

## AbstractID: 5833 Title: IMRT Measured Dose Gradients For a Simulated Para-Spinal Mass

**Purpose:** To compare IMRT treatment techniques for a simulated para-spinal mass located in the thoracic spine of an anthropomorphic phantom and to measure the accuracy of Megavoltage-CT (MVCT) images for localizing spinal anatomy in the T-Spine region.

**Methods and Materials:** Treatment planning CT images were acquired on a kilovoltage CT simulator of a whole body anthropomorphic RANDO phantom and used to create a planning target volume (PTV) covering the T7 to T9 vertebral bodies. The fixed gantry IMRT cases were planned using the Pinnacle treatment planning system and delivered on a Varian 21EX with a 120-leaf multileaf collimator. Inverse treatment plans were created with 9 and 12 equally spaced fixed fields starting at 0-degrees (IEC Scale). Inverse planning was performed using Direct Machine Parameter Optimization (DMPO), and gradient decent optimization with sliding window leaf sequencing. Helical tomotherapy cases were planned using the TomoTherapy HI-ART treatment planning system. Relative dose measurements were made using calibrated film placed in the RANDO phantom. MVCT images of the RANDO phantom were acquired with a tomotherapy system and fused with the treatment planning CT images. The phantom was then correctly positioned, and the fusion error was measured by imaging the T7 and T9 phantom vertebrae. A principal component analysis was used to determine the largest factors in image registration.

**Results:** The 9-Field DMPO and helical tomotherapy cases had PTV uniformities of 10% and maintained a large dose gradient.

**Conclusions:** Helical tomotherapy and 9-Field DMPO treatments yielded similar dose gradients (10%/mm) and PTV dose uniformity indices (10%). The sliding window treatment deliveries were consistently worse in cord sparing and dose uniformity. Anthropomorphic phantom studies indicated that megavoltage CT images were capable of imaging the spine for placement at isocenter within 1-mm of the desired position.