

Inguino-scrotal bladder hernia: an unexpected finding on ^{68}Ga -PSMA-11 PET/CT

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ABSTRACT

Bladder herniation is an uncommon condition mimicking suspicious metastasis on PET/CT imaging. We report a 67 y/o man with prostate cancer referred for recurrence evaluation with ^{68}Ga -PSMA-11 PET/CT. The scan showed an asymmetric site of intense tracer accumulation in the left inguino-scrotal region with the same SUV_{max} to the pelvic bladder. Reviewing cross sectional CT images with PET confirmed the inguino-scrotal bladder herniation.

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Introduction

Prostate-specific membrane antigen (PSMA) targeted positron emission tomography (PET) is known as a novel imaging tool in prostate cancer with higher sensitivity and specificity than the currently approved PET imaging agents (1). Also, PSMA is expressed in non-prostatic tissues and other pathologic and benign conditions that may cause potential sources for pitfalls while reporting PSMA PET/CT scans. The degree of PSMA uptake is dependent on the extent of PSMA expression and marked PSMA tracer activity is seen in kidneys, ureters, and urinary bladder mostly related to the physiologic tracer excretion way (2). Here we introduce a known case of prostate cancer referred for recurrence evaluation by ^{68}Ga -

PSMA-11 PET/CT, whereas accidentally diagnosed with bladder hernia by reviewing combined PET/CT images, but first simulated nodal recurrence during the first interpretation of PET.

Case Report

A 67 y/o man with history of prostate adenocarcinoma underwent ^{68}Ga -PSMA-11 PET/CT for recurrence evaluation. The scan was performed 1 hour after IV injection of 3.8 mCi (140.6 MBq) ^{68}Ga -PSMA-11 on a Biograph 6 truepoint SIEMENS PET/CT scanner from skull top to mid-thigh for 6–8 bed positions at 3 min per position. For transmission scans, whole body CT images were obtained using 4 mm slice thickness

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on a spiral six-slice scanner, with 50 mA and 110 Kvp. The iterative method using ordered-subset expectation maximization (OSEM) with two iterations and eight subsets, and 5 mm Gaussian filter size was used for reconstruction of the PET images(3).

For analyzing the scan, PET images were read independently from CT images, and then attenuation-correction combined PET/CT images were reviewed. As a rule, interpreting benign and malignant lesions are primarily on visual analysis and SUV_{max} values are used as guidance. The results are based primarily on the PET data, and the CT is used for exact anatomic localization (4). The maximum intensity projection (MIP) image demonstrated intense radiotracer activity in the

right ischium, as well as an unexpected zone of tracer activity in the left inguino-scrotal region (Figure 1, A, arrow). The fused PET/CT images proved that tracer activity in the right ischium with SUV_{max} of 15.4 was in favor of a single bone metastasis in this region. Also, fused sagittal PET/CT slices (Figure 1, B, arrows) showed a tear-drop shaped accumulation of radiotracer in the left inguino-scrotal region with SUV_{max} of 33.5 which was very similar to the SUV_{max} of pelvic bladder ($SUV_{max}=37$), mimicking a suspicious site of metastasis. Reviewing PET images and correlation with concurrent cross-sectional CT slices in axial and coronal sections revealed the nature of activity as a bladder herniation (Figure 1, C and D, arrows).

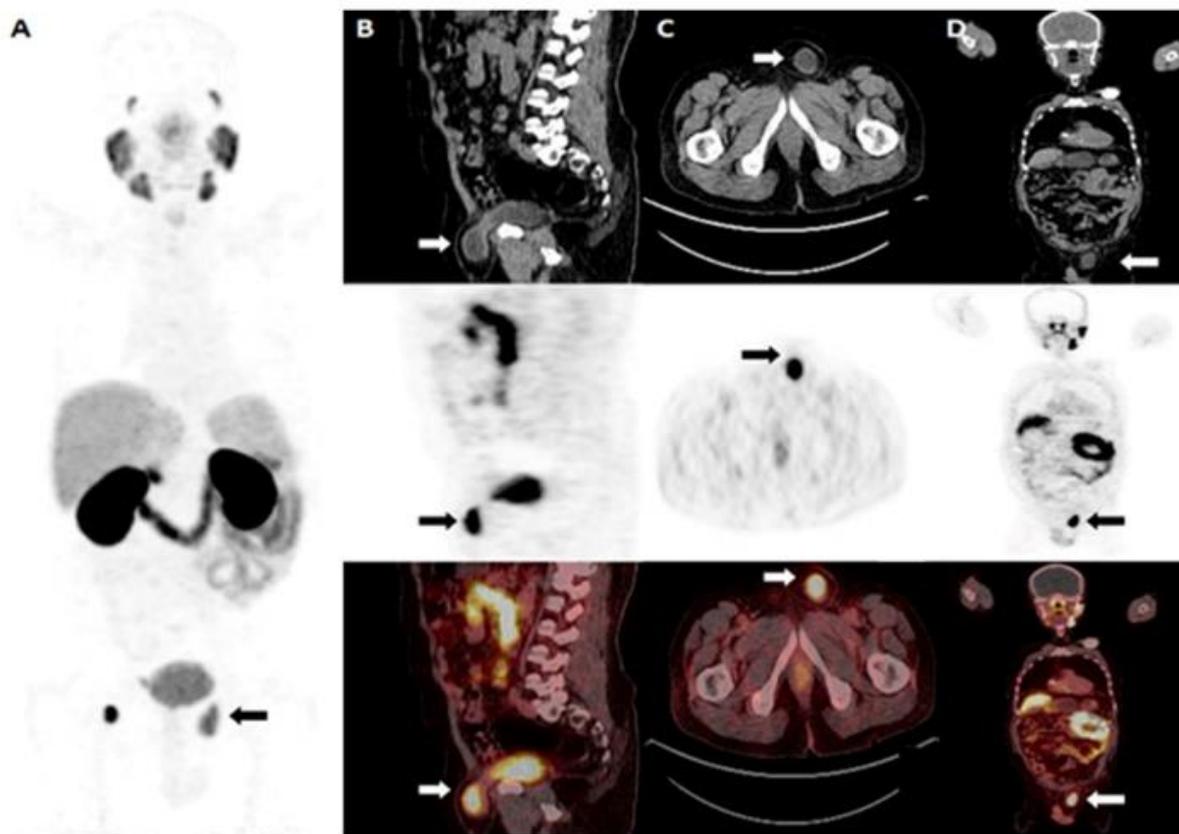


Figure 1. Inguino-scrotal bladder herniation in ^{68}Ga -PSMA PET/CT scan. A: MIP, B, C and D: sagittal, axial and coronal slices of PET/CT, respectively

Discussion

Bladder herniation is an uncommon clinical presentation comprising up to 4% of all inguinal hernias (4, 5). Most of the patients are asymptomatic and usually detected incidentally on radiographic imaging or at the time of herniorrhaphy (4, 6, 7). In patients with tear-drop (narrow neck) shaped herniated bladder, incomplete emptying of the herniated part can lead to a higher urinary activity in the herniated

bladder which could be a potential source of misinterpretation (8). This clinical pathology rarely showed significant sequel and the most common clinical finding is double or two-phase micturition (7). There are several studies reported inguinal bladder herniation as an important pitfall on 2- ^{18}F -FDG PET/CT (4, 5, 7-13), as well as another report of inguinal herniation of urinary bladder on Na ^{18}F PET-CT by Usmani S et al(4).

Extended application of ^{68}Ga -PSMA-11 PET/CT for prostate cancer imaging encourages us for better cognition of this novel radiotracer. As urinary excretion is the main route of ^{68}Ga -PSMA-11 elimination, high physiologic urinary bladder activity at the time point of imaging underestimates the detection of primary involvement or local recurrences by ^{68}Ga -PSMA-11 PET/CT (14). Recent studies have demonstrated the promising role of early dynamic imaging during the first minutes post injection of ^{68}Ga -PSMA-11 and it was proved that local prostate cancer lesions showed radiotracer activity before the accumulation of radiotracer in the urinary system. Thus, adding early dynamic acquisition to imaging at 60 minutes post injection, may improve detection of PSMA-avid lesions next to the urinary bladder, which may be obscured by physiologic activity of bladder (14, 15). Beside the significance of early imaging, the importance of delayed imaging was noted in different studies. Delayed imaging improves the tumor-to-non tumor ratio in the prostate gland, supporting a role of delayed imaging for better visualization of prostate cancer (16,17).

Here, inguino-scrotal bladder hernia should be considered as a possible cause of inguinal abnormalities on ^{68}Ga -PSMA-11 PET/CT with high SUV_{max} similar to the urinary system activity that early dynamic, as well as delayed imaging may help improve the detection rate and decreases the false positive results. Our case report is an example of possible misinterpretation causes in PET images with no relevant combined CT scan. This entity could be a source of false positive diagnosis of nodal metastases in the evaluation of recurrence in malignancies. Careful attention to the nature and intensity of radiotracer accumulation in the suspected area, as well as correlation with CT scan findings avoid these kinds of potential pitfalls on the PET/CT imaging (4, 9, 14).

Conclusion

Bladder herniation is a possible cause of false positive results in PET images and this case report signifies the concurrent interpretation of the PET images with the corresponding CT data for the correct diagnosis.

Conflict of Interest

The authors declare no conflict of interest.

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