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Phase measurement of cognitive impairment specific to radiotherapy

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Purpose: Memory impairment is an early-delayed effect of radiotherapy (RT). The prospective longitudinal measurement of the cognitive phase effects from RT was conducted on treated and untreated brain tumor patients. The study design investigated semantic vs. perceptual and visual vs. verbal memory to determine the most disease-specific measure of RT-related changes and understanding of the neurotoxicity from RT to the brain.

Methods and Materials: Tests of memory that had previously shown RT-related phasic changes were compared with experimental tests of memory to test hypotheses about cognition targeted to the neural toxicity of RT. The results from 41 irradiated and 29 non-irradiated patients with lowgrade, supratentorial tumors were analyzed. The methods controlled for comorbid white matter risk, recurrence, interval after treatment, and age (18-69 years). The effects were examined before RT and at three points after RT to 1 year using a mixed effects model that included interval, group, surgical status, medication use, practice, and individual random effects. Four new tests of memory and other candidate cognitive tests were investigated, and a post hoc analysis of a comprehensive battery of tests was performed to identify the cognitive processes most specific to RT.

Results: The RT effects on memory were identified in the treated group only; among the new tests of memory and the complete neurocognitive battery, the RT effects were significant only for delayed recall ($p<0.009$) and interval to recognize ($p<0.002$). Tumor location was not related to the treatment effect. Memory decline was specific to retrieval of semantic memories; a double dissociation of semantic from perceptual visual memory was demonstrated in the RT group.

Conclusions: These results implicate memory dependent on the semantic cortex and the hippocampal memory system. A cognitive measurement that is brief but specific to neural mechanisms is effective and feasible for studies of RT damage.

Keywords: Brain neoplasms, Conformal radiotherapy, Radiation injury, Memory, Cognitive Disorders.

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Disorders associated with six types of neoplasm: A 16 year population-based study

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Background: Annual rates of cancer diagnosis and costs are reported for specific cancers and age groups over 16 years using health utilization data in addition to the odds ratios for broad international classification of disease (ICD) categories of associated disorders.

Methods: Using physician assigned ICD diagnosis, annual cancer diagnosis rates of six cancers (colorectal, breast, prostate, lung, mesothelioma, and pancreatic) were measured for the period of 1993-2009 in the Calgary, Alberta catchment area. As well, the patient cohort diagnosed with any neoplasm (n=261896) was analyzed by year for three age groups: youth (<25 years), adult (26-69 years), and geriatric (=70 years). Total direct cancer diagnosis costs and associated disorders costs were calculated by year and mean total costs compared by type of cancer. Odds ratio data was calculated for each broad category of ICD diagnosis given the presence or absence of specified cancer types.

Results: Annual rates of diagnosis increased for all six cancers and all three age groups. All six cancers showed their annual rates of diagnosis to be at least 2.1 times greater in 2009 compared to 1994. Colorectal cancer maintained the highest annual cancer rate of diagnosis, the geriatric group had the highest annual rates of cancer diagnosis out of the three age groups, and the youth group annual rates of cancer diagnosis increased by a factor of 2.6. Breast cancer had the highest associated per patient costs whereas prostate cancer had the lowest. In addition to other neoplasms, odds ratios indicated that most cancer types were associated with disorders of the blood and blood producing organs.

Conclusion: Prevalence has been steadily increasing in the Calgary, AB catchment over the study period. Trends in annual rates of diagnosis have implications for future burden on healthcare system and provide a basis for comparison of local rates and expenditures with other healthcare principalities.

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