COMPARISON OF IMAGE QUALITY, MYOCARDIAL PERFUSION, AND LEFT VENTRICULAR FUNCTION BETWEEN ULTRA-LOW-DOSE IMAGING USING A HIGH-EFFICIENCY SOLID-STATE SPECT CAMERA AND STANDARD LOW-DOSE IMAGING USING AN ANGER SPECT CAMERA: RESULTS FROM THE MULTICENTER NUCLEAR LOW-DOSE IMAGING AT A MILLISIEVERT (MILLISIEVERT) STUDY

Oral Contributions
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Background: SPECT myocardial perfusion imaging (MPI) plays a central role in diagnosis of patients with established or suspected coronary disease; however, the degree to which its radiation dose can be reduced has not been studied. Compared to standard Anger SPECT (A-SPECT) cameras, new high-efficiency cameras with multiple solid-state cadmium-zinc-telluride detectors (CZT) offer potential to maintain image quality, while reducing administered activity and thus radiation dose to patients. However, no previous study has compared image quality (IQ), interpretation, or ejection fraction (EF) in patients who received both ultra-low-dose (ULD) imaging on a CZT camera and standard low-dose (SLD) imaging on an A-SPECT camera.

Methods: 101 patients at 3 sites scheduled to undergo clinical A-SPECT MPI using a same day rest/stress Tc-99m protocol received divided administration of the rest injection. ~3.5 mCi were administered, followed in 45m by rest ULD imaging using a D-SPECT (Spectrum Dynamics) CZT camera. The remainder of the planned rest dose was then administered, followed in 45m by SLD A-SPECT rest images. All imaging was supine. Images were scored visually by 2 blinded readers for IQ (1 uninterpretable to 5 excellent), extracardiac activity (0 None to 4 Severe), and summed rest score SRS. Total perfusion defect (TPD; % of myocardium) and EF were assessed quantitatively. Continuous variables were compared using paired t-tests or correlated using Pearson's correlation coefficient r.

Results: 46 patients (46%) were women, mean age was 64 years, mean body mass index was 26.1, and 46 patients had prior history of myocardial infarction. Mean injected activity was 3.61 mCi for ULD CZT (effective dose 1.2 mSv) and 8.08 mCi (2.7 mSv) for SLD A-SPECT. Mean IQ was superior for ULD CZT images (4.29 vs 3.88, p=0.0001). Extracardiac activity was similar (0.79 for CZT vs 0.98, p=0.06). Mean TPD was 5.30% for SLD A-SPECT and 4.55% for ULD CZT (p=0.02). SRS was highly correlated (r=0.87, p<0.0001), as was EF (r =0.81, p<0.0001).

Conclusions: ULD CZT rest imaging correlates highly with SLD A-SPECT. It has improved image quality and comparable extracardiac activity, while achieving a radiation dose reduction of 55% to 1 mSv.