

Two dimensional CT dosimetry using new GAFCHROMIC® XR-QA radiochromic film

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Purpose: Reliable dosimeter is highly desirable for low kVp energy photons to assess dose received by patients during diagnostic CT procedures. New XRQA model radiochromic film is characterized in terms of dose sensitivity and reproducibility.

Methods and Materials: Pieces of XRQA film were exposed in air to different doses in the center of GE LightSpeed 4-slices CT scanner to reconstruct reflection vs. dose response curve. We also exposed different film pieces to the same dose by changing the current and exposure time to investigate reproducibility and dose rate dependence. Finally, 2.5cm x 10cm film strip was placed at the anterior surface of patient to perform our first in vivo dose measurement for diagnostic pelvic CT scan. Scan was performed with collimator opening of 4x3.75mm, 220mA and 0.8sec helical scan using Body protocol, 120kVp (with HVL of 5.6mm Al) and Pitch of 0.75.

Results: XRQA film can be used in a dose range from 100mR to 10,000mR. Polymerization completely saturates after 10 hours. Change in film's reflectivity does not depend on dose rate and reproducibility amongst 5 pieces was within +/-2%. Our in vivo measurements revealed that surface exposure was ranging from 3,400 to 4,200mR with spatial frequency of 10mm between the exposure peaks. We also performed dose measurements of axial and helical scans on 64 slice CT scanners with film placed on Rando phantom.

Conclusion: Radiochromic film XRQA appears to be reliable and promising tool for diagnostic radiology dosimetry in both in vivo and in vitro absolute dose measurements.