FILMS IN REVIEW

The Use of Nuclear Imaging to Assess the Myocardial Viability

1. Discussion

Terms commonly used to describe different myocardial states are “viable”, “stunned”, “hibernating”, “infarcted”, and “scarred”. Common problems are to equate infarcted myocardium with irrecoverable dysfunction, making no allowance for partial-thickness infarction, and to equate viable myocardium with hibernation. It is particularly important to distinguish between viable and hibernating myocardium since the presence of viable myocardium does not per se imply recovery of function after revascularization.

2. Viable myocardium

The term “viable” describes myocardial cells that are alive and hence also the myocardium that they constitute. Although individual myocytes may only be viable or nonviable to a first approximation, the macroscopic myocardium in ischemic heart disease exhibits a continuum of states from fully viable, through partially viable in areas of partial-thickness infarction, to nonviable, or scarred, in areas of full-thickness infarction with no remaining myocytes (Fig. 1A). Whether applied to a myocyte or to a segment of myocardium, the term “viable” implies nothing with regard to contractile state. Thus, viable myocardium may contract normally or it may be dysfunctional, depending on other circumstances (Underwood et al., 2004).

3. Stunned myocardium

Stunning is a form of contractile dysfunction of viable myocardium caused by a brief period of ischemia followed by restoration of perfusion. The dysfunction may persist from an hour to several days, but function ultimately returns to normal if normal perfusion is maintained.

Figure 1A  SPECT myocardial perfusion images for a male patient 48 years old with known history of CAD from previous angiography and showed akinetic anterior wall by echocardiography. The routine $^{99m}$Tc-Myoview study (rest and adenosine stress) was done to assess for reversible ischemia initially and it showed minimal reversible ischemia in the basal anterior wall and the rest of the anterior wall is showing almost non-reversible perfusion defect.
4. Hibernating myocardium

Hibernation is also a state of contractile dysfunction in viable myocardium, but now in the setting of chronic ischemic heart disease. In contrast to stunned myocardium, in which function recovers spontaneously, hibernating myocardium requires an intervention such as revascularization for recovery (Bax et al., 2004).

5. 201Thallium

201Thallium has been used extensively for identifying myocardial viability and hibernation; it was the first tracer to be used for this purpose. The tracer behaves as a potassium analogue and myocardial uptake depends upon regional flow and upon an intact sarcolemmal membrane to facilitate transport. Therefore, 201Thallium provides information on both perfusion and cell viability (Fig. 1B).

201Thallium imaging remains a valuable technique to predict both regional and global functional recovery in patients with ischemic left ventricular dysfunction. Positive predictive accuracy for regional improvement after revascularization ranges from 57% to 92% and negative predictive accuracy from 62% to 100% (Underwood et al., 2004).

References


Tarek El-Maghraby, MD, PhD, ABNC
Saad Specialist Hospital, Alkhobar, Saudi Arabia
Tel.: +966 507083033
E-mail address: tarek116@hotmail.com