

MEETING ABSTRACT

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# PET/MR attenuation correction in brain imaging using a continuous bone signal derived from UTE

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In the absence of transmission sources in combined clinical PET/MR systems, MR images are used for MR-based attenuation correction (MRAC). The main challenge in MR-AC is to separate the bone and air, as neither have a signal in the MR images. In the attenuation maps supplied by the vendor, a single value is assigned to bone using an ultra-short echo time (UTE) MR sequence. The purpose of this study was to develop a new multi-class segmentation-based MR-AC method, employing Continuous-Bone-using-R2\* (MRAC\_CBuR2\*), and evaluate it on a large patient cohort. 53 [18F]-FDG PET/MR brain patients were included in this study. MRAC was based on an aligned CT (MRAC\_CT, used as reference), standard MRAC\_UTE and MRAC\_CBuR2\*. Our method segments the air, brain, CSF and soft tissue voxels on the UTE images, and uses a mapping of R2\* values to HU to measure the density in bone voxels. Aligned anatomical masks are used to improve accuracy in noisy regions. Region-based analysis was performed using ICBM 2009a brain atlas with anatomical labels pre-defined. Using CBuR2\*, 82% of the voxels in the brain are within  $\pm 5\%$  of PET\_CT, compared to 27% when using UTE. Using our method, there are clear improvements over UTE. The average error over the full brain is 0.8% ( $\pm 1.7\%$ ), compared to -7.1% ( $\pm 2.4\%$ ) in UTE. Of note, the maximum error in the cerebellum is -15% and 7% in UTE and CBuR2\*, respectively. The proposed method uses the available UTE images to segment tissue classes, and uses the R2\* map to measure a continuous bone signal. The improvement over the vendor provided UTE reduces both the global and local error on the reconstructed PET images.

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