

Evaluation of impact of injected activity of ^{18}F -FDG on the PET image quality

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Positron emission tomography (PET) is a modern radionuclide method of medical imaging which allows to quantitative estimate of radiopharmaceuticals distribution in vivo. PET is based on the injection of radiopharmaceuticals labeled with ultrashort-lived positron-emitted radionuclides.

Image quality in PET depends on physical characteristics of radionuclide, technique parameters of scanner, acquisition protocol and reconstruction algorithm. Injected activity is one of the main examination parameters. It should guarantee good image quality and provide low patient dose. In order to determine the optimal activity of radiopharmaceutical, several factors should be considered: patient related factors (weight, body mass), and scanner related factors (detector material, acquisition mode, acquisition time per bed) [1].

Quality control (QC) of PET images of the patients could be based on the quantitative parameters [2] or image evaluation by the expert. The aim of this study was to perform QC of the PET images of the patients obtained with different PET injected activity.

The study was based on the different PET/CT units with different practice and protocol parameters. Fifteen series of PET images of the patients were collected from three PET/CT scanners (Siemens Biograph mCT 128). All patients underwent PET/CT study with ^{18}F -FDG. Injected activity of ^{18}F -FDG was 100 MBq per body surface area (BSA) on 1st scanner (2.5 min per bed); 110 MBq per BSA on 2nd scanner (2.3 min); 130 MBq per BSA on 3rd scanner (1 min). For all scanners the distributions of patient BSA were the same (Kruskal-Wallis: $p=0.5$).

Both methods demonstrated the same quality level for each PET/CT scanner. It means that decrease of injected activity in general and increase time per bed lead to reduce patient dose without loss of image quality. At the same time, increase of injected activity and decrease of time per bed lead to comparable quality.

In that case, in process of optimization of PET examination protocols it is necessary to consider relations between examination parameters.

1. IAEA. Standard Operating Procedures for PET/CT: A Practical Approach for Use in Adult Oncology (2013)
2. A.V. Petryakova, L.A. Chipiga, A.A. Ivanova, M.S. Tlostanova, A.A. Stanzhevsky, G.M. Mitusova. Comparison of Image Quality Control Methods in Positron Emission Tomography, Med. Phys, 62-73, 88 (2020)

The speaker is a student or young scientist

Yes

Section

1. Nuclear technology and methods in medicine, radioecology

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