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PET imaging of gliomas: Status quo and quo vadis?

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Abstract

PET imaging, particularly using amino acid tracers, has become a valuable adjunct to anatomical MRI in the clinical management of patients with glioma. Collaborative international efforts have led to the development of clinical and technical guidelines for PET imaging in gliomas. The increasing readiness of statutory health insurance agencies, especially in European countries, to reimburse amino acid PET underscores its growing importance in clinical practice. Integrating artificial intelligence and radiomics in PET imaging of patients with glioma may significantly improve tumor detection, segmentation, and response assessment. Efforts are ongoing to facilitate the clinical translation of these techniques. Considerable progress in computer technology developments (eg quantum computers) may be helpful to accelerate these efforts. Next-generation PET scanners, such as long-axial field-of-view PET/CT scanners, have improved image quality and body coverage and therefore expanded the spectrum of indications for PET imaging in Neuro-Oncology (eg PET imaging of the whole spine). Encouraging results of clinical trials in patients with glioma have prompted the development of PET tracers directing therapeutically relevant targets (eg the mutant isocitrate dehydrogenase) for novel anticancer agents in gliomas to improve response assessment. In addition, the success of theranostics for the treatment of extracranial neoplasms such as neuroendocrine tumors and prostate cancer has currently prompted efforts to translate this approach to patients with glioma. These advancements highlight the evolving role of PET imaging in Neuro-Oncology, offering insights into tumor biology and treatment response, thereby informing personalized patient care. Nevertheless, these innovations warrant further validation in the near future.

Keywords: IDH; FET; glioblastoma; supercomputing; vorasidenib.

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