AbstractID: 5794 Title: Performance evaluation of different fanbeam algorithms in the presence of noise.

Purpose: Different fanbeam reconstruction algorithms are being evaluated and the noise performances of these algorithms are compared at equivalent MTF.

Method and Materials: The fanbeam reconstruction algorithms under comparison are FBP with Parkers smooth weighting (PFBP), LCFBP, DFBP, reconstruction algorithm by Noo et.al and exact reconstruction algorithm by Kudo et.al . The MTF from the five different algorithms were plotted and compared. In order to establish the basis for an unbiased comparison of the noise variance between different algorithms, we established the condition of equivalent spatial resolution. To achieve this, a window function was applied to the ramp filtering kernel before backprojection for PFBP, LCFBP and Kudo's algorithm. A homogenous phantom was numerically simulated and Poisson noise with N_0= 2e5 was added to the projection data. The images were reconstructed from projection data with and without the Poisson noise added. These images were then subtracted from each other to result in a subtracted or pure noise image. The variance in these noise images over five different ROIs was subsequently compared. FBP with Parkers smooth weighting was chosen as the gold-standard and percentage decrease in variance in the images reconstructed using other four algorithms with respect to that of PFBP was tabulated.

Results: The results showed that the new reconstruction algorithms had better noise performance than state-of-the-art reconstruction algorithm (PFBP) after establishing the condition of equivalent spatial resolution. DFBP and exact reconstruction algorithm by Noo performed much better than the other three algorithms. Equal weighting scheme utilized definitely improved the noise performance over smooth weighting. DFBP showed a decrease of variance by about 23 % compared to PFBP.

Conclusion: The reduction in noise variance theoretically leads to a radiation dose reduction by about 23 %. This will be of significant importance especially in pediatric imaging.

Conflict of Interest (only if applicable):