Potential use of prostate specific membrane antigen (PSMA) for detecting the tumor neovasculature of brain tumors by PET imaging with 89Zr-Df-IAB2M anti-PSMA minibody.


1 Department of Neurosurgery, Faculty of Medicine, University of Tsukuba, Tsukuba, Ibaraki, 305-8575, Japan. m-matsuda@md.tsukuba.ac.jp.

Tumor angiogenesis has attracted increasing attention because of its potential as a valuable marker in the differential diagnosis of brain tumors as well as a novel therapeutic target. Prostate-specific membrane antigen (PSMA) is expressed by the neovasculature endothelium of some tumors, with little to no expression by the tumor cells or normal vasculature endothelium. The aim of this study was to investigate the potential of PSMA for the evaluation of the tumor neovasculature of various brain tumors and the possibility of detecting PSMA expression in brain tumors using PET imaging with 89Zr-Df-IAB2M (anti-PSMA minibody). Eighty-three tissue specimens including gliomas, metastatic brain tumors, primary central nervous system lymphomas (PCNSL), or radiation necroses were analyzed by immunohistochemical staining with PSMA antibody. 89Zr-Df-IAB2M PET scans were performed in three patients with recurrent high-grade gliomas or metastatic brain tumor. PSMA was highly expressed in the vascular endothelium of high-grade glioma and metastatic brain tumor, whereas PSMA was poorly expressed in the vascular endothelium of PCNSL and radiation necrosis. PSMA expression in high-grade gliomas and a metastatic brain tumor was clearly visualized by PET imaging with 89Zr-Df-IAB2M. Furthermore, a trend toward a positive correlation between the degree of 89Zr-Df-IAB2M uptake and PSMA expression levels in tumor specimens was observed. PET imaging of PSMA using 89Zr-Df-IAB2M may have potential value in the differential diagnosis of high-grade glioma from PCNSL or radiation necrosis as well as in the prediction of treatment efficacy and assessment of treatment response to bevacizumab therapy for high-grade glioma.

KEYWORDS: Brain tumor; PET; Prostate specific membrane antigen; Tumor neovasculature

PMID: 29524126 DOI: 10.1007/s11060-018-2825-5