Article published online: 2022-05-21

Case report

Indium-111 Capromab Pendetide (ProstaScint®) Demonstrates Renal Cell Carcinoma and Aortocaval Nodal Metastases from Prostate Adenocarcinoma

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Abstract

A 62-year-old male with a history of radical prostatectomy for a Gleason 9 (4 + 5) pT3N0Mx prostate cancer presented with rising prostate-specific antigen of 9.0 ng/dl. A contrast-enhanced computerized tomography (CT) revealed an enhancing left upper pole renal mass and aortocaval lymph nodes. Indium (In)-111 Capromab Pendetide (ProstaScint®) single-photon emission computerized tomography-CT showed abnormal increased uptake in left renal mass and aortocaval lymph nodes with no uptake in the prostate bed or pelvic lymph nodes. He underwent left radical nephrectomy and dissection of aortocaval lymph nodes. Pathology showed renal clear cell carcinoma and metastatic prostate adenocarcinoma involving aortocaval lymph nodes. Our case demonstrates a rare combination of two different malignancies, prostate cancer and clear cell renal cell cancer, showing In-111 ProstaScint® uptake. Though ProstaScint® uptake in renal cell carcinoma and in metastatic aortocaval lymph nodes from prostate cancer may be seen in clinical practice, this combination has not been reported previously.

Keywords: Clear cell renal carcinoma, ProstaScint® scan, prostate cancer

Introduction

Capromab pendetide (ProstaScint®; Cytogen Corporation, Princeton, NJ) is a monoclonal antibody to prostate-specific membrane antigen (PSMA). Labeled with Indium[111], it is used in prostate cancer patients as a diagnostic imaging agent for detecting nodal metastases preprostatectomy or recurrence in postprostatectomy patients with a rising prostate-specific antigen (PSA). It can localize sites of soft tissue metastasis in prostate cancer patients. We report a case in which ProstaScint® imaging demonstrated uptake in a patient at sites of primary renal cell carcinoma as well as aortocaval lymph nodes representing metastatic prostate cancer. This combination of findings has not been reported previously in the literature to our knowledge.

Access this article online

Quick Response Code:

Website: www.wjnm.org

DOI: 10.4103/1450-1147.163259

Case Report

A 62-year-old male with a history of radical prostatectomy for a Gleason 9 (4 + 5) pT3N0M × prostate cancer 7 years earlier presented with rising PSA of 9.0 ng/dl. Surgical pathology had revealed negative margins, intermediate lymphovascular invasion, extensive involvement of the entire prostate, and extraprostatic extension in multiple areas. He did not undergo irradiation or chemotherapy for the prostate carcinoma. Blood workup at the time he presented for computerized tomography (CT) did not reveal any derangement in blood chemistry or blood counts. Because his PSA increased from 0.63 ng/dl to 7.31 ng/dl over the prior 17 month interval, he underwent a contrast-enhanced chest, abdomen and pelvic CT and ProstaScint® scan including single-photon emission computerized tomography (SPECT)-CT. The contrast-enhanced CT revealed a 7.8 cm enhancing left upper pole renal mass that extended to the splenic

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renal hilum, pushed the pancreatic tail medially, and was inseparable from Gerota's fascia representing primary renal malignancy [Figure 1]. The CT also revealed 1.1 cm aortocaval lymph nodes slightly below the level of the renal vessels, which were concerning for metastasis [Figure 2]. In-111 ProstaScint® SPECT-CT showed abnormal increased uptake in large exophytic tumor arising from the anterosuperior aspect of left kidney [Figure 3], and in aortocaval lymph nodes [Figure 4] compatible with metastases. There was no uptake to indicate residual prostate tissue in the prostate bed or pelvic lymph node metastases. He underwent left radical nephrectomy and dissection of para-aortic and aortocaval lymph nodes. Pathology of the renal mass revealed a clear cell carcinoma (conventional type), Fuhrman grade 3 of 4. There was metastatic prostate adenocarcinoma involving nine of nine para-aortic lymph nodes.

Discussion

Prostate-specific membrane antigen is a type II membrane glycoprotein that was initially characterized by the murine monoclonal antibody (mAb) 7E11.[1] PSMA is strongly expressed in benign prostatic secretory acinar epithelium, prostatic intraepithelial neoplasia and prostatic adenocarcinoma. PMSA expression is greatest in high-grade and hormone-insensitive cancers.[2]

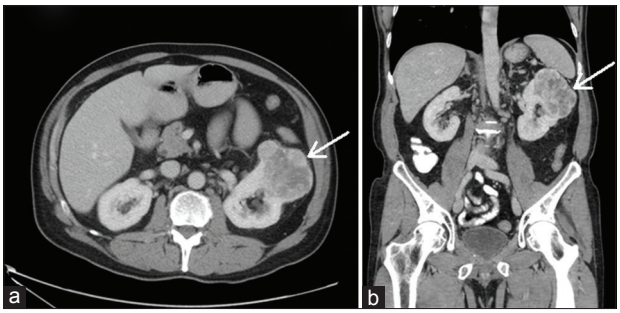

Figure 1: Computerized tomography (CT) axial postcontrast (a) and CT coronal postcontrast (b) shows a large enhancing left upper pole renal mass (arrows)

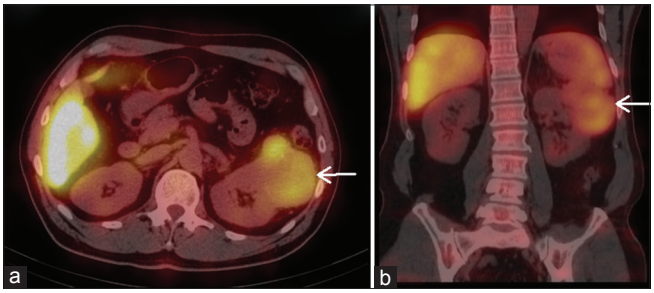

Figure 3: Fused axial single-photon emission computerized tomography (SPECT)- computerized tomography (CT) (a) and Fused coronal SPECT-CT (b) images 4 days after injection of In-111 ProstaScint® shows abnormal uptake in the exophytic mass arising from superior pole of left kidney (arrows)

Using this PSMA expression, the ^{111}indium-labeled 7E11 radioimmunoconjugate designated CYT356, ProstaScint® was approved in 1996 by the food and drug administration (FDA) as a diagnostic imaging agent in patients with prostate cancer.[3] Indium^{111} ProstaScint® imaging with SPECT has been a widely used targeted imaging in the clinical setting of prostate cancer.[4] It was approved by the FDA for biopsy proven prostate cancer thought to be localized with high risk of lymph node metastases and for postprostatectomy PSA relapse, negative metastatic workup with high risk of occult metastases. Studies have shown Capromab can be used to detect recurrence in the setting of early biochemical relapse,[5] to independently predict responses to radiotherapy and to aid in the selection of patients for salvage cryosurgical ablation or brachytherapy.[6] In our case, ProstaScint® scan was requested to detect recurrence in view of rising PSA levels and high initial Gleason score and was true positive for demonstration of retroperitoneal lymph nodes from prostate cancer.

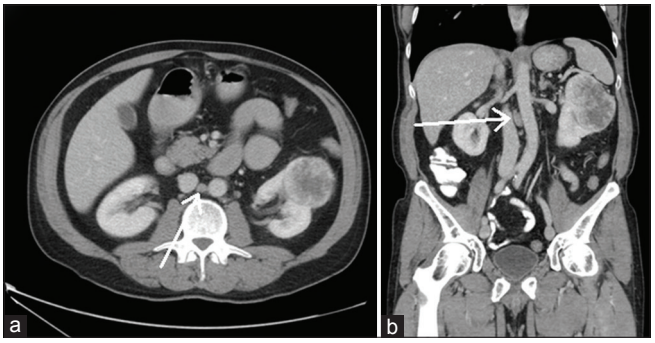

Figure 2: Axial contrast-enhanced (a) and coronal contrast-enhanced (b) computerized tomography scan shows an aortocaval lymph node enlargement (arrows)

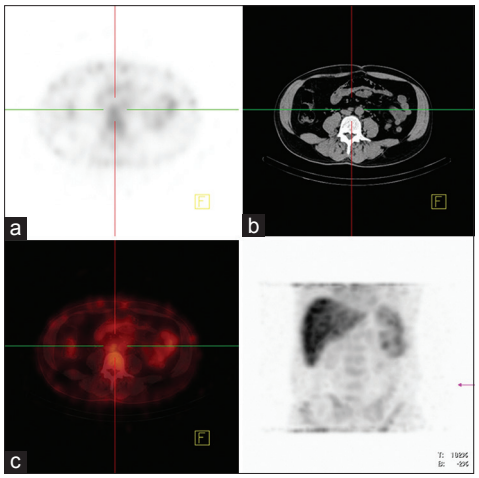

Figure 4: Axial single-photon emission computerized tomography (SPECT), (a) axial computerized tomography (CT) (b) and fused axial SPECT-CT (c) images 4 days after injection of In-111 ProstaScint® show increased radiotracer uptake in aortocaval lymph node (cross hairs)

Concerning In-111 ProstaScint® uptake in tumors other than prostate cancer, several studies have documented that anti-PSMA mAbs bind to the neovasculature associated with primary malignant solid tumors.[7] There is one case report in the literature where ^{111}Indium-capromab pendetide localized to renal cell carcinoma.[8] Similarly, in our patient In-111 ProstaScint® was avidly taken up by clear cell carcinoma of the left kidney, likely due to anti-PSMA mAbs binding to vascular endothelium of neovasculature expressed in this type of renal malignancy. PSMA expression has been described in proximal renal tubular epithelial cells, though, in the same study, there was the lack of PSMA expression in renal cell carcinoma.[7] In their study, they proposed that the reason could be related to loss of PSMA expression during malignant transformation. However, in another study involving 20 patients with metastatic conventional clear cell renal carcinoma,[9] neovascular endothelial cells expressed PSMA consistently in all 20 patients.

Data at cancer registries suggest that multiple synchronous or metachronous malignancies are much more common when prostate cancer is involved. A statistically significant excess of primary renal cell carcinoma independent of urothelial cancer is also associated with prostate cancer.[10]

Lymph nodal metastasis from prostate cancer has been described to be positive on ProstaScint® scan. However, in one study[11] involving 22 preoperative patients with obturator and common iliac lymph node metastases, mean preoperative PSA of 16 ng/ml and mean Gleason score at biopsy of 6.9, the sensitivity of ProstaScint® scan was 17%, specificity of 90%, negative predictive value 94% and positive predictive value of 11%. No other study with a larger number of patients has been done, though there have been case reports of prostate metastasis even to cervical[12] and supraclavicular[13] lymph nodes.

Our case demonstrates a rare combination of two different malignancies, prostate cancer and clear cell renal cell cancer, showing In-111 ProstaScint® uptake. Though ProstaScint® uptake in renal cell carcinoma and in metastatic retroperitoneal lymph nodes from prostate cancer may be seen in clinical practice, this combination has not been reported previously. Therefore, the possibility of In-111 ProstaScint® uptake in malignancy other than prostate cancer should be considered when abnormal findings on In-111 ProstaScint® study are atypical for the distribution of prostate cancer, and correlation with anatomic imaging is warranted to clarify the nature and significance of the uptake. The increasing use of SPECT-CT rather than SPECT only will facilitate arriving at the correct diagnosis.

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How to cite this article: Rizvi T, Deng C, Rehm PK. Indium-111 Capromab Pendetide (ProstaScint®) Demonstrates Renal Cell Carcinoma and Aortocaval Nodal Metastases from Prostate Adenocarcinoma. World J Nucl Med 2015;14:209-11.

Source of Support: Nil, **Conflict of Interest:** None declared.