

Myocardial Perfusion Imaging: Always Evolving

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Editorial referring to the article: Prognostic Value of Myocardial Perfusion Scintigraphy with IQ-SPECT Technology in Patients with Suspected or Known Coronary Artery Disease

Myocardial perfusion assessed by nuclear medicine began to be used in clinical practice in the 1970s with the radiotracer 201-thallium chloride in two-dimensional images.¹

Advances in the development of equipment, from the possibility of three-dimensional images by single-photon emission computed tomography (SPECT), and new tracers, such as those linked to 99-technetium, have allowed the consolidation of nuclear cardiology as a non-invasive tool with high diagnostic accuracy in the context of coronary artery disease.²

Over time, various prognostic and impactful patient management information has been added to the study of myocardial perfusion, such as myocardial ischemia burden, left ventricular ejection fraction,³ and transient dilation of the left ventricular cavity on post-stress images.⁴

The advent of positron emission tomography (PET), with superior spatial and temporal resolution, paved the way for analysis of myocardial metabolism and evaluation of coronary flow reserve.⁵ The latter can also be estimated by SPECT using cameras with cadmium, zinc, and tellurium (CZT) detectors, representing a relevant alternative in locations where PET myocardial perfusion radiotracers are not available.⁶

Nuclear cardiology continues to advance, and one of its concerns in this process is to offer imaging methods that, in addition to better diagnostic and prognostic performance, can provide less radiation exposure and greater patient comfort. In this context, the IQ SPECT methodology uses a collimator with a specific geometry that increases the sensitivity of radiation detection from the heart by up to four times compared to conventional scintigraphy equipment. Another technological gain that can be associated is computed tomography-based attenuation correction (CTAC) in hybrid scintigraphy with computed tomography (SPECT-CT) devices, which reduces attenuation artifacts, making the addition of prone position acquisitions

unnecessary. In this way, it is possible to significantly reduce the examination time and also the dose of radioactive material used.⁷

All technological innovations require validation, practical testing, and accumulated experience to be properly incorporated. An important question is whether IQ SPECT is able to reduce acquisition time and radiation exposure without compromising image quality while preserving the predictive value of myocardial perfusion scintigraphy.

Previous studies have shown that it is possible to reduce the dose of radioactive material by 75% or the imaging time to 25% of the standard while maintaining the same quality of interpretation and detection of myocardial ischemia.⁸

The retrospective study “Prognostic Value of Myocardial Perfusion Scintigraphy with IQ-SPECT Technology in Patients with Suspected or Known Coronary Artery Disease”⁹ showed that myocardial perfusion scintigraphy performed using IQ SPECT with CTAC methodology and considered normal was associated with a low rate of hard events (death and non-fatal myocardial infarction) over a follow-up of almost 3 years, even considering a population with a significant prevalence of known coronary artery disease or risk factors. This finding is consistent with several past publications using different radiotracers and technologies that have historically demonstrated the prognostic impact of myocardial perfusion scintigraphy.¹⁰

On the other hand, abnormal examination was associated with a higher risk of cardiovascular events, mainly considering the rate of combined events, which included myocardial revascularization. Also, the presence of left ventricular dysfunction, with ejection fraction $\leq 45\%$ measured by gated SPECT, was the independent prognostic variable for hard events. Again, these observations are consistent with the literature, both in relation to previous techniques and cameras with CZT.^{6, 10}

Despite the study's limitations, such as its retrospective nature and the low rate of events, its value lies in being a real-world assessment using a particular technology in a sample of patients, and the results are consistent with a vast body of established evidence.

Thus, although further research is needed, IQ SPECT with CTAC appears to be a technique that allows for reduced radiation exposure and shorter examination time, with greater patient comfort, while maintaining the known prognostic value of myocardial perfusion scintigraphy, with the knowledge that patients with normal test results have a low rate of coronary events.

Keywords

Myocardial Perfusion Imaging; Single Photon Emission Computed Tomography; Predictive Value of Tests; Coronary Artery Disease.

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References

1. Lebowitz E, Greene MW, Fairchild R, Bradley-Moore PR, Atkins HL, Ansari AN, et al. Thallium-201 for Medical Use. I. J Nucl Med. 1975;16(2):151-5.
2. Medical Advisory Secretariat. Single Photon Emission Computed Tomography for the Diagnosis of Coronary Artery Disease: An Evidence-Based Analysis. Ont Health Technol Assess Ser. 2010;10(8):1-64.
3. Rozanski A, Miller RJH, Gransar H, Han D, Slomka P, Dey D, et al. Benefit of Early Revascularization Based on Inducible Ischemia and Left Ventricular Ejection Fraction. J Am Coll Cardiol. 2022;80(3):202-15. doi: 10.1016/j.jacc.2022.04.052.
4. Miller RJH, Hu LH, Gransar H, Betancur J, Eisenberg E, Otaki Y, et al. Transient Ischaemic Dilation and Post-Stress Wall Motion Abnormality Increase Risk in Patients with Less Than Moderate Ischaemia: Analysis of the REFINE SPECT Registry. Eur Heart J Cardiovasc Imaging. 2020;21(5):567-575. doi: 10.1093/ehjci/jez172.
5. Johnson NP, Gould KL. Integrating Noninvasive Absolute Flow, Coronary Flow Reserve, and Ischemic Thresholds Into a Comprehensive Map of Physiological Severity. JACC Cardiovasc Imaging. 2012;5(4):430-40. doi: 10.1016/j.jcmg.2011.12.014.
6. Liga R, Neglia D, Kusch A, Favilli B, Giorgetti A, Gimelli A. Prognostic Role of Dynamic CZT Imaging in CAD Patients: Interaction between Absolute Flow and CAD Burden. JACC Cardiovasc Imaging. 2022;15(3):540-42. doi: 10.1016/j.jcmg.2021.09.030.
7. Nakajima K, Okuda K, Momose M, Matsuo S, Kondo C, Sarai M, et al. IQ-SPECT Technology and its Clinical Applications Using Multicenter Normal Databases. Ann Nucl Med. 2017;31(9):649-59. doi: 10.1007/s12149-017-1210-3.
8. Caobelli F, Pizzocaro C, Paghera B, Guerra UP. Evaluation of Patients with Coronary Artery Disease. IQ-SPECT Protocol in Myocardial Perfusion Imaging: Preliminary Results. Nuklearmedizin. 2013;52(5):178-85. doi: 10.3413/Nukmed-0570-13-03.
9. Rezende MF, Yahiro DS, Fernandes FA, Azevedo J, Mesquita CT. Prognostic Value of Myocardial Perfusion Scintigraphy with IQ-SPECT technology in patients suspected or known Coronary Artery Disease. International Journal of Cardiovascular Sciences. Int J Cardiovasc Sci. 2026; 39:e20240202. doi: 10.36660/ijcs.20240202
10. Shaw LJ, Iskandrian AE. Prognostic Value of Gated Myocardial Perfusion SPECT. J Nucl Cardiol. 2004;11(2):171-85. doi: 10.1016/j.nuclcard.2003.12.004.



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