Contribution of nuclear medicine to the diagnosis and management of primary brain tumours

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Abstract

Positron emission tomography (PET) is a powerful tool that can help physicians manage primary brain tumours at diagnosis and follow-up. In this context, PET imaging is used with three main types of radiotracers: ^{18}F-FDG, amino acid radiotracers, and ^{68}Ga conjugated to somatostatin receptor ligands (SSTRs). At initial diagnosis, ^{18}F-FDG helps to characterize primary central nervous system (PCNS) lymphomas and high-grade gliomas, amino acid radiotracers are indicated for gliomas, and SSTR PET ligands are indicated for meningiomas. Such radiotracers provide information on tumour grade or type, assist in directing biopsies and help with treatment planning. During follow-up, in the presence of symptoms and/or MRI modifications, the differential diagnosis between tumour recurrence and post-therapeutic changes, in particular radiation necrosis, may be challenging, and there is strong interest in using PET to evaluate therapeutic toxicity. PET may also contribute to identifying specific complications, such as postradiation therapy encephalopathy, encephalitis associated with PCNS lymphoma, and stroke-like migraine after radiation therapy (SMART) syndrome associated with glioma recurrence and temporal epilepsy, originally illustrated in this review. This review summarizes the main contribution of PET to the diagnosis, management, and follow-up of brain tumours, specifically gliomas, meningiomas, and primary central nervous system lymphomas.

Keywords: Amino acid; Brain tumour; FDG; Meningioma; PET; Positron emission tomography; Primary central nervous system lymphoma.

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