AbstractID: 1815 Title: Patient Dose in kV Cone-Beam CT Image-Guided Radiotherapy

Kilovoltage cone-beam computerized tomography (CBCT) systems integrated into the gantry of linear accelerators can be used to acquire high-resolution volumetric images of the patient in the treatment position. Using on-line software and hardware, patient position can be determined with a high degree of accuracy and subsequently set-up parameters can be adjusted to deliver the intended treatment. While the patient dose due to a single volumetric imaging acquisition is negligible compared to the therapy dose, repeated and daily image guidance procedures can lead to substantial dose to normal tissue. The dosimetric properties of a clinical CBCT system (Elekta Synergy XVI system) have been studied and additional measurements performed on a laboratory system with identical geometry. Dose measurements were performed with an ion chamber and MOSFET detectors at the center, periphery and surface of a 32 cm diameter cylindrical phantom (acrylic) as a function of x-ray energy (100,120,140 kVp) and longitudinal field-of-view (FOV) settings (1.8,10,26 cm). The measurements were performed in an isocentric geometry for a full 360-degree CBCT acquisition. For the current typical imaging protocol (660 mAs and 120 kVp) the dose-to-air at the center of the phantom and at the skin were determined to be 1.6 cGy and 3.7 cGy, respectively. A thorough characterization of imaging dose across relevant clinical conditions is used in the careful design of imaging techniques that are specific to patient size, anatomical site and imaging protocol.

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