AbstractID: 2715 Title: Direct Measurement of Pediatric CT Radiation Dose with a New Solid State Detector System

PURPOSE: Because of potential risks, the determination of CT radiation doses is important for young children. Direct patient measurements are usually not practical. Many CT scanners provide a calculation of the $CTDI_{volume}$. A unique, tiny solid state dosimeter system (which has recently been developed) permits the instantaneous measurement of cumulative patient entrance radiation doses during clinical CT procedures. This study compared the calculated $CTDI_{volume}$ to direct measurements with this new detector in pediatric patients.

METHODS AND MATERIALS: The new dosimeter system utilizes three tiny silicon detector chips 1cm x 0.5cm in size coupled to a small readout with thin cables. The system digitally displays the total accumulated dose. The energy response is +/-10% between 60 and 120 kVp. Radiation dose measurements during routine clinical head and body CT scans with a GE CT/i scanner were gathered for pediatric patients from newborns upto 18 years old.

RESULTS: Head and body data were separated and plotted in mGy per 100 mAs. The CT scanner calculated data showed no variation with patient size or anatomical location. The measured data, however, indicated radiation doses that were 2-3 times greater in small children and matched the calculated data for larger sizes. At the lower mAs values utilized for pediatric body scans, the measured radiation doses ranged from 2 to 5 mGy per procedure. At the higher mAs values for pediatric head CT scans, the radiation doses were 5-10 times greater than the body doses.

CONCLUSIONS: This solid state integrating detector system provides a new tool for the accurate and instantaneous measurement of CT radiation dose that was previously unavailable. Moreover, the data demonstrate that the scanner calculated CT radiation doses can be in error by a factor of 2 to 3 times due to patient size variations and non-homogeneity of patient anatomy.