ABSTRACT

Whole Brain Radiotherapy (WBRT) is a radiotherapy technique commonly used for the treatment of multiple brain metastases. Conventional WBRT has limitations in sparing the hippocampus because this structure is located within the treatment field and therefore receives a dose close to the prescribed dose. Advances in radiotherapy technology have enabled the implementation of Hippocampal Avoidance Whole Brain Radiotherapy (HA-WBRT), which reduces the dose delivered to the hippocampus while maintaining adequate target volume coverage. This study aimed to compare hippocampal Dose Volume Histogram (DVH) parameters between conventional WBRT using the Three-Dimensional Conformal Radiation Therapy (3D-CRT) technique and HA-WBRT using the Volumetric Modulated Arc Therapy (VMAT) technique. Treatment planning was performed using a single brain metastasis CT simulation dataset in the Monaco Treatment Planning System (TPS), employing a 6 MV photon beam and a prescribed dose of 30 Gy in 10 fractions. Plan evaluation was conducted using hippocampal DVH parameters, including minimum dose (D100%), mean dose (Dmean), maximum dose (Dmax), and target volume dose coverage. The results showed that, in the conventional WBRT plan, the hippocampal D100%, Dmean, and Dmax were 30.71 Gy, 30.99 Gy, and 31.21 Gy, respectively, with a target volume V95% of 99.33%. In the HA-WBRT plan, the corresponding hippocampal D100%, Dmean, and Dmax were reduced to 8.90 Gy, 11.18 Gy, and 16.72 Gy, respectively, while maintaining acceptable target volume coverage with a V95% of 98.88%. These findings indicate that HA-WBRT using the VMAT technique provides superior dosimetric sparing of the hippocampus compared with conventional WBRT while maintaining adequate target volume coverage, based on hippocampal DVH analysis.

Keywords **:** WBRT, HA-WBRT, VMAT, 3D-CRT, DVH