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# Current and Future Roles of Chimeric Antigen Receptor T-Cell Therapy in Neurology: A Review

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## Abstract

**Importance:** Advancements in molecular engineering have facilitated the creation of engineered T cells that express synthetic receptors, termed chimeric antigen receptors (CARs). This is promising not only in cancer treatment but also in addressing a spectrum of other conditions. This review provides a comprehensive overview of the current approaches and future potential of CAR T-cell therapy in the field of neurology, particularly for primary brain tumors and autoimmune neurological disorders.

**Observations:** CAR T-cell therapy for glioblastoma is promising; however, first-in-human trials did not yield significant success or showed only limited success in a subset of patients. To date, the efficacy of CAR T-cell therapies has been demonstrated in animal models of multiple sclerosis, but larger human studies to corroborate the efficacy remain pending. CAR T cells showed efficacy in treatment of patients with relapsed or refractory aquaporin 4-immunoglobulin G-seropositive neuromyelitis optica spectrum disorders. Further studies with larger patient populations are needed to confirm these results. Success was reported also for treatment of cases with generalized myasthenia gravis using CAR T cells. Chimeric autoantibody receptor T cells, representing a modified form of CAR T cells directed against autoreactive B cells secreting autoantibodies, were used to selectively target autoreactive anti-N-methyl-d-aspartate B cells under in vitro and in vivo conditions, providing the basis for human studies and application to other types of autoimmune encephalitis associated with neuronal or glial antibodies.

**Conclusions and relevance:** CAR T cells herald a new era in the therapeutic landscape of neurological disorders. While their application in solid tumors, such as glioblastoma, has not universally yielded robust success, emerging innovative strategies show promise, and there is optimism for their effectiveness in certain autoimmune neurological disorders.

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