

**Purpose:**

To investigate the discrepancy between planned and delivered doses due to tumor regression and anatomic changes using weekly Cone-Beam CT (CBCT) for patients with head and neck cancer treated with intensity modulated radiation therapy (IMRT).

**Methods:**

Nine patients each with eight weekly CBCT images who received IMRT for head and neck cancer were analyzed. For each patient, weekly CBCT image was converted into "CT of the week" using deformable image registration and fused with the planning CT. The weekly dose was calculated on the fused CBCT images, and the calculated weekly doses were registered back into planning CT space using deformable image registration. The accumulated dose was then calculated in planning CT space. For the gross tumor volume (GTV) and lymph nodes, the minimum dose and dose range were compared with the treatment plan; for the parotids, the mean dose was evaluated.

**Results:**

The minimum dose delivered to the GTV and nodes was reduced from the treatment plan with a mean discrepancy of 1.0Gy (1.6%) and 2.5Gy (5.3%), respectively. The range of doses delivered increased by 2.1Gy (39.3%) for the GTV and 4.0Gy (16.2%) for the lymph nodes compared to the planned dose. For the parotid, the mean dose delivered increased by 2.0Gy (4.5%) from the treatment plan.

**Conclusions:**

Dosimetric discrepancy from treatment plans of patients with head and neck cancer resulted from tumor regression and anatomic changes during IMRT. Such discrepancy can be monitored and investigated with on-board CBCT imaging. Further studies are needed to determine how best to intervene to provide more accurate radiation therapy.