AbstractID: 7503 Title: Effect of Matrix Size on SNR and Contrast Ratio on Super-Resolution processing of PET Images

Objectives: Super resolution (SR) techniques reconstruct a high resolution image from a series of low resolution images taken from different points of view of the same object. The aim of this abstract is to investigate how CR and SNR vary with SR processing of images initially reconstructed using different matrix sizes.
Methods: A Jaszczak phantom with a hot spot insert was scanned on a DISCOVERY STE PET/CT scanner. The phantom was filled with 0.34uCi/cc and scanned for 15 minutes in 2D. A NEMA IEC phantom containing six spheres was also scanned for 3 minutes in 2D using a sphere-to-background ratio of 5.34:1. SR images of 512*512 were then generated for all acquired data using 3 different matrix sizes and image combinations: A) 64 images of 64*64, B) 16 128*128, and C) 4 256*256. In each case, the pixel grid was offset by 1 mm along the X and Y axes. All reconstructions were done using OSEM with a FOV of 51.2 cm. In addition, each original low resolution image was up-sampled to a 512*512 image. Resolution and contrast ratio were assessed by plotting line profiles across cylinders of different sizes in the Jaszczak phantom of each high resolution image (SR and up-sampled) while SNR was determined by drawing ROIs on all spheres and background in the IEC phantom. In addition, 5 lung nodule patient studies were processed using these 6 methods and assessed visually.
Results: Line profiles showed that the contrast ratio constantly increased from A to C by 180%, while the SNRs decreased by 56%. SR images always produced higher CR (143-214%) and lower SNR (65-78%) compared to their up-sampled counterparts. Comparison of patient studies showed that method B had the best overall image quality.
Conclusion: SR processing using 16 128*128 images results in the optimum clinical image quality.