EDITORIAL

Recent Changes in Management of Acute Myocardial Infarction: Implications for Emergency Care Physicians*

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The management of acute myocardial infarction has been evolving rapidly since 1980. The results of experimental and clinical studies have caused a growing consensus that reperfusion of an occluded coronary artery, performed in the first few hours of evolving acute myocardial infarction, often reduces early mortality and reduces infarct size. For many reasons, the use of thrombolytic therapy in patients with acute myocardial infarction has altered the way in which we evaluate and care for these patients. It is the purpose of this editorial to recommend changes in the routine evaluation and care of patients with suspected acute myocardial infarction to provide for the safe and effective use of this new therapy.

Current status of thrombolytic therapy. Studies using streptokinase have provided most of our current clinical experience, although recombinant tissue-type plasminogen activator (rt-PA), a relatively fibrin-specific agent with a superior coronary recanalization rate, is under intensive investigation and has recently been made available for general use (1). Several randomized trials (2–4) have reported both the efficacy and benefit associated with intracoronary streptokinase. The importance of these early findings is not inconsequential; however, the inherent delay in initiating therapy with intracoronary treatment makes this approach impractical for most clinical situations. Intravenous administration obviates this problem. Recently, the results of two large intravenous thrombolytic therapy trials from Europe have been reported (5–8). The GISSI (Gruppo Italiano per lo Studio della Streptochinasi nell'Infarto) study (5), a large trial enrolling 11,806 patients, demonstrated a highly significant 18% reduction in 21 day mortality overall among patients treated with streptokinase within 12 h of the onset of chest pain. Mortality was reduced by 23% in those treated within 3 h and by an astonishing 47% in those treated within 1 h. This benefit from therapy has recently been demonstrated to be sustained for at least 1 year (6). The ISAM (Intravenous Streptokinase in Acute Myocardial Infarction) trial (7) in Germany enrolled 1,741 relatively low risk patients; it demonstrated a 12% reduction overall in 21 day mortality and a 20% reduction in those patients treated with streptokinase within 3 h of the onset of symptoms; however, these differences were not statistically significant. Most recently, the second international study of infarct survival (ISIS-2 trial) (9) reported a 33% reduction in mortality (from about 12% to 8%) in the nearly 4,000 patients randomized to intravenous streptokinase within 4 h of the onset of symptoms as compared with control patients. It seems clear from these studies, as well as other observations, that patients with anterior myocardial infarction benefit most from coronary reperfusion. No study published to date has been sufficiently large to demonstrate a reduction in mortality in patients with inferior myocardial infarction.

Thrombolytic therapy plus angioplasty. Preliminary results from the TIMI (Thrombolysis in Myocardial Infarction) Phase 1 study (1) suggest that rt-PA results in reperfusion in about two-thirds of patients judged by coronary angiography 90 min after intravenous therapy. One-third do not respond to this treatment and two-thirds of those successfully treated are left with a coronary stenosis >75%. In addition, a substantial portion of patients experience recurrent signs of ischemia on the first day after thrombolytic therapy and a
The use of thrombolytic therapy is currently under intense investigation, but early and late success of this invasive and expensive treatment is not yet established (10, 11).

To achieve the beneficial results of thrombolytic therapy, a well organized and efficient community emergency care system is required. Without such a system, any attempt to introduce a program of early thrombolytic therapy will be ineffective and may be unsuccessful or result in increased risk for the patient or both.

**Risks of thrombolytic therapy.** The results of all these trials are encouraging, but should not be construed as evidence that such treatment should be given to all patients with an acute coronary syndrome. The use of thrombolytic therapy carries with it the risk of serious and occasionally fatal bleeding and its effect on reducing mortality in patients, other than the early treatment of those with anterior infarction, has not been established. Cardiac catheterization performed, in conjunction with the administration of thrombolytic agents results in a high incidence of hematoma at the arterial puncture site and greatly increases the need for blood transfusion. The most serious complication is intracranial bleeding. In the GISSI trial, without the use of routine heparin, the incidence rate of stroke was 0.2%: in the ISAM trial the overall incidence rate was 0.46%. In the TIMI trial, with intravenous rt-PA, the incidence rate of stroke has been 1.6% at a dose of 150 mg given over 6 h and 0.6% at 100 mg given over 6 h (12). Clearly, patients of advanced age and those with a history of stroke, transient cerebral ischemia, severe hypertension, long-standing diabetes or other conditions possibly influencing the cerebral vasculature have an increased likelihood of intracerebral hemorrhage with the use of thrombolytic and associated heparin therapy.

In view of these introductory remarks, it is evident that the use of thrombolytic therapy for acute myocardial infarction influences many aspects of the evaluation and care of patients with chest pain. In the remaining part of this editorial we will review the emergency care of patients with suspected acute myocardial infarction and make recommendations for changes in their evaluation and care to optimize the use of thrombolytic therapy.

**Pre-hospital management of acute myocardial infarction.** Well managed emergency medical systems that have extensive physician involvement, in both paramedic training and supervision, are programs that provide adequate pre-hospital diagnosis, triage and treatment. To achieve excellent pre-hospital care, patients with acute myocardial infarction must arrive at the hospital in optimal condition. At present, there are relatively few cardiologists who work directly in either paramedic management or training or who provide regular support to noncardiologist emergency medical service directors—the persons ultimately responsible for the treatment delivered by these pre-hospital systems. Cardiologists must become more intimately involved with the activities of the emergency system directors in each community in order to update treatment and triage plans so that coronary reperfusion therapy will benefit as many patients as possible. The program must take into account the local geography and distribution of hospital facilities and recognize the need for transfer of a well defined subset of acutely ill patients from less specialized hospitals to those with angiographic and surgical facilities. There need to be willingness and encouragement by the medical community for the transport of high risk patients directly to nearby facilities that are best able to provide specialized care. This is an important divergence from the past when all such patients were routinely admitted to the closest hospital.

**Initial management of acute myocardial infarction in the emergency department.** Perhaps the two greatest impediments to rapid reperfusion therapy are the patient’s misinterpretation or denial of symptoms that prevents him or her from seeking help and the delay from hospital admission to initiation of treatment. Several processes often occur in the emergency department that serve to delay definitive care. These include waiting for the results of routine blood tests, sending the patient for X-ray examination and extensive consultation with other physicians, including the patient’s practitioner or cardiologist, or both. Couple these events with the often slow, methodical delivery of medications from the pharmacy, and transporting the patient to the coronary care unit where reevaluation by a new medical team occurs before initiating therapy, and delays of 1.5 to 2 h become common. In the past, emphasis has been on the accurate diagnosis of acute myocardial infarction (for example, extensive and repetitive history taking, multiple physical examinations, extensive laboratory examinations including serial enzyme determinations, electrocardiogram [ECG] and chest radiograph), monitoring, antiarrhythmic therapy and routine specialty consultation. This compulsive approach to the evaluation of these patients may have been appropriate in an era when therapy was primarily directed at the prevention of complications.

**Today’s active interventional therapy requires a different approach.** We believe that there is an urgent need for cardiologists to initiate educational efforts to alter the attitudes and practices of the hospital’s medical staff. Acute myocardial infarction must be recognized as a true medical emergency analogous to that of hemorrhagic shock. Formation of a triage and treatment team composed of the emergency department nursing and physician staff and backed up...
After thrombolytic therapy is initiated, heparin is often recommended to reduce the likelihood of coronary some high risk patients, including those in cardiogenic shock, or both. Before, during and after the procedure or revascularization, these need to be considered in the patient's management. Early coronary angiography followed by angioplasty or revascularization surgery need to be considered in some high risk patients. Including those in cardiogenic shock and those with contraindications to thrombolytic therapy. After thrombolytic therapy is initiated, heparinization is often recommended to reduce the likelihood of coronary reocclusion.

Future developments. If thrombolytic therapy is to have a significant impact on acute and postinfarction mortality and morbidity, it must be effective early and be widely applicable. Given the constraints of time and cost, it is neither appropriate nor practical to rely on a system of care that would transport all patients with myocardial infarction to regional centers before reperfusion therapy is initiated. The availability of intravenously administered drugs such as streptokinase, urokinase and tissue plasminogen activator makes effective reperfusion therapy appropriate in any hospital with an adequately trained staff. There are several areas that can be addressed to reduce delay from the onset of symptoms to initiating treatment. In the pre-hospital phase, the routine use of a fully portable 12 lead ECG for diagnosing acute myocardial injury and the administration of intravenous or intramuscular thrombolytic therapy before transport to the hospital must be studied. This approach offers the opportunity of earlier reperfusion but increases the risk of misdiagnosis and misuse of this therapy, which may result in serious complications. Because it is known that very early therapy is most effective, careful evaluation of pre-hospital thrombolytic therapy is urgently needed.

The role of early cardiac catheterization and angioplasty needs to be defined in patients with acute myocardial infarction. Although residual high grade stenosis is a common finding after thrombolytic therapy, questions yet to be answered include: should all or only certain types of coronary stenoses receive additional treatment with angioplasty and when should such procedures be carried out? The management of patients whose thrombosed artery fails to reperfuse with intravenous thrombolytic therapy also needs to be defined. At present it is difficult to identify those patients without angiography. Even if they are identified, those patients in most instances cannot undergo angioplasty quickly enough to salvage ischemic myocardium.

It is clear that early entry into the system for patients with suspected acute myocardial infarction is necessary if they are to receive the maximum benefit from coronary reperfusion therapy. The most challenging problem will be educating and modifying the behavior of patients through appropriate public education programs that encourage early evaluation of patients who are at risk for acute myocardial infarction. Although organizations such as the American Heart Association have made major efforts in public education to reduce the time from onset of symptoms to the time when patients seek help, the denial of symptoms and delay in seeking care are still perhaps the greatest impediments to early treatment. Our current understanding of the pathophysiology of transmural infarction suggests that the “window of opportunity” is narrow and that a 1 h reduction in the delay from onset of symptoms to treatment can make a major impact in reducing the morbidity and mortality of myocardial infarction.
Recommendations. Although there is uncertainty about methods of optimizing the treatment of patients with acute myocardial infarction, experience to date suggests that several facets of their care need to be changed. These include the following:

1. Cardiologists must become more involved in community emergency medical systems. Paramedics need expert training in the recognition of patients with acute myocardial infarction. Each emergency medical system director needs to reevaluate the delivery of care to individuals with suspected infarction and the facilities available for their treatment. Each community hospital must work with the director of the emergency medical system to assure that high risk patients are transported to the facility best able to provide for their care with appropriate concern for geographic considerations and transport time.

2. Emergency departments must streamline triage and treatment protocols of patients with chest pain. The cardiologist must work with the emergency department director to provide a treatment plan for all groups of patients with acute myocardial infarction. The concept of rapid triage and treatment should be analogous to that of a patient admitted with severe trauma or hemorrhagic shock.

3. Patients who present with acute anterior myocardial infarction who are under the age of 75, have ST segment elevation, chest pain for <6 h and no contraindications should receive thrombolytic therapy. Survival has been the major endpoint measured to date. More sensitive indicators of benefit are currently being examined. Treatment of patients with other types of infarction may benefit from thrombolytic therapy by a reduction in myocardial infarct size and associated physical disability. However, this has yet to be substantiated. Therefore, as with all treatment, patient selection should be guided by weighing the potential benefits against the potential risks of thrombolytic therapy.

Conclusions. Coronary artery reperfusion therapy is at a stage of rapid development and has the potential of markedly reducing the morbidity and mortality of acute myocardial infarction. It is our hope that the management of patients during the early phase of acute myocardial infarction will also rapidly evolve so that a large percentage of patients with myocardial infarction will be able to receive early coronary reperfusion therapy.

References