Comparison of dosimetric parameters and toxicity in esophageal cancer patients undergoing 3D conformal radiotherapy or VMAT.

Abstract:

Volumetric-modulated arc therapy (VMAT) achieves high conformity to the planned target volume (PTV) and good sparing of organs at risk (OAR). This study compares dosimetric parameters and toxicity in esophageal cancer (EC) patients treated with VMAT and 3D conformal radiotherapy (3D-CRT). Between 2007 and 2014, 17 SC patients received neoadjuvant chemoradiation (CRT) with VMAT. Dose-volume histograms and toxicity were compared between these patients and 20 treated with 3D-CRT. All patients were irradiated with a total dose of 45 Gy. All VMAT patients received simultaneous chemotherapy with cisplatin and 5-fluorouracil (5-FU) in treatment weeks 1 and 5. Of 20 patients treated with 3D-CRT, 13 (65 %) also received CRT with cisplatin and 5-FU, whereas 6 patients (30 %) received CRT with weekly oxaliplatin and cetuximab, and a continuous infusion of 5-FU (OE-7). There were no differences in baseline characteristics between the treatment groups. For the lungs, VMAT was associated with a higher V5 (median 90.1 % vs. 79.7 %; p = 0.013) and V10 (68.2 % vs. 56.6 %; p = 0.014), but with a lower V30 (median 6.6 % vs. 11.0 %; p = 0.030). Regarding heart parameters, VMAT was associated with a higher V5 (median 100.0 % vs. 91.0 %; p = 0.043), V10 (92.0 % vs. 79.2 %; p =
0.047), and Dmax (47.5 Gy vs. 46.3 Gy; p = 0.003), but with a lower median dose (18.7 Gy vs. 30.0 Gy; p = 0.026) and V30 (17.7 % vs. 50.4 %; p = 0.015). Complete resection was achieved in 16 VMAT and 19 3D-CRT patients. Due to systemic progression, 2 patients did not undergo surgery. The most frequent postoperative complication was anastomosis insufficiency, occurring in 1 VMAT (6.7 %) and 5 3D-CRT patients (27.8 %; p = 0.180). Postoperative pneumonia was seen in 2 patients of each group (p = 1.000). There was no significant difference in 3-year overall (65 % VMAT vs. 45 % 3D-CRT; p = 0.493) or 3-year progression-free survival (53 % VMAT vs. 35 % 3D-CRT; p = 0.453).
Although dosimetric differences in lung and heart exposure were observed, no clinically relevant impact was detected in either patient group. In a real-life patient cohort, VMAT enables reduction of lung and heart V30 compared to 3D-CRT, which may contribute to reduced toxicity.