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Сравнение мультипараметрического и бипараметрического протоколов магнитно-резонансной томографии для выявления рака предстательной железы рентгенологами с различным опытом

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АННОТАЦИЯ

Обоснование. Проведение магнитно-резонансной томографии позволяет выявить клинически значимый рак предстательной железы, диагностировать экстракапсулярную экстензию, стадировать онкологический процесс. Протокол сканирования, включающий только T2-взвешенные и диффузионно-взвешенные изображения, представляет собой жизнеспособную альтернативу мультипараметрической магнитно-резонансной томографии при условии сохранения высокой диагностической точности теста. В недавних исследованиях диагностическая точность бипараметрической и мультипараметрической магнитно-резонансной томографии в выявлении рака предстательной железы продемонстрировала незначительные различия.

Цель — сравнение диагностической точности бипараметрической и мультипараметрической магнитно-резонансной томографии для выявления клинически значимого рака предстательной железы по системе PI-RADS v2.1 с использованием мультифокальной биопсии под контролем магнитно-резонансной томографии в качестве золотого стандарта.

Материалы и методы. Данное исследование является ретроспективным. Мы изначально обработали записи историй болезни 126 пациентов. Критериями включения в исследование были наличие мультипараметрической магнитно-резонансной томографии по стандарту PI-RADS 2.1, клинической информации об уровнях свободного и связанного простатспецифического антигена крови, мультифокальной биопсии предстательной железы при соблюдении временного интервала между магнитно-резонансной томографией и биопсией не более 14 дней. Три исследователя (врачи-рентгенологи с опытом работы менее 2 лет, от 2 до 5 лет, более 5 лет соответственно) независимо друг от друга оценивали бипараметрическую магнитно-резонансную томографию предстательной железы на предмет наличия патологических очагов. Спустя 2 недели исследователи оценивали датасет мультипараметрической магнитно-резонансной томографии предстательной железы. Каждый выявленный очаг, начиная с категории PI-RADS 3, сопоставлялся с результатом мультифокальной фьюжн-биопсии. Результат биопсии представлялся в виде суммы значений по шкале Gleason, при этом к клинически значимым данным биопсии относилась сумма Gleason 7 и выше. Опухолевыми очагами по данным магнитно-резонансной томографии считались находки, соответствующие критериям PI-RADS 4 и 5.

Результаты. Наилучшие показатели чувствительности и специфичности выявления очагов на магнитно-резонансной томографии предстательной железы — 62,5 и 74,6% соответственно. Наивысшая достигнутая диагностическая точность составила 70,1%. Мультипараметрическая магнитно-резонансная томография обладает более высокими показателями специфичности выявления очагов предстательной железы при интерпретации рентгенологами с опытом работы менее 2 лет и более 5 лет.

Заключение. Как бипараметрическая, так и мультипараметрическая магнитно-резонансная томография предстательной железы продемонстрировала неоптимальные показатели диагностической точности. Имеется тенденция к улучшению чувствительности и специфичности метода с увеличением опыта работы рентгенолога. Бипараметрические протоколы сканирования предстательной железы имеют безусловное экономическое преимущество перед мультипараметрическими за счёт отсутствия расходов на контрастное вещество и расходные материалы и значительного снижения времени загрузки МРТ-сканера, однако их использование может привести к снижению диагностической точности метода.

Ключевые слова: магнитно-резонансная томография; МРТ; рак предстательной железы, PI-RADS.

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Comparison of multiparametric and biparametric magnetic resonance imaging protocols for prostate cancer diagnosis by radiologists with different experience

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ABSTRACT

BACKGROUND: Magnetic resonance imaging can detect clinically significant prostate cancer and diagnose extracapsular extension and cancer stage. A scanning protocol that includes only T2-weighted and diffusion-weighted images represents a viable alternative to multiparametric magnetic resonance imaging provided that the high diagnostic accuracy of the test is maintained. In recent studies, biparametric and multiparametric magnetic resonance imaging demonstrated slight differences in the diagnostic accuracy in detecting prostate cancer.

AIM: To compare the diagnostic accuracy of biparametric and multiparametric magnetic resonance imaging for the detection of clinically significant prostate cancer using PI-RADS v2.1 with magnetic resonance imaging-guided multifocal biopsy as the gold standard.

MATERIALS AND METHODS: This retrospective study initially processed the medical records of 126 patients. The inclusion criteria were as follows: presence of PI-RADS 2.1 multiparametric magnetic resonance imaging, clinical information on free and bound prostate-specific antigen blood levels, a multifocal prostate biopsy performed, and a time interval between magnetic resonance imaging and biopsy of no more than 14 days. Three investigators (radiologists with <2, 2–5, and >5 years of experience) independently evaluated biparametric magnetic resonance imaging of the prostate for the presence of pathological foci. After 2 weeks, the researchers evaluated the multiparametric magnetic resonance imaging dataset of the prostate. Each lesion detected, starting from PI-RADS category 3, was compared with the result of a multifocal fusion biopsy. The biopsy result was presented as a sum of Gleason scores, and a Gleason score of ⩾7 was considered clinically relevant. According to magnetic resonance imaging data, findings meeting PI-RADS criteria 4 and 5 were considered tumor foci.

RESULTS: The best values of sensitivity and specificity of foci detection on magnetic resonance imaging of the prostate gland were 62.5% and 74.6%, respectively. The highest diagnostic accuracy achieved was 70.1%. Magnetic resonance imaging had higher specificity rates for detecting prostatic foci when interpreted by radiologists with 2 years and >5 years of experience.

CONCLUSION: Both biparametric and multiparametric magnetic resonance imaging of the prostate demonstrated suboptimal diagnostic accuracy. The sensitivity and specificity of the method tended to improve with increasing experience of the radiologist. Biparametric protocols of prostate scanning have a definite economic advantage over multiparametric protocols because of the absence of contrast agents and consumables and a significant decrease in magnetic resonance scanner loading time; however, their use can lead to a decrease in the diagnostic accuracy of the method.

Keywords: magnetic resonance imaging; MRI; prostate cancer; PI-RADS.

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比较具有不同经验的放射科医生检测前列腺癌的多参数和双参数磁共振成像协议

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简评

论证。磁共振成像（MRI）允许发现有临床意义的前列腺癌、诊断囊外扩展并对癌症发展进行分期。如果扫描协议仅包括T2加权和弥散加权图像，只要检查的诊断准确度保持较高水平，其就能很好地替代多参数磁共振成像。在最近的研究中，双参数（bpMRI）和多参数（mpMRI）磁共振成像在检测前列腺癌方面的诊断准确度差别不大。

该研究的目的是比较bpMRI和mpMRI在检测有临床意义的前列腺癌方面的诊断准确度。比较是根据PI-RADS v2.1系统进行的，以MRI引导下的多点活检为金标准。

材料和方法。本研究是一项回顾性研究。我们初步处理了126名患者的病史。纳入标准为：（1）符合PI-RADS 2.1标准的mpMRI；（2）血液中游离和结合前列腺特异性抗原水平的临床信息；（3）前列腺多点活检。磁共振成像与活检之间的时间间隔不超过14天。研究由三名放射科医生进行。医生的工作经验分别为2年以下、2至5年和5年以上。这些医生（研究人员）独立评估前列腺bpmRI 是否存在病灶。2周后，研究人员（这些医生）对前列腺mpMRI 数据集进行了评估。从PI-RADS 3类别开始，将发现的每个病灶与多点融合活检结果进行了比较。活检结果显示为Gleason评分值的总和。Gleason评分7分或更高被认为是有临床意义的活检结果。磁共振成像显示的肿瘤灶被认为是符合PI-RADS标准4和5的结果。

结果。前列腺磁共振成像检测病灶的最佳灵敏度和特异度分别为62.5%和74.6%。诊断准确率最高达到70.1%。由工作经验少于2年和多于5年的放射科医生进行mpMRI解读时，前列腺病灶检测的特异度更高。

结论。前列腺的bpMRI和mpMRI都显示出不理想的诊断准确度。随着放射科医生经验的增加，该方法的灵敏度和特异度有提高的趋势。与多参数协议相比，双参数前列腺扫描协议具有明显的经济优势。这种优势是不需要造影剂和消耗品的费用，并大大减少磁共振扫描仪的装载时间。不过，使用这种方法可能会降低诊断准确度。

关键词：磁共振成像；MRI；前列腺癌；PI-RADS。

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List of Abbreviations

DWI: diffusion-weighted imaging
DCE: dynamic contrast enhancement
MRI: magnetic resonance imaging
bpMRI: biparametric magnetic resonance imaging
mpMRI: multiparametric magnetic resonance imaging
T2WI: T2-weighted imaging
SS-EPI: single-shot echo planar imaging
TSE: turbo-spin echo

BACKGROUND

Multiparametric magnetic resonance imaging (mpMRI), which includes T2-weighted imaging (T2WI), diffusion-weighted imaging (DWI), and dynamic contrast enhancement (DCE) sequences, is critical in the clinical assessment of patients with high prostate-specific antigen (PSA) levels.

MRI can be used to diagnose clinically significant prostate cancer, detect extracapsular extension, and determine the disease stage. In 2019, the American College of Radiology and the European Association of Urology (European Symposium on Urogenital Radiology, ESUR) released the Prostate Imaging Reporting and Data System, version 2.1 (PI-RADS v2.1) for standardizing MRI data acquisition and image interpretation [1].

Since 2020, the American Urological Association and European Association of Urology have recommended the use of mpMRI for biopsy-naïve men who were suspected of prostate cancer [2, 3]. A clinical study by O. Rouvière et al. [3] showed that 27% of men with high PSA levels could avoid an unnecessary biopsy using mpMRI. Since most men undergo PSA testing at least once in their lifetime, these guidelines have resulted in a marked increase in demand for prostate MRI.

Assigning a PI-RADS assessment category relegates the use of DCE imaging to a minor role because it is only used for the differential diagnosis between PI-RADS 3 and 4 lesions in the peripheral zone. In addition, the use of DCE poses a risk of nephrogenic systemic fibrosis in patients with renal insufficiency. Therefore, interest in parametric MRI (bpMRI) is growing, which is an abbreviated prostate MRI protocol that excludes DCE imaging [4–6].

Owing to its high diagnostic accuracy, the bpMRI protocol, a combination of T2WI and DWI sequences, is emerging as a viable alternative to mpMRI [7]. Recent studies have shown minor differences in the diagnostic accuracy between bpMRI and mpMRI for detecting prostate cancer [6]. Efforts to create a bpMRI protocol have been successful in demonstrating intensity nonuniformity, resolution, and nonlinearity comparable to those of mpMRI [8].

The growing interest in bpMRI has encouraged the PI-RADS Steering Committee to issue a consensus statement calling for a higher-quality data before making evidence-based recommendations on bpMRI as an initial diagnostic work-up [9].

The aim of this study was to compare the diagnostic accuracy of bpMRI with that of mpMRI in detecting clinically significant prostate cancer based on PI-RADS v2.1 using targeted MRI/transrectal ultrasound (TRUS) fusion-guided prostate biopsy (number of points) as the gold standard.

The objectives of this study were to identify the sensitivity and specificity of mpMRI in comparison with bpMRI in diagnosing clinically significant prostate cancer (PI-RADS ≥4). In addition, the study compared the sensitivity and specificity of mpMRI with those of bpMRI images assessed by radiologists with different levels of experience. Finally, the interobserver agreement between radiologists with different levels of experience in assessing mpMRI and bpMRI images was evaluated.

MATERIALS AND METHODS

Study Design

This was an observational, single-center, retrospective extrapolation study.

Eligibility Criteria

Inclusion criteria: availability of a PI-RADS 2.1 mpMRI scan, clinical laboratory values of blood-free and bound PSA levels, and targeted MRI/TRUS fusion biopsy. Biopsy must be performed within 14 days after MRI.

Noninclusion criteria: image artifacts on the prostate MRI scan or MR images not compliant with PI-RADS 2.1, absence of one or more clinical markers, and a time interval between mpMRI and biopsy of >14 days.

Exclusion criteria: significant mpMRI artifacts, which precluded an adequate assessment, and uninformative biopsies.

Following the above criteria, radiologists with <2 years or >5 years of experience excluded 19 patients from the sample, whereas those with 2–5 years of experience excluded 23 patients.

Study Site

Patients who underwent prostate MRI and TRUS fusion biopsy were recruited from the European Medical Center (a private medical institution).

Study Duration

The study analyzed electronic medical records from January 1, 2022, to June 1, 2022.

Medical Intervention

The medical records of 126 patients were analyzed. Prostate mpMRI was performed using a Siemens Magnetom Aera 1.5T 4G (Germany) with a body coil. The scanning protocol included the following set of pulse sequences (Table 1). After unloading and anonymization, several DCE images were removed from the mpMRI sequences, resulting in a dataset of bpMRI sequences. Three investigators (radiologists with <2 years of experience, 2 –5 years of experience, and >5 years of experience) independently evaluated prostate bpMRI sequences for pathological lesions. The lesion was assigned a score from 1 to 5 (as instructed in PI-RADS v2.1, DWI was used for peripheral zone lesions, and T2WI for transition zone lesions); then, an overall prostate PI-RADS v2.1 score was determined. The reference method was prostate histopathology based on targeted MRI/TRUS fusion biopsy.

After 2 weeks, the investigators evaluated the prostate mpMRI dataset, which included a series of dynamic contrast enhancement images. MRI interpretation was conducted by investigators who were blinded to the biopsy results. According to PI-RADS 2.1 [1], early contrast enhancement allows for reliable differentiation between PI-RADS 3 and 4 lesions localized in the peripheral zone.

Primary Outcome

The prostate lesion identified by bpMRT or mpMRI should be consistent with the histopathological findings.

Outcome Reporting Method

The identified lesions were tabulated, specifying their zonal location based on the PI-RADS 2.1 sector map. The central zone and anterior fibromuscular stroma were excluded from the assessment.

Each identified lesion of PI-RADS ⩾3 was compared with the findings of targeted MRI/TRUS fusion biopsy. MRI/TRUS fusion biopsy overlays a prostate ultrasound on the saved prostate MR images (typically, axial T2WI). The biopsy sites were targeted and tracked on the obtained three-dimensional reconstruction of the prostate.

The biopsy findings were presented as the total Gleason score [10]. A total Gleason score of ⩾7 is considered clinically significant. PI-RADS 4 and 5 MR images were consistent with malignant lesions.

Ethics Review

This study was approved by the Local Ethics Committee of the European Medical Center (Minutes of the Meeting No. 1 of April 24, 2023).

Statistical Analysis

For each dataset, the experts separately calculated the diagnostic power parameters, including the Youden index. Interobserver agreement between radiologists was estimated as percentages and Fleiss kappa.

Calculations were performed using R software version 4.1.3[1] using irr[2] and dpyr packages[3].

RESULTS

Study Subjects (Participants)

Radiologists with <2 and >5 years of experience analyzed a total of 107 patient datasets, whereas radiologists with 2–5 years of experience analyzed 103 patient datasets.

Key Findings

The highest sensitivity and specificity of bpMRI for detecting pathological lesions in the prostate were 70.0% and 67.2%, respectively. The highest sensitivity and specificity of mpMRI for detecting pathological lesions in the prostate were 62.5% and 74.6%, respectively. No adverse events were reported.

Table 1. Prostate multiparametric magnetic resonance imaging protocol

Pulse sequence	Slice orientation	TE/TR, ms	FOV, mm	Pixel size, mm	Slice thickness/ overlap, mm	Estimated scanning time, min
T2WI TSE	Sagittal	120/3800	250 × 250	1 × 1	3/0.3	2:26
T2WI TSE	Axial	110/3938	180 × 180	0.45 × 0.6	2.5/0	3:33
DWI SS-EPI	Axial	87/2425	160 × 160	1.25 × 1.32	3/0.3	6:50
T2WI TSE	Coronal	110/2500	160 × 160	0.38 × 0.42	2.5/0	4:50
DCE-T1WI, temporal resolution of 15 s	Axial	2.3/4.6	250 × 250	0.9 × 1	3/0	5:46
CE-T1WI	Axial	1.3/2.3	400 × 350	1.6 × 1.7	4/0	0:21

Notes. CE, contrast enhancement; DCE, dynamic contrast enhancement.

[1] R Project for Statistical Computing. Available at: https://www.r-project.org/.

[2] irr: Various coefficients of interrater reliability and agreement. Available at: https://cran.r-project.org/web/packages/irr/index.html.

[3] dplyr: Grammar of data manipulation. Available at: https://github.com/tidyverse/dplyr.

The number of prostate lesions detected by radiologists with different levels of experience is presented in Table 2. The diagnostic accuracy of the radiologists is presented in Tables 3 and 4 for the bpMRI and mpMRI sequences, respectively. The interobserver agreement values are shown in Tables 5 (unit fractions) and 6 (Fleiss kappa).

DISCUSSION

Summary of the Key Findings

The main finding of our study is that the diagnostic power of prostate MRI is low. The maximum diagnostic accuracy for lesion detection was 70.1%, with a sensitivity of ⩽62.5% and specificity of ⩽74.6%. Based on the obtained values, MRI cannot be considered a reliable method for early diagnosis because of its suboptimal sensitivity (Fig. 1).

This study also showed that mpMRI improved the diagnostic power of the method by increasing specificity. This is true when interpreted by radiologists with <2 (77.6% with mpMRI vs. 70.2% with bpMRI) and >5 years (74.6% with mpMRI vs. 67.2% with bpMRI) of experience.

Discussion of the Key Findings

The results obtained are consistent with those published in the scientific literature worldwide. J. Wallström et al. [6] reported that the mpMRI scan identified one additional case compared with the bpMRI (84 vs. 83 cases, respectively). In a retrospective study by C.K. Kuhl et al. [7], mpMRI detected an additional 10 out of a total of 329 cancers. In a prospective study by J.P. Zawaideh et al. [11], bpMRI identified 116 cases, whereas mpMRI identified 117 cases. In meta-analyses, Z. Kang [12] and X.K. Niu [13] reported similar diagnostic accuracy of bpMRI and mpMRI in detecting prostate cancer.

Our findings are inconsistent with those of the classical PROMIS study [14], which demonstrated high sensitivity (93%) but low specificity (41%) of MRI. However, this study considered PI-RADS 3 lesions to be positive MRI results. The histological criteria for clinically significant prostate cancer differed because Gleason 3 + 4 lesions were excluded. The suboptimal diagnostic accuracy of MRI may be due to the abnormal distribution of normal cases and pathologies in our sample.

The main difference in mpMRI is the inclusion of DCE in the scanning protocol. This study demonstrates that DCE enhances the specificity of detecting prostate lesions by radiologists with <2 years and those with >5 years of experience (Tables 2 and 3; Fig. 2). However, radiologists with 2–5 years of background paradoxically experienced a decrease in specificity when evaluating the mpMRI datasets.

DCE imaging in prostate mpMRI has traditionally been limited by longer image acquisition times. This includes the time-consuming procedure of contrast administration, which involves preparing for the injection by catheterizing the patient. Longer analysis times for DCE images and

Table 2. Absolute and relative number of prostate lesions detected by radiologists with different levels of experience, *n* (%)

Level of experience, years	Protocol	True positive	True negative	False-positive	False negative
<2	bpMRI	19 (17.8)	47 (43.9)	20 (18.7)	21 (19.6)
	mpMRI	19 (17.8)	52 (48.6)	15 (14.0)	21 (19.6)
2–5	bpMRI	31 (29.8)	23 (22.1)	42 (40.4)	8 (7.7)
	mpMRI	32 (30.8)	19 (18.3)	46 (44.2)	7 (6.7)
⩾5	bpMRI	28 (26.2)	45 (42.1)	22 (20.6)	12 (11.2)
	mpMRI	25 (23.4)	50 (46.7)	17 (15.9)	15 (14.0)

Notes. bpMRI/mpMRI, biparametric/multiparametric magnetic resonance imaging.

Table 3. Comparison of the PI-RADS 2.1 diagnostic criteria for prostate lesions using biparametric magnetic resonance imaging by radiologists with different levels of experience

Level of experience, years	Sensitivity	Specificity	Accuracy	Prognostic value		Youden index
				Positive	Negative	
<2	47.5 (31.5–63.9)	70.2 (57.7–80.7)	61.7 (51.8–70.9)	48.7 (36.8–60.8)	69.1 (61.6–75.8)	0.177
2–5	79.5 (63.5–90.7)	35.4 (23.9–48.2)	51.9 (41.9–61.8)	42.5 (36.7–48.4)	74.2 (58.8–85.3)	0.149
⩾5	70.0 (53.5–83.4)	67.2 (54.6–78.2)	68.2 (58.5–76.9)	56.0 (46.1–65.5)	79.0 (69.4–86.1)	0.372

Notes. The values are presented as the median (Me) and 95% confidence interval (95% CI).

Table 4. Comparison of the PI-RADS 2.1 diagnostic criteria for prostate lesions using multiparametric magnetic resonance imaging by radiologists with different levels of experience

Level of experience, years	Sensitivity	Specificity	Accuracy	Prognostic value		Youden index
				Positive	Negative	
<2	47.5 (31.5–63.9)	77.6 (65.8–86.9)	66.4 (56.6–75.2)	37.4 (28.2–47.3)	55.9 (42.2–68.8)	0.251
2–5	82.1 (66.5–92.5)	28.2 (18.6–41.8)	49.0 (39.1–59.0)	41.0 (35.9–46.3)	73.1 (55.7–85.4)	0.113
⩾5	62.5 (45.8–77.3)	74.6 (62.5–84.5)	70.1 (60.5–78.6)	59.5 (47.8–70.3)	76.9 (68.6–83.6)	0.371

Notes. The values are presented as the median (Me) and 95% confidence interval (95% CI).

Table 5. Interobserver agreement between radiologists (unit fractions)

Protocol / Level of experience	bpMRI, <2 years	mpMRI, <2 years	bpMRI, >5 years	mpMRI, >5 years	bpMRI, 2–5 years	mpMRI, 2–5 years
bpMRI, <2 years	1	0.798	0.558	0.673	0.413	0.356
mpMRI, <2 years		1	0.654	0.817	0.356	0.298
bpMRI, >5 years			1	0.808	0.442	0.452
mpMRI, >5 years				1	0.413	0.357
bpMRI, 2–5 years					1	0.904
mpMRI, 2–5 years						1

Notes. bpMRI/mpMRI: biparametric/multiparametric magnetic resonance imaging.

Table 6. Interobserver Agreement Between Radiologists (Fleiss's kappa)

Protocol / Level of experience	bpMRI, <2 years	mpMRI, <2 years	bpMRI, >5 years	mpMRI, >5 years	bpMRI, 2–5 years	mpMRI, 2–5 years
bpMRI, <2 years	1	0.669	0.318	0.482	0.195	0.136
mpMRI, <2 years		1	0.446	0.693	0.129	0.087
bpMRI, >5 years			1	0.699	0.206	0.229
mpMRI, >5 years				1	0.194	0.165
bpMRI, 2–5 years					1	0.846
mpMRI, 2–5 years						1

Notes. bpMRI/mpMRI, biparametric/multiparametric magnetic resonance imaging.

higher software requirements are also important factors. However, DCE helped increase the diagnostic accuracy (66.4% vs. 61.7% for a radiologist with <2 years of experience and 70.1% vs. 68.2% for a radiologist with >5 years of experience).

The use of bpMRI is also supported by concerns over the long-term safety of gadolinium-based contrast agents. Small amounts of gadolinium may be retained in the brain and other tissues. Although newer macrocyclic contrast agents have not been reported to cause adverse effects in clinical practice for patients with normal renal function, MRI contrast agents should be used only when they provide significant diagnostic value [15], as demonstrated in this study.

As previously mentioned, DCE as part of mpMRI is used to distinguish between PI-RADS 3 and 4 lesions located in the peripheral zone of the prostate. Based on the Epstein criteria, a clinically insignificant cancer is defined as a Gleason score of ⩽6, being organ-limited (TNM stage of <T3), and having a volume of <0.5 cm^3, which must be confirmed histopathologically [16]. The same definition was used in

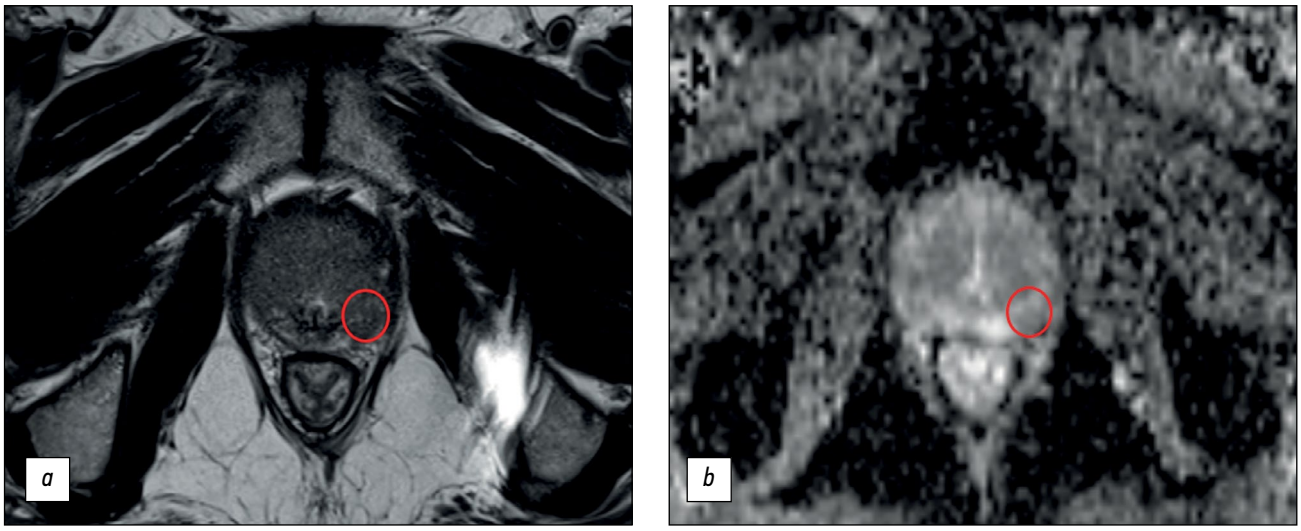

Fig. 1. An example of a false-positive result of parametric magnetic resonance imaging: (*a*) T2-weighted image in the axial plane: in the lateral posterior segment of the peripheral zone of the left lobe in the middle part of the prostate, a low-signal lesion consistent with the diffusion restriction zone is observed; (*b*) apparent diffusion coefficient map. This lesion was judged by the radiologist as PI-RADS 5. Fusion biopsy showed no signs of tumor growth in the prostate tissue.

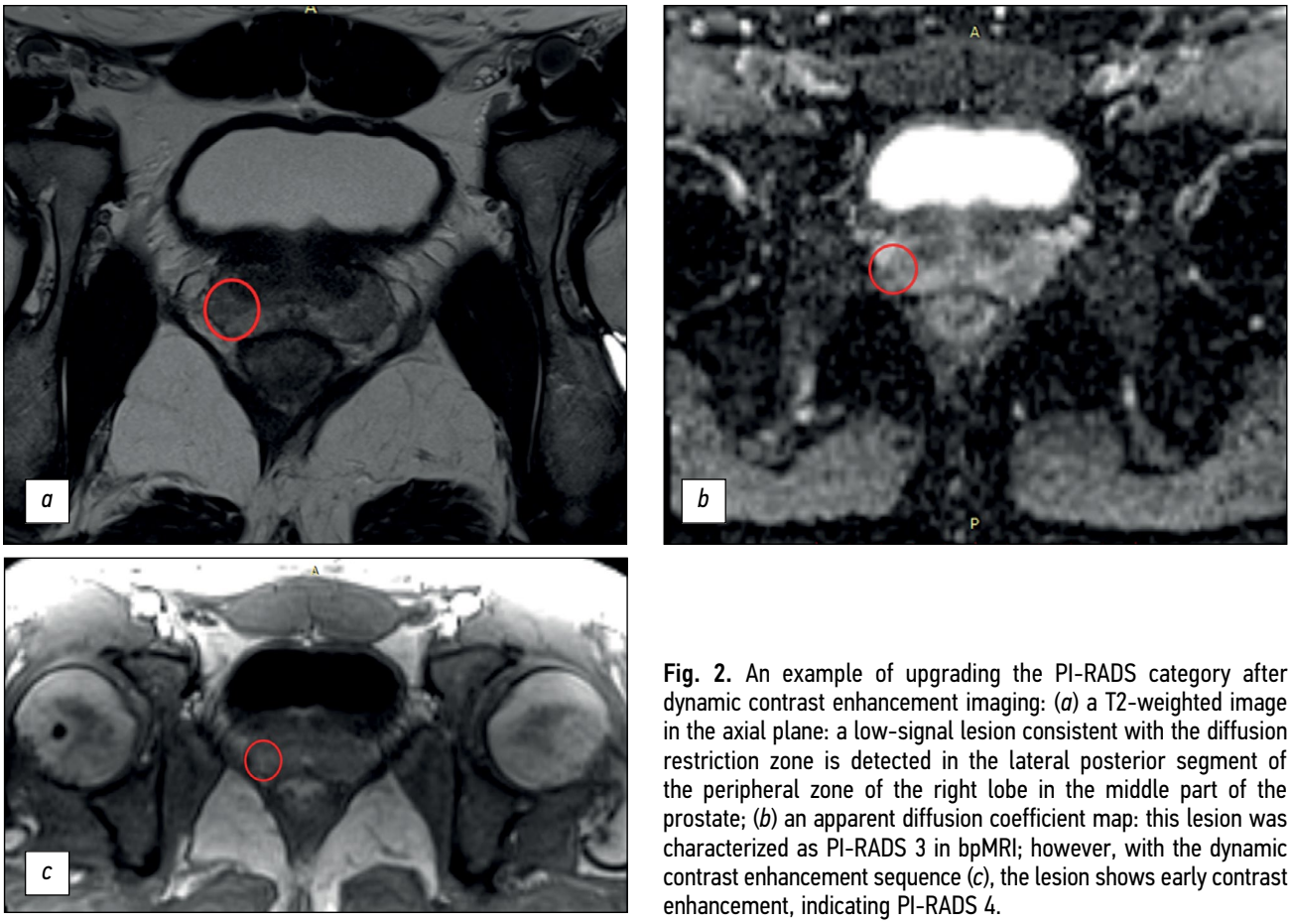

Fig. 2. An example of upgrading the PI-RADS category after dynamic contrast enhancement imaging: (*a*) a T2-weighted image in the axial plane: a low-signal lesion consistent with the diffusion restriction zone is detected in the lateral posterior segment of the peripheral zone of the right lobe in the middle part of the prostate; (*b*) an apparent diffusion coefficient map: this lesion was characterized as PI-RADS 3 in bpMRI; however, with the dynamic contrast enhancement sequence (*c*), the lesion shows early contrast enhancement, indicating PI-RADS 4.

PI-RADS v2.1 [1]. Identifying clinically insignificant tumors is crucial for active follow-up.

This study differs from those by the authors mentioned above [6, 7] in that it reports a decrease in the number of false-positive prostate tumors with DCE. As a result, this method had a higher positive prognostic value. J.P. Zawaideh et al. [11] obtained similar results.

If a lesion of the PI-RADS ⩾3 is detected, DCE will not alter the approach to scheduling a prostate biopsy. It is important to consider that transrectal biopsy is an invasive

procedure that carries the risk of infection and requires hospitalization [17].

Limitations

This study has significant limitations. The retrospective design of the study required the selection of patients who underwent fusion biopsy. Therefore, the distribution of normal cases and pathologies in our sample did not correlate with that of the general population. Sequential viewing of both bpMRI and mpMRI datasets by radiologists, even after the 2-week washout period, did not eliminate bias. The limited number of participating radiologists in the study prevented us from making a definitive conclusion about the consistency of their evaluations.

The interobserver agreement among experts with <2 and >5 years of work experience was moderate. However, the results were more consistent with the use of mpMRI. The literature presents varying data on the influence of radiologists' experience on the diagnostic quality of both protocols. For instance, E.D. *Campli et al.* [18] found no significant effect, whereas M. Gatti *et al*. [19] demonstrated that radiologists with little experience evaluated bpMRI with less accuracy.

CONCLUSION

Regardless of the protocol used, prostate MRI demonstrated suboptimal diagnostic power. Although parametric prostate scanning protocols may have economic benefits over multiparametric ones because of the absence of costs for contrast agents and consumables and a significant reduction in the loading time of the MR scanner, their use may lead to a decrease in the diagnostic accuracy of the method.

The observed trend of increased sensitivity and specificity of the method with a higher level of radiologist experience highlights the importance of training in the interpretation of prostate MRI based on PI-RADS.

A prospective study is necessary to confirm the role of bpMRI in the early diagnosis of prostate cancer.

ADDITIONAL INFORMATION

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