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PLATFORM PRESENTATION ☐

MRI-Based Japanese Models in Early Childhood

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Recently, there has been increasing concern about the effects of radio-frequency electromagnetic irradiation from wireless communication devices on the health of children. The World Health Organization (WHO) in 2006 placed top priority on dosimetry studies on the effects of radio-frequency electromagnetic field exposure on children. In order to identify safe levels of exposure, we intend to estimate the specific absorption rate (SAR) for children using computer simulations of numerical human models. However, there are few reports of SAR dosimetry with anatomically realistic models in early childhood. Therefore, for accurate dosimetry for children in early childhood, we developed anatomically realistic whole-body models in early childhood. The models are based on whole-body magnetic resonance imaging (MRI) data of healthy volunteers of three-, five- and seven-year-old. The height and weight of these subjects were close to the Japanese average values. It is impossible to segment the voxels in the MR images into tissues or organs with a fully automatic algorithm and achieve sufficient accuracy using today's image-processing technologies. Therefore, semiautomatic approximate segmentation was first performed by identifying the parts that could be classified relatively easily using an image segmentation tool (SliceOmatic ver 4.3; Tomovision Inc., Montreal, Canada). Subsequently, detailed segmentation was manually performed by health professionals; they used in-house PC software for accurate identification of tissues and organs from MR images. In the identification process, the boundaries of the tissues and organs were smoothed in three orthogonal (axial, sagittal, and coronal) planes. Final positioning and shaping of the tissues and organs were performed under the supervision of a pediatric radiologist using three-dimensional visualization software (INTAGE RV; Kubota Graphics Technologies Inc., Tokyo, Japan) and our in-house-developed software. The child models developed are in an upright posture, as if the child is standing on the ground with hands to the sides. Spatial resolutions of the models are equal to or higher than $2 \times 2 \times 2$ mm3. Also, the models are segmented into over 40 different tissues and organs types. In this presentation, we present the anatomical and physiological characteristics of the models and also demonstrate the SAR characteristics with the models.