AbstractID: 7395 Title: Region-of-Interest (ROI) Cone-Beam Computed Tomography (CBCT) using Rotational Digital Angiography (DA) Acquisitions

Purpose:
Region-of-interest (ROI) cone beam computed tomography (CBCT) promises significant integral dose reduction to patients during acquisition; however, reconstruction using these data result in truncation artifacts both inside and outside the ROI. We propose a new technique to equalize the intensity in the region outside the ROI to that inside to achieve reconstructions comparable to full-field-of-view (FFOV) CBCT.

Method and Materials:
A ROI filter comprised of a 2.25 cm diameter central aperture in 0.21 g/cm^2 gadolinium screens was installed on the x-ray-tube assembly of a standard C-arm gantry. Standard (unsubtracted) Rotational Digital Angiography (DA) acquisitions were performed of a head phantom. FFOV images without the filter in place were also obtained. The location of the ROI in the projection images was identified using edge detection and template matching. Intensities outside the ROI were equalized to those inside the ROI by mapping the intensities at the same percentiles in the cumulative histograms of these regions for every image. The equalized images were reconstructed using the 3D reconstruction software of the acquisition apparatus.

Results:
Inside the ROI, the reconstruction data are highly correlated to the FFOV data (R^2 = 0.87). Outside the ROI, the reconstruction while noisier due to fewer photons is comparable to the FFOV, but some artifacts due to the incomplete equalization and detection of the ROI edges, are visible. Further refinement methods are being investigated. Integral Dose Reduction was estimated to be 80% compared to the FFOV 12" acquisition.

Conclusion:
DA-ROI-CBCT promises to be a feasible clinical technique for non-subtracted applications such as those in cardiology and orthopedics allowing substantial integral dose reduction to the patient, while providing similar reconstructions to standard FFOV acquisitions.

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