

AbstractID: 9495 Title: Comparison of shifts in CBCT and Tomotherapy imaging modalities in prostate IGRT

Purpose: Dose conformity in radiation therapy continues to improve with more sophisticated treatment planning algorithms. This trend has further increased the importance of IGRT to ensure the dose is deposited as intended. This study compares the magnitude of shifts in prostate IGRT as measured by two imaging modes: Siemens MV-CBCT and TomoTherapy helical MVCT.

Method and Materials: A total of 18 patients with implanted prostate markers were studied. Patients were treated either by step-and-shoot IMRT on a Siemens's linac or on a TomoTherapy unit. Prior to each treatment, MVCT was acquired and registered with KVCT based on three implanted gold markers. Lateral, longitudinal and vertical shifts were determined. A total of 173 daily localizations from CBCT and 425 daily localizations from helical MVCT were collected. In both cases, image fusion was carried out by the same group of therapists. The data was analyzed retrospectively.

Results: CBCT data: The lateral shifts range from 17mm left to 5mm right; the longitudinal shifts range from 16mm superiorly to 6mm inferiorly; the vertical shifts range from 14mm anteriorly to 15mm posteriorly. The mean shift in 3D is 7.7mm. Helical TomoTherapy data: The lateral shifts range from 10.2mm left to 20.6mm right; the longitudinal shifts range from 10.8mm superiorly to 13.1mm inferiorly; the vertical shifts range from 25.7mm anteriorly to 11.1mm posteriorly. The mean shift in 3D is 9.01mm.

Conclusion: The results of the two IGRT imaging modalities demonstrate a similarity in the magnitude of daily shifts required for patients undergoing IMRT for prostate. The shifts are significant and would result in target underdosing, or normal tissue overdosing, when not applied.