Introduction

- For PET/MR hybrid systems, several ways of generating an attenuation map from MR sequences exist [2] [3].
- Feasibility of these approaches for SPECT needs to be investigated.

**Objective:** Derive an attenuation map from MR sequences and investigate its accuracy for SPECT studies with patient CT as the reference.

Materials and Methods

Data Acquisition

- 5 patients (3 female, 2 male, average age 72 years) underwent SPECT/CT HMPAO brain and T1-MPRAGE and T2-TSE acquisitions.
- T2-TSE included to provide complementary information eg. ventricles.

MR derived CT

- Features: mean, median, maximum, minimum, variance across 3x3x3 voxel neighborhood.
- SPECT<sub>MRAC</sub> and SPECT<sub>CTAC</sub> reconstructed from MR derived CT and patient CT respectively.
- SPECT reconstructions used an Ordered Subset Expectation Maximization algorithm with 3D resolution recovery (OSEM-3D), attenuation and scatter correction in 4 subsets and 8 iterations.
- Relative difference (RD) computed from:

\[ RD = 100 \times \frac{|SPECT_{CTAC} - SPECT_{MRAC}|}{SPECT_{CTAC}} \]

Results and Discussion

- Figure 2: Generation of Pseudo-CT from MR images.
- Figure 3: Efficacy of MR derived CT on SPECT.
- Visually SPECT<sub>MRAC</sub> and SPECT<sub>CTAC</sub> compare well.
- Average error below 5% in the brain, less than 15% in the nasal and close to skull regions.

Figure 2: (A) T2-TSE, (B) T1-MPRAGE, (C) MR derived CT, (D) Patient CT.

Conclusions

- MR based AC in SPECT using pattern recognition techniques.
- Quantitatively equivalent SPECT reconstruction results.
- Misclassifications in skull and nasal regions could be improved using Ultra Short Echo Time sequences.

References