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Predictors of Clinically Significant Prostate Cancer: A Comparative Study of PSA, PSA Density, and MRI Parameters

Klinik Anlamlı Prostat Kanseri Belirteçleri: PSA, PSA Dansitesi ve MRG Bulgularının Karşılaştırılması

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ABSTRACT

Introduction: The purpose of this study was to compare prostate-specific antigen (PSA), PSA density (PSAd), the prostate imaging-reporting and data system (PI-RADS) score, and lesion dimension (four parameters) in clinically significant prostate cancer (PCa) detection.

Methods: This study included 154 patients who underwent multi-parametric prostate magnetic resonance imaging (mpMRI) and 12 quadrant systematic prostate biopsy between 01/2018 and 03/2019. Two radiologists used the PI-RADS version 2.1 to describe the MRI findings by consensus. A Gleason score ≥3+4 was assessed as clinically significant PCa. Areas under the curve (AUC) were calculated using receiver operating characteristics. Youden's index was used to determine ideal cutoffs. DeLong's test was used to evaluate statistically significant differences between the four parameters.

Results: The median age was 66 (±6.9) in this cohort. The median PSA level was 7.8 ng/dL (±18.4, 1.6-109.3), the median PSAd was 0.146 ng/mL/cm^3, and the median lesion dimension was 12 mm. In MRI, the number of cases with the PI-RADS scores from 1 to 5 were 34, 6, 11, 38, and 65, respectively. In terms of pathology, there was no tumor in 44 patients' samples, while insignificant cancer and clinically significant PCa were seen in 33 and 77, respectively. The AUC values of PSA, PSAd, PI-RADS score, and lesion dimension were 0.684, 0.731, 0.856, and 0.858, respectively. The optimal cutoffs were ≥10 ng/mL for PSA, ≥0.22 ng/mL/cm^3 for PSAd, ≥4 for the PI-RADS score and ≥10 mm for lesion dimension. DeLong's tests showed that the PI-RADS score and lesion dimension were significantly superior to PSA and PSAd. There was no significant difference between the PI-RADS score and lesion dimension.

ÖZ

Amaç: Klinik anlamlı prostat kanseri (KAK) tespitinde, prostat-spesifik antijen (PSA), PSA yoğunluğu (PSAd), prostat görüntüleme-raporlandırma ve bilgi sistemi (PI-RADS) skoru ve lezyon boyutu içeren dört parametrenin karşılaştırılması amaçlanmıştır.

Yöntemler: Bu çalışma, 01/2018 ile 03/2019 arasında, multi-parametrik prostat manyetik rezonans görüntüleme (mpMRG) ve 12 kadran sistematik prostat biyopsisi yapılan 154 olguyu kapsamaktadır. MRG bulguları 2 radyolog tarafından konsensüs ile PI-RADS versiyon 2.1 kullanılarak değerlendirildi. Gleason ≥3+4 tümörler KAK olarak tariflendi. Eğrinin altında kalan alan (EAA) alıcı çalışma karakteristik eğrisi (ROC) kullanılarak hesaplandı. Uygun sınır değeri tespit için Youden'in indeksi kullanıldı. Dört parametre arasındaki anlamlı farklılık DeLong testi yardımıyla değerlendirildi.

Bulgular: Kohortda ortanca yaş 66 (±6,9) idi. Ortanca PSA 7,8 ng/dL, PSAd 0,146 ng/mL/cm^3 ve lezyon boyutu 12 mm idi. MRG'de PI-RADS skor 1'den 5'e olgu sayısı sırasıyla 34, 6, 11, 38 ve 65'ti. Patolojide, 44 olguda tümör görülmezken, 33 klinik sessiz kanser, 77 KAK saptandı. PSA, PSAd, PI-RADS skoru ve lezyon boyutu için EAA'lar sırasıyla; 0,684, 0,731, 0,856 ve 0,858 idi. En uygun sınır değerler PSA için ≥10 ng/mL, PSAd için ≥0,22 ng/mL/cm^3, PI-RADS skoru için ≥ skor 4 ve lezyon boyutu için ≥10 mm idi. DeLong testinde PI-RADS skoru ve lezyon boyutu, PSA ve PSAd'den daha üstün bulundu. PI-RADS skoru ile lezyon boyutu arasında anlamlı fark yoktu.

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ABSTRACT

Conclusion: The PI-RADS score and lesion dimension had higher accuracy than PSA and PSAd in clinically significant PCa detection. Lesions ≥10 mm were associated with the risk of clinically significant PCa, and this should be considered in reporting.

Keywords: Multiparametric prostate MRI, PI-RADS category, prostate-specific antigen, prostate biopsy, prostate cancer

ÖZ

Sonuç: KAK tanısında, PI-RADS skoru ve lezyon boyutu PSA ve PSAd'den daha yüksek doğruluğa sahiptir. 10 mm'den büyük lezyonlar KAK için potansiyel riskli olup raporlamada bu dikkate alınmalıdır.

Anahtar Kelimeler: Multi-parametrik prostat MRG, PI-RADS kategori, prostat-spesifik antijen, prostat biyopsisi, prostat kanseri

Introduction

Prostate cancer (PCa) is the second most common cancer in men (1). Digital rectal examination (DRE), prostate-specific antigen (PSA), and transrectal ultrasound-guided biopsy are utilized in screening. Randomized controlled studies have shown that PSA screening decreases disease-specific mortality (2). The serum PSA level may increase in both benign and malignant conditions; therefore, it is often used in combination with other screening methods. However, when these screening methods are used alone or together, they have low specificity in Pca diagnosis. Redundant diagnosis of clinically insignificant cancer is another problem with these methods (3).

Publication of the prostate imaging-reporting and data system (PI-RADS) guidelines has changed the clinical picture. Multi-parametric prostate magnetic resonance imaging (mpMRI) prevented unnecessary biopsies and introduced targeted biopsy, which reduced the diagnosis of indolent cancer and made a beneficial contribution to clinically significant PCa detection (4,5). Although PI-RADS is not directly recommended for management, biopsy should be considered for score 4 or 5 lesions (6).

PSA density (PSAd) is considered superior to serum PSA alone in the diagnosis of PCa (7). In recent studies, the combination of PSAd and mpMRI facilitated detection of clinically significant PCa, and PSAd may help to predict negative biopsy results (7,8). On the other hand, undifferentiated tumours producing less PSA or large prostate volume decreased the capability of PSAd to detect cancer (7,9).

Clinically significant PCa is defined as volume ≥0.5 cc and/or Gleason score ≥3+4 and/or extraprostatic extension (6). An increased tumor volume is associated with aggressive biological behaviour, the risk of extraprostatic extension, PSA recurrence, and metastasis (10,11). Image-guided focal therapy or active surveillance options could be offered more safely with the accurate measurement of preoperative tumor dimensions (12).

This study aimed to compare PSA, PSAd, PI-RADS score, and tumor dimensions in clinically significant PCa detection.

Methods

Study Population

This retrospective study was approved by the Non-Interventional Clinical Research Ethics Committee of İzmir Katip Çelebi University (approval number: 18.06.2020/729). Written informed consent was obtained from all participants. One-hundred and fifty-four patients who underwent mpMRI and 12 quadrant systematic biopsies between January 2018 and December 2019 were included. All patients had a clinical suspicion of PCa with either elevated PSA or abnormal DRE. The patients included in this study with PI-RADS score 1 were sampled due to having elevated PSA or abnormal DRE. Cognitive-fusion biopsy was added to systematic biopsy in those who had a transitional zone (TZ) lesion (n=19) on the mpMRI. The patients treated before mpMRI were excluded.

MR Acquisition Protocol

All MR scans were acquired on a 1.5T scanner (Aera, Siemens Healthineers, Erlangen, Germany). The protocol included the following sequences: turbo spin-echo T2-weighted imaging (T2WI) with axial, sagittal, and coronal orientations (Axial T2WI parameters were as follows: repetition time, 5660 ms; echo time, 99 ms; field of view, 200×180 mm; acquisition matrix, 320×288; slice thickness, 3 mm with no gap; number of excitations, 6), a diffusion-weighted imaging with an axial orientation (repetition time, 4000 ms; echo time, 76 ms; b-values, 0, 200, 600, and 1400 sec/mm^2; field of view, 200×180 mm; acquisition matrix, 100×90; slice thickness, 3 mm with no gap) with apparent diffusion coefficient mapping, and dynamic contrast-enhanced sequences with an axial orientation (repetition time, 2.48 ms; echo time, 1.52 ms; the field of view, 260×215 mm; acquisition matrix, 160×108; slice thickness 3 mm with a 0.3 mm gap; temporal resolution, 7 sec).

Image Analysis

Scoring was performed using the PI-RADSv2.1 (13). Standardized PI-RADSv2.1 is on a five-point scale, which describes clinically significant PCa as follows: 1, extremely unlikely; 2, unlikely; 3, equivocal; 4, likely; or 5, extremely likely. Two radiologists with 5 and 3 years of experience in prostate MRI, blinded to clinical and pathological data assigned the score individually to assess inter-reader agreement. After 1 month, PI-RADSv2.1 scoring was repeated with consensus, and the consensus score was used in statistical analysis.

Prostate volume was calculated on axial and sagittal T2WI using an ellipsoid formula (maximum anterior-posterior × transverse × longitudinal diameter ×0.52) (6). PSAd was obtained using PSA/volume.

Maximum single-axis size was considered a lesion dimension using the sequence in which the lesion was seen best, was mostly axial T2WI since it had highest spatial resolution. When multiple lesions were present, the PI-RADS score and dimension of index lesion were used in the statistical analysis.

Histopathologic and Clinical Evaluation

The pathological evaluation was based on the pathology reports. Tumors were graded by the genitourinary pathologists as proposed by the International Society of Urological Pathology (ISUP) in 2014. Accordingly, Gleason 3+3 tumors were categorized as ISUP 1, Gleason 3+4 tumors as ISUP 2, Gleason 4+3 tumors as ISUP 3, Gleason 4+4 tumors as ISUP 4, and Gleason ≥4+5 tumors as ISUP 5. Gleason ≥3+4 tumors were considered clinically significant PCa as defined in the PI-RADSv2 (6).

Fourty-nine of 154 were underwent radical prostatectomy (RP) after 12 quadrant biopsy. If there was any discrepancy between systematic biopsy and RP, ISUP results of RP were considered in statistical analysis. To match the lesions on the mpMRIs with histopathology, we first localized the index lesion on the mpMRI to the corresponding PI-RADS sector map and then recorded the biopsy/prostatectomy results for the relevant regions.

Statistical Analysis

The Kappa statistic was used to determine inter-reader agreement. Accordingly, it was classified as follows: 0.01-0.20, slight; 0.21-0.40, fair; 0.41-0.60, moderate; 0.61-0.80, substantial; and 0.81-0.99, almost perfect.

The PI-RADSv2.1 score and ISUP grade correlation were analysed using the Spearman's rank correlation. Pearson correlation analysis was used to determine the relationship between PSA, PSAd, dimension, and ISUP grade.

PSA, PSAd, the PI-RADS score, and lesion dimension were compared using receiver operating characteristic (ROC) curves in clinically significant PCa detection. Youden's index was used to determine ideal cutoff values and sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were computed. The area under the curve (AUC) was calculated for each ROC curve. DeLong's test was used to evaluate statistically significant differences between them.

All analyses were conducted using SPSS version 20 (IBM®, Armonk, NY, USA) and Medcalc® 19.12.0 (MedCalc Software bvba, Ostend, Belgium). Results were considered statistically significant at $p<0.05$.

Results

The median age of 154 cases was 66 (standard deviation ±6.9, range: 46-81). The median PSA level was 7.8 ng/dL (±18.4, 1.6-109.3), median PSAd 0.146 ng/mL/cm^3 (±0.402, 0.036-3.090), and median lesion dimension 12 mm (±16, 0-118) (Table 1).

There were no lesions in 34 patients. Fourteen patients had multifocal lesions. The total number of lesions was 138. Nineteen lesions (13.8%) were localized in TZ.

There were no tumors in 44 patients. The cognitive fusion biopsy results in 19 lesions were as follows: no tumor 2; ISUP 1 tumor 6; ISUP 2 tumor 7; ISUP 3 tumor 1; and ISUP 4 tumor 3. The numbers of cases with ISUP scores 1 to 5 were 33, 36, 24, 11, and 6, respectively (Table 2). There were 77 patients who had clinically significant PCa. The number of cases with the PI-RADS scores from 1 to 5 were 34, 6, 11, 38, and 65, respectively. There was no clinically significant PCa in patients assigned a PI-RADS score of 1. The ISUP ≥2 cancer detection rate was 18% in patients with a PI-RADS score of 2. The clinically significant PCa detection rate was 34% in patients with a PI-RADS score of 3, 80% in those with a score of 4, and 82% in those with a score of 5. As the PI-RADS score increased, the ISUP grade increased significantly (Figure 1) ($p<0.001$).

Inter-reader agreement was moderate (Kappa: 0.536). There was a strong correlation between PSA, PSAd, tumor dimension, and ISUP

Table 1. Summary of patient and lesion characteristics

Parameters	Number	Median	Standard deviation	Minimum	Maximum
Age	154	66	6.9	46	81
PSA (ng/mL)	154	7.8	18.4	1.6	109.3
PSAd (ng/mL/cm^3)	154	0.146	0.402	0.036	3.090
Dimesion (mm)	154	12	16	0	118
Lesion detected	138	-	-	-	-
Peripheral zone	119 (86.2%)	-	-	-	-
Tranzitional zone	19 (13.8%)	-	-	-	-

PSA: Prostate-specific antigen, PSAd: prostate-specific antigen density

Table 2. Values of the PI-RADSv2.1 score and ISUP grade

PI-RADSv2 score	No tumor	ISUP 1	ISUP 2	ISUP 3	ISUP 4	ISUP 5	Total
1	29	5	0	0	0	0	34
2	5	0	1	0	0	0	6
3	1	6	3	1	0	0	11
4	7	13	13	3	2	0	38
5	2	9	19	20	9	6	65
Total	44	33	36	24	11	6	154

PI-RADSv2.1: prostate imaging-reporting and data system version 2.1, ISUP: International Society of Urological Pathology

(p<0.001 for all). Pearson correlation coefficients were 0.373, 0.432, 0.629, respectively.

The AUC values of PSA, PSAd, the PI-RADS score, and lesion dimension were 0.684, 0.731, 0.856, and 0.858, respectively (Figure 2). The cut-offs calculated using Youden's index were ≥10 ng/mL for PSA, ≥0.22 ng/mL/cm^3 for PSAd, PI-RADS score ≥4, and ≥10 mm for lesion dimension in clinically significant PCa detection. For those cutoffs, sensitivity, specificity, PPV, and NPV were 53.2%, 79.2%, 71.9%, and 62.9% for PSA; 58.4%, 87%, 81.8%, and 67.7% for PSAd; 93.5%, 59.7%, 69.9%, and 90.2% for the PI-RADS score; and 88.3%, 66.2%, 72.3%, and 85% for lesion dimension, respectively (Table 3).

DeLong's tests showed that PSA and PSAd had similar accuracy in clinically significant PCa detection (p=0.162). The PI-RADS score was significantly superior to PSA and PSAd (p<0.001 and p=0.004, respectively). The accuracy of lesion dimension was also higher than those of PSA and PSAd (p<0.001 and p=0.002, respectively). There was no significant difference between the PI-RADS score and lesion dimension (p=0.915) (Figure 3, 4).

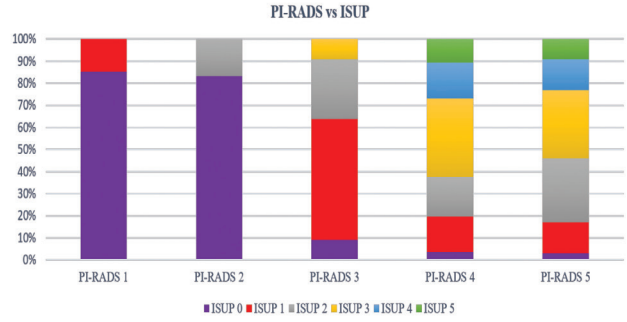

Figure 1. Percentages of ISUP grades in different PI-RADSv2.1 scores

ISUP: International Society of Urological Pathology, PI-RADSv2.1: prostate imaging-reporting and data system version 2.1

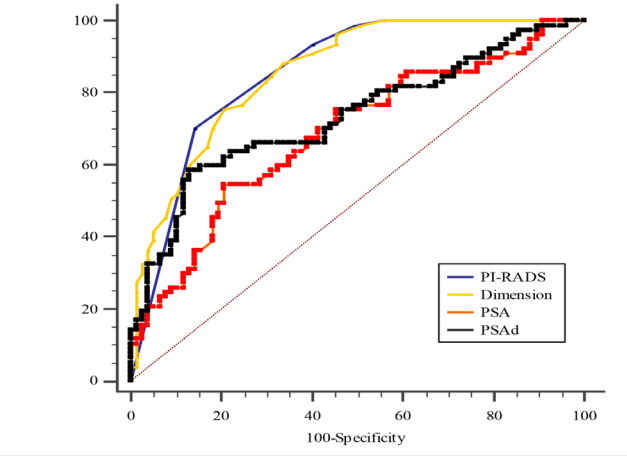

Figure 2. ROC curves of PSA, PSAd, the PI-RADSv2.1 score, and lesion dimension in clinically significant prostate cancer detection

ROC: PSA: prostate-specific antigen, PSAd: prostate-specific antigen density, PI-RADSv2.1: prostate imaging-reporting and data system version 2.1

Discussion

PSA is the first-line screening test in the diagnosis of PCa. However, mpMRI is the rising star of the new era in this field with a high sensitivity. In this study, the PI-RADS score and lesion dimension performed better in clinically significant PCa detection compared with PSA and PSAd. The

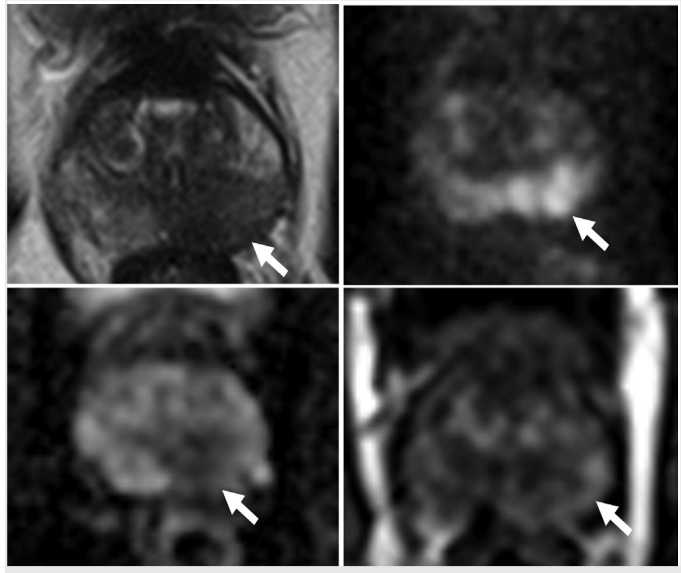

Figure 3. A 77-year-old patient with a PSA of 30 ng/mL, PSAd of 0.882 ng/mL/cm^3, and a 20 mm lesion localized in left mid peripheral zone (arrows). The lesion was slightly heterogeneous and moderately hypointense on T2WI (a), markedly hyperintense on a high b-value image (b), hypointense on an ADC map (c), and focally enhanced on DCE (d). Reader 1, reader 2, and consensus PI-RADSv2.1 scores were 5 for all. RP specimen revealed an ISUP-2 tumor with 23% involvement of the whole mount

PSA: Prostate-specific antigen, PSAd: prostate-specific antigen density, T2WI: T2-weighted imaging, ADC: apparent diffusion coefficient, DCE: dynamic contrast-enhanced, PI-RADSv2.1: prostate imaging-reporting and data system version 2.1, RP: radical prostatectomy, ISUP: International Society of Urological Pathology

Table 3. Diagnostic performance of PSA, PSAd, the PI-RADSv2.1 score, and lesion dimension in clinically significant prostate cancer detection

Parameters	Cutoff (≥)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
PSA	10 ng/mL	53.2	79.2	71.9	62.9
PSAd	0.22 ng/mL/cm^3	58.4	87	81.8	67.7
PI-RADS	Score 4	93.5	59.7	69.9	90.2
Dimension	10 mm	88.3	66.2	72.3	85

PSA: Prostate-specific antigen, PSAd: prostate-specific antigen density, PI-RADSv2.1: prostate imaging-reporting and data system version 2.1, PPV: positive predictive value, NPV: negative predictive value

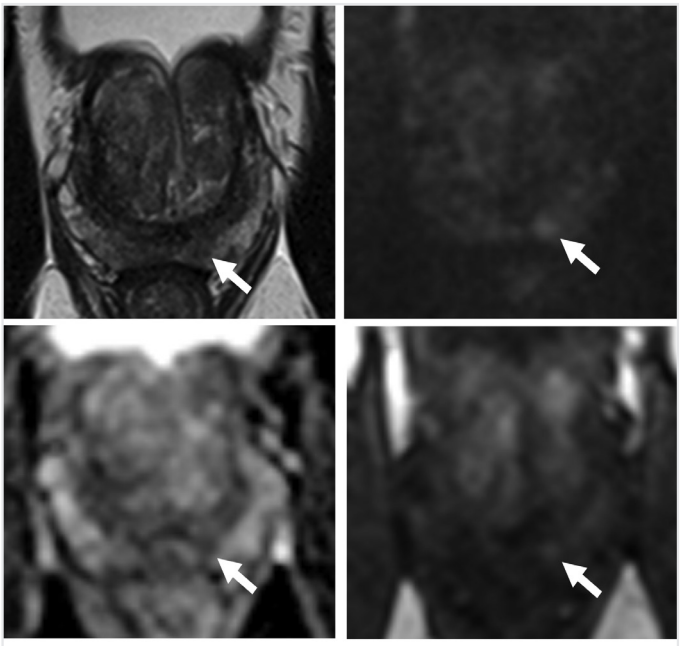

Figure 4. A 74-year-old patient with a PSA of 9.8 ng/mL, PSAd of 0.153 ng/mL/cm^3, and mpMRIs from a to d; T2WI, DWI, ADC, and DCE, respectively. An 9 mm lesion localized on the left mid-base peripheral zone (arrows). Reader 1, reader 2, and consensus PI-RADSv2.1 scores were 2, 3, and 3, respectively. TRUS systematic biopsy revealed an ISUP 1 tumor with 5% involvement in the relevant core

PSA: Prostate-specific antigen, PSAd: prostate-specific antigen density, mpMRI: multi-parametric prostate magnetic resonance imaging, T2WI: T2-weighted imaging, DWI: diffusion-weighted imaging, ADC: apparent diffusion coefficient, DCE: dynamic contrast-enhanced, PI-RADSv2.1: prostate imaging-reporting and data system version 2.1, RP: radical prostatectomy, ISUP: International Society of Urological Pathology

optimal cut-off values were ≥10 ng/mL, ≥0.22 ng/mL/cm^3, ≥4, and ≥10 mm for PSA, PSAd, the PI-RADS score, and lesion dimension, respectively.

Biopsy was traditionally recommended when PSA was ≥4 ng/dL (14,15). D'Amico et al. (16) classified low-risk patients as those with a Gleason score <7, T1c-T2a, and PSA ≤10 ng/mL; PSA >10 ng/mL increased the risk, regardless of Gleason score and T-staging (16). Catalona et al. (14) found sensitivity, specificity, PPV, and NPV of 27.7%, 93.1%, 54.1%, and 84.1%, respectively, with a cut-off of greater than 10 ng/mL for all ages. Therefore, better markers are required since PSA has low sensitivity and/or specificity in clinically significant PCa detection.

PSAd is one of the reliable parameter in the prediction of clinically significant PCa (7,8). Kundu et al. (17) showed that the clinically significant PCa detection rate was 10% in PSAd less than 0.1, whereas it was 45% in those PSAd greater than 0.19 ng/mL/cm^3 and pointed out that higher PSAd was correlated with a worsening pathological outcome. Corcoran et al. (9) have reported that PSAd was the strongest predictor compared with PSA, clinical stage, number of positive cores, and tumor volume in upgrading from a Gleason score of 3+3 to >3+3 and from 3+4 to >3+4 but not in upgrading from Gleason 7 to >7. It was emphasized that higher grade tumors produced less PSA, and PSAd lost its predictive ability with increasing grade (9). On the other hand, Cuocolo et al. (18) reported that the combination of PSAd and biparametric MRI did not significantly improve the diagnostic performance of mpMRI alone. Aminsharifi et al. (15) reported that clinically significant PCa was less common in gray zone patients with a PSA between 4 and 10 ng/mL when PSAd was <0.08 ng/mL/cm^3. In the risk classification of the National Compherensive Cancer Network, PSAd <0.15 ng/mL/cm^3 was defined as very low risk (19). Despite, the threshold was determined as <0.2 ng/mL/cm^3 in the PRIAS active surveillence protocol (20). In the present study, the optimal cut-off value was calculated as ≥0.22 ng/mL/cm^3 in clinically significant PCa detection with a sensitivity of 58.4%, specificity of 87%, PPV of 81.8%, and NPV of 67.7%. It seemed to be inconvenient to use as a marker alone in detection of clinically significant PCa in consequence of having lower performance than the PI-RADS score and tumor dimension. However, it may be used in addition to the PI-RADS score since PSAd had high specificity.

The PI-RADS score is a significant predictor in clinically significant PCa detection (21,22). It is quite successful to exclude to clinically significant PCa with high NPV. Also, it shows anterior tumours that can be overlooked by systematic biopsy (21,22). A PI-RADS score ≥4 was reported to be associated with clinically significant PCa (22,23). Nevertheless, Greer et al. (24) stated that there was no difference between scores of 3 and 4, and score ≥3 lesions needed to be biopsied. PI-RADS score ≥3 lesions were indicated for biopsy and, in the current randomized controlled trials, cited as PROMIS and PRECISION (25,26). This revealed that there has been no clear consensus in the literature about the threshold PI-RADS score yet. In our study, the optimal cut-off value was PI-RADS score ≥4 in clinically significant PCa detection with a sensitivity of 93.5%, a specificity of 59.7%, PPV of 69.9%, and NPV of 90.2%.

Clinically significant PCa was defined as a volume ≥0.5 cc and/or Gleason score ≥3+4 and/or extraprostatic extension in the PI-RADS guideline (6). Maximum tumor diameter was a significant and independent predictor of biochemical recurrence (10). Nelson et al. (11) reported that tumor volume was strongly correlated with pathological stage, extraprostatic extension, and biochemical recurrence in RP specimens. Tumor volume was revealed as a potential predictor of prognosis (11). Vargas et al. (27) showed that lesions ≥1 cm^3 were detectable independently of Gleason score. The PI-RADS primarily recommended single diameter measurement, whereas volume assessment was an alternative option (6). Single diameter measurement was more reproducible than volume according to the PRECISE panel (28). In this study, the maximum single axis was measured. There was a strong correlation between lesion dimension and ISUP grade ($p<0.001$). The optimal cut-off value was ≥10 mm in clinically significant PCa detection, with a sensitivity of 88.3%, specificity of 66.2%, PPV of 72.3%, and NPV of 85%. Lesion dimension had the highest AUC in clinically significant PCa detection and performed better than PSA and PSAd. These results showed that lesion dimension had a diagnostic value at least as high as the PI-RADS score.

The only size criterion was 15 mm, which raised the score from 4 to 5 in the PI-RADSv2.1 guideline (13). Rosenkrantz et al. (29) argued that a threshold of 15 mm was empirically used in PI-RADSv1 and was required of supporting data. They proposed 10 mm as a new threshold for a score of 5 since 56.4%-61.9% of the lesions measured between 10 and 14 mm were clinically significant PCa (29). An et al. (30) found this threshold to be 16 mm for the TZ lesions and 14 mm for the peripheral zone lesions and pointed out that the current 15 mm criterion was reasonable.

However, this study included only patients with PI-RADS score 4 and 5 lesions (30). The threshold for clinically significant PCa definition is 0.5 cc, corresponding to 1 cm in a single measurement. In our study, the optimal cut-off was 10 mm, independent of the PI-RADS score. Lesions ≥10 mm had a potential risk for clinically significant PCa, and this could be considered in reporting.

Study Limitation

The present study has some limitations. First, this was a retrospective study in which selection bias may exist. Second, 12 quadrant systematic biopsy was the reference test. That may have decreased the correlation of mpMRI with pathology and underestimated mpMRI performance. mpMRI is a candidate diagnostic tool for the screening test. If the study only included RPs, it would only include high-risk patients; however, this would not be compatible with the intended use. It may be claimed that it reflected daily practice better. Third, the consensus PI-RADSv2.1 score was considered as a definite score, but both readers may have made mistakes which limited the generalizability of the results. There was no actual solution to this limitation since interreader agrement was moderate and the major problematic issue of the PI-RADS guidelines. Fourth, this was a single-center study with a relatively small population. These data require support by large and prospective cohorts with multiple readers.

Conclusion

The PI-RADS score and lesion dimension performed better in clinically significant PCa detection compared to PSA and PSAd. The optimal cut-off values were ≥4 in the PI-RADS score and ≥10 mm in dimension. Lesions ≥10 mm were associated with the risk of clinically significant PCa and should be considered in reporting.

Ethics

Ethics Committee Approval: This retrospective study was approved by the Non-Interventional Clinical Research Ethics Committee of İzmir Katip Çelebi University (approval number: 18.06.2020/729).

Informed Consent: Written informed consent was obtained from all participants.

Peer-review: Externally peer-reviewed.

Authorship Contributions: Surgical and Medical Practices - M.C., Y.A., C.G.; Concept - M.C., Y.A., İ.Ö., C.G., M.E.U.; Design - M.C., E.M.H.D., Y.A., İ.Ö., C.G., M.E.U.; Data Collection or Processing - M.C., E.M.H.D.; Analysis or Interpretation - M.C., E.M.H.D., C.G., M.E.U.; Literature Search - M.C.; Writing - M.C., E.M.H.D., M.E.U.

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