Contribution ID: **29**   Type: **Talk**

Impact of Atlas-CT-Based Bone Anatomy Compensation on MR-Based Attenuation Correction for Brain PET Imaging in a Time-of-Flight PET/MRI System: A Direct Comparison to a Patient-CT-Based Approach

Wednesday, May 20, 2015 9:50 AM (15 minutes)

An atlas-CT-based bone-anatomy compensation for MR-based attenuation correction (MRAC) in brain PET/MRI imaging is a current standard. However, the impact of an anatomical difference has not been clinically evaluated. Thus, we aim to evaluate the impact of the anatomical dissimilarity on MRAC. Whole-body FDG-PET/CT followed by PET/MRI were performed for twelve patients in an integrated TOF PET/MRI system. The MRAC utilized an atlas-CT (MRAC-atlas) as well as a patient-specific-CT (MRAC-patient) to produce AC maps (pseudoCT). Instead of using atlas-CT, the MRAC-patient approach derived pseudoCT from patient-specific-CT aligned to MR. For quantitative evaluation, CTAC was considered as gold standard for AC, and PET mean activity concentration values were measured and compared in eight 10 ml volumes-of-interest (VOI). PET activity concentration with MRAC, compared to CTAC, were systematically underestimated on average by 0.63 ± 0.34 kBq/ml ($4.0\pm2.2\%$) and 0.22 ± 0.21 kBq/ml ($1.4\pm1.5\%$) for the MRAC-atlas and the MRAC-patient, respectively: using the MRAC-atlas, the error was increased to 0.41 ± 0.25 kBq/ml ($2.6\pm1.8\%$) on average ($p\approx0$). However, the error increase was patient-dependent (highest: 5.7% vs. lowest: 0.3%) and VOI dependent (highest 3.1% vs. lowest: 1.9%). For the first time, the atlas-CT-based MRAC was compared to the patient-specific-CT-based MRAC for brain PET imaging in an integrated TOF PET/MRI system. Overall, the MRAC-atlas achieves quantification accuracy similar to CTAC with a small but measurable difference of 5% in values, which is 2.6% higher than the error of the MRAC-patient.

Primary author: YANG, Jaewon (UCSF)

Co-authors: Dr VIGNERON, Daniel (UCSF); Dr TOHME, Michel (GE Healthcare); Dr MAJUMDAR, Sharmila (UCSF); Dr BEHR, Spencer (UCSF); Dr JIAN, Yiqiang (GE Healthcare); Dr SEO, Youngho (UCSF)

Presenter: YANG, Jaewon (UCSF)

Session Classification: Session 10 - Clinical MR-PET

Track Classification: 7 - Clinical MR-PET