

AbstractID: 10250 Title: Initial dosimetric experience with mega voltage computed tomography (MVCT) detectors and estimation of pre and post-repair dosimetric parameters of a first Helical Hi-Art II Tomotherapy machine in India.

Abstract

Purpose: On-board mega voltage computed tomography (MVCT) detectors of a Helical Tomotherapy™ (HT) machine are routinely used for imaging and dosimetric purpose. First objective of this study was to estimate dosimetric and general capability (TomoImage registration, reconstruction, spatial resolution, artifacts free image and dose during TomoImage) of MVCT detectors. Second objective was to investigate system dosimetric stability (output and energy) of HT after major repairs.

Methods and Materials: The lateral beam profiles were first measured in water at a depth of 1.5 cm with an A1SL (0.05 CC) ion chamber and later with the MVCT detectors for 5 cm jaw width with source to axis distance (SAD) of 85 cm. After a period of eight months, due to degraded image quality and gas leakage with the detector mechanism, the MVCT detectors were replaced. Due to frequent fluctuations in output and energy, the target was also replaced within the same period. Fixed-gantry/fixe-couch measurements were made daily to investigate system stability. Static gantry output and energy measurements were measured with the manufacturer supplied and the independent (third party) dosimeters. Central axis depth dose (CADD) was measured and compared. The surface dose was also estimated. Thermoluminescence dosimeters (TLDs) were used subsequently.

Results: The spatial resolution of MVCT detectors was optimal and the dose during TomoImage was 2 cGy. The results of lateral beam profiles showed an excellent agreement between the two normalized plots. The HT system has maintained its calibration to within $\pm 2\%$ and energy to within $\pm 1.5\%$ over the initial twelve months period. CADD measured with three dosimeters showed good agreement with each other.

Conclusion: Based on the consistency in the lateral beam profile shape, the on-board detectors proved to be a viable dosimetric quality assurance tool for HT. Tomotherapy output and energy was found stable after major repairs.