The Contribution of 68Ga Prostate-Specific Membrane Antigen Positron Emission Tomography/Computed Tomography Imaging to Detecting Brain Metastasis in Prostate Cancer

Seçkin Bilgiç

Department of Nuclear Medicine, Kocaeli City Hospital, Kocaeli, Türkiye

Cite this article as: Bilgiç S. The contribution of 68Ga PSMA PET/CT imaging to detecting brain metastasis in prostate cancer. *Cerrahpaşa Med J.* 2024;48(2):197-198.

Prostate cancer (PCa) metastasizes to various sites, predominantly to the bone (84%). However, brain metastasis (BM) is a rare but critical concern, occurring in approximately 3.1% of cases.[1] Despite being rare, BM carries a poor prognosis in PCa. In this group, with a median survival of only 2 months, early treatment is crucial to delay potential neurological complications.[2] Detecting brain metastases promptly through advanced imaging techniques like ^{68}Ga-PSMA PET/CT allows for timely intervention, and potentially extending survival.

A 78-year-old male presents with left arm pain and a pathological fracture in the left humerus. Written informed consent was obtained from the patient. Following an elevated prostate-specific antigen (PSA) level (40.93 ng/dL), the biopsy reveals an upgrade to International Society of Urological Pathology (ISUP) grade 5 PCa. In the initial 68Ga-prostate-specific membrane antigen positron emission tomography/computed tomography (PSMA PET/CT) imaging, intense PSMA expression is detected in the prostate gland, pelvic lymph nodes, and various bone metastases (Figure 1).

After 3 years of androgen deprivation therapy and docetaxel chemotherapy, a follow-up ^{68}Ga-PSMA PET/CT scan shows progression of bone lesions and a new focal area adjacent to the left basal ganglion with intense PSMA expression. Despite normal neurological findings initially, the patient later presents with balance loss. Brain magnetic resonance imaging reveals an increase in lesion size to 30 mm, with evidence of a 7 mm midline shift to the right, indicating a mass effect on cerebral structures. Unfortunately, the patient does not survive the severe neurological complications secondary to the diagnosis of brain metastasis in the 12th month. Written informed consent was obtained from the patient.

Guidelines recommend that ^{68}Ga-PSMA PET/CT imaging be planned as a whole-body PET scan, extending from the mid-thigh to the base of the skull.[3] However, the inclusion of the cranial region in the imaging protocol is not routine and should be based on clinical indications as per relevant guidelines. Our case highlights the value of the early detection of brain metastases before the onset of neurological symptoms, as evidenced by the detection of brain metastasis 6 months before the development of neurological symptoms.

Received: April 25, 2024 **Accepted:** May 19, 2024 **Publication Date:** July 10, 2024
Corresponding author: Seçkin Bilgiç, Department of Nuclear Medicine, Kocaeli City Hospital, Kocaeli, Türkiye **e-mail:** bilgic.seckin@gmail.com
DOI: 10.5152/cjm.2024.24022

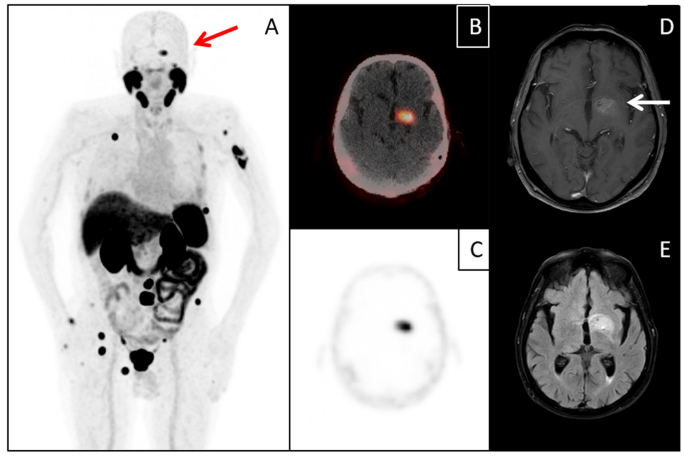

Figure 1. The whole-body ^{68}Ga-PSMA PET/CT images (A) show intense PSMA uptake in brain metastasis, indicated by the red arrow. Fusion PET/CT and PET images highlight a slightly hypodense lesion demonstrating intense PSMA uptake at the level of the left basal ganglion (B, C). Concurrent T1 MRI images reveal a contrast-enhanced lesion (D—white arrow). At 6 months without treatment (E), FLAIR images show an increase in lesion (hyperintense) size and midline shift. MRI, magnetic resonance imaging; PSMA PET/CT, prostate-specific membrane antigen positron emission tomography/computed tomography.

Although rare, reports in the literature indicate delayed or missed diagnoses of BM in PCa cases.[4] Various studies suggest that while disease progression could be determined from the pre-PSMA era, the use of PSMA enables earlier diagnosis and potentially more favorable outcomes.[5-7]

Especially in high-risk, metastatic, or castration-resistant cases, planning the imaging from the vertex to mid-thigh in ^{68}Ga PSMA PET/CT scans can help capture brain metastases before neurological symptoms develop.

Informed Consent: Written informed consent was obtained from the patient who participated in this study.

Peer-review: Externally peer-reviewed.

Declaration of Interests: The author has no conflict of interest to declare.

Funding: The author declared that this study has received no financial support.

References

1. Gandaglia G, Abdollah F, Schiffmann J, et al. Distribution of metastatic sites in patients with prostate cancer: a population-based analysis. *Prostate*. 2014;74(2):210-216. [CrossRef]
2. Nguyen T, Bartscht T, Schild SE, Rades D. Performance status is associated with survival in elderly patients irradiated for cerebral metastases from prostate cancer. *Anticancer Res*. 2020;40(3):1665-1668. [CrossRef]
3. Fendler WP, Eiber M, Beheshti M, et al. PSMA PET/CT: joint EANM procedure guideline/SNMMI procedure standard for prostate cancer imaging 2.0. *Eur J Nucl Med Mol Imaging*. 2023;50(5):1466-1486. [CrossRef]
4. Son Y, Chialastri P, Scali JT, Mueller TJ. Metastatic adenocarcinoma of the prostate to the brain initially suspected as meningioma by magnetic resonance imaging. *Cureus*. 2020;12(12):e12285. [CrossRef]
5. Hatzoglou V, Patel GV, Morris MJ, et al. Brain metastases from prostate cancer: an 11-year analysis in the MRI era with emphasis on imaging characteristics, incidence, and prognosis. *J Neuroimaging*. 2014;24(2):161-166. [CrossRef]
6. McLaughlin LA, Yildirim O, Rosenblum MK, et al. Identification of incidental brain tumors in prostate cancer patients via PSMA PET/CT. *J Neurooncol*. 2023;163(2):455-462. [CrossRef]
7. Gzell CE, Kench JG, Stockler MR, Hruby G. Biopsy-proven brain metastases from prostate cancer: a series of four cases with review of the literature. *Int Urol Nephrol*. 2013;45(3):735-742. [CrossRef]