عنوان مقاله:

Application of Patient-Customized Cast Type M3 Wax Bolus using a 3D printing for Photon Beam Radiation Therapy in Patients with Scalp Malignant Tumor

محل انتشار:

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خلاصه مقاله:

Introduction: We investigated the usefulness of patient-customized cast type M3 wax bolus (MWB) in radiation therapy in scalp malignant tumor patients by 3D conformal radiation therapy (3D CRT) and intensity-modulated radiation therapy (IMRT). Material and Methods: A helmet-type polylactic acid (PLA) hollow model was fabricated using a 3D Printing, and the molten MWB was poured into the mold and allowed to harden. Subsequently, a solid MWB head cast was obtained by removing the PLA. The radiation volume was verified using a metal oxide semiconductor field-effect transistor (MOSFET) dosimeter and EBT3 film. Results: Radiation dose verification was performed at the anterior, right, and left angles of planning tumor volume. The error rate demonstrated a maximum value of 5.5% and an average of 3.3% using the MOSFET dosimeter, and a maximum value of 7.0% and an average of 5.4% applying the EBT3 film. The homogeneity indices of the treatment plans were obtained as 0.09 and 0.12 using 3D CRT and IMRT, respectively. Moreover, the conformity number of the treatment plans was reported as 0.79 using 3D CRT and 0.81 applying IMRT. Conclusion: The density of the MWB head cast was 1.05 g/cm3 which is closer to that of the equivalent tissue than the existing helmet type bolus material. In addition, it reduces the processing time and associated pain during custom manufacturing and has little air gaps. Therefore, it can be considered an effective method for the treatment of patients with scalp malignant tumors.

کلمات کلیدی:

Cast Type, 3D printing, 3D Conformal Radiation Therapy, Intensity Modulated Radiation Therapy