

AbstractID: 4352 Title: Evaluation of helical tomotherapy megavoltage CT system for daily automatic patient setup correction and manual prostate gland motion correction

Purpose:

To evaluate the efficacy of helical tomotherapy megavoltage CT system (MVCT), and to study patient setup uncertainty and inter-fractional internal organ motion for prostate cancer patients during the course of external beam treatment.

Method and Materials:

34 prostate cancer patients that received definitive helical tomotherapy treatments were included in this study. MVCT images were registered with planning CT images using automatic bone registration followed by manual registration based on soft tissue match. Patient setup corrections and internal organ motion corrections in the medial-lateral (ML), superior-inferior (SI), anterior-posterior (AP) directions, and rotations around the longitudinal axis were obtained from 1345 daily MVCT image registrations.

Results:

The mean and standard deviation of patient setup corrections were 3.1 ± 7.3 mm in the ML direction, -0.8 ± 4.9 in the SI direction, -0.2 ± 6.4 in the AP direction, and $0.8 \pm 1.3^\circ$ for rotations around the longitudinal axis. The mean and standard deviation of internal organ motion corrections were -0.1 ± 0.8 mm in the ML direction, -0.1 ± 0.7 mm in the SI direction, and 0.0 ± 1.9 mm in the AP direction. The fraction of manual registrations that did not have adjustment in the ML, SI, or AP direction was 84%, 95%, and 71%, respectively. The prostate motion variability did not change during the course of treatment.

Conclusion:

Patient setup uncertainty dominated target position uncertainty. Helical tomotherapy MVCT system was effective in correcting patient setup errors and internal organ motions in the ML and AP directions, but provided limited soft tissue resolution in the SI direction.