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Evaluating the efficacy of advanced imaging techniques in differentiating histological and molecular glioblastomas from adult diffuse gliomas: PWI, DWI, and MRS

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Abstract

BackgroundThe fifth edition of the World Health Organization (WHO) CNS Tumors (CNS5) introduced a molecular framework for glioma classification, emphasizing the IDH gene and MGMT methylation status.PurposeTo evaluate the effectiveness of dynamic susceptibility contrast perfusion-weighted imaging (DSC-PWI), diffusion-weighted imaging (DWI), and multi-voxel magnetic resonance spectroscopy (MRS) in distinguishing histological glioblastomas (GBMhis) and molecular glioblastomas (GBMmol) from adult diffuse gliomas, while also differentiating oligodendrogliomas (ODGs) and assessing the impact of MGMT methylation.Material and MethodsWe conducted a retrospective analysis of 141 adult diffuse glioma patients. Imaging techniques included DSC-PWI, DWI, and MRS, analyzed for their ability to differentiate GBMhis, GBMmol, and ODGs from adult diffuse gliomas. Pathological and molecular data, including IDH, 1p19q, and MGMT status, were collected to correlate imaging findings with prognostic outcomes.ResultsDSC-PWI and DWI effectively distinguished GBMhis from diffuse gliomas. DWI-ADC was the only technique capable of identifying ODGs. Although MGMT methylation positively impacted prognosis, it was not directly reflected in imaging parameters. Significant differences in progression-free survival and overall survival were observed between groupings.ConclusionThis study suggests that DSC-PWI and DWI can help differentiate glioma types, while multi-voxel MRS shows limited sensitivity.

Keywords: 1p19q; Glioblastoma; O6-methylguanine-DNA methyltransferase; diffusion-weighted imaging; isocitrate dehydrogenase; magnetic resonance spectroscopy; perfusion-weighted imaging.