

Dosimetric study for mastectomy carcinoma left breast cases with volumetric modulated arc therapy (VMAT)

Bisht Jyoti¹, Gupta Meenu¹, Kant Ravi¹, Nautiyal Vipul¹, Kumar Viney¹, Dobhal Rishabh¹, Ahmed Mushtaq¹, Saini Sunil²

¹Department of Radiation Oncology & ²Surgical Oncology Cancer Research Institute Swami Rama Himalayan University, Dehradun, Uttarakhand

Abstract

Background

Radiation therapy for breast cancer has evolved from conventional to 3-dimensional radiation therapy (3-DCRT) and through more precise IMRT and VMAT. 3-DCRT is preferred for breast treatment as it reduces low dose area in contra lateral lung but with the advances in radiotherapy image guided techniques can deliver precise and lower doses to OARs with better coverage. This study is aimed to evaluate the doses of PTV, heart and ipsi-lateral lung with contra lateral lung doses delivered by VMAT technique.

Method and material

Total 10 patients of carcinoma left breast with mastectomy were selected for VMAT planning with prescription of 45 Gy/20#. Eclipse 16.1 treatment planning system was used and treatment was delivered by True Beam with 6 MV photon energy with image guidance. The VMAT technique includes the non-continuous partial arc and continuous partial arc to deliver the dose. Dose volume histogram (DVH) was used to analyze for doses of planning target volume (PTV) and organs at risk (OARs).

Results

PTV was covered with average 94.96% of prescribed dose. The average homogeneity index was found 0.02 and average conformity index was found 0.97 for VMAT plans. Mean doses for heart were measured 14.49 ± 2.11 Gy and for $V_{25\text{Gy}}$ 11.16 ± 1.97 Gy. Ipsilateral lung mean doses were observed 16.23 ± 1.01 Gy, $V_{20\text{Gy}}$ doses were 28.73 ± 1.52 Gy, $V_{30\text{Gy}}$ doses were 14.78 ± 2.5 Gy and $V_{40\text{Gy}}$ doses were 5.59 ± 1.98 Gy. The contralateral lung mean doses were reported 7.69 ± 1.79 Gy and $V_{10\text{Gy}}$ 19.05 ± 2.05 Gy. Average planning target volume was 1710.98cc. The average homogeneity index was 0.02 and conformity index was 0.96.

Conclusion

OARs doses with the use of VMAT with continuous and partial arcs are within limit and PTV coverage was also satisfactory. The contralateral lung doses were also within limit. For more precise treatment and low doses of heart and contra lateral lung VMAT technique can be preferred for carcinoma left breast treatment.