

Purpose:

Over a 6 week head and neck cancer treatment course, radiation and chemotherapy induce considerable changes in the volume and geometry of the tumor and normal tissues. When using highly conformal radiotherapy, even relatively small changes in the tumor volume could alter target coverage and possibly the therapeutic efficacy. The purpose of this study is to investigate the dosimetric impact of anatomic changes during the treatment course.

Method and Materials:

A representative patient with nasopharynx cancer treated with IMRT was studied. Cone beam CT scans covering the skull base and upper neck were acquired at the beginning and after every 10 treatment fractions. The GTV was contoured on the initial treatment planning CT scan and recontoured on subsequent CBCT scans to reflect treatment-related changes over time. Radiation dose was recalculated on each CBCT using the same treatment isocenter and the original IMRT fields, MLC sequences, and monitor units. The GTV DVH's were compared to assess changes in tumor coverage.

Results:

Somewhat counterintuitively, GTV coverage decreased over time as the tumor volume decreased. GTV volume decreased by 15% after 10 fractions and 40% after 20 fractions. Conversely, 100% of the prescribed dose covered 95% of the GTV initially, 80% after 10 fractions, and 74% after 20 fractions.

Conclusion:

These results show that temporal changes in tumor volume and geometry can have a potentially clinically significant effect on the dosimetry. The decreasing GTV coverage over time implies the need to re-evaluate the treatment plan during the course of treatment and incorporate changes necessary to achieve adequate tumor coverage.