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The Added Value of Volumetric Parameters in PSMA PET/CT In Follow-Up of Patients with Prostate Cancer

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ABSTRACT

Background: Prostate cancer, the 2nd most frequent cancer-related death among males in the United States, is primarily found in the male reproductive organ.

Aim: To evaluate the role of PSMA PET/CT-derived volumetric quantitative parameters in prostate cancer patient follow-up, assessing their precision and correlation with PSA levels.

Patients and methods: This prospective investigation involved 98 cases with pathologically proven well-differentiated prostate cancer. The study would be conducted in the Nuclear Medicine and Radiation Oncology department from October 2021 to October 2023.

Results: According to TL-PSMA versus SUV max, 27 versus 12 patients were classified as progressive primary neoplasm ($p<0.001$), 32 versus 19 patients were classified as progressive nodal deposits ($p<0.001$), 20 versus 22 patients were classified as progressive osseous deposits ($p = 0.019$), and 6 versus 2 patients were classified as progressive extra-osseous deposits ($p = 1$). There was statistically insignificant variance among SUV max response and TL-PSMA response in detecting the non-progressed patients with prostate neoplasm (P value 0.415), including sensitivity and specificity of 71% and 72% versus 91% and 84%, respectively. There was statistically insignificant variance among SUV max response and TL-PSMA response in detecting the non-progressed patients with pelvic lymph nodal deposits, osseous deposits, and extra-osseous deposits (P value 0.119, 0.311, 0.620), respectively.

Conclusion: Prostate-specific membrane antigen positron emission tomography is a rapidly growing imaging method for prostate cancer, with potential in various clinical situations, but requires indications and interpretation criteria.

Keywords: *Prostate cancer; PSMA PET/CT; SUV max.*

1. INTRODUCTION

Prostate cancer is the predominant form of cancer affecting the male reproductive organ and is the 2nd most prevalent cause of cancer-related fatalities in males in the United States, following lung cancer [1, 2].

Prostate-specific membrane antigen (PSMA) is currently being studied as a molecular target for both clinical imaging and radiation treatment of prostate cancer. A PSMA PET/CT utilizing 68Ga/18F PSMA ligands is an extremely sensitive technique for identifying original tumors as well as locally recurring or metastatic lesions following the initial therapy for prostate cancer. Recent studies have shown that 68Ga/18F-PSMA imaging and treatments can accurately locate initial cancer of the prostate and achieve a high rate of identification in cases of recurrent cancer in prostate [3, 4].

PSMA ligand images from PET can be evaluated in a semi-quantitative manner utilizing standardized uptake values. Nevertheless, alterations in the standardized uptake value of lesions due to therapy may not be sufficient to determine the overall response. Accurate evaluation of the total amount of tumor present is necessary, particularly when assessing the effectiveness of treatment [5, 6].

The release of prostate-specific antigen by cancer cells is extremely variable and does not correspond to the size or severity of prostate tumor lesions. As a result, measuring prostate-specific antigen levels in the blood is not an ideal method for evaluating alterations in tumor burden. Recently, various volumetric parameters derived from prostate-specific membrane antigen positron emission tomography-computed tomography, such as standardized uptake value max, standardized uptake value mean, PSMA-TV, and TL-PSMA expression, have become important in prognostic investigations and as a substitute marker for tumor load when evaluating the response of cases with different stages of prostate cancer during monitoring [7, 8].

The objectives of our investigation encompassed an evaluation of the additional role of positron emission tomography-computed tomography -derived volumetric quantitative parameters (such as standardized uptake value max, standardized uptake value mean, PSMA-TV, and TL-PSMA expression) in monitoring cases with prostate cancer. Examining the potential of PSMA-TV and TL-PSMA expression parameters as more accurate indicators of patient overall health during follow-up, as opposed to using standardized uptake value max and standardized uptake value mean. Additionally, investigating the association among various PSMA/PET CT parameters and various concentrations of prostate-specific antigen.

2. PATIENTS AND METHODS

This prospective investigation involved 98 cases with pathologically proven well-differentiated prostate cancer. The study would be conducted in the nuclear medicine and radiation oncology department from October 2021 to October 2023, Kasr El-Ainy Hospital, Cairo University, after the approval of the departmental and the university's ethical review board.

Inclusion criteria:

patients with histopathologically proven well-differentiated prostate cancer, patients with complete clinical, laboratory, pathological, and operative data and informed written consent, and naïve patients regarding cancer prostate treatment.

Exclusion criteria:

patient with history of previous total prostatectomy, history of second primary malignancy, incomplete follow-up data, patient with interval surgical interference, and patients received medical treatment for enlarged prostate as it affected PSA.

Study protocol:

The 18F-PSMA-1007 PET/CT was carried out on an Ingenuity TF 64 (Philips Healthcare, Cleveland, OH, United States of America).

3. METHODS

All cases have been exposed to full medical history and complete medical records to obtain age, kidney function tests, treatment received, and PSA levels, including total and free levels, before and during the follow-up study.

Patients were treated with different lines of treatment, including radical prostatectomy, hormonal therapy, radiotherapy, and PSMA ligand radiotracers, with most receiving combined therapies from these lines. Patients underwent initial 18F-PSMA-1007 PET/CT before therapy, followed by sequential PET/CT after 3 to 6 months, with interval therapy to evaluate response to different therapy lines qualitatively and quantitatively.

Patient preparation:

Patients were advised to avoid exercise, hydration, and carbohydrates for several days before receiving a radioactive tracer injection. The dose ranged from 1.8 to 2.2 MBq/kg body weight. positron emission tomography-computed tomography scan images were taken after the injection, with waiting times based on the radiotracer's half-life and kidney function, to achieve the optimal target to background ratio.

Imaging acquisition:

The study utilized the Ingenuity TF 64 integrated positron emission tomography-computed tomography scanner, which combined a modular positron emission tomography component with a 64-channel computed tomography scan component. The positron emission tomography component featured a ring diameter of ninety centimeters and twenty-eight detector modules, with a 4.5 nanoseconds hardware coincidence window for the standard field of view. The scanner gathered information in a three-dimensional mode and stored events from all detector rings in a list-mode format. The system utilized its inherent reconstruction processes to generate static, gated, or dynamic pictures. The system supports three different reconstructions FOV: 256 mm for brain studies, 576 mm for typical whole-body studies, and 676 mm for large patient whole-body studies. All patients underwent low-dose CT imaging in the arms-up position, followed by PET scans in the caudal-

cranial direction. Cases were directed to participate in shallow breathing throughout the imaging process. The scanner calibration factor has been utilized to translate reconstructed pictures into radioactive concentration, with calibration performed quarterly and validation bimonthly as recommended by the manufacturer. The CT contrast dose was 1.5 ml/kg body weight. After acquisition, images have been reconstructed by a standard iterative algorithm.

Qualitative assessment:

The study involved two experienced radiologists and nuclear medicine physicians who analyzed positron emission tomography images. They found tumor lesions with higher focal tracer uptake than surrounding background activity and grouped them based on their localization, such as prostate gland, lymph nodes, or distant metastasis.

Semi-quantitative assessment:

Each patient's maximal standardized uptake values have been computed. Regions of interest were manually delineated on attenuation-corrected emission pictures in the axial planes of lesions showing localized enhanced uptake to measure the maximum standardized uptake values.

Response to treatment:

An analysis has been conducted on a per-patient basis. The pre- and post-treatment 18F-PSMA-1007 positron emission tomography-computed tomography scans have been analyzed, and the "imaging response" has been classified based on the SUV max reaction and TL-PSMA response.

Ethical approval

The techniques utilized in investigations including human subjects adhered to the ethical norms set by the institutional research committee and the 1964 Helsinki statement and its subsequent amendments.

Statistical analysis

The data has been encoded and inputted by the statistical software package for the Social Sciences (SPSS) version 28 (IBM Corp., Armonk, NY, USA). Quantitative data will be summarized utilizing the mean, median, standard deviation, minimum, and maximum. Categorical data will be summarized utilizing frequency (count) and relative frequency (%). A Chi-square (X^2) test has been used to compare categorical data. In cases where the anticipated frequency is less than 5 (Chan, 2003), the exact test has been used. P values below 0.05 were deemed to be statistically significant. The Kappa measure of agreement has been utilized to evaluate the level of agreement among categorical variables.

4. RESULTS

The mean age of the cases involved in our investigation is 67.91 ± 9.3 years, the mean weight of patients is 89 ±18 kg, and the mean dose of 18F PSMA-1007 during initial and follow-up studies is 289.29±71.63 MBq (Table 1).

The initial PSMA PET/CT study illustrated a mean standardized uptake value max of 11.1, with a TL-PSMA expression of 78.98 and PSMA-TV expression of 37.34. The mean SUV max of PSMA-avid pelvic lymph nodes was 8.67, with a TL-PSMA expression of 22.04 and PSMA-TV expression of 17.53. The mean SUV max of osseous deposits was 14.27, with a TL-PSMA expression of 50.41 and PSMA-TV expression of 33.83. The mean SUV max of extra-osseous deposits was 9.93, with a TL-PSMA expression of 98.27 and PSMA-TV expression of 25.10. The mean standardized uptake value max of the prostate neoplasm was 8.05, with a TL-PSMA expression of 58.18 and PSMA-TV expression of 32.31. while the mean SUV max of prostate-specific membrane antigen-avid pelvic lymph nodes was 7.61, with TL-PSMA expression of 19.85 and PSMA-TV expression of 16.38. The mean SUV max of osseous deposits was 13.15, with TL-PSMA expression of 43.11 and PSMA-TV expression of 34.11 (Table 2).

During the follow-up study, the site of metastatic deposits was similar to the deposits in the initial PET/CT study: 95 patients with positive prostatic lesions, 97 patients with positive pelvic lymph nodes, 92 patients with positive disseminated osseous lesions, and 12 patients with extra-osseous deposits (6 patients with pulmonary deposits, 2 with hepatic deposits, 1 with peritoneal deposits, 1 with plural deposits, 1 with adrenal deposits, and 1 with gluteal muscle nodules) (Table 3).

The concordance among SUV max response and TL-PSMA response in detecting disease progression in prostate neoplasm was 33.3%. (9/27) with P value < 0.001. The concordance between SUV max response and TL-PSMA response in detecting disease progression in pelvic lymph nodal deposits was 46.8%. (15/32) with a P value. The concordance between SUV max response and TL-PSMA response in detecting disease progression in osseous deposits was 45%. (9/20) with a P value < 0.019. The concordance between SUV max response and TL-PSMA response in detecting disease progression extraosseous deposits was 16%. (1/6) with P value (Table 4).

There was statistically insignificant variance among standardized uptake value max response and total lesion prostate-specific membrane antigen response in detecting the non-progressed patients with prostate neoplasm (P value 0.415). There was statistically insignificant variance among standardized uptake value max response and total lesion prostate-specific membrane antigen response in detecting the non-progressed patients with pelvic lymph nodal deposits (P value 0.119). There

was statistically insignificant variance among standardized uptake value max response and total lesion prostate-specific membrane antigen response in detecting the non-progressed patients with osseous deposits (P value 0.311). There was statistically insignificant variance among standardized uptake value max response and total lesion prostate-specific membrane antigen response in detecting the non-progressed patients with extra-osseous deposits (P value 0.620) (Table 5).

Table (1): General characteristics of the cases:

	Mean ± standard deviation
Age (Years)	67.91 ±9.3
Weight (kg)	89 ±18
Dose of 18F PSMA-1007 (MBq)	289.29±71.63

Table (2): Mean and standard deviation of different parameters during the initial and follow-up PET/CT study.

	Mean± SD in initial study	Mean± SD in follow-up study	% of change
prostate SUVmax	11.10±12.15	8.05±8.66	27.47 %
prostate volume	27.04±19.35	25.08±16.04	7.24 %
prostate neoplasm (TV-PSMA)	37.34±29.12	32.31±23.61	13.47 %
Prostate neoplasm (TL-PSMA)	78.98±95.61	58.18±57.39	26.33 %
Pelvic lymph nodal deposits (SUV max)	8.67±12.18	7.61±10.97	12.31 %
Pelvic lymph nodal deposits (TV-PSMA)	17.53±13.09	16.38±14.66	6.56 %
Pelvic lymph nodal deposits (TL-PSMA)	22.04±21.58	19.85±17.92	9.93%
Bone marrow deposits (PSMA-SUVmax)	14.27±13.88	13.15±14.04	7.86 %
Bone marrow deposits (TV-PSMA)	33.83±26.77	34.12±24.17	-0.85 %
Bone marrow deposits (TL-PSMA)	50.41±44.20	43.11±51.13	14.48%
Extra-osseous deposits (PSMA-SUVmax)	9.93±7.97	8.17±6.04	17.77%
Extra-osseous deposits (TV-PSMA)	25.10±23.32	27.55±35.54	-9.75 %
Extra-osseous deposits (TL-PSMA)	98.27±148.57	103.11±181.97	-4.92%

SUV: standard uptake value

PSMA-TV: total volume PSMA expression

TL-PSMA: total lesion PSMA expression

Table (3): Site of metastases in the initial PET/CT Study.

	n=98 (100 %)
Prostatic neoplasm	
yes	95 (96.9 %)
No	3 (3.1 %)
Pelvic lymph nodal deposits	
yes	97 (98.9%)
No	1 (1.1 %)
Bone marrow deposits	
Yes	92 (93.8 %)
No	6 (6.2 %)
Extra-osseous deposits	
Yes	12 (12.2 %)
No	86 (87.8 %)

Table (4): Relation between SUV max response and TL-PSMA response Regard as prostate neoplasm, pelvic lymph nodal deposits, bone marrow deposits and osseous deposits in 95,97,92 ,12 patients respectively.

		SUV max response of prostate neoplasm				
		PD	Non-PD	Total number	Kappa	P value
		Count %	Count %			
TL-PSMA response of prostate neoplasm	PD	9 (75%)	18 (21.2%)	27	0.350	< 0.001
	Non-PD	3 (25%)	5 (78.8%)	68		
Total number		12	83	95		
		SUV max response of pelvic lymph nodal deposits				
		PD	Non-PD	Total number	Kappa	P value
		Count %	Count %			
TL-PSMA response of pelvic lymph nodal deposits	PD	15 (78.9%)	17 (21.8%)	32	0.260	< 0.001
	Non-PD	4 (21.1%)	61 (78.2%)	65		
Total number		19	87	97		
		SUV max response of bone marrow deposits				
		PD	Non-PD	Total number	Kappa	P value
		Count %	Count %			

TL-PSMA response of bone marrow deposits	PD	9 (40.9%)	11 (15.7%)	20	0.260	0.019
	Non-PD	13 (59.1%)	59 (84.3%)	72		
Total nubmer		22	70	92		
		SUV max response of extra-osseous deposits				
		PD	Non-PD	Total number	Kappa	P value
		Count %	Count %			
TL-PSMA response of extra-osseous deposits	PD	1 (50.0%)	5 (50.0%)	6	Zero	1
	Non-PD	1 (50.0%)	5 (50.0%)	6		
Total number		2	10	12		

Table (5): Sensitivity and specificity of imaging responses in detecting non-progressed cases (progression free cases) regard as prostate neoplasm, pelvic lymph nodal, bone marrow deposits and extra-osseous deposits in 95,97,92 ,12 respectively.

Prostate neoplasm			
	SUV max response	TL-PSMA response	P value
Sensitivity	91.11%	71.11%	0.415
Specificity	84.00 %	72.00 %	
Positive predictive value (PPV)	83.67 %	69.57 %	
Negative predictive value (NPV)	91.30%	73.47 %	
Accuracy	87.37 %	71.58%	
Pelvic lymph nodal deposits			
	SUV max Response	TL-PSMA Response	P value
Sensitivity	82.61%	71.52%	0.119
Specificity	77.55%	74.00%	
Positive predictive value (PPV)	78.55 %	70.25 %	
Negative predictive value (NPV)	81.00 %	69.81 %	
Accuracy	80.00 %	72.00%	
Bone marrow deposits			
	SUV max Response	TL-PSMA Response	P value
Sensitivity	83.72%	76.42%	0.311
Specificity	67.31%	68.55%	

Positive predictive value (PPV)	68.62 %	62.42%	
Negative predictive value (NPV)	82.05 %	77.55 %	
Accuracy	73.91 %	71.09 %	
Extra-osseous deposits			
	SUV max Response	TL-PSMA Response	P value
Sensitivity	66.67%	55.00%	0.620
Specificity	100.00%	62.50%	
Positive predictive value (PPV)	100.00%	55.00%	
Negative predictive value (NPV)	75.00%	62.00%	
Accuracy	83.33%	77.03%	

Case Presentation

A 61-year-old case with pathologically proven prostatic adenocarcinoma performed PSMA PET-CT before starting treatment and after therapy.

Pathology:

adenocarcinoma in both lobes of the prostate with Gleason score of 7 (4+3) and ISUP grade 3, presented with serum total PSA of 47 ng/ml.

Initial PSMA PET-CT results:

PSMA avid prostate neoplasm with PSA avid metastatic lymph nodes including bilateral internal & external iliac nodes as well as left para-aortic and aorto-caval nodes.

Prostate:

SUV max 56.4 and TLPSMA 1468.6 as measured over the mid-gland lesion.

Lymph nodes:

SUV max 40 and TLPSMA 163.9 as measured over a 2.9 cm right external iliac node and SUV max 48 and TLPSMA 66.1 as measured over a 2.5 cm left internal iliac node.

Follow-up of the patient was done where he received hormonal therapy as well as radiation on pelvis. His follow-up serum total PSA level became 7.65 ng/ml.

The post-therapy PSMA PET/CT 6 months following the initial one (figure 2), the results were: Prostate:

SUV max 28 and TLPSMA 72 as measured over the mid-gland lesion.

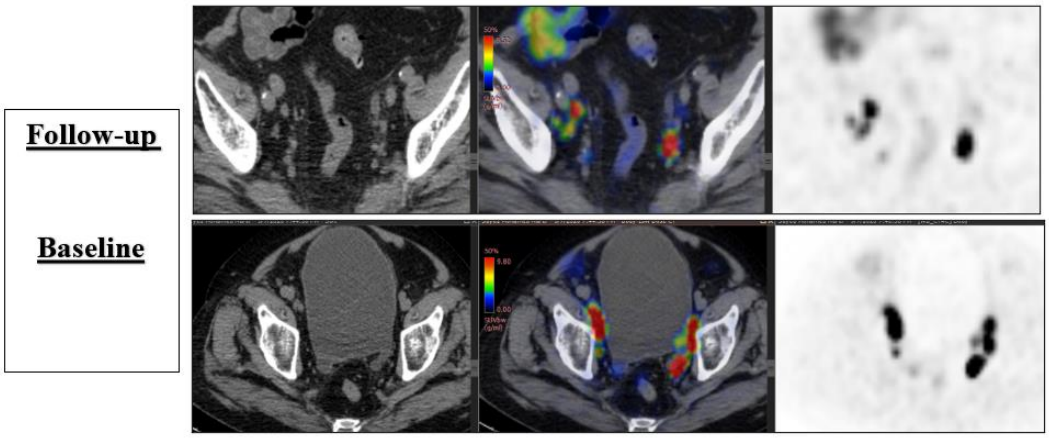

Figure (1): post-therapy PSMA-PET/CT study showing non-progressive TL-PSMA response and SUV max (partial response) of pelvic lymph nodes of case1.

Lymph nodes (figure 1):

SUV max 6 and TLPSMA 22 as measured over a 1.8 cm right external iliac node and SUVmax 8.6 and TLPSMA 31 as measured over a 1.7 cm left internal iliac node.

Opinion:

SUV max response: Non-progressive disease (partial response (PR)), TL-PSMA response: Non-progressive disease (Non-PD) and Post-therapy PSA response: PSA responder (Partial response (PR)).

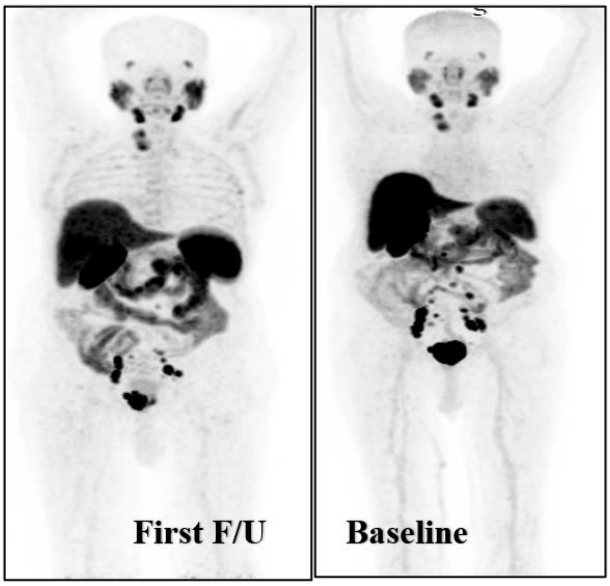

Figure (2): MIP of post-therapy PSMA-PET/CT study of case 1.

5. DISCUSSION

This study shows that the mean age of the cases involved in our study is 67.91 ± 9.3 years, the mean weight of patients is 89 ±18 kg, and the mean dose of 18F PSMA-1007 during initial and follow-up studies is 289.29±71.63 MBq.

This study shows the initial PSMA PET/CT study illustrated a mean standardized uptake value max of 11.1, with a TL-PSMA expression of 78.98 and PSMA-TV expression of 37.34. The mean SUV max of prostate-specific membrane antigen-avid pelvic lymph nodes was 8.67, with a TL-PSMA expression of 22.04 and PSMA-TV expression of 17.53. The mean SUV max of osseous deposits was 14.27, with a TL-PSMA expression of 50.41 and PSMA-TV expression of 33.83. The mean SUV max of extra-osseous deposits was 9.93, with a TL-PSMA expression of 98.27 and PSMA-TV expression of 25.10. The prostate neoplasm's mean standardized uptake value max was 8.05, with a TL-PSMA expression of 58.18 and a PSMA-TV expression of 32.31. while the mean SUV max of prostate-specific membrane antigen-avid pelvic lymph nodes was 7.61, with TL-PSMA expression of 19.85 and PSMA-TV expression of 16.38. The mean SUVmax of osseous deposits was 13.15, with TL-PSMA expression of 43.11 and PSMA-TV expression of 34.11.
The findings of our study are consistent with those of Yechil et al., who reported a maximum standardized uptake value of 12.19± 7.89 and a mean standardized uptake value of 6.21± 4.31 in the prostate gland. Additionally, they discovered a derived tumor volume of 7.49 ± 7.54 and a TL-PSMA value of 43.537 ± 4.12. [9].

This study shows that during the follow-up study, the location of metastatic deposits was similar to the deposits in the initial PET/CT study: 95 patients with positive prostatic lesions, 97 patients with positive pelvic lymph nodes, 92 patients with positive disseminated osseous lesions, and 12 patients with extra-osseous deposits (6 patients with pulmonary deposits, 2 with hepatic deposits, 1 with peritoneal deposits, 1 with plural deposits, 1 with adrenal deposits, and 1 with gluteal muscle nodules).

Our findings align with the results presented by YECHIEL et al., a retrospective investigation involving ninety-one cases who were newly diagnosed with prostate neoplasm. The investigation aimed to investigate the association among advanced imaging parameters, like prostate PSMA-TV, and the presence of metastatic illness in newly diagnosed prostate cancer cases who underwent PSMA-PET/CT for staging purposes. [9].

This study shows that the concordance between SUV max response and TL-PSMA response in detecting disease progression in prostate neoplasm was 33.3%. (9/27) with P value < 0.001.

Nevertheless, those results disagree with Yechil et al. Who found that TL-PSMA expression of the prostrate neoplasm has

statistically significant difference as p value =.1). according to the SUV max response with [9].

Our study shows that the concordance between SUV max response and TL-PSMA response in detecting disease progression in pelvic lymph nodal deposits was 46.8%. (15/32) with P value < 0.001.

Which is in line with Yechil et al., who found that both prostate PSMA-TL and SUV max response measurements were found to be significantly distinct among both groups (P value < 0.005) [9].

The results of our investigation revealed that there was a forty-five percent agreement among the maximum standardized uptake value response and the reaction of the total lesion prostate-specific membrane antigen in osseous deposits. The P value for the concordance among standardized uptake value max response and TL-PSMA response in extra-osseous deposits has been found to be less than 0.019, indicating a statistically significant correlation. The concordance rate among these two factors was measured to be sixteen percent. The fraction 1/6 has a P value of one.

This investigation demonstrates that there is a statistically insignificant distinction in the correlation among the biochemical reaction and the post-therapy PSMA PET/CT study when utilizing volumetric measurement, which includes the total lesion PSMA expression in the prostate, lymph nodes, bones, and other areas outside of the bones.

In this work, we conducted a retrospective assessment of PSMA-PET characteristics in forty-three cases prior to and following systemic therapy. These parameters included mean standardized uptake value (SUV mean), total tumor volume (TTV), SUV max, and SUV peak. These findings align with the research conducted by Grubmüller et al. Prostate-specific antigen levels, prostate-specific membrane antigen (positron emission tomography-computed tomography scan, & magnetic resonance imaging were conducted both prior to and following systemic treatments, with a maximum interval of eight weeks. prior and six weeks following the treatment. The modified PET Response Criteria in Solid Tumors (PERCIST) and Response Assessment Criteria in Solid Tumors (RECIST) 1.1 have been utilized to analyze the PSMA-PET and CT (MRI) images. The results were then compared to the prostate-specific antigen response. The study reported that a total of thirty-one cases achieved a biochemical partial response, which corresponds to 46.2 percent of the overall patient population. The prostate-specific antigen parameters showed a concordance rate of 61.3 percent (nineteen out of thirty-one cases) for total tumor volume and 51.6 percent (sixteen out of thirty-one cases) for SUV max. The agreement with the RECIST criterion was 66.7 percent (twelve out of eighteen). Out of the twelve cases, 17.9% had a biochemical stable illness. Two out of the twelve cases (16.7 percent) had a total tumor volume that was concordant, whereas seven out of the twelve cases (58.3%) had their tumor volume determined by SU max. Based on the RECIST criteria, nine cases had a stable disease response, and four out of the nine cases (44.4%) showed a correlation with biochemically stable illness. Out of the total number of cases, twenty-four cases had biochemical progressive disease, accounting for 35.8 percent of the group. The PET parameters and RECIST criteria for this subgroup were as follows: the total tumor volume was 62.5 percent (fifteen out of twenty-four cases), the maximum standardized uptake value was 37.5% (nine out of twenty-four cases), and the RECIST criteria were met by 40% of the cases (four out of ten). [10].

The findings of this investigation align with the research conducted by Acar et al., which attempted to assess the therapeutic response using Ga-68 PSMA I&T PET/CT in patients undergoing Lu-177 prostate-specific membrane antigen imaging and therapy [11].

Nevertheless, our investigation contradicts the findings of B. Okudan et al., who examined the connection among volumetric parameters obtained from 68Ga- prostate-specific membrane antigen positron emission tomography-computed tomography scans in 85 prostate cancer cases experiencing biochemical recurrence. They concluded that volumetric parameters, specifically whole-body PSMA-TV & whole-body TL-PSMA, exhibited a statistically significant association with levels of prostate-specific antigen (r = 0.403 and r = 0.556, respectively, both at P < 0.001) [12].

6. CONCLUSION

The utilization of PSMA-PET CT in prostate cancer is seeing significant growth. However, it is crucial to ensure that its implementation is properly supported by clear guidelines for optimal usage and accurate criteria for interpretation. A prostate-specific membrane antigen positron emission tomography-computed tomography scan has significant potential in several therapeutic scenarios. Utilization of the prostate-specific membrane antigen positron emission tomography-computed tomography scan criteria should ideally classify cases as either responders or non-responders. Responders can be further categorized into individuals with stable disease, partial response, or complete response based on PSMA-PET CT imaging. It is important to incorporate and assess the use of PSMA-PET CT response evaluation within the framework of a clinical study. Volumetric parameter in 18F-PSMA PET/CT is more matching with PSA level than routine SUV max in the progressive course of prostate cancer, especially in the primary neoplasm and lymph nodal deposits. Despite overall sensitivity and specificity being not significant between the two parameters, the volumetric parameter could provide useful information, especially in the equivocal follow-up studies.

7. RECOMMENDATIONS

Further clinical studies are needed with multicenter cooperation to validate findings and evaluate the effect of different parameters on treatment decisions and overall survival rates. Other PET-derived volumetric parameters, such as SUV peak and total body tumor burden, should also be evaluated. The main recommendation is to optimize reproducibility by limiting variation factors and harmonizing procedures and parameters in all scans, focusing on SUV parameters.

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