

AbstractID: 11624 Title: The Use of a Simple Contrast to Noise Ratio (CNR) Metric to Predict Low Contrast Resolution Performance in CT

Purpose: To investigate the use of a simple contrast to noise metric and its ability to predict low contrast resolution in CT scans .
Method and Materials: The ACR low contrast phantom was scanned with 120 kVp and various exposure levels ranging from 50 to 1600 effective mAs. Each scan was reconstructed with 5 mm thickness and 8 different reconstruction filters, ranging from very smooth (B10) through very sharp (B80). Each image was windowed and leveled to the same settings, anonymized to reduce reader bias and put in random order. The images were sent to 9 independent readers, experienced in evaluating the ACR phantom for low contrast resolution. Each reader scored the smallest size set of rods visible in each image. Separately, a simple contrast to noise ratio (CNR) was obtained for each image, calculated as $(A-B)/\sigma$ where A is the mean of an ROI placed over the 25mm rod, B is an ROI of same size placed in the background next to the 25mm rod, and σ is the standard deviation of the background. **Results:** For many of the lower exposure and filter combinations, the largest 25mm rod was not visible and no measurement of CNR could be made. For those images in which it was visible, the CNR ranged from 0.15 for 300mAs and filter B70, to 6.4 for 1600mAs and filter B10. The measured CNR does correlate well with observer performance within a reconstruction filter setting, though there is wide variability in observer performance. However, CNR did not correlate well with observer performance across reconstruction filters. **Conclusion:** The correlation between CNR and observer performance suggests it may be possible to use this metric to predict low contrast performance for cases with a fixed reconstruction filter and might be useful if a limited range of filters are used.