AbstractID: 5849 Title: Registration of Gated PET Images Using Wavelet Denoising

Objective: Gated PET images are characterized by low signal to noise ratio which results in poor image registration. The aim of this abstract is to evaluate the accuracy of image registration of gated PET images following wavelet denoising. **Methods:** A NEMA/IEC phantom containing 6 spheres of varying diameters (1-3.7cm) was filled with F-18 water and positioned on a unidirectional translating platform in the FOV of a DST PET/CT scanner. A sinusoidal waveform (5 sec cycle, 2cm peak to peak) was used to drive the platform during the PET data acquisition. The platform motion was tracked using an RPM device which sent a trigger signal to the PET scanner at a specific phase of every repeating cycle of the waveform. PET data was acquired in 2D for 30 minutes using LIST mode and then rebinned using a gated prescription (10 bins of 500 msec each) into 13 different scan durations ranging from 1 min to 30 min. This scheme resulted in 13 gated image sets each corresponding to a different scan duration. The same experiment was then repeated using four different sphere/background ratios of 2, 3.4, 7.4 and 13.5. PET images were then reconstructed using OSEM. At each contrast ratio and scan duration, the gated images were first processed using wavelet denoising and then registered to the first bin. The estimated motion from this registration was then compared to that without wavelet denoising as well as to the true motion. **Results:** Wavelet denoising decreases the background noise without blurring the image. The effect of wavelet denoising on image registration decreased with increasing sphere-to-background ratio and increasing scan duration. Plots showing the difference between image registration with and without wavelet denoising will be presented. **Conclusion:** Wavelet denoising improves image registration. This improvement quickly diminishes with increasing scan duration and/or contrast ratio.