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Oncology

Pitfalls of FDG-PET in the prostate for the surgical oncologist

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ABSTRACT

A 78-year-old man was referred for investigation of prostate cancer following incidental uptake on 18F-fluorodeoxyglucose (FDG) positron emission tomography (PET). Despite normal PSA and benign digital rectal exam, he was referred for consideration of trans-perineal biopsy to exclude prostate cancer. It was only on review of imaging that it became clearly apparent that the 18F-FDG uptake was due to urinary tracer pooling in a trans-urethral resection cavity. Surgeons, oncologists and nuclear medicine physicians should be aware of this common pitfall in interpretation of 18F-FDG-PET in the prostate.

Introduction

18F-FDG PET/CT is the scan of choice for staging and re-staging of a wide range of malignancies including head and neck, haematological, lung, colorectal and gynaecological.[1] Incidental prostatic uptake is reported in 0.6–2.3% of men receiving 18F-FDG PET/CT for reasons unrelated to the prostate gland.[2] Of these men, the rate of subsequent diagnosis of prostate cancer ranges from 5.4% to 28.3%.[2] For those men who are found to have benign pathology this can result in over investigation, anxiety, increased exposure to radiation, complications of additional investigations, and health care costs.[3] The presented case demonstrates an uncommon dilemma of apparent incidental prostatic uptake on 18F-FDG PET/CT that clinicians should be aware of.

Case presentation

A 78-year-old man underwent 18F-FDG PET/CT for re-staging of stage 4 follicular lymphoma. 18F-FDG-PET showed high uptake in the left lobe of the prostate with a recommendation for urology referral given suspicion for prostate cancer (Fig. 1). He had an additional past medical history of multiple myeloma, type 2 diabetes and peripheral vascular disease.

Upon urological review, the patient had no significant lower urinary tract symptoms, a normal prostate specific antigen (PSA) of 0.51ng/ml and benign digital rectal examination. On further history, 6 years prior the patient had a trans-urethral resection (TUR) of the prostate and cystolithopaxy for benign prostatic hyperplasia and bladder outlet obstruction. On formal review of imaging, the 18F-FDG-PET uptake appeared to correlate on CT with fluid density within the prostate continuous with urine from the bladder on sagittal and coronal views (Fig. 2). This incidental finding was best explained by urinary tracer pooling within the prostatic urethra and TUR cavity. No further investigation was required.

Discussion

18F-FDG is a glucose analogue which is able to imitate local tissue consumption, thus demonstrating amplified trapping in tumour cells due to increased metabolic activity.[1] The role of 18F-FDG in prostate cancer is limited however with a low overall sensitivity.[4] Reasons for this include the relatively low glucose utilisation in prostate cancer compared to other malignancies, and urinary excretion of the radioisotope which can mask pathological uptake in the prostate. This can result in diagnostic misinterpretation as demonstrated in this case. Furthermore, non-malignant conditions may also result in increased uptake of 18F-FDG in the prostate including prostatitis, benign prostatic hypertrophy and cystic malformations.[4] Current conventional imaging strategies for prostate cancer instead use multi-parametric magnetic resonance imaging (MRI), CT and increasingly prostate-specific membrane antigen (PSMA) PET.

All patients with incidentally detected 18F-FDG avid prostatic lesions require careful consideration to assess for clinically significant malignancy. Clinical correlation can be made with a thorough genitourinary history including lower urinary tract symptoms, infections, prior surgeries and known history of prostate cancer. PSA and digital rectal examination are crucial adjuncts in diagnosis of malignancy. All men

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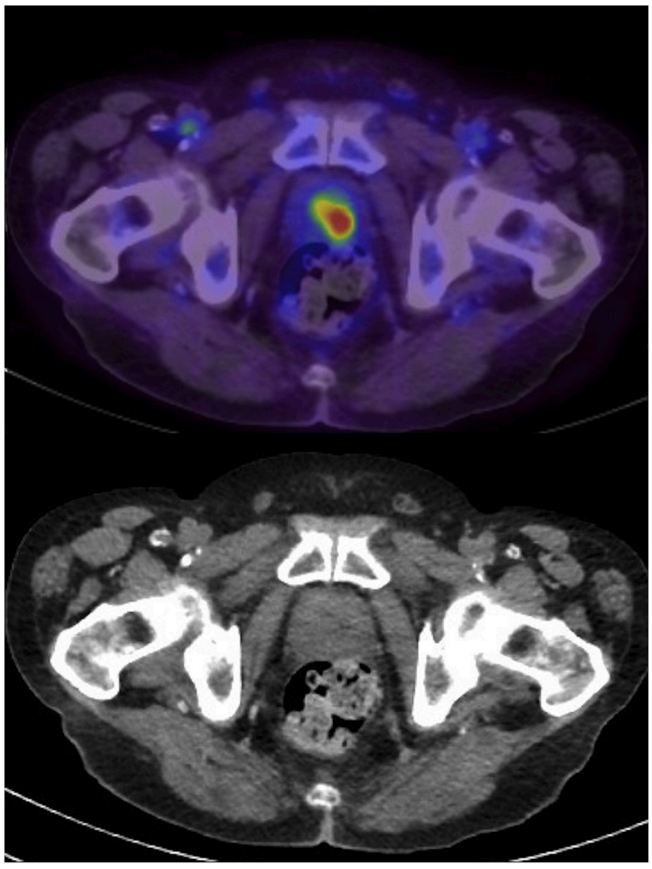

Fig. 1. 18F-FDG PET/CT axial images demonstrating high intensity in the left aspect of the prostate on fused image (above) correlated with fluid density on CT (below).

found to have elevated PSA or abnormal digital rectal examination should by referred to urology.[5] Trans-perineal or trans-rectal biopsy of the prostate may be considered if suspicion of cancer is high, however this investigation is not without risk of complication. As such, critical appraisal of the 18F-FDG PET findings prior to proceeding is important.

Anatomic location of the 18F-FDG uptake should be taken into consideration. Prostate cancer is more likely to occur in the peripheral zone, whereas lesions in the central zone and midline are less likely to be malignant.[5] Furthermore, as is apparent in our case, the anatomic changes secondary to trans-urethral resection is more likely to affect the central glandular tissue. A pitfall of this case is the asymmetry of the 18F-FDG uptake. This is a result of asymmetrical glandular regrowth of the prostate or potential incomplete TUR of the right lobe.

Conclusion

Further evaluation with clinical and biochemical tests are essential in all men with incidental prostatic uptake on 18F-FDG PET. However, it is important to consider the common pitfalls of this imaging modality in the genitourinary system in order to avoid unnecessary intervention.

Disclosures

The authors have no conflicts of interest or financial disclosures to be made.

Consent

Informed patient consent obtained.

Author contributions

EO: Conceptualization; Investigation; Supervision; Visualization; Roles/Writing - original draft. JT: Conceptualization; Investigation; Writing - review & editing. DB: Conceptualization; Investigation; Supervision; Writing - review & editing.

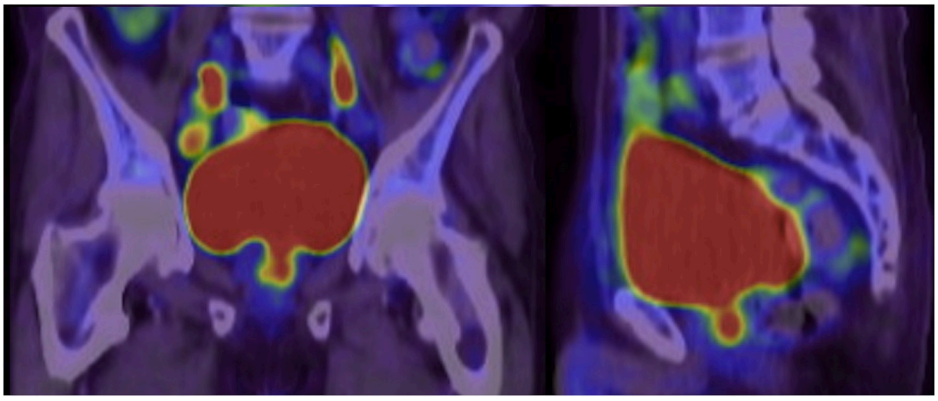

Fig. 2. 18F-FDG PET/CT fused images in sagittal and coronal planes demonstrating continuity of intensity in the prostate with the urinary bladder consistent with urinary tracer pooling.

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