

'Toxicity map' of brain may help protect cognition for cancer patients

March 20 2013

New research from Wake Forest Baptist Medical Center is giving radiation oncologists who treat brain tumors a better understanding of how to preserve the brain's functions while still killing cancer.

Ann M. Peiffer, Ph.D., assistant professor of <u>radiation oncology</u> at Wake Forest Baptist, and colleagues looked at how radiation treatment to different brain areas impacts function to help protect cognition for patients during and after <u>radiation therapy</u> and beyond.

Radiation treatment of organs with cancer is designed to give enough of a dose to be toxic to the cancer tumor with minimal impact to the surrounding tissue and avoid normal tissue death. For treatment of organs like the lung, kidney or liver, doctors know exactly how much radiation to give before organ function is affected.

However, the same isn't true for <u>brain tissue</u>, so the researchers worked to develop a "toxicity map" of the brain to preserve function. Peiffer said this is the first attempt to relate treatment dose to <u>brain function</u>, as opposed to brain tissue death. While avoiding normal tissue death is important, it doesn't necessarily help prevent the cognitive and functional problems associated with cancer treatments.

"The issue is the toxicity to the brain and its function, which is cognition or how you think, and these functions are affected at a much lower dose of radiation than what causes <u>tissue death</u>," Peiffer said.



The toxicity map was created by taking advantage of data from larger clinical trials held at Wake Forest Baptist. In one of those trials, 57 brain cancer survivors returned six months or more after their radiation treatment to determine whether Donepezil, a drug normally used to improve mental function for those with early Alzheimer 's disease, was effective at improving their cognition. Participants completed cognitive testing upon enrollment, and their scores provided the performance data for the toxicity map. The researchers then went back into the medical records to match participants to their individual radiation dose levels and MRIs taken prior to treatment, Peiffer said.

"By matching cognitive performance to these measurements, we determined which area of the brain and what dose influenced performance on the cognitive tasks," she said. "This gave us a preliminary look at what areas are important to consider for protecting cognition during our planning for <u>radiation treatment</u>."

Peiffer said by looking at the irradiation dose received by specific brain areas important to different cognitive functions, tolerance levels related to function can be established. The exposed amount of these critical <u>brain areas</u> were then related to outcomes of specific tests used to assess cognition or the ability of the patients to think and perform tasks, such as remembering a grocery list or what a drawing looked like, Peiffer said.

"As technology advances and we are able to spare increasing amounts of normal tissue and important functional structures during treatment, it is important to understand and be able to predict the threshold that we need to maintain to prevent treatment toxicities in function," Peiffer said.

Advances in cancer treatment have increased survivorship rates and the length of time individuals are able to live following treatment, Peiffer said, and quality of life becomes a very important issue for these



patients. More research is necessary to validate these data, she said.

Provided by Wake Forest University Baptist Medical Center

Citation: 'Toxicity map' of brain may help protect cognition for cancer patients (2013, March 20) retrieved 27 April 2024 from https://medicalxpress.com/news/2013-03-toxicity-brain-cognition-cancer-patients.html

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