

Detection of Sarcomatoid Lung Metastasis With ^{68}Ga -PSMA PET/CT in a Patient With Prostate Cancer

Llanos Geraldo, MD, Francesco Ceci, MD, Christian Uprimny, MD,
Dorota Kendler, MD, and Irene Virgolini, PhD

Abstract: A 70-year-old man with prostate cancer (adenocarcinoma; pT3aN0Mx; GS: 4 + 4) underwent radical prostatectomy and lymph node dissection in February 2008. In December 2009, biochemical recurrence occurred and prostate-specific antigen progressively increased to 4.63 ng/mL despite local salvage radiotherapy and androgen deprivation. ^{68}Ga -PSMA PET/CT showed a positive left iliac lymph node and a pathological left pulmonary lesion, which was highly positive in a subsequent ^{18}F -FDG PET/CT. Lymph node resection confirmed an adenocarcinoma metastasis of the prostate cancer and lung surgery demonstrated a sarcomatoid metastasis of prostate cancer. After surgery, prostate-specific antigen decreased to 0.03 ng/mL.

Key Words: prostate cancer, PSA, ^{68}Ga -PSMA PET/CT, sarcomatoid, undifferentiated, lung metastasis

(*Clin Nucl Med* 2016;41: 421–422)

Received for publication August 31, 2015; revision accepted December 20, 2015. From the Medizinische Universität Innsbruck, Innsbruck Austria.

Author contribution: L.G. as the principal and corresponding author is responsible for study concept and drafting the manuscript. F.C. qualifies as author based on his contribution toward drafting the manuscript. C.U. qualifies as author based on his contribution to draft and revision the manuscript. D.K. and I.V. qualify as authors due to their contribution to revise the manuscript for intellectual content.

Conflicts of interest and sources of funding: none declared.

Correspondence to: Llanos Geraldo, Universitätsklinik für Nuklearmedizin, Medizinische Universität Innsbruck, Anichstraße 35, 6020 Innsbruck, Austria. E-mail: llanos.geraldo-roig@tirol-kliniken.at

Copyright © 2016 Wolters Kluwer Health, Inc. All rights reserved.

ISSN: 0363-9762/16/4105-0421

DOI: 10.1097/RLU.0000000000001157

REFERENCES

1. Nguyen QN, Levy LB, Lee AK, et al. Long-term outcomes for men with high-risk prostate cancer treated definitively with external beam radiotherapy with or without androgen deprivation. *Cancer*. 2013;119:3265–3271.
2. Roehl KA, Han M, Ramos CG, et al. Cancer progression and survival rates following anatomical radical retropubic prostatectomy in 3,478 consecutive patients: long-term results. *J Urol*. 2004;172:910–914.
3. Kobe C, Maintz D, Fischer T, et al. Prostate-specific membrane antigen PET/CT in splenic sarcoidosis. *Clin Nucl Med*. 2015;40:897–898.
4. Krohn T, Verburg FA, Pufe T, et al. [(68)Ga]PSMA-HBED uptake mimicking lymph node metastasis in coeliac ganglia: an important pitfall in clinical practice. *Eur J Nucl Med Mol Imaging*. 2015;42:210–214.
5. Budaus L, Leyh-Bannurah SR, Salomon G, et al. Initial experience of Ga-PSMA PET/CT imaging in high-risk prostate cancer patients prior to radical prostatectomy. *Eur Urol*. 2015. [Epub ahead of print].
6. Rowe SP, Gage KL, Faraj SF, et al. (1)(8)F-DCFBC PET/CT for PSMA-based detection and characterization of primary prostate cancer. *J Nucl Med*. 2015;56:1003–1010.
7. Mease RC, Foss CA, Pomper MG. PET imaging in prostate cancer: focus on prostate-specific membrane antigen. *Curr Top Med Chem*. 2013;13:951–962.
8. Ceci F, Uprimny C, Nilica B, et al. (68)PSMA PET/CT for restaging recurrent prostate cancer: which factors are associated with PET/CT detection rate? *Eur J Nucl Med Mol Imaging*. 2015;42:1284–1294.
9. Eiber M, Maurer T, Souvatzoglou M, et al. Evaluation of hybrid ^{68}Ga -PSMA ligand PET/CT in 248 patients with biochemical recurrence after radical prostatectomy. *J Nucl Med*. 2015;56:668–674.
10. Humphrey P. Histological variants of prostatic carcinoma and their significance. *Histopathology*. 2012;60:59–74.
11. Rodrigues DN, Hazell S, Miranda S, et al. Sarcomatoid carcinoma of the prostate: ERG fluorescence in-situ hybridization confirms epithelial origin. *Histopathology*. 2015;66:898–901.
12. Yendamuri S, Caty L, Pine M, et al. Outcomes of sarcomatoid carcinoma of the lung: a Surveillance, Epidemiology, and End Results Database analysis. *Surgery*. 2012;152:397–402.

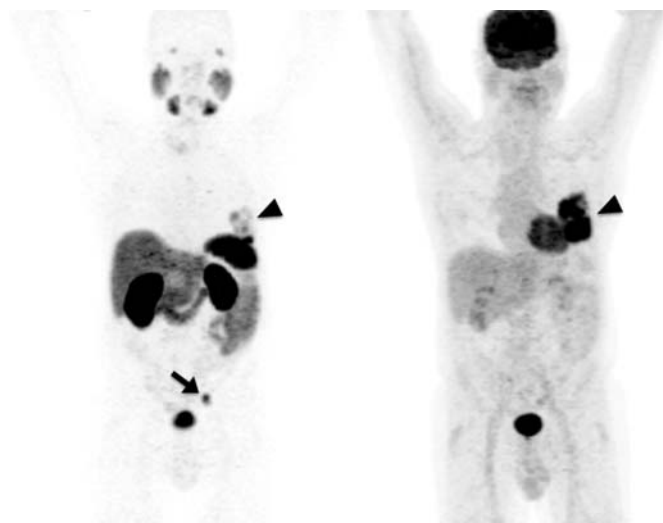


FIGURE 1. Biochemical recurrence in prostate cancer is a common event after radical prostatectomy and/or radiotherapy occurring in up to 40% of cases within 10 years after the initial treatment.^{1,2} In the presented case, prostate-specific antigen (PSA) level continued rising despite local radiotherapy and androgen suppression (PSA level, 4.63 ng/mL) 2 years after primary treatment. A ^{68}Ga -PSMA PET/CT was performed (MIP image on the left), where a positive left iliac lymph node (arrow) as well as a left heterogeneous PSMA-positive lung mass (arrowhead) were observed. It has been reported that other malignancies or even benign lesions may show a pathologic uptake of PSMA ligands.^{3,4} In this case, due to the localization, single pulmonary appearance and relatively low uptake the pulmonary lesion was suspected to be a secondary primary. After lymph node dissection, the PSA values continuously rose (PSA level, 7.12 ng/mL) and ^{18}F -FDG PET/CT was performed (MIP image on the right). The lung mass was highly ^{18}F -FDG positive. No evidence of local recurrence of prostate cancer in both PET/CT scans was found.

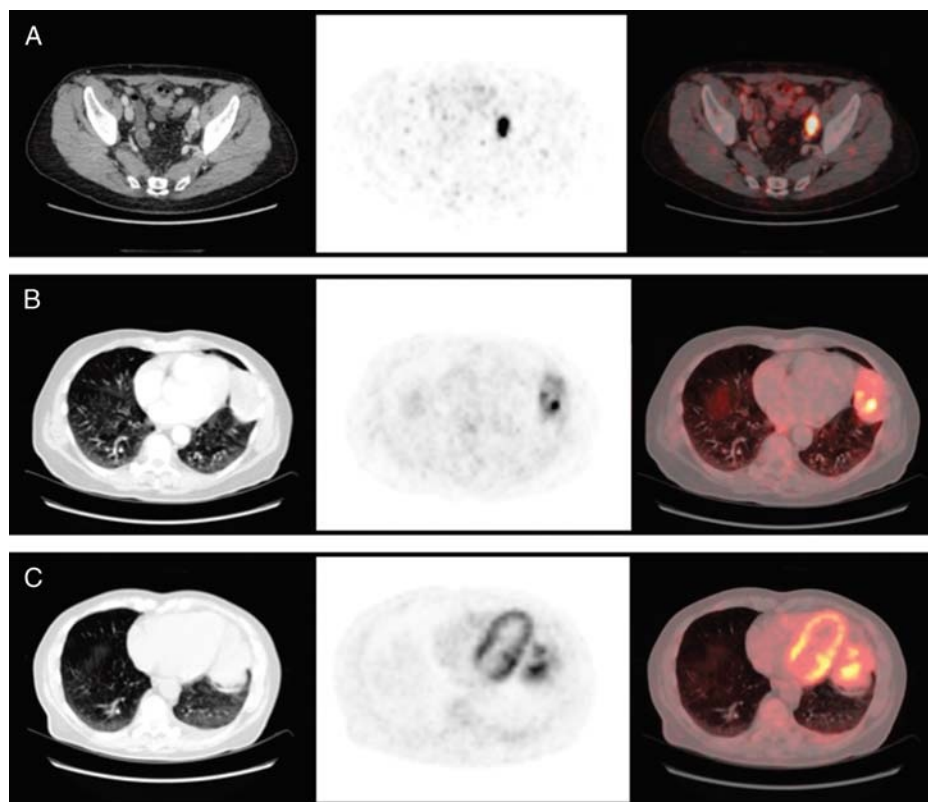


FIGURE 2. Axial CT (left column), PET (central column), and fused PET/CT images (right column). **A** and **B**, ^{68}Ga -PSMA PET/CT. **C**, ^{18}F -FDG PET/CT. **A**, ^{68}Ga -PSMA expressing a left iliac lymph node lesion. **B**, ^{68}Ga -PSMA–positive lesion in basal segment of left lung. PET with ^{68}Ga -PSMA ligand is a promising imaging procedure for prostate cancer.^{5–7} In comparison with choline PET, this radiotracer shows a higher detection rate even at relatively low PSA levels.^{8,9} **C**, At 3 months after surgical resection of the iliac lymph node metastasis, the remaining ^{68}Ga -PSMA–positive lung lesion had grown and showed high FDG uptake, which is uncommon in well-differentiated prostate cancer. Therefore, a second lung malignancy was suspected. However, histology confirmed a sarcomatoid, partially undifferentiated, metastasis of prostate carcinoma, a rare entity belonging to the group of nonacinar carcinomas (approximately 5%–10% of all prostate cancer).¹⁰ In the case of our patient, the lesion only showed a moderate elevation of PSA level, but sarcomatoid prostate cancer can even develop without PSA level elevation. In such cases, the detection of disease progression can be difficult. This case report demonstrates that even this rare histologic subtype of prostate cancer can be detected by ^{68}Ga -PSMA PET. Only approximately 100 cases are reported in the literature. The pathogenesis of this type of prostate cancer is still uncertain, although many of the published cases of sarcomatoid prostate cancer have been associated with a prior history of differentiated prostate adenocarcinoma, confirming the common tumor derivation from prostate epithelium.¹¹ The most frequent localizations of sarcomatoid metastases are the lung and lymph nodes, and the surgical treatment seems to be the most effective therapeutic approach.¹⁰ After the resection of the lung metastasis, PSA level decreased to less than 0.05 ng/mL. In addition, according to the course of disease of other sarcomatoid malignancies, sarcomatoid prostate cancer is associated with a poor prognosis.¹² It is notable that after resection of the ^{68}Ga -PSMA–positive lesions our patient does not show any evidence for tumor recurrence in the follow-up of nearly 1 year.