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Original article

Prostate cancer detection and complication rates with transrectal ultrasound-guided prostate biopsies among different operators

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ABSTRACT

Objective: To evaluate interoperator differences in cancer detection and complication rates using transrectal ultrasound (TRUS)-guided prostate biopsies. We also analyzed whether there was a correlation between the experience of the operator and the cancer detection rate.
Materials and methods: Medical records of 1879 patients who underwent a TRUS-guided prostate biopsy between 2005 and 2009 were retrospectively reviewed. Among them, 1496 patients who underwent a first biopsy without previous prostate surgery were selected for the analysis. Five urology residents performed 327, 351, 218, 332, and 268 biopsies, respectively. Cancer detection rates were analyzed by comparing the initial 20 and 100 patients with the final 20 and 100 patients. Patients were subdivided into two groups: prostate-specific antigen (PSA) of approximately 4–10 and >10 ng/mL. Prostate cancer (CaP) detection and complication rates were compared among operators.
Results: Cancer was detected in 541 patients (36%). The operators performed a median of 403 (range: approximately 277–436) transrectal sono-guided prostate biopsies with CaP detection rates of approximately 33.9–42.2% ($p = 0.243$). Among different operators, we found no differences in cancer detection rates for the initial 100 or final 100 patients, even when separating patients into PSA > 10 ng/mL and 4 < PSA < 10 ng/mL groups. But significant individual variations in CaP-positive rates ($p = 0.046$) were observed in the first 20 biopsies for patients with PSA > 10 ng/mL receiving a TRUS biopsy; however, variable PSA levels in different groups of patients may have been responsible for this finding. There were no differences in complication rates among the different operators for the initial 20 and final 20 biopsies or for the initial 50 and final 50 biopsies.
Conclusion: No clinically significant differences in CaP detection existed among operators performing TRUS-guided prostate biopsies. Complication rates did not differ among the operators. A TRUS-guided prostate biopsy is a rapidly learned technique and is a good diagnostic tool for CaP detection.

1. Introduction

Before the availability of prostate-specific antigen (PSA) testing, prostate cancer (CaP) was often detected at advanced and less-curable stages. The utilization of PSA has led to earlier detection of organ-confined CaP. During the early stages of CaP, patients can be relatively symptom free, and a prostate biopsy may be recommended if the PSA level is abnormal or if a palpable nodule is found during a digital rectal examination (DRE).

A transrectal ultrasound (TRUS)-guided biopsy is the standard procedure for diagnosing CaP, and is a tool for diagnosing smaller or atypically located tumors, which cannot be palpated on a DRE.[1] Several CaP predictors were studied, such as procured cores and PSA levels. In this study, we evaluated whether the operator is an independent factor in CaP detection, and whether complication rates decrease when operators become skilled in this procedure.

2. Materials and methods

From 2006 to 2009, 2748 TRUS-guided biopsies were performed at our institution. Among these, 1496 patients received their first TRUS biopsy and were included in the study. The following data were obtained by retrospective chart review: age, PSA level, TRUS-calculated prostate volume, pathological diagnosis, Gleason grade,

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Table 1
Demographic data of patients examined by different operators.

	Operator					*p*
	1	2	3	4	5	
No. of biopsies	327	351	218	332	268	–
Malignancy (%)	118 (36.1)	119 (33.9)	75 (34.4)	116 (34.9)	113 (42.2)	0.206
Median age (years)	75 (~55–89)	76 (~49–88)	75 (~47–89)	76 (~43–86)	76 (~42–86)	0.107
Median prostate size (cm^3)	38.8 (~10.0–142.0)	36.0 (~13.0–143.2)	47.0 (~11.2–155.0)	39.9 (~16.7–167.2)	35.9 (~10.2–130.5)	0.103
PSA (%)	–	–	–	–	–	0.244
~4–10 ng/dL (%)	183 (59)	173 (56)	112 (54)	181 (58)	130 (49)	–
>10 ng/dL (%)	126 (41)	138 (44)	95 (46)	139 (42)	138 (51)	–
Median PSA (ng/mL)	8.5 (~0.5–949)	8.5 (~0.4–988)	9.1 (~0.85–850)	8.5 (~0.4–9221)	9.6 (~0.4–9442)	0.244
Abnormal DRE (%)	51.1	56.1	52.8	55.4	54.5	0.700
Gleason score ≥ 7 (%)	71 (60.2)	80 (67.2)	45 (60.0)	73 (62.9)	79 (69.9)	0.409

PSA = prostate-specific antigen; DRE = digital rectal examination.

and the number of cores. Biopsies were performed by five urology residents, with 12 samples per biopsy (six from lateral cores and six from medial cores, random biopsy). An evacuation enema was given, and 80 mg gentamycin was given before the procedure, with 1 g cefazolin replacing gentamycin if a deterioration in renal function was noted. All operators used the same equipment to perform the procedure (side-firing probe MG1522, MN series 1816 magnum core tissue biopsy needle, bard), and biopsy results were interpreted by the same group of pathologists.

Patients were categorized according to their PSA levels as either approximately 410 or >10 ng/mL, and the CaP detection and complication rates for these two groups were analyzed by the various operators. The first and last 20, and the first and last 100 patients' CaP detection rates by the same operator and different operators were also analyzed.

Complications of the TRUS-guided biopsy were defined by the occurrence of acute urinary retention or urinary tract infection (UTI) that required hospitalization, but did not include minor complications such as hematuria and rectal bleeding. We divided patients into groups with prostate sizes of >45 and <45 cm^3, and compared complication rates between the first and last 20,and between the first and last 50 patients. The prostate size (in cm^3) was measured using the ellipsoid formula: by multiplying the largest anteroposterior (height), transverse (width), and cephalocaudal (length) prostate diameters by 0.52.

Categorical variables between operators were compared using Pearson's Chi-square and continuous variable Kruskal–Wallis tests and analysis of variance.

3. Results

In total, 1496 patients receiving a TRUS-guided biopsy of the prostate for the first time were selected for the analysis. Five urology residents performed a median of 327 (range: approximately 218–351) TRUS biopsies. The overall CaP predictive value was 36.2% without significant differences among operators (range: approximately 33.9–42.2%, $p = 0.243$).

Patient demographics for each operator are listed in the Table 1. The median age, median PSA value, median prostate size, and abnormal DRE percentage did not differ between groups.

Overall cancer detection rates ranged between 33.9% and 42.2%, and Gleason scores of >7 accounted for approximately 60.2–69.9% ($p = 0.409$) (Table 1). Among different operators, we found no differences in cancer detection for the first 100 or last 100 patients, even if we separated them into groups by PSA scores of PSA > 10 ng/mL, 4 ng/mL < PSA < 10 ng/mL (Table 2). Although no significant differences in cancer detection rates were found between the first 20 and last 20 patients receiving a prostate biopsy among the different operators, there was significant individual variation in CaP-positive rates ($p = 0.046$) for the first 20 patients with a PSA value of >10 ng/mL receiving a TRUS-guided biopsy (Table 3).

The overall complication rate was 2.0%, and no significant difference was noted among operators ($p = 0.289$). When we compared the first 20 and 50 patients with the last 20 and 50 patients, respectively, with prostate sizes of >45 or <45 $cm,^3$ there was no significant difference in complication rates between the different operators (Tables 4 and 5).

4. Discussion

CaP has increased in Taiwan over the past decade. In 2007, there were an estimated 3367 new cases in Taiwan, which made CaP the fifth leading cancer in men. There were 936CaP-related deaths in 2009, ranking seventh in cancer-related mortality in men.

Table 2
Cancer detection rates of the first and last 100 patients (pts.).

Cancer detection rate	Operator					*p*
	1	2	3	4	5	
Overall						
First 100 pts. (%)	42 (42)	36 (36)	27 (27)	34 (34)	41 (41)	0.175
Last 100 pts. (%)	32 (32)	37 (37)	40 (40)	39 (39)	38 (38)	0.798
First 100 biopsies						
PSA ~4–10 ng/dL (%)	14/52 (26.9)	10/51 (19.6)	13/52 (25)	12/56 (21.4)	11/51 (21.6)	0.904
PSA > 10 ng/dL (%)	24/42 (57.1)	24/38 (63.2)	18/42 (42.9)	22/41 (53.7)	30/49 (61.2)	0.358
Last 100 biopsies						
PSA ~4–10 ng/dL (%)	9/48 (18.8)	11/47 (23.4)	10/49 (20.4)	10/42 (23.8)	10/49 (20.4)	0.972
PSA > 10 ng/dL (%)	23/45 (51.1)	25/46 (54.3)	29/49 (59.2)	26/48 (54.2)	26/47 (55.3)	0.958

PSA = prostate-specific antigen.