Dose absorption and protocol optimisation in PET-CT clinical practice

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During the last years, the use of multi-modality imaging instruments in the nuclear medicine department has increased significantly. Using CT in PET/CT enables both anatomical and functional images to be collected in a single imaging session. Unfortunately, CT acquisitions are mostly associated with a considerable patient radiation dose and, therefore, require appropriate justification[1-4]. Being the operator of PET/CT instruments, the technologist should be aware of the basic parameters that are influencing the patient dose during these multi-modality acquisitions. In fact, the technologist can play an important role in patient dose optimization, in collaboration with the medical physicist and the nuclear medicine physician.

Patient CT doses depend on the selected scan protocol and the anatomical region being scanned. Using (non-optimized) diagnostic exposure factors, effective doses for whole body CT in PET/CT examinations may amount up to 25 mSv[2-4]. As a result, the CT scan constitutes a significant additional radiation dose, compared to the dose attributed to the use of the radiopharmaceutical.

There is a strong need to optimize these diagnostic CT protocols by adjusting scan parameters such as tube current, pitch, tube voltage, collimation, slice thickness, etc.[5] Optimization should be performed according to the level of quality needed to perform a specific diagnostic task[1,4]. Further dose reductions can be obtained by the implementation of dedicated dose-reduction tools which become more and more available on PET/CT systems[2,3,5]. Doing so, effective radiation doses from diagnostic whole-body CT scans can be reduced down to about 7 mSv[3].

In most situations, the CT part of the scan does not need to be of diagnostic quality, as the CT images are only being used for localization of lesions or to generate attenuation maps. In the latter cases, CT exposure factors should be adjusted to significant lower values. Effective doses down to 1 mSv are reported in literature for whole-body low-dose CT protocols[2].

References

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