Performance and Comparison of Auto-planning with previously delivered head and neck plans

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Introduction:

This study is to assess the quality and feasibility of selected head and neck treatment plans generated with the Auto-planning module in Pinnacle treatment planning system. The dosimetry and delivery of the Auto-plan VMAT and IMRT after initial optimization was retrospectively compared with previously treated plans.

Materials and Methods:

10 patients with oropharyngeal or hypopharyngeal cancers were reviewed to test the consistency of the Pinnacle Auto-planning function. Pinnacle v9.10 Auto-plan module was used to generate VMAT (2 Arcs) and IMRT (9 fields) head and neck plans based on the adapted RTOG protocol dosimetric requirements for target coverage as well as organ at risk (OAR) sparing. Treatment planning CTs were taken with Siemens Somatom AS CT scanner in supine, head-first position using a custom aquaplast immobilization mask. Alignment tattoos were given at the time of simulation. CT images had slice spacing of 3 mm. All the plans were constructed with concurrent boost technique of 3 dose levels of 70, 63, and 58/54Gy corresponding to average volumes of 125, 510 and 256cc respectively(Fig.1). The Auto-plan parameters were created and stored in the treatment technique library. All plans were calculated with grid size of 4mm. These plans were compared with dosimetrist generated plans for dose distribution and delivery assessment.

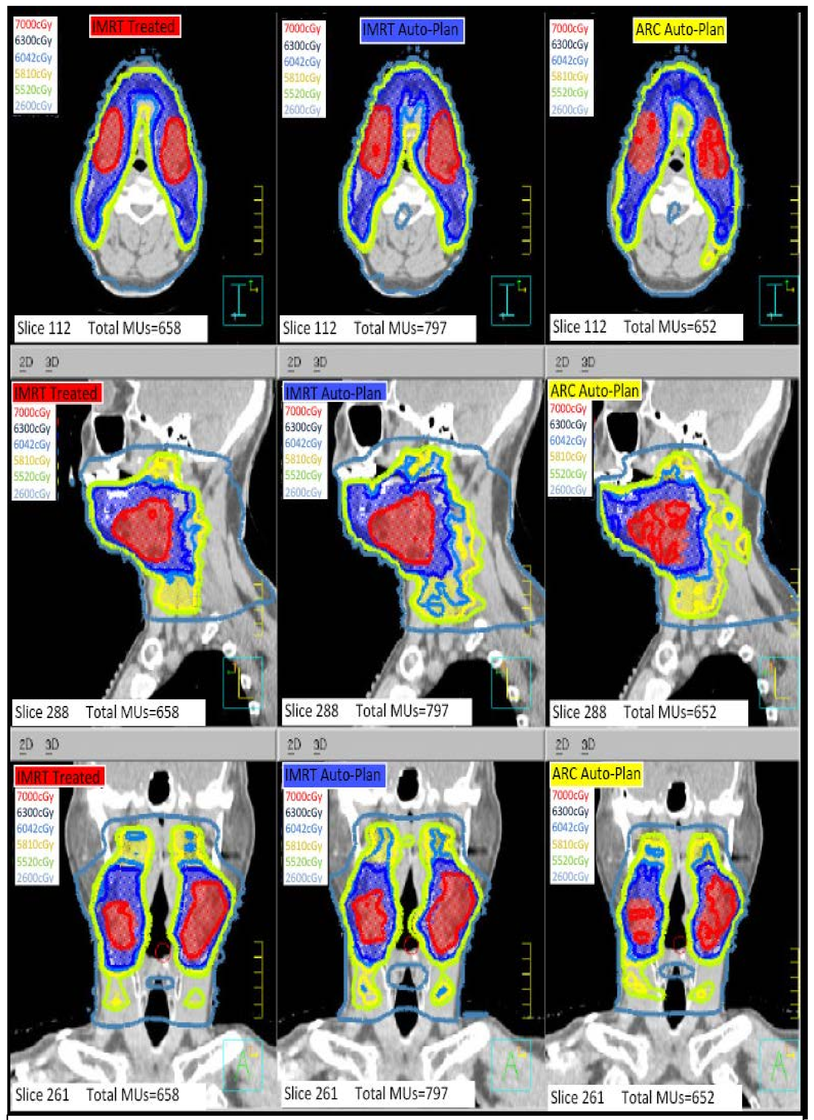

Fig. 1: Auto-plan compared with previously treated plan

Results and Discussion:

The Auto-plans were performed with minimal manual interaction. The planning time required for initial optimizing iteration for each VMAT Auto-plan was between 110 to 120 minutes, each IMRT Auto-plan required 30 to 60 minutes. The delivery time and monitor units decreased for VMAT Auto-plan and increased for IMRT Auto-plan compared with plans constructed manually. The following criteria was used to assess dose distribution: 95% of target volume achieves greater than 95% of prescribed dose and mean dose to larynx and both parotids as well as spinal cord max dose. VMAT and IMRT dosimetry was verified using a 2D chamber array (PTW-729 OCTAVIUS), with a 3mm, 3% distance to agreement passing criteria, which indicated the plans were deliverable clinically. There was consistent coverage of the PTV and not a significant difference or improvement in the sparing of critical structures like the parotids or larynx when Auto-plan VMAT and IMRT was compared to previously treated IMRT plans for the oropharynx and hypopharynx.

Conclusion:

Auto-plan function was demonstrated to be consistent and feasible for producing clinically acceptable plans. One benefit offered by Auto-planning is time saving in user's initial preparation of optimization process by creating structures which otherwise proved to be time consuming if done manually. Auto-plan's initial optimization achieved an equivalent outcome for beginner or advanced skilled dosimetrists which can help an institution's standardization process. For complex H&N cases, clinical adoption of the Auto-plan may require more iterations by dosimetrists, may increase in monitor units and delivery to obtain optimal results. In conclusion, Auto-plan is a reasonable method for the initial optimization of cancers of the oropharynx and hypopharynx.