

Dose issue in Nuclear Medicine & Hybrid Imaging

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Nuclear medicine imaging techniques and hybrid imaging devices (like SPECT/CT and PET/CT) are key elements of medical imaging today. The combination of a nuclear medicine imaging technique and an anatomical imaging modality, in particular, has been demonstrated to provide clinical value in patients with a range of benign and malignant diseases.

Imaging techniques like CT and nuclear medicine methods are based on the use of ionizing radiation. In the case of CT, an X-ray transmission source rotates around the patient while a detector array on the opposite site of the patient acquires the range of photons transmitted through the body of the patient. In nuclear medicine examinations, patients are injected with a given amount of a radiotracer, a biomolecule labeled with a radioactive isotope, specific to the purpose of the functional, nuclear medicine examination. The emitted radiation from inside the patient can be measured, and from this data, the tracer distribution can be reconstructed.

In both, CT and nuclear medicine examinations, radiation energy is deposited in the body of the patients by the fractions of photons absorbed within the body tissues and by scattered photons. In combined imaging, patient exposure results from the added contributions from both CT and nuclear medicine examination.

Exposure to ionizing radiation in a quantity as used in medical imaging bears the risk of stochastic effects like radiation induced cancer. Thus, these risks need to be taken into account when performing an examination and the rationale for a radiation exposure should be based on the ALARA (as low as reasonably achievable) principle.