Title: A Skeletal Reference Dosimetry Model for the Adult Female

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Absorbed dose estimates to the skeletal tissues (active bone marrow and endosteum) are an essential feature of risk estimates in both occupational and medical dosimetry. At present, the vast majority of skeletal reference models (SRMs) used for these purposes are based on studies in the late 1960s and early 1970s at the University of Leeds in which a novel optical scanning method was used to obtain linear chord-length distributions across several skeletal sites of a single 44-year male subject. These data form an essential component of the ICRP's SRM published in ICRP Publications 30, 70, and 89. Recently, researchers at the University of Florida's Bone Imaging & Dosimetry Project have developed an image-based skeletal reference model for the adult male at an age representative of cancer patients undergoing radionuclide therapy (66-year). In the present study, initial work on an adult male cancer patient was further developed to add a companion SRM, the adult female cancer patient. A 64-year-old female cadaver was selected having a body-mass index of 22.5 kg m^{-3} and a cause of death presenting a low probability of skeletal deterioration. In-vivo CT images were acquired prior to bone harvesting at 13 skeletal sites, all with high percentages of active bone marrow. Next, high-resolution ex-vivo CT images were acquired from which volumes of both cortical bone and trabecular spongiosa were determined via image segmentation. Finally, physical sections of spongiosa were cut and imaged via microCT. Both sets of images (ex-vivo CT and ex-vivo microCT) were combined under Paired-Image Radiation Transport (PIRT) via methods described previously by Shah et al. (JNM 46:344-353; 2005). Once fully established, skeletal dose estimates from the UF reference female skeletal model may be scaled to individual patients via CT-based measurements of spongiosa volume (adjustments at the macroscopic level) and potentially CT-based measurements of bone mineral density (adjustments at the microscopic level).

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