ABSTRACT

Whole Brain Radiotherapy (WBRT) is one of the radiotherapy techniques commonly used for brain metastases by delivering irradiation to the entire brain tissue. Three-Dimensional Conformal Radiotherapy (3D-CRT) is widely applied in WBRT planning because it can produce a more conformal dose distribution to the target volume. However, the use of standard lateral beam geometry in WBRT may increase radiation exposure to Organs at Risk (OAR), particularly the eye lenses. This study aimed to analyze the effect of beam angle adjustment on dose distribution in the Planning Target Volume (PTV) and OAR in WBRT planning using the 3D-CRT technique. The study was conducted using CT-simulator data from 10 patients imported into the Monaco Treatment Planning System (TPS). Three planning methods were compared, namely Superposition, Non-Optimization, and Optimization methods. Dose distribution evaluation was performed using Dose Volume Histogram (DVH) dosimetric parameters, including V95%, V3000, and maximum dose (Dmax) to the body, eyes, and lenses. The results showed that the average V95% values for the Superposition, Non-Optimization, and Optimization methods were 99.07%, 98.88%, and 98.96%, respectively, while the average V3000 values were 89.49%, 88.57%, and 90.26%, respectively. The average Body Dmax values for the Superposition, Non-Optimization, and Optimization methods were 3207.57 cGy, 3250.88 cGy, and 3204.75 cGy, respectively. The maximum doses to the left and right lenses in the Optimization method were 775.59 cGy and 727.56 cGy, respectively, which were lower than those of the Non-Optimization method at 968.20 cGy and 875.04 cGy. The Superposition method also demonstrated lens dose reduction through gantry angle modification without compromising target dose coverage. Overall, the Optimization method provided the best lens protection, while the Superposition method served as an effective alternative for improving critical organ sparing in WBRT 3D-CRT planning.

Keywords: *Whole Brain Radiotherapy, 3D-CRT, dose distribution, gantry angle, organ at risk, TPS Monaco.*