

Purpose: Dose optimization in CT is crucial in paediatrics since children are at higher risk for developing secondary cancer from medical exposure compared to adults. We examine the possibility for systematic dose reduction in clinical CT protocols with Adaptive Statistical Iterative Reconstruction (ASIR) technique.

Methods: Utilizing a Catphan-600 phantom and the Discovery CT750 HD (64-slice CT) scanner we documented the effect of applying 0% or 50% ASIR on image quality (IQ) parameters over a wide range of kVp (80-140) and mA(10-400) settings. We assess the following parameters noise, spatial and contrast resolution, MTF, CNR and Wiener spectrum. For reconstruction we used axial 0.625 mm slices and both axial and coronal 5 mm MPR slices. We also studied the effect of varying amount of ASIR (0%, 30%, 50%, 70% and 100% ASIR) on image quality for 80kVp/150mA, 100kVp/150mA and 120kVp/150mA. By comparing the variable ASIR images to baseline images we have assessed the stepwise changes in the IQ parameters.

Results: Improvements in image quality were demonstrated by using 50% ASIR for axial slices and their multiplanar reformats. On average this technique reduces noise by 30% for 0.625 mm axial, 26% for 5mm axial MPR and 28% for coronal MPR. However, it also reduces spatial resolution by 2.3% for 0.625 mm axial and 8.1% for 5 mm Axial MPR and 5.7% for Coronal MPR. ASIR improved the low contrast detectability by 30%. The CT number accuracy is not affected by the algorithm.

Conclusions: Improved low contrast detectability and reduced image noise with ASIR in CT images could result in dose reduction in current paediatric protocols without compromising image quality or diagnostic objective. This study also provides quantitative assessment of the applicability and utility of ASIR for different diagnostic tasks.