Association of Systematic Biopsy vs. Magnetic Resonance Imaging/Ultrasound Fusion Targeted Biopsy with Prostate Cancer Upstaging at Radical Prostatectomy

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Introduction and Objectives

Magnetic resonance imaging (MRI)/ultrasound fusion targeted biopsy (TB) has demonstrated favorable detection rates of clinically-significant prostate cancer compared with systematic biopsy (SB). However, the predictive role of TB vs. SB in upstaging at radical prostatectomy remains undefined.

We sought to determine the prognostic value of targeted vs. systematic biopsy in upstaging to ≥T3a at radical prostatectomy.

Methods

We retrospectively queried our institutional database to identify men who underwent SB and TB followed by radical prostatectomy between April 2015 and June 2017.

Upstaging was regarded as pathological stage ≥T3a after radical prostatectomy with clinical stage ≤T2c.

Each multi-parametric MRI was interpreted using Prostate Imaging – Reporting and Data System (PI-RADS) v2. Pathologic variables included maximum tumor involvement (%), perineural invasion (PNI), and Gleason grade group (GG) in SB vs. TB.

Binary logistic regression was performed to identify clinical, radiological, and pathologic features on SB vs. TB associated with the presence of upstaging from biopsy to radical prostatectomy.

Results

Upstaging was identified at radical prostatectomy in 39 out of 95 (41%) patients.

Patients with upstaging (≥T3a) at radical prostatectomy had elevated prostate-specific antigen [PSA] (median 9 vs. 6.3 ng/mL, P=0.007), PSA density (median 0.22 vs. 0.15 ng/mL/mL, P=0.001), higher maximum tumor involvement on TB cores (median 85% vs. 75%, P=0.01), and higher rate of PNI on SB (28% vs. 9%, P=0.02).

Table 1. Characteristics of the study cohort.

	No upstaging (n=56)	Upstaging (n=39)	P value
Age, median (IQR), yr	63 (60-68)	62 (59-68)	0.63
Abnormal DRE, n (%)	25 (44.6%)	10 (25.6%)	0.08
PSA, median (IQR), ng/mL	6.39 (4.9-8.55)	9 (5.76-16.7)	**0.007**
PSA density, median (IQR), ng/mL/mL	0.15 (0.10-0.22)	0.22 (0.15-0.40)	**0.001**
SB max tumor involvement (%), median (IQR)	37.5 (12.5-75)	50 (30-90)	0.25
TB max tumor involvement (%), median (IQR)	75 (46.25-90)	85 (70-100)	**0.01**
Maximum PI-RADS score, n (%)			**0.007**
≤3	9 (16%)	2 (5%)	
4	29 (51.7%)*	12 (30.7%)*	
5	18 (32.1%)#	25 (64.1%)#	
PNI on TB, n (%)	16 (28.5%)	18 (46.1%)	0.08
PNI on SB, n (%)	5 (8.9%)	11 (28.2%)	**0.02**
TB Grade Group, n (%)			**0.01**
GG 1	12 (21.4%)*	2 (5.1%)*	
GG 2	27 (48.2%)	16 (41%)	
GG 3	11 (19.6%)	6 (15.4%)	
GG 4	4 (7.1%)‡	9 (23.1%)‡	
GG 5	2 (3.6%)#	6 (15.4%)#	
SB Grade Group, n (%)			**0.02**
GG 1	27 (48.2%)*	8 (20.5%)*	
GG 2	19 (33.9%)	14 (35.9%)	
GG 3	7 (12.5%)	10 (25.6%)	
GG 4	1 (1.8%)	4 (10.3%)	
GG 5	2 (3.6%)	3 (7.7%)	

Moreover, compared with organ-confined disease, upstaging was more detected in greater biopsy GG4 and 5 on TB (P=0.01); however, significant difference on SB was found only in GG1 (P=0.02).

Upstaging was also more frequently found among patients with PI-RADS score 5 on MRI (P=0.007).

On univariate analysis of upstaging at radical prostatectomy, maximum tumor involvement on TB cores (OR 1.01, P=0.02), maximum PI-RADS 5 vs PI-RADS 3 on MRI (OR 6.25, P=0.02), PNI on SB (OR 4.00, P=0.01), biopsy GG4-5 vs GG1 on TB (OR 15.00, P=0.003), biopsy GG2-3 vs GG1 on SB (OR 3.11, P=0.02), and biopsy GG4-5 vs GG1 on SB (OR 7.87, P=0.01) were all associated with an increased risk of upstaging (Table 2).

Table 2. Univariate and multivariate regression models for the prediction of upstaging at radical prostatectomy

	Univariate		Multivariate	
	OR (95% CI)	P value	OR (95% CI)	P value
Age	0.98 (0.92-1.05)	0.70		
Abnormal DRE	0.42 (0.17-1.04)	0.06		
PSA	1.00 (0.99-1.00)	0.61		
PSA density	0.99 (0.94-1.03)	0.66		
SB max tumor involvement	1.00 (0.99-1.02)	0.31		
TB max tumor involvement	1.01 (1.002-1.03)	0.02	1.004 (0.98-1.02)	0.66
Maximum PI-RADS score				
3	1.00 (Ref)		1.00 (Ref)	
4	1.86 (0.34-9.92)	0.46	1.43 (0.22-9.05)	0.70
5	6.25 (1.20-32.46)	0.02	4.05 (0.63-25.97)	0.13
PNI on TB	2.14 (0.91-5.04)	0.08		
PNI on SB	4.00 (1.26-12.69)	0.01	4.07 (1.02-16.19)	**0.04**
TB Grade Group				
GG1	1.00 (Ref)		1.00 (Ref)	
GG2-3	3.47 (0.71-16.97)	0.12	1.92 (0.31-11.96)	0.48
GG4-5	15.00 (2.55-88.17)	0.003	6.28 (0.82-47.75)	0.07
SB Grade Group				
GG1	1.00 (Ref)		1.00 (Ref)	
GG2-3	3.11 (1.18-8.17)	0.02	1.89 (0.63-5.64)	0.25
GG4-5	7.87 (1.64-37.69)	0.01	2.85 (0.44-18.17)	0.26

On multivariate analysis, PNI on SB (OR 4.07, 95%CI 1.02-16.19, P=0.04) remained significantly associated with the risk of upstaging at radical prostatectomy (Table 2).

Conclusion

PNI on SB is a significant predictor of upstaging to ≥T3a at radical prostatectomy, whereas no TB pathological features yielded a significant association.

SB maintains an important role in the prediction of non-organ confined disease in patients with prostate cancer.

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