

# Stress-first Myocardial Perfusion Imaging



Nasir Hussain, MD<sup>a</sup>, Matthew W. Parker, MD<sup>a</sup>, Milena J. Henzlova, MD<sup>b</sup>, William Lane Duvall, MD<sup>a,\*</sup>

## KEYWORDS

- Myocardial perfusion imaging • Stress only • Stress first • Radiation reduction • Stress protocols
- SPECT

## KEY POINTS

- Normal stress-only myocardial perfusion imaging (MPI) studies have the same prognosis as full rest-stress MPI studies.
- Stress-only MPI studies decrease test time by 38% compared with conventional rest-stress protocols.
- Stress-only MPI studies decrease radiation exposure to patients by 27% to 76% compared with conventional rest-stress protocols.
- Successful stress-first protocols require attenuation correction for maximal effectiveness.

## INTRODUCTION

Myocardial perfusion imaging (MPI) is traditionally conceptualized as 2 images. First, an image of radiotracer distribution under stress conditions is reviewed for any areas of decreased activity. The reader then compares these areas with a resting scan to determine whether the defect is reversible (ischemia) or fixed (infarction). However, when stress MPI is normal, the rest image becomes superfluous.

As far back as 1992,<sup>1</sup> nuclear cardiologists suggested reviewing stress MPI before deciding on the need to image the patient at rest. This stress-first strategy provides high-quality perfusion data equivalent to a full rest-stress study, saves time in the imaging laboratory, and reduces radiation exposure in appropriately selected patients. However, only a minority of nuclear cardiology laboratories use a stress-first protocol, perhaps reflecting challenges such as the need for attenuation correction, feasibility of real-time review of stress images, and concerns about reimbursement.<sup>2,3</sup>

In current clinical practice, most appropriately indicated diagnostic stress MPI studies are found to be normal, especially in patients with no prior history of coronary artery disease (CAD). In a study by Rozanski and colleagues<sup>4</sup> of 39,515 patients with no history of CAD who underwent diagnostic stress MPI from 1991 to 2009, the prevalence of normal MPI studies had increased among all subgroups from a prevalence rate of 59.1% in 1991, to 91.3% in 2009. The prevalence rate of normal studies reached as high as 97.1% among exercising patients without typical angina. In a recent multicenter study of 108,654 patients undergoing clinically indicated stress MPI studies, an overall increase in the prevalence of normal studies was seen from 1996 to 2012 in all patients (46.2%–68.2%), patients without CAD (67.8%–82%), and patients with CAD (25.3%–39.2%).<sup>5</sup> With the increasing prevalence of normal MPI studies, it is imperative that more cost-effective strategies be developed for the initial evaluation of patients who are presently at low risk for abnormal findings during stress MPI studies, and stress-first protocols represent an attractive option.

<sup>a</sup> Division of Cardiology, Hartford Hospital, 80 Seymour Street, Hartford, CT 06102, USA; <sup>b</sup> Mount Sinai Heart, Mount Hospital, One Gustave L Levy Place, New York, NY 10029, USA

\* Corresponding author.

E-mail address: [lane.duvall@hhchealth.org](mailto:lane.duvall@hhchealth.org)

## DIAGNOSIS/PROGNOSIS

The diagnostic accuracy of single-photon emission computed tomography (SPECT) MPI for detecting flow-limiting CAD is well established, such that patients are unlikely to undergo diagnostic angiography after a normal SPECT MPI result and they have a benign 1-year prognosis.<sup>6-8</sup> This is a relevant issue for clinicians when interpreting stress-only SPECT MPI; that is, given normal stress-only SPECT MPI, are the expected rates of cardiac events in the coming year similar to those suggested by a full rest-stress MPI study?

A recent review cited 10 studies that all showed annualized cardiac event rates less than 1% following a normal stress-only MPI.<sup>9</sup> The pooled patient experience from the 4 studies directly comparing the prognosis of rest-stress and stress-only imaging suggests that the cardiac event rate is marginally lower following a normal stress-only MPI than following a normal rest-stress MPI (Fig. 1).<sup>10-13</sup> Low all-cause mortality and cardiac event rates following normal stress-only MPI suggest that rest imaging can be omitted without any reduction in the prognostic value of the test.

## PATIENT SELECTION

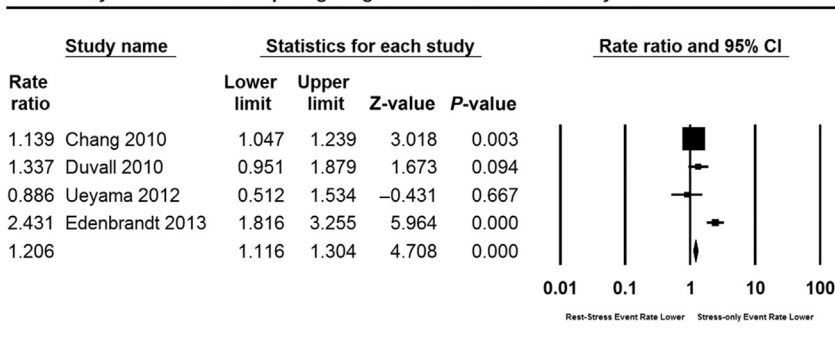
At present, there are no published guidelines for the determination of which patients are suitable candidates for stress-first MPI protocols. The first step in the appropriate selection of patients for any imaging protocol is to ensure that the study is appropriately indicated.<sup>14,15</sup> Once MPI is deemed appropriate, selecting patients for a stress-first protocol requires some initial evaluation of the patient in order to customize the patient's experience in the nuclear laboratory. In general, patients with low to intermediate pretest probability for

CAD (based on age, gender, risk factors, symptoms, and rest electrocardiogram [ECG]) are suitable candidates for a stress-first or stress-only MPI protocol. Another suitable group is patients with a high body mass index (>35 kg/m<sup>2</sup>) or weight more than 115 kg (250 pounds); patients with recent (<3 years) negative noninvasive or invasive tests for the presence of obstructive CAD also seem to be suitable candidates.

A clinical scoring system has been proposed as a prediction model for determining which patients will undergo a successful stress-first technetium-99m (Tc-99m) MPI study and not require rest images.<sup>16</sup> Eight clinical variables with their assigned scores are listed in Table 1 (a higher score correlates with an unsuccessful stress-first MPI study). Using this prediction model, patients were stratified into low-risk (-2 to <5), intermediate-risk (≥5 and <10), and high-risk (≥10) score groups. The low-risk cohort had a success rate of 92% for not requiring rest images, whereas the intermediate-risk and high-risk cohorts had 27% and 65% of patients requiring rest images, respectively.

In order to simplify the triage of patients to a stress-first protocol, we reevaluated the predictive accuracy of this model in a new population and analyzed CAD status alone as the determination of imaging protocol.<sup>17</sup> A history of CAD was defined as a previous myocardial infarction, a history of percutaneous coronary intervention, or previous coronary artery bypass grafting. Simply assigning all patients with no history of CAD to a stress-first protocol resulted in an 88% success rate for not needing subsequent rest images. Note that 54% of patients with known CAD did not require rest images as well. A simplified approach with a high success rate may therefore be to triage all patients without known CAD to a stress-first MPI protocol, with most patients with

**Meta Analysis of Studies Comparing Prognosis of Normal Stress-only to Normal Stress-Rest MPI**



**Fig. 1.** Meta-analysis of studies investigating the prognosis of normal stress-only MPI studies. CI, confidence interval.

Download English Version:

<https://daneshyari.com/en/article/2897739>

Download Persian Version:

<https://daneshyari.com/article/2897739>

[Daneshyari.com](https://daneshyari.com)