AbstractID: 5696 Title: A New CT Reconstruction Technique for Removal of Streak Artifacts due to Metallic Dental Fillings and Implants for the Treatment of Head and Neck Cancer with Intensity Modulated Radiation Therapy

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Purpose: To remove or reduce the streak artifacts induced by metallic dental fillings and implants in CT images for head and neck patients treated with intensity modulated radiation therapy (IMRT).

Materials and Method: A cylindrical phantom was constructed using tissue-equivalent plastic to simulate a human head. The phantom was filled with distilled water. A piece of 1 cm-wide half elliptic tissue-equivalent bolus was attached to a thin circular plastic plate inside the phantom to mimic the gingiva. Two human second molars with metallic fillings were implanted into the bolus on each side. The phantom was scanned on a GE LightSpeed CT scanner with a slice thickness of 2.5 mm. The acquired CT images were first decomposed into spatio-frequency components using a wavelet transform. The decomposition tree allowed us to examine and characterize different localized frequency information related to undesired artifacts. Once the spatio-frequency signatures of metal objects were modeled, the corresponding coefficients in the wavelet domain were thresholded using a dynamic thresholding scheme. The thresholded images gave metal objets, which were then superimposed on a neighbor slice. New data were generated by re-projecting the original slice and superimposed slice. The final image was reconstructed with no or reduced image artifacts due to dental fillings and implants.

Results: Comparison of original images to reconstructed images indicates that the streak artifacts were either completely removed or significantly reduced. The structural details near the metal objects were clearly identifiable. The image quality was sufficient for target delineation in IMRT treatment planning.

Conclusions: The proposed technique can greatly reduce the streak artifacts induced by metallic dental fillings and implants without sacrifice of spatial resolution. The technique has the potential to significantly improve the accuracy of target and critical organ delineation and dose calculation in the head and neck IMRT treatment planning.