

## عنوان مقاله:

Comparing  $511$  keV Attenuation Maps Obtained from Different Energy Mapping Methods for CT Based Attenuation Correction of PET Data

## محل انتشار:

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## خلاصه مقاله:

**Introduction:** The advent of dual-modality PET/CT scanners has revolutionized clinical oncology by improving lesion localization and facilitating treatment planning for radiotherapy. In addition, the use of CT images for CT-based attenuation correction (CTAC) decreases the overall scanning time and creates a noise-free attenuation map ( $\mu$ map). CTAC methods include scaling, segmentation, hybrid scaling/segmentation, bilinear and dual energy methods. All CTAC methods require the transformation of CT Hounsfield units (HU) to linear attenuation coefficients (LAC) at  $511$  keV. The aim of this study is to compare the results of implementing different methods of energy mapping in PET/CT scanners. **Materials and Methods:** This study was conducted in 2 phases, the first phase in a phantom and the second one on patient data. To perform the first phase, a cylindrical phantom with different concentrations of  $K_2HPO_4$  inserts was CT scanned and energy mapping methods were implemented on it. For performing the second phase, different energy mapping methods were implemented on several clinical studies and compared to the transmission (TX) image derived using  $Ga-68$  radionuclide source acquired on the GE Discovery LS PET/CT scanner. **Results:** An ROI analysis was performed on different positions of the resultant  $\mu$ maps and the average  $\mu$ value of each ROI was compared to the reference value. The results of the  $\mu$ maps obtained for  $511$  keV compared to the theoretical values showed that in the phantom for low concentrations of  $K_2HPO_4$  all these methods produce  $511$  keV attenuation maps with small relative difference compared to gold standard. The relative difference for scaling, segmentation, hybrid, bilinear and dual energy methods was 4.92, 3.21, 4.43, 2.24 and 2.29%, respectively. Although for high concentration of  $K_2HPO_4$  the three methods; hybrid scaling/segmentation, bilinear and dual energy produced the lowest relative difference of 10.91, 10.88 and 5%, respectively. For patients it was found that for soft tissues all the mentioned energy mapping methods produce acceptable attenuation map at  $511$  keV. The relative difference of scaling, segmentation, hybrid, and bilinear methods compared to TX method was 6.95, 4.51, 7, and 6.45% respectively. For bony tissues, the quantitative

analysis showed that scaling and segmentation method produce high relative difference of ۲۶ and ۲۳.۲%,  
... respectively and the relative difference of hybrid and bilinear in comparis

**کلمات کلیدی:**  
PET/CT, XCOM, TX

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