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Risk stratification after acute myocardial infarction

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Cardiovascular disease is a leading cause of death in both developed and developing world and acute myocardial infarction (AM!) is the single most important cardiovascular cause of mortality. The goal of risk stratification after AM! is to identify patients whose outcome can be improved through specific intervention[1].

Risk stratification must begin when AM! is diagnosed. The central component of an empirical disease-management strategy is the quantification of a patient's short term and long term risk[1].

Risk Stratification Phases

1. Acute evaluation phase
2. Hospital Phase
3. Predischarge Phase

Acute Evaluation Phase

a) Clinical Indicators

Certain demographic and historical factors are associated with poor prognosis. The initial clinical history and physical examination can provide critical information for risk stratification of a patient with acute infarction[1].

Important Predictors of poor outcome are:

Female Gender

ii) Age >70 years
iii) Diabetes Mellitus
iv) Prior Angina Pectoris
v) Previous Myocardial Infarction
vi) Location of Infarction

b) Electrocardiogram

12 Lead Resting ECG carries important prognostic information, It has been shown that:

• Mortality is greater in patients experiencing anterior wall MI than with inferior wall Ml even when corrected for infarct size.

Patients with right ventricular infarction complicating inferior infarction as suggested by ST elevation in V4R have greater mortality.

• Patients with multiple leads showing ST elevation and a high sum of ST segment elevation have an increased mortality.

• Patients whose ECG demonstrates persistent advanced heart block (Mobitz type II, third degree or interventricu lar conduction abnormalities -bifasicu lar and trifasicular) have a worse prognosis.

• Persistent horizontal or down sloping ST segment depression, Q-waves in multiple leads and atrial arrhythmias are also indicators of poor outcome.

Hospital Phase

Risk stratification is a continuous process throughout the hospital stay. Continuos ECG monitoring provides very important information for risk stratification though optimal duration of such monitoring is unclear, but there is evidence that it should be continued for at least 24 hours after transfer from an intensive care unit[2]. The features, which may suggest high risk for adverse outcome, include:

Recurrent ischemia and infarction following AM! either in the same location or at a distance[3].

• Post infarct angina because it indicates jeopardized myocardium.

- Silent post infarct isehemia detected by ambulatory monitoring.
- Patients with significant ventricular ectopic activity or sustained afrial or ventricular arrhythmia.
- Patients with hemodynamic instability.
- Evidence of significant left ventricular dysfunction with or without overt heart failure.
- Patients with mechanical complication like significant new mitral regurgitation or VSD.

High risk patients may benefit from early invasive course with pre-discharge coronary angiography and revascularization but evidence does not support a consistent mortality benefit of such approach to all patients of AMI[4,5].

Assessment at Predischarge Phase

Discussion of risk stratification after rnyocardial infarction has largely beeii focussed on stratification immediately before discharge from the hospital. At the time of discharge, it is important to identify patients at higher than average risk of reinfarction or cardiac death by either non-invasive or invasive testing

Factors Determining Short Time and Long Time Survival are:

1. Left Ventricular function
2. Myocardial Ischemia
3. Instability of Electrical Activity

Assessment of left Venticular Function

- Left ventricular ejection fraction may be the most easily assessed measurement of left ventricular function.
- In patients with low EF the measurement of exercise capacity is useful for further identifying those patients at particular high risk.
- One important determinant of prognosis is infarct size, estimated by serial cardiac markers, rest echocardiogram and/or nuclear cardiology imaging techniques
- Rest left ventricular imaging may not distinguish adequately between infarcted, irreversibly damaged and stunned or hibernating myocardium. This difficulty can be overcome by exercise and pharmacological stress echocardiography, stress radionuclide ventricu jar angiography, perfusion imaging in conjunction with pharmacological stress and positron emission tomography.

Asscssni ent of Myocardial lscheam ia It is important to assess a patient's risk for further ischemia and myocardial infarction.

A predischarge evaluation for ischernia allows clinician to select patients who might benefit from revascularization following AMI and to assess the adequacy of medical management (1).

Assessment Tools:

I) Exercise Tolerance Test
ii) Myocardial Perfusion Imaging
iii) Coronary Arteriography

Treadmill Exercise Testing

- ETT following AMI has traditionally utilized submaximal protocol that requires the patient to exercise until either symptoms of angina appear or there is ECG evidence of ischemia or a target work load (approx. - 5 METS) has been reached[2].
- A positive stress test may identify high risk patient but value of a negative test in the post thrombolytic era is very uncertain.

Myocardial Perfusion

- Thallium 201 or Sestamibi during exercise or pharmacological stress increase the sensitivity for detection of patients at risk for death or recurrent infarction.
- Perfusion imaging may be helpful for risk stratification in patients with un-interpretable ECG or inability to exercise.

Angiography

Coronary angiography is the gold standard for diagnosis of coronary artery disease and status of patency of infarct related vessel. It has the advantage of permitting simultaneous identification and treatment (angioplasty) of coronary obstruction but it does have important limitations. Firstly the coronary artery plaques that are most likely to rupture and produce further events, are those that are lipid laden and have a thin fibrous cap. These cannot be adequately identified with arteriography because the degree of stenosis does not correlate well with the risk of plaque instability / rupture. Secondly coronary arteriography does not provide information on the functional significance of coronary lesions.

Assessment for Instability in Myocardial Electrical Activity

Following AMI patients are at greatest risk tbr the sudden death due to ventricular arrhythmias over the course of 1-2 years[1]. Following techniques are used:

Measurement of QT dispersion

II) HoIter monitoring
iii) Invasive electrophysiological testing
iv) Baro reflex sensitivity
v) A signal averaged electrocardiogram

• Several clinical factors denote patients at increased risk for sudden arrhythmic events. Left ventricular dysfunction, anterior or Q-wave infarction, a killip class of III or IV, multivessel coronary disease and a larger infarction.

• An increase in the frequency of ventricular premature complexes. particularly to more than six per hour, appear to increase the risk for late death or recurrent ventricular tachycardia or fibrillation by approximately 60% in niany studies but not all. Similarly, patients who have ventricular fibrillation or sustained tachycardia more than 48 hours after infarction have an increased risk for subsequent sudden death.

Conclusion

• A multitude of recent studies provide an empirical basis for a comprehensive strategy of early and continued risk assessment, which can offer both physician and patient the benefit of targeted, evidence based intervention, risk reduction and enhanced survival based on known and discoverable risk factors as well as clinical manifestations.

• Risk assessment should begin with the initial clinical assessment.

• High risk patients probably benefit from a more aggressive approach including early catheterization and revascularization. Randomized studies have not shown that routine cardiac catheterization is more effective than a conservative strategy for patients who have uncomplicated infarction. This population can be further stratified, however, by left ventricular function and evidence of persistent ischemia

• Patients who have nearly normal left ventricular function have a very low risk for death and may therefore be candidates for early discharge from the hospital. Pre discharge stress testing should be used for further risk stratification within this group of patients.

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