

How to cite this article:

Gholami A, Taheri F, Askari E, Ghorbani H, Saber Tanha A. Pulmonary lymphangitic carcinomatosis as a rare occurrence in prostate cancer: Findings on [^{99m}Tc]Tc-PSMA and [¹⁷⁷Lu]Lu-PSMA scintigraphy. Iran J Nucl Med. doi: 10.22034/irjnm.2026.130616.1779

CASE REPORT

Pulmonary lymphangitic carcinomatosis as a rare occurrence in prostate cancer: Findings on [^{99m}Tc]Tc-PSMA and [¹⁷⁷Lu]Lu-PSMA scintigraphy

Alireza Gholami¹, Fatemeh Taheri², Emran Askari², Hamidreza Ghorbani^{3,4}, Amin Saber Tanha²

¹Department of Medical Physics, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

²Nuclear Medicine Research Center, Mashhad University of Medical Sciences, Mashhad, Iran

³Department of Urology, Imam Reza hospital, Mashhad University of Medical Sciences, Mashhad, Iran

⁴Uro-Oncology Research Center, Tehran University of Medical Sciences, Tehran, Iran

Corresponding Author:

Dr. Amin Saber Tanha

Address: Nuclear Medicine Research Center, Mashhad University of Medical Sciences, Ahmadabad St, 91766-99199, Mashhad, Iran.

Email: saberta4011@mums.ac.ir

Running title: Pulmonary lymphangitis carcinomatosis in PSMA scintigraphy

Article History:

Received: 17 June 2026

Revised: 04 August 2026

Accepted: 06 August 2026

Published Online: 08 August 2026

ABSTRACT

This report describes a patient with prostate cancer who demonstrated bilateral pulmonary lymphangitic carcinomatosis (PLC) identified on [^{99m}Tc]Tc-prostate-specific membrane antigen (PSMA) imaging. A 77-year-old man with significantly high PSA levels, extensive skeletal and lymph node metastases, received standard androgen deprivation therapy (ADT) and [¹⁷⁷Lu]Lu-PSMA radioligand therapy, in addition to palliative care for lung involvement. In spite of these treatments, his clinical condition deteriorated rapidly and he exhibited no significant response to the therapy. This case illustrates a rare occurrence of lymphangitic carcinomatosis in a patient with prostate cancer who presented with no respiratory symptoms.

Keywords: Radio-ligand therapy; Theranostics; SPECT/CT; Pulmonary metastasis; Castration resistance

INTRODUCTION

Pulmonary lymphangitic carcinomatosis (PLC) is an unusual form of metastasis, in which the tumor spreads through the lymphatic system of the lung and is particularly rare, especially in the

How to cite this article:

Gholami A, Taheri F, Askari E, Ghorbani H, Saber Tanha A. Pulmonary lymphangitic carcinomatosis as a rare occurrence in prostate cancer: Findings on [^{99m}Tc]Tc-PSMA and [¹⁷⁷Lu]Lu-PSMA scintigraphy. Iran J Nucl Med. doi: 10.22034/irjnm.2026.130616.1779

setting of staging a patient with prostate cancer [1]. PLC is most frequently linked to breast, gastric, and lung malignancies while occurs in fewer than 0.2% of prostate cancer and is usually accompanied by a poor prognosis [2, 3]. At present, there are no effective therapeutic strategies for the management of PLC. Corticosteroid therapy may offer only transient symptomatic relief of dyspnea, while the overall prognosis remains poor, with a typical survival ranging from 3 to 12 months [4]. This report discusses a case of prostate cancer with bilateral PLC on [^{99m}Tc]Tc-PSMA-11 scintigraphy along with [¹⁷⁷Lu]Lu-PSMA-617 post-treatment images.

CASE PRESENTATION

A 77-year-old man presented with lower urinary tract symptoms (LUTS) prompting serum prostate-specific antigen (PSA) level measurement which was over 400 ng/mL. Given a medical history of diabetes mellitus, hypertension, and chronic kidney disease, the patient had multiple sessions of dialysis as well as bilateral nephrostomies with the right nephrostomy still in place at the time of imaging. Considering the highly elevated level of serum PSA, he was initially referred for [^{99m}Tc] Tc-PSMA and [^{99m}Tc]Tc-MDP scintigraphy. Additionally, The patient underwent [^{99m}Tc]Tc-PSMA SPECT/CT imaging three hours after intravenous injection of 20 mCi [^{99m}Tc]Tc-HYNIC-PSMA. SPECT imaging was conducted in a step-and-shoot mode (30 seconds per stop), capturing 64 frames per head, utilizing a noncircular orbit over 360° (180° per head), saved in a 64×64 matrix, and reconstructed via the iterative reconstruction (IR) technique. CT acquisition utilized a tube voltage of 120 kV, a tube current of 140 mAs, and a reconstructed slice thickness of 2.5 mm, carried out after SPECT for attenuation correction and anatomical localization.

[^{99m}Tc]Tc-MDP bone scan showed multiple small sclerotic metastases throughout the cervico-thoracic vertebrae and ribs as well as in the right scapula (Figure 1A). In addition, Whole-body [^{99m}Tc]Tc-PSMA scintigraphy demonstrated diffuse bilateral pulmonary uptake (Figure 1B). [^{99m}Tc]Tc-PSMA SPECT/CT revealed PSMA uptake in the bilateral base and left mid to apex of the prostate gland (Figure 1C, first column in soft tissue window), innumerable PSMA-avid bulky lymph node metastases (Figure 1C, second column in soft tissue window), multiple PSMA-avid sclerotic skeletal metastases involving T1 and L5 vertebrae, 2nd, 3rd, 4th, 6th, and 11th ribs, sacrum, left acetabulum, and right iliac bone (Figure 1C, bone window), along with diffuse bilateral PSMA uptake in both lungs (Figure 1C, lung window). The CT component of SPECT/CT revealed interlobular septal and peribronchovascular interstitial thickening throughout both lungs, more prominently in basal segments of lower lobes, while the PSMA images revealed a clear pattern of linear and branching radiotracer uptake, mainly following the bronchovascular bundles. This pattern aligns with lymphatic tumor spread strongly suggested the presence of PLC. (Figure 1C, lung window).

Since corticosteroid therapy can aid as a palliative care for lymphangitic carcinomatosis [5], he was started on [¹⁷⁷Lu]Lu-PSMA at a dose of 200 mCi (Figure 1D) one week after [^{99m}Tc]Tc-PSMA imaging, in conjunction with Leuprolide and Bicalutamide as well as corticosteroids to address pulmonary involvement. Despite receiving RLT, his condition progressively worsened, and he died one month later due to urosepsis.

DISCUSSION

PLC is a serious, advanced form of metastatic cancer that mainly targets the lymphatic system in the lungs [6]. The underlying mechanism includes the invasion of cancerous cells into the lymphatic channels, causing blockages that result in thickening of the interstitial tissue, inflammation, and ultimately fibrosis [7]. In metastatic prostate cancer, lymphatic spread typically

goes to bone and regional lymph nodes in the retroperitoneum and pelvic region, while lung involvement is uncommon, rendering lymphangitic spread to the lungs in prostate cancer a rare and significant event [8]. The diagnosis of PLC is linked to a poor prognosis, with around fifty percent of patients expire within two months of experiencing their initial respiratory symptoms and three weeks after being admitted to the hospital [3]. PLC is rarely reported in patients with prostate cancer; however, multiple reports have shown this type of metastatic spread using various molecular imaging modalities, including [⁶⁸Ga]Ga-PSMA [9, 10], [¹⁷⁷Lu]Lu-PSMA [11], [^{99m}Tc]Tc-PSMA and [^{99m}Tc]Tc-FAPI-46 [12], [¹⁸F]F-FDG, [¹⁸F]F-DCFPyL [13] and [¹⁸F]F-PSMA-1007 [14]. There have been a few case reports highlighting the detection of PLC using [⁶⁸Ga]Ga-PSMA-11 PET/CT in patients with prostate cancer. One notable case, recently reported by Moreau et al., involved a patient who was undergoing staging assessment and was unexpectedly found to have both PLC and a rare atypical intrapericardial metastasis at the same time [9]. Radiotracer uptake in lungs may be observed in various interstitial pulmonary disorders [15, 16]. The differential diagnosis of diffuse uptake in both lung fields following [^{99m}Tc]Tc-PSMA scintigraphy may include pneumonitis, interstitial pneumonia, bronchiectasis, pulmonary sarcoidosis, and cancer-associated sarcoid-like reactions. While renal dysfunction can change how PSMA tracers spread in the body by boosting blood-pool activity, in this report the SPECT/CT scan was taken about 3 hours after administration of the [^{99m}Tc]Tc-HYNIC-PSMA. At that point, we wouldn't typically anticipate seeing diffuse intense pulmonary activity that could be solely linked to extended blood-pool retention. Moreover, the pulmonary uptake was heterogeneous rather than homogeneous and closely corresponded to the interlobular septal and peribronchovascular abnormalities on CT images. As lung biopsy could not be carried out because of the patient's poor clinical condition, and post-mortem examination was not available in our country, histopathological confirmation could not be obtained. Therefore, the concordance between the clinical signs and imaging results pointed more towards PLC as the likely diagnosis, rather than attributing the nonspecific tracer retention to renal dysfunction. It is of utmost importance to consider PLC as a possible diagnosis for diffuse lung uptake in high-risk prostate cancer patients which should be confirmed by anatomical imaging. Interestingly, in the specific context of PLC, the integration of simultaneously acquired morphological and functional data has been reported to offer valuable insights into the overall tumor burden, which may in turn help predict patient prognosis [17]. In a particular report, reported by Aggarwal et al., recurrent pulmonary lymphangitic carcinomatosis was identified on the [¹⁷⁷Lu]Lu-PSMA-617 post-therapy scan of a patient with metastatic castration-resistant prostate cancer (mCRPC), even though a high-resolution CT scan (HRCT) showed no unusual anatomical lesions in the chest [11]. Since our experience also showed acceptable uptake of [¹⁷⁷Lu]Lu-PSMA in PLC, even though our patient didn't show a strong therapeutic response, [¹⁷⁷Lu]Lu-PSMA imaging could still offer important diagnostic insights that extend beyond its therapeutic application. Although a previous case report has described a rare instance of radiation pneumonitis (RP), radiation recall pneumonitis (RRP) and drug-induced pneumonitis as possible secondary complications following [¹⁷⁷Lu]Lu-PSMA RLT [18], our patient did not develop any respiratory symptoms after receiving a single cycle of [¹⁷⁷Lu]Lu-PSMA treatment. Furthermore, no clinical evidence of RLT-related pulmonary toxicity was observed during follow-up; however, the use of “theranostics”, requires strict adherence to radioprotection principles, in addition to consider possible side effects, given that RP, RRP and drug-induced pneumonitis are significant complications, despite being infrequently reported.

How to cite this article:

Gholami A, Taheri F, Askari E, Ghorbani H, Saber Tanha A. Pulmonary lymphangitic carcinomatosis as a rare occurrence in prostate cancer: Findings on [^{99m}Tc]Tc-PSMA and [¹⁷⁷Lu]Lu-PSMA scintigraphy. Iran J Nucl Med. doi: 10.22034/irjnm.2026.130616.1779

CONCLUSION

Our observation, supported by clinical follow-up and imaging findings, suggested the uncommon occurrence of bilateral PLC in prostate cancer, which was found during [^{99m}Tc]Tc-PSMA imaging performed as an initial staging procedure. This case underscores the aggressive characteristics of PLC in metastatic prostate cancer, emphasizing the importance of being aware of unusual metastatic patterns while reviewing the [^{99m}Tc]Tc-PSMA scan. Though the [¹⁷⁷Lu]Lu-PSMA scintigraphy could reveal the uptake in PLC and thereby highlighting the diagnostic utility of this radiopharmaceutical, in this patient, it did not prevent the disease progression or alter the fatal course of its complication despite [¹⁷⁷Lu]Lu-PSMA treatment attempt. Future studies and research are needed to determine the therapeutic efficacy of [¹⁷⁷Lu]Lu-PSMA RLT in PLC.

REFERENCES

1. Ramos-Laguna KA, West W, El-Baba F, Ponce-Zepeda J, Chan P, Lindgren B, Chang CF. Pulmonary lymphangitic carcinomatosis from metastatic prostate carcinoma initially presenting as interstitial lung disease and dyspnea. *Chest*. 2024;166(4):A5423–4.
2. Lindell MM, Doubleday LC, von Eschenbach AC, Libshitz HI. Mediastinal metastases from prostatic carcinoma. *J Urol*. 1982;128(2):331–3.
3. Klimek M. Pulmonary lymphangitis carcinomatosa: systematic review and meta-analysis of case reports, 1970–2018. *Postgrad Med*. 2019;131(5):309–18.
4. Bruce D, Heys S, Eremin O. Lymphangitis carcinomatosa: a literature review. *J R Coll Surg Edinb*. 1996;41(1):7–13.
5. Lin RJ, Adelman RD, Mehta SS. Dyspnea in palliative care: expanding the role of corticosteroids. *J Palliat Med*. 2012;15(7):834–7.
6. Gilchrist F, Alton H, Brundler M, Edwards L, Plunkett A, Rao S. Pulmonary lymphangitic carcinomatosis presenting as severe interstitial lung disease in a 15-year-old female. *Eur Respir Rev*. 2011;20(121):208–10.
7. Soares FA, Pinto A, Landell G, De Oliveira J. Pulmonary tumor embolism to arterial vessels and carcinomatous lymphangitis. A comparative clinicopathological study. *Arch Pathol Lab Med*. 1993 Aug;117(8):827–31.
8. Fabozzi SJ, Schellhammer PF, El-Mahdi AM. Pulmonary metastases from prostate cancer. *Cancer*. 1995;75(11):2706–9.
9. Moreau A, Tabutin M, Bouhamama A, Kryza D. A Rare Atypical intrapericardial prostate adenocarcinoma metastasis with 68Ga-PSMA-11 PET/CT. *Clin Nucl Med*. 2024;49(12):1130–1132.
10. Tang VD, Campbell P, Pattison DA. Lymphangitic carcinomatosis from prostate cancer identified with gallium-68 prostate-specific membrane antigen positron emission tomography imaging. *Urology*. 2018;114:e1–e2.
11. Aggarwal P, Satapathy S, Sood A, Singh P, Singh H, Chopra S, Prakash G, Mittal BR. Recurrent pulmonary lymphangitis carcinomatosis detected on 177Lu-PSMA-617 post-therapy scan in mCRPC with negative PSMA PET and HRCT. *Eur J Nucl Med Mol Imaging*. 2026;53(3):1365–1366..

How to cite this article:

Gholami A, Taheri F, Askari E, Ghorbani H, Saber Tanha A. Pulmonary lymphangitic carcinomatosis as a rare occurrence in prostate cancer: Findings on [^{99m}Tc]Tc-PSMA and [¹⁷⁷Lu]Lu-PSMA scintigraphy. Iran J Nucl Med. doi: 10.22034/irjnm.2026.130616.1779

12. Raeisi N, Aghaee A, Aryana K, Soltani S, Ghorbani H. 99mTc-PSMA and 99mTc-FAPI-46 Uptake in Pulmonary Lymphangitic Carcinomatosis: A Rare Form of Metastasis in Prostate Cancer Patient, Responding to Modified Treatments. Clin Nucl Med. 2024;49(12):e691-e692.
13. Zukotynski KA, Jadvar H, Potvin K, Cho SY, Kim CK, Winquist E. Prostate Cancer Lymphangitic Pulmonary Carcinomatosis: Appearance on: 18: F-FDG PET/CT and: 18: F-DCFPyL PET/CT. Clin Nucl Med. 2020;45(9):727–9.
14. Liu BL, Hong JJ, Tang K, Lin J, Zheng XW. 18F-PSMA-1007 uptake in pulmonary lymphangitic carcinomatosis metastasis from prostate cancer. Clin Nucl Med. 2021;46(7):e355–7.
15. Dondi F, Bellini P, Cossandi M, Camoni L, Rinaldi R, Viganò GL, Bertagna F. The Role of [18F] FDG PET Imaging for the Assessment of Pulmonary Lymphangitic Carcinomatosis: A Comprehensive Narrative Literature Review. Diagnostics (Basel). 2025;15(13):1626..
16. Bouchelouche K, Vendelbo MH. Pulmonary opacities and bronchiectasis avid on 68Ga-PSMA PET. Clin Nucl Med. 2017;42(4):e216–7.
17. Park Y-J, Im Y, Kwon OJ, Han J, Ahn M-J, Kim J, Um SW , Choi JY. Prognostic value of pretherapeutic FDG PET/CT in non-small cell lung cancer with pulmonary lymphangitic carcinomatosis. Sci Rep. 2023;13(1):345.
18. Wang JS, Wong T, Wu KA, Mullikin TC, Armstrong A. Diffuse pneumonitis after Lutetium-177-PSMA-617 treatment in a patient with metastatic castration-resistant prostate cancer. BMJ Case Rep. 2024;17(2):e257772.

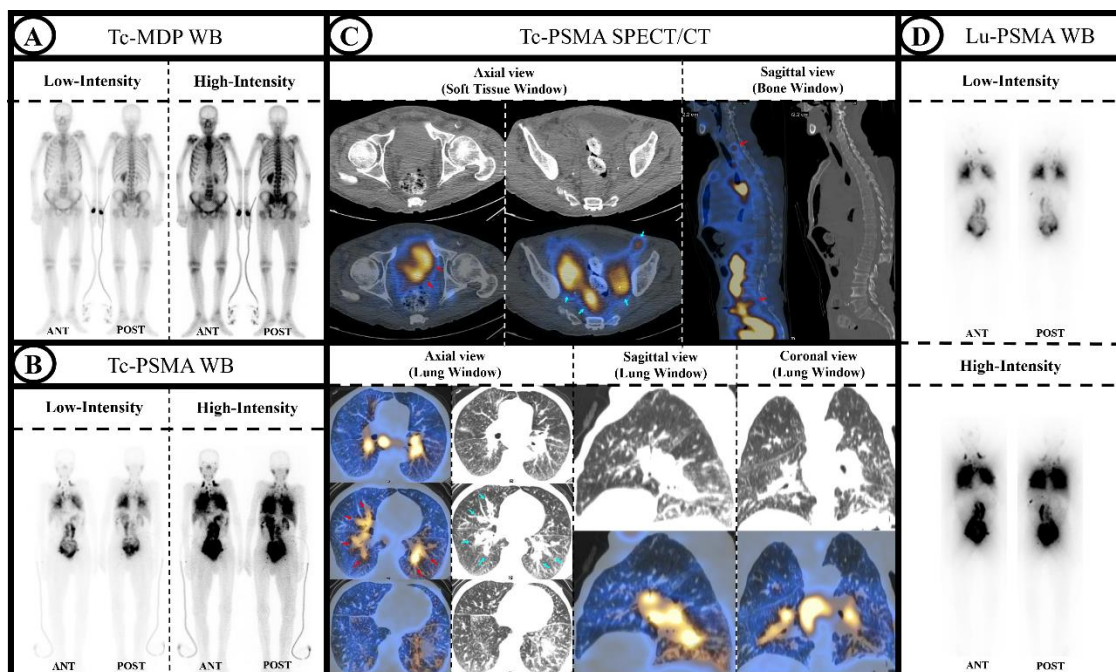


Figure 1. Whole-body [^{99m}Tc]Tc-MDP bone scan demonstrating multiple small sclerotic skeletal metastases (A). Whole-body [^{99m}Tc]Tc-PSMA scintigraphy showing diffuse bilateral pulmonary uptake (B). [^{99m}Tc]Tc-PSMA SPECT/CT: soft tissue window (first and second columns) demonstrating PSMA uptake in the prostate gland (red arrows) and PSMA-avid bulky lymph node metastases (blue arrows), bone window showing PSMA-avid skeletal metastases (red arrows), and lung window revealing diffuse pulmonary uptake (red arrows) corresponding to interlobular septal thickening on CT (blue arrows), consistent with PLC (C). [^{177}Lu]Lu-PSMA scan (D)