Use of volumetric modulated arc radiotherapy in patients with early stage glottic cancer

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ABSTRACT

Aims and background. We compared conformal, intensity-modulated radiotherapy (IMRT) and intensity-modulated arc therapy (IMAT) in early stage glottic cancer in terms of dosimetric features as target coverage, dose to the organs at risk and total treatment time.

Methods and materials. Five consecutive T1 glottic squamous cell carcinoma patients were selected for the study. Three-dimensional conformal radiotherapy (3D-CRT), 3-field or 5-field intensity-modulated radiotherapy (3F-IMRT and 5F-IMRT), or IMAT, which was in 2 different forms – a regular IMAT (R-IMAT) and an alternative IMAT (A-IMAT) with an unirradiated section, was planned for each patient. The prescribed dose was 63 Gy in 28 fractions. The minimum dose for 95% of the clinical target volume (D95), maximum dose point at clinical target volume (Dmax), total monitor units, left and right carotid artery doses (V35 and V50 – percentage of volume receiving 35 Gy and 50 Gy), and total treatment time were calculated for each plan.

Results. Median D95 values in the 5 plans studied with each technique ranged between 63 and 63.3 GY (P = NS). Median Dmax values for each technique ranged between 65.4 and 70.8 Gy. The number of hot spots with IMRT and IMAT was significantly higher than with 3D-CRT plans. Conformal radiotherapy plans median V35 (93.6%) and V50 (76.6-83.3%) values for carotid arteries were significantly higher than with IMRT and IMAT (2.9%-11.4% and 0.0%). Average treatment times for 3D-CRT, 3F-IMRT, 5F-IMRT, R-IMAT and A-IMAT techniques were calculated as 64, 119, 147, 39 and 32 seconds, respectively.

Conclusions. IMAT has significantly decreased the treatment time compared to IMRT and 3D-CRT with acceptable homogeneous clinical target volume coverage and low carotid dose.

Key words: glottic cancer, intensity-modulated radiotherapy, radiotherapy, volumetric arc therapy.

The authors state explicitly that there are no actual or potential conflicts of interest, grants or any other financial support.

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Received July 11, 2011; accepted October 13, 2011.