AbstractID: 10269 Title: Organ doses and projection angles in cone beam CT

Purpose: To calculate how organ doses varies with projection angle for two types of cone beam CT geometry.

Method: We used the PCXMC software package to compute organ doses to patients. We modeled a typical x-ray spectrum using 120 kV x-ray tube voltage and 6 mm Al filtration. Two cone beam irradiation geometries were modeled: (a) a standard CT gantry; and (b) a C-arm. Both systems made use of a detector with dimensions of 30 cm x 40 cm. For the CT gantry system, the source to isocenter distance was 57 cm, and the SID was 93 cm. For the C-arm system, the source to isocenter distance was 78.5 cm, and the SID was 120 cm. Organ dose to the five most radiosensitive organs (breast, colon, lung, red bone marrow, and stomach) were obtained for each cone beam arrangement at 15 degree intervals as the x-ray tube rotates through 360 degrees around the patient.

Results: On average, patient doses using the C-arm were ~60% of those obtained using the CT gantry. Ratios of maximum to minimum doses as a function of x-ray tube angle ranged from ~2.3:1 for the lung to ~31:1 for the stomach. For the breast, colon, and stomach the highest doses were obtained for AP projections, whereas for the lung and red bone marrow, PA projections resulted in the highest organ doses. In all cases, dose minima were obtained when the x-ray beam entered the patient in a lateral orientation.

Conclusions: The high maximum to minimum dose ratios for radiosensitive organs such as the stomach and breast indicate that modulation of the x-ray tube current with projection angle could result in substantial dose reductions in cone beam CT.