AbstractID: 3537 Title: Region-of-interest (ROI) Computed Tomography: Combining dual resolution XRII images

Purpose: High-resolution computed tomographic systems can require large radiation dose for full-field-of-view (FFOV) reconstructions. We have developed a method for obtaining data inside an ROI at high-dose and high-resolution and combining it with low-dose, low-resolution data outside the ROI. The combined image is reconstructed to obtain improved image quality both inside and outside the ROI but at reduced integral dose.

Method and Materials: Projection images of a head phantom were obtained using the 5" and 12" modes of an x-ray image intensifier. The 5" mode effectively defined an ROI and the 12" mode encompassed the whole object (i.e., FFOV), but at 1/4 the dose of the 5" mode. The 5" and 12" projection images were aligned and combined. Since the data outside the ROI was obtained at a lower dose, the intensity inside and outside the ROI in the combined image was equalized prior to backprojection. The mapping function was determined, using the pixels lying just inside and outside the ROI. A second approach was simulated by assigning the average pixel value in the ROI to all pixels outside the ROI. Both cases were reconstructed using a Feldkamp cone-beam algorithm.

Results: For both cases, we obtained reconstruction comparable to FFOV reconstruction inside the ROI. However, the combined image produced a reconstructed image comparable to the FFOV reconstruction outside the ROI as well. Moreover, the resolution of the region inside the ROI in the reconstructed image was determined by the 5" mode as opposed to the 12" mode.

Conclusion: ROI CT using two sets of data provides a way to reconstruct an ROI with greatly reduced integral dose and artifacts and yet improved spatial resolution.

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