

AbstractID: 5061 Title: Dosimetric improvement in treatment of advanced-stage nasopharyngeal carcinoma using split organ delineation approach and multiple virtual organs generation approach in intensity-modulated radiation therapy dose optimization

Purpose: To evaluate the efficacy of improving target coverage and sparing of the organs-at-risk (OARs) using split organ delineation approach (SODA) and multiple virtual organs generation approach (MVOGA) in planning of intensity-modulated radiation therapy (IMRT) for advanced-stage nasopharyngeal carcinoma (NPC)

Method and Materials: Twenty NPC patients with T3-4 tumors were selected. For each patient, a reference (REF) IMRT plan was generated with optimized target coverage and sparing of OARs. An investigative plan (INV) was also generated with the same planning protocol as the REF plan, with the exceptions that first, the contours of the parotid glands and temporal lobes were split into target-overlapping and non-overlapping regions, and second, multiple virtual organs were created to represent the normal tissues (such as segments of mucosa and muscles that are not conventionally designated as OARs). Each of the split and virtual organs was assigned with independent dose-volume constraints. The REF and INV plans were compared with respect to the conformity index (CI), and dose-endpoints of the OARs using paired-t test.

Results: The INV plan was superior to the REF plans in terms of the CI of the GTVs (0.55 vs 0.50, $p = 0.017$), CI of the PTVs (0.79 vs 0.70, $p = 0.000$), and the minimum dose of the PTVs (47.2Gy vs 44.8Gy, $p = 0.008$). For the OARs, there was significant reduction in dose in the INV plan in terms of the mean dose (max 4.6Gy, $p = 0.003$) to the parotid glands, the maximum dose (max 10Gy, $p < 0.024$) and the mean dose (max 6Gy, $p < 0.000$) to the virtual organs.

Conclusion: Using a split organ delineation approach and multiple virtual organs generation approach in IMRT treatment planning, further dosimetric improvement in target coverage in the regions that overlapped with organs-at-risk can be achieved, together with sparing of the parotid glands and normal surrounding tissues.