AbstractID: 5030 Title: Dose Delivered to Patients for Megavoltage Cone-Beam CT Imaging

Purpose: Megavoltage Cone-Beam CT (MVCBCT) has recently been introduced in the clinic to improve patient alignment prior to dose delivery. The objective of this research was to evaluate the dose delivered to patients for MVCBCT acquisition. We also studied the possibility of making simple plan modifications to compensate for the dose delivered by daily MVCBCT imaging.
Method and Materials: Because MVCBCT uses the treatment beam, conventional CT scans (pelvis and head and neck patients) were imported in a treatment planning system (Phillips, Pinnacle) to simulate an MVCBCT acquisition. To validate the dose obtained from Pinnacle, a simple water-equivalent cylindrical phantom with spaces for MOSFETs and an ion chamber was used to measure the actual dose delivered during MVCBCT.
Results: The MVCBCT dose delivered to the phantom, calculated from Pinnacle, was within 3% to all the MOSFET measurement points. The difference between Pinnacle and the ion chamber was 0.2%. For a typical MVCBCT (arc: 270° to 110°) the delivered dose forms an anterior-posterior gradient. Head and neck patients receive dose ranging from 0.7 to 1.2 cGy per MVCBCT monitor unit (MU). The range is 0.6 to 1.2 cGy per MVCBCT MU for pelvis patients. The total dose for daily positioning using MVCBCT can be reduced and made uniform by alternating between two opposed imaging arcs. Dose-volume histograms of a compensated plan for a pelvis patient imaged with 10 MU MVCBCTs for 40 fractions show no additional dose to the target and small increases at low doses.
Conclusion: Given that clinical MVCBCTs are currently performed at doses ranging from 2-15 MU, simple plan modifications, such as reducing the total number of MU, can be used to nearly eliminate the dose used for daily positioning. Results for other body sites will also be presented.

Conflict of Interest:
Research sponsored by Siemens OCS.