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MR Imaging Techniques for Microenvironment Mapping of the Glioma Tumors: A Systematic Review

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Abstract

Rationale and objectives: The tumor microenvironment (TME) is a critical regulator of cancer progression, metastasis, and treatment response. Currently, various imaging approaches exist to assess the pathophysiological features of the TME. This systematic review provides an overview of magnetic resonance imaging (MRI) methods used in clinical practice to characterize the pathophysiological features of the gliomas TME.

Methods: This review involved a systematic comprehensive search of original open-access articles reporting the clinical use of MR imaging in glioma patients of all ages in the PubMed, Scopus, and Web of Science databases between January 2010 and December 2023. We restricted our research to papers published in the English language.

Results: A total of 1137 studies were preliminarily identified through electronic database searches. After duplicate studies were removed, 44 studies met the eligibility criteria. The glioma TME was accompanied by alterations in metabolism, pH, vascularity, oxygenation, and extracellular matrix components, including tumor-associated macrophages, and sodium concentration.

Conclusion: Multiparametric MRI is capable of noninvasively assessing the pathophysiological features and tumor-supportive niches of the TME, which is in line with its application in personalized medicine.

Keywords: Glioma; Magnetic resonance imaging (MRI); Microenvironment mapping.

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