Journal of Nuclear Medicine, published on November 10, 2022 as doi:10.2967/jnumed.122.265127

Detecting CXCR4 expression in meningioma on ^{68}Ga-Pentixafor PET

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Word count: 501

Running Title: CXCR4 expression in meningioma

The C-X-C chemokine receptor 4 (CXCR4) is crucial for tumor proliferation, migration, and angiogenesis in many different cancers. Recently, ^{68}Ga-Pentixafor, a radiotracer composed of a synthetic, cyclic pentapeptide analogue of stromal-cell derived factor-1 (SDF-1 or CXCL12), a ligand for CXCR4, has been successfully introduced for assessment of haematological malignancies, including lymphomas of the body and CNS, myeloma, and leukemia[1,2]. Furthermore, ^{68}Ga-Pentixafor uptake has been described in various solid tumors, but not yet in meningioma.

We report the case of a 67-year-old woman diagnosed with newly diagnosed primary CNS lymphoma who was referred for ^{68}Ga-Pentixafor PET/MR (NCT05093335) two days after MRI was performed with intravenously injected gadopentetate dimeglumine (Magnevist; Bayer HealthCare Pharmaceuticals, Wayne, NJ). PET imaging was acquired for 15 min starting 15 min after intravenous injection 150 MBq of ^{68}Ga-Pentixafor on a hybrid device (GE Signa PET/MR, Waukesha, WI). PET demonstrated a homogenously enhancing lesion in the right temporal lobe with radiotracer uptake of SUVmax 5.3 (Fig. 1A, B, orange arrow). Incidentally, slightly less high uptake with SUVmax of 4.8 was observed in a dural based extra-axial homogenously enhancing mass in the left middle cranial fossa, a known meningioma (Fig. 1A, B, blue arrow).

Here, we show that ^{68}Ga-pentixafor can not only detect CNS lymphoma but also meningioma with high tumor-to-background activity ratio on PET, given the minimal uptake of this radiotracer in brain parenchyma. A recent analysis in 55 meningioma specimens showed that CXCR4 mRNA was expressed in 43 (78%) of the tumor specimens, and CXCR4 stimulation led to ERK1/2 phosphorylation/activation and cell proliferation[3]. CXCR4 and SDF1 were often detected in the same tumor tissues suggesting an autocrine/paracrine feedback loop potentially promoting the phenotypic behavior of the tumor, such as the ability to grow autonomously.

Our findings suggest that ^{68}Ga-Pentixafor PET may be useful for delineation of meningioma and elucidating biologic characteristics, and, especially in treatment-refractory meningiomas, may

guide CXCR4-based theranostic approaches with Pentixather that was previously evaluated in blood cancers[4].

Disclosure

The authors declared no conflict of interest for the present work. Marius Mayerhoefer received speaker honoraria from GE Heathcare, Siemens Healthineers, and Bristol Myers Squibb.

Acknowledgments

This study was supported in part by the NIH/NCI Cancer Center Support Grant P30 CA008748.

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Figure 1: Contrast-enhanced T1-weighted MRI images show enhancing lesions with focal ^{68}Ga-pentixafor uptake on axial fused PET/MRI and maximum-intensity-projection PET images (A, B), corresponding with the biopsy-proven lymphoma (orange arrow) and the known meningioma (blue arrow).