AbstractID: 13094 Title: A Novel Organ Dosimetry in an Anthropomorphic Phantom Using XRQA-2 Radiochromic Film

Purpose: A novel method to measure organ dose distributions in a phantom of heterogeneous tissue composition was established using radiochromic XRQA-2 films. Film response accuracy was validated using thermoluminescent dosimeters (TLDs). **Method and Materials:** Film response accuracy and sensitivity in CT exposure geometry were verified by comparing TLD responses between two CTDI head phantoms. The phantoms were placed end-to-end to allow for a uniform scatter environment. TLDs and films were placed between cross-sectional slabs of a 5-yr old anthropomorphic phantom's thorax and abdomen regions. Software was written for dosimeter comparison within a complex anthropomorphic phantom. Film accuracy within the anthropomorphic phantom was measured by comparing TLD results within the lung, liver, and kidney organs. **Results:** Film and TLD dose response differences were measured for CTDI phantom, 45% (SD ± 2%), and for the anthropomorphic phantom in the lung, 28% (SD ± 8%), and liver/kidneys, 15% (SD ± 4%). Due to consistent response differences in low and high organ dose, a tissue specific correction was applied to the film organ responses. Corrected film response agreed to better than 3% (SD ± 2%), for CTDI scans, and 3% (SD ± 3%) for lungs, 5% (SD ± 3%) for liver, and 4% (SD ± 3%) for kidneys. Film measured a heterogeneous dose distribution within the organ volumes; the extent of which was not measured with the TLDs. XRQA film demonstrated an advantage over the TLD method by discovering a 15% greater maximum dose to lung in a region unmeasured by TLDs. **Conclusion:** XRQA films demonstrated lower sensitivity to absorbed dose measurements due to geometric inefficiencies of measuring dose from a beam situated end-on to the film. Corrected film responses demonstrated equivalent measurement accuracy as TLD detectors with the added advantage of measuring high-resolution dose distributions throughout an organ volume.