Radiation Dosimetry for Myocardial Perfusion Imaging Protocols in Current Practice: Mechanisms to Meet Exposure Limits

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Abstract:
Background: In 2010, the American Society of Nuclear Cardiology recommended radiation dose reduction techniques, which if implemented correctly will result in quality myocardial perfusion imaging (MPI) at the lowest possible effective dose. Current dosing patterns and their relationship to the 20 mSv annual occupational limit are unknown. The study’s aim was to discover protocol frequency with associated dosimetry and propose methods to meet exposure limits.

Methods: 2992 reports from 612 facilities applying for Intersocietal Accreditation Commission accreditation were evaluated. Imaging protocols utilized included one-day technetium (Tc-1d), two-day technetium (Tc-2d), dual isotope (DI), thallium (Tl) and stress only (S).

Results: 82% utilized Tc-1d, 7.4% Tc-2d, 8.6% DI, 1.5% Tl and 0.5% S protocols. The mean dose was: Tc-1d 12.9 mSv, Tc-2d 16.9 mSv, DI 32.6 mSv, Tl 24.5 mSv and S 8.4 mSv. 10.8% of administered doses resulted in >20 mSv of radiation dose (see figure for dose distributions). The mean dose for all studies was 15.1 mSv. If all DI protocols were replaced with lower dose options, the total mean population exposure would be 13.6 mSv with only 2.2% being >20 mSv (p<0.0001).

Conclusions: Despite increased radiation dose, DI protocols continue to be utilized. Elimination of highest radiation dose DI protocols would substantially improve the safety profile of patients undergoing MPI.

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