

# Unexpected Metastatic Localization of Prostate Cancer Determined by Ga-68 PSMA PET/CT: Choroid

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**ABSTRACT** Prostate-specific membrane antigen (PSMA) is a transmembrane protein with overexpression in most prostate cancer cells. Gallium-68-PSMA (68Ga-PSMA) positron emission tomography/computed tomography (PET/CT) imaging is a game changer within the management of prostate cancer. The prognosis of prostate cancer is principally determined by the metastatic condition. The presence and localization of metastasis have an effect on the selection of treatment protocol. We present the case of a prostate cancer patient with choroid metastasis demonstrated at 68Ga-PSMA PET/CT. In our case, we presented an example of an uncommon metastatic site such as choroid. Advances in imaging techniques such as 68Ga-PSMA PET/CT have led to more detection of rare metastatic sites in prostate cancer patients.

**Keywords:** Prostatic neoplasms; choroid; neoplasm metastasis; 68Ga-PSMA

Prostatic malignancy is the most prevalent cancer in men in the United States and the second most dominant cancer in men worldwide, after lung cancer.<sup>1,2</sup> Prostate-specific membrane antigen (PSMA) is a transmembrane protein with overexpression in most prostate cancer cells. This antigen is of increasing interest as a target molecule for imaging and treatment.<sup>3</sup> Gallium-68-PSMA (68Ga-PSMA) positron emission tomography/computed tomography (PET/CT) imaging is a game changer in the management of prostatic malignancy since 2013. 68Ga-PSMA (Glu-NH-CONH-Lys-(Ahx)-[Ga-68(HBED-CC)]) PET/CT scanning is an advanced and promising scanning modality with high sensitivity to identify malignant prostate lesion areas with a good tumor/background ratio.<sup>4</sup> 68Ga-PSMA PET/CT is frequently used in staging, restaging and evaluation of response to treatment in patients with prostate cancer. The most frequent metastatic sites are bone and pelvic lymph nodes. There are small number of case reports revealed rare metastatic sites of prostate cancer.

## CASE REPORT

Fifty-seven year old patient was diagnosed with prostate adenocarcinoma with initial prostate-specific antigen (PSA) of 11.3 ng/mL and Gleason's score of 5+4. He had radical prostatectomy followed with external beam radiotherapy (RT) to pelvis. 68Ga-PSMA PET/CT (Philips, True Flight Select, USA) was performed in our clinic upon detection of increased PSA levels during follow-up. Written informed consent was acquired from the patient. 68Ga-PSMA PET/CT scan revealed PSMA avid metastatic mediastinal lymph nodes, liver metastasis, enlarged abdominal and pelvic lymph nodes and sclerotic skeletal metastasis (Figure 1A). Besides these, there was a focal Ga-68 PSMA expression observed in the posterior part of the right eyeball with a diameter of approximately 13x10 mm (SUV<sub>max</sub>: 6.4) (Figure 1B, Figure 1C). Orbital magnetic resonance imaging showed a T2W hypointense, T1W isointense lesion (12x8 mm) behind the right bulbus oculus with, en-

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**FIGURE 1:** Ga-68 PSMA PET/CT: (A) maximum intensity projection image shows PSMA avid multiple metastatic lesions including the choroidal metastasis (arrow); (B) axial CT image and (C) axial PET/CT fused image showing a focal Ga-68 PSMA expression in the posterior part of the right eyeball (SUVmax: 6.4).  
68Ga-PSMA: Gallium-68-prostate-specific membrane antigen; PET/CT: Positron emission tomography/computed tomography.

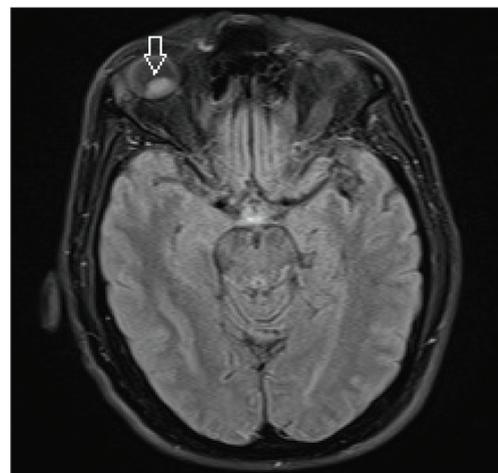
hancing contrast, and low apparent diffusion coefficient values (Figure 2). With advanced ophthalmological examination, it was shown that the lesion was in the choroid part of the uvea. Upon re-interrogation of the patient, it was learned that he had symptoms of decreased vision and blurring due to the choroidal lesion. Systemic treatment (chemotherapy) and external beam RT was started and he has been in follow-up since two months. It was observed that the symptoms of the patient regressed with the local treatment given.

## DISCUSSION

Accurate evaluation and detection of extraprostatic spread in prostate cancer is of great importance in predicting prognosis and treatment planning. Prostate cancer mostly metastasizes to bone, lymph nodes and pelvic structures. Consistent with the literature, we identified bone and lymph nodes as the most often metastatic localization of prostate cancer in our clinic. Choroid (uvea) is a rare metastasis localization as observed in the literature.<sup>5</sup> This is the only case with choroidal metastasis in our clinic so far.

The choroid is the vascular part of the eye and the most prevalent ophthalmic site for metastasis due to its high blood flow. The most frequent cancers that metastasize to the choroid are breast (40-47%) and then lung (21-29%). Bilateral, multiple metastasis are mostly secondary to breast malignancy; unilateral-unicentric metastasis, like our patient, are mostly seen

due to lung cancer. With this information, we investigated a second accompanying malignancy and lung cancer was ruled out by PET/CT. Choroidal metastasis treatment depends on systemic condition of the patient. Treatment choices comprise chemotherapy, immunotherapy, hormonal therapy, whole-eye RT, plaque RT, transpupillary RT, or photodynamic therapy and enucleation.<sup>6</sup> Cochran et al. published a case with bilateral uveal metastasis and summarized ten cases of uveal metastasis from prostate cancer. In these cases, they found that the mean time from prostate adenocarcinoma diagnosis to uveal metastasis was 28 months, but in our case this time interval was 6.5 months.<sup>7</sup> Shields et al. had a retrospective review for



**FIGURE 2:** Magnetic resonance imaging shows a lesion (12x8 mm) behind the right bulbus oculus (arrow).

2,214 uveal metastasis from 1,111 patients. Similar to other studies, they found that the main tumor mostly originated from the breast (37%) and lung (26%), and the primary tumor was observed to be prostate in 2%.<sup>8</sup>

The prognosis of prostate cancer is primarily determined by the metastatic status. The presence and localization of metastasis also affect the treatment method. In our case, we presented an example of 68Ga-PSMA uptake at an uncommon site of metastasis. Advances in imaging techniques such as 68Ga-PSMA PET/CT have led to more detection of rare metastasis sites in prostatic malignancy patients. While evaluating the patients with prostate cancer, unusual metastatic foci should be carefully examined in addition to expected localizations as it will completely affect patient management.

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#### Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

#### Authorship Contributions

**Idea/Concept:** Gözde Mütevelizade; **Design:** Gözde Mütevelizade; **Control/Supervision:** Gözde Mütevelizade, Gül Gümüşer, Elvan Sayıt; **Data Collection and/or Processing:** Gözde Mütevelizade, Ceren Sezgin; **Analysis and/or Interpretation:** Gözde Mütevelizade, Gül Gümüşer, Elvan Sayıt; **Literature Review:** Gözde Mütevelizade, Ceren Sezgin; **Writing the Article:** Gözde Mütevelizade; **Critical Review:** Gözde Mütevelizade, Ceren Sezgin, Gül Gümüşer, Elvan Sayıt; **References and Fundings:** Gözde Mütevelizade; **Materials:** Gözde Mütevelizade.

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