A critical analysis of the prostate magnetic resonance imaging lesion diameter threshold for advanced pathology features

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Abstract

Purpose: To investigate the relationship between lesion size determined using mpMRI and histopathological findings of specimens obtained after mpMRI fusion biopsy and radical prostatectomy. Material and Methods: We retrospectively analyzed 590 patients with PCa who underwent an MRI fusion biopsy between 2017-2019. We measured the diameter of suspicious tumor lesions on diffusion-weighted mpMRI and stratified the cohort into two groups. Group A included patients with a suspicious tumor lesion equal and smaller than 10 mm and Group B included those with a suspicious tumor lesion larger than 10 mm. RP was performed in 53 patients. The patients in Groups A and B were compared according to their pathological findings obtained with fusion biopsy and RP. Results: After applying the inclusion and exclusion criteria, Group A consisted of 144 patients and Group B comprised 146. In Group B, PI-RADS score determined in mpMRI was higher than Group A, and there was a statistically significant difference between the two groups in terms of clinical T-stage. The PCa detection rate and the number of positive cores were statistically significantly higher in Group B than in Group A. In addition, there was a statistically significant difference between the two groups in relation to the biopsy, the ISUP grades and the presence of clinically significant PCa. In Group B, pathological T-stage and extraprostatic extension (EPE) and surgical margin (SM) positivity were found to be higher among the patients who underwent RP. In the multivariate analysis, the mpMRI lesion size being >10 mm was found to be an independent predictive factor for SM and EPE positivity. Conclusion: The radiologists and clinicians should be awared of the possibility of presence of features that may affect local staging, such as EPE positivity, in the presence of lesions larger than 10 mm in which prostate cancer is detected.

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Results: After applying the inclusion and exclusion criteria, Group A consisted of 144 patients and Group B comprised 146. In Group B, PI-RADS score determined in mpMRI was higher than Group A, and there was a statistically significant difference between the two groups in terms of clinical T-stage. The PCa detection rate and the number of positive cores were statistically significantly higher in Group B than in Group A. In addition, there was a statistically significant difference between the two groups in relation to the biopsy, the ISUP grades and the presence of clinically significant PCa. In Group B, pathological T-stage and extraprostatic extension (EPE) and surgical margin (SM) positivity were found to be higher among the patients who underwent RP. In the multivariate analysis, the mpMRI lesion size being >10 mm was found to be an independent predictive factor for SM and EPE positivity.

Conclusion: The radiologists and clinicians should be awared of the possibility of presence of features that may affect local staging, such as EPE positivity, in the presence of lesions larger than 10 mm in which prostate cancer is detected.

What's Known?

-The relationship between prostate cancer aggressiveness according to the characteristics of the lesion on MpMRI has been reported in a limited number of studies in the literature.

-PIRADS classification is made according to the lesion characteristics in MpMRIand there is a 15 mm cut-off for the size of the lesion in the differentiation of the lesion between PIRADS 4 and 5.

What's New?

In the PIRADS classification, the 15 mm border in lesion 4 and 5 distinction should be reduced to 10 mm. In our study, the cut-off value between prostate aggressiveness and MR lesion was 10 mm.

INTRODUNCTION

Prostate cancer (PCa) is the most common cancer among males and the second most common cancer worldwide. In addition, it ranks fifth among the causes of cancer-related mortality (1). In daily practice, unlike many types of cancer, PCa is divided into clinically significant (csPCa) and clinically insignificant tumors (cisPCa), and this differentiation is directly related to the survival of the patient (2). Although the widespread use of serum prostate specific antigen (PSA) screening has led to a decrease in cancer-related deaths, it also results in a greater rate of cisPCa diagnosis and treatment (3). The priority in the management of patients diagnosed with PCa is to accurately evaluate the presence of csPCa, effectively demonstrate the extent of the disease at the time of diagnosis, and predict the risk of progression (3). For this purpose, multiparametric magnetic resonance imaging (mpMRI) has been increasingly used in recent years, extending the area of use of targeted biopsies and increasing accuracy rates in the differentiation of csPCa and staging (4).

The Prostate Imaging Reporting and Data System (PI-RADS) scoring, which is used to classify and standardize findings defined in the prostate, facilitates the clinical use of mpMRI (5). In addition to the diagnosis of PCa, mpMRI provides information for the correct assessment of the risk of extraprostatic spread (EPE), seminal vesicle invasion (SVI), and lymph node metastasis (LNM) and may affect the treatment strategy (6). Since the PI-RADS scoring used during the evaluation of mpMRI includes some subjective criteria, the sensitivity of the examination varies depending on the experience of the evaluating physician (5). This increases the importance of using parameters that can be standardized, such as prostate lesion size in order to increase the capacity of mpMRI in determining morphological and functional results, and the lesion size is considered to be correlated with clinical parameters (7).

In this study, we aimed to investigate the relationship between lesion size determined using mpMRI and histopathological findings of specimens obtained after mpMRI/transrectal ultrasound (TRUS) fusion biopsy and radical prostatectomy (RP).

MATERIAL AND METHOD

Patient Selection and Data Collection

This retrospective study protocol was approved by the local ethics committee of Bakirkoy Dr. Sadi Konuk Training and Research Hospital, and the study was conducted according to the tenets of the Declaration of Helsinki. All subjects were informed about the study protocol, and their written consent was obtained (2021-258). Our retrospective study was composed of 290 patients who were enrolled from January 2017 to June 2019. All patients were admitted to the urology clinic of our hospital with the suspicion of PCa. The inclusion criteria were as follows: (i) having undergone 3-T mpMRI, (ii) having a single peripheral zone lesion with a PI-RADS v2 score of [?]3, and (iii) having a PSA value of >10 ng/mL and/or digital rectal examination positivity. The exclusion criteria were (i) absence of a 3-T mpMRI examination or the available mpMRI examination having non-diagnostic image quality, (ii) having any contraindication to MRI, and (iii) absence of fusion biopsy results. The patients included in the study and considered to be eligible for RP underwent robot-assisted laparoscopic radical prostatectomy (RALP) performed by two expert surgeons (S.Ş., A.İ.T.) using DaVinci Xi Surgical System ® (Intuitive Surgical, CA, USA). The clinical features of the patients, including age, PSA levels, PSA density (PSAD), prostate volume (PV), number of positive biopsy cores, the largest diameter of suspicious tumor lesions on diffusion-weighted MRI (DW-MRI), postoperative Gleason score, pathological stage, EPE, surgical margin (SM) positivity, SVI, and tumor volume were recorded.

Multiparametric MRI Examination and Image Analysis

Multiparametric prostate MRI was performed using a 3.0-T MR unit (Verio; Siemens Medical Solutions, Erlagen, Germany) with a 16-channel pelvic phased array coil. Imaging sequences comprised thin-section turbo spin echo T2-weighted (TSE) images (number of slices, 20; slice thickness, 3 mm with no intersection

gap; TR/TE, 5800/100 ms; number of signals acquired, 2; and resolution, 0.8x0.8 mm) in the transverse, sagittal and coronal planes. Diffusion-weighted images were obtained using multiple b values (b-factor, 50/500/1000/1500 s/mm^2; number of slices, 20; slice thickness, 3 mm; TR/TE, 3900/75; and resolution, 1.4 mmx1.4 mm) in the transverse plane and apparent diffusion coefficient (ADC) maps were constructed from the b50, b100, b1000 and b1500 images by utilizing SyngoVia WorkStation software. Dynamic contrast-enhanced (DCE)-MRI sequences (T1 high-resolution isotropic volume with fat suppression) obtained after the administration of a gadolinium injection (slice thickness, 3 mm; intersection gap, none; TR/TE, 5.08/1.77; resolution, 1.4 mmx1.4 mm, contrast agent injection started 24 seconds after first acquisition; temporal resolution, 8 seconds; total DCE time, 200 seconds; and number of dynamic time points, 25). We stratified the study cohort into two groups using a tumor diameter of 1 cm. Group A consisted of patients with normal MRI findings or a suspicious tumor lesion of $<$1 cm in diameter, and Group B comprised those with a tumor diameter of $>$ 1 cm (Figure 1).

Biopsy Protocol

Biopsies were performed with the Toshiba (Japan) Aplio 500 Platinum image fusion system. Regions suspicious for malignancy on mpMRI (targeted lesions) were sampled with two cores. This was followed by standard 10-core systemic biopsy. Each biopsy was performed by the same experienced radiologist (R.T.).

Histopathological Analysis

The histopathological analysis of the biopsy materials was performed by an experienced uropathologist (F.T.). The reports were structured in accordance with the 2016 the International Society of Urological Pathology (ISUP) Gleason grading system (2). The pathological long-axis diameter of the lesion on the specimens and the biopsy core numbers for the pathologic lesions were also recorded.

The RP specimens were processed macroscopically after weight, volume and size measurements were recorded. After separating the seminal vesicles from the specimen, 2 mm-thick slices were taken from the apex and bladder neck for the SMs of the apex and bladder neck. The remaining prostate tissue was sliced at 4-5 mm thickness, starting from the apex. All the slices were mapped as right and left and anterior and posterior, and each quadrant was processed with a separate block. Then, all the seminal vesicles separated into right and left were processed with cross-sections. Routine hematoxylin-eosin stained sections with a thickness of 4 micrometers were examined under a microscope after 12 hours of routine tissue processing.

In addition to the SMs of the apex and bladder neck, the anterior, anterolateral, posterior and posterolateral SMs were evaluated, and the tumor quadrants were marked and mapped. All the tumor-containing blocks were examined and graded according to the 2016 ISUP consensus (2). The prognostic parameters of tumors included in radical prostatectomy reports were as follows: perineural invasion, lymphovascular invasion, SVI, EPE, tertiary pattern if present, ratio of secondary pattern to tumor, diameters of predominant tumors, ratio of tumor tissue to the whole prostate, presence/absence of prostate incision, presence/absence of prostate incision, and involvement of lymph nodes, if any. In addition, the presence of intraductal involvement in tumors was investigated and reported. Mostly, the diagnosis of acinar type adenocarcinoma and the presence and rate of ductal differentiation were also noted.

Statistical Analysis

Statistical analysis was performed using SPSS v. 15.0 for Windows. Categorical variables were given as numbers and percentages. The conformance of continuous data to a normal distribution was evaluated using the Shapiro-Wilk test. The independent t-test was used for the comparison of groups with a normal distribution, and the Mann-Whitney U test was used for the comparison of groups that did not comply with a normal distribution. In the comparison of categorical variables, the Pearson chi-square and exact tests were used as appropriate. Parameters with a possible predictive value associated with EPE and positive SM were evaluated using univariate and multivariate logistic regression analyses. A p value of $<$0.05 was considered statistically significant.

RESULTS

A total of 290 patients were stratified into Group A (n = 144) and Group B (n = 146). The mean age of the patients was 63.9 +- 7.9 years, and the median PSA value was 6.49 ng/dL (range: 4.7-9.5 ng/dL). According to the mpMRI examination, 17 (5.9%) cases were evaluated as PI-RADS 2, 77 (26.6%) as PI-RADS 3, 165 (56.9%) as PI-RADS 4, and 31 (10.7%) as PI-RADS 5. The fusion biopsy results revealed the detection rates of ISUP Grade 1, 2, 3, 4 and 5 to be 65 (22.4%), 51 (17.6%), 34 (11.7%), 13 (4.5%), and 6 (2.1%), respectively. RALP was performed in 53 (18.3%) of the patients included in the study, who underwent a fusion biopsy. The histopathological analysis of these cases after RALP showed that 22 (41.5%) patients had EPE, 16 (30.1%) had SM positivity and four (7.5%) had SVI positivity. The demographic findings of the patients are shown in Table 1.

When the patients were evaluated according to the mpMRI lesion size, it was observed that the PSAD value was statistically significantly higher in Group B than in Group A (p = 0.012). The PI-RADS score was also higher in Group B compared to Group A, and the two groups statistically significantly differed in terms of clinical T-stage (p < 0.001 and p <0.001, respectively). According to the fusion biopsy results, the rate of PCa detection and the number of positive cores were statistically significantly higher in Group B than in group A (p = 0.001 and p = 0.007, respectively). In addition, there was a statistically significant difference between the biopsy-ISUP grade values of the two groups (p <0.001). Another significant difference was detected in relation to the presence of clinically significant PCa (p <0.001). While the rate of csPCa detection among all biopsies was 62.3% in Group B, it was determined to be 38.9% in Group A. The rate of cisPCa detection was statistically similar in the two groups (Table 2).

It was observed that the pathological T-stage in the patients who underwent RALP was more advanced in Group B (p = 0.003). In addition, the EPE and SM positivity rates were higher in Group B compared to Group A (p = 0.001 and p = 0.004, respectively). The two groups were statistically similar in terms of preoperative clinical stage, ISUP grade of specimen pathology, Gleason upgrade rate, and SVI and LNM detection rates among the patients who underwent RALP (Table 3).

Possible variables associated with EPE positivity after RALP (age, PSA, PSAD, biopsy-ISUP grade, number of positive cores, clinical T-stage, and mpMRI lesion size) were evaluated using the univariate analysis, and the mpMRI lesion size being >10 mm was determined to be significant in predicting EPE positivity. The multivariate analysis revealed only the mpMRI lesion size being >10 mm as an independent predictor of EPE positivity. According to the univariate analysis of the possible variables associated with SM positivity (age, PSA, PSAD, PI-RADS, biopsy-ISUP grade, number of positive cores, clinical T-stage, Damigo risk group, and mpMRI lesion size), the mpMRI lesion size being >10 mm and the presence of biopsy-ISUP grade 2 significantly predicted SM positivity. In the multivariate analysis, the mpMRI lesion size being >10 mm was found to be an independent predictive factor for SM positivity (Table 4).

DISCUSSION

The result of the analyses undertaken in our study showed that PCa aggressiveness increased clinically and histopathologically in the patients with an index lesion size over 10 mm and the increase in lesion size was able to predict the aggressiveness of the disease. We took 10 mm as the threshold lesion size since a sphere of 0.5 cc corresponds to 1 cm, which is the standard limit for cisPCa according to the Epstein criteria (2). Lee et al. determined that lesion size detected in mpMRI was an independent predictive factor for the presence of cisPCa (8).

The role of mpMRI in PCa management has been continuously increasing over the last decade. The European Urology Association guidelines recommend the use of mpMRI in various indications in patients who have not yet been diagnosed with PCa or before treatment in those who have been diagnosed with this cancer (9). In addition, the use of mpMRI has become more popular in the last decade to increase the detection of csPCa and reduce the number of complications associated with biopsy procedures (10, 11). In recent years, the PI-RADS scoring system, which was developed to standardize mpMRI findings among radiologists and clinicians, has been revised and updated to PI-RADS version 2 that involves diffusion-weighted imaging (DWI), T2-weighted imaging, and apparent diffusion coefficient (ADC) in high b-value (>1400) images (5).

In addition, in this scoring system, 15 mm lesion size was determined as the cut-off value in T2-weighted imaging and DWI in distinguishing between category 4 and 5 lesions (5). Rosenkrantz et al. reported that when they reduced the 15 mm size criterion to 10 mm, resulting in increasing PI-RADS score 4 to 5, they detected PCa in 33 (79%) of 42 cases and csPCa in 26 (62%) and suggested that the size limit in score 5 should be reduced to 10 mm for PI-RADS versions (12). In a study by Lee et al. including 188 patients, when the index lesion size cut-off value was taken as 10 mm, no difference was found between the groups in terms of the number of positive biopsy cores and clinical T-stage (8). However, in our study with a higher number of patients, we determined that the rate of positive cores, clinical T-stage, biopsy-ISUP grade, and PI-RADS scores were higher among the patients in Group B.

An mpMRI-targeted fusion biopsy is known to have a higher rate of detecting csPCa compared to the standard systematic TRUS biopsy, and the former also has higher upgrade rates in the Gleason score obtained from RP (13, 14). In our study, an mpMRI fusion biopsy was performed in all patients, and it was observed that the patients in both groups had similar rates (38.5 vs 37%) in terms of Gleason upgrade, and these rates were consistent with the literature (15).

According to the PCa risk classification models, the pathological stage in the RP specimen can be predicted by examining tumor size, localization and extension in mpMRI images. Studies on this subject have revealed that mpMRI not only provides anatomical tumor localization but also predicts pathological stage in the RP specimen (16, 17). In our study, when we took the lesion size cut-off value as 10 mm in the preoperative mpMRI in the patients who underwent RALP, there was no difference in the clinical T-stage of the patients, but we observed higher pathological T-stage in Group B. In contrast, Lee et al. determined no difference in pathological T-stage between the patients with a lesion size of less than or more than 10 mm (8).

In studies investigating the relationship between the PI-RADS index lesion size determined in mpMRI and the ISUP-Gleason grade, it has been reported that the ISUP grade was more advanced and the tumor progressed more aggressively in larger lesions. It has also been shown that increased lesion size and other factors had prognostic value for the course of the disease (18-20). Considering these factors, it has been suggested that mpMRI has a potential role in risk classification before definitive treatment in patients with PCa (21). EPE, SVI, LNM, and SM are important oncological prognostic markers in histopathological evaluation after RP (22, 23). Considering these oncological prognostic markers, mpMRI can help plan surgical treatment, preserve the neurovascular bundle, and reduce the rate of positive SMs (24). Drovak et al. showed that when the maximal tumor lesion size was 13 mm and above, the positivity of SM was significantly higher (25). Tonttila et al., investigating the relationship between lesion size in mpMRI and the pathology of the RP specimen, found higher EPE, SVI and LNM rates and higher ISUP grades in patients with lesions larger than 15 mm (26). In our study, we observed that the index lesion size being >10 mm was an independent predictive factor for EPE and SM positivity.

In the PAIREDCAP study, the PCa detection rates based on PI-RADS scores determined according to the index lesion size were evaluated and the effect of lesion size on PCa detection was emphasized. That study provided guidance in determining the treatment protocol according to lesion size (27). Related to this, Lee et al. stated that if the lesion size measured in mpMRI was over 10 mm, there was a much higher possibility of csPCa, and these patients were not suitable for active surveillance (AS). They found that among the patients with PCa who were suitable for AS, there was a significant rate of Gleason upgrade according to the prostatectomy pathology those with a MRI-DWI lesion diameter of >10 mm. Thus, the authors suggested that patients with a lesion larger than 10 mm were not suitable for AS (8). Similarly, in our study, we found an increased probability of having csPCa among the patients with a lesion size of over 10 mm. Ozden et al. reported that the rate of csPCa detection increased in patients with an mpMRI lesion size of >10 mm among those who underwent a cognitive-targeted biopsy (7). Considering these findings, our study supports the literature and can shed light on future studies to revise the 15 mm criterion used for the differentiation of PI-RADS 4 and 5 categories. This study has several strengths, including all biopsies being in the form of fusion biopsies performed by a single experienced radiologist, RALP being performed by two specialist urologists, and histopathological evaluation being undertaken by a single uropathologist. The

use of fusion biopsy combined with systematic biopsy in all patients reduced the possibility of overlooking csPCa in patients with large prostate volumes. The limitations of the study include the retrospective design and the low rate of RALP in our cohort.

CONCLUSION

The radiologists and clinicians should be awared of the possibility of presence of features that may affect local staging, such as EPE positivity, in the presence of lesions larger than 10 mm in which prostate cancer is detected. For index lesion size, 10 mm was determined as a cut-off value for the prediction of the positivity of SM and EPE, which are prognostic factors affecting survival after RP. However, the results obtained from our study need to be supported by prospective studies with a higher number of patients.

Take Home Messages:

- There is a relationship between index lesion size and PCa aggressiveness.

- There is a relationship between index lesion size and SM and EPE positivity, which are prognostic factors affecting survival after RP.

- When we take the cut-off value of the index lesion size as 10 mm in MpMRI, the clinical and histopathologically higher PCa aggressiveness in lesions above 10 mm.

Compliance with ethical standards

Conflict of interest

The authors declare to have no conflict of interest.

Research involving human participants

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Patients have given prior consent.

Table 1: Clinical characteristics of the study groups

Variables	
Age, years	63.9 ± 7.9
PSA, ng/dL	6.49 (4.7-9.5)
Prostate volume, ml	45 (33-62.5)
PSAD, ng/dl/ml	0.14 (0.10-0.23)
Biopsy results, n(%) Benign PCa	121 (41.7) 169 (58.3)
PI-RADS score, n (%)	
II	17 (5.9)
III	77 (26.6)
IV	165 (56.9)
V	31 (10.7)
MRI lesion size, mm	9.5 (7-13)
Clinical T-stage	
T1c	240 (82.8)
T2	40 (13.8)
T3	10 (3.4)
ISUP grade, n(%)	
I	65 (22.4)

Variables	
II	51 (17.6)
III	34 (11.7)
IV	13 (4.5)
V	6 (2.1)
RP, n(%)	53 (18.3)
Pathological T-stage, n(%) T2a T2b T2c T3a T3b	9 (17.0) 5 (7.5) 19 (35.8) 17 (32.1) 4 (7.5)
EPE, n (%)	22 (41.5)
SM, n (%)	16 (30.1)
SVI, n (%)	4 (7.5)
Lymph node metastasis, n (%)	1 (1.9)

PSA: Prostate-specific antigen; PSAD: Prostate-specific antigen density; PI-RADS: Prostate Imaging Reporting and Data System; MRI: Magnetic resonance imaging; ISUP: International Society of Urological Pathology; RP: Radical prostatectomy; EPE: Extraprostatic extension; SM: Surgical margin; SVI: Seminal vesicle invasion

Table 2: Clinical characteristic of the study groups according to the multiparametric magnetic resonance imaging lesion size

	mpMRI lesion size	mpMRI lesion size	p value
Variables	<10 mm (n = 144)	[?]10 mm (n = 146)	
Age, years	63.3 ± 7.7	64.7 ± 8.1	0.137
PSA, ng/dL	6 (4.6-9.2)	6.9 (4.8-9.8)	0.078
PSAD, ng/dl/ml	0.13 (0.00-0.21)	0.16 (0.11-0.28)	**0.012**
Prostate volume, ml	48 (35-63)	45 (30-61.25)	0.195
MRI lesion size, mm	7 (6-8)	13 (11-16.25)	**<0.001**
Number of positive cores	2 (1-5)	4 (1-7)	**0.007**
Biopsy results Benign PCa	74 (51.4) [a] 70 (48.6) [a]	47 (32.2) [b] 99 (67.8) [b]	**0.001**#
PI-RADS score, n (%)			**<0.001**#
II	8 (5.6) [a]	9 (6.2) [a]	
III	50 (34.7) [a]	27 (18.5) [b]	
IV	85 (59.0) [a]	80 (54.8) [a]	
V	1 (0.7) [a]	30 (20.5) [b]	
Clinical T-stage			**<0.001**#
T1c	132 (91.7) [a]	108 (74.0) [b]	
T2	10 (6.9) [a]	30 (20.5) [b]	
T3	2 (1.4) [a]	8 (5.5) [a]	
Biopsy-ISUP grade, n(%)			**<0.001**#
Benign	74 (51.4) [a]	47 (32.2) [b]	
I	38 (26.4)[a]	27 (18.5) [a]	
II	21 (14.6) [a]	30 (20.5) [a]	
III	8 (5.6) [a]	26 (17.8) [b]	
IV	3 (2.1) [a]	10 (6.8) [b]	
V	0[a]	6 (4.1) [b]	
Disease significance, n (%)			**<0.001**#

	mpMRI lesion size	mpMRI lesion size	p value
No PCa	74 (51.4) [a]	47 (32.2) [b]	
Clinically insignificant	14 (9.7) [a]	8 (5.5) [a]	
Clinically significant	56 (38.9) [a]	91 (62.3) [b]	

[#] Pearson's chi-square test; PSA: Prostate-specific antigen; PSAD: Prostate-specific antigen density; MRI: Magnetic resonance imaging; PI-RADS: Prostate Imaging Reporting and Data System; ISUP: International Society of Urological Pathology

Table 3: Clinical data and pathological results of patients that underwent radical prostatectomy

Variables	MRI lesion size	MRI lesion size	p value
	<10 mm (n = 26)	[?]10 mm (n = 27)	
Preoperative clinical T-stage, n (%) T1c T2 T3	21 (80.8) 4 (15.4) 1 (3.8)	21 (77.8) 6 (22.2) 0	0.728 ^
Pathological T-stage, n (%) T2 T3	21 (80.8)[a] 5 (19.2) [a]	11 (40.7) [b] 16 (59.3) [b]	**0.003** [#]
Biopsy-ISUP grade, n (%)			0.919 ^
I	10 (38.5)	9 (33.3)	
II	11 (42.3)	12 (48.1)	
III	4 (15.4)	4 (11.1)	
IV	1 (3.8)	2 (7.4)	
RP-ISUP grade, n (%)			0.313 ^
I	3 (11.5)	5 (18.5)	
II	15 (57.7)	10 (37.0)	
III	8 (30.8)	10 (37.0)	
IV	0	2 (7.4)	
Gleason upgrade, n (%) csPCa	10 (38.5)	10 (37.0)	0.915 [#]
EPE, n (%)	5 (19.2)	17 (63.0)	**0.001** [#]
SM, n (%)	3 (11.5)	13 (48.1)	**0.004** [#]
SVI, n (%)	1 (3.8)	3 (11.1)	0.610 ^
Lymph node metastases, n(%)	0	1 (3.7)	1.000 ^

[#] Pearson's chi-square test ^Fisher's exact test

MRI: Magnetic resonance imaging; ISUP: International Society of Urological Pathology; csPCa: Clinically significant prostate cancer; EPE: Extraprostatic extension; SM: Surgical margin; SVI: Seminal vesicle invasion

Table 4: Results of the logistic regression analysis of parameters associated with EPE and SM positivity in patients that underwent radical prostatectomy

	Univariate	Univariate	Univariate	Multivariate	Multivariate	Multivariate
	OR	95% CI	p value	OR	95% CI	p value

	Univariate	Univariate	Univariate	Multivariate	Multivariate	Multivariate
EPE*						
MRI lesion size (Cat.)						
<10 mm	ref			ref		?>?
10 mm	7.140	2.047-24.909	**0.002**	6.600	1.770-24.612	**0.005**
MRI lesion size (scale)	1.076	0.965-1.201	0.188			
SM +**						
MRI lesion size (Cat.)						
<10 mm	ref			ref		?>?
10 mm	7.119	1.720-29.463	**0.007**	8.432	1.758-40.443	**0.008**
MRI lesion size (scale)	1.105	0.985-1.240	0.089			
Biopsy-ISUP grade, n (%)						
I	ref			ref		
II	4.400	1.095-17.676	**0.037**	4.635	0.966-22.240	0.055?>?
III	0.333	0.033-3.377	0.352	0.284	0.025-3.177	0.307

*Age, PSA, PSAD, biopsy-ISUP grade, number of positive cores, and clinical T-stage

**Age, PSA, PSAD, PI-RADS, Bx-ISUP grade, number of positive cores, clinical T-stage, and Damigo risk group

EPE: Extraprostatic extension; Cat: Categorical; SM: Surgical margin; ISUP: International Society of Urological Pathology

Legends:

Table 1: Clinical characteristic of the study groups

Table 2: Clinical characteristic of the study groups according to the multiparametric magnetic resonance imaging lesion size

Table 3: Clinical data and pathological results of patients that underwent radical prostatectomy

Table 4: Results of the logistic regression analysis of parameters associated with extraprostatic extension and surgical margin positivity in patients that underwent radical prostatectomy

Figure 1: There are T2 weighted images of a patient with history of high PSA values (4,8 ng/mL). There is a lesion on left peripheral zone which is hypointens on axial T2 weighted image (Fig. 1a) and showing diffusion restiriction (Fig. 1b-c) and early arterial enhancement (Fig 1d). The lesion was reported as PIRADS 5 and largest dimension of lesion was delineated and measured better on coronal T2 sequence (Fig. 1e) than saggital (Fig. 1f) and axial (Fig. 1a) T2 weighted images. After biyopsy, the histopathological result was Gleason 4+5.

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