

AbstractID: 13629 Title: Feasibility study of MVCT imaging guided adaptive proton therapy for head and neck cancers

**Purpose:** Extending MVCT's potential for daily patient position and anatomy verification, we investigated the feasibility of using MVCT to assess the daily delivered dose for head and neck patients treated with proton beams.

**Method and Materials:** A Rando head phantom was scanned on a Philips Brilliance Big Bore CT scanner to obtain the planning kVCT images. The corresponding MVCT images were acquired on a helical Tomotherapy unit. To establish CT-electron density curves, a Gammex RMI 465 electron density phantom was scanned on both kVCT and MVCT scanners. A typical 4-field plan was created for the phantom and dose distribution was calculated using pencil beam algorithm from the XIO treatment planning system. After MVCT and kVCT images manually registered, kVCT-based treatment plan with structure contours and beam configuration including beam shaping devices was mapped to MVCT images for dose re-computation. Dose map, isodose curves, dose profiles, gamma maps, and dose-volume histograms were used for dose comparison.

**Results:** Although the noise level in MVCT images is higher than that with the conventional kVCT, the dose distribution recomputed on MVCT image is comparable to the dose distribution computed on the kVCT images. The dose comparison showed an agreement of higher than 97% between the two plans given the criteria of 3% dose difference and 3 mm distance to agreement. The biggest dose difference between two plans occurred around the periphery of the target. There was negligible difference in the DVH comparison.

**Conclusions:** MVCT images acquired for daily setup verification in image-guided proton therapy are feasible for assessment of daily delivered proton dose distributions with accuracy comparable to that of kVCT-based dose calculation. The original treatment plan based on kVCT can be transferred to the daily MVCT image set to evaluate the actual dose distribution for adaptive proton therapy.