Original Article

An Analysis of the Diagnostic Performance of Tc-99m PSMA SSPECT/CT in Biochemically Recurrent Prostate Cancer Compared with Ga-68 PSMA PET/CT: A Single-center, Prospective Study

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Abstract

Objective: Biochemical recurrence (BCR) after initial management of Prostate Carcinoma (PC) is frequent. Subsequent interventions rely on disease burden and metastasis distribution. ^{68}Ga prostate-specific membrane antigen positron emission tomography/computed tomography (PSMA PET/CT) is an excellent imaging modality in BCR. However, ^{68}Ga is radionuclide generator produced and has restricted availability. ^{99m}Tc-labeled PSMA could be a potential cost-effective alternative. We compared the performance of ^{99m}Tc-PSMA single-photon emission CT (SPECT)/CT and ^{68}Ga-PSMA PET/CT in BCR with a serum prostate surface antigen (PSA) level of <20 ng/mL. **Materials and Methods:** The prospective study included 25 patients with BCR and at least one lesion on a ^{68}Ga-PSMA PET/CT. All patients underwent 99 mTc-PSMA SPECT/CT, and disease distribution and metastatic burden were compared with ^{68}Ga-PSMA PET/CT. The maximum standard uptake value (SUVmax) and the tumor-to-background ratio (TBR) were computed and analyzed. **Results:** The mean age and serum PSA (SPSA) were 69.72 ± 6.69 years and 5.65 ± 6.07 ng/mL. Eleven patients (44%) had SPSA ≤2 ng/mL. Recurrent sites were noted in the prostate (19, 76%), prostatic bed (3, 12%), and pelvis lymph nodes (LNs) (13, 52%). Distant metastasis to bones (13, 52%), lungs (5, 20%), and retroperitoneal LNs (2, 8%) were noted. Both modalities were concordant for the recurrent disease at the prostate, prostatic bed, bone, and lung lesions. ^{99m}Tc-PSMA could localize pelvis LNs in most patients (10/13, 76.9%). The site-specific sensitivity and specificity between the two modalities were not significantly different ($P > 0.05$). TBR shows excellent correlation with SUVmax (0.783, $P < 0.001$). Four (16%) patients were understaged with ^{99m}Tc-PSMA due to the nonvisualization of the subcentimeter size LNs. No patient with systemic metastases was understaged. **Conclusions:** ^{99m}Tc-PSMA SPECT/CT has good concordance with ^{68}Ga-PSMA PET/CT in BCR, even at low PSA levels. However, it may miss a few subcentimeter LNs due to lower resolution. ^{99m}Tc-PSMA SPECT/CT could be a simple, cost-effective, and readily available imaging alternative to PET/CT.

Keywords: *^{68}Ga-prostate-specific membrane antigen positron emission tomography/computed tomography, ^{99m}Tc-prostate-specific membrane antigen single photon emission computed tomography/computed tomography, biochemical recurrence, prostate cancer*

Introduction

Prostate Carcinoma (PC) is the most prevalent cancer in men worldwide, accounting for approximately 21% of diagnosed cancers.[1] Following initial management, consistently detectable raised serum prostate surface antigen (PSA) indicates a residual tumor. Biochemical recurrence (BCR) is defined as an elevated PSA >0.2 ng/mL or 2.0 ng/mL following radical prostatectomy and radiation therapy.[2] PC recurrence after prostatectomy occurs in 20%–35% of cases, with a median time of 2–3 years after surgery.[3] Accurate identification of the recurrence site/s is paramount for further management. Individuals encountering localized recurrences may meet the criteria for curative interventions.[4]

Imaging plays a pivotal role in the management of BCR. Imaging helps to identify and differentiate the local recurrence from oligometastases and disseminated metastatic disease. It facilitates the identification of optimal management strategies and prognostication. Radiographic progression without raised PSA is not infrequent in metastatic castration-resistant PC patients treated with enzalutamide. Therefore, relying exclusively on PSA in follow-up without concurrent imaging

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may inadvertently overlook disease progression.[5] Bone scans and computed tomography (CT) have limited value in BCR, especially when PSA serum levels are below 10 ng/mL. Multiparametric magnetic resonance imaging (MRI) is valuable for identifying local recurrence.[6] However, MRI usually images a limited field of view. At BCR, performing a sensitive investigation to detect small lesions and, preferably, whole-body imaging is crucial.

Functional imaging targeting overexpression of prostate surface membrane antigen (PSMA) in PC cells is novel. PSMA expression correlates with Gleason score, probability of recurrence, or disease progression.[7,8] In BCR, ^{68}Ga PSMA positron emission tomography (PET)/CT is promising. It detects more lesions (63.8%) than bone scans and CT (45.3%). One-fourth of recurrent PC lesions are found only on ^{68}Ga PSMA PET/CT.[9] It has excellent sensitivity (96.8%) at a PSA level of more than 2 ng/mL. It could detect lesions even at a low level of PSA (<0.2 ng/mL), albeit at lower sensitivity (57.9%).[10] Available PET radiopharmaceuticals such as 68Ga-PSMA-11, ^{18}F-PSMA-1007, and ^{18}F-DCFPyl have similar performance.[11] However, ^{68}Ga is a generator (^{68}Ge/^{68}Ga) produced isotope. The radioactivity output during each elution is restricted, limiting the number of patients that can undergo imaging. The generating system's availability, life, and running costs are decisive factors.[12]

^{99m}Tc-labeled PSMA is envisioned as a practical and affordable solution to ^{68}Ga PSMA PET/CT.[13] ^{99m}Tc is eluted from a ^{99}Mo/^{99m}Tc generator. Even in the modest nuclear medicine laboratory, there is a substantial amount of ^{99m}Tc-Pertechnatate on hand. A head-to-head comparison of the ^{99m}Tc-PSMA single-photon emission CT (SPECT)/CT and ^{68}Ga-PSMA PET/CT has shown comparable detection rates.[14] ^{99m}Tc-PSMA-I&S-SPECT/CT show excellent lesion detection in the BCR (82.9% and 100% at PSA >4 ng/mL and >10 ng/mL). Although, this tracer has a lower detection rate (20%) at a lower PSA level (< 1 ng/ml).[15] However, these small retrospective studies included diverse patients with variable and higher PSA levels. The precise performance of the ^{99m}Tc-PSMA SPECT/CT is largely unknown at a lower level of raised PSA (<20 ng/mL). We aimed to prospectively evaluate the performance of ^{99m}Tc PSMA SPECT/CT compared to ^{68}Ga PSMA PET/CT in BCR.

Materials and Methods

Patient population

This prospective study was done in a tertiary care teaching hospital between January 2020 and June 2022. It included PC patients with BCR referred for ^{68}Ga-PSMA PET/CT for restaging. All patients with positive ^{68}Ga-PSMA PET/CT scans were subjected to a ^{99m}Tc-PSMA SPECT/CT study under the approved protocol. The institutional ethics committee approved the study (2019-101-IMP-109). All patients were informed about the protocol and gave written consent for the study.

Inclusion criteria

- Histopathologically confirmed adenocarcinoma prostate
- Patients who have received primary management for PC (prostatectomy ± lymph node [LN] dissection and/or external radiotherapy and/or antiandrogen therapy and/or chemotherapy)
- The patient presents with BCR in follow-up.[2]

Exclusion criteria

- SPSA more than 20 ng/mL
- Patients with a lower level of persistent PSA after prostatectomy (PSA <0.2 ng/mL) or radiation therapy (PSA <2 ng/mL)
- Patient with negative ^{68}Ga-PSMA PET/CT scan
- Histopathology (HPE) other than adenocarcinoma
- History of malignancy other than PC.

^{68}Ga-prostate-specific membrane antigen positron emission tomography/computed tomography protocol

No specific patient preparation was required for the study. Gallium-68 was obtained from a ^{68}Ge/^{68}Ga radionuclide generator (IGG100, Eckert and Ziegler Radiopharma GmBH, Berlin, Germany). Radiolabelling of PSMA-11 was done per the manufacturer's instructions (ABX Biochemicals GmbH). Patients were administered 1.5–2 MBq/kg of the radiotracer intravenously. The patients were kept hydrated and instructed to empty their bladders regularly. A PET/CT scan (vertex-mid-thigh) was done 60 min after injection on a Biograph™ PET/CT scanner (Siemens Healthineers). Noncontrast CT was performed with CareDose® automatic modulation for keV and mA with a slice thickness of 2 mm, pitch 0.813, rotation time 0.5 s, and FOV 500 mm. PET scan was acquired from the vertex to mid-thigh at 3 min per bed position in three-dimensional (3D) mode. The CT scan was used for anatomical localization and attenuation correction of PET emission data. PET data were reconstructed using a 3D ordered subset expectation maximization algorithm (two iterations, 21 subsets, Gaussian filter 2.0 mm, matrix size 400 × 400, and slice thickness 2.0 mm).

^{99m}Tc-prostate-specific membrane antigen single photon emission computed tomography/computed tomography

^{99m}Tc-PSMA SPECT/CT study was done within 7 days of the PET/CT study. No specific patient preparation was required. The PSMA-T4 kit (Tricine-EDDA; Polatom, Poland) was labeled with ^{99m}Tc-pertechnetate per the supplier's instructions. Patients were given ~740 MBq of ^{99m}Tc-PSMA. The patients were kept hydrated and instructed to empty their bladders regularly. A GE Infinia Hawkeye camera was used to perform imaging 2 h later. A whole-body planar acquisition was done (exposure time per pixel: 180 s and pallet velocity: 13 cm/min, stored in a 1024 × 256 matrix). SPECT/CT of the thorax and the abdomen-pelvis region was done in step and shoot protocol. It was acquired at 30 sec/view over 360° and stored in

a 128 × 128 matrix with a window of 15% centered on 140 keV and scattering correction. Low-dose CT was performed with a current of 2.5 mA, voltage 140 kV, and matrix size 512 × 512.

Image interpretation

Two skilled nuclear medicine physicians (Manish Ora and Sanjay Gambhir with more than 5 years of experience reporting ^{68}Ga-PSMA PET/CT) independently and anonymously assessed the images. All analyses were done on syngo.via (Siemens Healthineers). ^{68}Ga-PSMA PET/CT scans were categorized as normal or abnormal. All areas of nonphysiological tracer uptake higher than the background were considered pathological. The CT scan confirmed the findings to rule out physiological uptake and ascertain pathological lesions. The prostate, prostatic bed (for patients who have undergone radical prostatectomy), pelvic lymph nodes, nonregional LNs, and other metastatic locations were evaluated in all the scans. We reevaluated delayed and postvoid images for suspicious findings. CT images were evaluated for nonavid metastatic lung nodules. In case of discrepancy between readers, a consensus was obtained.

The planar and SPECT/CT scans of every patient were separately assessed. The images of SPECT/CT were processed in the Xeleris workstation (GE Healthcare). Like PET/CT, all areas of nonphysiological tracer uptake higher than the background were considered pathological. The prostate and other areas of interest were evaluated in all the scans. To get reference counts, a region of interest (ROI) was marked on the gluteal muscles. On all abnormal uptakes, ROIs were created, and the tumor-to-background ratio (TBR) was computed.

Data analysis and reference standard

PET/CT diagnostic criteria were hypermetabolic foci with a definite CT finding suggesting malignancy. The maximum standard uptake value (SUVmax) was measured. A true positive was defined as a match between the SPECT and PET images. False negatives were considered in cases SPECT/CT failed to detect the disease site detected on PET/CT. We considered any areas of abnormally increased uptake on the SPECT/CT with no uptake on the PET/CT as false positives.

Statistical analysis

Continuous variables were presented in median (interquartile range) and mean ± standard deviation, whereas categorical variables were in number and frequency (%). The McNamara test was used to test the change in proportions between the two methods. The sensitivity and specificity of the ^{99m}Tc PSMA were calculated considering ^{68}Ga PSMA PET/CT as the gold standard. $P < 0.05$ was considered statistically significant. The Statistical Package for the IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp, was used for data analysis.

Results

Patient profile

Twenty-five patients with PC were included in the study. The mean age of the patient was 69.7 ± 6.7 years. The most common Gleason scores of the tumor were 4 + 4 and 4 + 5 (6 patients each, 24%). Radical prostatectomy and orchidectomy were done in 6 patients (24%) each. SPSA level was 5.65 ± 6.07 ng/mL. Eleven patients (44%) had SPSA levels of less or equal to 2 ng/mL [Table 1].

^{68}Ga-prostate-specific membrane antigen positron emission tomography/computed tomography

All PET/CT scans revealed at least one avid lesion. The most common findings were primary prostatic mass (19, 76%). SUVmax of the prostatic mass lesions was 13.21 ± 7.3. Seminal vesicle and urinary bladder involvement was noted in 7 (28%) and 6 (24%) patients. Three patients had prostatic bed recurrence after radical prostatectomy. Pelvis LNs were noted in the 13 patients (52%). The most common sites of metastases were bones (13, 52%), lungs (5, 20%), and retroperitoneal LNs (2, 8%), respectively. In all patients having a recurrence in prostatic mass or prostate bed, concurrent pelvis LN, retroperitoneal LN, and bone metastases were noted in 12, 2, and 11 patients, respectively. SUVmax of the lesions is detailed in Table 1.

^{99m}Tc-prostate-specific membrane antigen single-photon emission computed tomography/computed tomography

The ^{99m}Tc-PSMA study could identify at least a pathological site in all the patients. The findings were concordant with the ^{68}Ga-PSMA PET/CT for localizing pathology at the prostatic bed, prostatic mass, bones, and lung metastases [Table 2].

Table 1: Distribution of demographic and other variables in study patients (*n*=25)

Variables	Values*
Age (years)	70 (65–76) (69.72±6.69)
Gleason score	7 (7–8.5) (7.36±1.32)
PSA (ng/mL)	3.11 (0.79–9.73) (5.65±6.07)
Prostatectomy (yes)	6 (24)
Orchidectomy (yes)	6 (24)
Hormonal/chemotherapy (yes)	17 (68)
SUVmax (^{68}Ga-PSMA PET/CT)	
Prostatic mass (19 patients)	14 (7–17) (13.21±7.3)
Pelvic LN (13 patients)	14 (4.3–20) (15.7±14.7)
Retroperitoneal LN (2 patients)	2.5 (2–NA) (2.5±0.71)
Bone (13 patients)	13 (3–31.25) (16.63±16.27)
Lung (5 patients)	6.5 (6–NA) (6.5±0.71)
Operative bed (3 patients)	15 (7–NA) (19.33±14.98)

*Continuous variables presented in median (Q1–Q3) (mean±SD)/ frequency (%) maximum standard uptake value. NA: Not applicable, PSA: Prostate surface antigen, PSMA: Prostate-specific membrane antigen, PET: Positron emission tomography, CT: Computed tomography, LN: Lymph node, SD: Standard deviation

It could localize pelvis LNs in most patients (10/13, 76.9%) [Figure 1]. However, it could not pick up the pelvis and retroperitoneal LN involvement in three (3/13, 23.1%) patients and one (1/2, 50%) patient [Figure 2]. The mean TBR was 9.6 ± 6.4. TBR shows a good positive correlation with SUVmax (0.783, $P < 0.001$) [Figure 3]. There was no significant ($P > 0.05$) difference in site-specific sensitivity and specificity between both modalities [Table 2].

Change in the restaging

Of 25 patients, 21 (84%) had concordant staging on ^{99m}Tc-PSMA SPECT/CT and ^{68}Ga-PSMA PET/CT. Four patients were understaged by the ^{99m}Tc-PSMA SPECT/CT due to nonavidity of the subcentimeter-sized pelvis and retroperitoneal LNs. SPSA level of false-negative cases on SPECT/CT ranged from 3.1 to 16.1 ng/mL. None of the patients with systemic metastases was understaged. No false-positive finding was noted on the ^{99m}Tc-PSMA scan.

Table 2: Sensitivity and specificity of ^{99m}Tc prostate surface membrane antigen scan compared with ^{68}Ga-prostate surface membrane antigen positron emission tomography/computed tomography (n=25)

^{68}Ga-PSMA PET/CT[#]	^{99m}Tc-PSMA SPECT/CT		$P^{\$}$
	Sensitivity, n (%)	Specificity, n (%)	
Prostatic bed (3/22)	3 (100)	22 (100)	0.99
Prostatic mass (19/6)	19 (100)	6 (100)	0.99
Pelvis LNs (13/12)	10 (76.9)	12 (100)	0.25
Retroperitoneal LNs (2/23)	1 (50)	22 (95.7)	0.99
Urinal bladder invasion (6/19)	6 (100)	19 (100)	0.99
Seminal vesicle invasion (7/18)	7 (100)	18 (100)	0.99
Bone (13/12)	13 (100)	12 (100)	0.99
Lung (5/20)	5 (100)	20 (100)	0.99

[#]In ^{68}Ga-PSMA PET/CT: The parenthesis shows the number of patients with present and absent disease in a particular region, McNemar test was used to test the difference between the two methods, $^{\$}P<0.05$ significant. PSMA: Prostate-specific membrane antigen, PET: Positron emission tomography, CT: Computed tomography, LNs: Lymph nodes

Discussion

Study findings

We conducted a prospective study in PC patients with BCR and evidence of the disease on ^{68}Ga-PSMA PET/CT. We compared ^{68}Ga-PSMA PET/CT findings with ^{99m}Tc-PSMA SPECT/CT. It included 25 patients with a mean SPSA level of 5.65 ± 6.07 ng/mL. The most common findings were primary prostatic mass with or without local invasion, regional-nonregional LNs, and bone and lung metastases. The ^{99m}Tc-PSMA study showed at least a lesion in all the patients. The findings were concordant between ^{68}Ga-PSMA PET/CT and ^{99m}Tc-PSMA in all locations except the pelvis and retroperitoneal LNs. In four patients, ^{99m}Tc-PSMA could not visualize subcentimeter-sized pelvis and retroperitoneum LNs, resulting in an understaging.

Current role of prostate-specific membrane antigen positron emission tomography/computed tomography and performance in recurrent PC

BCR after the initial management of PC is not uncommon. It is seen in about 20%–40% of patients following radical prostatectomy and 30%–50% after radiotherapy.[16] A PSA level >0.2 ng/mL measured 6–13 weeks after radical prostatectomy is considered a BCR.[17] It is worthwhile to note the propensity of metastasis in PC. In an autopsy series including 1589 PC patients, metastases were detected in 35%. Bone metastases were most common (90%), followed by lung (46%), liver (25%), pleura (21%), and adrenal involvement (13%). Most skeletal lesions (90%)

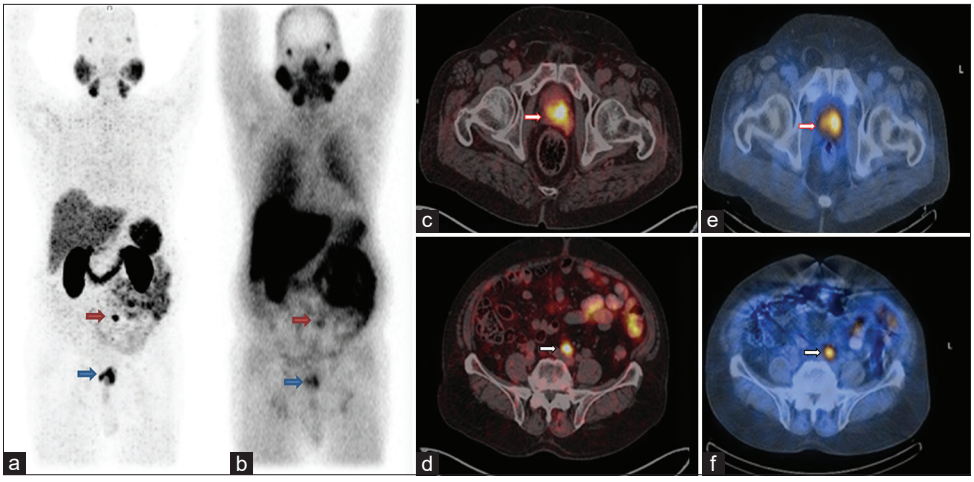

Figure 1: A 68-year–old male patient with Prostate cancer (PC)(Gleason score 4 + 3) presented with biochemical recurrence and prostate surface antigen level 10.95 ng/mL. (a) ^{68}Ga-prostate-specific membrane antigen (PSMA) Maximum Intensity projection image(MIP) showing abnormal tracer uptake in the prostatic region (blue arrow) and focal uptake in the abdominal region (red arrow), (b) ^{99m}TC-PSMA MIP also reveals abnormal tracer uptake at these sites (blue and red arrows). Axial fused positron emission tomography/computed tomography (PET/CT), (c and d) At the prostatic level show prostatic lesion (red arrow) and left common iliac lymph node (white arrow). ^{99m}TC-PSMA PET/CT, (e and f) Same findings (red and white arrows)

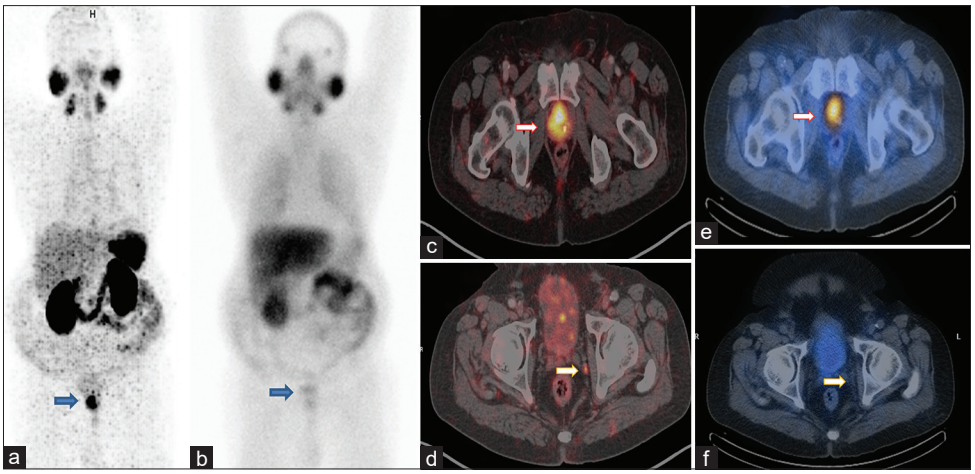

Figure 2: A 72-year-old patient with Prostate Cancer (PC) (Gleason score 4 + 4) presented with biochemical recurrence and serum prostate surface antigen level of 0.36 ng/mL. (a): ^{68}Ga prostate-specific membrane antigen (PSMA) Maximum Intensity Projection image (MIP) showing abnormal tracer uptake in the prostatic region (blue arrow), (b) ^{99m}TC-PSMA MIP also reveals abnormal tracer uptake in the prostatic region (blue arrow). Axial fused positron emission tomography/computed tomography (PET/CT), (c and d) At the prostatic level show prostatic lesion (red arrow) and left obturator lymph node (~7 mm in size) (yellow arrow). ^{99m}TC-PSMA PET/CT, (e and f) tracer avidity in the prostate gland (red arrow). No abnormal uptake is noted in the lymph node (Yellow Arrows)

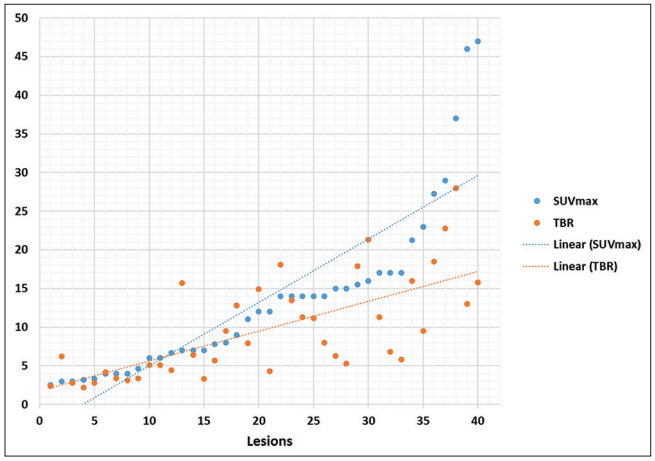

Figure 3: Corresponding tumor-to-background ratio and SUVmax of each lesion. TBR: Tumor-to-background ratio

involved the vertebrae.[18] It highlights the importance of whole-body imaging in PC. PSMA PET/CT is an emerging modality that has an unparalleled role in the staging of PCs and is more accurate than CT and bone scans.[9] We found systemic metastasis (M1a or M1b stage) in 14 patients (56%). Localized imaging targeting the abdomen and pelvis could have missed lungs and distant skeletal metastases.

PSMA PET/CT helps to evaluate local recurrence and unveil distant metastasis in BCR after radical prostatectomy.[9] It has good sensitivity and specificity of 76% (74–78) and 45% (27–58) for detecting PC recurrence and restaging (35 studies, 3910 patients).[19] It is a sensitive technique even at low PSA levels and has a detection rate of 57.9% and 72.7% for PSA levels 0.2–0.5 and 0.5–1 ng/mL, respectively. Excellent detection rates (93.0%) are noted in patients with more than 1 ng/mL.[10] In our study, eight patients had a PSA level of <1 ng/mL.

^{99m}Tc HYNIC prostate-specific membrane antigen single-photon emission computed tomography/computed tomography as an alternative to prostate-specific membrane antigen positron emission tomography/computed tomography

The widespread use of PSMA PET/CT faces two critical obstacles. First is the limited availability of the ^{68}Ga. It is generated using a ^{68}Ge/^{68}Ga generator with limited output. When compared to ^{18}F tracers, the radioactivity yield is relatively low. Therefore, it is not feasible to perform a large number of patients.[12] The second is the PET/CT scanner's limited availability. These led to the development and utilization of readily available ^{99m}Tc. ^{99m}Tc Hydrazinonicotinic acid (HYNIC) PSMA SPECT/CT detected all prostate (100%) and most bone lesions (91.7%) in a previous study by Lawal *et al*. However, it had a lower sensitivity for detecting the LN metastases (62.5%). All enlarged LNs (>1 centimeter) were detected. However, it could only localize 28% of subcentimeter-size LNs. The size of LNs (P = 0.033) and the SUVmax of lesions (P = 0.007) were significant predictors of lesion detection.[20] Similar results were noted in our study. We found an excellent sensitivity (100%) for detecting prostatic mass and bone lesions. High TBR leads to the identification of the many subcentimeter-sized LNs. However, the sensitivity was 76.9% and 50% for detecting pelvis and retroperitoneal LNs. We must note a small number of retroperitoneal LN (n = 2) in our study.

A large prospective study by Schmidkonz *et al*. evaluated the role of ^{99m}Tc-MIP1404-scintigraphy in 225 PC patients with BCR. Tracer-positive lesions were detected in 77% (174/225) of all patients. Local recurrence (25%), LNs (47%), bones (27%), and lungs (5%) were common sites of involvement. The detection rate was 90% at PSA levels ≥2 ng/mL.[21] Our study also found a similar trend in

metastatic disease distribution. Schmidkonz *et al*. included patients with variable PSA levels (median PSA 3.5 ng/mL, 0.01–93). The authors noted no PSMA-positive lesion in 51 of 225 (23%) patients. In contrast, we included only those patients with at least one lesion ^{68}Ga PET/CT scan. In another study, 23 patients with metastatic PC underwent ^{99m}Tc-EDDA/HYNIC-iPSMA SPECT/CT followed by ^{68}Ga-PSMA-11 PET/CT. Sites considered positive were compared based on the SUVmax and TBR. SUVmax and TBR of prostate, bone, and LN lesions were (25.2 ± 4.7, 18.4 ± 1.6, and 11.4 ± 1.2 [P = 0.037]) and (35.9 ± 45.2, 15.4 ± 18.9, and 19.1 ± 51.7 [P = 0.035]), respectively. However, the study included patients with very high S PSA levels (mean = 80.85 ng/dL).[22] Our study found a high TBR correlated with the SUVmax.

Limitations and future directions

This study has a few important limitations. It is a single-center, small prospective study including 25 patients. We excluded patients with high SPSA levels (>20 mg/mL). There is a lack of histopathological confirmation of recurrent and metastatic sites, as obtaining the histopathology of all metastatic sites is impractical. The study included only patients with positive ^{68}Ga-PSMA PET/CT scans, and positive findings on the PET/CT were considered pathological. Recent advancements in gamma camera technologies may further improve the resolution of SPET/CT. A larger prospective study with raised but low PSA levels (<20 ng/mL) is needed to confirm the study's findings and cost-effectiveness. Based on the study findings, we may extrapolate the similar or better detection rate of the ^{99m}Tc-PSMA SPECT/CT in patients with higher PSA levels either at presentation or BCR.

Conclusions

In prostate cancer patients with elevated SPSA (<20 ng/mL), ^{99m}Tc-PSMA SPECT/CT performs similarly to ^{68}Ga-PSMA PET/CT. It has concordance with ^{68}Ga-PSMA PET/CT for prostatic masses, local recurrence, bones, and lung metastases with no (P > 0.05) difference in site-specific sensitivity and specificity. However, it may miss a few subcentimeter-sized LNs due to lower resolution. TBR shows a good correlation with SUVmax. The ^{99m}Tc-PSMA SPECT/CT could be a simple, cost-effective, and readily available imaging alternative of ^{68}Ga-PSMA PET/CT in PC, overcoming the need for ^{68}Ga radioisotopes. It could aid the widespread use of PSMA receptor-based functional imaging and radionuclide therapy in PC.

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Conflicts of interest

There are no conflicts of interest.

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