ABSTRACT

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Early outcome after craniospinal irradiation with pencil beam scanning proton therapy for children, adolescents and young adults with brain tumors.

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Central nervous system (CNS) tumors are the most common solid malignancies in children and adolescents and young adults (C-AYAs). Craniospinal irradiation (CSI) is an essential treatment component for some malignancies, but it can also lead to important toxicity. Pencil beam scanning proton therapy (PBSPT) allows for a minimization of dose delivered to organs at risk and, thus, potentially reduced acute and late toxicity. This study aims to report the clinical outcomes and toxicity rates after CSI for C-AYAs treated with PBSPT. Seventy-one C-AYAs (median age: 7.4 years) with CNS tumors were treated with CSI between 2004 and 2021. Medulloblastoma (n = 42: 59%) and ependymoma (n = 8; 11%) were the most common histologies. Median prescribed total PBSPT dose was 54 GyRBE (range: 18-60.4), and median prescribed craniospinal dose was 24 GyRBE (range: 18-36.8). Acute and late toxicities were coded according to Common Terminology Criteria for Adverse Events. After a median follow-up of 24.5 months, the estimated 2-year local control, distant control, and overall survival were 86.3%, 80.5%, and 84.7%, respectively. Late grade ≥3 toxicity-free rate was 92.6% at 2 years. Recurrent and metastatic tumors were associated with worse outcome. In conclusion, excellent tumor control with low toxicity rates was observed in C-AYAs with brain tumors treated with CSI using PBSPT.

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