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Chapter 1 : Radioprotection Cirkus - Publications ICRP et ICRU

ICRP Publication ICRP Statement on Tissue Reactions / Early and Late Effects of Radiation in Normal Tissues and Organs - Threshold Doses for Tissue Reactions in a Radiation Protection Context.

Mishra Find articles by Anil K. Dwarakanath Find articles by Bilikere S. This article has been cited by other articles in PMC. Dynamic PET scans in different regions of the body were performed in 49 patients so as to measure percentage uptake of 18FDG in brain, liver, spleen, adrenals, kidneys and stomach. As per the clinical protocol, the patients were refrained from eating and drinking for a minimum period of 4 h prior to the study. The estimated residence time in males was 0. The effective dose was found to be 0. The present results did not demonstrate significant difference in the kinetics of 18FDG distribution in male and female patients. Due to this fact, it is a challenging area of radiation safety in diagnostic radiation medicine 3. Amongst all the radiopharmaceuticals developed so far for PET imaging, 18F-fluorodeoxyglucose 18FDG has widespread application and is most commonly used. Although several dose estimates in humans have been reported from internal administration of 18FDG, most of these are based on the bio-distribution studies in animals 6 , 7 , 8 , 9 or by combining data from animals and measurements in humans 10 , 11 , 12 , 13 , 14 , 15 , Kinetics of 18FDG distribution has also been reported using segmented dynamic PET scan protocols, whole body PET scans at different time intervals or using thermoluminescent dosimeters TLD 17 , 18 , 19 , 20 , 21 , 22 , The study protocol was approved by the Ethical Committee of the Institute and the study was carried out after obtaining written informed consent of the patients. A couple of studies have reported effective dose from CT component using softwares like WinDose and internal dose from 18FDG by using medical internal radiation dose MIRD method either by using established biokinetic models or by obtaining kinetics of 18FDG distribution using dynamic PET protocols 18 , Subjects - A total of 49 patients 27 male, 22 female were included in this study. The mean age of male patients was The patients were oncological cases in remission who could comfortably lie down on the couch for the study period of 75 min without movement. As per the clinical protocol, the patients were refrained from eating and drinking for a minimum period of 4 h prior to their studies. It operates in 2D as well as 3D mode. For the present study, the data were acquired in 3D mode. A radioactive pin source of 68Ge PET protocol involving dynamic acquisition of temporal images was used. Dynamic PET images were acquired in three different regions of the body for 75 min at five min per frame so as to study variation in 18FDG activity with respect to time in six organs namely brain, liver, spleen, adrenals, kidneys and stomach. The images were reconstructed using a fully 3D ordered subset expectation maximization 3D-OSEM algorithm with all corrections scatter, random, dead time, attenuation and normalization incorporated into the iterative reconstruction scheme. The data were not decay corrected. Since the axial field of view AFOV of the PET scanner was only 15 cm, it was not possible to obtain uptake in all the six organs simultaneously. The study was divided into three sets of patients in which only brain; liver, spleen and adrenals together and kidneys and stomach together were studied. The characteristics of the male and female patients on whom dynamic PET scans were performed are described in Table I. Table I Open in a separate window Description of measurements - Regions of interest ROI were drawn around the source organs for all planes that contained them. The volume of the source organs was estimated by using CT volume rendering technique. The total uptake of radioactivity in Bq was obtained by multiplying this with the estimated volume of the organs for each subject. Time activity curves were produced for entire organ volumes. To obtain cumulated activity in the source organs, time activity curves were integrated using the trapezoidal rule 18 , Analytical integration was performed on this single exponential decay and then summed with the numerical integration to yield the total cumulated activity in the source organ as follows: The cumulated activity for the remainder of the body was calculated as the difference between the cumulated activity in the total body and the sum of the cumulated activities in the source regions. Assuming instantaneous uptake and an effective half-life of 1. Thus, the cumulated activity for the remainder of the body was: The input parameters required by the OLINDA software for the estimation of the absorbed dose are the type of radionuclide, a phantom or phantoms , and the number of disintegrations per unit administered activity or

residence time. The type of radionuclide chosen for the present study was 18F and the adult male and female phantoms were used for absorbed dose estimation. The residence time calculated as per the methodology described above was used as input for the source organs and remainder of body. The volume of the source organs estimated using CT volume rendering technique was used to estimate the subject specific mass of the source organs by multiplying the measured volume of the source organs of each subject with their respective specific gravities 27 , Since the estimated mass of the source organs and total mass of the subjects differed from the standard phantoms used in the software, the masses were accordingly modified for all the subjects for the purpose of dose estimation. Considering the specific gravity of 1. The relative weight of the brain to total body was estimated to be 2. A time-activity curve depicting the uptake of activity for an adult male and female brain is shown in Fig. The average residence time for males and females brain was estimated to be 0. Based on the physical half-life of 1. This yielded average residence time for the remainder of the body to be 2. The average self dose to the brain of male subjects was 0. The average total dose to brain that includes contribution from remainder of body was 0. Patient characteristics, biokinetic data in brain and the associated radiation dose received by this group of patients is provided in Table II.

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45 Abstract- The use of various technologies to provide security screening for 46 individuals and objects has been rapidly escalating, in keeping with the significant 47 increase in security concerns worldwide.