reperfusion are key determinants of myocardial salvage. The major potential benefit from PPCI is a reduction in reinfarction rate and need for target vessel revascularization. If, however, thrombolytic therapy can be delivered within 3 h from symptom onset and there are no contraindications, there is no overall advantage in PPCI.

In conclusion, the most important factor in determining outcomes in patients who present with a STEMI is the time taken from onset to reperfusion. Pre-hospital delays remain unacceptably high. These can be reduced by training paramedics to record, analyse, or transmit ECGs and therefore deliver reperfusion therapy as quickly as possible. Increased education of physicians is required, with particular emphasis on reperfusion therapy in patients with an atypical presentation and particularly in the elderly, in order to reduce significantly the number of patients who are eligible for reperfusion but do not receive it.

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References