“Myocardial viability assessment is an important part of cardiac PET to assist physicians to decide upon the best surgical or medical procedures. F-18 FDG imaging provides the unique ability to assess metabolic activity in an area of hypoperfusion. The presence of glucose activity by FDG imaging provides evidence of viability beyond perfusion by either PET or SPECT.”
These materials were prepared in good faith by MITA as a service to the profession and are believed to be reliable based on current scientific literature. The materials are for educational purposes only and do not replace either the need for individualized patient diagnosis and treatment planning by qualified physicians based on existing good practices or the need for implementation by qualified radiologists or other qualified healthcare practitioners. Neither MITA nor its members are responsible for any diagnostic or treatment outcomes. MITA, its members, and contributors do not assume any responsibility for the user’s compliance with applicable laws and regulations. MITA does not endorse the proprietary products or processes of any one company.
Information about myocardial viability is necessary in the management of patients with ischemic cardiomyopathy in that only viable myocardial segments benefit from revascularization.

Viable myocardium exhibits an affinity for glucose compared to irreversible damaged heart muscle.

FDG PET has been showed to be the gold standard when assessing myocardial viability.
Objectives

- Review the ischemic cascade in acute and chronic CAD
- Review various states of myocardial viability
- Review predictors of survival in patients with heart failure
- Evaluate how glucose metabolism may identify high risk patients
Ischemia: Supply and Demand

18. Dilsizian and Narula  Atlas of Nuclear Cardiology, 3rd Ed. 2009; Figure 9-15, p212
Myocardial Hibernation

18. Dilizian and Narula. Atlas of Nuclear Cardiology, 3rd Ed. 2009; Figure 9-21B, p215
Blood Flow vs. Metabolism: Mismatch

18. Dilsizian and Narula, Atlas of Nuclear Cardiology, 3rd Ed. 2009; (L) Figures 8-23, 8-24, p194 and (R) Figure 8-26B, p195
Survival by PET Viability Pattern and Treatment

Viability determined by presence of mismatch more accurately predicted the success of the intervention

Mismatch and Clinical Benefit: The PARR-2 Trial

Quantitative Scoring of Mismatch Size

PARR-2 = PET and Recovery after Revascularization-2

Mismatch and Clinical Benefit: The PARR-2 Trial

Progressive revascularization benefit with increasing mismatch (>7%)

Figure 2. Interaction hazard ratios and 95% confidence interval at various levels of mismatch as a continuous variable

Hazard ratio decreases with increasing mismatch score

PARR-2 = PET and Recovery after Revascularization-2

Appropriate Use Criteria in Heart Failure

<table>
<thead>
<tr>
<th>Clinical Scenario: Evaluation for Ischemic Etiology</th>
<th>SPECT</th>
<th>PET</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>With Angina/ischemia equivalent</strong></td>
<td>R</td>
<td>M</td>
</tr>
<tr>
<td><strong>Without Angina/ischemic equivalent</strong></td>
<td>R</td>
<td>M</td>
</tr>
</tbody>
</table>

*Comparing to SPECT*: PET may increase accuracy for detection of multi-vessel disease, provide myocardial perfusion reserve for detection of patients with CAD and allow assessment of glucose metabolism that may then identify high-risk patients.

### Clinical Scenario:
Viability evaluation amenable to revascularization

<table>
<thead>
<tr>
<th></th>
<th>SPECT</th>
<th>PET</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rest/Redist</td>
<td>Stress/Rest</td>
</tr>
<tr>
<td>Severely reduced ventricular function (EF &lt;30)</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Moderately reduced ventricular function (EF 30-39%)</td>
<td>M</td>
<td>A</td>
</tr>
<tr>
<td>Mild ventricular function abnormality (EF 40-49%)</td>
<td>M</td>
<td>A</td>
</tr>
</tbody>
</table>

PET validated by PARR-1, PARR-2: Higher sensitivity for viable myocardium vs. SPECT

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**Appropriateness ratings:**
- R = Rarely
- M = May Be
- A = Always

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Summary

- The physics of PET and pharmacokinetics of the tracers are more optimal for MPI\(^1-5, \, 9-10\)
- Cardiac PET addresses the need for improved interpretive certainty and greater efficiency\(^1-4\)
- Cardiac PET performs well even with challenging patient types (e.g. pharm stress, obese, female) and more accurately identifies multi-vessel disease\(^1,3-4,6,7,17\)
- PET can help improve the management of patients with known or suspected CAD, heart failure and cardiac sarcoidosis\(^1-3,6,7,18-24\)
Summary

- Quantification of myocardial blood flow adds incremental prognostic value\textsuperscript{18,22,23}
- PET can help to implement a strategy for the reduction of radiation exposure from cardiac imaging procedures\textsuperscript{25-26}


References


References


References


References


25. Einstein EJ. Effects of radiation exposure from cardiac imaging: How good are the data? J Am Coll Cardiol 2012; 59(6):553-565

Important Safety Information

- Image interpretation errors can occur with PET imaging. A negative image does not rule out recurrent prostate cancer and a positive image does not confirm its presence. Clinical correlation, which may include histopathological evaluation, is recommended.

- Hypersensitivity reactions, including anaphylaxis, may occur in patients who receive PET radiopharmaceuticals. Emergency resuscitation equipment and personnel should be immediately available.

- PET/CT imaging contributes to a patient’s overall long-term cumulative radiation exposure, which is associated with an increased risk of cancer. Safe handling practices should be used to minimize radiation exposure to the patient and healthcare providers.

- Adverse reactions, although uncommon, may occur when using PET radiopharmaceuticals. Always refer to the package insert prior to use.