ABSTRACT

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A Prospective Study of Conventionally Fractionated Dose Constraints for Re-Irradiation of Primary Brain Tumors in Adults.

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PURPOSE/OBJECTIVE: Dose constraints for reirradiation of recurrent primary brain tumors are not well-established. This study was conducted to prospectively evaluate composite dose constraints for conventionally-fractionated brain reirradiation.
MATERIALS/METHODS: A single-institution, prospective study of adults with previously irradiated, recurrent brain tumors was performed. For 95% of patients, electronic dosimetry records from the first course of radiation (RT1) were obtained and deformed onto the simulation CT for the second course of radiation (RT2). Conventionally-fractionated treatment plans for RT2 were developed that met protocol-assigned dose constraints for RT2 alone and the composite dose of RT1+RT2. Prospective composite dose constraints were based on histology, interval since RT1, and concurrent bevacizumab. Patients were followed with magnetic resonance imaging including spectroscopy and perfusion studies. Primary endpoint was the rate of symptomatic brain necrosis at six months after RT2.
RESULTS: Patients were enrolled from March 2017 to May 2018; twenty were evaluable. Eighteen had glioma, one had atypical choroid plexus papilloma, and one had hemangiopericytoma. Nineteen patients were treated with VMAT and one was treated with protons. Median RT1 dose was 57 Gy (range, 50-60Gy). Median RT1-RT2 interval was 49 months (range, 9-141 months). Median RT2 dose was 42.4 Gy (range, 36-60Gy). Median PTV volume was 186 cc (range, 8-468cc). Nineteen of 20 patients (95%) were free of grade 3+ CNS necrosis. One patient had grade 3+ necrosis two months after RT2; the patient recovered fully and lived another 18 months until dying of disease progression. Median overall survival from RT2 start for all patients was 13.3 months (95% CI, 6.3-20.7); for glioblastoma patients, 11.5 months (95% CI, 6.1-20.1).
CONCLUSION: Brain reirradiation can be safely performed with conventionally fractionated regimens tailored to prior dose distributions. The prospective composite dose constraints described here are a starting point for future studies of conventionally fractionated reirradiation.

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