AbstractID: 11377 Title: Improving Image Quality of Low Dose Cone Beam CT (CBCT) Imaging with Sparse Representation

Purpose: To present a methodology for reducing cone beam CT (CBCT) dose using low dose imaging protocols and sparse representation techniques to achieve similar image quality as regular or high dose imaging protocols. **Method and Materials**: The frequent usage of CBCT raises the concern of excessive non-therapeutic dose delivered to patients, especially to pediatric patients. Sparse representation (SR) was applied to low dose CBCT imaging, achieved by using low mAs, to suppress image noise and streak artifacts. The denoising algorithm was applied to low dose clinical images based on the concept of sparse representation using the training dictionary, which was constructed from the regular dose clinical images to approximate the anatomical site of interest. Validation was carried out using two phantoms (a CATPHAN phantom and an anthropomorphic head & neck phantom) and clinical prostate images. Comparisons with the modified edge preserving curvature anisotropic diffusion filter (MCDF) were carried out. **Results:** For CATPHAN phantom images, the SR algorithm outperformed the MCDF algorithm in terms of contrast to noise ratio (CNR). CNR was improved by an average of 32% for the SR algorithm. In contrast, MCDF only improved CNR by an average of 2.4%. Visual assessments of the anthropomorphic head & neck phantom and patient images indicated the SR algorithm not only suppressed the image noise but also preserved fine details of anatomical structures and was significantly better than MCDF. **Conclusion:** SR can be used to reduce image noise and CBCT imaging artifacts present in low dose CBCT images. Dose reductions up to 88% were observed without loss of image quality based on visual assessment.