



Abdominal Splenosis Mimicking Peritoneal Spread of Prostate Adenocarcinoma in ^{68}Ga -PSMA PET/CT- A Case Report

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Abstract

Background: ^{68}Ga -labeled prostate-specific membrane antigen ligand (^{68}Ga -PSMA) PET/CT has become a routine in our department for imaging patients with prostate cancer, staging of medium and high-risk patients, assessment of biochemical failure and planning of ^{177}Lu -PSMA therapy. Data accumulated exposes us to potential pitfalls in interpretation of ^{68}Ga -PSMA PET/CT studies. We report a case of a patient with potential misinterpretation of peritoneal spread.

Case Presentation: A 69-years-old man patient with prostate adenocarcinoma Gleason 9 underwent ^{68}Ga -PSMA PET/CT for disease extent assessment. Multiple soft tissue masses accumulating the tracer were detected in the left subdiaphragmatic area, anterior abdomen adjacent to the abdominal wall and on the bowel serosa presenting as abdominal metastatic spread. However, the spleen was not identified in its usual anatomical place. We approached the patient revealing that he had a post-traumatic splenectomy two decades earlier. $^{99\text{m}}\text{Tc}$ -labeled heat-damaged red blood cells ($^{99\text{m}}\text{Tc}$ -dRBCs) SPECT/CT study confirmed our interpretation of ^{68}Ga -PSMA PET/CT as identifying physiological tracer uptake in abdominal splenosis rather than metastatic spread.

Conclusion: Splenosis and not metastasis as the cause for abdominal lesions showing increased ^{68}Ga -PSMA uptake, should be considered in a patient with a previous history of abdominal trauma or splenectomy where spleen is not identified in its normal bed. Correlation with $^{99\text{m}}\text{Tc}$ -dRBCs scan may assist in localizing ectopic splenic tissue sites.

Keywords: PET; Prostate adenocarcinoma; ^{68}Ga -PSMA; Splenosis

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Introduction

Prostate cancer is the second most frequently diagnosed cancer in men and the fifth leading cause of cancer death worldwide [1]. PET imaging with ^{68}Ga -PSMA ligands has been recently introduced in the imaging algorithm of patients with prostate cancer [2]. The spleen is a PSMA-expressing organ showing physiologic uptake of the tracer [3,4,5]. We report a case of post splenectomy abdominal splenosis as a potential cause for pitfall on ^{68}Ga -PSMA PET/CT by abdominal metastatic spread. $^{99\text{m}}\text{Tc}$ -dRBCs SPECT/CT study has been used for re-assuring the diagnosis of splenosis. We also review other unexpected settings of benign PSMA expressing tissue as potential pitfalls on ^{68}Ga -PSMA PET/CT interpretation.

Case Presentation

A 69-years-old male patient with a newly-diagnosed Gleason 9(5+4) prostate adenocarcinoma, was referred for staging with ^{68}Ga -PSMA PET/CT. Serum level of PSA was 1.68 ng/ml. Eight months earlier the patient underwent Transurethral Resection of the Prostate (TURP) due to Benign prostatic hyperplasia. PET/CT was acquired following administration of 156 MBq (4.2 mCi) ^{68}Ga -PSMA. In addition to uptake at the primary tumor site at the prostate gland, multiple foci of increased tracer uptake SUV_{max} of 4.15 ± 1.15 was detected corresponding to multiple soft tissue masses ranging in size between 8.0 mm to 40.0 mm at the left abdomen subdiaphragmatically, at the anterior abdomen adjacent to the abdominal wall and on the transverse colon serosa (Figure 1).

Absence of normal spleen on CT has raised the suspicion of post splenectomy splenosis. Patient's history revision has revealed a post-traumatic splenectomy two decades earlier. A subsequent $^{99\text{m}}\text{Tc}$ -dRBCs scan, planar and SPECT/CT was performed using a hybrid SPECT/CT camera (Optima 640, GE Healthcare) (Figure 2).

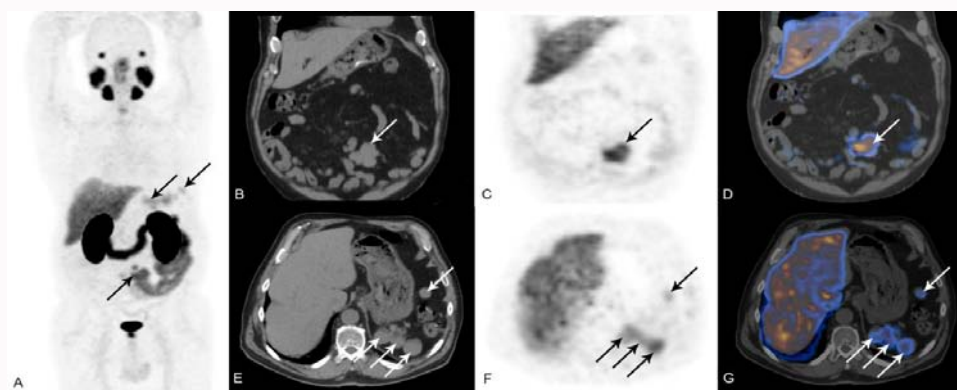


Figure 1: A whole-body ^{68}Ga -PSMA PET/CT study Maximum Intensity Projection (MIP) (A), coronal CT, PET and fused PET/CT (B, C and D respectively) and axial CT, PET and fused PET/CT (E, F and G respectively), demonstrated a tracer uptake ($\text{SUV}_{\text{max}} 4.15 \pm 1.15$) by multiple soft tissue masses in the left abdomen, below the diaphragm, left mesentery and the anterior abdomen at the navel level (white and black arrows).

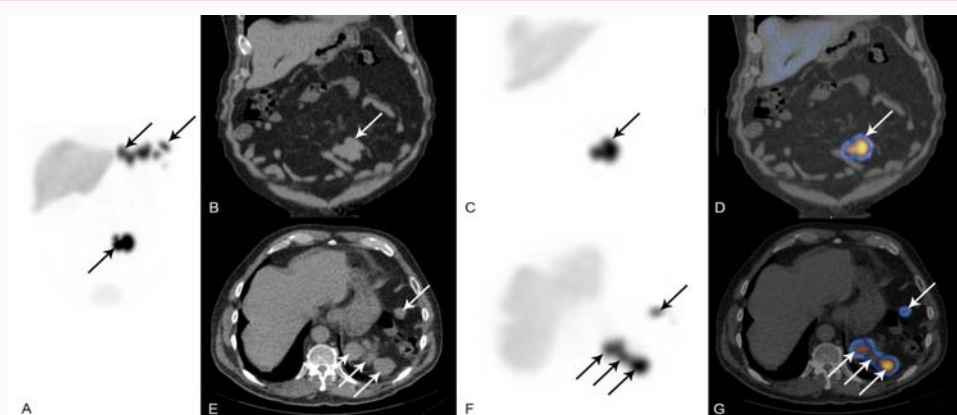


Figure 2: A subsequent $^{99\text{mTc}}$ -dRBCs SPECT/CT study Maximum Intensity Projection (MIP) (A), coronal CT, SPECT and fused SPECT/CT (B, C and D respectively) and axial CT, SPECT and fused SPECT/CT (E, F and G respectively), revealed multiple areas of increased activity, anatomically matching with the suspected masses seen on the ^{68}Ga -PSMA PET/CT study, confirming the diagnosis of splenosis.

There was a full matching between $^{99\text{mTc}}$ -dRBCs and ^{68}Ga -PSMA uptake in the abdominal lesions confirming that the lesions seen on PET/CT represented physiologic uptake in splenosis and not metastatic spread (Figures 3-5).

Discussion

There is accumulating clinical data showing a high diagnostic accuracy of the novel ^{68}Ga -PSMA PET/CT technique for staging of patients with newly diagnosed intermediate and high-risk prostate cancer. Diagnostic accuracy of the study interpretation is based on familiarity with potential pitfalls caused by unexpected sites of physiologic uptake or uptake with non-tumoral lesions. Several previous publications presented cases of increased ^{68}Ga -PSMA uptake in benign lesions including adrenal adenomas, paravertebral schwannoma, Paget's bone disease, splenic sarcoidosis, follicular thyroid adenoma, meningioma, serous cystadenoma of the pancreas, Pseudoangiomatous Stromal Hyperplasia (PASH) of the breast, liver hemangioma, subacute stroke and newly formed blood vessels, tuberculosis and Healing nonmalignant fracture [2,6-16]. Celiac lymph nodes were reported to show physiologic uptake and so were PSMA-expressing organs such as spleen [2,3,4]. Therefore as shown in the current presented patient, ectopically located splenic tissue may lead a false-positive misinterpretation of PET/CT confusing ectopic sites of normal splenic tissue with physiologic tracer uptake and metastatic spread. Ectopic splenic tissue is manifested in two

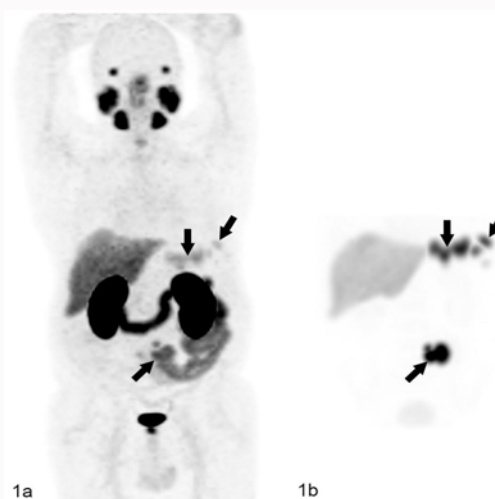


Figure 3: Maximum Intensity Projection (MIP) of ^{68}Ga -PSMA (PET/CT) (A), and $^{99\text{mTc}}$ -dRBCs (SPECT/CT) (B). There was a full matching between $^{99\text{mTc}}$ -dRBCs and ^{68}Ga -PSMA uptake in the abdominal lesions, confirming that the lesions seen on PET/CT represented physiologic uptake in splenosis and not metastatic spread.

distinct forms, accessory spleens and splenosis. Accessory spleens are congenital [17], while splenosis may be found following trauma in 26% to 65% of cases and following elective splenectomy for

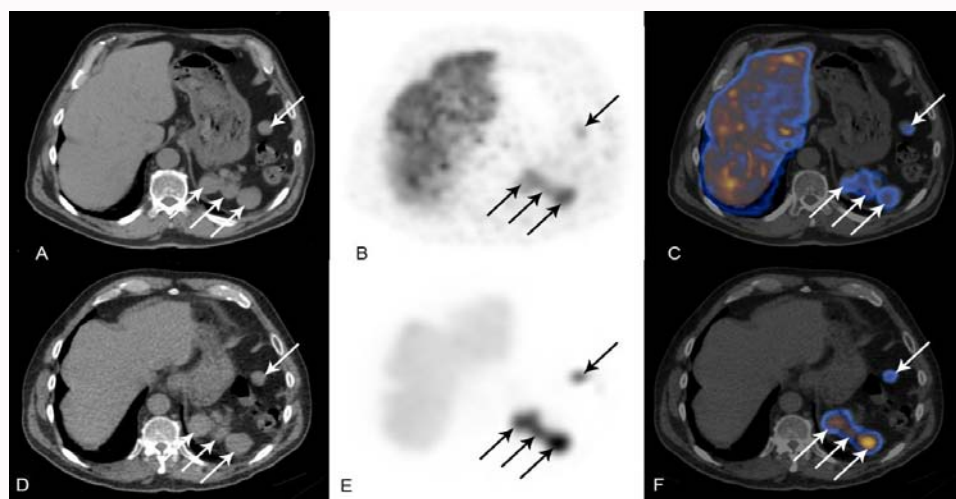


Figure 4: ^{68}Ga -PSMA PET/CT axial CT, PET and hybrid PET/CT (A, B and C respectively), and $^{99\text{m}}\text{Tc}$ -dRBCs SPECT/CT axial CT, SPECT and hybrid SPECT/CT (D, E and F respectively), demonstrated the suspected masses to match anatomically.

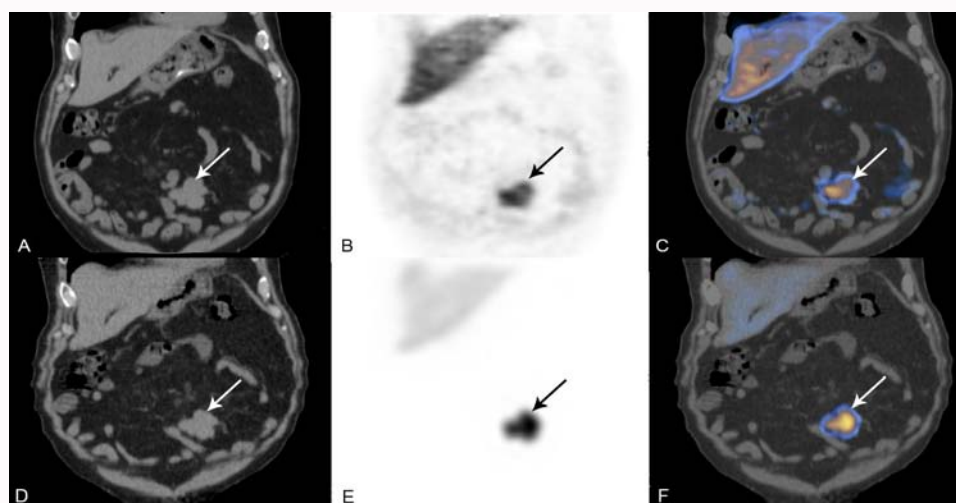


Figure 5: ^{68}Ga -PSMA PET/CT coronal CT, PET and hybrid PET/CT (A, B and C respectively), and $^{99\text{m}}\text{Tc}$ -dRBCs SPECT/CT coronal CT, SPECT and hybrid SPECT/CT (D, E and F respectively), demonstrated the suspected masses to match anatomically.

hematologic disorders in 16% to 20% [18]. Splenosis detection is usually incidental, and no therapy is indicated when asymptomatic. It can be found with any shape and size, usually with no expression of typical architecture such as hilum or defined capsule [19]. Splenosis is of clinical significance in the case of bleeding, local compression on adjacent structures and when misdiagnosed as tumor [20-22]. $^{99\text{m}}\text{Tc}$ -dRBCs imaging is a highly specific since the tracer is taken almost exclusively by splenic tissue [23,24]. It is a sensitive imaging technique given the high contrast between splenules and surrounding tissues. Performing the scan using a hybrid SPECT/CT camera allows both, diagnosing the tissue of the lesion in question as composed of splenic tissue and locating the ectopic splenic tissue in the abdomen [25]. In the presented case SPECT/CT and PET/CT could be correlated for each suspected lesion.

Conclusion

Abdominal sites of ^{68}Ga -PSMA uptake may be detected in case of splenosis. These lesions may be misinterpreted as metastatic abdominal spread in patients with prostate adenocarcinoma. Previous patient's history and absent spleen in the normal location

should raise the possibility of splenosis. The latter can be confirmed by a complementary $^{99\text{m}}\text{Tc}$ -dRBCs scan.

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