Glioblastoma recurrence

- Molecular and clinical determinants of response to checkpoint inhibitor immunotherapy in glioblastoma
- Hybrid Therapy for Newly Diagnosed and Recurrent Glioblastoma: Staged Procedure Integrating Open Surgical Resection With Laser Interstitial Thermal Therapy
- Profiling Glioma Stem Cell Dynamics via 3D-Based Cell Cycle Reporter Assays
- Modeling Glioma Stem Cell-Mediated Tumorigenesis Using Zebrafish Patient-Derived Xenograft Systems
- An In Vivo Model of Recurrent Glioblastoma
- Recent advances in molecular mechanisms of microRNAs in pathogenesis and resistance of treatment in glioblastoma
- Targeting CXCR4 and TRPV1 with alpha-Conopeptide G1 derived from Conus geographus for Glioblastoma: an integrative in-silico and network pharmacology approach
- Multimerin-1 modulates macrophage M2 polarization and enhances tumor cell stemness in glioblastoma

Glioblastoma recurrence and glioblastoma progression are related concepts in the context of glioblastoma, but they are not the same, and it's important to understand the differences between them.

Glioblastoma Recurrence:

Definition: Glioblastoma recurrence refers to the reappearance of active tumor tissue after an initial treatment has been administered. This can occur at or near the original tumor site.

Timing: Recurrence typically occurs after a period of initial treatment and a variable period of stability or remission. It can happen weeks, months, or even years after the initial treatment.

Characteristics: Recurrent glioblastoma consists of tumor cells that survived the initial treatment, which may have been surgery, radiation therapy, and chemotherapy.

Diagnosis: Recurrence is usually confirmed through imaging studies, such as MRI or CT scans, which show new or enlarging areas of contrast-enhancing tumor.

Management: The management of recurrent glioblastoma often involves a different treatment approach than the initial therapy. Options may include additional surgery, alternative chemotherapy, experimental therapies, or palliative care.

Glioblastoma Progression:

Definition: Glioblastoma progression is a broader term that encompasses any changes in the tumor over time. It includes both the initial growth and the later recurrence of the tumor.

Timing: Progression can refer to the continuous growth or spread of the tumor from the time of diagnosis. It covers all stages of tumor growth, from the initial formation to the reappearance of active tumor cells in recurrence.

Characteristics: Progression may involve the tumor's aggressive growth, infiltration into surrounding brain tissue, and the development of treatment-resistant features.

Diagnosis: Progression is assessed through various clinical and imaging criteria, including changes in the size and characteristics of the tumor over time.

Management: The management of glioblastoma progression depends on the stage and extent of tumor growth. It often includes a combination of treatments, such as surgery, radiation, and chemotherapy, with the goal of delaying or controlling tumor growth.

In summary, glioblastoma progression is a broad term that encompasses the entire course of tumor growth and development, from diagnosis to recurrence. Glioblastoma recurrence specifically refers to the reappearance of tumor tissue after an initial treatment. Both are critical concepts in the clinical management and treatment of glioblastoma, but they occur at different points in the disease course and may require different approaches for diagnosis and treatment.

Glioblastoma has an unfavorable prognosis mainly due to its high propensity for tumor recurrence. It has been suggested that Glioblastoma recurrence is inevitable after a median survival time of 32 to 36 weeks [1) 2)].

Less than 10% of recurrent gliomas recur away from the original tumor site [3)].

A merely anatomical analysis of the glioblastoma growth pattern cannot reliably provide prognostic information. The occurrence of most recurrences next to the resection margin and the high percentage of growing residual tumors underline the importance of complete resections [4)].

Natural history

The natural history of recurrent Glioblastoma, is largely undefined for the following reasons:

1) Lack of uniform definition and criteria for tumor recurrence

2) Institutional variability in treatment philosophy

3) The heterogeneous nature of the disease, including location of recurrence and distinct mechanisms believed to contribute to known subtypes of Glioblastoma.

The criteria used to define recurrent glioblastoma Glioblastoma remain ambiguous due to the varied presentation of new lesions. First, the infiltrative nature of Glioblastoma cells makes it difficult to eliminate microscopic disease despite macroscopic gross-total resection. Studies have shown that Glioblastoma recurrence most often occurs in the form of a local continuous growth within 2 to 3 cm from the border of the original lesion [5) 6) 7)].

Etiology

One of the factors that cause recurrence is the strong migratory capacity of Glioblastoma cells. Wanibuchi et al., reported that actin, alpha, cardiac muscle 1 (ACTC1) could serve as a marker to detect Glioblastoma migration in clinical cases [8)].

Glioblastoma demonstrates considerable intratumoral phenotypic and molecular heterogeneity and contains a population of cancer stem cells (CSC) that contributes to tumor propagation, maintenance, and treatment resistance.

These cells are associated with vascular niches which regulate glioma stem cells (GSC) self-renewal and survival.

Studies suggest that while blood vessels support glioma stem cells, these tumor cells in turn may regulate and contribute to the tumor vasculature by transdifferentiating into endothelial cells directly or through the secretion of regulatory growth factors such as vascular endothelial growth factor (VEGF) and hepatoma derived growth factor (HDGF) [9].

Intratumoral heterogeneity and the presence of these CSCs may contribute to the treatment-resistant nature of Glioblastoma and its propensity to recur in patients [10] [11].

Questionable cells

Zhou et al. conducted a comprehensive review of existing literature and studies on GBM, focusing on the identification and characterization of questionable cells (Q cells). Advanced imaging techniques, such as diffusion tensor imaging (DTI), magnetic resonance spectroscopy (MRS), and positron emission tomography (PET), were utilized to identify Q cells beyond the tumor core. They also analyzed the functional properties, cellular microenvironment, and physical characteristics of Q cells, as well as their implications for surgical resection.

The review revealed that Q cells exhibit unique functional attributes, including enhanced invasiveness, metabolic adaptations, and resistance mechanisms. These cells reside in a distinct cellular microenvironment and are influenced by physical properties such as solid stress and stiffness. Advanced imaging techniques have improved the identification of Q cells, enabling more precise surgical resection. Targeting Q cells in therapeutic strategies could significantly reduce the risk of GBM recurrence.

The presence of Q cells in the peritumoral brain zone (PBZ) and beyond is a critical factor in GBM recurrence. Current treatments, which primarily target tumor cells in the TC, are insufficient to prevent recurrence due to the neglect of Q cells. Future research should focus on understanding the mechanisms influencing Q cells and developing targeted therapies to improve patient outcomes [12].

Diagnosis

Glioblastoma recurrence Diagnosis.

Differential Diagnosis

Glioblastoma recurrence Differential Diagnosis.

Treatment

see Glioblastoma recurrence treatment.

Outcome

see Glioblastoma recurrence outcome.

Case series

see Glioblastoma recurrence case series.

Case reports

A 52-year-old woman was admitted for management of Glioblastoma recurrence. After tumor removal surgery, the patient experienced sustained Cerebrospinal fluid fistula from the wound despite reparative attempts. The plastic surgery team performed wound repair procedure after remnant tumor removal by the neurosurgery team. Acellular dermal matrix was applied over the mesh plate to prevent Cerebrospinal fluid fistula and the postoperative status of the patient was evaluated. No sign of Cerebrospinal fluid fistula was found in the immediate postoperative period. After 3 years, there were no complications including Cerebrospinal fluid fistula, wound dehiscence, and infection. Lee et al. hereby propose this method as a feasible therapeutic alternative for preventing Cerebrospinal fluid fistula in patients experiencing wound problem after neurosurgical procedures [13].

Corns et al. describe the case of a patient with Glioblastoma recurrence encroaching on Broca's area. Gross total resection of the tumour was achieved by combining two techniques, awake craniotomy to prevent damage to eloquent brain and 5-aminolevulinic acid fluorescence guided resection to maximise the extent of tumour resection. This technique led to gross total resection of all T1-contrast enhancement tumour with the avoidance of neurological deficit. They recommend this technique in patients when awake surgery can be tolerated and gross total resection is the aim of surgery [14].

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