Location and Pathological Characteristics of Cancers in Radical Prostatectomy Specimens Identified by Transperineal Biopsy Compared to Transrectal Biopsy

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Purpose: Anterior tumors are estimated to constitute 20% of prostate cancers. Current data indicate that transperineal biopsy is more reliable than transrectal biopsy in identifying these tumors. If correct, this superior reliability should result in an increased proportion of anterior tumors identified by transperineal biopsy. We investigated this hypothesis with reference to prostatectomy specimens.

Materials and Methods: Radical prostatectomy histopathology records were retrospectively examined. Patients were grouped based on primary transperineal or transrectal biopsy as the modality used to identify the initial cancer. After grouping, tumor location and size were recorded and, thus, the proportion of anterior tumors was determined.

Results: A total of 1,132 (414 transperineal and 718 transrectal) prostatectomy specimens were examined. Overall mean tumor size (1.8 and 2.0 cm^3), stage (pT2 63.3% and 61%) and significance (5.1% and 5.1%) for the transperineal and transrectal methods were similar. However, the transperineal method was associated with proportionally more anterior tumors (16.2% vs 12%, $p = 0.046$), and identified them at a smaller size (1.4 vs 2.1 cm^3, $p = 0.03$) and lower stage (extracapsular extension 13% vs 28%, $p = 0.03$) compared to the transrectal method. The pT3 positive surgical margin rate for anterior vs other tumors was 69% vs 34.9%, respectively.

Conclusions: Overall transrectal and transperineal biopsy identify cancers that are similar in size, stage and significance. However, transperineal biopsy detected proportionally more anterior tumors (16.2% vs 12%), and identified them at a smaller size (1.4 vs 2.1 cm^3) and stage (extracapsular extension 13% vs 28%) compared to transrectal biopsy. Identifying anterior tumors early is important because the positive surgical margin rate for anterior pT3 lesions is significantly higher.

Key Words: prostatic neoplasms; pathology; prostatectomy; biopsy, needle; diagnosis

Abbreviations and Acronyms

AS = active surveillance
DRE = digital rectal examination
ECE = extracapsular extension
PSM = positive surgical margin
TP = transperineal
TR = transrectal

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Of all prostate cancer it is estimated that anterior tumors constitute 20%.[1] Based on current data, transperineal biopsy is more reliable than transrectal biopsy in identifying these tumors.[1,2] However, this evidence is based on the labeling of biopsies as anterior zone without directly correlating them with whole specimens. TP biopsy typically takes more cores than

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TR biopsy. Therefore, it is possible that TP biopsy simply identifies more cancers independent of location.

Huo et al reported that biopsy core accuracy, when correlated with prostatectomy specimens, had an average sensitivity and specificity for location of 48% and 84%, respectively.[3] Rogatsch et al found the positive predictive value of apical cores in correctly identifying cancer in that location in the prostatectomy specimen was only 71.1%.[4] Thus, the concordance between core location and actual location is not particularly reliable.

Assuming TP biopsy does identify more anterior tumors due to its more direct approach to this region, then the proportion of anterior tumors in prostatectomy specimens should be higher compared to TR identified tumors. More readily identifying anterior tumors should have the potential advantages of identification at a smaller size and lower stage as well as a lower PSM rate. Therefore, we quantified the percentage of anterior tumors in prostatectomy specimens from men in whom cancer was identified by primary TP vs TR prostate biopsy. The secondary study goal was to qualify the size, stage and grade of the anterior tumors.

METHODS

In this retrospective study we examined radical prostatectomy specimens taken between 2004 and 2010 at 2 institutions (Westmead and St. Vincent's Hospitals, Sydney). Patients were grouped by the modality used to identify the initial cancer as primary TP or TR biopsy. There were 6 surgeons who contributed to the database, and the indication for selecting between TR and TP for the initial biopsy was entirely at the discretion of the urologist. Almost all prostate biopsies were done by the surgeon who subsequently performed the surgery.

For the TP group only specimens in which cancer had been identified on initial TP biopsy were included and, thus, men with a prior negative TR biopsy were excluded from study. TP biopsies were performed using ultrasound guidance and a biopsy template. There were 12 zones targeted but additional cores could have been taken for larger prostates. The mean number of cores taken was previously reported as 23 (range 13 to 43).[3] The majority of TR biopsies had 12 cores taken under ultrasound guidance. Additional cores may have been taken if a suspicious area was palpable on DRE. In this study we had access to the mode of biopsy only and not the initial biopsy report. Thus, the number and location of positive cores were not known. DRE information was also not available.

All initial histopathology was reported by experienced uropathologists with each prostate specimen fully embedded for analysis. Sectioning was performed at 3 to 4 mm intervals with each slice divided into 4 quadrants. The anatomical locations of tumor foci were reproduced in a prostate cancer map. The total tumor volume for each radical prostatectomy specimen was calculated using a 3-dimensional volume estimation method as reported by Chen et al[5] and recommended by the Royal College of Pathologists of Australasia. Data were collected from the histopathology reports, and included prostate size, tumor grade, size and stage, and margin status. The prostate was then divided into 4 zones of anterior base, anterior apex, posterior base and posterior apex. Anterior was defined as the portion of prostate above the urethra. A zone was marked positive if it held the main tumor or if more than 20% of the zone was occupied by tumor. Tumors were classified as anterior only if 1 or both of the anterior segments were positive. If a posterior segment was positive it was labeled as other. Data were analyzed with SPSS® using the chi-square or Student t test as appropriate.

RESULTS

TP vs TR Biopsy for All Tumors

A total of 1,132 prostatectomy specimens were examined, with 414 cancers detected by TP biopsy and 718 by TR biopsy. Overall mean prostate volume and tumor size were similar between TP and TR tumors. A higher proportion of lower grade tumors (Gleason 6 or less) was present in the TR vs the TP group (10.8% vs 15.5%, respectively, $p = 0.043$). ECE was present in 149 (36%) of the TP and 274 (38.2%) of the TR specimens. The frequencies of each stage are given in table 1 and are similar between the groups.

The rate of PSMs for pT2 disease was 14.2% and 6.6% for TP and TR, respectively ($p = 0.001$). For pT3 disease the rates were 39% and 36.6% for TP and TR, respectively. Overall the incidence of insignificant cancer (size less than 0.5 cc, Gleason 6 or less, organ confined[6]) was 5.1% for the TP and TR biopsy groups.

TP vs TR Biopsy for Anterior Only Tumors

For TP biopsy 67 (16.2%) cancers were anterior only compared to 86 (12%) for TR biopsy ($p = 0.046$, table 2). For anterior only tumors mean size was 1.4 cm^3 for TP detected vs 2.1 cm^3 for TR detected

Table 1. *Overall tumor characteristics*

	TP Group	TR Group	p Value
Mean ± SD cm^3 tumor size	1.8 ± 1.5	2.0 ± 1.9	0.12
Mean ± SD cc prostate size	52.4 ± 17.2	50.8 ± 18.4	0.15
No. Gleason score (%):			
6 or Less	45 (10.8)	111 (15.5)	0.043
7	331 (80)	528 (73.5)	
8 or Greater	38 (9.2)	79 (11.0)	
No. stage (%):			
T2	262 (63.3)	437 (61)	0.71
T3a	119 (28.7)	217 (30.2)	
T3b	29 (7.0)	52 (7.2)	
Any T, N1	4 (1)	12 (1.7)	
No. ECE (%)	149 (36)	274 (38.2)	0.47
No. PSM (%):*			
T2	37 (14.2)	29 (6.6)	0.001
T3	59 (39)	98 (36.6)	0.49
Totals	96 (23.2)	127 (17.7)	0.025
No. insignificant Ca (%)†	21 (5.1)	37 (5.1)	0.95

* Percentages taken as a percent of each stage.
† As defined by Epstein criteria.