event is precipitated by acute coronary occlusion, consideration of thrombolysis is warranted in the absence of contraindications.

In light of the increased risk associated with clinically significant right-to-left shunting across a patent foramen ovale in the presence of acute elevations of right ventricular and right atrial pressure, treatment should be directed at improving RV function in the case of RV infarction or alleviating the primary event, which leads to acute elevation of right-sided pressures. These include consideration of thrombolysis or thrombectomy for the case of acute massive pulmonary embolism, placement of a chest tube in the case of pneumothorax, and aggressive medical and mechanical therapy for treatment of RV failure in the presence of RV infarction. In the case of RV infarction, atrial-ventricular pacing appears to have beneficial results.4

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Acute Myocardial Infarction

Shifting Paradigms of Diagnosis and Care in a Cost-Conscious Environment

Prompt diagnosis of all patients with myocardial infarction (MI) is an elusive goal. Experience from the Framingham cohort reveals that a large proportion of afflicted patients suffer a clinically silent MI recognized by the ECG days to years after its occurrence.1 Furthermore, MI even in a hospital setting is often missed or recognized after long delays when it occurs in the context of old age, debilitation, use of various drugs, anesthesia, or postoperative state. Another subset of patients with MI and problematic diagnosis comprises those presenting with atypical pain or symptoms other than pain;5 for the latter cases, the diagnosis of MI is supported by the enzymatic and ECG changes. This notwithstanding, many current reports from emergency department (ED) experience focus exclusively on detection of cases of MI in groups of patients with chest pain.3,4

For the past 30 years the management algorithm for patients with suspected MI has dictated their admission to a coronary care unit (CCU) or other monitored environment. Confirmation of the diagnosis has been based on changes in the serum creatine kinase (CK), and especially its myocardial-specific isofrom (CK-MB), still today considered the gold standard. Serial ECGs eventually provide unequivocal diagnostic certainty, but only when they reveal new Q waves, loss of R waves, or gain in the R waves in leads V1 to V3, the last with true posterior MI. In the absence of early diagnostic ECG or enzymatic changes, the decision for admission is based on the physician’s clinical judgement. This model has been comfortably implemented in a context of perceived unlimited resources and has provided peace of mind for the admitting physicians who can avoid missing the diagnosis by rarely discharging patients. Even with such a liberal policy of admissions, 2 to 5% of patients with evolving MI are being discharged home having been told that their chest pain was of benign nature.5,6 A number of such patients have fared poorly or died, and this outcome has led to the commonest (20%) malpractice claim associated with the practice of emergency medicine.7,8

In the above sketched model, the CCU provided the setting for prompt management and often prevention of complications of MI. There was no concern for early diagnosis of MI in such a system where patients who eventually “ruled-in” or “ruled-out” were cared for in like manner. With the advent of thrombolytic therapy, this has drastically changed. Now it is important to diagnose MI as expeditiously as possible and institute prompt thrombolysis for the patients for whom it has been recommended.9 It has been established beyond a doubt that the benefits of thrombolysis are realized particularly in those patients treated within the first 3 h after the onset of symptoms. Consequently, concerted efforts are made to eliminate delays, and the goal of the profession is to implement this lifesaving treatment within 30 to 60 min of patients’ presenting to the ED.10,12 In addition, early diagnosis of MI is increasingly demanded in an effort to prevent admission to the CCU of all patients who belatedly receive a negative diagnosis. The annual cost in the United States for the CCU care of such patients, currently representing 70 to 50% of all admissions, is estimated
at 3.5 to 4.0 billion dollars. Since resources are limited, issues of cost-effectiveness are dominating the current debates aimed at changing our modus operandi. Intense pressures are exerted by federal and private insurers on physicians to use sparingly the CCU beds, confirm or exclude the diagnosis of MI in a matter of a few hours, and even complete a full evaluation of patients without an MI before their discharge, all within 24 h, and in the ED. Two approaches have been advanced in caring for patients with low probability for MI. One advocates management in an intermediate care unit, an environment with monitored beds similar to the “post-CCU” or “step-down unit” or “telemetry unit.” The other, which appears to represent the current trend, emphasizes sifting of all therapeutic and diagnostic activities from the ICU to the ED. Thus, “the chest pain diagnostic and treatment centers” have emerged as components of the ED, and they are rapidly proliferating in the United States. It appears that the objectives of these systems have been met, since data show that care of the patients has been provided expeditiously, and the flod of unnecessary admissions to the CCU has been halted. All these have been accomplished at a 50% lower cost than that incurred for CCU “rule-out” admissions, and the patients cared for and evaluated with this method have not suffered any complications after their discharge as assessed by follow-up studies at 48 h and 30 days. A welcomed spin-off of such an approach appears to be the more efficient and frequent use of fibrinolytic therapy for patients in whom it is indicated by a system attuned to quick and uniform workup of patients on presentation to the ED. Patients who were found not to have suffered an MI by the initial ED evaluation have undergone exercise testing shortly thereafter and, when appropriate, discharged within hours of presentation without complications at follow-up. There is a range of ways in instituting and operating a chest pain center either as component of the ED physical plan or in a location adjacent to the ER. The former appears to be the favored model. Resources needed range from building and staffing such a unit anew, to redeployment of existing equipment and manpower. Some other interesting approaches are currently proposed and may soon even be implemented in the care of patients. These include the following: (1) the administration of standard thrombolysis to patients with such indication in the prehospital phase of their illness; (2) the use of a small dose of a thrombolytic agent in all patients with suspected MI in a prehospital setting, with completion of this therapy in the ED for those with subsequently confirmed diagnosis; and (3) extending the services of early evaluation and therapy of chest pain to the community hoping to prevent the progression to MI.

What are the modalities available to clinicians in their quest to diagnose MI expeditiously? The triad of symptoms, the ECG, and the myocardial enzymes have been in use for a long time. Since chest pain is occasioned absent, a high index of suspicion should be maintained, particularly in dealing with elderly patients with pulmonary congestion and negative history of prior angina. The ECG when used serially can provide data ranging from definitive to suggestive, although rarely a normal record is obtained from a patient with evolving MI. Although in 50% of the MI cases, the first ECG may not be diagnostic, it is still believed by most to be the best test for the evaluation of patients with suspected MI. Enzymes released by necrosing myocytes and detected in the serum have been used for many years and are thought to be necessary for confirmation of an MI. Assays for CK, and CK-MB enzyme activities in particular, represent the current standard. Rapid developments in this area have made available an array of myocardial enzymatic markers for diagnosis of MI. First, the measurement of the serum mass concentration of CK-MB has been found to be a more efficient test than the familiar enzyme activities of CK and CK-MB. Second, assays for myoglobin, and troponin T and I have been added to the list of currently available diagnostic markers. Third, kits are becoming available that can provide results of enzymatic assays within a few minutes. Fourth, a more recent method uses measurements of serum MB subforms (MB2 and MB1) and their ratio in the early diagnosis of MI; the sensitivity and specificity of the subforms were reported to be very high, and diagnostic values are detected within 3 to 4 h after onset of symptoms. The relevant literature comprises data on using these new enzymatic myocardial markers once after admission, serially at short or long time intervals, and in conjunction with the conventional CK and CK-MB activities and the ECG for the diagnosis of MI. There is controversy about the relative merits of the different enzymes as to their sensitivity and specificity at different times after onset of symptoms. Some believe that there are no advantages from the use of some of these assays when they are compared with CK-MB assays. Also, lack of specificity is cited as an occasional problem stemming from either release of enzymes from noncardiac muscle damage, or in cases of reversible myocardial ischemia. There is laboratory support for the later. The main objectives of the studies cited above have been the evaluation of the early performance of the new enzymatic assays, their incorporation in diagnostic algorithms of MI, and their comparison with the conventional means of making a definitive but delayed diagnosis.

In this issue of CHEST (see page 1502), Mair and colleagues report on an algorithm designed to diagnose MI in a representative cohort of patients presenting to
the ED with nontraumatic chest pain due to common causes. The authors used seven parameters assessed once upon presentation to the ED. Using areas under receiver operating characteristic plots and classification and regression trees methods, they found that the ECG was the best discriminator between patients with vs. without MI for the subgroup presenting within 3 h of onset of the symptoms, while for the remainder the CK-MB mass (not activity) performed best. Their algorithm outperformed each of the seven parameters used singly. The study design is in keeping with the appropriate preoccupation to diagnose MI as early as possible based on data gathered once immediately on admission. However, one worries whether “resampling” of the seven variables, 30 and 60 min after the initial assessment might not have led to different statistical results. After all, inquiry about symptoms and ECG recordings are frequently repeated within the above time frame, and this could have been extended to the enzymes. Such a study design would have provided additional information, although the relationship of their classifiers to the eventual outcome would have been inevitably altered by the effects of interposed fibrinolytic therapy.

Advantages purported to accrue from using these new enzymatic assays include (1) rapid diagnosis of MI especially in patients with nondiagnostic ECGs leading to a faster and more cost-effective triage of patients to either CCU or observation in the ED where the necessary testing can get under way, and (2) early administration of thrombolysis to more patients resulting from early diagnosis of evolving MI. The former has already been shown, but the latter is debatable. Fibrinolytic therapy is currently advised for patients presenting within 12 h of onset of symptoms and ST segment elevation or presumably new left-bundle branch block in their ECG, regardless of the results of an enzymatic test. For patients with nondiagnostic ECG changes (ST segment depression or T-wave inversion) thrombolysis should not be given, even when enzymatic confirmation for MI has become available, because it does not confer benefits or may even be harmful. It is, therefore, unlikely that these new enzymatic assays will have a role in improving the rate of thrombolysis use in the ED or CCU.

A number of other diagnostic techniques have been investigated for the diagnosis of MI. These include echocardiography, resting thallium-201 or Te-99m sestamibi myocardial scintigraphy, radionuclide ventriculography, positron emission tomography, and MRI. These modalities are either nonspecific, expensive, and cumbersome, or have interpretation problems, and therefore, do not presently lend themselves as routine tools for the early diagnosis of MI. While our interest in new developments should be intense, suffices at the present time, when evaluating patients with suspected MI, to scrutinize the patients’ symptoms for atypical features, record and closely compare serial ECGs, and use the standard enzymatic assays for confirmation of the diagnosis. Whether one or more of the new enzymatic methods should become part of our routine management has not yet been firmly established.

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Inhaled Corticosteroids in COPD

A Light at the End of the Tunnel?

COPD is characterized by a progressive deterioration of lung function with an FEV1 decline averaging 70 mL/yr. In bronchial asthma, the rate of decrement is only 5 mL/yr. This low decline in FEV1 has been attributed to the widespread use of corticosteroids and bronchodilators, which suppress inflammation and decrease airway hyperresponsiveness. In COPD, FEV1 decline is sustained and only cessation of smoking decreases the progression of lung function deterioration.

Blair and Light6 and Mendella et al7 showed that a short-course of systemic corticosteroids given to a comparable number of stable COPD patients improved FEV1 up to 25%. In a larger group of 107 patients, Weir et al8 using oral prednisolone, significantly improved the spirometric baseline to 42%. Moreover, Postma and colleagues9 in a retrospective study, showed that steroids slow down decrements in FEV1 and possibly prolong life in subjects with severe COPD. In contrast, in a placebo-controlled double-blind crossover trial by Eliasson and coworkers,10 16 COPD patients were given oral prednisone, and only 1 was steroid-responsive with a 32% increase in FEV1. Callahan et al11 did a meta-analysis on 10 selected placebo-controlled studies meeting strict standards of >20% improvement in FEV1 from baseline. They found that 10% of all patients responded to oral corticosteroid therapy.

The advent of inhaled corticosteroids has undoubtedly benefited asthma patients, providing an alternative approach for long-term administration with relative safety and ease.12

In COPD, the use of inhaled corticosteroids is unclear. Previous reports claimed less benefit of inhaled corticosteroids than oral preparations.13 Failure of inhaled corticosteroids to improve FEV1 from baseline spirometry was reported in patients with mild COPD treated for 1 year.14 Thompson et al15 reported that the inflammatory changes in chronic bronchitis correlated well with bronchoalveolar lavage findings and spirometric changes before and after 6 weeks of inhaled corticosteroid treatment. They showed significant improvement in FEV1 with modulation of the inflammatory changes in the airways. In one of the first reports to examine the long-term effects of inhaled.