Purpose: To evaluate volumetric changes in the target and critical organs during IMRT treatment for patients with head-and-neck cancer, and investigate discrepancy between the planned doses and doses of the day using daily CBCTs.

Methods: Four head-and-neck patients with 150 daily kilo-voltage CBCTs were selected for this study. For each patient, CBCTs were rigidly registered with the planning CT based on the bony structures. Contours of the target and critical organs were then deformed from the planning CT to each CBCT using a commercial deformable registration algorithm. After rigid imaging registration, the planning dose matrix was mapped to the corresponding CBCT images. The doses of the day to the deformed structures were compared with the planned doses.

Results: Significant volume shrinkage in PTV was observed with a mean volume of 27.8 Å± 8.1cc (range: 20.7cc - 38.4cc). The volume variations were 2.6 Å± 2.4cc (range: 0.2cc - 5.9cc) for the right parotid, and 4.0 Å± 4.8cc (range: 0.4cc - 11.0cc) for the left parotid. The differences in D95 between the dose of the day and planned dose were 0.4 Å± 1.2% for the GTV and 1.8 Å± 2.4% for the PTV. The difference in the mean dose for right parotid and left parotid were from -9.3% to 24.3% (mean 8.4%) and from -11.4% to 26.1% (mean 8.7%), respectively. The average mean dose variations were 1.9 Å± 1.2% for the spinal cord, 2.3 Å± 3.3% for the mandible, and 2.6 Å± 3.7% for the larynx.

Conclusions: No significant changes in daily dose coverage of the tumor were observed despite of tumor shrinkage and anatomic changes. The daily mean dose changes in the parotid glands were greater than other sensitive structures. With deformable contours from the planning CT, daily CBCT along with rigid dose transformation can provide quantitative dose guidance for re-planning.