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Preoperative 3-Tesla multiparametric endorectal MRI findings and the odds of upgrading and upstaging at radical prostatectomy in men with clinically localized prostate cancer

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Abstract

Purpose—To investigate whether 3T multiparametric endorectal MRI (erMRI) can add information to established predictors regarding occult extraprostatic or high-grade prostate cancer (PC) in men with clinically localized PC.

Methods and Materials—At a single academic medical center, this retrospective study's cohort included 118 men with clinically localized PC who underwent 3T multiparametric erMRI followed by radical prostatectomy (RP) from 2008 to 2011. Multivariable logistic regression analyses in all men and in 100 with favorable-risk PC addressed whether erMRI evidence of T3 disease was associated with prostatectomy T3 or Gleason score (GS) 8–10 (in patients with biopsy GS $\geq$ 7) PC, adjusting for age, PSA level, clinical T-category, biopsy GS, and percent positive biopsies.

Results—The accuracy of erMRI prediction of extracapsular extension and seminal vesicle invasion was 75% and 95%, respectively. For all men, erMRI evidence of a T3 lesion vs. T2 was associated with an increased odds of having pT3 disease (adjusted odds ratio (AOR) 4.81, 95% confidence interval (CI) (1.36, 16.98), $p=0.015$) and pGS 8–10 (AOR 5.56, (1.10, 28.18),

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Conflicts of Interest Notification:

No financial conflicts of interest to disclose for any of the authors.

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$p=0.038$). In the favorable-risk population, these results were AOR 4.14, (1.03, 16.56), $p=0.045$ and AOR 7.71, (1.36, 43.62), $p=0.021$, respectively.

Conclusions—3T multiparametric erMRI in men with favorable-risk PC provides information beyond that contained in known preoperative predictors about the presence of occult extraprostatic and/or high-grade PC. If validated in additional studies, this information can be used to counsel men planning to undergo RP or radiotherapy (RT) about the possible need for adjuvant RT or the utility of adding hormone therapy, respectively.

Keywords

prostate cancer; magnetic resonance imaging; multiparametric MR; prostate-specific antigen; extracapsular extension; Gleason score

Introduction

In men with clinically localized prostate cancer (PC) who undergo radical prostatectomy (RP), the pathologic findings of extracapsular extension (ECE), seminal vesicle invasion (SVI), and/or Gleason score 8 to 10 are associated with an increased risk of biochemical recurrence, metastasis, and/or death from PC (1). Despite risk groups and nomograms (2, 3) that have been developed to assist in predicting these outcomes based on known clinical and pathological preoperative prognostic factors, including prostate-specific antigen (PSA), clinical T-category, Gleason score, number of positive biopsies, percent positive biopsy cores, length of tissue invaded by cancer, and perineural invasion, there is still additional information needed to optimize these predictions for the individual patient that may be afforded through the use of imaging (2).

Prior studies (4, 5) have established that findings of ECE and SVI on 1.5-Tesla endorectal magnetic resonance imaging (erMRI) are associated with these findings at RP in men with clinically localized PC. However, adjusting for the known prognostic factors and examining what additional information is afforded by erMRI has been performed in only a few studies with older MRI technology (6–8). With the advent of more sophisticated MR imaging, including “multiparametric” imaging (9) (the combined use of morphologic and functional MRI sequences including T2-weighted (T2W), diffusion-weighted (DW), dynamic contrast-enhanced (DCE), and magnetic resonance spectroscopic (MRS) imaging) and higher field strength capabilities (3T vs. 1.5T MRI), improved predictions of prostatectomy stage and grade may be possible. However, whether 3T multiparametric erMRI can provide additional information beyond the established predictors about the presence of occult extraprostatic or high-grade PC in men with clinically localized PC is unknown.

Therefore, in this study, we analyzed preoperative 3T multiparametric erMRI using multivariate logistic regression analysis on a contemporary series of 118 previously untreated men with clinical category T1–T2 PC at our institution to assess whether the MRI findings of ECE or SVI were associated with upstaging or upgrading at RP after adjusting for known predictors of these end points.

Methods and Materials

Patient Selection & Treatment

The study cohort comprised 118 men with PC who were treated with RP (76 robot-assisted laparoscopic and 42 open procedures) between June 2008 and September 2011 following a 3-Tesla multiparametric erMRI exam at Brigham and Women’s Hospital. The criterion used to order an erMRI was the treating physicians’ concern that despite a diagnosis of clinically localized disease (cT1–cT2), pathologic T3 disease may be present due to the presence of

other adverse factors. The erMRI occurred at a median time of 6.0 weeks after biopsy and 6.9 weeks prior to RP. No patients underwent any PC-specific therapy prior to their RP. Cancer staging evaluation included a history and physical examination, serum PSA value, transrectal ultrasound (TRUS)-guided needle prostate biopsy with Gleason sum histologic grading, and 3-Tesla multiparametric erMRI. All staging was assigned according to 2002 American Joint Committee on Cancer (AJCC) staging criteria (10). A biopsy (with 101/118 (86%) of men having 12-core biopsy) was performed under TRUS guidance using a standard 18-gauge Tru-Cut needle (Baxter Healthcare). PSA determination was made prior to biopsy and erMRI. This study was performed under an IRB-approved protocol through the Partners Human Research Committee and appropriate informed consent was obtained.

MRI Protocol

A 3-Tesla whole body MRI scanner (General Electric Medical Systems, Milwaukee, WI), a whole-body transmit-receive coil, external rigid phased-array torso coil, and endorectal coil (Medrad, Pittsburgh, PA), were used for all erMRI studies. The endorectal coil was filled with air after insertion. Multiparametric imaging sequence parameters (Table 1) included multiplanar T2-weighted (T2W), T1-weighted (T1W), dynamic intravenous contrast-enhanced (DCE), and diffusion-weighted (DW) imaging with multiple b values (0–1400 s/mm²) and Apparent Diffusion Coefficient (ADC) maps of the prostate. Gadopentetate dimeglumine (Magnevist) contrast was administered intravenously (at a weight-based dosing of 0.2 ml/kg) with an MRI-compatible power injector during the DCE portion of the MRI exam.

MRI Imaging Interpretation

The patients' MR exams were all interpreted by a radiologist with experience in genitourinary imaging at the study site's department of radiology. In all cases the electronic medical records (EMR) were used to identify clinical factors important for staging, including PSA and biopsy Gleason sum. The radiologist interpreted qualitative characteristics from the images, evaluating the signal intensity on T1W and T2W imaging, whether there was restricted diffusion on DWI, and whether there was contrast enhancement using DCE imaging, and combined these findings and their anatomic location to form the radiologic interpretation. The information for this study was collected from the resulting clinical radiology reports, which included the radiologist's standard assessment, using conventional MR morphologic signs, of focal tumor and whether there was ECE, neurovascular bundle invasion (NVBI), SVI, pelvic/retroperitoneal lymph node metastatic involvement, or metastatic bone involvement. If the report noted possible, probable, or definite ECE (qualitatively designated in the report language depending on the certainty with which common MR signs indicating ECE (well-described in Roethke et al. (11)) were observed), with or without NVBI or SVI, we categorized this as an erMRI T3 lesion, while the absence of these statements resulted in an erMRI T2 lesion designation.

Pathologic Specimens

The pathologic specimens of the 118 patients who underwent radical prostatectomy were step-sectioned and reviewed by an expert GU pathologist. Evidence of extraprostatic disease, including SVI, ECE, nodal involvement, and/or positive surgical margins (PSMs), was recorded. Gleason histologic grading on the pathological specimens was used. The T-category as defined using the 2002 AJCC categorization was recorded as the RP T-category.

Statistical Methods

1. Description of the Study Cohort Stratified by erMRI T-category—The distributions of clinical and pathologic characteristics of the study cohort were calculated

and are illustrated in Table 2. Comparisons of the distribution of categorical factors stratified by erMRI T-category (T2 vs. T3), including clinical and RP T-category, biopsy and RP Gleason sum, presence of extracapsular extension or seminal vesicle invasion at RP, D'Amico risk group (3), and margin status were compared using the Mantel-Haenszel Chi-square metric. In cases of small sample size, a 2-sided Fisher's exact test was used to conduct these comparisons. Again, using erMRI T-category stratification, the median and distribution of continuous variables including age, PSA level, and percent positive biopsies were compared using a Wilcoxon Rank Sum Test.

2. Logistic Regression Multivariable Analysis—A logistic regression multivariable analysis (MVA) (Table 3) was used to assess whether erMRI ECE findings (T3 vs. T2 as baseline) were associated with the RP endpoints of ECE or SVI, adjusting for age at the time of RP in years, PSA level, biopsy Gleason sum (8 to 10 vs. 7 vs. 6 as baseline), clinical T-category (T2 vs. T1c as baseline), and percent positive biopsies. We performed a second logistic regression MVA (Table 4) evaluating the endpoint of RP Gleason 8 to 10, and for this analysis, men with biopsy Gleason sums 8 to 10 were excluded and the MVA employed the Firth method because there was an absence of RP Gleason 8 to 10 in men with biopsy Gleason 6 or less. Otherwise, the analysis was performed in identical fashion to the prior model evaluating RP T-category. Both MVAs were repeated evaluating men with favorable- (low- or intermediate-) risk (3) disease. Unadjusted and adjusted odds ratios (UORs and AORs, respectively) were calculated for each clinical covariate, and these were reported with 95% confidence intervals (CIs). A P-value < 0.05 was considered statistically significant. The statistical software used was SAS version 9.3 (SAS Institute, Cary, NC).

Results

Description of the Study Cohort Stratified by erMRI T-category

The distributions of the clinical and pathologic characteristics of the 118 men in the study cohort are listed in Table 2 stratified by erMRI T-category. Among men with erMRI T3 PC, there were significantly more men who had evidence of ECE or SVI at RP compared to those with erMRI T2 disease (51% vs. 21% respectively, $p=0.0012$). The other distributions evaluated (see Table 2) were not significantly different ($p=0.13$ or higher) amongst men with erMRI T2 vs. T3 disease.

Performance Characteristics of 3T erMRI

The overall accuracy of 3T erMRI to predict ECE was 75%, while its accuracy to predict SVI was 95%. The sensitivity, specificity, positive predictive value (PPV) and negative PV of 3T erMRI to predict pathologic ECE were 28%, 91%, 50%, and 79%, respectively. The analogous performance characteristics of 3T erMRI were 50%, 99%, 83% and 96% for SVI.

Logistic Regression Multivariable Analysis: Pathologic ECE or SVI Outcome

Preoperative erMRI evidence of category T3 disease was significantly associated with an increased odds of finding ECE or SVI (AOR 4.81, CI (1.36, 16.98), $p=0.015$) as compared to erMRI evidence of T2 disease in the 118 men in the study cohort after adjusting for preoperative predictors of pathologic T-category, as shown in Table 3. In addition, both biopsy Gleason sum 8 to 10 (AOR 8.34, CI (1.78, 39.06), $p=0.007$) and increasing percent positive biopsies (AOR 1.03, CI (1.01, 1.06), $p=0.013$) were significantly associated with an increased odds of finding ECE or SVI as compared to pT2 disease on multivariate analysis (Table 3). For the 100 men in the study with favorable-risk disease, erMRI evidence of category T3 as compared to T2 disease was significantly associated with an increased odds of RP ECE and/or SVI (AOR 4.14, CI (1.03, 16.56), $p=0.045$).

Logistic Regression Multivariable Analysis: Pathologic Gleason Sum Upgrade Outcome

For the subset of 105 men in the study cohort with a biopsy Gleason sum of 7 or less, erMRI evidence of category T3 disease was associated with an increased odds of finding RP Gleason 8 to 10 as compared to 7 or less (AOR 5.56, CI (1.10, 28.18), $p=0.038$) after adjusting for known preoperative predictors of upgrading, including age, PSA, clinical T-category, biopsy Gleason score, and percent positive biopsies, as shown in Table 4. Also, biopsy Gleason score 7 as compared to 6 was associated with an increased odds of upgrading to Gleason sum 8 to 10 (AOR 28.19, CI (1.44, 552.49), $p=0.028$). For the 100 men in the study with favorable-risk disease, erMRI evidence of category T3 as compared to T2 disease was significantly associated with an increased odds of RP Gleason score 8 to 10 (AOR 7.71, CI (1.36, 43.62), $p=0.021$) PC.

Discussion

Several studies using 1.5T erMRI have evaluated MRI's ability alone to identify occult extraprostatic disease and whether the information provided from 1.5T erMRI significantly added to the information in the established predictive factors of PSA level, Gleason score and clinical T-category for men with clinically localized PC (4–6, 8, 12–14). In the current study, we evaluated the ability of 3T multiparametric erMRI in a clinical setting to predict occult ECE and SVI as well as occult Gleason score 8 to 10 PC after adjusting for age, clinical T-category, PSA level, biopsy Gleason score, and percentage of positive biopsies. We found that 3T erMRI evidence of ECE or SVI was significantly associated with RP ECE and SVI in all study patients and histologic upgrading to Gleason sum 8 to 10 in men with biopsy Gleason score 7 or less after adjustment for known predictive factors. These findings were also true in the subgroup of 100 men with favorable- (low- or intermediate-) risk PC.

The clinical significance of these findings is that 3T erMRI appears to have the ability to add significantly to established predictors of upstaging and upgrading at RP in a contemporary study and favorable-risk cohort. In this population of favorable-risk patients, better risk assessment is needed to optimally counsel a man who is planning to undergo RP on the potential need for adjuvant radiotherapy (RT) or a man planning to undergo RT on the possible need for concurrent androgen suppression therapy (AST), based on randomized trials showing a survival benefit when adjuvant RT (15) or concurrent AST (16–20) is added to men with the high-risk features (i.e. ECE and SVI) with which the erMRI findings in this study are associated. Based on the findings in Table 2, 16/118 men (14%) were predicted to have ECE by erMRI, who we would favor having additional treatment as noted above. This comes with the consequence that the erMRI PPV for ECE was 50%, so 8 men (7%) incorrectly predicted to have ECE would be over-treated using this management strategy. This is the first study in a favorable-risk population indicating potential benefit for 3T multiparametric erMRI. Thus, it is too early to recommend this type of study as a standard of practice. Ideally, we would like to select men for erMRI who would be at high risk for ECE to increase the PPV for ECE (and minimize the potential for over-treatment). To recommend this type of study for standard of care, a study would need to be performed showing that for patients whose only risk factor for adverse pathologic features is erMRI predicting T3 disease, overall survival is improved when additional treatment (RT to RP or AST to RT) is given.

Several points require further discussion. First, it is noteworthy that the majority of men (85%) in this study had favorable-risk disease (Table 2). While the assessment of erMRI prediction of ECE as an independent predictor for pathologic ECE has been found in prior study populations of men with intermediate- or high-risk PC (4, 5), this study shows the value of 3T erMRI in predicting occult high-risk disease in favorable-risk patients. Second, our study had multiple staff radiologists of varying levels of experience contributing to the

reports used in this study. This can lead to the issue of inter-observer variability noted by past prostate MRI studies (21), a significant portion which may be due to the steep learning curve for interpreting prostate MRI studies (22). Although inter-observer variability can significantly affect staging accuracy (21), the overall accuracy of erMRI predicting ECE was 75% and for SVI was 95% in our study. Our staging accuracy results may not have been as significantly impacted by inter-observer variability as in studies using only T1- and T2-weighted sequences due to the use of multiple different sequence parameters (including T1W, T2W, DW, and DCE imaging) for staging, which has been shown to increase staging accuracy for both experienced and less-experienced readers (21). Furthermore, despite the more favorable risk profile of the current study, the performance characteristics of the current study using 3T multiparametric erMRI appears to be at least as good and perhaps better than in prior PC studies with 1.5T erMRI, many of which featured study populations with more significant numbers of unfavorable-risk patients (9). This observation is important since the widespread use of PSA screening, particularly in the U.S., has resulted in men presenting with more favorable-risk disease compared to the pre-PSA era (9). Thus, our study suggests that 3T erMRI may be of value in this population pending future prospective studies. However, there are no results available from a randomized trial comparing patient outcomes in prostate cancer after receiving a 3T vs. 1.5T multiparametric erMRI for staging and using this information to affect treatment selection. Third, erMRI evidence of ECE or SVI was also associated with an increased odds of RP Gleason score 8 to 10 PC in all men with Gleason score 7 or less (AOR 5.56, $p=0.038$) and in men with favorable-risk PC (AOR 7.71, $p=0.021$). This finding, in conjunction with recent literature indicating an association between Gleason grade and ADC values derived from DWI (9, 23), suggests that there are a number of MRI-based features using 3T multiparametric erMRI which may be used to assess PC aggressiveness.

Several potential limitations in this study should be noted. First, our study was performed using retrospective chart review which included recording data from clinical prostate MR studies and their resulting reports, neither of which have yet been optimized (9). Also, this study only included patients who underwent RP following erMRI. Results may differ in a population not selected to undergo RP. Additionally, reports from standard clinical pathologic specimen analysis, rather than whole-mount histologic analysis, were used in the study, limiting the ability to correlate laterality of disease with MRI and pathology findings. However, the significant association with Gleason score upgrading remains robust. While it is a limitation that retrospective clinical reports were used, this shows that widespread utilization of 3T multiparametric erMRI for PC may be clinically feasible and useful outside of a controlled research setting. Further work is ongoing to ascertain whether improved information from 3T multiparametric erMRI, including morphologic, semi-quantitative, and quantitative characteristics from multiparametric imaging, will add further to the established prognostic factors for predicting both upstaging and upgrading (9). Additionally, despite an apparent advance in predicting pT3 in a favorable-risk population with an ECE PPV of 50% and SVI PPV of 83%, further work is needed to more reliably identify occult ECE to reduce this high false-positive rate.

3T multiparametric erMRI in men with favorable-risk PC provides information beyond that contained in known preoperative predictors about the presence of occult extraprostatic and/or high-grade PC. If additional studies validate this finding, then this information can be used to counsel men who plan to undergo RP or RT about the possible need for adjuvant RT or the clinical utility of adding hormone therapy, respectively.

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Summary

In clinically localized prostate cancer (PC), 3T multiparametric endorectal MRI (erMRI) may aid in detecting the presence of occult extraprostatic or high-grade PC. In this retrospective study of 118 patients who underwent erMRI followed by radical prostatectomy, logistic regression analyses evaluated preoperative predictors of pathologic T3 or Gleason 8–10 disease. These demonstrated that in favorable-risk PC, erMRI provides additional, independent information about the presence of occult extraprostatic and/or high-grade PC, both important in treatment selection.

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Table 1

3-Tesla Multiparametric erMRI Sequence Parameters.

Parameter	Pulse Sequence	TR (ms)	TE (ms)	Flip Angle (°)	BW (Khz)	FOV (cm)	Section Thickness (mm)	Matrix	NEX
Axial T1	SPGR (EDR)	225	3.3	75	31.25	40	5	256 × 160	0.5
T2 (Axial/Sagittal/Coronal)	FRFSE-XL (No phase-wrap, Tailored RF)	3500	102	90	31.25	16	3	384 × 224	2
Axial DWI (b=500 and 1400 s/mm ²)	SE-DW-EPI	2500	65.7	--	250	18*10.8	3	128 × 96	12
Axial 3D DCE	SPGR (multi-phase)	3.6	1.3	15	62.5	26	6	256 × 160 × 20	0.5
Axial T1 Pre-Contrast	SPGR (No phase-wrap, EDR)	385	6.2	65	31.25	16	3	384 × 192	1
Axial T1 Post-Contrast	SPGR (No phase-wrap, EDR)	385	6.2	65	31.25	16	3	384 × 192	1

Representative details of a PC staging MR examination as implemented on a 3T scanner with an endorectal coil and torso phase-array coils. Abbreviations: TR= repetition time; TE= echo time; BW=bandwidths; FOV=field of view; NEX = number of excitations; SPGR = spoiled gradient echo; EDR = extended dynamic range; FRFSE-XL= fast recovery fast spin echo accelerated; SE-DW-EPI= spin-echo diffusion-weighted echo planar imaging; RF = radiofrequency.

Table 2

Comparison of the distribution of clinical and pathologic characteristics of the 118 men in the study cohort stratified by erMRI prediction of organ-confined (T2) vs. locally invasive disease (T3).

Clinical or pathologic characteristic	Number (%) of patients, stratified by erMRI findings		P-value
	erMRI T2 N=102	erMRI T3 N=16	
Age (years), median (interquartile range)	57.06 (52.38–60.89)	60.25 (55.89–65.18)	0.13
PSA (ng/ml), median (interquartile range)	5.20 (4.0–6.94)	7.79 (3.1–10.27)	0.21
Clinical T-category			
T1c	79 (77)	12 (75)	0.47
T2a	15 (15)	3 (19)	
T2b	6 (6)	0 (0)	
T2c	2 (2)	1 (6)	
Biopsy Gleason Sum			
6	40 (39)	5 (31)	0.80
7	51 (50)	9 (56)	
8 to 10	11 (11)	2 (13)	
Percent Positive Biopsies, median (interquartile range)	34.52 (25.00–50.00)	41.67 (13.34–50.00)	0.69
D'Amico Risk Group			
Low	35 (34)	3 (19)	0.44
Intermediate	52 (51)	10 (63)	
High	15 (15)	3 (19)	
RP T-Category			
T2a	10 (10)	0 (0)	0.0012
T2b	2 (2)	1 (6)	
T2c	69 (68)	7 (44)	
T3a	17 (17)	2 (13)	
T3b	4 (4)	6 (38)	
RP Gleason Sum			
6	26 (25)	2 (13)	0.16
7	63 (62)	9 (56)	
8 to 10	13 (13)	5 (31)	

Clinical or pathologic characteristic	Number (%) of patients, stratified by erMRI findings		P-value
	erMRI T2 N=102	erMRI T3 N=16	
Margin Status			
Negative	77 (75)	11 (69)	0.55
Positive	25 (25)	5 (31)	

RP = radical prostatectomy. PSA = prostate-specific antigen. Notably, percentages may not add up to 100% due to rounding errors.

Table 3

Unadjusted and adjusted odds ratios with 95% confidence intervals and associated p-values from the logistic regression analysis predicting pathologic category T3 in the 118 men in the study cohort.

Clinical Characteristic	Number of Men	Number of Events (% of men)	Univariable Analysis		Multivariable Analysis	
			UOR (95% CI)	P-value	AOR (95% CI)	P-value
erMRI						
T2	102	21 (21)	1.00 (ref)	--	1.00 (ref)	--
T3	16	8 (50)	3.86 (1.30, 11.49)	0.015	4.81 (1.36, 16.98)	0.015
Age (years)	118	29 (25)	1.03 (0.96, 1.10)	0.41	0.99 (0.92, 1.07)	0.84
PSA (ng/ml)	118	29 (25)	1.02 (0.95, 1.10)	0.57	1.01 (0.92, 1.11)	0.81
Clinical T-Category						
T1c	91	22 (24)	1.00 (ref)	--	1.00 (ref)	--
T2	27	7 (26)	1.10 (0.41, 2.94)	0.85	0.79 (0.26, 2.42)	0.67
Biopsy Gleason Sum						
6	45	5 (11)	1.00 (ref)	--	1.00 (ref)	--
7	60	18 (30)	3.43 (1.16, 10.11)	0.026	2.46 (0.76, 7.97)	0.13
8 to 10	13	6 (46)	6.86 (1.64, 28.73)	0.0085	8.34 (1.78, 39.06)	0.007
Percent Positive Biopsies	118	29 (25)	1.03 (1.01, 1.05)	0.013	1.03 (1.01, 1.06)	0.013

PSA = prostate-specific antigen; UOR = unadjusted odds ratio; AOR = adjusted odds ratio; CI = confidence interval; ref=baseline reference. Notably, p-values not assessable for baseline reference characteristics (indicated by a -- line).

Table 4

Unadjusted and adjusted odds ratios with 95% confidence intervals and associated p-values from the logistic regression analysis predicting pathologic Gleason score 8 to 10 amongst the 105 men with biopsy Gleason score 7 or less.

Clinical Characteristic	Number of Men	Number of Events (% of men)	Univariable Analysis		Multivariable Analysis	
			UOR (95% CI)	P-value	AOR (95% CI)	P-value
erMRI						
T2	91	6 (7)	1.00 (ref)	--	1.00 (ref)	--
T3	14	4 (29)	5.67 (1.36, 23.56)	0.017	5.56 (1.10, 28.18)	0.038
Age (years)	105	10 (10)	1.17 (1.04, 1.30)	0.0077	1.10 (0.99, 1.23)	0.085
PSA (ng/ml)	105	10 (10)	1.09 (1.00, 1.20)	0.055	1.03 (0.93, 1.14)	0.56
Clinical T Category						
T1c	81	9 (11)	1.00 (ref)	--	1.00 (ref)	--
T2	24	1 (4)	0.35 (0.042, 2.89)	0.33	0.35 (0.043, 2.83)	0.33
Biopsy Gleason Sum						
6	45	0	1.00 (ref)	--	1.00 (ref)	--
7	60	10 (17)	18.92 (1.05, 342.70)	0.047	28.19 (1.44, 552.49)	0.028
Percent Positive Biopsies	105	10 (10)	0.99 (0.96, 1.02)	0.49	0.97 (0.93, 1.01)	0.13

PSA = prostate-specific antigen; UOR = unadjusted odds ratio; AOR = adjusted odds ratio; CI = confidence interval; ref=baseline reference. Notably, p-values not assessable for baseline reference characteristics (indicated by a -- line).