ABSTRACT

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A Multi-institutional Comparative Analysis of Proton and Photon Therapy-Induced Hematologic Toxicity in Patients With Medulloblastoma.

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PURPOSE: This multi-institutional retrospective study sought to examine the hematologic effects of craniospinal irradiation (CSI) in pediatric patients with medulloblastoma using proton or photon therapy.
METHODS AND MATERIALS: Clinical and treatment characteristics were recorded for 97 pediatric patients with medulloblastoma who received CSI without concurrent chemotherapy or with concurrent single-agent vincristine from 2000 to 2017. Groups of 60 and 37 patients underwent treatment with proton-based and photon-based therapy, respectively. Overall survival was determined by Kaplan-Meier curves with log-rank test. Comparisons of blood counts at each timepoint were conducted using multiple t tests with Bonferroni corrections. Univariate and multivariate analyses of time to grade ≥3 hematologic toxicity were performed with Cox regression analyses.
RESULTS: Median age of patients receiving proton and photon CSI was 7.5 years

(range, 3.5-22.7 years) and 9.9 years (range, 3.6-19.5 years), respectively. Most patients had a diagnosis of standard risk medulloblastoma, with 86.7% and 89.2% for the proton and photon cohorts, respectively. Median total dose to involved field or whole posterior fossa was 54.0 Gy/Gy relative biological effectiveness (RBE) and median CSI dose was 23.4 Gy/Gy(RBE) (range, 18-36 Gy/Gy[RBE]) for both cohorts. Counts were significantly higher in the proton cohort compared with the photon cohort in weeks 3 to 6 of radiation therapy (RT). Although white blood cell counts did not differ between the 2 cohorts, patients receiving proton RT had significantly higher lymphocyte counts throughout the RT course. Similar results were observed when excluding patients who received vertebral body sparing proton RT or limiting to those receiving 23.4 Gy. Only photon therapy was associated with decreased time to grade ≥3 hematologic toxicity on univariate and multivariable analyses. No difference in overall survival was observed, and lymphopenia did not predict survival. CONCLUSIONS: Patients who receive CSI using proton therapy experience significantly decreased hematologic toxicity compared with those receiving photon therapy.

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