

CANCER-RELATED COGNITIVE IMPAIRMENT: NEUROINFLAMMATORY MECHANISMS AND CLINICAL IMPLICATIONS

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RESUMO

Introduction: Cancer-related cognitive impairment (CRCI), or “chemobrain,” is a prevalent condition affecting up to 75% of cancer patients. It is characterized by significant deficits in memory, attention, and executive function. As a multifactorial syndrome, CRCI involves direct neurotoxicity and chronic neuroinflammation. Despite its profound impact on survivors’ quality of life, the underlying biological mechanisms remain incompletely understood, highlighting the need for enhanced diagnostic and management strategies. **Objective:** This study focuses on understanding the effects of inflammatory mechanisms inside the nervous system while patients are undergoing chemotherapy treatment, also known as chemobrain. **Methods:** A comprehensive literature review was conducted across major scientific databases, including PubMed and Semantic Scholar. Targeted search strategies addressed key domains of cancer-related cognitive impairment (CRCI), including biological, psychological, and treatment-related mechanisms, as well as clinical features, diagnostic approaches, and management. Alternative terminology, such as “chemobrain,” and related concepts were also incorporated. Fifty studies were included based on their relevance to CRCI mechanisms and clinical outcomes. **Results:** Cancer-related cognitive impairment (CRCI) affects a considerable proportion of cancer survivors and is commonly associated with difficulties in memory, attention, processing speed and executive function. While neuroinflammation is widely considered a central mechanism, largely due to chronic activation of the innate immune system and increased levels of inflammatory cytokines, the extent to which it alone accounts for cognitive decline remains uncertain. Other mechanisms, including direct neurotoxicity, oxidative stress, and mitochondrial dysfunction, are also likely to contribute, particularly in the context of chemotherapeutic agents capable of crossing the blood-brain barrier. Evidence from neuroimaging and biomarker studies supports the presence of structural and functional brain alterations, such as reduced gray matter volume and disrupted connectivity in the prefrontal cortex, as well as elevated inflammatory markers in plasma and cerebrospinal fluid, though these findings are not always consistent across studies. Clinically, CRCI has a significant on quality of life, social functioning, and work performance. Interestingly, patients subjective cognitive complaints often do not align with objective neuropsychological test results. **Conclusion:** CRCI is a prevalent and significant condition among cancer patients, associated with cognitive deficits. Neurotoxicity, neuroinflammation, genetic, and psychosocial factors contribute to symptom severity. Despite research advances, gaps remain regarding diagnostic criteria, biomarkers, and therapeutic interventions, emphasizing the need for further studies to improve detection, management, and patients’ quality of life.

Palavras-chave: Cancer-related Cognitive Impairment; Chemobrain; Cognitive Dysfunction; Cancer Survivorship.