2011 Imaging Criteria

Positron Emission Tomography (PET), Cardiac[1, 2*RIN, 3, 4]

ICD-9-CM: 92.05, 92.19
CPT: 78459, 78491, 78492
I/O Setting: Outpatient

INDICATION(S)

100 Assessment of myocardial viability
200 Assessment of myocardial perfusion

100 Assessment of myocardial viability **[All]**[5, 6]
- 110 Evidence of ischemia **[One]**
  - 111 Angina/anginal equivalent[7, 8]
  - 112 MI/CABG/PCI by Hx
- 120 EF ≤ 35% by testing[9]
- 130 SPECT scan nondiagnostic for extent of myocardial viability[10*MDR, 11, 12]
- 140 Cardiac revascularization/transplant planned[13, 14]

200 Assessment of myocardial perfusion **[All]**[15]
- 210 Evidence of ischemia **[One]**
  - 211 Angina/anginal equivalent[7, 8]
  - 212 MI/CABG/PCI by Hx
- 220 Abnormal stress test **[One]**
  - 221 By ETT
  - 222 By stress echo
  - 223 By nuclear stress test/SPECT scan
- 230 SPECT scan nondiagnostic for decreased myocardial perfusion[11, 16*MDR, 17]
- 240 Angiography not feasible[18]
- 250 Cardiac revascularization planned

Notes

(1)
These criteria include the following procedures:
Cardiac Perfusion Study
Cardiac Viability Study

(2)-RIN:
PET scan performed as a screening test for asymptomatic individuals without cardiac risk factors is not covered by these criteria.

(3)
Identification of myocardial tissue that is both viable and can be perfused is the key in the work-up of a patient undergoing cardiac revascularization. Current imaging options for evaluation of myocardial viability or perfusion include SPECT, nuclear stress tests, MRI, and PET. Each test has its own advantages and disadvantages. SPECT scans assess myocardial perfusion and membrane integrity but have resolution problems with signal degradation. Nuclear stress tests assess myocardial contractile reserve but can only imply myocardial viability. PET assesses myocardial metabolic activity, showing areas of viable or hibernating myocardium, but does not provide information on a patient's functional status. The sensitivity and specificity of PET is slightly better than SPECT because PET has higher resolution and less attenuation (Nandalur et al., Acad Radiol 2008; 15(4): 444-451; Weinsaft et al., Cardiol Clin 2007; 25(1): 35-56, v).

(4)
While MRI and CT image anatomy, PET scans image physiology, including disease activity. PET requires the IV injection or inhalation of a tracer labeled with a positron-emitting radionuclide which accumulates in the studied tissue. The radionuclide emits positrons, which are imaged during radioactive decay. Recent improvements in both hardware and software used in PET devices have created a clinical tool which provides improved resolution, image quality, and shorter acquisition study time (Miller and DiCarli, Am J Geriatr Cardiol 2007; 16(6): 355-362).

(5)
PET provides metabolic information that is helpful in characterizing nonviable (irreversible damage) from viable (reversible damage) cardiac tissue. In high-risk patients, the presence of viable myocardium may be the deciding factor between revascularization and medical management (Lalonde et al., Cardiol Clin 2009; 27(2): 237-255).

(6)
Patients with chronic LV dysfunction may have viable myocardium that is both "hibernating" and "stunned." Following an episode of ischemia, contractile function may remain reduced for a period of time before eventually recovering. Prolonged or repetitive reduction in myocardial flow may lead to chronically reduced contractility in viable myocardial tissue, which is referred to as "hibernating myocardium." PET, SPECT, and MRI are used to evaluate for viability in patients with LV dysfunction. Functional MRI assesses the presence of scar tissue; PET and SPECT provide additional information on the viable tissue that further assists in determining if revascularization is warranted (Bax et al., Cardiol Clin 2009; 27(2): 265-276; Lalonde et al., Cardiol Clin 2009; 27(2): 237-255).

(7)-DEF:
Angina pectoris is defined as discomfort in the chest associated with myocardial ischemia. Symptoms of angina may vary from patient to patient and include sensations of pain (classically involving the chest with radiation to the left arm), choking, pressure, squeezing, tightness, heaviness, or burning. Isolated shoulder, back, neck, and jaw complaints can also be described.

(8)
As a significant number of patients with acute MI do not have classic symptoms of chest pain, it is important to consider atypical angina (also known as an anginal equivalent) when evaluating a patient with risk factors or a history of CAD (Anderson et al., J Am Coll Cardiol 2007; 50(7): e1-e157). Atypical presentations are seen more frequently in women, the elderly, and diabetic patients and may include jaw or neck pain, nausea with vomiting, dyspnea and unexplained fatigue (Amsterdam et al., Circulation 2010: July 26, 2010; Berg et al., Gend Med 2009; 6(3): 454-462).

(9)
Testing includes imaging by TTE, TEE, left ventriculogram, or by RVG.

(10)-MDR:
Requests for PET in patients who have not undergone SPECT require secondary medical review.

(11)

In certain patients, SPECT may be anticipated to yield suboptimal results. Myocardial SPECT studies in women tend to have a higher rate of false positives than men due to attenuation artifact from breast tissue. The distorted images generally affect the anterior aspect of the heart (Nurkalem et al., J Digit Imaging 2008; 21(4): 446-451). Breast implants made from either silicone or saline can compound the amount of artifacts seen in SPECT studies (Stinis et al., Int J Cardiovasc Imaging 2006; 22(3-4): 449-455). Attenuation artifact from excess soft tissue and large upper extremities in obese individuals can interfere with SPECT image interpretation. The lateral aspect of the heart is most affected when there is excess tissue under the arm (Lalonde et al., Cardiol Clin 2009; 27(2): 237-255; Hepner and Thomas, Am Heart Hosp J 2007; 5(3): 189-191).

(12)

SPECT scan has traditionally been used for evaluation of cardiac viability; it is less costly and more readily available than PET. PET scanning is, however, quickly emerging as an alternative to SPECT for assessing cardiac viability. Additional research is necessary to determine the long-term benefits of evaluation with cardiac PET.

The sensitivity (88% to 93%), specificity (58% to 74%), and positive predictive value (77%) of myocardial PET scanning is superior to that of nuclear stress testing for assessing myocardial viability (Schinkel et al., J Nucl Med 2007; 48(7): 1135-1146). It remains unknown which imaging technique is best for determining clinical management (i.e., surgical intervention versus medical therapy) in patients with reduced EF. Studies such as the PARR-2 have shown only a nonsignificant trend towards reduction in cardiac events for PET-assisted management versus standard care. Evidence in support of the usefulness of PET for assessment of myocardial viability is growing, but additional validation of its effect on clinical management is needed (Bengel et al., J Am Coll Cardiol 2009, 54: 1-15).

(13)

Imaging is performed in potential heart transplant candidates to exclude the presence of viable myocardium.

(14)

Patients with severe stenosis by coronary angiography are not candidates for revascularization if the surrounding myocardium is nonviable. Once viability is confirmed, however, evidence shows that revascularization results in improvement in LV function, symptoms, exercise capacity, and survival (Schinkel et al., J Nucl Med 2007; 48(7): 1135-1146).

(15)

PET has a sensitivity of 92% and specificity of 85% for detecting stenosis and assessing cardiac perfusion. The purpose of evaluating myocardial perfusion is to determine the extent and severity of suspected CAD and to identify cardiac dysfunction. Early diagnosis of CAD can improve patient outcomes by modifying risk factors, directing therapy to alleviate ischemic symptoms, and to delay its progression (Nandalur et al., Acad Radiol 2008; 15(4): 444-451).

(16)-MDR:

Requests for PET in patients who have not undergone SPECT require secondary medical review.

(17)

There are limited studies in which head-to-head comparisons evaluating the sensitivity and specificity of PET and SPECT regarding myocardial perfusion have been done. PET scanning for the assessment of myocardial perfusion is limited to those situations in which a prior SPECT scan is inconclusive or cannot be performed.

Additional studies such as the ongoing study of myocardial perfusion and coronary anatomy imaging roles in CAD (SPARC), a prospective multicenter observational registry comparing PET, SPECT, and CTA may provide additional evidence on the comparative clinical and cost effectiveness of these modalities in the evaluation of myocardial perfusion (Hachamovitch et al., J Nucl Cardiol 2009, 16: 935-48).

(18)

Contraindications to angiogram may include patients with significant renal insufficiency, poor arterial access, or allergies to contrast material.