The radiation reduction methods in imaging need more attention

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The use of imaging in cardiology has been rapidly growing during recent years. New techniques such as computed tomography have been introduced, but also the use of more established techniques such as nuclear myocardial perfusion imaging (MPI) and cardiac magnetic resonance imaging has been growing globally.

The potential risks of imaging have recently been actively discussed. These risks include the imaging procedures themselves, the stressors used, the contrast agents, and the ionizing radiation. Although the use of more non-invasive methods is probably increasing patient safety, concerns due to other risks have been raised.

One of the risk components is that related to ionizing radiation. In many situations such as in the elderly or in patients with low life expectancy, the risk of radiation is exceedingly small and radiation is not the main issue when an imaging test is selected. Although the risk of radiation caused by imaging may be considered similar to many other risks of imaging and normal life activities, much less than those of the disease itself, it cannot be disregarded.

According to the ALARA principle (as low as reasonably achievable), all meaningful opportunities to reduce the risk due to radiation should be taken. Consequently, numerous recommendations and methods to minimize the radiation dose for patients have been published.

In the present issue of the journal, an expert team jointly with the International Atomic Energy Agency (IAEA) have published a study about how radiation reduction strategies are used globally in MPI. The team conducted a survey in centres performing MPI in all continents. Nuclear cardiology laboratories and practitioners were contacted and information about their practice over a 1-week period in Spring 2013 were collected.

The survey provided interesting data. While the global mean radiation dose was in the range that has been published many times previously (10.0 ± 4.5 mSv), the variability of doses between the centres was huge (range 2.2–24.4 mSv). There were also clear differences in radiation doses between geographical regions. Europe had the lowest doses, while Latin America, North America, and Asia had the highest doses. The doses from African centres were also in the lowest range but the data were from a small number of sites, which, however, may well reflect the current situation in that continent.

Interestingly, but maybe not surprisingly, the radiation doses were inversely related to the adherence to best practices in reducing radiation (defined prior to survey). The best practices were evaluated on the basis of how the centres utilized the simple techniques that are effective in reducing radiation dose without compromising the diagnostic value of the test. If all eight methods were in use, the maximum score of 8 was given. The global median score was a decent 5, but the variability was large. An important finding was that the World Bank income level and laboratory volume were not associated with the score.

This kind of survey is naturally not without limitations. One of the main limitations is that it is not known whether laboratories are representative of all nuclear cardiology laboratories worldwide and it was not possible to estimate what percentage of all existing centres participated. Respondents may represent a subset of laboratories with a better best practice use. Also the survey focused only on radiation dose optimization; the image quality was not assessed and the appropriateness of the examinations was not studied.

Despite these limitations, the message of the survey became clear: the radiation reduction methods are far from fully exploited. Although Europe was among the highest in adherence to best practices and lowest in radiation doses, one cannot be satisfied with the situation. The European sites complied poorly with some very simple methods to reduce radiation doses. The use of stress-only imaging was reported in only 46% sites and weight-based dosing for technetium in 47% of sites. Europe’s advantage came mainly from the fact that other regions more often used thallium and unnecessarily high doses of tracer.
The phenomenon is not specific to nuclear cardiology. Huge variability of radiation dose due to computed tomography angiography has been detected. This may reflect the general phenomenon that the adherence to safety issues appears not to be the highest priority, while the test performance has gained a lot of attention.

As the authors summarized, this survey demonstrated that only a minority of laboratories of worldwide nuclear cardiology practices achieved targeted radiation dose levels. Since patients undergoing procedures at laboratories adhering to best practice receive significantly lower radiation doses without compromising the test quality, these simple practices that cost nothing should be made a requirement for all laboratories.

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References


