Purpose/Objective(s): To prospectively compare Volumetric Intensity-Modulated Arc Therapy (VMAT) and conventional intensity-modulated radiation therapy (IMRT) in coverage of planning target volumes and avoidance of multiple OARs (organs at risk) in patients undergoing definitive chemoradiotherapy for advanced (stage III or IV) squamous cell cancer of the head and neck.

Materials/Methods: Computed tomography scans of 20 consecutive patients with advanced tumors of the larynx, naso-, oro- and hypopharynx were prospectively planned using IMRT (7 field) and VMAT using two arcs. Calculated doses to planning target volume (PTV) and organs at risk (OAR) were compared between IMRT and VMAT plans. Dose-volume histograms (DVH) were utilized to obtain calculated doses to planning target volume (PTV) and organs at risk (OAR), including parotids, cochlea, spinal cord, brainstem, anterior tongue, pituitary and brachial plexus, and were compared between IMRT and VMAT plans. In addition the plans were compared for dose conformity and homogeneity. The final treatment plan was chosen by the radiation oncologist.

Results: VMAT was chosen as the ultimate plan in 18 of 20 patients (90%) because the plans were thought to be otherwise clinically equivalent. The IMRT plan was chosen in 2 of 20 patients because the VMAT plan produced concentric irradiation of the cord which was not overcome even with an avoidance structure. For all patients, VMAT plans had a lower number of average monitor units on average (MU = 548.75) than IMRT plans (MU = 1511.53) (p<0.0001). Using the conformity index (CI), defined as the 95% isodose volume divided by the PTV, the IMRT plan was more conformal with a lower conformity index (CI = 1.71) than the VMAT plan (CI = 2.11) (p=0.027). Dose homogeneity, as measured by average standard deviation of dose distribution over the PTV, was not different with VMAT (1.43 Gy) or IMRT (1.71 Gy) (p=0.105). There were no differences in sparing organs at risk.

Conclusions: In this prospective study, VMAT plans were chosen over IMRT 90% of the time. Compared to IMRT, VMAT plans used only one third of the MU, had shorter treatment times, similar dose homogeneity, and similar sparing of OAR. IMRT did provide superior dose conformity. This difference in conformity was not clinically significant.

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