Establishing the Prognostic Value of Rb-82 PET Myocardial Perfusion Imaging

A Step in the Right Direction*

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In the last decade, positron emission tomography (PET) myocardial perfusion imaging (MPI) has emerged as a valuable clinical tool for the management of patients with known or suspected coronary artery disease (CAD). Compared with single-photon emission computed-tomography (SPECT), PET provides higher-quality images and superior diagnostic accuracy (1). Increased availability of PET scanners, Medicare approval of PET-MPI reimbursement, and greater access to the generator-produced perfusion tracer rubidium (Rb)-82 have increased utilization. However, despite the growth of Rb-82 PET-MPI, the literature showing its prognostic value has been limited (2–6). Small sample sizes (2,3), possible overlap in study populations (3,4), a focus on high-risk patients with known CAD (2), substantial patient exclusions (2–4,6), limited outcomes data (5), and smaller numbers of cardiac events (3) are some limitations of the existing literature. Furthermore, the majority of studies did not use current PET technology, which may include the application of computed tomography (CT) for attenuation correction (AC) and electrocardiographic (ECG) gating for measurement of left ventricular (LV) volumes and systolic function (LVEF).

In this issue of iJACC, Dorbala et al. (7) report on the prognostic value of gated Rb-82 PET-MPI in 1,432 consecutive patients followed up for a mean of 1.7 years. The investigators carefully performed image acquisition, processing, and interpretation using contemporary, clinically relevant techniques, including CT AC, rest/stress ECG gating, and iterative reconstruction (7). In their study, the rates of both all-cause death and cardiac events increased with increasing extent and severity of Rb-82 PET-MPI findings. In Cox proportional hazards modeling, Rb-82 PET-MPI variables of ischemia and scar and the difference between LVEF at rest and stress (LVEF reserve) were found to be incremental to clinical variables and LVEF at rest for predicting both cardiac events and all-cause death. In addition, LVEF reserve had incremental prognostic value compared with perfusion image interpretation—a truly novel finding.

What are the potential weaknesses of this study? The study group is quite heterogeneous—31% had known CAD, 17% were studied for pre-operative evaluation, 48% had an intermediate likelihood of CAD. Both rest and stress LVEF were only available on 985 patients (69% of the study group); these patients were not formally compared with the remaining patients. The clinical models for cardiac events and all-cause mortality only included those variables that were statistically significant in the study group. However, experienced clinicians usually also incorporate the presence and severity of typical angina and diabetes not requiring insulin into their patient assessment; these variables should therefore be forced into prognostic models to better reflect clinical decision making. The annual all-cause mortality rate was high (3.5%) in patients with normal perfusion scans, suggesting a population with extensive noncardiac problems.
Table 1. Approximate Annual Event Rates in Relation to Rb-82 PET-MPI Results

<table>
<thead>
<tr>
<th>Author/Ref #</th>
<th>n (Known CAD %)</th>
<th>All-Cause Death (%)</th>
<th>Cardiac Events (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Normal</td>
<td>Mildly Abnormal</td>
</tr>
<tr>
<td>Marwick et al. (2)</td>
<td>657</td>
<td>&gt;50*</td>
<td>0.8</td>
</tr>
<tr>
<td>Yoshinaga et al. (3)</td>
<td>367</td>
<td>40</td>
<td>NA</td>
</tr>
<tr>
<td>Lertsburapa et al. (6)</td>
<td>1,441</td>
<td>54</td>
<td>2.4</td>
</tr>
<tr>
<td>Dorbala et al. (7)</td>
<td>1,432</td>
<td>31</td>
<td>2.5</td>
</tr>
</tbody>
</table>

*Prior myocardial infarction: 48%, prior revascularization: 37%, and on medical therapy: >50%.

CAD = coronary artery disease; NA = not applicable; PET-MPI = positron emission tomography–myocardial perfusion imaging; Rb = rubidium.
believe that broader application of PET to other patients is not yet justified, because SPECT-MPI has a far larger and more robust prognostic database encompassing at least 40,000 patients in over 20 studies (14). To match these considerable data, carefully designed outcomes-based single-center studies and multicenter registries, such as the SPARC (Study of Perfusion and Anatomy’s Role in CAD) trial, are needed. Such studies should help identify those patients who are most likely to benefit from PET-MPI and thereby justify more widespread use.

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REFERENCES


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