Neural stem cell-based therapies and glioblastoma management: Current evidence and clinical challenges

Benmelouka, A.Y.
Munir, M.
Sayed, A.
Attia, M.S.
Ali, M.M.
Negida, A.
Alghamdi, B.S.
Kamal, M.A.
Barreto, G.E.
Ashraf, G.M.
Meshref, M.
Bahbah, E.I.

Abstract
Gliomas, which account for nearly a quarter of all primary CNS tumors, present significant contemporary therapeutic challenges, particularly the highest-grade variant (glioblastoma multiforme), which has an especially poor prognosis. These difficulties are due to the tumor's aggressiveness and the adverse effects of radio/chemotherapy on the brain. Stem cell therapy is an exciting area of research being explored for several medical issues. Neural stem cells, normally present in the subventricular zone and the hippocampus, preferentially migrate to tumor masses. Thus, they have two main advantages: They can minimize the side effects associated with systemic radio/chemotherapy while simultaneously maximizing drug delivery to the tumor site. Another fea-ture of stem cell therapy is the variety of treatment approaches it allows. Stem cells can be genetically engineered into expressing a wide variety of immunomodulatory substances that can inhibit tumor growth. They can also be used as delivery vehicles for oncolytic viral vectors, which can then be used to combat the tumorous mass. An alternative approach would be to combine stem cells with prodrugs, which can subsequently convert them into the active form upon migration to the tumor mass. As with any therapeutic modality still in its infancy, much of the research regarding their use is primarily based upon knowledge gained from animal studies, and a number of ongoing clinical trials are currently investigating their effectiveness in humans. The aim of this review is to highlight the current state of stem cell therapy in the treatment of gliomas, exploring the different mechanistic approaches, clinical applicability, and the existing limitations.

Author keywords
Cancer
Glioblastoma
Neural stem cells
Neuro-oncology
Recombinant vectors

Stem cells