How low can we go?

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This editorial refers to the article published by Ramon *et al* titled “Evaluation of the effect of reducing administered activity on assessment of function in cardiac gated SPECT” in XX edition of the Journal of Nuclear Cardiology.

For approximately fifteen years, nuclear cardiology has slowly been implementing software to allow for lower administered myocardial perfusion tracer activity.¹ More recently, solid-state cameras have also become available allowing the same. The combination of hardware and software has further pushed the dosing limits.² In 2016, the American Society of Nuclear Cardiology published updated guidelines for *SPECT; Stress, Protocols and Tracers*, which updated dosing guidelines to align with novel hardware and software. Still, it seems with the current tools, many in the field have questioned if doses can be reduced to a fraction of standard doses without compromising the diagnostic accuracy of the procedures. Potentially, all of the tools, including hardware, software and supportive guidelines are available. It has previously been shown that it is possible to allow imaging with a quarter of the historical dose while maintaining the diagnostic accuracy for perfusion defect detection.³ It is reasonable to hypothesize that reducing doses might compromise diagnostic accuracy for cardiac function sooner than perfusion defect detection since the total acquired counts are divided into either eight or sixteen frames per cardiac cycle. The publication

provides evidence that utilizing doses reduced to 25% of standard doses also does not compromise the diagnostic accuracy of cardiac function.⁴

Although the hardware and software are available to allow significant myocardial perfusion tracer dose reductions, nuclear cardiology laboratories need to proceed with caution. There is a significant learning curve associated with acquisition, processing and interpretation when utilizing these tools. Conventional A-SPECT cameras have relatively large fields of view allowing for flexibility in positioning myocardial perfusion imaging studies. Being slightly off-center does not have a detrimental effect on images. Positioning of the heart on solid-state systems is critical.^{5,6} When positioned slightly off-center, artifacts that mimic perfusion abnormalities will likely occur. Technologists are generally very comfortable with standard processing utilizing filtered back projection and basic iterative reconstruction. Most technologists are less familiar with the pitfalls associated with incorporation of resolution recovery algorithms or attenuation correction into processing. Labs must proceed with increased caution with reducing administered activity when performing 16-frame gated SPECT acquisitions as opposed to 8-frame/cycle acquisitions as there are only half as many counts/frame.

Average body mass indices the study subjects range from normal to slightly overweight. Reducing doses by 75% or potentially 50% may be detrimental to the image quality of obese patients. Although body mass index is a better patient measure than weight alone, considering chest circumference in a reduced dosing algorithm may be of further benefit.

Interpretation of procedures performed with newer technology including acquisitions with solid-state cameras and processing with resolution recovery algorithms is quite different from those acquired with A-SPECT cameras with standard processing. Discerning true

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perfusion abnormalities from artifacts, and the thresholds of both sensitivity and specificity are quite different.

The tools exist. The education on the best practices for acquisition, processing and interpretation of myocardial perfusion imaging procedures performed using novel technology is available. However, both physicians and technologists transitioning to newer technology must take advantage of the proper training to assure that diagnostic accuracy for both perfusion defect detection and cardiac function are not compromised.

Disclosures

Mr. Pagnanelli has received Consultant fees as well as honorarium for The Speakers Bureau of Astellas Inc. Dr. Borges-Neto has received Grants from Ge Health. He is part of the Speakers bureau of AAA but has not received any honorarium up to this date.

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