WHO grade 4 glioma

- Diagnostic yield of intraoperative frozen sections obtained through robot-assisted stereotactic biopsy of brain lesions
- Risk Factors, Indications, and Effectiveness of Cerebrospinal Fluid Diversion in Patients With High-Grade Glioma-Associated Hydrocephalus: A Systematic Review and Meta-Analysis
- Role of Amide Proton Transfer Weighted MRI in Predicting MGMTp Methylation Status, p53-Status, Ki-67 Index, IDH-Status, and ATRX Expression in WHO Grade 4 High Grade Glioma
- Gliomas Uncovered: A Deep Dive Into Immunohistochemical and Molecular Features From a Tertiary Care Facility Perspective
- Automated feature learning and survival prognostication in grade 4 glioma using supervised machine learning models
- Diagnostic Utility of Intratumoral Susceptibility Signals in Adult Diffuse Gliomas: Tumor Grade Prediction and Correlation with Molecular Markers Within the WHO CNS5 (2021) Classification
- Characteristics and Outcomes of Patients With IDH-Mutant Grade 2 and 3 Gliomas After Deferred or Adjuvant Radiotherapy
- Methionine PET Findings in the Diagnosis of Brain Tumors and Non-Tumorous Mass Lesions: A Single-Center Report on 426 Cases

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According to the fifth edition of the World Health Organization Classification of Tumors of the Central Nervous System 2021, grade 4 glioma classification includes IDH-mutant astrocytomas and glioblastomas.

Grade 4 gliomas are considered the most aggressive and are associated with a poorer prognosis.

The most common type of Grade 4 glioma is glioblastoma

Key characteristics of Grade 4 gliomas, particularly glioblastomas, include:

Aggressive Growth: Grade 4 gliomas grow rapidly and are more invasive than lower-grade gliomas.

High Cellularity: These tumors have a high number of cells, often with a significant degree of atypia (abnormal cell appearance).

Necrosis: Central areas of cell death, known as necrosis, are common in Grade 4 gliomas.

Angiogenesis: Grade 4 gliomas stimulate the formation of new blood vessels (angiogenesis), which helps sustain their rapid growth.

Genetic Alterations: Glioblastomas often exhibit genetic mutations and alterations, such as mutations in the genes EGFR (epidermal growth factor receptor) and IDH (isocitrate dehydrogenase).

Treatment for Grade 4 gliomas typically involves a combination of surgery, radiation therapy, and chemotherapy. However, due to their aggressive nature, complete eradication of these tumors can be challenging. The prognosis for Grade 4 gliomas is generally poor, and the median survival is often limited despite aggressive treatment.

Research and clinical trials continue to explore new and more effective treatments for Grade 4 gliomas, with a focus on targeted therapies and immunotherapies to improve outcomes for patients with this challenging diagnosis. Management of Grade 4 gliomas requires a multidisciplinary approach involving neurosurgeons, oncologists, and other specialists.

Prospective observational diagnostic studies

Hemodynamic measurements such as cerebral blood flow (CBF) and cerebrovascular reactivity (CVR) can provide useful information for diagnosing and characterizing brain tumors. Previous work showed that arterial spin labeling (ASL) in combination with vasoactive stimulation enabled simultaneous non-invasive evaluation of both parameters, however, this approach had not been previously tested in tumors. This work aimed to investigate the application of this technique, using a pseudo-continuous ASL (PCASL) sequence combined with breath-holding at 3 T, to measure CBF and CVR in high-grade gliomas and metastatic lesions, and to explore differences across tumoral- - peritumoral regions and tumor types. To that end, 27 patients with brain tumors were studied. Baseline CBF and CVR were measured in the tumor, edema, and gray matter (GM) volumes of interest (VOIs). Peritumoral ipsilateral ring-shaped VOIs were also generated and mirrored to the contralateral hemisphere. Differences in baseline CBF and CVR were evaluated between contralateral and ipsilateral GM, contralateral and ipsilateral peritumoral rings, and among VOIs and tumor types. CBF in the tumor was higher in grade 4 gliomas than metastases. In grade 4 gliomas, edema had lower CBF than the tumor and contralateral GM. CVR values differed between grade 3 and grade 4 gliomas and between grade 4 and metastases. CVR values in the tumor were lower compared to the contralateral GM. Differences in CVR between contralateral and ipsilateral-ring VOIs were also found in grade 4 gliomas, presumably suggesting tumor infiltration within the peritumoral tissue. A cut-off value for CVR of 27.9%-signal-change is suggested to differentiate between grade 3 and grade 4 gliomas (specificity = 83.3%, sensitivity = 70.6%). In conclusion, CBF and CVR mapping with ASL offered insights into the perilesional environment that could help to detect infiltrative disease, particularly in grade 4 gliomas. CVR emerged as a potential biomarker to differentiate between WHO Grade 3 glioma and WHO Grade 4 glioma [1)]

This study presents an innovative approach to assessing hemodynamic parameters in brain tumors and highlights the potential of CVR as a diagnostic biomarker. While promising, limitations in sample size, patient variability, and lack of validation necessitate further research. With refinement and validation, PCASL-based CVR mapping could become a valuable tool for non-invasive tumor characterization, aiding in personalized treatment planning and prognosis.

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Calvo-Imirizaldu M, Solis-Barquero SM, Aramendía-Vidaurreta V, García de Eulate R, Domínguez P, Vidorreta M, Echeveste JI, Argueta A, Cacho-Asenjo E, Martinez-Simon A, Bejarano B, Fernández-Seara MA. Cerebrovascular Reactivity Mapping in Brain Tumors Based on a Breath-Hold Task Using Arterial Spin Labeling. NMR Biomed. 2025 Mar;38(3):e5317. doi: 10.1002/nbm.5317. PMID: 39844376.