Clin Nucl Med. 2023 Oct 24. doi: 10.1097/RLU.0000000000004903. Online ahead of print.

68Ga-PSMA-11 PET/CT Imaging in Brain Gliomas and Its Correlation With Clinicopathological Prognostic Parameters

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PMID: 37883060 DOI: 10.1097/RLU.0000000000004903

Abstract

Background: Gliomas are the most common primary central nervous system tumors, of which the malignant gliomas account for 60%-75%. The primary and secondary brain malignancies are highly treatment resistant, and their marked angiogenesis attracts interest as a potential therapeutic target. The grade of gliomas, Ki-67 index, and IDH mutation status are among the major prognostic markers in gliomas. Prostate-specific membrane antigen (PSMA) is a zinc-dependent peptidase that is not only expressed in prostate cancer cells but also in the tumor neovasculature. The initial PSMA PET studies in central nervous system tumors using 68Ga-HBED-CC-PSMA (68Ga-PSMA-11) PET tracer confirmed selective target expression in gliomas of different grades, with higher expression in high-grade glioma compared with low-grade glioma.

Aims and objectives: The aim of the present study was to correlate and compare the 68Ga-PSMA-11 and 18F-FDG uptake in brain tumors with their clinicopathological prognostic parameters, so as to study their prognostic implications. In addition, the study also aimed to identify patients who are likely to benefit from potential PSMA-targeted therapies.

Patients and methods: This ongoing prospective study was approved by the institutional scientific and medical ethics committee. The patients with primary or recurrent glioma lesions on MRI underwent regional brain PET/CT scanning with 68Ga-PSMA-11 and 18F-FDG. The final histopathology of the brain lesions (glioma grade), Ki-67 index, and IDH mutation status were compared with SUVmax values of the 68Ga-PSMA-11 and 18F-FDG PET/CT.

Results: A total of 15 patients (13 males and 2 females; age range, 21-73 years; median age, 58 years) were included in this study analysis. Among the 15 patients, 10 were treatment naive and 2 were patients with recurrent glioma. Three patients turned out to be WHO grade I-II, 6 belonged to grade III, and 6 grade IV (glioblastoma multiforme) on final histopathology. The 68Ga-PSMA-11 PET/CT showed tracer uptake in all high-grade gliomas with good tumor-to-background ratio. It was PSMA nonavid in 2/3 low-grade gliomas, and it showed low-grade uptake in 1/3 patients. PSMA expression (as evaluated by SUVmax values) was significantly higher in higher-grade tumors, those with IDH mutation wildtype status, and higher Ki-67 indices. FDG PET SUVmax also showed significant correlation with these prognostic parameters.

Conclusions: In these preliminary results, PSMA PET appears to be an important tool in the evaluation and prognosis of gliomas. PSMA-directed theranostics can be explored as a personalized approach in gliomas with high PSMA uptake. However, with the limitation of small sample size, larger clinical trials are warranted to draw conclusive evidence regarding the same.