ABSTRACT

This study aims to analyze the differences in dose distribution between Intensity Modulated Radiation Therapy (IMRT) and Three-Dimensional Conformal Radiation Therapy (3D-CRT) on the Planning Target Volume (PTV) as well as serial and parallel Organs at Risk (OAR). The research was conducted on 15 brain cancer patients at a referral hospital's radiotherapy facility. Dosimetric evaluation was performed using Dose Volume Histogram (DVH) analysis, Conformity Index (CI), and Homogeneity Index (HI), referencing the International Commission on Radiation Units and Measurements (ICRU) recommendations and established clinical organ dose tolerance limits. The results show that both techniques achieved PTV dose coverage of V95% in line with ICRU recommendations for most patients, with excess dose volume (V107%) remaining within acceptable limits. For serial OAR such as the brainstem and spinal cord, both techniques generally met the established tolerance limits. For parallel OAR such as the eyeball and cochlea, IMRT tended to deliver lower doses to critical organs, although it increased the volume of low-dose surrounding tissue. The average CI and HI values for IMRT were closer to ICRU recommendations, indicating better dose conformity and homogeneity compared to 3D-CRT, with statistical analysis showing significant differences. Overall, IMRT provides superior dosimetric advantages for brain cancer cases with complex target geometry. However, the selection of radiotherapy technique should still consider treatment time efficiency, resource availability, and patient clinical conditions.

***Keywords**: brain cancer, IMRT, 3D-CRT, OAR, PTV*