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INTERESTING IMAGE

Mismatched Imaging Findings of Prostate Cancer Diagnosis: 68 Ga-PSMA PET/CT vs mpMRI

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Abstract

Multiparametric magnetic resonance imaging (mpMRI) is the modality of choice for initial diagnosis of prostate cancer (PCa), including biopsy-naïve patients. Nevertheless, clinicians must be aware of the possibility that up to one-fourth of clinically significant cancers might be missed by the modality. Acknowledgment of this occurrence and the increased availability of 68 Ga-PSMA PET/CT in clinical routine, open the door to new, fascinating, indications for this functional modality in the context of PCa detection. With the case herein illustrated, we report a paradigmatic example of mismatch findings between PET/CT and mpMRI better elucidating the potential indication.

Keywords 68 Ga-PSMA PET/CT · MpMRI · Prostate cancer · Fusion biopsy · Primary diagnosis

Figure Legend

The case herein illustrated reports the imaging findings of a 64-year-old male with clinical suspicion of prostate cancer (PCa). The patient presented with elevated PSA (6.68 ng/ml) and a free/total PSA ratio of 13%, and showed a suspicion of peripheral lesion on the right prostatic lobe at DRE (digital rectal examination). Consequently, the patient underwent multiparametric magnetic resonance imaging (mpMRI) prior to prostate biopsy. As visible in the multipanel figure (a, b, c), the scan demonstrated a PI-RADS IV lesion in the left prostatic lobe, indicated with black arrows in all mpMRI sequences: DCE (a), DWI-ADC (b), T2-weighted (c), while no pathological finding was seen on the right lobe. Given the discrepancy with DRE, the patient underwent 68 Ga-PSMA PET/CT within 1 month from mpMRI examination. On the contrary to mpMRI, the PET scan revealed the presence of two suspicious lesions on both sides of the gland, located at the peripheral zones: one on the right lobe (SUVmax 5.56; SUVratio-to-background 2.07, computed over background SUV measured at the anterior portion of the gland; red arrow, d) and one on the left lobe, the latter corresponding to the mpMRI lesion (SUVmax 5.34; SUVratio-to-background 1.99; red arrow, e). (*) indicates bladder radioactive content. A few days later, the patient underwent prostate fusion biopsy, as previously described [1]. In particular, the prostatic gland and derived regions of interest (ROIs) were fused and targeted in real time with the TRUS (transrectal ultrasound) images using a 3-dimensional triplane 6/9 MHz Pro Focus Transducer 8818 TRUS system (BK Ultrasound, Peabody, MA). Pathology results proved positive for prostate cancer (GS 3 + 3) only on the left lobe. The patient was considered anyhow eligible for radical prostatectomy, based on clinical suspicion, which was performed via RALP (robotic-assisted laparoscopic prostatectomy). The definite pathology results demonstrated the presence of prostatic cancer (GS 3 + 4) on both sides, corresponding to the lesions indicated by 68 Ga-PSMA PET/CT (d, e), herein better illustrated in the whole-gland pathological examination (hematoxylin and eosin staining, × 5), where tumor areas result defined with red lines (f). Of note, some minor tumor foci that were undetected by both imaging modalities.

As recommended by the joint EAU guidelines, the optimal imaging examination for initial PCa detection is represented by mpMRI [2, 3]. From our previous experience [1, 4, 5], however, 68 Ga-PSMA PET/CT can

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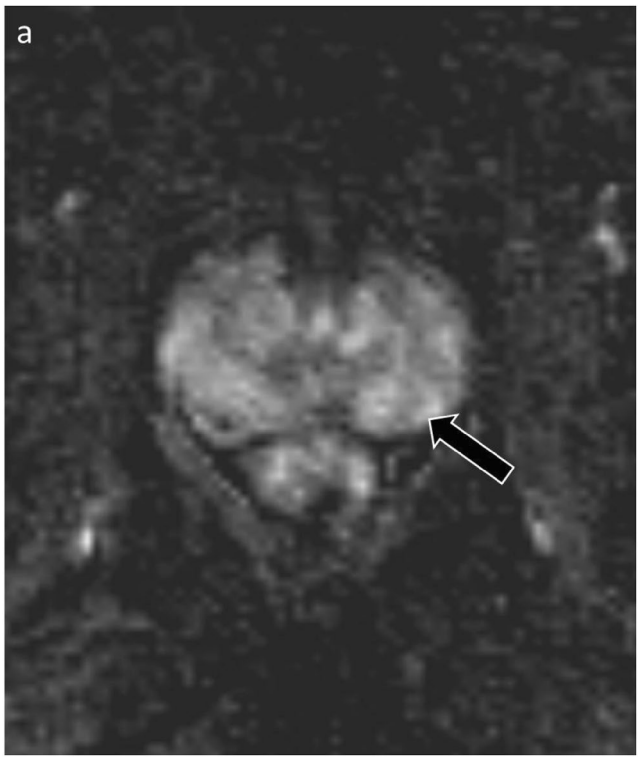
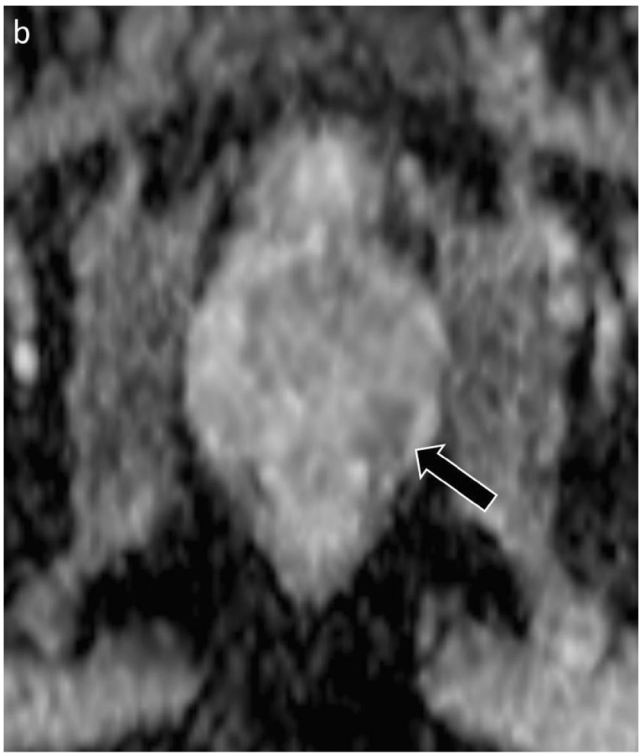
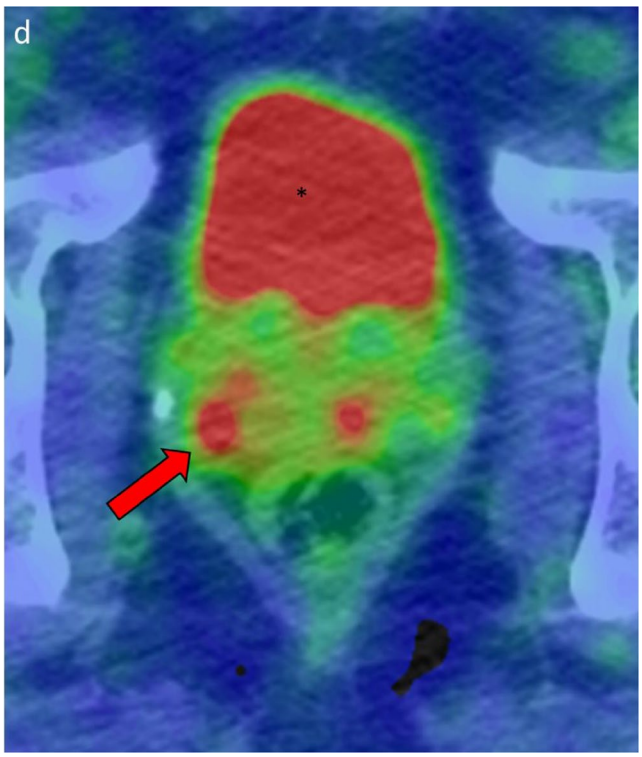
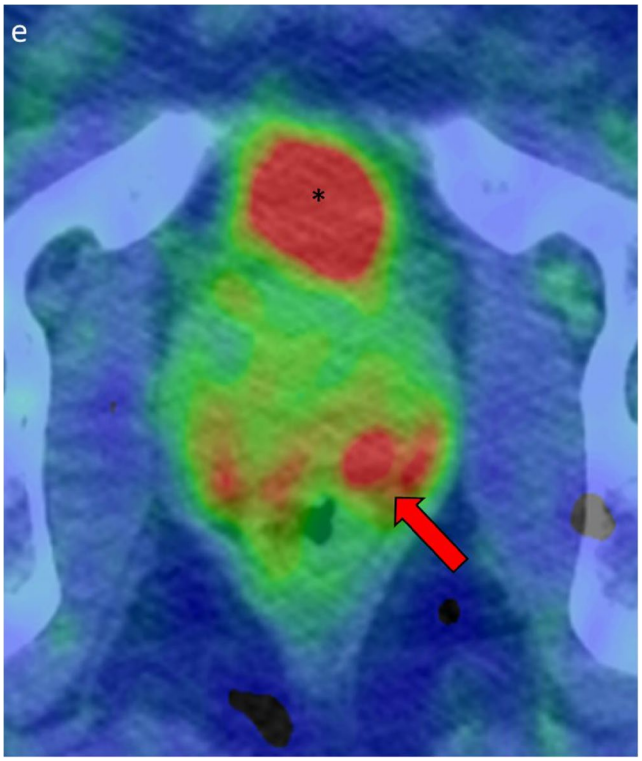
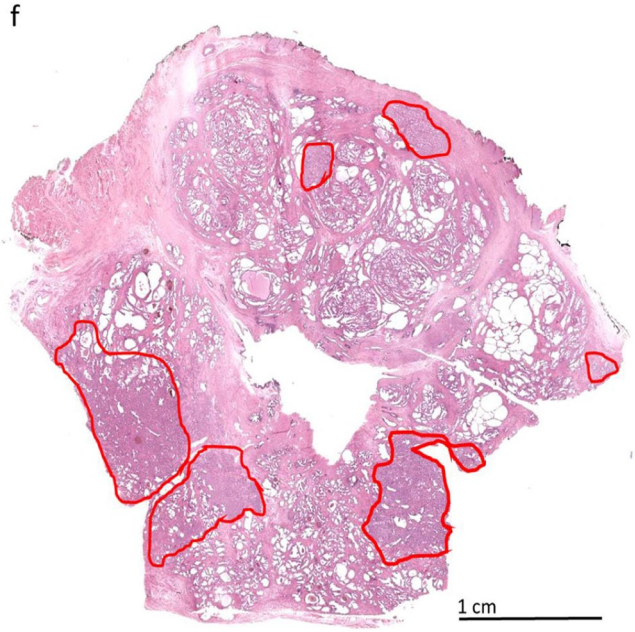
overcome the limitations of mpMRI in PCa diagnosis, particularly in case of patients unable to undergo mpMRI because of contraindications or with negative mpMRI or a first negative biopsy, but still highly suspicious for PCa. This includes also clinically significant cancer foci that in our study could be identified with a diagnostic accuracy of 90%. Bringing this case example to the attention of a larger audience aims on the other hand to shed light on the possibility to anticipate the use of 68 Ga-PSMA PET/CT at an earlier stage, even in the case of biopsy-naïve patients, particularly when having conflicting results from clinical and instrumental evaluation of the prostatic gland. In fact, in our patient, despite mpMRI and biopsy results leading to a single GS 3 + 3 lesion, commonly deserving a simple watch-and-wait strategy for the patient, the clinical suspicion for a more aggressive tumor form and the results of PET/CT suggested the most adequate treatment, i.e., radical prostatectomy, which ultimately revealed the existence of two foci of clinically significant PCa precisely located where 68 Ga-PSMA PET/CT had already shown us non-invasively.











Abbreviations *DCE*, Dynamic contrast enhanced; *DRE*, Digital rectal examination; *DWI-ADC*, Diffusion-weighted imaging-apparent diffusion coefficient; *EAU*, European Association of Urology; *GS*, Gleason score; *mpMRI*, Multiparametric magnetic resonance imaging; *PCa*, Prostate cancer; *PET/CT*, Positron emission tomography/computed tomography; *PI-RADS*, Prostate imaging reporting and data system; *PSA*, Prostate-specific antigen; *PSMA*, Prostate-specific membrane antigen; *RALP*, Robotic-assisted laparoscopic prostatectomy; *ROIs*, Regions of interest; *SUV*, Standardized uptake value; *TRUS*, Transrectal ultrasound

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Author contribution Egesta Lopci contributed in planning, conception, data acquisition, analysis, and reporting of the work in the current paper. Piergiuseppe Colombo contributed in data collection and final approval of manuscript. Massimo Lazzeri contributed in study conduct, manuscript revision, and final approval of the work.

Data availability Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

Declarations

Ethical approval and consent to participate All procedures performed involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individuals.

Consent for publication The patient has signed a general informed consent for scientific publication.

Competing interests Egesta Lopci reports receiving grants from Fondazione AIRC (Associazione Italiana per la Ricerca sul Cancro) and from the Italian Ministry of Health, and faculty remuneration from ESMIT (European School of Multimodality Imaging & Therapy) and MI&T congress. Piergiuseppe Colombo and Massimo Lazzeri declare that they have no conflict of interest.

References

1. Lopci E, Saita A, Lazzeri M, et al. 68Ga-PSMA positron emission tomography/computerized tomography for primary diagnosis of prostate cancer in men with contraindications to or negative multiparametric magnetic resonance imaging: a prospective observational study. J Urol. 2018;200:95–103.
2. Mottet N, Bellmunt J, Bolla M, et al. EAU-ESTRO-SIOG guidelines on prostate cancer. Part 1 screening diagnosis and local treatment with curative intent. Eur Urol. 2017;71:618–29.
3. Mottet N, Roderick CN, van den Bergh, et al. EAU-EANM-ESTRO-ESUR-SIOG Guidelines on prostate cancer—2020 Update.Part 1: Screening, Diagnosis, and Local Treatment with Curative Intent. Eur Urol. 2020;S0302–2838(20)30769–7.
4. Lopci E, Lughezzani G, Castello A, et al. Prospective evaluation of 68Ga-labeled prostate-specific membrane antigen ligand positron emission tomography/computed tomography in primary prostate cancer diagnosis. Eur Urol Focus. 2020;S2405–4569(20):30092–4.
5. Lopci E, Lughezzani G, Castello A, et al. PSMA-PET and micro-ultrasound potential in the diagnostic pathway of prostate cancer. Clin Transl Oncol. 2020. https://doi.org/10.1007/s12094-020-02384-w.