TMSJ
TURKISH MEDICAL STUDENT JOURNAL

Turk Med Stud J 2025;12(2):39-43
DOI: 10.4274/tmsj.galenos.2025.2025-3-1

CASE REPORT

A RARE CASE OF ISOLATED SOLITARY PULMONARY METASTASIS OF PROSTATE CARCINOMA

Işıl Çetin[1], Etkin Marangoz[1], Fazlı Yanık[2]

[1]Trakya University School of Medicine, Edirne, TÜRKİYE
[2]Trakya University Faculty of Medicine, Department of Thoracic Surgery, Edirne, TÜRKİYE

ABSTRACT

Prostate cancer is the fourth most diagnosed cancer and the eighth leading cause of cancer-related mortality globally. Although distant metastases of prostate cancer are common, isolated pulmonary metastasis is exceptionally rare, occurring in fewer than 1% of cases. We present the case of a 61-year-old male who was diagnosed with extraprostatic highly invasive prostate adenocarcinoma in 2011, at the age of 49. He had a high prostate-specific antigen level of 41 ng/mL and a Gleason score of 7 (4+3), placing him in the intermediate-risk category (grade group 3). Following a radical prostatectomy, external iliac and pelvic lymphadenectomy, the patient was regularly monitored. Twelve years later, during routine follow-up and restaging, a Gallium-68 prostate-specific membrane antigen positron emission tomography computed tomography scan revealed a 2 cm nodular lesion in the upper lobe of the left lung, which was identified as a metastasis of prostate cancer. Histopathological analysis following surgical resection confirmed the diagnosis of isolated lung metastasis of prostate cancer. To the best of our knowledge, this is only the second reported case of singular pulmonary metastasis of prostate cancer in Türkiye. This case highlights the rarity of isolated pulmonary metastasis in prostate cancer, which occurs in fewer than 1% of cases. Despite the absence of elevated high prostate-specific antigen levels, long-term follow-up and routine imaging are essential for detecting distant metastases in prostate cancer patients. This case underscores the need for careful monitoring and imaging of prostate cancer patients during long-term follow-up, even in the absence of elevated prostate-specific antigen levels, to detect unusual metastatic sites like isolated pulmonary metastasis.

Keywords: Lung metastasis, prostate cancer, prostate-specific antigen

INTRODUCTION

Prostate cancer (PCa) is the fourth most common cancer worldwide and has the eighth highest mortality rate among all cancer types. The age-standardized incidence rate in men is 29.4 per 100,000, and the mortality rate is 7.3 per 100,000 (1). PCa is classified into four main types: ductal adenocarcinoma, prostatic intraepithelial neoplasia-like carcinoma, treatment-related neuroendocrine prostate carcinoma, and adenoid cystic (basal cell) carcinoma of the prostate (2). These different types can show varying metastatic patterns, with bone metastases being the most frequently observed in the majority of cases. However, the metastatic behavior and organ involvement can depend on the subtype of the cancer, making each case unique (3).

Prostate cancer typically metastasizes to the bones, particularly the spine, pelvis, and ribs, due to its affinity for hematopoietically active red bone marrow. Additionally, the cancer cells shedding from the primary tumor site can occasionally form clusters in the bloodstream, adhere to the vascular endothelium, and break apart to reach distant organs. However, most of these cells are susceptible to apoptosis or fail to establish a conducive microenvironment in the target organs, which significantly reduces the likelihood of distant metastases, such as to the lungs, especially in early stages (3). Therefore, pulmonary metastasis from PCa is a relatively rare occurrence, generally manifesting in the advanced stages of the disease. Pulmonary involvement in metastatic PCa has been observed in over 40%

Address for Correspondence: Işıl Çetin, Trakya University School of Medicine, Edirne, TÜRKİYE
e-mail: isilcetin@outlook.com.tr
ORCID iD of the authors: IÇ: 0009-0008-4210-7558; EM: 0009-0001-7493-6632; FY: 0000-0002-8931-5329
Received: 28.03.2025 Accepted: 10.06.2025 Publication Date: 30.06.2025

Cite this article as: Çetin I, Marangoz E, Yanık F. A rare case of isolated solitary pulmonary metastasis of prostate carcinoma. Turk Med Stud J. Turk Med Stud J. 2025;12(2):39-43.

of autopsy studies. However, isolated lung metastasis is very uncommon, occurring in less than 1% of cases (4).

Isolated lung metastasis from PCa remains an exceptionally rare clinical presentation. To date, only one case has been reported in Türkiye, with the current case potentially being the second documented instance in the literature (5). This case report aims to present a rare occurrence of PCa with isolated lung metastasis and highlights the importance of individualized follow-up strategies for PCa patients. The early detection of metastases in unusual sites, such as the lungs, emphasizes the need for tailored approaches in patient monitoring and management.

CASE REPORT

In this case, we present a 61-year-old male with a 20 pack-year smoking history. When he was 49 years of age, the patient presented to an external hospital with urinary symptoms, and his prostate-specific antigen (PSA) level was measured at 41 ng/mL (normal: <4 ng/mL, high risk of PCa) and prompted his referral to Trakya University Faculty of Medicine for further evaluation in 2011. The patient initially underwent a prostate biopsy, which revealed prostate adenocarcinoma with a Gleason score (GS) of 7 (3+4), grade group 2. Subsequently, the patient underwent radical prostatectomy (RP) with curative intent, including the removal of right and left obturator, right external iliac and pelvic lymph nodes. No evidence of distant metastasis was detected at that time. The primary tumor involved both lobes of the prostate and had extraprostatic spread. However, no evidence of seminal vesicle invasion or tumor involvement in the spermatic cord was observed. Based on the RP findings, the patient was diagnosed with extraprostatic highly invasive prostate adenocarcinoma with a total GS of 7 (4+3), grade group 3, classified as intermediate risk and staged pathologically as pT3aN0. He ceased smoking and was regularly followed up by medical oncology and thoracic surgery departments between 2011 and 2016, during which no complications or issues were detected, and normal PSA values followed.

In 2017, three months earlier, the patient's PSA level was measured at 0.9 ng/mL (normal: <0.2 ng/mL after prostatectomy). Prostate-specific membrane antigen positron emission tomography/computed tomography (PSMA PET/CT) revealed involvement of the left internal iliac lymph node, which was evaluated as lymph node metastasis. Subsequently, lymphadenectomy was performed, revealing sinus histiocytosis-type reactive hyperplasia in two lymph nodes, with no epithelial cells detected on pan-cytokeratin staining. The patient underwent androgen deprivation therapy with goserelin acetate [luteinizing hormone–releasing hormone (LHRH) agonist] in 2018.

Given the return of the disease and the presence of lymph node involvement, a disease relapse was suspected. PCa typically metastasizes first to regional lymph nodes, bones, or lungs, generally with multiple metastases. The observation of a lung nodule in 2023, after lymphadenectomy, raised concern for a possible isolated pulmonary metastasis, which warranted further investigation. The head, neck, mediastinum, thorax, abdomen, and pelvis were assessed using Gallium (Ga)-68 PSMA PET/CT for restaging. A 2-cm nodular lesion showing increased Ga-68 PSMA metabolic activity was detected in the upper lobe of the left lung, which could not be definitively classified as primary lung cancer or PCa metastasis (Figure 1).

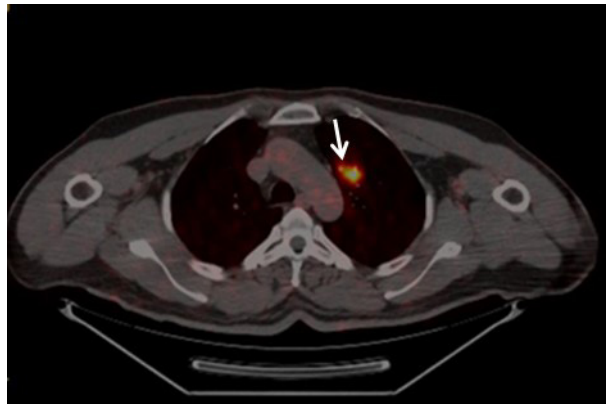

Figure 1: A Gallium-68 prostate-specific membrane antigen positron emission tomography/computed tomography scan of the patient performed in 2023 for restaging, showing an isolated metastasis to the left lung (arrow) with increased metabolic activity.

After the observation of the nodule, the case was discussed at the oncology council. While PCa typically spreads through regional lymph nodes or to the bone tissue, metastasis via hematogenous dissemination was considered in this case (3). The lung nodule observed prompted a more detailed investigation into potential isolated pulmonary metastasis, and surgery was planned based on the assessment that malignancy was the primary consideration. The patient underwent left upper lobe anterior segmentectomy and mediastinal lymphadenectomy. Lymph nodes numbered 5, 6, 7, 8, 9, 10, and 11 were sampled. The drain was removed on the second postoperative day, and the patient was discharged on the third postoperative day following surgery.

The resected material from the upper lobe of the lung had a stapled margin measuring 13x11.6 cm on its outer surface and had a mottled and anthracotic appearance. When the stapler line was opened and serial sections were taken, a tumor was measured 1.4x1.5x1.6 cm in size with an off-white color and hard consistency. The tumor's distal surface appeared adjacent to the pleura, and the entire tumor was sampled. In lymph node number 8, yellow-colored soft tissues were identified, and no lymph node was observed. Tumor-negative fibroadipose tissue was detected. Other lymph nodes showed soft tissues with an anthracotic appearance, which exhibited signs of hyperplasia and anthracosis.

Immunohistochemical analysis revealed PSA (+), NK3 Homeobox 1 (NKX3.1) (+), Cytokeratin 7 (CK7) (-), Cytokeratin 20 (CK20) (-), Alpha-Methylacyl-CoA Racemase (AMACR) (+), and Thyroid Transcription Factor-1 (TTF-1) (-). These findings are all consistent with PCa lung metastasis (Figures 2-5).

Postoperatively, Ga-68 PSMA metabolic activity was confirmed to be due to isolated lung metastasis of PCa. The patient is currently being followed up regularly with PSA levels within the normal range and with no complaints and treatment.

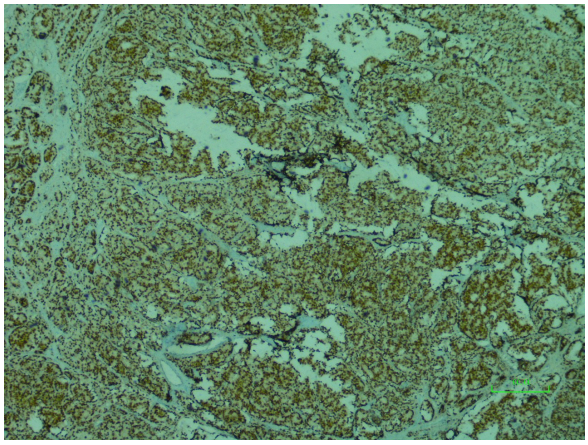

Figure 2: NK3 Homeobox 1 (+): Supporting the diagnosis of prostate cancer metastasis.

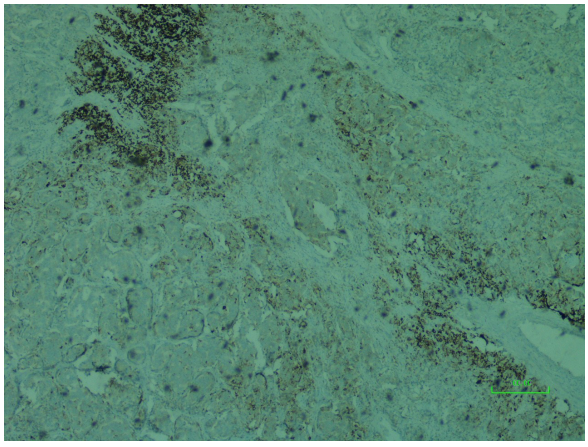

Figure 3: Alpha-Methylacyl-CoA Racemase (+): Overexpressed in prostate cancer.

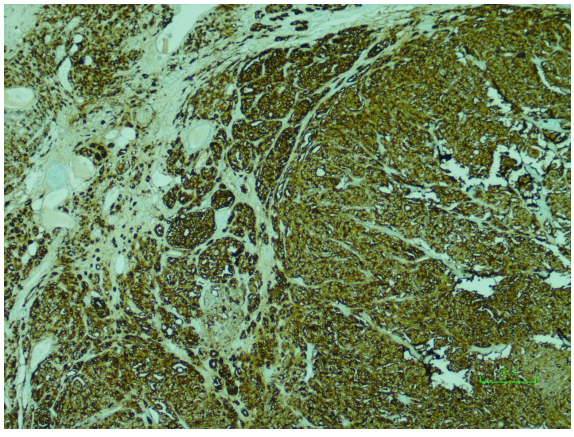

Figure 4: Prostate-Specific Antigen (+) represents prostate cancer-originated metastasis.

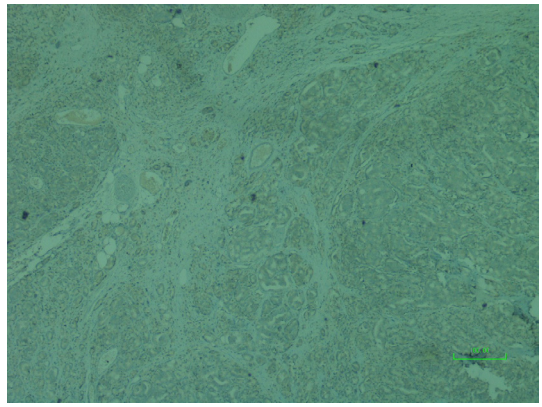

Figure 5: Thyroid Transcription Factor-1 (+) excludes primary lung cancer.

DISCUSSION

Prostate cancer is the fourth most commonly diagnosed malignancy worldwide, following breast, lung, and colorectal cancers, and accounts for approximately 7.3% of all cancer cases (1). The clinical progression and prognosis of PCa are significantly influenced by the presence and distribution of metastases. Bone is the most common site of metastatic involvement, particularly the spine, pelvis, and ribs, due to the affinity of PCa cells for hematopoietically active bone marrow.

Although pulmonary metastasis may occur in advanced stages, isolated lung metastasis without concurrent bone or lymph node involvement is exceedingly rare, reported in fewer than 1% of cases (3, 4). Despite autopsy studies showing lung involvement in up to 40% of patients with metastatic PCa, these typically co-occur with other systemic metastases.

Localized PCa often remains asymptomatic in its early stages and is commonly detected through PSA testing, digital rectal examination (DRE), and imaging modalities such as magnetic resonance imaging and transrectal ultrasound. However, in rare scenarios where patients present with atypical findings such as a solitary pulmonary lesion and normal PSA levels, diagnosis may be delayed or misdirected, underscoring the importance of histopathological confirmation and immunohistochemical profiling (6).

Maru et al. (7) reported a case of a 77-year-old ex-smoker with a solitary pulmonary nodule and normal PSA levels. The case was initially suspected to be primary lung cancer because primary lung cancers are typically singular, while PCa metastases usually present as multiple lesions. Their review of 23 cases of isolated lung metastasis from PCa indicated that normal PSA levels were found in 73% of cases, suggesting that isolated lung metastasis may occur even in the absence of elevated PSA levels, so in some rare cases PCa may metastasize without a significant rise in PSA levels. This highlights the limitations of PSA monitoring and emphasizes the need for additional imaging or molecular markers to detect hidden metastases. Aside from PSA testing, different immunohistochemical markers are used for diagnosis in the resected material. Notably, PSA expression is observed, and while the sensitivity of AMACR is inconsistent,

it is considered significant in the context of PCa, showing an increase. Additionally, NKX3.1 has shown near 100% sensitivity in some studies for PCa (8). In the differential diagnosis of adenocarcinomas, particularly in cases where TTF-1 is negative or the primary is unknown, several markers are utilized. These include Paired Box Gene 8, GATA Binding Protein 3, Caudal Type Homeobox 2, CK7, CK20, and, for male patients, PSMA or NKX3.1 (9). In our case, the immunohistochemistry results indicated PCa metastasis rather than a primary lung tumor.

Extraprostatic highly invasive tumors have a higher potential of recurrence. If PSA's time of doubling is more than one year and the pathological grade is lower than 4, as in our case, possible recurrence may be low (10). However, our patient had lymph node metastasis six years after RP. For this cause, androgen deprivation therapies like LHRH agonists and antagonists were used for our patient, which are commonly used as a systemic treatment for reducing the symptoms and risks of consequences of the disease, such as compression of the spinal cord or pathological fractures (6, 10). Additionally, Ciriaco et al. (11) examined the effectiveness of lung resection surgery in 9 patients with isolated lung metastasis following RP between 2011 and 2017. Four of these patients had solitary lung nodules, while five had multiple nodules. Notably, except for one patient who had both multiple nodules and bone metastasis (and received adjuvant therapy), the remaining patients were free of recurrence for up to 23 months following surgery. This study demonstrates that lung resections may be a viable treatment option even without the use of adjuvant therapy, although further research is needed given the limited number of cases (11). In our case, the patient had a history of smoking cessation 12 years prior, after RP, and he had PCa metastasis to the left lung with normal PSA levels. Unlike the cases presented by Maru et al. (7) and Ciriaco et al. (11), our patient exhibited a solitary tumor in the left upper lung, which was confirmed to be a metastasis from PCa. This case highlights the need for vigilance in the detection of isolated lung metastasis, even when PSA levels remain normal, and reinforces the rarity of this clinical presentation.

Regular PSA monitoring and DREs are crucial for tracking PCa recurrence. Incorporating routine imaging and prostate biopsies into surveillance protocols can significantly enhance early detection of both local recurrence and distant metastases (12). According to a 16-year follow-up of the European Randomized Study of Screening for PCa, PCa-related mortality decreases with long-term follow-ups. The study used PSA values to assess the risk, and as mentioned, a one-time screening may be ineffective in reducing mortality rates. Therefore, for patients with a history of PCa, regular follow-ups and screenings are crucial for disease management, as most patients have asymptomatic metastases (13). Mahmoud et al. (14) examined PCa lung metastasis in a literature review, analyzing a total of 58 studies. They found that most cases were asymptomatic. Only 13 of the studies reported general symptoms related to urinary and pulmonary systems, while 45 studies observed no symptoms at all (6). In our case, the metastatic nodule likely caused pulmonary symptoms such as abnormal phlegm, chest pain, and nonspecific lymphadenitis.

Our case represents one of the rare documented examples of isolated lung metastasis from PCa in Türkiye. To the best of our knowledge, a previously reported case in the country had high levels of PSA and carcinoembryonic antigen (CEA). The patient's CEA level was 529 ng/mL (normal range: <3 ng/mL), and the PSA level was 7.5 ng/mL (normal range: <4 ng/mL). This patient experienced remission of cancer five years after RP. In contrast, our patient developed isolated lung metastasis 12 years postoperatively with normal PSA and CEA levels, and the immunohistochemical profile was unique, showing PSA (+), NKX3.1 (+), CK7 (-), CK20 (-), AMACR (+), and TTF-1 (-) (5). Additionally, a similar case in the country involved a solitary nodule in the lung and brain metastasis without lymph node or bone involvement, further highlighting the diverse metastatic patterns of PCa (15).

CONCLUSION

In conclusion, these differences emphasize the variability in clinical presentation and immune response in PCa metastasis, suggesting that PSA and CEA levels, while informative, are not always reliable indicators of metastatic progression, especially in cases with normal serum markers. Since such metastases are often asymptomatic, long-term follow-up and advanced imaging are crucial for detecting late recurrences. This case underscores the need for routine imaging beyond PSA monitoring in post-prostatectomy patients. Our findings highlight the necessity of continuous surveillance, even in cases initially considered curative, to improve patient outcomes and disease management.

Ethics

Informed Consent: *Written informed consent was obtained.*

Acknowledgement

The authors would like to express their sincere gratitude to Prof. Dr. Ebru Taştekin and Dr. Selahattin Türkay Demirbozan from the Department of Pathology, Trakya University, for their valuable support and contributions during the evaluation acquisition of immunohistochemical images.

Footnotes

Conflict of Interest: *The authors declared no conflict of interest.*

Author Contributions: *Surgical and Medical Practices: F.Y., Concept: F.Y., Design: I.Ç., E.M., Data Collection or Processing: I.Ç., E.M., Analysis and/or Interpretation: I.Ç., E.M., F.Y., Literature Search: I.Ç., E.M., Writing: I.Ç., E.M., F.Y.*

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

REFERENCES

1. Bray F, Laversanne M, Sung H et al. Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2024;74(3):229-63. [Crossref]
2. Kench JG, Amin MB, Berney DM et al. WHO classification of tumours fifth edition: evolving issues in the classification, diagnosis, and prognostication of prostate cancer. Histopathology. 2022;81(4):447-58. [Crossref]
3. Manna F, Karkampouna S, Zoni E et al. Metastases in prostate cancer. Cold Spring Harb Perspect Med. 2019;9(3):a033688. [Crossref]

4. Wu LX, Lei L, Zhu YC et al. A prostate cancer patient with isolated lung metastases: a case report. Transl Cancer Res. 2020;9(3):2064-8. [Crossref]
5. Ürün Y, Utkan G, Perçinel S et al. Isolated pulmonary metastasis presenting with an CEA elevation five years after radical prostatectomy. UHOD. 2013;23(3):200-1. [Crossref]
6. Cornford P, van den Bergh RCN, Briers E et al. EAU-EANM-ESTRO-ESUR-ISUP-SIOG guidelines on prostate cancer-2024 update. Part I: screening, diagnosis, and local treatment with curative intent. Eur Urol. 2024;86(2):148-63. [Crossref]
7. Maru N, Okabe A, Hino H et al. Solitary lung metastasis from primary prostate cancer with normal prostate specific antigen levels: a case report and literature review. World Acad Sci J. 2022;4(4). [Crossref]
8. Compérat E. New markers in prostate cancer: inmunohistochemical. Arch Esp Urol. 2019;72(2):126-34. [Crossref]
9. Yatabe Y, Dacic S, Borczuk AC et al. Best practices recommendations for diagnostic immunohistochemistry in lung cancer. J Thorac Oncol. 2019;14(3):377-407. [Crossref]
10. Tilki D, van der Bergh RCN, Briers E et al. EAU-EANM-ESTRO-ESUR-ISUP-SIOG guidelines on prostate cancer. Part II—2024 update: treatment of relapsing and metastatic prostate cancer. Eur Urol. 2024;86(2):164-82. [Crossref]
11. Ciriaco P, Briganti A, Bernabei A et al. Safety and early oncologic outcomes of lung resection in patients with isolated pulmonary recurrent prostate cancer: a single-center experience. Eur Urol. 2019;75(5):871-4. [Crossref]
12. Zograbyan V, Kalfayan G, Fattouhi S et al. Prostate cancer with isolated lung metastasis: an unusual presentation. Chest. 2021;160(4):A1736. [Crossref]
13. Hugosson J, Roobol MJ, Månsson M et al. A 16-yr follow-up of the European randomized study of screening for prostate cancer. Eur Urol. 2019;76(1):43-51. [Crossref]
14. Mahmoud AM, Moustafa A, Day C et al. Prostate cancer lung metastasis: clinical insights and therapeutic strategies. Cancers (Basel). 2024;16(11):2080. [Crossref]
15. Yılmaz N, Araz O, Uçar EY et al. Prostate cancer metastasis presenting as a solitary mass in the lung: case report. Türkiye Klinikleri Arch Lung. 2017;18(1):33-6. [Crossref]