

When less is more: New protocol limits use of SPECT MPI

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A new stress test protocol that investigates reducing the use of perfusion imaging in low risk patients undergoing SPECT myocardial perfusion imaging for possible angina symptoms was found to be diagnostically safe, revealed a US retrospective analysis. The study, reported as an abstract¹ at the International Conference on Nuclear Cardiology and Cardiac CT (ICNC11) May 5 to May 8 in Berlin, Germany, predicted that using exercise ECG stress testing alone in patients with high exercise capacity would have had no adverse effects on their prognosis at five years.

"Our results are reassuring in that there are few [patients](#) whose diagnosis of [coronary artery disease](#) (CAD) would be missed," said Milena Henzlova, the first author of the study. "Not only would widespread adoption of this approach reduce radiation exposure, it would also save considerable amounts of time and money."

Single-photon emission computed tomography (SPECT) [myocardial perfusion imaging](#) (MPI) has been used for over 30 years to detect ischemia in patients with suspected CAD. In SPECT MPI patients are injected with radioactive agents (such as Tc-99m or Thallium 201) whose passage through the heart is viewed with a SPECT camera. By comparing the heart's blood flow at rest and during stress (patients exercise on a treadmill, cycle ergometers or undergo pharmacological stress with vasodilators or dobutamine), cardiologists can determine if the myocardium receives sufficient blood supply, as well as the location and extent of underlying CAD.

"Because it's non invasive and many patients with a chest pain syndrome don't have coronary disease, SPECT MPI is often viewed as a 'gate keeper' to [coronary angiography](#)," explained Lane Duvall, an investigator in the study.

While SPECT MPI represents a well established technique, the main disadvantage is that patients are exposed to diagnostic levels of radiation. In recent years intensive efforts have been made to reduce [ionizing radiation](#) associated with [cardiac imaging](#) due to concerns that it damages DNA in cells and may ultimately give rise to cancer. Indeed, extrapolating data from the survivors of the Hiroshima and Nagasaki atomic bombs, Andrew Einstein, from Columbia University Medical Center, New York, has estimated that the low levels of radiation encountered during medical imaging might lead to a 2% excess relative risk for future cancers.

Other studies have suggested that exercise treadmill testing alone may be sufficient to predict CVD outcome without use of SPECT MPI in [low risk patients](#). In 2011, Bourque and colleagues from the University of Virginia, Charlottesville, reported that patients who exercise at >10 metabolic equivalents (METs), [the unit used to estimate the amount of oxygen used by the body during physical activity] during stress testing had a very low prevalence of significant ischemia and very low rates of cardiac events during follow-up².

The advantage of exercise treadmill testing is that it offers a quicker study that involves no radiation exposure, with prognostic information provided via a variety of treadmill scores, most notably the Duke Treadmill score. "This has led to investigators questioning the added value of SPECT MPI over exercise testing alone. There's growing recognition that patients need to be treated as individuals and that those in whom the CVD risks are considered negligible shouldn't be undergoing the risks of radiation exposure," said Duvall.

In the current abstract, Henzlova, Duvall and colleagues, from the Mount Sinai School of Medicine, New York, US, set out to investigate retrospectively if a provisional injection protocol in which patients where they met certain criteria were converted to exercise treadmill tests without imaging maintained diagnostic accuracy and prognostic ability. For the retrospective study, data was reviewed from a total of 24,689 patients who had undergone SPECT MPI between February 2004 and June 2010. After exclusion of patients older than 65 years of age, who had known CAD and uninterruptable resting ECGs, 5,352 subjects were identified for analysis.

Subjects were divided into those who would have met all the criteria for not undergoing SPECT MPI (the No injection group n= 1,561 [29.2%]) and those who met the criteria for undergoing SPECT MPI (the Yes injection group, n=3,791, [70.8%]). For the study the criteria laid down for patients considered eligible for not undergoing SPECT MPI included achieving a maximal predicted heart rate $>85\%$, > 10 METs of exercise, no symptoms of chest pain or significant shortness of breath during stress, and no ECG changes (ST depression or arrhythmia). Outcomes for the two groups at five years were then compared based on their actual myocardial perfusion imaging results and all-cause mortality that had been retrospectively identified from the National Death Index.

At a mean follow-up of 60.6 months, 1.1% of patients had died in the No-injection cohort compared to 2.2% Yes injection cohort (P=.01). Furthermore perfusion results were abnormal in 5.9% of the No injection group compared to 14.4% in the Yes injection group (P10 METS on exercise stress testing: was SPECT imaging useful? J Nucl Cardiol 2011, 2 230-7.

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