

AbstractID: 12852 Title: Comparison of Dose Deposition from kV X-rays During CBCT Scans between Two Commercially Available On-Line Imaging Systems

Purpose: Accurate dosimetry of the additional dose from kV cone-beam CT (CBCT) image-guided radiation therapy (IGRT) is becoming increasingly important for radiation oncologists to make decisions on IGRT frequency in regards to the additional dose to radiosensitive organs, especially skin. In this study, the skin doses and dose profiles during CBCT scans within an anthropomorphic Rando Phantom were compared for two commercially available systems: X-ray Volumetric Imager (XVI, Elekta Oncology Systems, Crawley, UK) and On-Board Imager (OBI, Varian Medical Systems, Palo Alto, CA).

Method and Materials: CBCT scans were acquired using the XVI (v. 4.2) on an Elekta Synergy linac (Elekta, Crawley, UK). Doses from three clinical scan protocols Head and Neck S20F0, Chest M20F1, and Prostate M10F1 were compared to doses from similar protocols on OBI (v. 1.4) system using the same 2D reference dosimetry protocol that employs XR-QA GAFCHROMIC™ film.

Results: Our results show that the skin dose of 4.5 ± 0.2 cGy from the Prostate M10F1 protocol on XVI, compared to 3.7 ± 0.09 cGy from Pelvis protocol on the OBI system, has higher values. Measured skin dose from XVI Head and Neck S20F0 protocol ranged from 0.44 ± 0.01 mGy to 1.58 ± 0.03 mGy, which is significantly lower than the dose from OBI Standard and High Quality head protocols. Dose profiles for the three XVI protocols are heavily dependant on gantry angle sweep during the CBCT acquisition.

Conclusions: The skin dose from the XVI system is higher for the pelvis and thorax, but is much lower for the head CBCT scans compared to OBI protocols. Given the ability to manipulate the preset parameters, lower doses may be achieved with the XVI system by lowering the total mAs for a given scan, while taking into consideration the image quality reduction.