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Specific Absorbed Fraction from Korean Tomographic Phantom for Internally Deposited Photon Source

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Absorbed fraction (AF) and specific absorbed fraction (SAF) are crucial values to the calculation of radionuclide S-values and consequently to internal dose estimates. The formalism of the Medical Internal Radiation Dose (MIRD) committee of the Society of Nuclear Medicine (SNM) has been served as a standard in the calculation of individual organ doses for biologically distributed radionuclides and for different types of radiation. Although those quantities are highly sensitive to individual anatomical difference, the SAF dataset calculated by Caucasian-based stylized phantoms have been applied to Korean population until now. This study was intended to calculate the SAFs by using Korean tomographic phantom and compare the results with those from the existing Caucasian-based data for the first time. The up-to-date realistic Korean tomographic phantom, KTMAN-2, which was developed from computed tomography (CT) images of average Korean adult male, was employed for this study. The SAFs of 32 target organs and tissues for the photon source uniformly deposited in a total of 37 source organs and tissues were calculated from KTMAN-2, which was implemented into Monte Carlo code, EGSnrc coded and compiled for the purpose of this study. The results were compared with those from adult Oak Ridge National Laboratory (ORNL) phantom. When the source organ is identical with the target organ, there was no significant difference in SAF between Korean and Caucasian phantoms. However, when the source and target organs were different, significant difference in SAF was shown, which was mainly attributed to the difference of inter-organ distance and organ shape between the Korean tomographic and ORNL adult phantoms.

Keywords : Specific Absorbed Fraction, Monte Carlo Calculation, Korean