AbstractID: 6816 Title: Patient dose from kilo-voltage cone beam computed tomography (kV-CBCT) imaging

Purpose: To investigate patient dose from on-board imager-based kV-CBCT.

Method and Materials: Radiation doses from kV-CBCT were measured using TLDs at different locations in three anthropomorphic-phantoms (H&N, chest and pelvis) and patients retrospectively. kV-CBCT scans were performed in standard settings (125 kV, 80 mA and 25 ms) using a Varian Trilogy linear accelerator. Both full-fan (FOV=24 cm) and half-fan (FOV=40 cm) modes were evaluated for H&N case while only half-fan (FOV=45 cm) technique was studied for chest and pelvic cases. The skin dose in both phantoms and patients were measured at 4 locations: anterior, posterior, Rt-Lat, and Lt-Lat. Doses measured in the phantoms included different critical organs. The dosimeters used were high sensitivity TLD-100H and only those with standard-deviations less than 3% and sensitivity within ±3% were selected for this study. Each TLD was individually calibrated using an ion chamber under the irradiation condition. Phantom data was averaged from 3 separate measurements and patient data was averaged from 5 measurements in each category.

Results: The skin dose for H&N cases were 9-10cGy for half-fan mode in both the phantom and patients. The dose for brain and brainstem were 7.1cGy and 7.6cGy, respectively. The doses in same locations were 2-3cGy lower if the full-fan mode is used. The skin dose for chest cases was 8-10cGy and were same for the phantom and patient measurements. Measured mean lung dose was 8.5cGy and spinal cord dose was 6.2cGy. For pelvis, measured skin dose was 2.9-4.2cGy and the prostate and rectum dose were 2.9cGy.

Conclusions: For pelvic cases, kV-CBCT dose was comparable or less than that from portal imaging. For chest and H&N cases the dose can be two times higher than that for the pelvis cases. Daily CBCT may lead to extra 400cGy to skin and 250cGy to spinal cord in 40 fractions.