

Myocardial perfusion stress (MPS) imaging uses a small amount of radioactive tracer (technetium sestamibi or tetrofosmin) which is taken up and retained in myocardium. The heart is scanned with a gamma camera using Single Photon Emission Computerised Tomography (SPECT) technology. The tracer intensity in any one part of the ventricular tomographic image directly reflects the adequacy of blood flow to the corresponding part of myocardium. (Figure 1)

A perfusion defect on a MPS study may be produced by stress ischaemia, stable infarction, or hibernating myocardium. Differentiation is achieved by comparison with a resting MPS study. A reversible perfusion defect is the cardinal MPS sign of reversible ischaemia, and its severity in turn reflects the severity of ischaemia. A fixed perfusion defect indicates either a fixed infarct (severity of perfusion defect reflecting the thickness of the infarct) or infrequently hibernating myocardium. MPS testing has an excellent safety profile with mortality generally quoted at < 0.01%.

Nuclear myocardial perfusion imaging is the best validated and most standardised of all cardiac imaging modalities. Nuclear MPS predicts clinical cardiac outcome, and does so equally well in men and women, diabetics and non-diabetics, obese and non-obese, patients who can exercise and those who cannot.

In the general patient population, a normal MPS carries the risk of a significant cardiac event of less than 1% per annum. Sensitivity and specificity for prediction of significant coronary artery disease is 80-85%, similar to stress echocardiography.

Applications in general practice includes:

1. Triaging of chest pain - eg chest pain in "intermediate risk" patients where there is enough concern to investigate, but not enough to warrant the risks associated with an angiogram; Chest pain in patients who are unable to adequately exercise.
2. Investigation of patients with an abnormal resting ECG where interpretation of exercise ECG is impossible (eg, baseline ST segment changes, LBBB).
3. When stress ECG is equivocal or may be falsely positive eg middle-aged women.
4. Cardiac event prediction in asymptomatic patients eg before major surgery, before major physical stresses, and where silent myocardial ischaemia is likely eg diabetics.
5. In patients with known coronary artery disease eg to assess perfusion post angioplasty, or to determine if a stenosis is functionally significant.

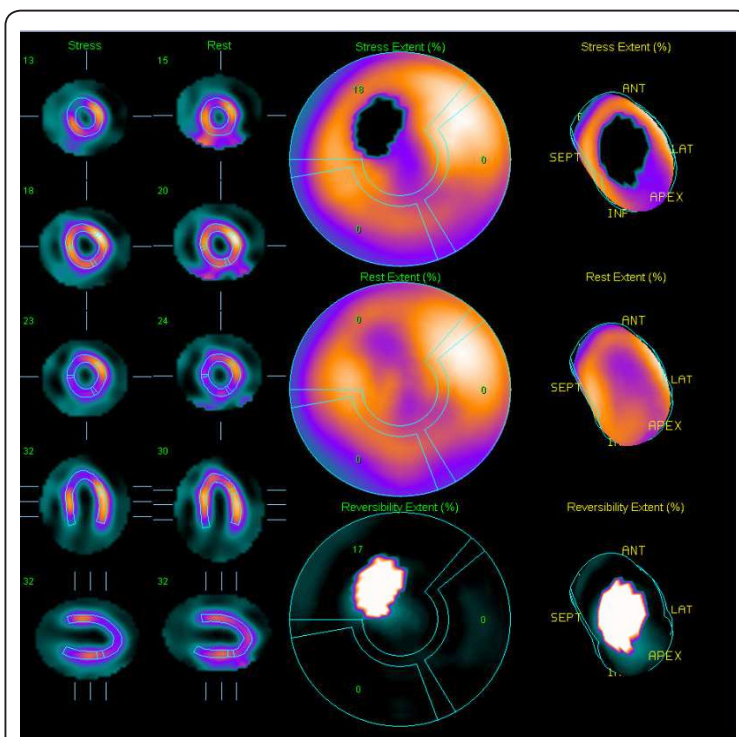


Figure 1 A composite display of a moderate sized, reversible perfusion defect in the left anterior descending (LAD) artery territory.(arrows)
Left panel : SPECT slices demonstrate a distal anteroseptal defect.
Right panel top: left ventricular perfusion at stress on polar & 3D map.
Right panel mid: left ventricular perfusion at rest.
Bottom panel : extent of reversibility of defect.

Myocardial physiological stress can be best achieved with graded exercise ECG, eg Bruce protocol, which demonstrates the patient's exercise response and may also elicit index symptoms. The radiotracer is injected either at peak exercise, or with symptoms. Where the patient is unable to exercise, pharmacologic stress can be utilised via the intravenous infusion of coronary vasodilators, either dipyridamole ('Persantin') or adenosine ('Adenoscan'). The second line pharmacological agent, dobutamine, is administered as a graded intravenous infusion and is both chronotropic and inotropic.