

Supplementary Table S1| Current checkpoint inhibitor clinical trials for glioma that are active, recruiting, enrolling by invitation, or not yet recruiting

| NCT Number | Title | Status | Conditions | Interventions | Phase | Enrollment | Start Date |
|-------------|------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|----------------|------------|------------|
| NCT02658279 | Pembrolizumab (MK-3475) in Patients with Recurrent Malignant Glioma with a Hypermutator Phenotype | Active, not recruiting | Glioma; Recurrent Malignant Glioma | Pembrolizumab | Not Applicable | 27 | 22-Jan-16 |
| NCT02829931 | Hypofractionated Stereotactic Irradiation with Nivolumab, Ipilimumab and Bevacizumab in Patients with Recurrent High-Grade Gliomas | Active, not recruiting | Malignant Glioma | Hypofractionated Stereotactic Radiation Nivolumab Bevacizumab Ipilimumab | Phase 1 | 33 | 22-Aug-16 |
| NCT02658981 | Anti-LAG-3 Alone & in Combination w/ Nivolumab Treating Patients w/ Recurrent GBM (Anti-CD137 Arm Closed 10/16/18) | Active, not recruiting | Glioblastoma; Gliosarcoma; Recurrent Brain Neoplasm | Anti-LAG-3 Monoclonal Antibody BMS 986016 Anti-CD137 Nivolumab | Phase 1 | 63 | 24-Aug-16 |
| NCT03233152 | Intra-tumoral Ipilimumab Plus Intravenous Nivolumab Following the Resection of Recurrent Glioblastoma | Recruiting | Glioblastoma | Ipilimumab Nivolumab | Phase 1 | 6 | 17-Nov-16 |
| NCT03425292 | A Longitudinal Assessment of Tumor Evolution in Patients with Brain Cancer | Recruiting | Newly Diagnosed High Grade Glioma | Temozolomide conformal brain radiation therapy Nivolumab Ipilimumab Bevacizumab Lomustine | Phase 1 | 90 | 1-Mar-18 |
| NCT03426891 | Pembrolizumab and Vorinostat Combined with Temozolomide for Newly Diagnosed Glioblastoma | Active, not recruiting | Glioblastoma; Brain Tumor; GBM | Pembrolizumab Vorinosta Temozolomide Radiotherapy | Phase 1 | 21 | 16-Mar-18 |
| NCT04047706 | Nivolumab, BMS-986205, and Radiation Therapy with or without Temozolomide in Treating Patients with Newly Diagnosed Glioblastoma | Recruiting | Glioblastoma | IDO1 Inhibitor BMS-986205 Nivolumab Radiation Therapy Temozolomide | Phase 1 | 30 | 13-Aug-19 |
| NCT04201873 | Pembrolizumab and a Vaccine (ATL-DC) for the Treatment of Surgically Accessible Recurrent Glioblastoma | Recruiting | Recurrent Glioblastoma | Dendritic Cell Tumor Cell Lysate Vaccine Pembrolizumab Poly ICLC | Phase 1 | 40 | 8-Jan-20 |
| NCT04160494 | D2C7-IT With Atezolizumab for Recurrent Gliomas | Recruiting | Malignant Glioma | D2C7-IT Atezolizumab | Phase 1 | 18 | 20-Mar-20 |
| NCT04521686 | Study of LY3410738 Administered to Patients with Advanced Solid Tumors with IDH1 or IDH2 Mutations | Recruiting | Cholangiocarcinoma; Chondrosarcoma; Glioma; Any Solid Tumor | LY3410738 Gemcitabine Cisplatin Durvalumab | Phase 1 | 200 | 20-Aug-20 |
| NCT04606316 | Surgical Nivolumab and Ipilimumab for Recurrent GBM | Recruiting | Glioblastoma; GBM; | Nivolumab Ipilimumab Surgery | Phase 1 | 60 | 1-Feb-21 |

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| | | | Glioblastoma Multiforme; Grade IV Astrocytoma | | | | |
| NCT04826393 | ASP8374 + Cemiplimab in Recurrent Glioma | Active, not recruiting | Glioblastoma; Recurrent Glioblastoma | ASP8374 Cemiplimab | Phase 1 | 14 | 9-Mar-22 |
| NCT03277638 | Laser Interstitial Thermotherapy (LITT) Combined with Checkpoint Inhibitor for Recurrent GBM (RGBM) | Recruiting | Glioblastoma, Adult | Pembrolizumab Laser Interstitial Thermotherapy | Phase 1 2 | 34 | 29-Nov-17 |
| NCT05053880 | A Study to Evaluate Safety and Efficacy of ACT001 and Anti-PD-1 in Patients with Surgically Accessible Recurrent Glioblastoma Multiforme | Recruiting | Recurrent Glioblastoma Multiforme (GBM) | ACT001 Pembrolizumab | Phase 1 2 | 48 | 22-Sep-21 |
| NCT04977375 | Trial of Anti-PD-1 Immunotherapy and Stereotactic Radiation in Patients with Recurrent Glioblastoma | Recruiting | Glioblastoma Multiforme | Pembrolizumab Stereotactic Radiation Therapy Surgical Resection | Phase 1 2 | 30 | 9-Dec-21 |
| NCT05084430 | Study of Pembrolizumab and M032 (NSC 733972) | Active, not recruiting | Glioblastoma Multiforme; Anaplastic Astrocytoma; Gliosarcoma | M032 Pembrolizumab | Phase 1 2 | 28 | 25-Feb-22 |
| NCT02337686 | Pembrolizumab in Treating Patients with Recurrent Glioblastoma | Active, not recruiting | Recurrent Glioblastoma; Recurrent Gliosarcoma | Pembrolizumab Conventional Surgery | Phase 2 | 20 | 28-Apr-15 |
| NCT03018288 | Radiation Therapy Plus Temozolomide and Pembrolizumab with and without HSPPC-96 in Newly Diagnosed Glioblastoma (GBM) | Active, not recruiting | Glioblastoma | Pembrolizumab HSPPC-96 Temozolomide | Phase 2 | 90 | 21-Sep-17 |
| NCT03452579 | Nivolumab Plus Standard Dose Bevacizumab Versus Nivolumab Plus Low Dose Bevacizumab in GBM | Active, not recruiting | Glioblastoma | Nivolumab Low Dose Bevacizumab Standard Dose Bevacizumab | Phase 2 | 90 | 21-May-18 |
| NCT03557359 | Nivolumab for Recurrent or Progressive IDH Mutant Gliomas | Active, not recruiting | Gliomas | Nivolumab | Phase 2 | 20 | 12-Jun-18 |
| NCT03661723 | Pembrolizumab and Reirradiation in Bevacizumab Naïve and Bevacizumab Resistant Recurrent Glioblastoma | Active, not recruiting | Glioblastoma | Pembrolizumab Bevacizumab Re-irradiation | Phase 2 | 61 | 28-Sep-18 |
| NCT04056910 | Ivosidenib (AG-120) with Nivolumab in IDH1 Mutant Tumors | Recruiting | Advanced Solid Tumor; IDH1 Mutation Glioma | Ivosidenib Nivolumab | Phase 2 | 35 | 14-Aug-19 |
| NCT03718767 | Nivolumab in Patients with IDH-Mutant Gliomas with and without Hypermutator Phenotype | Recruiting | Glioma; Glioblastoma; High Grade Glioma; Low Grade Glioma; | Nivolumab | Phase 2 | 95 | 27-Mar-19 |

| | | | Malignant Glioma | | | | |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|---------|-----|-----------|
| NCT03743662 | Nivolumab with Radiation Therapy and Bevacizumab for Recurrent MGMT Methylated Glioblastoma | Active, not recruiting | Glioblastoma | Re-irradiation Bevacizumab Nivolumab Re-resection | Phase 2 | 39 | 12-Nov-18 |
| NCT03899857 | Pembrolizumab for Newly Diagnosed Glioblastoma | Active, not recruiting | Newly Diagnosed Glioblastoma | Pembrolizumab | Phase 2 | 56 | 21-Oct-20 |
| NCT04013672 | Study of Pembrolizumab Plus SurVaxM for Glioblastoma at First Recurrence | Active, not recruiting | Recurrent Glioblastoma | Pembrolizumab SurVaxM Sargramostim Montanide ISA 51 | Phase 2 | 40 | 19-Mar-20 |
| NCT04145115 | A Study Testing the Effect of Immunotherapy (Ipilimumab and Nivolumab) in Patients with Recurrent Glioma with Elevated Mutational Burden | Recruiting | Diffuse Glioma; Recurrent Astrocytoma, IDH-Mutant, Grade 4; Recurrent Glioblastoma, IDH-Wildtype; Secondary Glioblastoma | Ipilimumab Nivolumab | Phase 2 | 37 | 30-Oct-20 |
| NCT04195139 | Nivolumab and Temozolomide Versus Temozolomide Alone in Newly Diagnosed Elderly Patients With GBM | Active, not recruiting | Glioblastoma Multiforme | Nivolumab Temozolomide | Phase 2 | 103 | 22-Feb-18 |
| NCT04479241 | LUMINOS-101: Lerapolturev (PVSRIPO) and Pembrolizumab in Patients with Recurrent Glioblastoma | Active, not recruiting | Glioblastoma; Recurrent Glioblastoma; Supratentorial Glioblastoma; Brain Tumor | Lerapolturev pembrolizumab | Phase 2 | 30 | 21-Oct-20 |
| NCT04583020 | Neoadjuvant PD-1 in Newly Diagnosed Glioblastoma | Recruiting | Glioblastoma | Camrelizumab Radiation Temozolomide | Phase 2 | 42 | 12-Nov-20 |
| NCT04588987 | Neoadjuvant Carilizumab and Apatinib for Recurrent High-Grade Glioma | Recruiting | Neoadjuvant Therapy; Carilizumab; Apatinib; Recurrent High-Grade Glioma | Biological: PD-1 | Phase 2 | 60 | Oct-20 |
| NCT04729959 | Testing the Addition of the Immune Therapy Drugs, Tocilizumab and Atezolizumab, to Radiation Therapy for Recurrent Glioblastoma | Recruiting | Diffuse Astrocytoma, IDH-Wildtype; Recurrent Glioblastoma | Atezolizumab Conventional Surgery Fractionated Stereotactic Radiation Therapy Tocilizumab | Phase 2 | 12 | 6-Jul-21 |
| NCT04817254 | Association of Peripheral Blood Immunologic Response to Therapeutic Response to Adjuvant Treatment with Immune Checkpoint Inhibition (ICI) in Patients with | Recruiting | Glioblastoma; Gliosarcoma; Malignant Glioma | TMZ Ipilimumab Nivolumab | Phase 2 | 48 | 8-Dec-21 |

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| | Newly Diagnosed Glioblastoma or Gliosarcoma | | | | | | |
| NCT04952571 | Combined Treatment of Camrelizumab and Bevacizumab for Adult Patients with Recurrent Glioblastoma (GBM) | Recruiting | Recurrent Glioblastoma | Camrelizumab Bevacizumab | Phase 2 | 94 | 1-May-21 |
| NCT05074992 | A Trial of Neoadjuvant Therapy in Patients with Newly Diagnosed Glioblastoma | Recruiting | Glioblastoma | Drug: Ipilimumab | Phase 2 | 43 | 24-Aug-22 |
| NCT05366062 | ERC1671 to Treat Malignant Gliomas When Given in Combination With GM-CSF, Cyclophosphamide, Bevacizumab and Pembrolizumab | Not yet recruiting | Glioma, Malignant | ERC1671 GM-CSF Cyclophosphamide Pembrolizumab | Phase 2 | 28 | 1-Jul-22 |
| NCT05465954 | Efineptakin Alfa and Pembrolizumab for the Treatment of Recurrent Glioblastoma | Not yet recruiting | High Grade Astrocytic Tumor; Recurrent Glioblastoma, IDH-Wildtype; Recurrent Gliosarcoma | Efineptakin alfa Pembrolizumab | Phase 2 | 34 | 15-Nov-22 |
| NCT02017717 | A Study of the Effectiveness and Safety of Nivolumab Compared to Bevacizumab and of Nivolumab with or Without Ipilimumab in Glioblastoma Patients | Active, not recruiting | Recurrent Glioblastoma | Nivolumab Bevacizumab Ipilimumab | Phase 3 | 529 | 7-Feb-14 |
| NCT02667587 | An Investigational Immunotherapy Study of Temozolomide Plus Radiation Therapy with Nivolumab or Placebo, for Newly Diagnosed Patients with Glioblastoma (GBM, a Malignant Brain Cancer) | Active, not recruiting | Brain Neoplasms | Nivolumab Temozolomide Radiotherapy | Phase 3 | 716 | 9-May-16 |
| NCT05235737 | The Assessment of Immune Response in Newly Diagnosed Glioblastoma Patients Treated with Pembrolizumab | Not yet recruiting | Newly Diagnosed Glioblastoma | Pembrolizumab | Phase 4 | 36 | 1-Mar-22 |

Results obtained from clinicaltrials.gov by searching entries with Glioma OR GBM OR Glioblastoma and selecting relevant studies investigating checkpoint inhibitors (excluding missing info, unknown status, and pediatric tumors)

Supplementary Table S2| Current checkpoint inhibitor clinical trials for meningioma that are active, recruiting, enrolling by invitation, or not yet recruiting

| NCT Number | Title | Status | Conditions | Interventions | Phases | Enrollment | Start Date |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-----------------|------------|------------|
| NCT04728568 | Exploratory Study of PD-1 Neoadjuvant Treatment of Recurrent Meningioma | Recruiting | Meningioma, Malignant | Sintilimab | Not Applicable | 15 | 1-Jun-20 |
| NCT03267836 | Neoadjuvant Avelumab and Hypofractionated Proton Radiation Therapy Followed by Surgery for Recurrent Radiation-refractory Meningioma | Active, not recruiting | Meningioma; Meningioma, Adult | Avelumab Proton Therapy Surgery | Phase 1 | 9 | 10-Jan-18 |
| NCT03604978 | Nivolumab and Multi-fraction Stereotactic Radiosurgery with or Without Ipilimumab in Treating Patients with Recurrent Grade II-III Meningioma | Recruiting | Grade 2 Meningioma; Grade 3 Meningioma; Recurrent Meningioma | Ipilimumab Nivolumab Stereotactic Radiosurgery | Phase 1 Phase 2 | 15 | 21-Nov-18 |
| NCT02648997 | An Open-Label Phase II Study of Nivolumab in Adult Participants with Recurrent High-Grade Meningioma | Recruiting | Meningiomas | Nivolumab - 240 mg Ipilimumab - 1 mg/kg Nivolumab - 480 mg Nivolumab - 3 mg/kg External Beam RT | Phase 2 | 50 | Mar-16 |
| NCT03173950 | Immune Checkpoint Inhibitor Nivolumab in People with Recurrent Select Rare CNS Cancers | Recruiting | Medulloblastoma; Ependymoma; Pineal Region Tumors; Choroid Plexus Tumors; Atypical/Malignant Meningioma | Nivolumab | Phase 2 | 180 | 13-Jul-17 |
| NCT03279692 | Phase II Trial of Pembrolizumab in Recurrent or Residual High-Grade Meningioma | Active, not recruiting | High Grade Meningioma | Pembrolizumab | Phase 2 | 26 | 7-Nov-17 |
| NCT04659811 | Stereotactic Radiosurgery and Immunotherapy (Pembrolizumab) for the Treatment of Recurrent Meningioma | Recruiting | Grade I Meningioma, Adult; Grade II Meningioma, Adult; Grade III Meningioma, Adult; Recurrent Meningioma | Pembrolizumab Stereotactic Radiosurgery | Phase 2 | 90 | 25-Mar-21 |

Results obtained from clinicaltrials.gov by searching entries with meningioma and selecting relevant studies investigating checkpoint inhibitors (excluding missing info, unknown status, and pediatric tumors)

Supplementary Table S3| Current vaccine clinical trials for glioma that are active, recruiting, enrolling by invitation, or not yet recruiting

| NCT Number | Title | Status | Conditions | Interventions | Phases | Enrollment | Start Date |
|-------------|--------------------------------------------------------------------------------------------------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------|------------|------------|
| NCT05557240 | Neoantigens Phase I Trial in Newly Diagnosed Glioblastoma Patients | Recruiting | Glioma, Malignant | NeoPep Vaccine1 plus Poly-ICLC NeoPep Vaccine2 plus Poly-ICLC | Not Applicable | 10 | 13-Sep-22 |
| NCT01957956 | Vaccine Therapy and Temozolomide in Treating Patients with Newly Diagnosed Glioblastoma | Active, not recruiting | Giant Cell Glioblastoma; Glioblastoma; Gliosarcoma | Malignant Glioma Tumor Lysate-Pulsed Autologous Dendritic Cell Vaccine Temozolomide | Early Phase 1 | 21 | 11-Nov-13 |
| NCT03360708 | Vaccine Therapy in Treating Patients with Recurrent Glioblastoma | Active, not recruiting | Giant Cell Glioblastoma; Recurrent Glioblastoma; Recurrent Gliosarcoma | Malignant Glioma Tumor Lysate-Pulsed Autologous Dendritic Cell Vaccine | Early Phase 1 | 20 | 3-Jun-19 |
| NCT00639639 | Vaccine Therapy in Treating Patients with Newly Diagnosed Glioblastoma Multiforme | Active, not recruiting | Malignant Neoplasms of Brain | Tetanus toxoid Therapeutic autologous dendritic cells Therapeutic autologous lymphocytes | Phase 1 | 42 | Jan-06 |
| NCT02287428 | Personalized NeoAntigen Cancer Vaccine w RT Plus Pembrolizumab for Patients with Newly Diagnosed GBM | Recruiting | Glioblastoma | Radiation Therapy Personalized NeoAntigen Vaccine Pembrolizumab Temozolomide | Phase 1 | 56 | Nov-14 |
| NCT02193347 | IDH1 Peptide Vaccine for Recurrent Grade II Glioma (RESIST) | Active, not recruiting | Brain Cancer; Brain Neoplasm, Primary; Brain Neoplasms, Recurrent; Brain Tumor Cancer of the Brain | PEPIDH1M vaccine Tetanus-Diphtheria Toxoid (Td) Temozolomide | Phase 1 | 24 | 28-Jan-16 |
| NCT02549833 | Neo-adjuvant Evaluation of Glioma Lysate Vaccines in WHO Grade II Glioma | Active, not recruiting | Oligodendroglioma; Astrocytoma, Grade II; Glioma, Astrocytic; Glioma; Malignant; Glioma; Oligoastrocytoma, Mixed | GBM6-AD and poly-ICLC before and after surgery GBM6-AD and poly-ICLC after surgery only | Phase 1 | 28 | 17-Oct-16 |
| NCT02924038 | A Study of Varlilumab and IMA950 Vaccine Plus Poly-ICLC in Patients with WHO Grade II Low-Grade Glioma (LGG) | Active, not recruiting | Glioma; Malignant Glioma; Astrocytoma, Grade II; Oligodendroglioma; Glioma, Astrocytic; Oligoastrocytoma, Mixed | IMA950 poly-ICLC Varlilumab | Phase 1 | 14 | 3-Apr-2017 |
| NCT03893903 | AMPLIFYing NEOepitope-specific VACCine Responses in Progressive Diffuse Glioma | Recruiting | Malignant Glioma | IDH1R132H peptide vaccine Avelumab | Phase 1 | 60 | 19-Oct-18 |

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| NCT03914768 | Immune Modulatory DC Vaccine Against Brain Tumor | Enrolling by invitation | Diffuse Intrinsic Pontine Glioma; Glioblastoma | Immunomodulatory DC vaccine to target DIPG and GBM | Phase 1 | 10 | 31-Mar-19 |
| NCT04201873 | Pembrolizumab and a Vaccine (ATL-DC) for the Treatment of Surgically Accessible Recurrent Glioblastoma | Recruiting | Recurrent Glioblastoma | Dendritic Cell Tumor Cell Lysate Vaccine Pembrolizumab Poly ICLC | Phase 1 | 40 | 8-Jan-20 |
| NCT04642937 | Study of CD200 Activation Receptor Ligand (CD200AR-L) and Allogeneic Tumor Lysate Vaccine Immunotherapy for Recurrent Glioblastoma | Active, not recruiting | Glioblastoma | hPIA8 | Phase 1 | 24 | 1-Dec-20 |
| NCT04842513 | Multi Peptide Vaccination with XS15 in Addition to Standard Postoperative Radiation Therapy and Temozolomide Chemotherapy in Newly Diagnosed Glioblastoma | Recruiting | Glioblastoma Multiforme of Brain | Multipeptide plus XS15 | Phase 1 | 15 | 3-May-21 |
| NCT04943718 | Personalized Vaccine for Patients with Recurrent Malignant Glioma | Recruiting | Malignant Glioma; Recurrent Glioma | Personalized vaccine | Phase 1 | 10 | 15-Jul-21 |
| NCT04968366 | Safety & Efficacy of DC Vaccine and TMZ for the Treatment of Newly diagnosed Glioblastoma After Surgery | Recruiting | Glioblastoma Multiforme of Brain | Autologous dendritic cells pulsed with multiple neoantigen peptides Temozolomide adjuvant chemotherapy | Phase 1 | 10 | 30-Jul-21 |
| NCT04552886 | Dendritic Cell Vaccination with Standard Postoperative Chemoradiation for the Treatment of Adult Glioblastoma | Recruiting | Glioblastoma | TH-1 Dendritic Cell Immunotherapy | Phase 1 | 24 | 11-Oct-21 |
| NCT04963413 | RENEW: Feasibility of CMV RNA-Pulsed Dendritic Cells Vaccines for the Treatment of Newly Diagnosed Glioblastoma Patients. | Recruiting | Glioblastoma | Autologous DCs derived from PBMC loaded with RNA encoding the human CMV matrix protein pp65-flLAMP plus GM-CSF | Phase 1 | 10 | 13-Jan-22 |
| NCT05283109 | ETAPA I: Peptide-based Tumor Associated Antigen Vaccine in GBM | Not yet recruiting | Glioma, Malignant | Tumor Associated Antigen Peptide Vaccine P30-EPS Vaccine Hiltonol | Phase 1 | 36 | Nov-22 |
| NCT04801147 | Immunotherapy With Autologous Tumor Lysate-Loaded Dendritic Cells In Patients with Newly Diagnosed Glioblastoma Multiforme | Recruiting | Glioblastoma | Biological: Dendritic Cells Vaccine | Phase 1 Phase 2 | 76 | Jun-10 |
| NCT02649582 | Adjuvant Dendritic Cell-immunotherapy Plus Temozolomide in Glioblastoma Patients | Recruiting | Glioblastoma Multiforme of Brain | Dendritic cell vaccine plus temozolomide chemotherapy | Phase 1 Phase 2 | 20 | Dec-15 |
| NCT03382977 | Study to Evaluate Safety, Tolerability, and Optimal Dose of Candidate GBM Vaccine VBI-1901 in Recurrent GBM Subjects | Active, not recruiting | Glioblastoma Multiforme | VBI-190 Carmustine Lomustine | Phase 1 Phase 2 | 98 | 6-Dec-17 |
| NCT04116658 | First-in-Human, Phase 1b/2a Trial of a Multipeptide Therapeutic Vaccine | Recruiting | Glioblastoma, Adult | Multiple doses of EO2401 | Phase 1 Phase 2 | 52 | 13-Jul-20 |

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| | in Patients with Progressive Glioblastoma | | | | | | |
| NCT04388033 | Clinical Study of an Dendritic and Glioma Cells Fusion Vaccine With IL-12 for Treatment-naïve GBM Patients. | Recruiting | Glioblastoma; Glioma; Neoplasms, Neuroepithelial; Neuroectodermal Tumors; Neoplasms, Nerve Tissue | Dendritic Cell Tumor Fusion Vaccine Interleukin-12 Temozolomide | Phase 1 Phase 2 | 10 | Dec-20 |
| NCT01204684 | Dendritic Cell Vaccine for Patients with Brain Tumors | Active, not recruiting | Glioma; Anaplastic Astrocytoma; Anaplastic Astro-oligodendroglioma; Glioblastoma | Autologous tumor lysate-pulsed DC vaccination Tumor lysate-pulsed DC vaccination+0.2% resiquimod Tumor-lysate pulsed DC vaccination +adjuvant polyICLC | Phase 2 | 60 | 8-Oct-10 |
| NCT01814813 | Vaccine Therapy with Bevacizumab Versus Bevacizumab Alone in Treating Patients with Recurrent Glioblastoma Multiforme That Can Be Removed by Surgery | Active, not recruiting | Recurrent Glioblastoma; Recurrent Adult Brain Tumor; Gliosarcoma | HSPPC-96 Bevacizumab | Phase 2 | 90 | May-13 |
| NCT02358187 | A Vaccine Trial for Low Grade Gliomas | Recruiting | Low Grade Glioma | HLA-A2 Restricted Glioma Antigen-Peptides with Poly-ICLC | Phase 2 | 25 | Jan-15 |
| NCT02455557 | SurVaxM Vaccine Therapy and Temozolomide in Treating Patients with Newly Diagnosed Glioblastoma | Active, not recruiting | Glioblastoma; Gliosarcoma | Montanide ISA 51 VG Sargramostim SVN53-67/M57-KLH Peptide Vaccine Temozolomide | Phase 2 | 66 | 4-May-15 |
| NCT02465268 | Vaccine Therapy for the Treatment of Newly Diagnosed Glioblastoma Multiforme | Recruiting | Glioblastoma Multiforme; Glioblastoma; Malignant Glioma Astrocytoma, Grade IV; GBM | pp65-shLAMP DC with GM-CSF unpulsed PBMC and saline pp65-flLAMP DC with GM-CSF | Phase 2 | 175 | Aug-16 |
| NCT03395587 | Efficiency of Vaccination with Lysate-loaded Dendritic Cells in Patients with Newly Diagnosed Glioblastoma | Recruiting | Glioblastoma | Autologous, tumor lysate-loaded, mature dendritic cells (DC) standard therapy | Phase 2 | 136 | 6-Mar-18 |
| NCT03400917 | Autologous Dendritic Cells Loaded with Autologous Tumor Associated Antigens for Treatment of Newly Diagnosed Glioblastoma | Active, not recruiting | Newly Diagnosed Glioblastoma | Biological: AV-GBM-1 | Phase 2 | 55 | 20-Jun-18 |
| NCT03688178 | DC Migration Study to Evaluate TReg Depletion in GBM Patients with and Without Varlilumab | Recruiting | Glioblastoma | Human CMV pp65-LAMP mRNA-pulsed autologous DCs Temozolomide Varlilumab Unpulsed DCs | Phase 2 | 80 | 26-Aug-20 |
| NCT04523688 | Vaccination With Autologous Dendritic Cells Loaded with | Not yet recruiting | Glioblastoma | Autologous Dendritic Cells (DC) vaccine | Phase 2 | 28 | Mar-21 |

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| | Autologous Tumour Homogenate in Glioblastoma | | | Temozolomide | | | |
| NCT04888611 | Neoadjuvant PD-1 Antibody Alone or Combined with DC Vaccines for Recurrent Glioblastoma | Recruiting | Recurrent Glioblastoma | Camrelizumab plus GSC-DCV Camrelizumab plus Placebo | Phase 2 | 40 | 26-Oct-21 |
| NCT05163080 | SurVaxM Plus Adjuvant Temozolomide for Newly Diagnosed Glioblastoma (SURVIVE) | Recruiting | Newly Diagnosed Glioblastoma | SurVaxM | Phase 2 | 265 | 18-Nov-21 |
| NCT03548571 | Dendritic Cell Immunotherapy Against Cancer Stem Cells in Glioblastoma Patients Receiving Standard Therapy | Active, not recruiting | Glioblastoma | Dendritic cell immunization Adjuvant temozolomide | Phase 2 Phase 3 | 60 | 26-Apr-18 |
| NCT00045968 | Study of a Drug [DCVax®-L] to Treat Newly Diagnosed GBM Brain Cancer | Active, not recruiting | Glioblastoma Multiforme; Glioblastoma; GBM; Grade IV Astrocytoma; Glioma; Brain Cancer; Brain Tumor | Dendritic cell immunotherapy | Phase 3 | 348 | Dec-06 |
| NCT04277221 | ADCTA for Adjuvant Immunotherapy in Standard Treatment of Recurrent Glioblastoma Multiforme (GBM) | Recruiting | Glioblastoma Multiforme | Autologous Dendritic Cell/Tumor Antigen, ADCTA | Phase 3 | 118 | 19-Sep-19 |
| NCT05100641 | AV-GBM-1 vs Control as Adjunctive Therapy After RT/TMZ for Newly Diagnosed GBM | Not yet recruiting | Primary Glioblastoma | AV-GBM-Autologous monocytes | Phase 3 | 726 | Mar-22 |

Results obtained from clinicaltrials.gov by searching entries with Glioma OR GBM OR Glioblastoma AND vaccine and selecting relevant studies (Excluding missing info, unknown status, and pediatric tumors)

Supplementary Table S4| Current CAR-T cell clinical trials in glioma that are active, recruiting, enrolling by invitation, or not yet recruiting

| NCT Number | Title | Status | Conditions | Interventions | Phases | Enrollment | Start Date |
|-------------|-----------------------------------------------------------------------------------------------------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|------------|
| NCT04717999 | Pilot Study of NKG2D CAR-T in Treating Patients with Recurrent Glioblastoma | Not yet recruiting | Recurrent Glioblastoma | NKG2D CAR-T | Not Applicable | 20 | 1-Sep-21 |
| NCT05024175 | Long-term Follow-up of Subjects Treated with CARv3-TEAM-E T Cells | Not yet recruiting | Glioblastoma Recurrent, EGFR vIII Mutant; Newly Diagnosed Glioblastoma, EGFRvIII Mutant; Recurrent Glioblastoma, EGFR vIII Negative | CARv3-TEAM-E T cells | Not Applicable | 18 | Dec-21 |
| NCT02208362 | Genetically Modified T-cells in Treating Patients with Recurrent or Refractory Malignant Glioma | Active, not recruiting | Recurrent Glioblastoma; Recurrent Malignant Glioma; Recurrent WHO Grade II Glioma; Recurrent WHO Grade III Glioma; Refractory Glioblastoma; Refractory Malignant Glioma; Refractory WHO Grade II Glioma; Refractory WHO Grade III Glioma | IL13Ralpha2-specific Hinge-optimized 4-1BB-co-stimulatory CAR/Truncated CD19-expressing Autologous TN/MEM Cells IL13Ralpha2-specific Hinge-optimized 41BB-co-stimulatory CAR Truncated CD19-expressing Autologous T-Lymphocytes | Phase 1 | 82 | 18-May-15 |
| NCT03423992 | Personalized Chimeric Antigen Receptor T Cell Immunotherapy for Patients with Recurrent Malignant Gliomas | Recruiting | Glioma; Malignant Glioma of Brain | Chimeric antigen receptor T cells | Phase 1 | 100 | 2-Mar-18 |
| NCT03389230 | Memory-Enriched T Cells in Treating Patients with Recurrent or Refractory Grade III-IV Glioma | Recruiting | Glioblastoma; Malignant Glioma; Recurrent Glioma; Refractory Glioma; WHO Grade III Glioma | HER2(EQ)BBζ/CD19t+ T cells Leukapheresis | Phase 1 | 42 | 14-Aug-18 |
| NCT03170141 | Immunogene-modified T (IgT) Cells Against Glioblastoma Multiforme | Enrolling by invitation | Glioblastoma Multiforme of Brain; Glioblastoma Multiforme | Antigen-specific IgT cells | Phase 1 | 20 | 31-May-19 |

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| NCT04003649 | IL13Ra2-CAR T Cells with or without Nivolumab and Ipilimumab in Treating Patients With GBM | Recruiting | Recurrent Glioblastoma; Refractory Glioblastoma | IL13Ralpha2-specific Hinge-optimized 4-1BB-co-stimulatory CAR/Truncated CD19-expressing Autologous TN/MEM Cells Ipilimumab Nivolumab | Phase 1 | 60 | 26-Sep-19 |
| NCT04099797 | C7R-GD2.CAR T Cells for Patients with GD2-expressing Brain Tumors (GAIL-B) | Recruiting | Diffuse Intrinsic Pontine Glioma; High Grade Glioma; Embryonal Tumor; Ependymal Tumor | Genetic: (C7R)-GD2.CART cells Cyclophosphamide Fludarabine | Phase 1 | 34 | 3-Feb-20 |
| NCT04214392 | Chimeric Antigen Receptor (CAR) T Cells with a Chlorotoxin Tumor-Targeting Domain for the Treatment of MMP2+ Recurrent or Progressive Glioblastoma | Recruiting | Recurrent Glioblastoma; Recurrent Malignant Glioma; Recurrent WHO Grade II Glioma; Recurrent WHO Grade III Glioma | Chlorotoxin (EQ)-CD28-CD3zeta-CD19t-expressing CAR T-lymphocytes (via ICT delivery) Chlorotoxin (EQ)-CD28-CD3zeta-CD19t-expressing CAR T-lymphocytes (via ICT/ICV dual delivery) | Phase 1 | 36 | 26-Feb-20 |
| NCT05063682 | The Efficacy and Safety of Brain-targeting Immune Cells (EGFRvIII-CAR T Cells) in Treating Patients with Leptomeningeal Disease from Glioblastoma. Administering Patients EGFRvIII -CAR T Cells May Help to Recognize and Destroy Brain Tumor Cells in Patients | Active, not recruiting | Glioblastoma; Glioblastoma Multiforme; Glioma, Malignant | BEGFRvIII-specific hinge-optimized CD3 ζ-stimulatory/41BB-co-stimulatory Chimeric Antigen Receptor autologous T-lymphocytes | Phase 1 | 10 | 15-May-20 |
| NCT04550663 | NKG2D CAR-T(KD-025) in the Treatment of Relapsed or Refractory NKG2DL+ Tumors | Not yet recruiting | Solid Tumor; Hepatocellular Carcinoma; Colorectal Cancer; Glioma | KD-025 CAR-T cells | Phase 1 | 10 | 25-Sep-20 |
| NCT05131763 | NKG2D-based CAR T-cells Immunotherapy for Patient With r/r NKG2DL+ Solid Tumors | Recruiting | Hepatocellular Carcinoma; Glioblastoma; Medulloblastoma; Colon Cancer | NKG2D-based CAR T-cells | Phase 1 | 3 | 1-Mar-21 |
| NCT04661384 | Brain Tumor-Specific Immune Cells (IL13Ralpha2-CAR T Cells) for the Treatment of Leptomeningeal Glioblastoma, Ependymoma, or Medulloblastoma | Recruiting | Ependymoma; Glioblastoma; Medulloblastoma; Recurrent Metastatic Malignant Neoplasm in the Leptomeninges | IL13Ralpha2-specific Hinge-optimized 41BB-co-stimulatory CAR Truncated CD19-expressing Autologous T-Lymphocytes | Phase 1 | 30 | 5-Mar-21 |
| NCT05241392 | Safety and Efficacy Study of Anti-B7-H3 CAR-T Cell Therapy for Recurrent Glioblastoma | Recruiting | Glioblastoma | B7-H3-targeting CAR-T cells | Phase 1 | 30 | 27-Jan-22 |
| NCT05474378 | B7-H3 Chimeric Antigen Receptor T Cells (B7-H3CART) in Recurrent Glioblastoma Multiforme | Recruiting | Brain and Nervous System | B7-H3CART | Phase 1 | 39 | 12-Jul-22 |

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| NCT05540873 | A Clinical Study of IL13R α 2 Targeted CAR-T in Patients With Malignant Glioma (MAGIC-I) | Recruiting | Recurrent Malignant Glioma | YYB-103 | Phase 1 | 18 | 18-Jul-22 |
| NCT05366179 | Autologous CAR-T Cells Targeting B7-H3 in Recurrent or Refractory GBM CAR.B7-H3Tc | Recruiting | Glioblastoma Multiforme | CAR.B7-H3T cells infusion | Phase 1 | 36 | 2-Sep-22 |
| NCT05353530 | Phase I Study of IL-8 Receptor-modified CD70 CAR T Cell Therapy in CD70+ and MGMT-unmethylated Adult Glioblastoma (IMPACT) | Not yet recruiting | Glioblastoma | Ex-Vivo expanded autologous IL-8 receptor (CXCR2) modified CD70 CAR (8R-70CAR) T cells | Phase 1 | 18 | Oct-22 |
| NCT05577091 | Tris-CAR-T Cell Therapy for Recurrent Glioblastoma | Not yet recruiting | Recurrent Glioblastoma | Inverse correlated dual-target, truncated IL7Ra modified CAR - expressing autologous T-lymphocytes | Phase 1 | 10 | 1-Nov-22 |
| NCT05168423 | CART-EGFR-IL13Ra2 in EGFR Amplified Recurrent GBM | Not yet recruiting | Glioblastoma | 5x10(7) CART-EGFR-IL13Ra2 1x107 CART-EGFR-IL13Ra2 1x10(8) CART-EGFR-IL13Ra2 5x108 CART-EGFR-IL13Ra2 Cyclophosphamide Fludarabine | Phase 1 | 18 | 19-Mar-23 |
| NCT03638206 | Autologous CAR-T/TCR-T Cell Immunotherapy for Malignancies | Recruiting | B-cell Acute Lymphoblastic Leukemia; Lymphoma; Myeloid Leukemia; Multiple Myeloma; Hepatoma; Gastric Cancer; Pancreatic Cance; Mesothelioma; Colorectal Cancer; Esophagus Cancer; Lung Cancer Glioma; Melanoma; Synovial Sarcoma; Ovarian Cancer; Renal Carcinoma | CAR-T cell immunotherapy | Phase 1 Phase 2 | 73 | 1-Mar-18 |
| NCT03941626 | Autologous CAR-T/TCR-T Cell Immunotherapy for Solid Malignancies | Recruiting | Esophagus Cancer; Hepatoma; Glioma; Gastric Cancer | CAR-T/TCR-T cells immunotherapy | Phase 1 Phase 2 | 50 | 1-Sep-19 |
| NCT04077866 | B7-H3 CAR-T for Recurrent or Refractory Glioblastoma | Recruiting | Recurrent Glioblastoma; Refractory Glioblastoma | Temozolomide B7-H3 CAR-T | Phase 1 Phase 2 | 40 | 1-May-22 |

Results obtained from clinicaltrials.gov by searching entries with Glioma OR GBM OR Glioblastoma AND CAR-T Therapy and selecting relevant studies (Excluding missing info, unknown status, and pediatric tumors)