AbstractID: 9634 Title: Dosimetryc study to voxel model applied to carciac procedures in nuclear medicine

Purpose: The objective of this study is to realize a computational dosimetry on a simplified model of miocardic perfusion, considering the usual different ways to describe the spectra emitted for Tc-99m. Method and Materials: The GEANT4 code was used to simulate two geometries: the radial dose distribution from an isotropic point source described by the three spectra, modeled with photon emission from the center of a 1.3-m-diam sphere of muscle tissue; and a second considering an uniform distribution of Tc-99m in the heart muscle of the adult male voxel model MAX, to take the organs dose distribution. The different ways to describe the spectra emitted for Tc-99m was: monoenergetic spectrum of 140 keV; three photons emissions spectrum (2.1, 141 and 143 keV) and total spectrum (including characteristics x-rays and Auger electrons). Results: For distance low than 1 cm from the point source the radial dose distribution is higher for total spectrum. The radiation dose in a sphere with 0.01 mm defined at the center of the sphere of muscle was 0.369 mGy Bq⁻¹ h⁻¹ (total spectrum), 0.276 mGy Bq⁻¹ h⁻¹ (three photon spectrum), and 0.005 mGy Bq⁻¹ h⁻¹ (monoenergetic spectrum). This data shown that include Auger electrons, characteristic x-rays, and low energy gamma give a significant contribution to total energy deposition. This results corroborates the simulations realized using the voxel model. The data variation shown that monoenergetic and three gamma spectra, comparing to total spectra simulated, produce a decrease on absorbed dose on cardiac tissue of 19.2% and 7.1%, respectively. Conclusion: The results shown that the combined transport of electrons Auger and characteristics x-rays of the Tc-99m increase the radiation dose, especially on organs/tissues closer to those have had absorbed the radiopharmaceuticals. This study indicates the importance on describe the complete radiopharmaceuticals spectrum on dosimetric simulations in Nuclear Medicine.