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1: [Int J Radiat Oncol Biol Phys](#). 2009 Mar 15;73(4):1082-7. Epub 2008 Aug 26.



Dose-dependent effects of radiation therapy on cerebral blood flow, metabolism, and neurocognitive dysfunction.

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PURPOSE: A prospective study was performed to formally relate dose-dependent radiologically defined changes in normal brain induced by radiotherapy (RT) to neurocognitive dysfunction in subjects with primary brain tumors. **METHODS AND MATERIALS:** Adult patients receiving three-dimensional RT for central nervous system (CNS) tumors were enrolled. Positron emission tomography (PET) scanning and neuropsychological testing were performed before RT and 3 weeks and 6 months after treatment. Analyses were performed for correlations between changes in 2-deoxy-2-[(18F)]-fluoro-d-glucose (FDG)-PET (metabolism), (15)O-PET (relative blood flow), regional radiation dose, follow-up time, and neuropsychological test scores. **RESULTS:** Eleven subjects were enrolled and 6 completed follow-up studies. The PET data showed reduced FDG uptake, with average decreases of 2-6% in regions of the brain receiving greater than 40 Gy at 3 weeks' and 6 months' follow-up. The (15)O-H(2)O PET showed increases (<10%) at 3 weeks in relative regional blood flow in brain receiving greater than 30 Gy, but less at the 6-month follow-up studies. There were significant correlations between decreases in FDG uptake and increased scores from the Symptom Checklist-90-R, with an average increase in T score of 2 ($p < 0.0001$). The Wisconsin Card Sorting Test showed a significant correlation of decreased FDG uptake with increased errors and perseveration in test performance, with an average decrease in T score of 11 ($p = 0.037$). **CONCLUSIONS:** A dose-dependent response of CNS tissue was detected using FDG PET in this small number of patients. Decreases in CNS metabolism correlated with decreased performance on neuropsychological tests for problem solving, cognitive flexibility, and global measures of psychopathology. Additional research is needed to verify and define these findings.

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