

Recurrent Prostate Cancer

Nat Lenzo, MMed MSc(Oncol) EMBA FRACP FAANMS¹; Jaideep S. Sohi, MD²;
Tee-Sin Lim, MBBS, FRANZCR³

Affiliations: ¹Nuclear Medicine and Internal Medicine Physician, GenesisCare Theranostics; ²President, American Molecular Imaging, Inc., Assistant Professor of Nuclear Medicine, California Northstate University School of Medicine; ³Radiation Oncologist, GenesisCare

CASE SUMMARY

A 58-year-old man with a Gleason score of 4+5=9 prostate cancer underwent radical prostatectomy in January 2016. At the time of surgery, the cancer had progressed through the capsule and into the seminal vesicles. However, no nodes were involved. His post-operative prostate specific antigen (PSA) was 0.27 ng/ml. Patient was deemed at high risk for recurrence and was referred for salvage pelvic and prostatic bed radiotherapy in October 2016. A ⁶⁸Ga PSMA-11 PET/CT was performed with no abnormal activity detected.

After radiotherapy, the patient's PSA decreased from 0.58 ng/ml to nadir of 0.46 ng/ml and then spiked to 0.63 ng/ml in July 2017. Repeat ⁶⁸Ga PSMA-11 PET/CT demonstrated no abnormal activity, and the patient entered an active surveillance program with repeat PSA tests every 3-6 months. At this time, the patient was not placed on hormone therapy or androgen deprivation therapy (ADT).

In March 2018, the patient's PSA levels rose significantly to 2.9 ng/ml, necessitating a third ⁶⁸Ga PSMA-11 PET/CT, which demonstrated PSMA-positive pathology. Patient received stereotactic radiotherapy to lymph nodes in the left internal iliac and right internal iliac stations. Active surveillance was again employed with no concomitant ADT.

IMAGING FINDINGS

Pursuant to the patient's rising PSA, a third ⁶⁸Ga PSMA-11 PET/CT exam in March 2018 (**Figures 1-2**) revealed a moderately PSMA avid lymph node in the left internal iliac

station at the presacral region and a small, mildly PSMA avid lymph node in right internal iliac station. Activity was also detected in the bladder.

Due to continued rising PSA levels, the patient received a fourth ⁶⁸Ga PSMA-11 PET/CT exam in July 2020 (**Figures 3-4**), which detected a new PSMA avid right internal iliac node and a new PSMA avid right para-aortic node. Ureteric activity was also apparent. Sequential Ga-68 PSMA-11 PET/CT exams demonstrated an increase in physiologic activity. However, the previously treated nodal disease was improved.

DIAGNOSIS

Recurrent prostate cancer with possible metastasis to right paraaortic and pelvic lymph nodes

FOLLOW-UP

Patient reinitiated stereotactic radiotherapy without ADT.

DISCUSSION

Contrary to declining death rates for many common cancers, prostate cancer deaths are rising, with an increase of 5 percent from 2019 to 2020.¹ Although most primary prostate cancer cases can be managed with radiotherapy or radical prostatectomy, 40 percent of men treated for this cancer will have disease relapse,² with castration-resistant prostate cancer accounting for most deaths.³ ⁶⁸Ga PSMA-11 PET/CT suggests better sensitivity to low levels

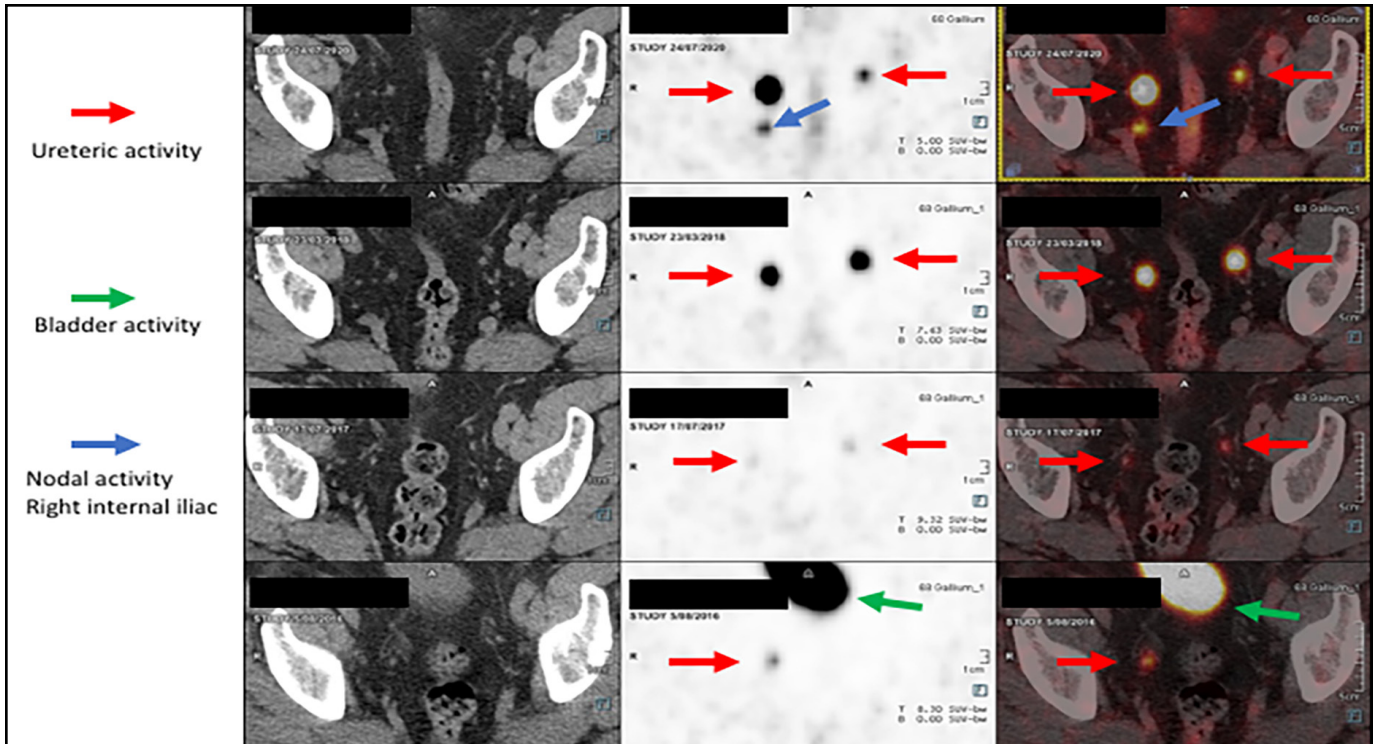


FIGURE 1. Physiological ureteral uptake (red arrows). PSMA avid right internal iliac lymph node (blue arrow). Increased bladder activity (green arrow).

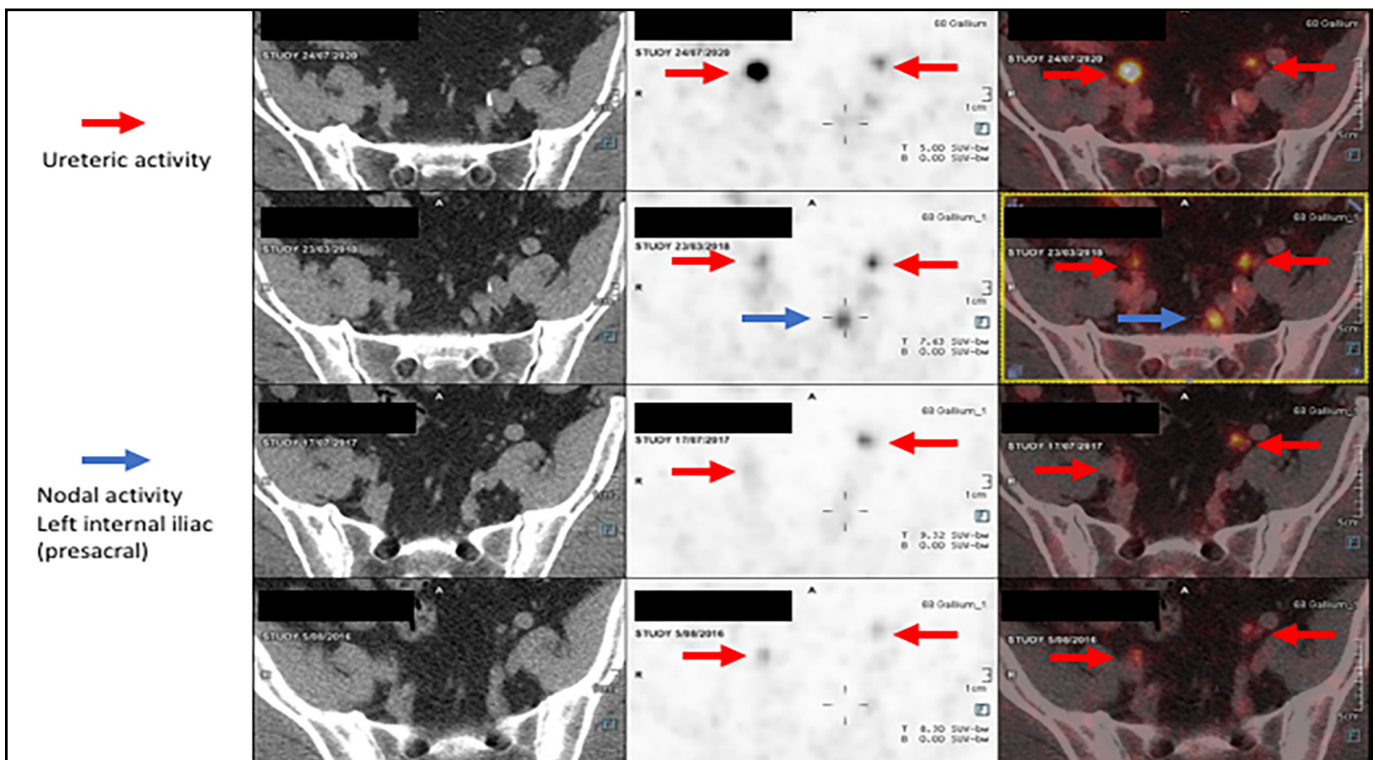


FIGURE 2. Physiological ureteral uptake (red arrows). PSMA avid left internal iliac lymph node (blue arrow).

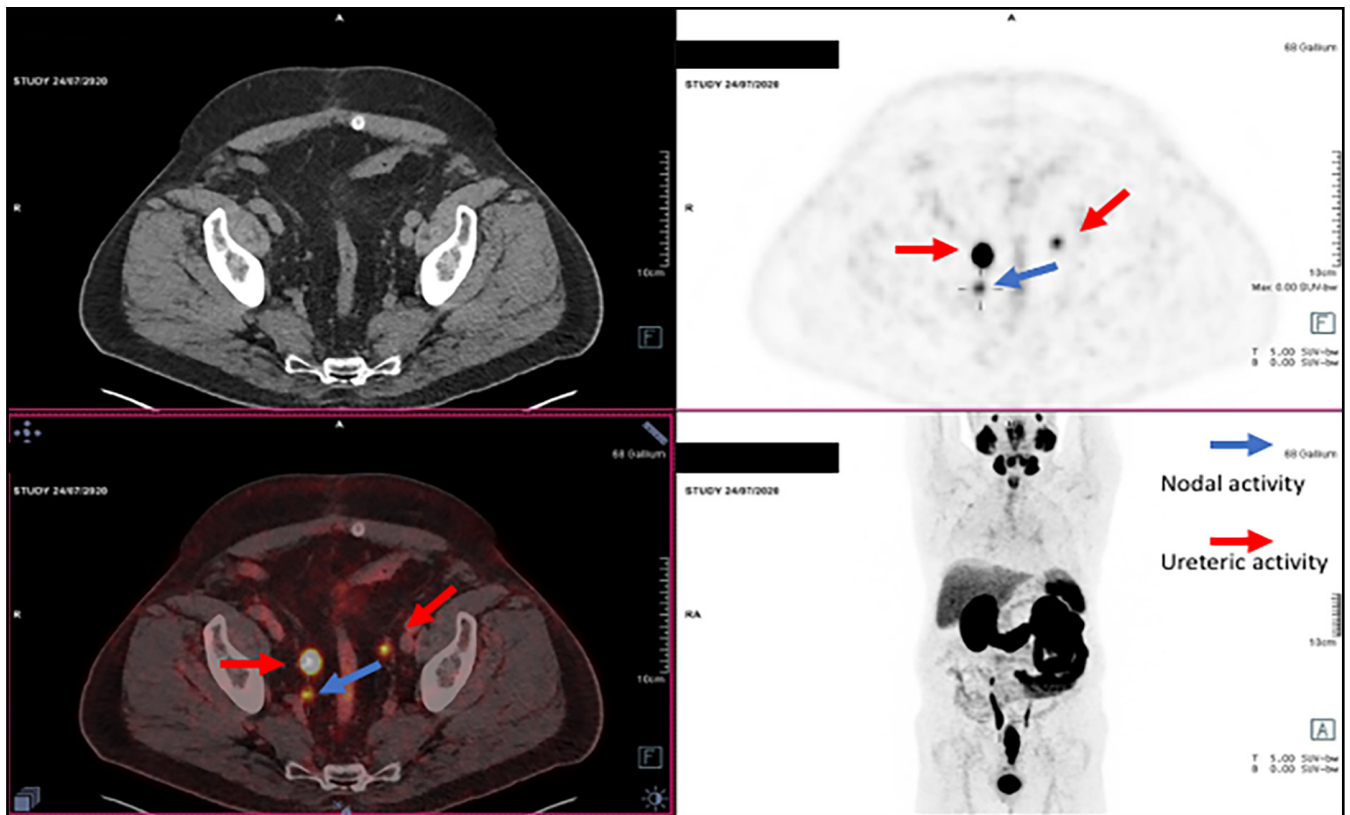


FIGURE 3. Physiological ureteral uptake (red arrows). PSMA avid right internal iliac lymph node (blue arrow).

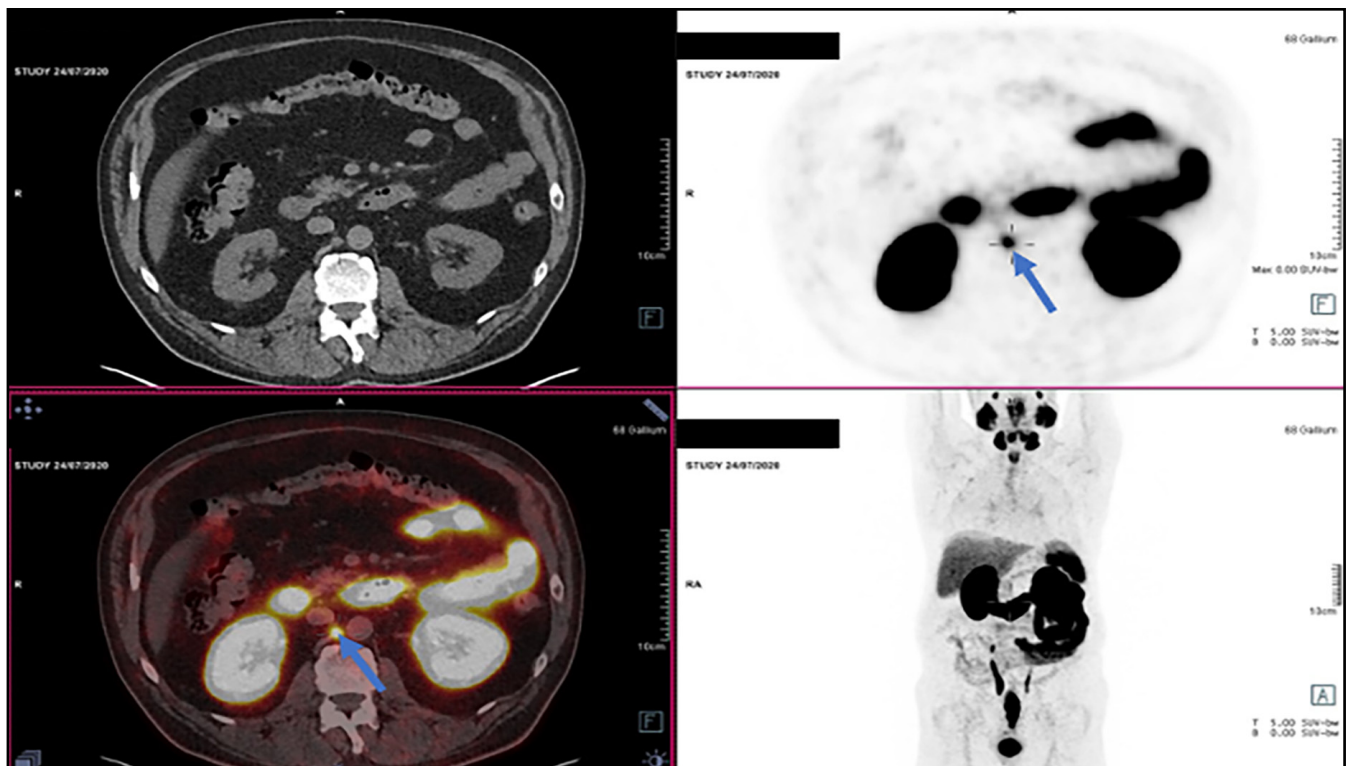


FIGURE 4. PSMA avid right paraaortic lymph node (blue arrow).

of PSA,⁴ and the ability to identify the location of disease recurrence after radical prostatectomy in half of the patients with a PSA level between 0.5 and 1 ng/ml,^{5,6} as demonstrated in this case study.

Additionally, ⁶⁸Ga PSMA-11 PET/CT is substantially more likely to detect metastases from prostate cancer than conventional imaging using CT and bone scan and using ⁶⁸Ga PSMA-11 PET/CT is more likely to change the course of treatment than conventional imaging.^{7,8}

CONCLUSION

This case report confirms the value of ⁶⁸Ga PSMA-11 PET/CT in following patients with castration-resistant prostate cancer post-surgery and determining the most appropriate course of treatment when metastatic disease is detected.

Ureteric activity may be prominent. Physiologic increased activity may be seen in the kidneys, salivary glands and small bowel. The sensitivity of ⁶⁸Ga PSMA-11 PET increases with rising PSA levels, with a lower yield at PSA < 0.5 ng/ml and a higher yield at PSA > 2.0 ng/ml. Stereotactic radiotherapy may delay introduction of ADT, however, there is a survival advantage in treating oligometastatic disease.⁹

REFERENCES

1. Cancer Facts & Figures 2020. American Cancer Society. Available at <https://www.cancer.org/research/cancer-facts-statistics/all-cancer-facts-figures/cancer-facts-figures-2020.html>.
2. Mullins JK, Feng Z, Trock BJ, Epstein JI, Walsh PC, Loeb S. The impact of anatomical radical retropubic prostatectomy on cancer control: the 30-year anniversary. *J Urol*. 2012; 188: 2219-2224. doi:10.1016/j.juro.2012.08.028.
3. Denmeade SR, Isaacs JT. A history of prostate cancer treatment. *Nat Rev Cancer*. 2002; 2: 389-396. doi:10.1038/nrc801.
4. Pfister D, Bolla M, Briganti A, Carroll P, Cozzarini C, et al. Early salvage radiotherapy following radical prostatectomy. *Eur Urol*. 2014; 65: 1034-1043. doi:10.1016/j.eururo.2013.08.013.
5. Lenzo NP, Meyrick D, Turner JH. Review of Gallium-68 PSMA PET/CT Imaging in the Management of Prostate Cancer. *Diagnostics (Basel)*. 2018 Feb 11;8(1):16. doi: 10.3390/diagnostics8010016. PMID: 29439481; PMCID: PMC5871999.
6. von Eyben FE, Baumann GS, Baum RP. PSMA diagnostics and treatments of prostate cancer become mature. *Clin Transl Imaging*. 2018; 6: 145-148. doi:10.1007/s40336-018-0270-2.
7. Asokendaran ME, Meyrick DP, Skelly LA, Lenzo NP, Henderson A. Gallium-68 prostate-specific membrane antigen positron emission tomography/computed tomography compared with diagnostic computed tomography in relapsed prostate cancer. *World J Nucl Med*. 2019 Jul-Sep;18(3):232-237. doi: 10.4103/wjnm.WJNM_59_18. PMID: 31516365; PMCID: PMC6714155.
8. Pomykala KL, Czernin J, Grogan TR, Armstrong WR, Williams J, Calais J. Total-Body ⁶⁸Ga-PSMA-11 PET/CT for Bone Metastasis Detection in Prostate Cancer Patients: Potential Impact on Bone Scan Guidelines. *J Nucl Med*. 2020 Mar;61(3):405-411. doi: 10.2967/jnumed.119.230318. Epub 2019 Sep 20. PMID: 31541035; PMCID: PMC7067527.
9. Broughman JR, Fleming CW, Mian OY, Stephens KL, Tendulkar RD. Management of Oligometastatic Prostate Cancer. *Appl Radiat Oncol*. 2020 Sep;9(3):6-10. Epub 2020 Sep 9. PMID: 33134438; PMCID: PMC7595346.