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Technetium-99m-MIBI-SPECT for prostate cancer diagnosis

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Abstract. *The gold standard method for prostate cancer diagnosis is a transrectal ultrasonography-guided prostate biopsy. The detection rate of prostate cancer using the biopsy is approximately 25-30%. A non-invasive method Technetium-99m methoxy-isobutyl-isonitrile single-photon emission computed tomography (technetium-99m-MIBI-SPECT) could be used in prostate cancer detected. The study aimed to try to show that Tc99m-MIBI-SPECT, which is performed as a non-invasive method before biopsy in patients with prostate biopsy indication, may prevent unnecessary biopsy among these patients.*
Methods. Fifty-six patients who were admitted to our clinic for any lower urinary tract symptoms or routine control and who had a digital rectal examination or PSA value indication for prostate biopsy were included in this retrospective study. Technetium-99m-MIBI-SPECT our patients before the biopsy was performed, radiopharmaceutical uptake by the intensity and localization of the prostate was detected. Technetium-99m-MIBI-SPECT localization and intensity of involvement by prostate biopsy results were evaluated by nuclear medicine specialists.
Results. The patients' age and PSA level were 62.8 (31-78) years and 11.3 (2.5-100) ng/ml, respectively. Prostate cancer was detected in 27/56 (48.2%) patients. The suspicious diagnosis in technetium-99m-MIBI-SPECT images was observed in 36/56 (64.3%)patients, but prostate cancer was detected in 20 of them only. The sensitivity and specificity of technetium-99m-MIBI-SPECT were 74% and 45%, respectively. The positive and negative predictive values were 55% and 45% respectively. The diagnostic value of technetium-99m-MIBI-SPECT methods was considered as 58%.
Conclusion: The technetium-99m-MIBI-SPECT method in this study had low sensitivity and specificity for prostate cancer diagnosis. Therefore, we came to the conclusion that technetium-99m-MIBI-SPECT cannot be an alternative diagnostic method.

Key words: *diagnostic method, prostate cancer, technetium-99m-MIBI-SPECT, prostate biopsy.*

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Однофотонна емісійна комп'ютерна томографія у діагностиці раку передміхурової залози

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Резюме. *Золотим стандартним діагностики раку передміхурової залози вважається трансректальна біопсія простати. Частота діагностики раку передміхурової залози за допомогою біопсії становить приблизно 25-30%. Однофотонна емісійна комп'ютерна томографія (ОФЕКТ) була запропонована у якості альтернативного методу діагностики.*

Метою дослідження було визначити діагностичну значущість ОФЕКТ у пацієнтів із показаннями до біопсії простати.

Методи. До цього ретроспективного дослідження було включено п'ятдесят шість пацієнтів з симптомами нижніх сечовивідних шляхів або підвищенням PSA, що було показанням до біопсії простати. ОФЕКТ з використанням Технецію-99т проводили до біопсії простати. Фахівці ядерної медицини оцінювали локалізацію радіо фармпрепарату та інтенсивність залучення.

Результати. Вік пацієнтів та рівень PSA склали 62,8 (31-78) років та 11,3 (2,5-100) нг/мл, відповідно. Рак передміхурової залози був виявлений у 27/56 (48,2%) пацієнтів. За допомогою ОФЕКТ діагноз раку був встановлений у 36/56 (64,3%) пацієнтів, проте підтверджений лише у 20 з них. Чутливість та специфічність ОФЕКТ склали 74% та 45%, відповідно. Позитивна та негативна прогностична значущість склали відповідно 55% та 45%. Діагностична цінність ОФЕКТ у діагностиці раку простати склала 58%.

Висновки. ОФЕКТ продемонстрував низьку діагностичну значущість та не може бути альтернативним методом діагностики раку педеміхурової залози.

Ключові слова: *рак передміхурової залози, діагностика, однофотонна емісійна комп'ютерна томографія, біопсія простати.*

Introduction. According to the United States data, prostate cancer is the first in the male population with a rate of 29% among new cases of cancer each year. It is the second most common cause of cancer deaths after lung cancer with 9%. The lifetime risk of prostate cancer is high with 16.8% [1]. The incidence in Turkey was reported to be 19 per 100,000 according to 2009 data [2]. The incidence of prostate cancer has risen by about 1.7% since 1995, while the mortality rate has continued to decline by 4% per year since 1994. This situation is attributed to the increase in early diagnosis and treatment [3].

The risk of having prostate cancer is 30-50% in autopsy studies of men over 50 who die for any reason and reaches 80% over 80 years of age [4].

Geographical factors are an important reason for the emergence and progression of prostate cancer. The difference in the region of residence changes the risk significantly. In addition, the presence of prostate cancer in first-degree relatives causes the incidence to be higher than other types of cancer (such as lung, colorectal, breast) [5].

The diagnosis of prostate cancer generally presents with 5 different clinical conditions: 1) during the mass screening studies, 2) as a result of an examination, 3) biopsies performed on patients who go to the doctor for any urinary complaints (manifest prostate cancer), 4) in case of incidental detection of TUR-P operation due to BPH (incidental prostate cancer), 5) as a result of investigating the primary tumor of patients with metastatic cancer and in the case of autopsy in latent subjects [6].

Today, digital rectal examination (DRE), serum prostate-specific antigen (PSA) level, transrectal ultrasonography (TRUS) and biopsy (TRUS-Bx) are the main tools to detect prostate cancer in the early period. However, because of their low specificity, the search for more specific imaging techniques in the diagnosis of prostate cancer continues. The exact uptake mechanism of Tc99m-MIBI (2-methoxy isobutyl isonitrile) is unknown, but Tc99m-MIBI passes through cellular and mitochondrial membranes with passive diffusion depending on the electronegative membrane potential and lipophilicity. Therefore, it can only accumulate in the intact cell [7, 8].

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Tc99m-MIBI-SPECT has previously been studied especially in lung cancer and endocrine cancers (thyroid, parathyroid). However, it has found its place in studies on coronary artery diseases.

The success rate of prostate biopsy is about 25-30% in different studies. Therefore, a prostate biopsy is negative in approximately 70% of patients.

The study aimed to try to show that Tc99m-MIBI-SPECT, which is performed as a non-invasive method before biopsy in patients with prostate biopsy indication, may prevent unnecessary biopsy among these patients.

Methods. This retrospective study performed after obtaining Istanbul University Cerrahpaşa Medical Faculty Clinical Research Ethics Committee approval. Informed written consent was taken from all included patients.

Fifty-six patients who were admitted to our clinic for any lower urinary tract symptoms or routine control and who had a digital rectal examination or PSA value indication for prostate biopsy were included in the study. None of the patients had been previously diagnosed with prostate cancer.

Before the biopsy, Tc99m-MIBI-SPECT was performed to determine the involvement and localization of the radiopharmaceutical agent by the prostate. The severity of involvement was determined by scoring between 0-4 (Table 1).

Table 1

Tc99m-MIBI uptake severity

The scores	Definitions
0	No involvement
1	Very Low
2	Low
3	Medium
4	High

Tc99m-MIBI-SPECT images were evaluated for the right, left and bilateral prostate gland in terms of localization of involvement. Technetium-99m methoxy-isobutyl isonitrile (Tc-99m MIBI, Sestamibi) is a lipophilic monovalent cation used primarily in myocardial perfusion studies. Due to the negative and lipid structure of membrane potentials, it passes through the plasma and mitochondrial membranes by passive diffusion and is kept in the mitochondria significantly within the cell. Tc-99m MIBI is not metabolized in vivo and 27% is excreted in the urinary tract in 24 hours and 37% in the fecal route in 48 hours. In our study, radiopharmaceuticals labeled with the Tc-99m-linked MIBI kit, which can also be used as a tumor agent, were used. Although it varies according to weight, an average of 20 mCi Tc-99m MIBI was given intravenously. Early SPECT imaging was performed after 15 minutes and late SPECT imaging was performed in 120 minutes. SPECT imaging was obtained using the POSITRON branded Nucline SPRIT MODEL DH (Dual Head) gamma camera.

It is programmed in 64 * 64 * 16 matrix size and LEHR (Low Energy High Resolution) collimator is used. The zoom factor is set to full field. SPECT images were taken with 128 images and 20 seconds per frame and 3600 rotations in the bladder region. Images were performed when the bladder was full in the 15th minute and the bladder was empty in the 120th minute. The same shooting parameters were used for the 15th minute and 120th-minute images.

The images were processed using the interview XP program. First of all, SPECT images were checked in terms of motion artifact with the help of a sonogram. The projection data were reconstructed by applying the back-projection method. During this process, the MOSEM MAMMA subfilter was applied to the raw images in order to improve the image quality and minimize the noise artifacts. The cut off value was 0.25 and the order value was 10. The images obtained as a result of the process were examined in 3D and evaluated comparatively in transverse, sagittal and coronal sections.

Urine culture was performed before the biopsy and the patients with positive urine culture were given appropriate antibiotic treatment according to culture antibiogram. TRUS-guided prostate biopsy was performed in patients with a sterile control urine culture. Ciprofloxacin prophylaxis was started in patients who had a negative urine culture 1 day before biopsy.

Patients receiving any of the antiaggregant/antithrombotic treatments that increased the tendency to bleed for cardiovascular or neurological reasons were consulted with the necessary clinic. Antiaggregant / antithrombotic therapy was discontinued and alternatively, low molecular weight heparin was given. Prothrombin time, aPTT and INR were followed up and biopsies were performed for patients who were not at risk for bleeding.

Transrectal ultrasound with a biplanar 7.5MHz probe was used. The patients were examined in the left lateral decubitus position, while the knees and hips were bent at 90 degrees and the prostate gland was examined in the sagittal and transverse axis. Total prostate volume (PV) was calculated in all cases with prostate ellipse formula (volum = 0.52 * length * width * height). Local anesthesia was provided to the periprostatic area by transrectal ultrasound-guided lidocaine injection before the biopsy.

The patients underwent transrectal ultrasound-guided prostate biopsy. The biopsy was taken from 12 foci as standard in 32 patients with prostate volume below 40 cc, and 13-20 biopsies were taken from 9 patients with prostate volume above 40 cc. Twenty-eight saturation biopsies, including the transitional zone, were obtained from 12 patients who had previously undergone prostate biopsy and had no evidence of prostate cancer. Six focal biopsies were obtained from 3 patients

with total PSA values above 15 ng/mL and with stiffness or nodules in the digital rectal examination.

Rectal examination, prostate biopsy results and Tc99m-MIBI-SPECT results were evaluated together. Length, localization, number of foci and Gleason score of the foci diagnosed with prostate cancer were recorded. In Tc99m-MIBI-SPECT, localization and severity of involvement of the radiopharmaceutical agent by the prostate gland were evaluated.

After the examination, the patients were divided into three groups according to PSA values. The first group consisted of patients with PSA values of 4 ng/ml and below, the second group consisted of patients with PSA values between 4-10 ng/ml, and the third group consisted of patients with PSA values above 10 ng/ml.

For the statistical analysis, we used the nonparametric Mann-Whitney test and ROC analysis. Categorical variables were expressed as proportions, and, chi-square tests were used for comparison of 2 groups. McNemar's test was used for paired nominal data.

Results. Tc99m-MIBI-SPECT was performed in 59 patients with prostate biopsy indication. However, 56 patients underwent prostate biopsy as planned. The remaining 3 patients could not undergo prostate biopsy due to patient-related reasons and these patients were excluded from the study. Mean patient age and PSA values were 62.8 and 11.3 ng/ml, respectively. Prostate biopsy revealed prostate cancer in 27 of 56 patients and Tc99m-MIBI-SPECT was positive in 36 patients (Table 2).

Table 2

Demographic characteristics of the patients

Total number of patients	56
Number of patients with prostate cancer	27
Tc99m-MIBI-SPECT (+) number of patients	36
Average age	62.8 years (31-78 years)
PSA level	11.3 ng / ml (2.5-> 100)
The number of biopsy focuses	15.8 (6-28)

Of the 27 patients with prostate cancer, 9 were in the low, 15 were in the middle and 3 were in the high-risk group. Patient risk groups are defined as follows.

Low-risk group; T1-T2a, Gleason score 2-6 and PSA <10 patients Moderate risk group; Patients with T2b-T2c or Gleason score 7 or PSA 10-20 High-risk group; T3 or Gleason score was accepted as 8-10 or PSA> 20 patients.

Tc99m-MIBI-SPECT results were positive in 20 of 27 patients with prostate cancer. Radical prostatectomy (RP) was performed in 11 of 27 patients with prostate cancer (Table 3).

Table 3

Characteristics of Patients with Prostate Cancer

	Low-Risk Group	Medium Risk Group	High-Risk Group
Number of patients	9	15	3
Average PSA	5.32 (3.5-6.9) ng/ml	9.68 (3-18.5) ng/ml	> 73 (19.9-> 100) ng/ml
Number of patients (+)Tc99m-MIBI SPECT	7	12	1
Number of patients undergoing RP	5	6	0
Average age	64.6 (51-76)	64.4 (54-78)	64 (58-70)

Tc99m- MIBI-SPECT results were positive in 9 of 11 patients with RP. Two of the patients with prostate cancer have refused treatment, and one patient is not available, so it is not known what the condition is. Of the remaining 13 patients, 6 received primary radiotherapy (RT), 3 received hormonotherapy (HT) + RT and 4 received Active Surveillance.

Twenty-seven patients with prostate cancer were divided into two groups as low-risk and medium-high-risk groups, since the high-risk group was low. Tc99m-MIBI-SPECT results were compared for these two groups and it was found to be statistically significantly low compatible in the low-risk group ($p = 0.011$). There was no statistically significant accordance in the moderate-high risk group ($p = 0.273$).

The characteristics of Tc99m-MIBI-SPECT (+) patients and their distribution according to risk groups are summarized in Table 4.

Table 4

Characteristics of Tc99m-MIBI-SPECT (+) Patients

	Low-Risk Group	Medium Risk Group	High-Risk Group	Adenoma
Number of Patients	7	12	1	16
Mean PSA	4,9 (3,5-6)	10,8 (4-18,5)	>100	7,99 (3-34)
Mean Age	63,8 (51-76)	64,6 (54-78)	70	62,6 (49-75)

There was no statistically significant difference between the mean age of the risk groups for this study group (p = 0.705).

Patients' Tc99m-MIBI-SPECT and TRUS-Bx were recorded separately for right, left and bilateral prostate gland involvement localization. Cases with negative results in both methods were recorded as 'no features'. According to Mc-Nemar test which is one of the statistical analysis methods, the results are as in the table (Table-5).

Table 5

The results of Tc99m-MIBI-SPECT and TRUS-Bx methods according to the localization

		TRUS-Bx		Localization		Total
		No Features	Right	Left	Bilaterally	
Tc99m-MIBI-SPECT localization	No Features	13	1	1	5	20
	Right	10	4	1	4	19
	Left	2	0	6	2	10
	Bilaterally	4	2	0	1	7
Total		29	7	8	12	56

Statistical analysis: In this study, the p-value was statistically significantly different from '0 (p = 0.005). There was also low accordance between the two tests (kappa value = 0.207).

Mann-Whitney U test was applied statistically in Tc99m-MIBI- SPECT positive and negative cases according to PSA values and there was no significant difference (p: 0.527). TRUS-Bx and Tc99m-MIBI-SPECT test results were found to be statistically significant (p = 0.029) low compatible (Kappa value = 0.219) in the group with PSA 4 <PSA≤10. In the other two groups, the accordance of TRUS-Bx and Tc99m-MIBI-SPECT test results was statistically insignificant. PSA values of Tc99m-MIBI-SPECT positive and negative cases and the distribution and statistical results of the patients according to the specified groups are presented in two separate tables (Table 6, 7).

Table 6

PSA Values of Cases with Positive and Negative Tc99m-MIBI-SPECT

Tc99m-MIBI-SPECT		N	Mean Rank	Sum of Ranks
	,00	20	26,65	533,00
PSA level	1,00	36	29,53	1063,00
	Total	56		

Table 7

Distribution of Patients by PSA Groups

PSA Groups		TRUS-Bx-Localization				Total
		No Features	Right	Left	Bilaterally	
Tc99m-MIBI-SPECT-≤4 localization	No Features	2		0	1	3
	Right	1		0	0	1
	Left	0		1	1	2
	Bilaterally	2		0	0	2
	Total	5		1	2	8

Table 7 continuation

PSA Groups		TRUS-Bx-Localization				Total
		No Features	Right	Left	Bilaterally	
Tc99m-MIBI-SPECT- >4-≤10 localization	No Features	9	1	1	2	13
	Right	8	4	0	2	14
	Left	2	0	3	0	5
	Bilaterally	1	1	0	0	2
	Total	20	6	4	4	34
Tc99m-MIBI-SPECT- >10 localization	No Features	2	0	0	2	4
	Right	1	0	1	2	4
	Left	0	0	2	1	3
	Bilaterally	1	1	0	1	3
	Total	4	1	3	6	14

According to Tc99m-MIBI-SPECT technique, there was no statistically significant difference between focal length (p = 0.758) and tumor length (p = 0.161) (Table 8).

Table 8

Tc99m-MIBI-SPECT Results by Tumor and Focal Lengths

Tc99m-MIBI SPECT	N	Mean Rank	Sum of Ranks
,00	20	29,40	588,00
Length of Focus 1,00	36	28,00	1008,00
Total	56		
,00	20	24,70	494,00
Length of Tumor 1,00	36	30,61	1102,00
Total	56		

The sensitivity of the Tc99m-MIBI-SPECT method was 74% and the specificity was 45% according to the data of this study group, which was evaluated as the gold standard of TRUS- Bx. Positive predictive value was 55% and negative predictive value was 45% (Table 9).

Table 9

Tc99m-MIBI-SPECT and TRUS-Bx results

	TRUS- Bx (+)	TRUS-Bx. (-)	Total
SPECT (+)	20	16	36
SPECT (-)	7	13	20
Total	27	29	56

The correct diagnosis rate of Tc99m-MIBI-SPECT method was 58%.

There was low accordance (Kappa value = 0.187) between the two tests, but this accordance was statistically insignificant (p = 0.140).

Discussion. In our study, we tried to find an alternative to prostate biopsy and a less invasive method compared to biopsy in order to detect prostate cancer and reduce recurrent biopsies. For this purpose, we used the Tc99m-MIBI-SPECT method. When we look at the studies in the literature, we see that this issue has been popular especially in the last 5 years. Most of the studies have been performed on the staging of prostate cancer and the evaluation of metastases.

In a study on SPECT/CT, Aparici et al compared SPECT/MDCT (16 sections) and SPECT/CT (low dose) methods for prostate cancer staging using the 111In-capromab pendetide agent targeting the intracellular epitope of prostate-specific membrane antigen (PSMA). 38 patients with prostate cancer were included in the study and 21 of these patients underwent SPECT/MDCT and 17 of them underwent SPECT/CT. Lymph node positivity rates of SPECT/MDCT and SPECT/CT methods which were proved by lymph node pathology were as follows; 38.1% and 11.8%, respectively. Accordingly, for the purpose of staging prostate cancer, SPECT/MDCT was significantly more useful without changing the result [9].

Another study with Tc99m-MIBI Wakasugi et al., which included 99 patients in different cancer types with bone metastases, compared the conventional bone scans and Tc99m-MIBI scans [10]. Eleven patients with prostate cancer were included in this study. A total of 373 lesions were detected by both methods in all patients. In order to confirm these lesions, at least one of the plain X-ray, MRI, and bone marrow cytological examination methods were used except Tc99m- HMDP and Tc99m-MIBI methods. In addition, long-term follow-up of Tc99m-HMDP and progressive lesions were evaluated by confirmation methods [10]. Thus, 334 of 373 lesions were accepted as positive. Tc99m-MIBI detected 284 lesions and its sensitivity was calculated as 85%. Tc99m-HMDP detected 218 lesions and its sensitivity was 65.3%. Tc99m-MIBI had higher sensitivity and specificity in evaluating bone and marrow metastasis compared to Tc99m-HMDP [10].

By Shen G et al; Meta-analysis of twenty-seven studies using C-PET, MR, bone SPECT, and bone scintigraphy methods was performed to evaluate bone metastases in patients with prostate cancer. The results of the analysis were evaluated in two different ways: patient and lesion based. According to this, the sensitivity of MRI was higher than other methods in the patient-based study (97%). However, in the lesion-based study, it can be said that Choline- PET/CT is more useful in the evaluation of metastasis than other methods [11].

Most of the studies on Tc99m-MIBI-SPECT, as mentioned before, constitute the evaluation of bone or lymph node metastases in prostate cancer. A related case has also been reported in the literature. The 81-year-old male patient was admitted to the hospital with bilateral cervical painful lymphadenopathy. A case reported from Japan was screened with Tc99m-MIBI and mediastinal, hilar LAP was detected. Biopsy of mediastinal LAP revealed prostate cancer [12].

In order to make the diagnosis of prostate cancer, in other words, malignant-benign tissue distinction in the prostate gland is a major part of the studies performed by MR techniques. For this purpose, PET/CT and SPECT/CT with different radiopharmaceuticals were used, but as in our study, no other studies applied the SPECT method using the Tc99m-MIBI agent.

Watanabe H et al in his study 11 C-PET, 18 FDG-PET and Gadolinium MRI methods were compared in order to diagnose prostate cancer [13]. The study included 43 patients with suspected prostate cancer. Twenty-six patients were diagnosed as prostate cancer histopathologically. Imaging methods were applied to each patient. The images were evaluated retrospectively by the nuclear medicine specialist and the genitourinary radiologist.

As a result, the sensitivity of MR, C-PET and FDG-PET methods was 88%, 73%, and 31%, respectively; their accuracy was 88%, 67%, and 53%. According to the results of this study, we can say that MRI is more useful for differentiating malignant-benign tissue in the prostate gland [13].

In a study conducted at Ufuk University in 2011, the efficacy of perfusion CT to differentiate benign-malignant tissue in bladder and prostate cancer patients was investigated. In this study, permeability (PS), blood volume (BV), blood flow (BF) and mean transit time (MTT) of malignant pathologies and normal tissues of the prostate and bladder were obtained as perfusion parameters. BF, BV, and PS values were higher in benign and malignant tissues than normal tissues. When the mean perfusion values of the malignant and benign tissues were compared; perfusion values were significantly higher in patients with malignant masses except for MTT. This result suggests that perfusion parameters can be used to differentiate benign- malignant prostate and bladder except mean transit time [14].

In the study conducted at Firat University in 2010; the patients underwent pelvic dynamic contrast-enhanced MRI and diffusion-weighted MRI (DWI) with a preliminary diagnosis of prostate cancer. The aim of this study was to investigate the contribution of DWI to the diagnosis of malignant-benign differentiation of pathological lesions detected in these patients. Transrectal ultrasonography (TRUS) guided biopsy revealed normal prostate tissue in 11 cases, prostatitis in 9 cases and prostate adenocarcinoma in 30 cases and imaging results of these 3 groups were compared. ADC (Apparent Diffusion Coefficient) values of the patients with prostatitis were higher than the ADC values of the patients with prostate cancer and the difference was statistically significant ($p = 0.002$). No statistically significant difference was observed between the ADC values of the tissues with prostatitis and the ADC values of the normal prostate tissue ($p = 0.919$). As a result; diffusion MRI can provide significant contributions in the differentiation of cancerous tissue from benign prostate tissue and prostatitis in the prostate gland as a functional imaging method [15].

In a similar study from Atatürk University; diffusion MR findings and prostate biopsy results were compared between benign and malignant lesions of the prostate gland. Forty-four patients with suspected prostate cancer who were scheduled for TRUS-Bx were included in the study and 14 focal biopsies including the transitional zone were taken. According to biopsy results, 508 (82.5%) benign and 108 (17.5%) malignant out of 616 foci were reported. The sensitivity, specificity and positive predictive value of diffusion-weighted pelvic MRI were 91.7%, 86.6%, 60%, and 97.7%, respectively. When the areas outside of ADC mapping are ignored, we can say that diffusion-weighted pelvic MRI is an effective method to differentiate malignant lesions of the prostate with high sensitivity and specificity [16].

In a study conducted by Hildo et al. 8 patients diagnosed with prostate cancer by biopsy received 99mTechnetium-HYNIC (tricine/TPPTS) -Aca-Bombesin (7-14) (99mTc-HABBN) scintigraphy and SPECT/CT. In this study; high-affinity binding of bombesin peptide to high secreted gastrin-releasing

peptide receptor (GRPR) was utilized in patients with prostate cancer. GRPR was found to be sufficiently high in 8 patients [17].

In another study conducted before; In patients with prostate cancer, the 99mTc-HABBN agent had high metabolic stability in vitro but low metabolic stability in vivo. Therefore, 99mTc-HABBN SPECT/CT and scintigraphy could not obtain significant images in detecting prostate cancer [18].

In our study, the Tc99m-MIBI-SPECT method was used to detect prostate cancer. Tc99m-MIBI-SPECT results and prostate biopsy results of 56 patients who were scheduled for prostate biopsy were compared. Prostate biopsy was accepted as the gold standard. Tc99m-MIBI-SPECT has a sensitivity of 74%, a specificity of 45%, a positive predictive value of 55% and a negative predictive value of 45%. The diagnosis rate of Tc99m-MIBI-SPECT method was 58%.

There was a weak correlation between TRUS-Bx and Tc99m-MIBI-SPECT (Kappa Value = 0.187), but this correlation was insignificant statistically. (p = 0.140) However, when the positive results of prostate biopsy and Tc99m-MIBI-SPECT were classified as right, left, bilateral and evaluated with negative results of both tests, the p-value was found to be statistically different from '0' (p = 0.005). There was low accordance between the two tests (Kappa value = 0.207).

However, in the group with 4 <PSA≤10, TRUS-Bx and Tc99m-MIBI-SPECT test results were found to be statistically significantly low concordant (p = 0.029) (Kappa value = 0.219).

Also TRUS-Bx. and Tc99m-MIBI-SPECT results were statistically significant in the low-risk group, but both tests were found to be low concordant (p = 0.011).

As a result of all these studies, we can say that the Tc99m-MIBI agent is associated with the diagnosis and staging of prostate cancer. The fact that Tc99m-MIBI-SPECT is not an alternative to TRUS-Bx according to our study, current studies and information. However, Tc99m-MIBI- SPECT can be promising in selected patients, – especially 4<PSA≤10 – who are clinically suspected of prostate cancer and require re-biopsy, although the prostate biopsy result is negative. For this purpose, controlled studies involving more patient numbers and applying combined techniques such as adding MDCT to Tc99m-MIBI-SPECT are needed in light of the above studies.

Conclusion. The Tc99m-MIBI-SPECT technique is not a substitute for prostate biopsy, although there is low concordance between Tc99m-MIBI-SPECT and TRUS-Bx. The sensitivity and specificity of Tc99m-MIBI-SPECT method were 74% and 45%, respectively. The positive predictive value was 55% and the negative predictive value was 45%. The correct diagnosis rate of Tc99m-MIBI-SPECT method was 58%.

More beneficial results can be achieved by increasing the number of patients and applying combined techniques.

Author Contributions.

M. Kuru: management of the research, collected, analyzed, data analysis and interpretation, writing the manuscript;

Z. Talat: Concept, supervision, data analysis and interpretation;

M. S. Sağer: Consultation, literature search, data analysis and interpretation;

Ç. Demirdağ: Critical review, supervision.

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