Detection of Cerebrospinal Fluid Dissemination of Recurrent Glioblastoma Using TSPO-PET With $^{18}$F-GE-180

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**Abstract:** PET targeting the translocator protein (TSPO) represents an interesting approach for glioma visualization, as TSPO is highly expressed in tumor cells. We present a 32-year-old man with recurrent glioblastoma after multimodal treatment. PET with the novel TSPO ligand $^{18}$F-GE-180 was performed after reirradiation. Here, the previously reirradiated tumor showed a remaining circular TSPO expression. Moreover, cerebrospinal fluid dissemination was detected by a high focal uptake at the right lateral and at the fourth ventricle, whereas only a faint contrast enhancement was present in MRI. This case demonstrated the diagnostic potential of TSPO-PET for glioma imaging by visualizing even minimal disease burden.

**Key Words:** $^{18}$F-GE-180 PET, glioblastoma, cerebrospinal fluid, TSPO imaging

**REFERENCES**


PET is considered a useful complementary diagnostic tool for glioma imaging. Besides radiolabeled amino acids, PET targeting the translocator protein (TSPO) represents an interesting approach for glioma visualization, as TSPO is highly expressed in gliomas, whereas there is barely no expression in the healthy brain. Particularly, the novel TSPO ligand $^{18F}$-GE-180 has demonstrated advantageous imaging properties such as high binding affinity compared with ligands of the previous generation (eg, $^{11C}$-PK11195). Using $^{18F}$-GE-180 PET in gliomas, a high target-to-background contrast with high maximal tumor-to-background ratios ($TBR_{\text{max}}$) and tracer uptake even beyond contrast enhancement in MRI could be observed. Therefore, we present a 32-year-old man with recurrent glioblastoma (IDH-wildtype, unmethylated MGMT promoter methylation status) after multimodal treatment including repeated surgery, chemotherapy, and reirradiation. PET with 200 MBq of $^{18F}$-GE-180 (60-80 minutes of summation images) was performed in the follow-up after reirradiation. TSPO-genotyping revealed a high-affinity binding status (see also $^{6,8}$). The previously reirradiated tumor adjacent to the resection cavity showed a remaining circular TSPO expression ($TBR_{\text{max}}, 5.9; \text{A}$); moreover, a high focal uptake could be detected at the right lateral ventricle ($TBR_{\text{max}}, 3.3; \text{B}$, red arrow) and adjacent to the cerebellum with direct contact to the fourth ventricle ($TBR_{\text{max}}, 2.9; \text{C}$, white arrow). In the concomitant MRI, only a faint contrast enhancement was present at the right lateral ventricle; in the cerebellum, an alteration in the FLAIR sequence with a distinct contrast enhancement could be detected. In the course of disease of high-grade glioma patients, small amounts of tumor cells can spread beyond the original tumor site into the subarachnoid or intraventricular space, leading to cerebrospinal fluid dissemination occurring in up to 10% of patients. This case demonstrates the high diagnostic potential of $^{18F}$-GE-180 PET in brain tumors; because of its high tumor-to-background contrast, TSPO-PET with $^{18F}$-GE-180 represents a promising tool for glioma imaging and, especially, even for the delineation of minimal disease as present in cerebrospinal fluid spread of glioblastoma.