AbstractID: 11808 Title: Radiation Dose Reduction for Pediatric CT


**Purpose:**

The purpose of this study was to evaluate potential radiation dose reduction for pediatric CT.

**Materials and Methods:**

A dose-reduction simulation tool, which adds synthetic noise to raw projection measurements and reconstructs images at a simulated lower dose (Massoumzadeh, *et al*. Med. Phys. Vol. 36, pp. 174-189, 2009), was used to simulate low-dose CT images. Simulated low-dose CT images are created from full-dose CT images of normal and pathological slices (lung nodules and abdominal visceral lesions). The amount of added noise was task dependent, with 10 sets of simulated low dose ranged from 1% to 85% of original dose.

Sixteen pediatric cases were selected, including eight normal, three patients with pulmonary nodules, two patients with abdominal visceral organ lesions, and three patients with appendicitis without perforation. All studies performed on a 16-row scanner, with the effects of tube current modulation and bow tie filters included.

Following a short training session, 19 volunteer radiologists, from various clinical centers in the world who were attending the International Pediatric Radiology conference in Montreal in 2006, used a 5-point scale to rate a sequence of simulated, low-to-high exposure images for the presence or absence of lesions. They were total of 176 images with viewing sessions limited to 45 minutes. Diagnostic agreement between full-dose and reduced-dose images was assessed with a weighted Kappa statistic.

**Result:**

For detection of pulmonary nodules, a decrease in the average intra-observer agreement (kappa= 0.90) was found at 80% dose reduction, while for the detection of abdominal lesions or appendicitis a 50% reduction was observed.

**Conclusion**:

There is potential for dose reduction in CT studies, which is task dependent and greater for pulmonary nodule than for abdominal visceral lesions and appendicitis. The noise simulation methodology is a powerful tool to help understand the relationship among dose, noise, and observer agreement.