

# Prostate Cancer Metastasis to the Occipital Bone Detected on Prostate-specific Membrane Antigen Imaging: A Case Report

## Prostat Spesifik Membran Antijen Görüntülemeye Tespit Edilen Prostat Kanserinin Oksipital Kemiğe Metastazı: Bir Olgu Sunumu

✉ Mehmet Yiğit Yalçın<sup>1</sup>, ✉ Erdem Kısa<sup>2</sup>, ✉ Cem Yücel<sup>3</sup>, ✉ Uygur Miçooğulları<sup>3</sup>, ✉ Yusuf Özlem İlbey<sup>4</sup>

<sup>1</sup>Sakarya Sadıka Sabancı State Hospital, Clinic of Urology, Sakarya, Turkey

<sup>2</sup>Medicana International İzmir Hospital, Clinic of Urology, İzmir, Turkey

<sup>3</sup>University of Health Sciences Turkey, İzmir Tepecik Education and Research Hospital, Clinic of Urology, İzmir, Turkey

<sup>4</sup>Bezmialem Vakıf University Faculty of Medicine, Department of Urology, İstanbul, Turkey

**Cite as:** Yalçın MY, Kısa E, Yücel C, Miçooğulları U, İlbey YÖ. Prostate Cancer Metastasis to the Occipital Bone Detected on Prostate-specific Membrane Antigen Imaging: A Case Report. Anatol J Gen Med Res 2024;34(1):121-4

### Abstract

Prostate cancer metastasizes most commonly to the pelvic lymph nodes and to the axial skeleton. Metastatic spread of prostate adenocarcinoma to the occipital bone is very rare. <sup>68</sup>Ga-labelled prostate-specific membrane antigen position emission tomography/computed tomography (PSMA PET/CT) scanning has been shown to be more sensitive than conventional imaging techniques in patients with prostate cancer. <sup>68</sup>Ga-PSMA PET/CT scans detect previously unsuspected disease and may influence planned clinical management in a high proportion of patients with prostate cancer. Our intention is to emphasize the role of the <sup>68</sup>Ga-PSMA PET/CT where prostate cancer metastasis cannot be demonstrated by conventional imaging methods and thus contributes to the treatment choice.

**Keywords:** Prostate cancer, PSMA PET, occipital bone, metastasis, diagnosis

### Öz

Prostat kanseri en yaygın olarak pelvik lenf nodlarına ve aksiyal iskelete metastaz yapar. Prostat adenokarsinomunun oksipital kemiğe metastatik yayılımı çok nadirdir. <sup>68</sup>Ga işaretli prostat spesifik membran antijen pozisyonu emisyon tomografisi/bilgisayarlı tomografi (PSMA PET/BT) taramasının, prostat kanserli hastalarda konvansiyonel görüntüleme tekniklerinden daha duyarlı olduğu gösterilmiştir. <sup>68</sup>Ga-PSMA PET/BT taramaları önceden şüphelenilmeyen hastalıkları saptar ve prostat kanserli hastaların büyük bir kısmında planlanan klinik yönetimi etkileyebilir. Amacımız, prostat kanseri metastazının konvansiyonel görüntüleme yöntemleriyle gösterilemediği durumlarda <sup>68</sup>Ga-PSMA PET/BT'nin rolünü vurgulamak ve böylece tedavi seçimine katkıda bulunmaktır.

**Anahtar Kelimeler:** Prostat kanseri, PSMA PET, oksipital kemik, metastaz, tanı

\*It was published as a poster presentation at the 30<sup>th</sup> National Urology Congress organized by the Turkish Urology Association.



**Address for Correspondence/Yazışma Adresi:** Mehmet Yiğit Yalçın MD, Sakarya Sadıka Sabancı State Hospital, Clinic of Urology, Sakarya, Turkey  
**Phone:** +90 507 346 92 68 **E-mail:** yigityalcin@hotmail.com  
**ORCID ID:** orcid.org/0000-0001-9943-7453

**Received/Geliş tarihi:** 31.05.2023  
**Accepted/Kabul tarihi:** 20.03.2024



Copyright© 2024 The Author. Published by Galenos Publishing House on behalf of University of Health Sciences Turkey, İzmir Tepecik Training and Research Hospital. This is an open access article under the Creative Commons AttributionNonCommercial 4.0 International (CC BY-NC 4.0) License.

## Introduction

Prostate cancers (PCa) possess the property to metastasize to the bone frequently and these metastases appear particularly in the axial skeletal system<sup>(1)</sup>. Although rarely, these metastases may be seen in unusual bones such as the extracranial skull<sup>(2)</sup>. Skull metastases most commonly originate from PCa in males and PCas constitute 12-18% of these metastases<sup>(3)</sup>.

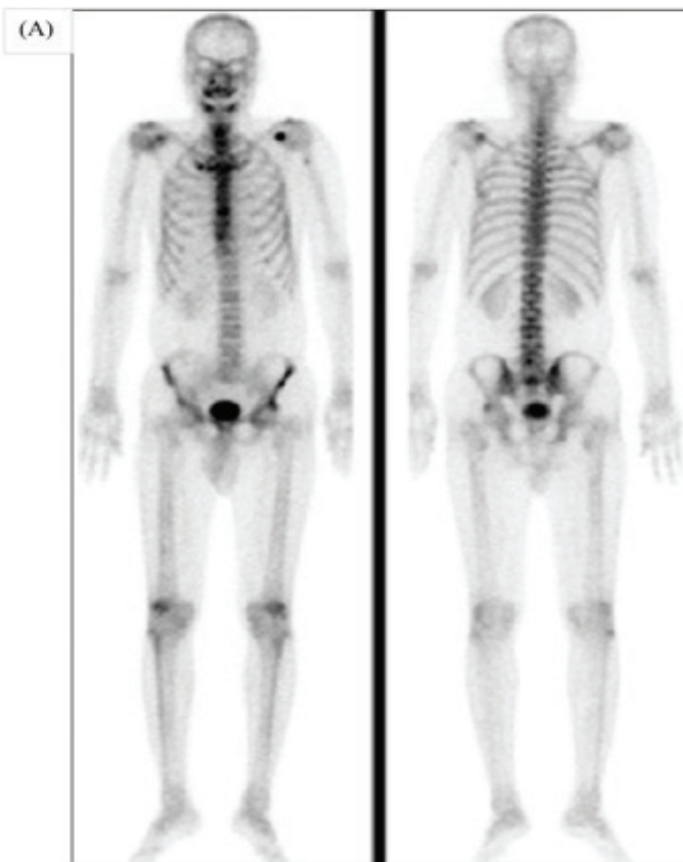
<sup>68</sup>Ga-labelled prostate-specific membrane antigen position emission tomography/computed tomography (PSMA PET/CT) has been a commonly used imaging method in the recent years for determining primary PCa stage and scanning for metastasis in cases of recurrence following definitive treatment of PCa. It is a more sensitive method that is particularly advantageous for individuals under high risk of metastasis when lymphadenopathy (LAP) and bone metastasis associated with PCa cannot be demonstrated by conventional imaging methods<sup>(4,5)</sup>. This case report

aims to present a case who successively underwent Transrectal ultrasound guided biopsy (TRUSG-Bx) due to high serum prostate specific antigen (PSA) levels, received a diagnosis of PCa, presented no metastasis in conventional imaging methods during staging, but in the <sup>68</sup>Ga-PSMA PET/CT scan, manifested metastasis in the occipital bone without involvement of the axial skeletal system.

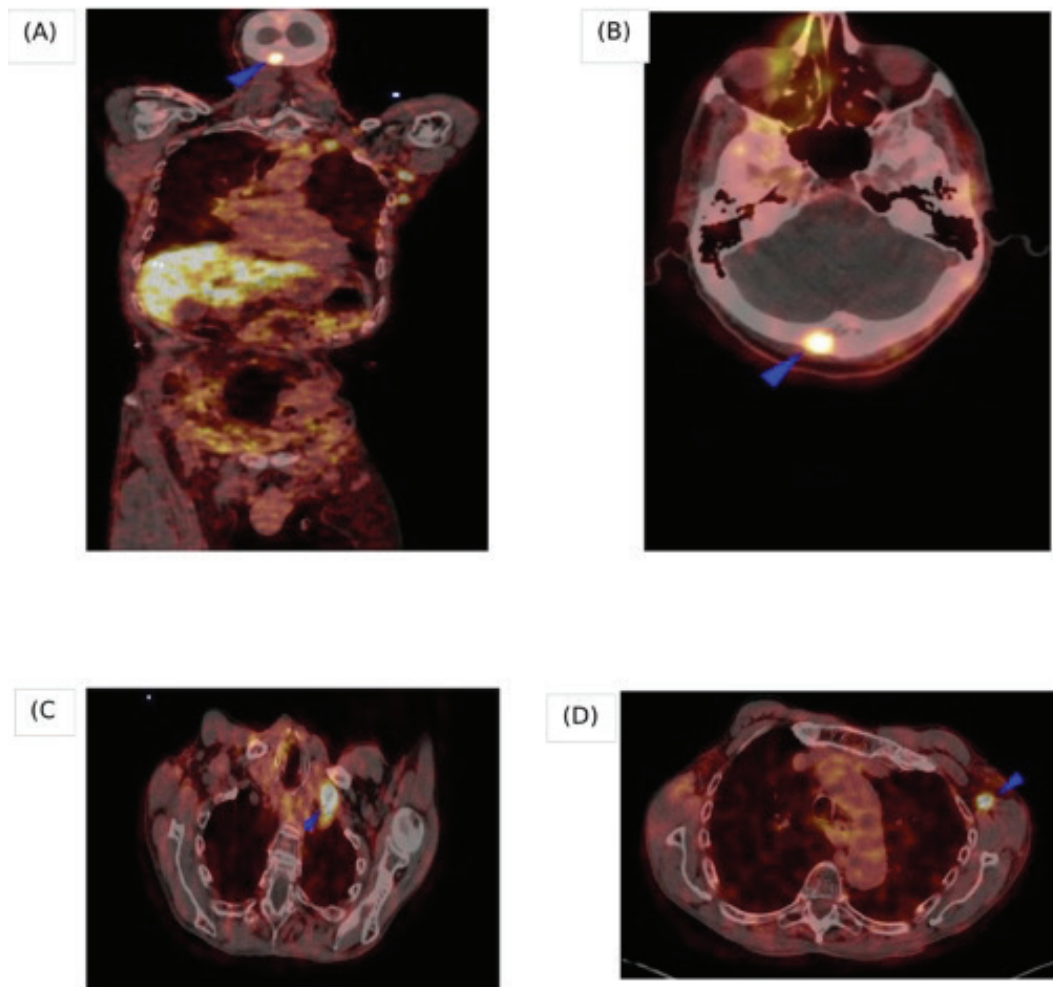
## Case Report

Seventy-five-year-old male patient presented to our polyclinic due to symptoms associated with the lower urinary system that had persisted for approximately a year. The patient had a serum PSA level of 98 µg/L, a creatinine level of 4.2 mg/dL and a glomerular filtration ratio (GFR) of 32 mg/dL. His prostate gland was found to be irregularly large and fixed to the surrounding tissue in the rectal examination. The patient underwent 10-quadrant TRUSG-Bx. Biopsy result indicated a prostatic adenocarcinoma, ISUP grade group 5, in situ ductal carcinoma, and a Gleason score 5+4=9. A multiparametric magnetic resonance imaging scan had been planned for the purpose of staging but an abdominopelvic CT was performed instead due to low GFR value. The abdominopelvic CT scan presented bilateral grade 3-4 hydronephrosis, conglomerate LAP in the right obturator region and a prostate gland indenting the bladder. <sup>99m</sup>Tc-Bone scan presented no findings of bone metastasis (Figure 1). While the <sup>68</sup>Ga-PSMA PET/CT scan of the patient showed no metastasis in the axial skeletal system, a 20x10 mm extracranial metastasis was identified on the right side of the occipital bone (SUV<sub>max</sub>: 21.1), right obturator, left supraclavicular and left axillary areas demonstrated LAP, consistent with metastasis (Figure 2 A-D). In addition, right obturator, left supraclavicular, and left axillary areas demonstrated LAP, consistent with metastasis. The patient sustained no pain due to occipital bone metastasis and presented no neurological findings as metastasis was extracranial. Bilateral nephrostomy was performed and following nephrostomy, the serum creatinine level of the patient regressed to 1.2 mg/dL.

The patient was diagnosed with oligometastatic hormone-sensitive PCa. The patient was treated with subcutaneous luteinizing hormone releasing hormone (LHRH) agonist goserelin and 6 cycles of chemotherapy with docetaxel in addition to LHRH. No toxicity was observed. At 6 months follow-up, his PSA and testosterone were found to have decreased to 0.46 µg/L and 8.3 ng/dL (normal reference 175-781 ng/dL), respectively.



**Figure 1.** <sup>99m</sup>Tc-Bone scan findings at diagnosis (A) no findings of bone metastasis



**Figure 2.** (A) Coronal fusion  $^{68}\text{Ga}$ -PSMA PET/CT and (B) transaxial fusion PET/CT showed increased metabolic activity ( $\text{SUV}_{\text{max}}$ : 21.1) on the right side of the occipital bone (arrows), (C) on the left supraclavicular and (D) left axillary areas (arrows) ( $\text{SUV}_{\text{max}}$ : 13)

PSMA PET/CT: Prostate-specific membrane antigen position emission tomography/computed tomography

## Discussion

This case report has presented a case diagnosed with PCa who did not present any bone metastasis in conventional imaging methods but, for the first time in the literature, manifested extracranial metastasis in the occipital bone without involvement of the axial skeletal system in a  $^{68}\text{Ga}$ -PSMA PET/CT scan. According to the literature, extracranial skull metastases most commonly originate from breast and lung cancers, whereas in males, they most commonly originate from PCa<sup>(1)</sup>. These metastases may be extra or intracranial. While intracranial metastases may be symptomatic due to the involvement of dural sinus and

cranial nerves, extracranial skull metastases are usually asymptomatic as observed in our case<sup>(6)</sup>.

$^{68}\text{Ga}$ -PSMA PET/CT is an important method for the diagnosis of lymph node metastasis in PCa. With this method, the mean LAP size that allows a diagnosis of PCa metastasis is  $13.1 \pm 7.7$  mm<sup>(7)</sup>. Also, a multi-center prospective study conducted with  $^{68}\text{Ga}$ -PSMA PET/CT determined some patients who had manifested no metastasis in conventional methods during PCa staging to have oligometastatic PCa. Moreover, the study detected more wide spread polymetastatic diseases in 20% of metastatic PCa patients<sup>(4)</sup>. Similarly, abdominopelvic CT and  $^{99\text{mTc}}$ -Bone scans failed to detect metastasis in our

patient in spite of high PSA levels and a high Gleason score in TRUSG-Bx. Consequently, a  $^{68}\text{Ga}$ -PSMA PET/CT was performed and this imaging method demonstrated high SUV in the obturator, supraclavicular, axillary regions and the occipital bone of the patient. The patient was diagnosed with oligometastatic PCa instead of non metastatic PCa and the treatment choice was therefore changed.

Occipital bone is a rare site for prostate cancer metastasis.  $^{68}\text{Ga}$ -PSMA PET/CT is a useful method for detecting metastasis in cases where PCa metastasis cannot be demonstrated by conventional imaging methods and thus contributes to the treatment choice. This demonstrates the potential clinical value of  $^{68}\text{Ga}$ -PSMA PET/CT in the management of prostate cancer.

### Ethics

**Informed Consent:** Written informed consent form was obtained from the patient.

### Authorship Contributions

Surgical and Medical Practices: M.YY., E.K., Concept: E.K., Y.Ö.İ., Design: C.Y., Data Collection or Processing: U.M., Analysis or Interpretation: M.YY., C.Y., Literature Search: M.YY., E.K., Writing: M.YY., E.K.

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The authors declared that this study received no financial support.

### References

1. Bubendorf L, Schöpfer A, Wagner U, et al. Metastatic patterns of prostate cancer: an autopsy study of 1,589 patients. *Hum Pathol* 2000;31:578-83.
2. Yamaga LYI, Cunha ML. Atypical metastases from prostate cancer detected on  $^{68}\text{Ga}$ -PSMA PET/CT: a case series. *Int Braz J Urol* 2021;47:205-9.
3. Messina M, Ricci F, Spina B, Boccardo F. Single skull metastasis 15 years after primary treatment of prostate cancer and with undetectable PSA levels: a case report and review of the literature. *Tumori* 2013;99:e220-4.
4. Roach PJ, Francis R, Emmett L, et al. The Impact of  $^{68}\text{Ga}$ -PSMA PET/CT on Management Intent in Prostate Cancer: Results of an Australian Prospective Multicenter Study. *J Nucl Med* 2018;59:82-8.
5. Giovacchini G, Giovannini E, Riondato M, Ciarmiello A. PET/CT With  $^{68}\text{Ga}$ -PSMA in Prostate Cancer: Radiopharmaceutical Background and Clinical Implications. *Curr Radiopharm* 2018;11:4-13.
6. Laigle-Donadey F, Taillibert S, Martin-Duverneuil N, Hildebrand J, Delattre JY. Skull-base metastases, *J Neurooncol* 2005;75:63-9.
7. Öbek C, Doğanca T, Demirci E, et al. The accuracy of  $^{68}\text{Ga}$ -PSMA PET/CT in primary lymph node staging in high-risk prostate cancer. *Eur J Nucl Med Mol Imaging* 2017;44:1806-12.