

PATHOMORPHOLOGICAL VERIFICATION OF MALIGNANT BRAIN TUMORS DETECTED BY MRI

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Introduction. Magnetic resonance imaging (MRI) is the primary non-invasive modality for detecting and characterizing intracranial neoplasms. However, radiological findings alone are insufficient for definitive diagnosis, as overlapping imaging features between tumor types and post-treatment changes present significant diagnostic challenges. Pathomorphological verification—histopathological and cytological examination of tissue specimens—remains the indispensable gold standard for accurate tumor classification, grading, and subsequent therapeutic decision-making.

Aim. To evaluate the diagnostic concordance between MRI findings and pathomorphological verification in patients with malignant brain tumors, and to assess the role of advanced MRI techniques in guiding targeted tissue acquisition.

Materials and Methods. A systematic review of contemporary literature (2017–2025) was conducted, analyzing studies that reported both MRI characteristics and corresponding histopathological diagnoses of malignant brain tumors. Data on diagnostic accuracy, concordance rates (kappa statistics), biopsy methodologies, and imaging-pathology correlations were extracted and synthesized.

Results. Conventional MRI demonstrates substantial diagnostic agreement with histopathology, with reported kappa values of 0.63–0.71 for diagnosis and grading. Sensitivity and specificity reach 88.2% and 100%, respectively, though discordance occurs in up to 4.5% of cases, frequently altering clinical management. Stereotactic biopsy and surgical resection achieve diagnostic yields exceeding 91%. Advanced MRI techniques—including diffusion-weighted imaging (DWI), perfusion-weighted imaging (PWI), MR spectroscopy (MRS), and amide proton transfer-weighted (APTw) imaging—significantly enhance the correlation between radiological phenotypes and underlying histopathological features such as cellularity, necrosis, and microvascular proliferation.

Conclusion. While MRI provides critical diagnostic information, pathomorphological verification is essential for definitive diagnosis and grading of malignant brain tumors. The integration of advanced MRI sequences with histopathology significantly reduces sampling errors and improves diagnostic accuracy. Optimal patient management requires a multidisciplinary approach that synthesizes neuroimaging findings with pathological confirmation.

Keywords: malignant brain tumors, magnetic resonance imaging, pathomorphological verification, histopathology, stereotactic biopsy, glioblastoma.