A call to neuroscientists to help reveal root causes of chemobrain

12 June 2018

A substantial fraction of non-central nervous system cancer survivors, especially those who have received chemotherapy, experience long-lasting cognitive difficulties, including problems with concentration, word-finding, short-term memory, and multitasking. Though well documented, cancer-related cognitive impairment (CRCI), known colloquially as chemobrain or chemofog, remains a mystery regarding its underlying neurological causes. In a Forum paper published June 12 in the journal *Trends in Neurosciences*, researchers at the National Cancer Institute propose a new approach to studying CRCI and call for changes in the way it's diagnosed.

"In our opinion, we need an infusion of new ideas from neuroscience," says lead author Todd S. Horowitz, Program Director in the Behavioral Research Program's (BRP) Basic Biobehavioral and Psychological Sciences Branch (BBPSB), located in the Division of Cancer Control and Population Sciences (DCCPS) at the NCI. "The current state of the art of our understanding of CRCI is not sufficient. Cognitive neuroscience would help us characterize the deficits people have and allow us to connect them to particular brain systems."

Better diagnosis tools will also help patients in their choices of cancer treatment options, as they will provide a clearer picture of who is likely to experience CRCI and which cognitive functions are likely to be affected.

The researchers stress the importance of developing better behavioral measurements of CRCI, an understanding of which brain systems are affected, and a better understanding of what the causes may be at the cellular level. They stress the need for development of new kinds of diagnostic testing, including behavioral measures, electrophysiological measures, and functional imaging, among others, to better understand the neurological basis of CRCI.

"As cancer treatments are improving long-term survivorship, there is increased focus on the long-term effects of treatment," says Horowitz. "CRCI is real and those of us in the field are intent on figuring it out."

Many studies confirm that CRCI develops in a subset of cancer survivors, persisting months and sometimes years after treatment is complete. But diagnosing it is remains inconsistent as current testing methods use standard neuropsychological tests, designed primarily for diagnosing focal brain lesions like stroke. "The kind of problems that people have with CRCI are more diffuse and they don't always show up in these neuropsychological tests," says Horowitz. For this reason, the prevalence of CRCI ranges from 17% to 75%, a range that confirms the insufficiency of current measurement techniques.

This lack of a reliable approach to identifying CRCI makes it harder to determine what causes it. "Patients and their families want to know what to expect during and after treatment," says Horowitz. For cancer patients and their families, a better understanding of who is likely to experience CRCI and what causes it may be helpful when deciding what forms of cancer treatment to pursue and ultimately finding ways to mitigate or prevent long-term cognitive difficulties.

Research suggests that those with a higher cognitive reserve or cognitive capacity—such as a stronger memory—are less likely to experience CRCI but those who are already experiencing memory or other cognitive problems may be more likely to have lingering difficulties.

"We believe taking a neuroscience approach to CRCI will help us figure out who is more likely to have these problems," says Horowitz. "If we can figure out what the specific cognitive limitations are, we can better come up with strategies for people to deal with them."

More information: *Trends in Neuroscience*, Horowitz et al: "A call for a neuroscience approach to cancer-related cognitive impairment." https://www.cell.com/trends/neurosciences/fulltext/S0166-2236(18)30114-0 , DOI: 10.1016/j.tins.2018.05.001

Provided by Cell Press