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Clinical-Prostate cancer

PI-RADS score is associated with biochemical control and distant metastasis in men with intermediate-risk and high-risk prostate cancer treated with radiation therapy

William Tyler Turchan, M.D.[a], Greg Kauffmann, M.D.[a], Pritesh Patel, M.D.[b], Aytek Oto, M.D.[b], Stanley L. Liauw, M.D.[a,*]

[a] *University of Chicago, Department of Radiation and Cellular Oncology, Chicago, IL*
[b] *University of Chicago, Department of Radiology, Chicago, IL*

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Abstract

Background: Novel methods of risk stratification are needed for men with prostate cancer. The Prostate Imaging Reporting and Data System (PI-RADS) uses multiparametric MRI (mpMRI) to assign a score indicating the likelihood of clinically significant prostate cancer. We evaluated pretreatment mpMRI findings, including PI-RADS score, as a marker for outcome in patients treated with primary radiation therapy (RT).

Methods: One hundred and twenty-three men, 64% and 36% of whom had National Comprehensive Cancer Network (NCCN) intermediate-risk and high-risk disease, respectively, underwent mpMRI prior to RT. PI-RADS score and size of the largest nodule were analyzed with respect to freedom from biochemical failure (FFBF) and freedom from distant metastasis.

Results: A PI-RADS score of ≤3, 4, or 5 was defined in 7%, 49%, and 44%; with a median nodule size of 0, 8, and 18 mm, respectively ($P < 0.001$). Median follow-up was 67 months. Men with PI-RADS ≤ 3, 4, or 5 disease had 7-year FFBF of 100%, 92%, and 65% ($P = 0.002$), and a 7-year freedom from distant metastasis of 100%, 100%, and 82%, respectively ($P = 0.014$). PI-RADS (Hazard Ratio 5.4 for PI-RADS 5 vs. 4, $P = 0.006$) remained associated with FFBF when controlling for NCCN risk category ($P = 0.063$) and receipt of androgen deprivation therapy ($P = 0.535$). Nodule size was also associated with FFBF (Hazard Ratio 1.08 per mm, $P < 0.001$) after controlling for NCCN risk category ($P = 0.156$) and receipt of androgen deprivation therapy ($P = 0.776$).

Conclusion: mpMRI findings, including PI-RADS score and nodule size, may improve risk stratification in men treated with primary RT

Keywords: Multiparametric magnetic resonance imaging; PI-RADS; Prostate cancer; Radiation therapy

1. Introduction

Prostate cancer is a heterogenous disease for which prognosis and treatment vary widely. National Comprehensive Cancer Network (NCCN) guidelines stratify men into risk categories based upon clinical stage, prostate-specific antigen (PSA), and the Gleason score and volume of disease identified on biopsy [1]. Given the degree to which clinical decisions and outcomes for prostate cancer patients depend upon accurate risk stratification, the need for additional metrics beyond the NCCN-defined risk groups has been emphasized [2].

The use of MRI to assess prostate cancer patients has been investigated for decades; however, the value of MRI in evaluating patients with prostate cancer was historically constrained by image quality and the limited utility of standard anatomical sequences [3]. Multiparametric MRI

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*Corresponding author. Tel.: +1-773-702-6870.
E-mail address: sliauw@radonc.uchicago.edu (S.L. Liauw).

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(mpMRI) has significantly increased the utility of MRI as a noninvasive method of assessing patients with prostate cancer. mpMRI combines information from anatomical T2-weighted (T2W) sequences with functional dynamic contrast enhanced and diffusion weight imaging sequences to improve detection and delineation of localized prostate cancer. mpMRI has been demonstrated to improve detection of clinically significant disease, prostate biopsy targeting, and staging of local disease [4,5]. mpMRI is also useful for optimizing therapy and predicting response to treatment; adverse features on pretreatment mpMRI, including radiographic extraprostatic extension (rEPE), radiographic seminal vesicle invasion (rSVI), lymph node involvement (LNI), and largest axial tumor dimension >15 mm, have been shown to correlate strongly with biochemical outcomes after primary radiation therapy (RT) [6–10].

While pretreatment mpMRI may provide useful information for clinical decision making, a potential limitation is difficulty interpreting mpMRI. Given the widespread adoption of mpMRI, interobserver variability, with respect to identification of adverse imaging features, is of significant concern [11–12]. The Prostate Imaging Reporting and Data System (PI-RADS) classification, which reflects the findings of mpMRI sequences, has aimed to standardize interpretation and reporting of mpMRI. In the PI-RADS version 2 classification (PI-RADS v2), T2W, dynamic contrast enhanced, and diffusion weight imaging sequences are used according to zonal anatomy to assign a score indicating the likelihood of clinically significant prostate cancer, defined as Gleason score ≥7, volume ≥0.5 cc, and/or EPE [13]. The criteria for PI-RADS v2 score varies by anatomic zone and is published by the American College of Radiology; this resource can be found at https://www.acr.org/-/media/ACR/Files/RADS/Pi-RADS/PIRADS-V2-1.pdf [13]. PI-RADS v2 has been validated for detecting clinically significant prostate cancer and has been demonstrated to have reasonable reproducibility [14–17]. Given its demonstrated reproducibility and sensitivity for detecting meaningful disease, we evaluated the utility of PI-RADS score as a marker for outcome in prostate cancer patients treated with primary RT.

2. Materials and methods

A prospectively maintained database was used to retrospectively identify 123 men with NCCN intermediate-risk or high-risk intact prostate cancer who underwent mpMRI prior to being treated with external beam RT (EBRT) and/or brachytherapy at our institution between 2008 and 2016. Patient characteristics are summarized in Table 1.

Table 1
Patient characteristics ($n = 123$).

	All Men ($n = 123$) Number (%) or median (IQR)	PI-RADS ≤ 3 ($n = 9$) Number (%) or median (IQR)	PI-RADS 4 ($n = 60$) Number (%) or median (IQR)	PI-RADS 5 ($n = 54$) Number (%) or media n (IQR)	*P* value
Age (y)	67 (71–62)	67 (58–73)	67 (62–71)	67 (62–73)	0.731
Pretreatment PSA (ng/ml)	9.2 (5.6–14.9)	10.5 (6.3–14.4)	7.1 (4.9–11.9)	11.3 (6.2–26.1)	<0.001
Clinical T-stage					<0.001
T1c–T2a	81 (66%)	9 (100%)	52 (87%)	20 (37%)	
T2b–T2c	22 (18%)	0 (0%)	4 (7%)	18 (33%)	
T3a–b	20 (16%)	0 (0%)	4 (7%)	16 (30%)	
Clinically node-positive	14 (11%)	0 (0%)	4 (7%)	10 (19%)	0.050
Gleason score					<0.001
6	9 (7%)	4 (44%)	4 (7%)	1 (2%)	
7	84 (68%)	3 (33%)	48 (80%)	33 (61%)	
8	17 (14%)	1 (11%)	7 (12%)	9 (17%)	
9	13 (11%)	1 (11%)	1 (2%)	11 (20%)	
NCCN risk category					0.003
Intermediate	79 (64%)	6 (67%)	47 (78%)	26 (48%)	
High	44 (36%)	3 (33%)	13 (22%)	28 (52%)	
Treatment modality					0.001
EBRT alone	97 (79%)	6 (66%)	42 (70%)	49 (91%)	
Brachy alone	24 (20%)	3 (33%)	18 (30%)	3 (6%)	
EBRT + brachy	2 (2%)	0 (0%)	0 (0%)	2 (4%)	
EBRT dose (Gy)	78 (78–78)	78 (78–78)	78 (78–78)	78 (78–78)	0.240
ADT	64 (52%)	2 (22%)	22 (37%)	40 (74%)	<0.001
ADT duration (mo)	13.5 (6.0–25.5)	8.5 (6.0–11.0)	7.5 (5.5–24.0)	21.0 (6.0–28.0)	0.143
Follow-up length (mo)	67 (95–43)	93 (33–105)	71 (44–93)	65 (43–94)	0.999

ADT = androgen deprivation therapy; Brachy = brachytherapy; EBRT = external beam radiation therapy; NCCN = National Comprehensive Cancer Network; PI-RADS = Prostate Imaging Reporting and Data System; PSA = prostate-specific antigen.

At the time of initial radiation oncology consultation, mpMRI was routinely obtained in men electing for active surveillance or brachytherapy. mpMRI was also obtained in some instances prior to EBRT, at the discretion of the treating physician. mpMRIs were obtained using a 1.5T or 3T scanner (Achieva Scanner, Philips Healthcare, Eindhoven, The Netherlands) with endorectal coil (Medrad, Bayer Healthcare, Warrendale, PA) and a phased-array surface coil, as previously described [10,18]. mpMRIs were reviewed by 2 genitourinary body radiologists, who were blinded to clinical risk factors and outcomes, using prospectively defined criteria. Largest axial tumor dimension was measured on the T2W axial slice with the largest tumor nodule. PI-RADS scores were assigned retrospectively in accordance with PI-RADS v2 [13].

Ninety-seven men (79%) received EBRT alone (median dose 78 Gy), 24 men (18%) underwent brachytherapy alone (median dose 145 Gy), and 2 men (2%) were treated with EBRT (45 Gy) followed by brachytherapy boost (110 Gy). Men with NCCN high-risk disease were routinely treated with whole pelvis RT (45 Gy−50.4 Gy). Sixty-four men (52%) received androgen deprivation therapy (ADT), with median duration 13.5 months. At the time of initial consultation, 12 men (10%) elected for active surveillance with a median time of 14.1 months until beginning primary RT. Further information regarding treatment patterns are recorded in Table 1.

Following the completion of RT, men were followed with regular clinical assessment and PSA every 3−9 months for the first 5 years after the completion of RT and subsequently annually. Median follow-up from completion of RT to most recent PSA was 67 months. Biochemical failure (BF) was defined using the Phoenix criteria. Freedom from BF (FFBF) and freedom from distant metastasis (FFDM) were determined by Kaplan-Meier methods with log rank tests performed for comparisons. Cox methods were used for multivariate analysis (MVA).

3. Results

A PI-RADS score of ≤3, 4, or 5 was defined in 9 (7%), 60 (49%), and 54 (44%), men, respectively. Pretreatment PSA, clinical T-stage, clinical N-stage, Gleason score, and NCCN risk category were significantly different among men with PI-RADS ≤3, 4, or 5 disease, respectively (Table 1, $P \leq 0.050$). Given that a dominant nodule >15 mm in maximum axial dimension, definite EPE, or invasive findings form the basis for a PI-RADS score of 5, men with PI-RADS 5 disease were significantly different than men with PI-RADS 4 or PI-RADS ≤ 3 disease in each of these categories ($P < 0.001$). Median largest axial tumor dimension was 0, 8, and 18 mm among men with PI-RADS ≤ 3, 4, or 5 disease, respectively ($P < 0.001$).

Seventeen men had BF with a median time to BF of 50 months. Seven-year FFBF was 81%. Six men had distant metastasis (DM) with a median time to DM of 43 months. Seven-year FFDM was 92%. Two men had prostate cancer mortality at 7 and 58 months following completion of RT, respectively.

Univariate analysis (UVA) demonstrated multiple clinicopathologic factors and radiographic findings associated with 7-year FFBF, as shown in Table 2. Clinicopathologic factors associated with 7-year FFBF included pretreatment PSA, T-stage, percentage of cores positive on biopsy, Gleason score, as well as NCCN risk category ($P < 0.050$). Adverse radiographic findings on mpMRI including rEPE, rSVI, LNI, and largest axial tumor dimension were also associated with 7-year FFBF on UVA (Table 2). UVA demonstrated similar clinical factors and radiographic findings associated with 7-year FFDM, as shown in Table 2 ($P < 0.050$). Notably, UVA also identified significantly higher 7-year FFBF ($P = 0.002$) and 7-year FFDM ($P = 0.007$) among men with a PI-RADS score of 4 compared to those with a PI-RADS score of 5.

Fig. 1 shows the Kaplan-Meier curve for 7-year FFBF stratified by PI-RADS score. Men with PI-RADS ≤3, 4, or 5 disease had 7-year FFBF of 100%, 92%, and 65%, respectively ($P = 0.002$). As shown in Model 1 of Table 3, PI-RADS (HR 5.4 for PI-RADS 5 vs. 4, P =0.006) remained associated with FFBF on MVA when controlling for NCCN risk category ($P = 0.063$) and receipt of ADT ($P = 0.535$). Fig. 2 shows the Kaplan-Meier curve for 7-year FFDM stratified by PI-RADS score. Men with PI-RADS ≤3, 4, or 5 disease had 7-year FFDM of 100%, 100%, and 82%, respectively ($P = 0.014$).

Largest axial tumor dimension was also associated with FFBF and FFDM when analyzed as a continuous variable on logistic regression ($P < 0.010$). Largest axial tumor dimension had an area under the receiver operator curve of 0.73 and 0.91 for predicting FFBF and FFDM, respectively. Optimal performance of largest axial tumor dimension as a predictor of BF was yielded from a cut-off point of 16 mm, resulting in a sensitivity of 65% and specificity of 70%. A cut-off point of 15 mm was ideal for predicting DM resulting in a sensitivity of 70% and specificity of 100%. Largest axial tumor dimension was associated with 7-year FFBF and 7-year FFDM on UVA, as shown in Table 2. Figs. 3 and 4, respectively, show the Kaplan-Meier curves for 7-year FFBF and 7-year FFDM stratified by largest axial tumor dimension ≤15 mm vs. >15 mm. Seven-year FFBF was 91% for men with largest axial tumor dimension ≤15 mm vs. 61% for men with largest axial tumor dimension >15 mm ($P = 0.002$). Seven-year FFDM was 100% for men with largest axial tumor dimension ≤15 mm vs. 77% for men with largest axial tumor dimension > 15 mm ($P < 0.001$). As shown in Model 2 of Table 3, largest axial tumor dimension remained associated with FFBF (HR 1.08 per mm, $P < 0.001$) after controlling for NCCN risk category ($P = 0.156$) and receipt of ADT ($P = 0.776$) on MVA.

Table 2
UVA for 7-year FFBF and 7-year FFDM in NCCN intermediate-risk and high-risk men treated with primary RT ($n = 123$).

	7-year FFBF	*P* value	7-year FFDM	*P* value
Pretreatment PSA				
<10 ng/ml vs. 10 to <20 ng/ml	92% vs. 80%	0.116	97% vs. 97%	0.624
<10 ng/ml vs. 10 to <20 ng/ml	92% vs. 57%	<0.001	97% vs. 74%	0.006
10 to <20 ng/ml vs. ≥20 ng/ml	80% vs. 57%	0.087	97% vs. 74%	0.064
Clinical T-stage				
T1c–T2a vs. T2b–T2c	92% vs. 72%	0.106	100% vs. 93%	0.091
T1c–T2a vs. T3a–b	92% vs. 49%	<0.001	100% vs. 54%	<0.001
T2b–T2c vs. T3a–b	72% vs. 49%	0.044	93% vs. 54%	0.027
Gleason score				
6 vs. 7	83% vs. 87%	0.742	100% vs. 97%	0.697
6 vs. 8	83% vs. 78%	0.520	100% vs. 83%	0.261
6 vs. 9	83% vs. 44%	0.139	100% vs. 67%	0.102
7 vs. 8	87% vs. 78%	0.022	97% vs. 83%	0.022
7 vs. 9	87% vs. 44%	0.001	97% vs. 67%	<0.001
8 vs. 9	78% vs. 44%	0.336	83% vs. 67%	0.398
Biopsy cores positive (%)				
<50% vs. ≥50%	95% vs. 69%	0.008	100% vs. 85%	0.018
NCCN risk category				
Intermediate vs. high	90% vs. 66%	0.006	100% vs. 78%	<0.001
Treatment modality				
EBRT alone vs. brachy alone	78% vs. 93%	0.128	90% vs. 100%	0.211
EBRT alone vs. EBRT + brachy	78% vs. 100%	0.641	90% vs. 100%	0.793
Brachy alone vs. EBRT + brachy	93% vs. 100%	1.000	100% vs. 100%	1.000
Androgen deprivation therapy				
Yes vs. no	74% vs. 90%	0.063	85% vs. 100%	0.017
Radiographic extraprostatic extension				
No/equivocal vs. yes	95% vs. 62%	<0.001	100% vs. 81%	0.003
Radiographic seminal vesicle invasion				
No/equivocal vs. yes	89% vs. 32%	<0.001	96% vs. 70%	0.001
Lymph node involvement				
No/equivocal vs. yes	86% vs. 49%	0.001	95% vs. 74%	0.004
Largest tumor diameter				
≤8 mm vs. >8 mm	91% vs. 76%	0.049	100% vs. 88%	0.077
≤9 mm vs. >9 mm	90% vs. 74%	0.095	100% vs. 87%	0.033
≤10 mm vs. >10 mm	91% vs. 73%	0.059	100% vs. 86%	0.022
≤12 mm vs. >12 mm	89% vs. 72%	0.083	100% vs. 83%	0.006
≤15 mm vs. >15 mm	91% vs. 61%	0.002	100% vs. 77%	<0.001
≤20 mm vs. >20 mm	86% vs. 51%	<0.001	96% vs. 72%	<0.001
PI-RADS score				
≤3 vs. 4	100% vs. 92%	0.506	100% vs. 100%	1.000
≤3 vs. 5	100% vs. 65%	0.091	100% vs. 82%	0.264
4 vs. 5	92% vs. 65%	0.002	100% vs. 82%	0.007

7-year FFBF = 7-year freedom from biochemical failure; 7-year FFDM = 7-year freedom from distant metastasis; brachy = brachytherapy; EBRT = external beam radiation therapy; NCCN = National Comprehensive Cancer Network; PI-RADS = Prostate Imaging Reporting and Data System; PSA = prostate-specific antigen.

4. Discussion

We evaluated the utility of PI-RADS score for predicting outcomes of patients with prostate cancer treated with primary RT. Within this cohort of intermediate-risk and high-risk prostate cancer patients, men with PI-RADS 5 disease had significantly decreased biochemical and distant control. On MVA, PI-RADS score and dominant nodule size remained associated with FFBF controlling for NCCN risk category and receipt of ADT. These findings support the potential of mpMRI to supplement traditionally used clinical variables to improve risk stratification in men with prostate cancer treated with primary RT.

Accurate risk stratification is crucial for determining prognosis and clinical management in patients with localized prostate cancer. Clinicopathologic factors are frequently used to predict outcomes for patients with localized prostate cancer. mpMRI is a noninvasive method of assessing patients with prostate cancer that has the potential to significantly augment current routine metrics for risk stratification and has been suggested by some to even be superior to traditional criteria [19]. Several studies have demonstrated a correlation between mpMRI findings and outcomes in prostate cancer patients [6–9]. Previously published data from our institution demonstrated that mpMRI findings can lead to substantial changes in

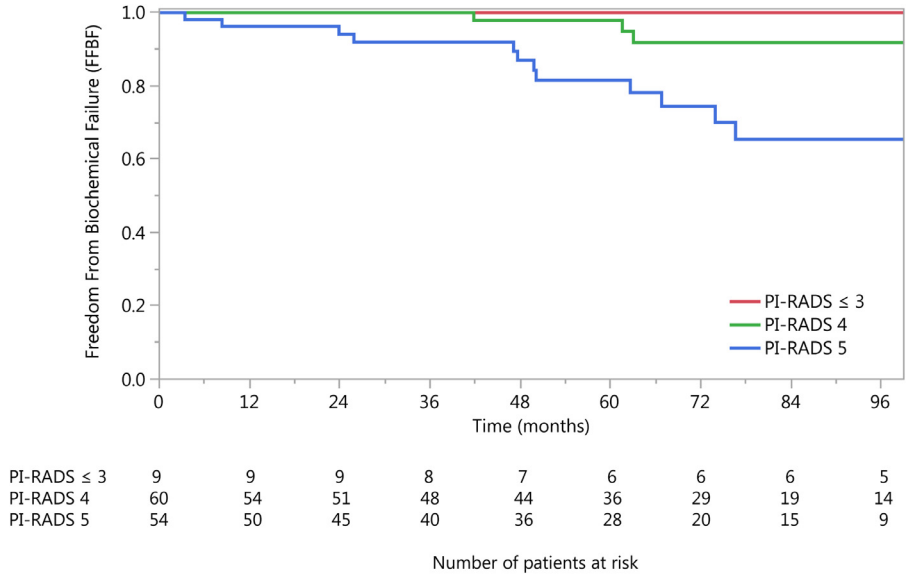

Fig. 1. FFBF in NCCN intermediate-risk and high-risk men treated with primary RT stratified by PI-RADS score on pretreatment mpMRI. Men with PI-RADS ≤3, 4, or 5 disease had 7-year FFBF of 100%, 92%, and 65%, respectively ($P = 0.002$). FFBF = freedom from biochemical failure; NCCN = National Comprehensive Cancer Network; PI-RADS = Prostate Imaging Reporting and Data System.

Table 3
MVA for 7-year FFBF in NCCN intermediate-risk and high-risk men with PI-RADS 4 or PI-RADS 5 disease treated with primary RT ($n = 114$).

	Model 1		Model 2	
	HR (95%CI)	*P* Value	HR (95%CI)	*P* Value
NCCN risk category—high vs. intermediate	2.93 (0.95–10.25)	0.063	2.38 (0.73–8.72)	0.156
Androgen deprivation therapy—yes vs. no	0.64 (0.16–2.83)	0.535	0.82 (0.78–3.45)	0.776
PI-RADS—5 vs. 4	5.37 (1.55–25.32)	0.006	-	
Largest axial size (per mm)	-	-	1.08 (1.03–1.14)	<0.001

NCCN = National Comprehensive Cancer Network; PI-RADS = Prostate Imaging Reporting and Data System.

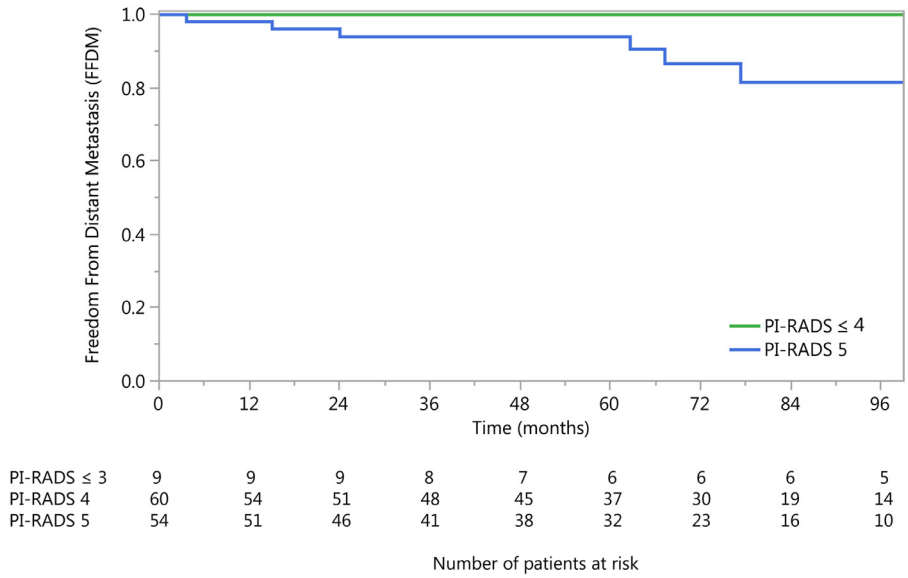

Fig. 2. FFDM in NCCN intermediate-risk and high-risk men treated with primary RT stratified by PI-RADS score on pretreatment mpMRI. Men with PI-RADS ≤3, 4, or 5 disease had 7-year FFBF of 100%, 100%, and 82%, respectively ($P = 0.014$). FFDM = freedom from distant metastasis; NCCN = National Comprehensive Cancer Network; PI-RADS = Prostate Imaging Reporting and Data System.

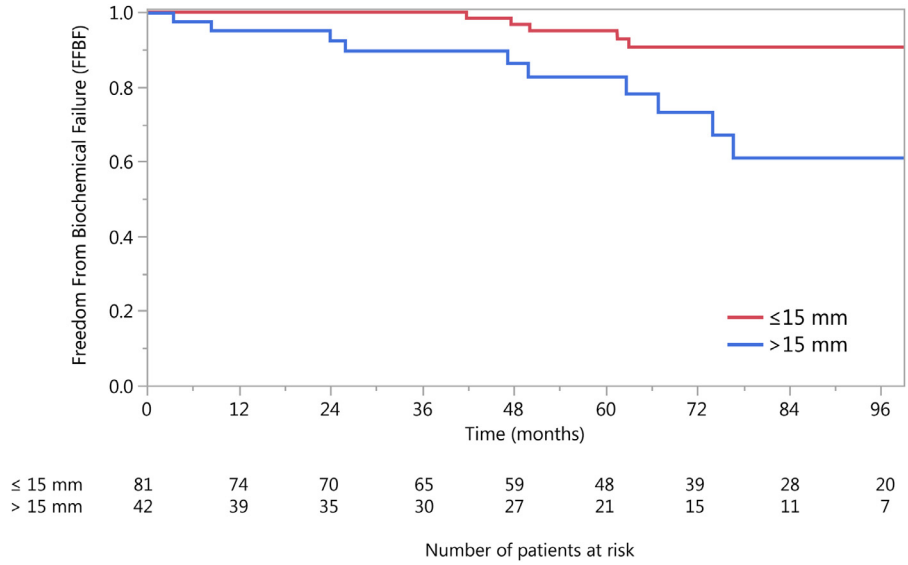

Fig. 3. FFBF in NCCN intermediate-risk and high-risk men treated with primary RT stratified by largest axial tumor dimension on pretreatment mpMRI ≤15 mm vs. >15 mm. 7-year FFBF was 91% for men with largest axial tumor dimension ≤15 mm vs. 61% for men with largest axial tumor dimension >15 mm ($P = 0.002$). FFBF = freedom from biochemical failure; NCCN = National Comprehensive Cancer Network.

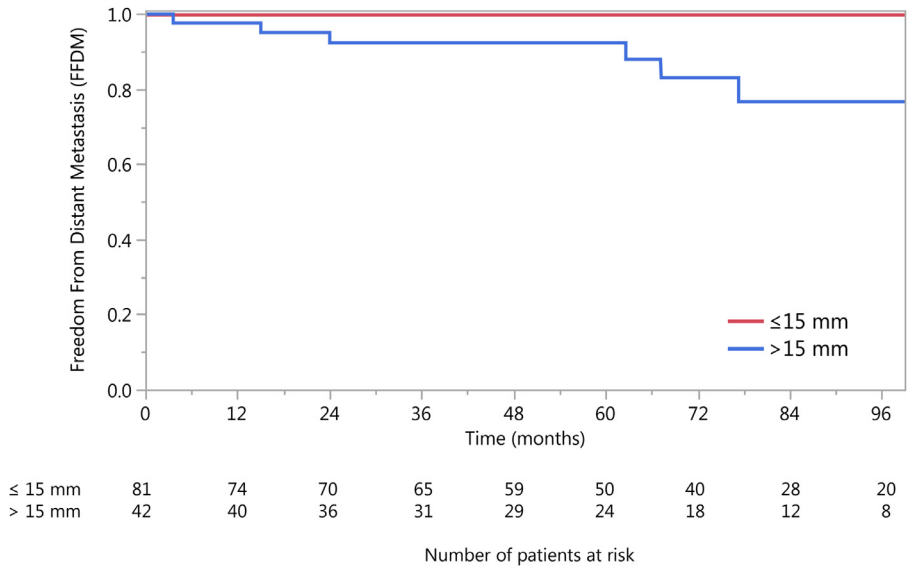

Fig. 4. FFDM in NCCN intermediate-risk and high-risk men treated with primary RT stratified by largest axial tumor dimension on pretreatment mpMRI ≤15 mm vs. >15 mm. 7-year FFDM was 100% for men with largest axial tumor dimension ≤15 mm vs. 77% for men with largest axial tumor dimension >15 mm ($P < 0.001$). FFDM = freedom from distant metastasis failure; NCCN = National Comprehensive Cancer Network.

clinical management [18] and that adverse features on pretreatment mpMRI, including rEPE, rSVI, LNI, and largest axial tumor dimension >15 mm, correlate strongly with biochemical outcomes after primary RT [10]. Our current findings support this conclusion, as with additional follow-up each of these factors remains a predictor of BF and DM. The finding that tumor size is associated with outcome after primary RT may not be surprising, given that the doses routinely used for the treatment of intact prostate cancer are relatively fixed and are not typically adjusted to account for the bulk of disease. Moreover, dominant nodule size has previously been demonstrated to be prognostic not only in the setting of primary RT, but also in patients undergoing prostatectomy [20] or salvage RT for biochemical recurrence following prostatectomy [21]. We found that patients with the smallest bulk of disease (<8 mm or PI-RADS ≤3) had 100% FFBF. Meanwhile, men with higher volume disease could be expected to benefit from more intensified treatments, such as brachytherapy boost.

A potential limitation of using radiographically-defined adverse features for clinical decision making is difficulty interpreting mpMRI. With the widespread adoption of mpMRI, concerns about reproducibility and interobserver

variability with respect to the identification of adverse features on imaging have been raised by many [11−12]. While the criterion of largest axial tumor dimension >15 mm may be more straight-forward, identification of rEPE, rSVI, and LNI may require expertise from a specialized radiologist. The nature of these radiographically-defined adverse features and the nonuniform way in which they may be conveyed in radiology reports has the potential to diminish the utility mpMRI as a tool for risk stratification in men with prostate cancer; a potential solution to this problem is PI-RADS. Although PI-RADS is validated for the detection of clinically significant prostate cancer, little information exists regarding its ability to predict long-term outcomes in patients. Men with PI-RADS ≤3, 4, or 5 disease had 7-year FFBF of 100%, 92%, and 65%, respectively (Table 2, $P = 0.002$), and 7-year FFDM of 100%, 100%, and 82%, respectively, (Table 2, $P = 0.014$). As previously noted UVA demonstrated multiple clinicopathologic factors (pretreatment PSA, clinical T-stage, Gleason score, percentage of cores positive, and NCCN risk category) and radiographic findings (rEPE, rSVI, and LNI, tumor size, and PI-RADS score), along with receipt of ADT to be associated with 7-year FFBF. Given that these clinicopathologic factors and radiographic findings are summarized by NCCN risk category and PI-RADS score, respectively, these factors were included along with receipt of ADT in our MVA. On MVA, PI-RADS score (Table 3, HR 5.4 for PI-RADS score of 5 compared to 4, $P = 0.006$) remained associated with FFBF when controlling for NCCN risk category and receipt of ADT, indicating that PI-RADS score has potential utility as a novel tool for risk stratification.

Although most studies have found the interobserver agreement of PI-RADS score to be at least moderate, if not better, the reproducibility of PI-RADS has been raised as a concern by some [15−17], which could serve as a potential limitation of using PI-RADS score for risk stratification. Our finding that PI-RADS score is associated with clinical outcomes is based upon the review of mpMRIs by 2 experienced genitourinary body radiologists at our institution, which may limit the degree to which our findings can be generalized to a broader population. Given this potential limitation, we also investigated the utility of largest axial tumor dimension as an isolated predictor of clinical outcome, as this is a component of the PI-RADS score that may be more objective and less likely to require specific training in order to accurately assess. Seven-year FFBF was 91% for men with largest axial tumor dimension ≤15 mm vs. 61% for men with largest axial tumor dimension >15 mm ($P = 0.002$), while 7-year FFDM was 100% for men with largest axial tumor dimension ≤15 mm vs. 77% for men with largest axial tumor dimension >15 mm ($P < 0.001$). On MVA including largest axial tumor dimension, NCCN risk category, and receipt of ADT, largest axial tumor dimension remained associated with FFBF (Table 3, HR 1.08/mm, $P < 0.001$). Despite our finding that largest axial tumor dimension was also associated with clinical outcome, our conclusions are still subject to the inherent limitations of a single-institution, retrospective study with moderate duration follow-up, a small sample size, and a limited number of events. A larger patient population along with longer median follow-up would help to further evaluate the association of mpMRI findings with clinical outcomes and is required to evaluate cause-specific and overall mortality outcomes. Despite these limitations, our presented findings support the association of mpMRI findings and PI-RADS score with clinical outcomes in men treated with primary RT.

5. Conclusions

Within this cohort of intermediate-risk and high-risk prostate cancer patients treated with primary RT, men with PI-RADS 5 disease had significantly decreased 7-year FFBF and only men with PI-RADS 5 disease failed distantly. When evaluated independently, largest axial tumor dimension was similarly associated clinical outcomes. mpMRI findings and PI-RADS score may be more strongly associated with outcome than clinical risk classification alone in men treated with primary RT.

Conflicts of Interest

None.

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