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CALCULATIONS OF SPECIFIC ABSORBED FRACTIONS IN ORGANS OF HUMAN BODY IN NUCLEAR MEDICINE DUE APPLICATION OF ^{81m}Kr

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Abstract

Monte Carlo simulations were performed to assess the dose in the treatment of radiopharmaceuticals ^{81m}Kr. This radiopharmaceutical is used in treatments in nuclear medicine as an indication for cardiovascular and pulmonary diseases. The aim of this paper was to evaluate the specific absorbed fraction (SAF) when this radiopharmaceutical is incorporated in the lungs. For this purpose, we developed a voxel phantom (thorax) and was compared to the ORNL phantom. All calculations and simulations are done using the MCNP5 / X code.

Purpose

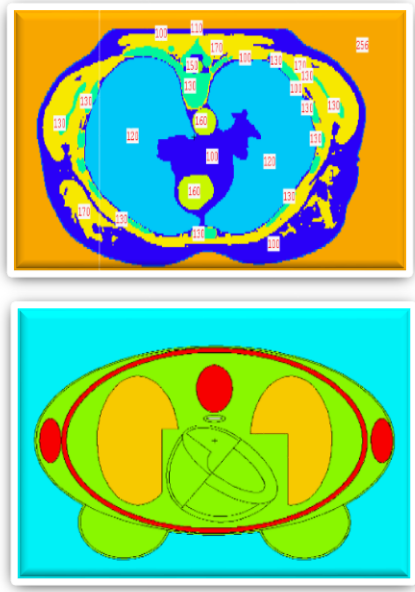
Nuclear medicine uses radioactive isotopes and compounds for diagnosis and therapy. The use of different isotopes depending on the procedure applied to the patient dose distribution. In order to produce the least damage to the patient in therapy and provide good results for diagnostic purposes, the isotope must have a short half-life.

Methods

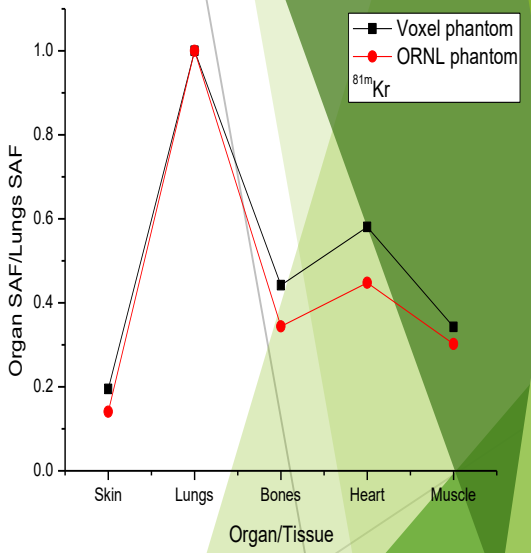
In this paper, two types of phantom were used - ORNL mathematical phantoms and voxel phantom. In order to calculate absorbed doses and SAF, a voxel phantom of the thorax was developed. The construction of voxele phantom depends on the quality of digital images of patients obtained during CT or MRI examination. In this paper, a voxel phantom (Thorax model) was obtained using a DICOM set of 108 CT images of the female patient under approved standard protocols.

Conclusion

The obtained results of the evaluation of specific absorbed fraction (SAF) in different organs / tissues, during the incorporation of ^{81m}Kr in the lungs, are shown during the process in the scintigraphic examination. The difference in the results obtained by the use of the voxel model and the ORNL mathematical phantom model is between 2.43% and 24.3%.



1) Cross section of voxel model and ORNL female phantom



2) Results of organ SAF (kg^{-1}) divided by lungs SAF (kg^{-1}) value for ^{81m}Kr

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