



## Metastatic Prostate Cancer with Pulmonary Involvement Mimicking Pneumonia: Findings on $^{18}\text{F}$ -FDG PET/CT and $^{68}\text{Ga}$ -PSMA PET/CT

Pnömoniyi Taklit Eden Akciğer Tutulum olan Metastatik Prostat Kanseri:  
 $^{18}\text{F}$ -FDG PET/BT ve  $^{68}\text{Ga}$ -PSMA PET/BT Bulguları

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### Abstract

A 68-year-old man with progressive exertional dyspnea after an upper respiratory tract infection underwent contrast-enhanced thorax computed tomography (CT) to exclude pulmonary thromboembolism. The radiological findings suggested pneumonia or alveolar edema.  $^{18}\text{F}$ -Fluorodeoxyglucose positron emission tomography/CT ( $^{18}\text{F}$ -FDG PET) scan was conducted due to progressive radiological findings. It revealed increased FDG uptake in the prostate gland, mediastinal, abdominopelvic multiple lymph nodes and bilateral lung lesions.  $^{68}\text{Ga}$ -prostate-specific membrane antigen-11 (PSMA) PET/CT scan was performed due to low FDG uptake in the lymph nodes and elevated plasma total prostate-specific antigen values. Moderate to high PSMA uptake corresponded to the localizations of FDG uptake on PET/CT. Furthermore, histopathological and immunohistochemical examinations demonstrated that the bilateral lung lesions and bilateral pleural effusion were compatible with metastases from prostate adenocarcinoma.

**Keywords:** Prostate cancer,  $^{68}\text{Ga}$ -PSMA PET/CT, pulmonary lymphangitic spread, pleural metastasis, pneumonia,  $^{18}\text{F}$ -FDG PET/CT

### Öz

Üst solunum yolu enfeksiyonu sonrası giderek artan efor dispnesi olan 68 yaşındaki erkek hastaya, pulmoner tromboemboliyi dışlamak için kontrastlı toraks bilgisayarlı tomografi (BT) gekindi. Radyolojik bulgular pnömoni veya alveolar ödem olduğunu düşündürdü. Radyolojik bulguların ilerlemesi nedeniyle  $^{18}\text{F}$ -Florodeoksiglukoz pozitron emisyon tomografisi/BT ( $^{18}\text{F}$ -FDG PET) taraması yapıldı. Prostat, mediastinal ve abdominopelvik çoklu lenf düğümlerinde ve bilateral akciğer lezyonlarında FDG alımının artışı gözlandı. Lenf düğümlerinde düşük FDG alımı ve plasmadaki yüksek total prostat spesifik antjen değerleri nedeniyle  $^{68}\text{Ga}$ -prostat spesifik membran antjeni-11 (PSMA) PET/BT taraması yapıldı. Orta-yüksek düzeyde PSMA tutulumu, PET/BT'de FDG tutulumu saptanan alanlarla korelasyon gösterdi. Ayrıca, histopatolojik ve immünohistokimyasal incelemeler, bilateral akciğer lezyonlarının ve bilateral pleral efüzyonun prostat adenokarsinomundan kaynaklanan metastazlarla uyumlu olduğunu gösterdi.

**Anahtar Kelimeler:** Prostat kanseri,  $^{68}\text{Ga}$ -PSMA PET/BT, pulmoner lenfanjistik yayılım, pleural metastaz, pnömoni,  $^{18}\text{F}$ -FDG PET/BT

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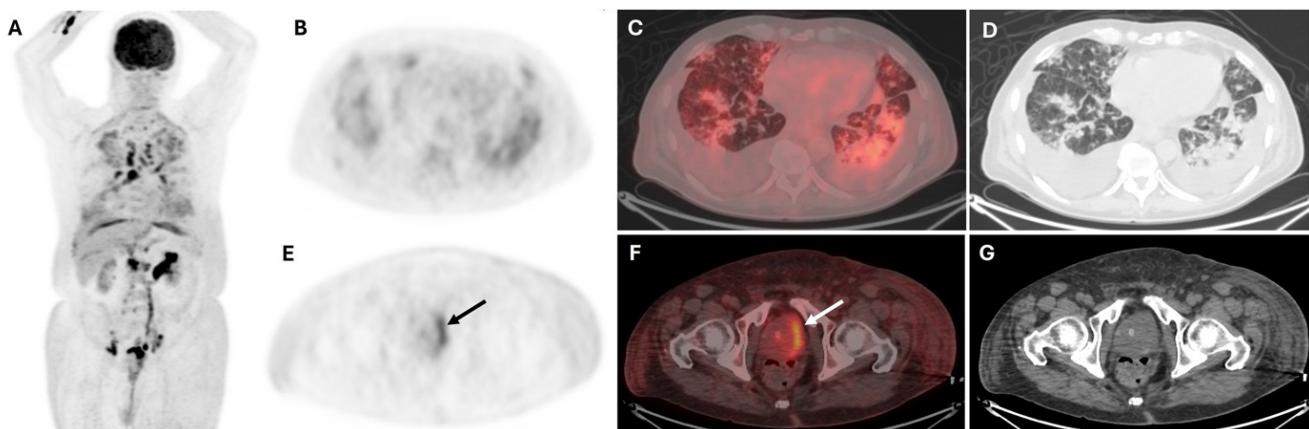
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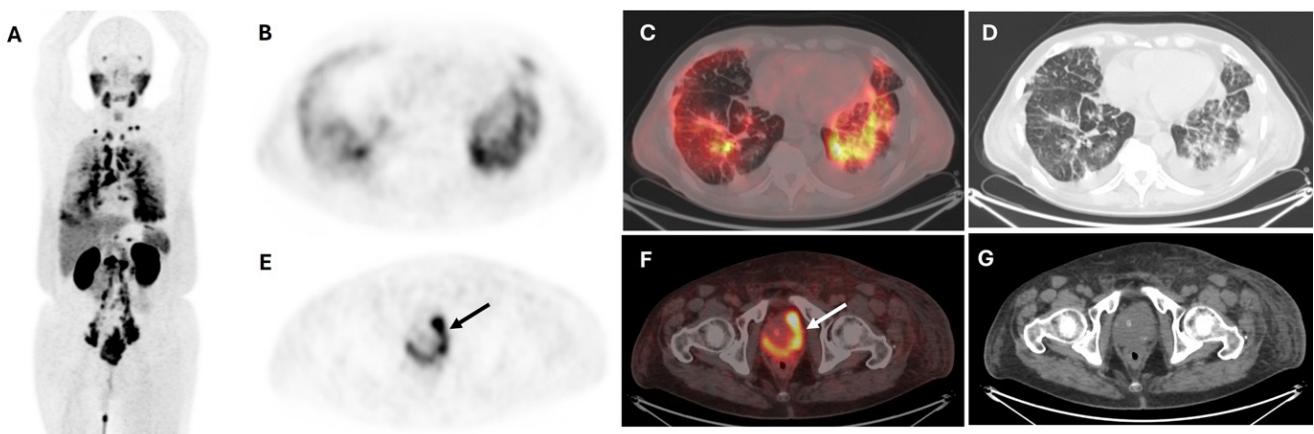
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**Figure 1.** Following an upper respiratory tract infection, a 68-year-old man with progressive exertional dyspnea underwent contrast-enhanced thorax computed tomography (CT) to exclude pulmonary thromboembolism. It was revealed that there was bilateral moderate pleural effusion, enlarged mediastinal lymph nodes, diffuse ground-glass opacities, interlobular septal thickening, consolidations, and atelectasis in bilateral lungs. Although the patient was treated with antibiotics and corticosteroids, the progression of radiological findings was observed in follow-up thorax CT performed due to increasing dyspnea. For further assessment,  $^{18}\text{F}$ -Fluorodeoxyglucose positron emission tomography ( $^{18}\text{F}$ -FDG PET)/CT scan was conducted. It displayed mild to high FDG uptake in multiple mediastinal and intra-abdominal lymph nodes, as well as mild FDG uptake in bilateral lung lesions (A, maximum intensity projection image; B, PET image; C, fused PET/CT image; D, CT image). Mild FDG uptake in the prostate gland (arrow) (maximum standardized uptake values: 5.2), high FDG uptake in the location between the left lateral wall of the urinary bladder and the left side of the prostate gland were incidentally observed (E, PET image; F, fused PET/CT image; G, CT image).



**Figure 2.** Due to low fluorodeoxyglucose (FDG) uptake in the lymph nodes and a markedly elevated plasma total prostate-specific antigen level of  $523 \mu\text{g/L}$  (normal:  $<4.1 \mu\text{g/L}$ ), a prostate fine-needle biopsy was performed and confirmed prostate adenocarcinoma (PCa).  $^{68}\text{Ga}$ -prostate-specific membrane antigen-11 positron emission tomography/computed tomography (PSMA PET/CT) was conducted. It showed mild to high PSMA uptake bilateral lung lesions and multiple lymph nodes (A, maximum intensity projection image; B, PET image; C, fused PET/CT image; D, CT image). It demonstrated increased PSMA uptake (maximum standardized uptake values, 14.1) extending from the prostate gland (arrow) to the urinary bladder and rectum (E, PET image; F, fused PET/CT image; G, CT image). Afterwards, immunohistochemical and histopathological assessments of the pleural fluid and bronchioalveolar lavage were consistent with prostate cancer (PCa) metastasis.

PSMA-ligand PET/CT plays a crucial role in detecting biochemical recurrence and staging intermediate- to high-risk PCa (1). In the diagnosis and staging of primary PCa, the role of  $^{18}\text{F}$ -FDG PET/CT is considerably limited (2,3). Therefore, integrating PSMA-ligand PET/CT and  $^{18}\text{F}$ -FDG PET/CT can provide a more comprehensive assessment of metastatic disease, particularly in atypical presentations.

PCa may metastasize the lungs, most commonly presenting with nodular involvement. Pulmonary lymphangitic spread (PLC) with ground-glass opacities, bilateral malignant pleural effusions, and thickenings in PCa are exceedingly rare (4,5,6). Pulmonary metastases from PCa may be overlooked on conventional imaging, particularly in patients with non-specific respiratory symptoms. Furthermore, both pulmonary metastases from PCa and certain benign or malignant lung diseases may demonstrate increased uptake of FDG and PSMA radiotracers (7).

In this case,  $^{18}\text{F}$ -FDG PET/CT revealed pathological radiotracer uptake in the prostate gland preceding both symptomatic presentation and laboratory findings. However,  $^{68}\text{Ga}$ -PSMA PET/CT provided superior accuracy in determining the extent of disease spread, thereby enabling informed treatment planning. Therefore, it should always be considered that bilateral pleural effusion and PLC with ground-glass opacity may represent metastatic spread from PCa, even in patients without a prior history of malignancy.

## Ethics

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

## Footnotes

### Authorship Contributions

Surgical and Medical Practices: N.A.D., Concept: E.T., A.N.Ç., Ö.Ö., Data Collection or Processing: E.T., A.N.Ç., Analysis or Interpretation: N.A.D., Ö.Ö., Literature Search: A.N.Ç., B.B., Writing: N.A.D.

**Conflict of Interest:** No conflicts of interest were declared by the authors.

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