Review Cell Oncol (Dordr). 2024 Dec 10. doi: 10.1007/s13402-024-01024-7.

Online ahead of print.

Role of BRCA1 in glioblastoma etiology

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PMID: 39656422 DOI: 10.1007/s13402-024-01024-7

Abstract

BRCA1 (Breast Cancer 1) is a tumor suppressor gene with a role in DNA repair by Homologous Recombination (HR), and maintenance of genomic stability that is frequently investigated in breast, prostate, and ovarian cancers. BRCA1 mutations or dysregulation in glioblastoma can lead to impaired DNA repair mechanisms, resulting in tumor progression and resistance to standard therapies. Several studies have shown that BRCA1 expression is altered, albeit rarely, in glioblastoma, leading to poor prognosis and increased tumor aggressiveness. In addition, the communication of BRCA1 with other molecular pathways such as p53 and PTEN further complicates its role in glioblastoma pathogenesis. Targeting BRCA1-related pathways in these cases has shown the potential to improve the efficacy of standard treatments, including radiotherapy and chemotherapy. The development of (Poly (ADP-ribose) Polymerase) PARP inhibitors that exploit the lack of HR also offers a therapeutic approach to glioblastoma patients with BRCA1 mutations. Despite these advances, the heterogeneity of glioblastoma and its complex tumor microenvironment make the translation of such approaches into clinical practice still challenging, and there is an "unmet need". This review discusses the current mechanisms of etiology and potential treatment of BRCA1-related glioblastoma.

Keywords: BRCA1; DNA repair mechanisms; Glioblastoma.