

Dosimetric comparison between VMAT and IMRT in adjuvant breast cancer irradiation

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Abstract

Objectives: To compare the dosimetric difference between the Volumetric Modulated Arc Therapy (VMAT) & Intensity Modulated Radiotherapy (IMRT) in breast cancer patients receiving adjuvant radiotherapy, regarding the dose distribution coverage of the target volume and lung doses.

Methods: Twenty patients with breast cancer (left and right sided) who received adjuvant localized radiotherapy to the breast or the chest wall, in Dar Al Fouad hospital were included. Eclipse 13.7.14 (Varian, Palo Alto, USA) planning system was used to design the VMAT & IMRT planning for each patient. VMAT plans were done using 2 half arcs while IMRT plans were made using five fields technique. The prescription dose was 50Gy/25fr/5w. All plans required 95% of the target volume receiving the prescription dose. The dose distribution of the target, conformity index (CI), Homogeneity Index (HI) and lung doses were compared.

Results: Both Rapid-Arc and IMRT plans showed comparative target coverage. The mean **HI** for Rapid-Arc and IMRT was 0.136 and 0.156 ($P=0.609$), respectively. The mean **CI** was 0.869 and 0.842 ($P=0.104$), respectively. V95 of plan target volume was 95.58% and 97.49% ($p=1.23$) respectively. Compared to the IMRT, Rapid-Arc plans had higher dosimetric parameters for the ipsilateral lung: V20 (21.46% for the VMAT vs. 18.45% for the IMRT, vs. 69.41% for the IMRT, $p=0.0624$). % was 77.84 $P=0.00963$) while V5 % for the VMAT Compared to Rapid-Arc plan, IMRT has increased treatment time [(132.9±7.2) s vs. (140.3±11.6) s, $P=0.030$] respectively. Both the machine units were almost the same [(457.0±30.4) MU vs. (484.7±44.9) MU, $P=0.094$] respectively.

Conclusion: VMAT planning and delivery is feasible in treatment and provides highly conformal plans with less treatment delivery times compared to IMRT. It has ability to deliver a large field mono-isocentric plan with reduction of setup uncertainty and in-room shifts. However IMRT has significant reduction in lung dose better than VMAT.