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Prostat Cancer and Obesity

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Research Article

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ABSTRACT

Objective: Obesity and aggressive prostate cancer are two important clinical conditions because of the prevalence and obesity increases the aggressiveness of prostate cancer. In this study, our aim was to investigate obesity rates at the time of diagnosis in patients who underwent Ga-68 PSMA PET/CT.

Methods: 104 patients with newly diagnosed prostate cancer who underwent Ga-68 PSMA PET/CT between 2021 and 2022 for staging were included in this study. The patients' height and weight, pathology results and PSA values, which were recorded routinely before PET/CT, were obtained from Nuclear Medicine patient files. The formula [mass (kg) / height2 (m)] was used to calculate the body mass index (BMI). According to the PSA values and Gleason score of the patients, intermediate and high-risk patients were included in the study.

Results: The median age of the patients was 70.5 (range:40-87 yrs) at the time of diagnosis and 67 (64.4 %) patients had metastases at the time of diagnosis. Of the patients, 15 (14.4%) were in the intermediate risk group and 89 (85.6%) were in the high risk group. Of the patients, 33 (31.7%) were normal weight, 45 (43.3%) were overweight, and 26 (25%) were obese. There was no significant difference between prostate cancer risk groups and BMI (p=0.126)

Conclusion: As a result, the weight of the majority of the patients in our study was above normal. However, there was no significant difference between overweight and obese and prostate cancer risk groups. However, considering all the literature information, being overweight increases the risk of cancer, and attention should be paid to dietary habits.

Keywords: Prostate cancer, obesity, PET/CT, Ga-68 PSMA

Prostat Kanseri ve Obezite

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ÖZET

Amaç: Obezite ve agresif prostat kanseri, yaygın olması ve obezitenin prostat kanserinin agresifliğini artırması nedeniyle iki önemli klinik durumdur. Bu çalışmada amacımız, Ga-68 PSMA PET/BT yapılan hastalarda tanı anında obezite oranlarını araştırmaktı.

Yöntem: Bu çalışmaya yeni tanı almış prostat kanseri olan ve evreleme amacıyla 2021-2022 yılları arasında Ga-68 PSMA PET/BT yapılan 104 hasta dahil edildi. Hastaların PET/BT çekimi öncesi rutin olarak kaydedilen boy ve kiloları ile patoloji sonuçları ve PSA değerleri Nükleer Tıp hasta dosyalarından elde edildi. [mass (kg) / height2 (m)] formülü Vücut kitle indeksi (VKİ) hesaplamada kullanıldı. Hastaların PSA değerleri ve Gleason skoruna göre intermediate ve yüksek riskli hastalar çalışmaya dahil edildi.

Bulgular: Tanı anında hastaların median yaşı 70.5 (range:40-87 yaş) idi ve tanı anında 67 hasta (%64.4) metastatikti. Hastalardan 15'i (%14.4) orta risk grubunda ve 89'u (%85.6) yüksek risk grubunda idi. Hastalardan 33'ü (%31.7) normal kilolu, 45'i (%43.3) fazla kilolu ve 26'sı (%25) obezdi. Prostat kanser risk grupları ile VKI arasında anlamlı fark bulunmadı (p=0.126)

Sonuç: Sonuç olarak, çalışmamızdaki hastalardan büyük çoğunluğunun kilosu normalin üzerindeydi. Bununla birlikte kilolu ve obez olmakla prostat kanser risk grupları arasında anlamlı farklılık bulunmadı. Ancak tüm literatür bilgileri de dikkate alındığında, fazla kilolu olmanın kanser riskini artırdığı göz önünde bulundurularak beslenme alışkanlıklarına dikkat edilmelidir.

Anahtar Kelimeler: Prostat Kanseri, Obezite, PET/BT, Ga-68 PSMA

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Introduction

Prostate cancer is the 2nd commonly diagnosed cancer in men, after lung cancer, according to Globocan statistics.[1] In an epidemiological study conducted in Turkey, the incidence rate of prostate cancer was found to be 35 per 100000.[2] In the aforementioned study, the median age at diagnosis was 68 years and the median PSA level was 10.0 ng/ml. PSMA (Prostate Specific Membrane Antigen) expression is increased in all prostate cancers. Aggressiveness of the disease is associated with metastatic disease and recurrence.[3] Positron Emission Tomography / Computed Tomography (PET/CT) is a high-level diagnostic hybrid imaging method that provides imaging at the molecular level. Since it is a hybrid imaging system, it also provides morphological information. PSMA (prostate-specific membrane antigen) is a transmembrane protein primarily present in all prostatic tissues. PSMA expression increases at high levels in prostate cancer patients (approximately 100-1000-fold).[4] Since PSMA is used in both diagnosis and treatment, it has taken its place among the theranostic agents in nuclear medicine applications. PET/CT with Ga-68 PSMA (Gallium-68 Prostate Specific Membrane Antigen) is now recommended as an alternative to standard bone and soft tissue imaging with NCCN updated guidelines.[5] Ga-68 PSMA PET/CT has high sensitivity and specificity in detecting metastatic lesions, even at very low PSA levels.[6] Cerci et al.[7] reported that in multicenter study the reliability and worldwide applicability of Ga-68 PSMA PET/CT in the examination of patients with biochemical recurrence.

There are many studies in the literature linking cancer and obesity. Obesity, develops as a result of hypertrophy and hyperplasia in the adipose tissue. The increased mortality and morbidity associated with obesity is thought to be due to the increase in hormones, adipokines and cytokines produced by fat tissue.[8] Obesity and aggressive prostate cancer are two important clinical conditions because of the prevalence and obesity increases the aggressiveness of prostate cancer. In this study, our aim was to investigate obesity rates at the time of diagnosis in patients who underwent Ga-68 PSMA PET/CT.

Materials and Methods

This study comprised 104 people with new diagnoses of prostate cancer who underwent staging with Ga-68 PSMA PET/CT between 2021 and 2022. The patients' height and weight, pathology results and PSA values, which were recorded routinely before PET/CT, were obtained from Nuclear Medicine patient files. On the basis of their PSA values and Gleason score, the patients were categorized as low risk, intermediate risk, and high risk. Patients with a Gleason score ≤ 6 and PSA ≤ 10 were considered low-risk, patients with a Gleason score of 7 and/or PSA <10- ≤20 were considered intermediate risk, and patients with a Gleason score of 8-10 or PSA >20 were considered high-risk. According to risk classification, patients in the low-risk class were not allowed to participate in the study. Furthermore, study participation was restricted to individuals who had previously undergone any form of treatment (chemotherapy, irradiation, etc.).

^{68}Ga-PSMA PET/CT Imaging Protocol

Patients received an intravenous injection of 2 MBq/kg 68Ga-PSMA 45-60 min before the start of the acquisition. 68Ga-PSMA PET / CT imaging of all patients was performed with General Electric Discovery PET / CT 600 (GE Medical Systems, LLC, 3000 N. GRANDVIEW BLVD., WAUKESHA, WI., U.S.A.) device. First, using a 16-section scanner, CT imaging was done at 120 kV, 172 mAs, and 2.5 mm axial slice thickness for attenuation correction and anatomical correlation. PET imaging was carried out for around three minutes in each bed position in three dimensions, encompassing the cranium and feet. Using the iterative reconstruction method, CT and PET images were matched and fused into transaxial, coronal, and sagittal images. The Digital Imaging and Communications in Medicine (DICOM) protocol was used to transport the data to a processing workstation (AW Volume Share5, GE Medical Systems S.C.S, France). Subsequently, semi-quantitative and visual analysis was conducted. The SUVmax computed by standard methods from the activity in the most intense voxel in the 3-D tumor region from the transaxial whole-body images.

The formula [mass (kg) / height2 (m)] was used to calculate the body mass index (BMI). In the BMI classification, less than 18.5 was considered underweight, 18.5-24.5 normal, 25-29.9 overweight, 30 and over obese. However, our main limitation in this evaluation is that the majority of the height-weight data of the patients were recorded according to their statements rather than measurement.

Our study is retrospective. For this reason, ethics committee approval was not received. The Helsinki Declaration of the World Medical Association was followed in the conduct of this research.

Statistical Analysis

The statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS) for Windows 22.0 (SPSS, Inc., Chicago, IL, USA). The mean, standard deviation, frequency, and median were employed in descriptive statistics. Fisher's exact test or chi-square were used to statistically compare categorical data. A P value of less than 0.05 was considered statistically significant.

Results

At the time of diagnosis, 67 (64.4%) of the patients had metastases, and the median age of the patients was 70.5 (range: 40-87 years). Every patient is diagnosed with adenocarcinoma. 89 (85.6%) of the patients were in the high-risk group, and 15 (14.4%) were in the intermediate-risk group. Of the patients, 45 (43.3%) were overweight, 26 (25%) were obese, and 33 (31.7%) were of normal weight.

According to Table 1, there was no significant difference (p=0.126) among the BMI and prostate cancer risk categories. When comparing the BMI groups to the patients' metastatic status at diagnosis, there was not a

significant difference (p= 0.745). Age and risk categorization did not significantly vary (p=0.107), despite the fact that BMI increased with age (p=0.004). Table 2 indicates that there was no statistically significant correlation found between the BMI of our patients and the presence or absence of metastases.

Discussion

Studies conducted so far have shown that weight gain and obesity are considered risks for the development and survival of many cancers. There are proven data between esophagus, thyroid, colon, kidney, gallbladder, liver, rectum, melanoma, multiple myeloma, leukemia, lymphoma, prostate cancer in men, and postmenopausal breast and endometrial cancers in women, and obesity.[9] Freedland et al.[10] according to the review study, although obesity is not directly related to prostate cancer, they reported that obesity increases tumor aggressiveness in patients with prostate cancer, while weight loss can reduce the risk of non-metastatic aggressive disease. Similarly, another review reported that obesity increases the incidence of aggressive prostate cancer.[11] According to the data of our study, 43.3% of our patients were overweight and 25% were obese. However, no significant difference was found between overweight and obese and prostate cancer risk groups in our study. Furthermore, there was no relationship discovered between BMI and metastatic presence.

One of the major limitations of our study was the inhomogeneity of the patient population and the small number of patients. Also, our other limitation in this evaluation is that the majority of the height-weight data of the patients were recorded according to their statements rather than measurement.

Conclusion

As a result, the majority of the patients in our study were above normal weight. However, there was no significant difference between overweight and obese and prostate cancer risk groups. However, considering all the literature information, being overweight increases the risk of cancer, and attention should be paid to dietary habits.

Conflict of interest

There is not a conflict of interest.

Table 1. The relationship between prostate cancer risk groups and BMI classification of patients

BMI	Prostat Cancer Risk Classification		*p value*
	Intermediate Risk n (%)	High Risk n (%)	
Normal weight (18.5-24.9)	6 (18.2)	27 (81.8)	*0.126*
Overweight (25-29.9)	3 (6.7)	42 (93.3)	
Obese (≥30)	6 (23.1)	20 (76.9)	

Abbreviation: BMI: Body mass index

Table 2. The relationship between presence/absence of metastasis and BMI classification of patients

BMI	Metastases		*p value*
	Present, n (%)	Absent, n (%)	
Normal weight (18.5-24.9)	23 (69.7)	10 (30.3)	*0.745*
Overweight (25-29.9)	28 (62.2)	17 (37.8)	
Obese (≥30)	16 (61.5)	10 (38.5)	

Abbreviation: BMI: Body mass index

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