Determining prognosis early after a myocardial infarction

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In the first 24 h after an acute myocardial infarction, several features of the illness can be associated with a good or poor prognosis. For example, patients in Killip Class IV have a worse prognosis than patients in Killip Class I. Patients with a third heart sound or pulmonary rales, ventricular tachycardia or severe hypotension have a poorer prognosis than patients without these features. Patients with a large number of abnormal ECG leads have a poorer prognosis than those with a few abnormal leads. Patients whose chest X-ray shows pulmonary oedema or cardiomegaly are at higher risk than those whose lungs are clear and the heart is small. Prognosis might be expected to be poor if the initial creatine kinase or Troponin I was markedly elevated. Post infarction angina also identified a high risk population.

The following two case examples illustrate the extremes of prognosis in which further risk stratification may not be necessary.

Example 1. 45-year-old male, no previous angina develops an inferior myocardial infarction with a small creatine kinase rise. He has no arrhythmias, no heart failure, no symptoms after initial treatment. Chest X-ray reveals a small heart, normal lung vascularity. An electrocardiogram shows Q waves in the inferior leads. This patient’s prognosis is very good.
Example 2. A 75-year-old female with diabetes, mild hypertension, and history of previous myocardial infarction followed by chronic stable angina pectoris. She develops an anterior myocardial infarction with a marked rise in creatine kinase and occasional episodes of non-sustained ventricular tachycardia. Post infarction angina is present. Physical examination reveals pulmonary rales, and a third heart sound. Chest X-ray shows cardiomegaly plus pulmonary vascular congestion. Q waves were present in leads I, AVL, and V1–V6. This patient's prognosis is not so good. Between these two extremes are patients in whom additional risk stratification may be useful.

Several years ago, the GUSTO investigators published the GUSTO Angiographic substudy, in which the early assessment of coronary patency and TIMI flow was correlated with survival\[5\]. Those with TIMI 3 flow had a markedly better survival at 30 days and at 2 years than those with less than TIMI 3 flow. In addition, those whose ejection fractions were less than 40% at 90 min had a poorer survival than those whose ejection fraction was greater than 40% at 90 min. The GISSI Investigators also published data in which ejection fraction was predictive of prognosis, but in this publication, ejection fraction was performed much later in the course of the myocardial infarction\[3\].

More recently, the GUSTO investigators reported 1300 patients who underwent left ventriculography at 90 or 180 min after the onset of thrombolytic therapy\[4\]. End-systolic volume index was calculated in the right anterior oblique projection and as might be expected the higher the end-systolic volume index, the greater the mortality risk at 30 days and 1 year. In general, most clinicians would predict that patients with an anterior myocardial infarction have a poorer prognosis than patients with an inferior myocardial infarction. This is probably related to the size of the infarction and probably correlates very well with the ejection fraction and the end systolic volume index.

In this issue Andrews and colleagues wondered whether new Q waves on the presenting electrocardiogram were independently associated with the worst outcome after a first infarction\[3\]. They studied 481 patients who presented within 4 h of symptoms and who also received streptokinase therapy. Mortality was evaluated at a median of 5.6 years. Patients were studied between 1989 and 1994 and deaths were classified as cardiac or non-cardiac. One hundred and sixty patients had new Q waves on their presenting electrocardiogram. Of these, 31 patients had inferior ST segment elevation, 137 had anterior ST segment elevation.

Patients with new Q waves on admission had a lower ejection fraction than those without new Q waves. Patients with anterior infarction and new Q waves had a higher mean left ventricular end-diastolic pressure than those without new Q waves.

These investigators found that patients with new Q waves at presentation had increased mortality at 30 days (7% vs 2%), at 1 year (9% vs 3%), and at 5 years (15% vs 6%) compared to patients without new Q waves. The investigators conclude that identification of new Q waves on the presenting electrocardiogram may allow very early risk stratification of patients at high risk for developing large infarctions and consequently a worse outcome with acute myocardial infarction. The data presented by these investigators has clinical relevance because the follow-up of patients is long term and thus more valuable than the usual clinical report in which 30 day mortality is the endpoint.

I suspect that the presence of Q waves on the electrocardiogram is associated with overall poorer left ventricular function than that found in patients without Q waves. Q waves may thus serve as a surrogate for other methods to evaluate left ventricular function for example, echocardiography.

At the University of Florida, we have unpublished data in patients whose ejection fraction was determined by transthoracic echocardiography in the first 24 h of a Q wave myocardial infarction. If ejection fraction was greater than 45%, the 30 days mortality is markedly less than if the ejection fraction was less than 45%.

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References