ABSTRACT

Anaplastic ependymoma is a highly malignant type of Spinal Cord Ependymoma (SCE). Proton therapy is used to treat this condition and to minimize toxicity to the critical neural structures surrounding the organ. Tumor size and depth influence the planned dose, the number of dose fractions, treatment duration, and the consideration of the radiation dose received by healthy organs, necessitating a precise treatment planning system. The Monte Carlo method provides an effective alternative for accurately predicting radiation dose distribution. This study aims to determine the total, primary, and secondary doses in cases of anaplastic ependymoma. Simulations were conducted using the PHITS 3.34 simulation program on an adult male MRCP mesh phantom. The irradiation directions included a single beam from posterior to anterior (PA) with an energy of 138 MeV and two oblique beams at a 30-degree angle from the right and left sides with an energy of 140 MeV, modulated by a Range Modulator Wheel (RMW). The total dose received by the Gross Tumor Volume (GTV), Clinical Target Volume (CTV), and Planning Target Volume (PTV) was 55.4 Gy – 57 Gy; 54 Gy - 55 Gy; and 49 Gy - 54.1 Gy, respectively. The primary dose received by the GTV, CTV, and PTV was 55.1 Gy – 56.8 Gy; 53.7 Gy - 54.8 Gy; and 48.8 Gy - 53.8 Gy, respectively. The secondary dose ranged from 10-1 Gy to 10-3 Gy. The dose organs at risk (OAR) received was less than 1 Gy, not exceeding the prescribed dose limit. Additionally, the dose received by the OAR with the two-beam oblique configuration at a 30-degree angle from the right and left sides of the tumor was lower compared to the dose received with the single-beam posterior-anterior configuration.

Keyword**:** *anaplastic ependymoma, radiation dose, proton therapy,* PHITS 3.34