

MINIMIZING RADIATION EXPOSURE

FROM MYOCARDIAL PERFUSION IMAGING

ASNC 2017 Choosing Wisely Challenge

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Disclosure Information



No disclosures or conflicts of interest.

Introduction

- ❖ In 2010 ASNC recommended that 50% of Myocardial Perfusion Imaging [MPI] should be accomplished with an effective dose of 9 mSv or less by 2014.
- ❖ A study in JACC, October 2015, concluded that only 1.5% of participating imaging centers met the guidelines.
- ❖ Aurora Cardiovascular Services has initiated protocols to exceed the guideline, resulting in >90% of MPI studies accomplished with 9 mSv or less.

Proposed solution - Part I

Pre-screen patients 2 weeks prior to testing using several criteria to select among four possible protocols for MPI.

- ❖ Pre-test likelihood of CAD
- ❖ BMI
- ❖ Results of prior imaging
- ❖ Need for information about exercise capacity
- ❖ Caffeine/medication status for urgent cases
- ❖ Third party coverage considerations

Proposed solution - Part II

- ❖ Use of half-time software as half-dose software
- ❖ Weight-based dosing
- ❖ Use of CT attenuation correction
- ❖ Choosing the most appropriate of four MPI protocols



Protocol A - Rest and pharmacologic PET MPI with coronary blood flow

- ❖ Weight based doses - 9 MBq/kg of Rb-82;
- ❖ Average effective dose for rest/pharm stress study is 2.46 mSv.
- ❖ Additional information (coronary blood flow values) are useful and cannot be obtained with traditional SPECT MPI.
- ❖ Exposure to staff has also been reduced.

Protocol B - Stress first (potential stress only) same-day SPECT MPI

- ❖ Use of Tc99m based imaging agents
- ❖ Perform stress imaging first, using 10 mCi
- ❖ 30 mCi resting dose given if needed as determined by an interpreting physician
 - If stress only, average effective dose is 2.9 mSv
 - If rest is needed, average effective dose is 12.9 mSv

Protocol C - Stress first (potential stress only) SPECT MPI 2-day study

- ❖ Use of Tc99-m based imaging agents
- ❖ Perform stress imaging first, using BMI-based doses of 10-20 mCi
- ❖ Interpreting physician determines if resting scan is needed
 - If stress only, average effective dose is 3.8 mSv
 - If resting is needed, average effective dose is 8.5 mSv

Protocol D - Traditional rest/stress same-day SPECT MPI

- ❖ Use of Tc99m based imaging agents
- ❖ Performed using weight (BMI) -based dosing
- ❖ Maximum weight limits for this protocol: 200# female, 250# male

Patient Size Category	Resting dose (mCi)	Stress Dose (mCi)	Estimated average total effective dose mSv
Small (BMI <25)	6.5	19.5	7.9
Medium (BMI 25-29)	7.0	21.0	8.5
Large (BMI 30-34)	7.5	22.5	9.0
Extra-large (BMI >35)	8.0	24.0	9.7

Outcome measure/results: 3807 out of 4181 (91 %) of patients were imaged with 9 mSv or less estimated total effective dose.

Protocol	Description	N (4181)	% of total studies	Estimated average total effective dose mSv
A	Stress/rest PET	1286	30.8	2.5
B1	Stress only same-day nuclear	419	10.0	2.9
B2	Stress/rest same-day nuclear	252	6.0	12.9
C1	Stress only two-day nuclear	177	4.2	3.8
C2	Stress/rest two-day nuclear	195	4.7	8.5
D*	Rest/stress same-day nuclear	1852	44.3	7.9 - 9.7

Interesting/surprising findings

- ❖ 44% of studies use traditional rest/stress same-day protocol
- ❖ 11% of studies are stress/rest
- ❖ 14% of studies are stress only
- ❖ 31% of MPI is accomplished using PET



Roadblocks/barriers to implementation of dose reduction strategies

- ❖ Obtaining and financially supporting a PET scanner/Rb generator
- ❖ Educating referring physicians about the advantages of PET MPI
- ❖ Obtaining prior-authorization for PET MPI can be challenging
- ❖ Multiple imaging protocols complicate lab logistics
- ❖ Assessing the need for resting images for SPECT MPI cases can cause additional time for patients

Impact on the field of nuclear cardiology - scalability

- ❖ Challenging the field of nuclear cardiology to adopt strategies to lower radiation exposure is consistent with our vision to provide the best patient care in the best setting in the most economical manner to provide the best value.
- ❖ We believe that informed discussions with patients instill a sense of trust. Patients are likely to be apprehensive about testing which is heightened with regards to nuclear imaging. We can involve each patient in making a choice to limit their medical radiation exposure and potentially save them money.
- ❖ We have proven that our lab can exceed the ASNC recommendations. The nuclear imaging community has many of the resources necessary to adjust protocols. The difficult part is investing the effort to optimize patient care.

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