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Radioprotection in patients undergoing nuclear medicine diagnostic tests based on the actual dose rate offered

Fernandes[a] S.C., Coura-Filho[b,c], G., Sapienza [b,c], M., Buchpiguel[b,c], C., Willegaignon[b,c] J.

[a] Master student, Department of Oncology, Faculty of Medicine; University of São Paulo, São Paulo, Brazil.

[b] Department of Nuclear Medicine, Faculty of Medicine; University of São Paulo, São Paulo, Brazil.

[c] Medical Research Laboratory (LIM-43), Hospital das Clínicas. Faculty of Medicine; University of São Paulo, São Paulo, Brazil.

E-mail: Samantha.fernandes@usp.br

1. INTRODUCTION

Nuclear Medicine makes use of radioactive substances, radiopharmaceuticals, for the diagnosis and therapy of diseases. The radiopharmaceutical is a radioisotope-labeled chemical that has affinity for a particular organ or biological tissue. As the main radioisotopes used in the area we have technetium-99m (^{99m}Tc), fluorine-18 (^{18}F) and iodine-131 (^{131}I)[1]. In all procedures the patient becomes radioactive, exposing everyone to their return to radiation. With the increasing number of procedures, increased exposure of patients, family members and health agents has been observed. Thus, it becomes clear the need to evaluate the exposure potential and the radiological risks offered by radioactive patients to other individuals during the accomplishment of such procedures and after discharge and, if necessary, establish radioprotection care according to the level of radiation issued[2,3].

2. MATERIALS AND METHODS

The present work was carried out with the support of the Coordination of Improvement of Higher Education Personnel - Brazil (CAPES) - Financing Code 001. Obtained approval from the Research Ethics Committee (CAPPesq) under number 16497.

The dose rate of 177 patients was submitted to the 9 main types of tests performed in Nuclear Medicine. The choice of the exams was made according to the representativeness of each exam in the total of exams done by the Sector. The dose rate was recorded with a Geiger-Müller type radiation detector (MIR-7028) at 1 and 2 meters from the patient and approximately 1 meter from the soil. Recording occurred at different times: 1st after the administration of the radiopharmaceutical, 2rd before the patient underwent the scintigraphic examination, pre-micturition and post-micturition, and 3rd after the examination and discharge of the Sector.

3. RESULTS

From the data collected, the level of radiation emitted by patients subject to exposing other individuals was identified. The estimation of the dose rate at discharge of the patient for the procedures of ^{18}F (FDG, oncologic PET), ^{18}F (NaF, PET bone), ^{99m}Tc (MIBI) and ^{99m}Tc (MDP, bone scintigraphy) , 2.55 µSv/h; 2.91 µSv/h; 4.03 µSv/h and 1.47 µSv/h. These results are in agreement with the literature. After data collection and analysis, effective T½ was calculated for each patient to estimate the actual dose given after discharge and within 24 hours. For the ^{18}F (FDG, oncology PET), ^{99m}Tc (MDP, bone scintigraphy) and ^{99m}Tc (MIBI-myocardial scintigraphy) procedures, the estimated doses were, respectively, 1 meter: 21.24 µSv/h; 38.22 µSv/h and 218.28 µSv/h. In 2 meters: 7.08 µSv/h; 12.74 µSv/h and 72.76 µSv/h. ^{18}F has greater potential for exposure than the other elements, but the effective half-life is less than, for example, ^{99m}Tc, figure 1 and 2.

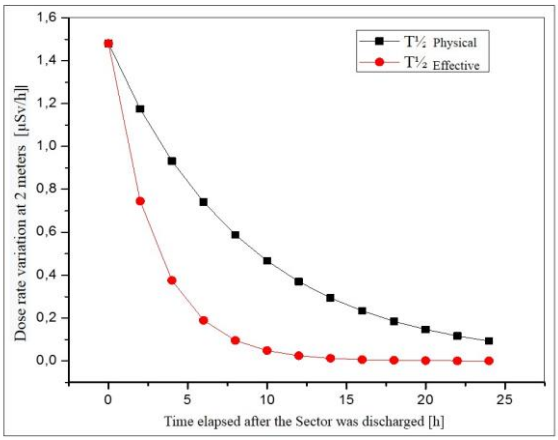

Figure 1. Representation of the elimination of the radiopharmaceutical considering the physical T½ and T½ Effective of the examination Bone Scintigraphy -

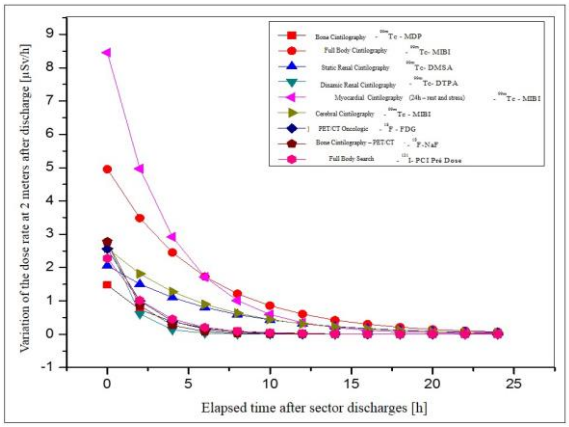

Figure 2. Representation of the score of radiofarmaco considering T½ Effective's Data referring to 2 meters.

4. CONCLUSION

From the data collected up to the present moment, it is possible to verify that the level of radiation emitted by the patient after the examination and release by the Nuclear Medicine Division exempts any radioprotection care with these patients, even considering the worst scenarios. (proximity to pregnant women and children). With the data obtained, it will be possible to estimate the dosimetry of specific organs for each radioisotope considering the effective T½ found and the personal characteristics of each patient.

5. REFERENCES

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