

ABSTRACT

Three-dimensional conformal radiation therapy (3D-CRT) is still widely used in Craniospinal Irradiation (CSI), particularly in healthcare facilities with limited technological resources. This study aimed to analyze and compare CSI planning using three 3D-CRT techniques—non-half beam block with collimator rotation (NHBWC), half beam block without collimator rotation (HBWOC), and half beam block with collimator rotation (HBWC)—in medulloblastoma patients based on target dose coverage and Organ at Risk (OAR) protection. This study employed a quantitative descriptive-analytic retrospective design using the Eclipse Varian Treatment Planning System (TPS) version 16.0. Dosimetric data were extracted from Dose-Volume Histogram (DVH) curves to evaluate dose distribution in target volumes and OARs. The results showed that all techniques achieved 95% target coverage, although cold spots and hot spots were observed due to body contour variations. The HBWOC technique demonstrated the best Homogeneity Index, while NHBWC showed the most ideal Conformity Index but also the greatest deviation from planning criteria. In terms of OARs, the mean parotid dose in NHBWC exceeded the tolerance limit (>25 Gy), whereas HBWOC and HBWC met the standard. Additionally, HBWOC and HBWC substantially reduced lung and kidney doses by up to 50% compared to NHBWC. Although HBWOC slightly increased heart and bowel doses, these remained within acceptable limits (<50 Gy). In conclusion, the HBWOC technique is the optimal approach, providing the best balance between target dose coverage and OAR protection.

Keywords: Medulloblastoma, Craniospinal Irradiation, 3D-Conformal Radiation Therapy (3D-CRT), Half Beam Block, Dose Distribution.