

AbstractID: 3678 Title: Image-Guided Adaptive Radiation Therapy for Improving Level I Lymph Node Coverage for Head and Neck Cases

**Purpose:**

Correcting anterior-posterior, lateral, superior-inferior, pitch, roll, and yaw with Image-Guided Radiation Therapy (IGRT) will not completely correct for anatomical deformation. The purpose of this work was to identify anatomical deformation error and develop multiple strategies for addressing this error using adaptive IGRT.

**Method and Materials:**

Ten H&N patients have been treated with helical tomotherapy. Megavoltage CT (MVCT) images were acquired prior to treatment. The daily setup were then used to calculate the random positional setup errors between the setup marks on the patient's mask and the internal anatomy. Level I lymph nodes (LV1) and the cord were contoured on each MVCT image. DVHs and LV1 EUDs were then calculated for each fraction. If the 2 Gy per fraction isodose line did not cover the LV1 nodes, then the treatment delivery was re-planned and adapted to account for anatomical deformation.

**Results:**

The total shifts were measured for over 400 treatment fractions. The standard deviation was  $\pm 2.8$  mm in the AP direction,  $\pm 2.9$  mm in the lateral direction, and  $\pm 3.2$  mm in SI direction. Dose reconstruction results indicated that the LV 1 nodes were frequently being under-dosed (*even with IGRT*). Using IGRT to align the patient relative to the spinal cord resulted in a reduction in the LV1 nodal EUD by 2 to 6 Gy. This is of particular concern because the risk (5 to 50 percent) of LV1 involvement for node-positive patients. By utilizing adaptive therapy, the LV1 were completely covered by the prescribed dose (50 Gy) in all cases. In addition, dose to the cord and mandibles were minimized.

**Conclusion:**

Adapting the treatment delivery by modifying the anterior border of the field can correct for the decrease in coverage due to anatomical deformation. This technique is an alternative to increasing PTV margins that allows increased sparing of normal tissues.