

Additional dosimetry while using techniques of hybrid SPECT-CT acquisition during a bone scan

Background: Nuclear medicine has experienced real success over the past and has brought new perspectives, mainly in the treatment of cancers.)

In bone disease, Single photon computed tomography associated to computed tomography (SPECT-CT) combined with conventional scintigraphy makes possible, in a single examination, a whole body exam and CT scan centered on a suspicious bone foci, thereby improving the diagnostic accuracy of planar scintigraphy. However, the additional radiation dose from X-ray CT, is now the subject of numerous public and technical discussions.

Aim: We proposed to evaluate for patients and workers, doses of radiation delivered during a SPECT-CT bone scan.

Methods: On our nuclear medicine department, equipped with 02 SPECT-CT, additional SPECT-CT was performed for 200 patients with indeterminate foci on bone scintigraphy. For these patients, we estimated effective doses received and analyzed the parameters involved in the variation of doses. The estimated total effective dose following a bone scan, was calculated by multiplying the average activity administered (between 555 and 740MBq) for each patient by the “effective dose per unit activity administered” conversion factors listed in the International Commission on Radiological Protection (ICRP) publication 53 and 80. The effective dose for a CT scan was appreciated from the product of the dose length (DLP) and a conversion factor specific body region, k (mSv mGy⁻¹ cm⁻¹), which take into account the change in biological sensitivities of different organs.

Concerning the workers under radiation (technicians and physicians), we compared for the same persons values of doses (mSv) recorded by the TLD dosimeters before the installation of the SPECT-CT machines with those recorded after the arrival of the 02 machines in the department.

Results: In fused imaging (SPECT-CT), we noted a significant increase in dose delivered to the patient. Effective dose was estimated on mSv between 3,16 –4,22. It was depended on the administered activity and patient age; while for CT scan, it depends on: tube current, tube potential, the speed of rotation of the cutting thickness, patient weight.

Regarding radiation workers (technicians and physicians) to reduce the radiation dose, appropriate protective clothing (lead apron, thyroid collars and lead goggles) should be worn for personnel inside the scan room] and staff should stay away from the scanner as much as possible, as the dose decreases as the square of the distance from the x-ray source.

Conclusion: Keeping radiation dose as low as reasonably achievable (ALARA) is the guiding principle for a medically indicated CT examination. Many techniques and strategies are available for radiation dose reduction. During a SPECT-CT examination following an inconclusive bone scan, the additional dose delivered by a CT scan is justified because of the direct benefit to the patient.

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