

Results of Finger-guided Transrectal Prostate Needle Biopsy Using an Iowa Trumpet

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Abstract

Background and Objective: Currently, the gold standard diagnosis of prostate cancer is transrectal ultrasound (TRUS)-guided prostate needle biopsy, obtaining 8 to 10 cores. Because Tak Hospital lacks a transrectal ultrasound, finger-guided transrectal prostate biopsy using an Iowa trumpet was used. The aim of this study was to determine the diagnostic values of this technique.

Methods: This retrospective study collected data from the hospital database from January 2006 to December 2015. Indications for biopsy included high prostate specific antigen (PSA) level (≥ 4 ng/mL) or abnormal findings on digital rectal examination (DRE). Repeat biopsy was indicated in patients with rising PSA (> 0.85 ng/mL/year). Patients with urinary tract infection and bleeding tendency were excluded. Pathological reports, PSA, and DRE results were collected.

Results: Two hundred and fifty-two patients were included and 286 biopsies were performed. Cancer detection rate at initial biopsy was 44%, and at the first repeat biopsy 17%. The sensitivity, specificity and positive predictive value for PSA ≥ 4 ng/mL were 98.2%, 5.0% and 44.9%, respectively; for PSA level > 10 ng/mL these were 87.4%, 61.7% and 64.2%, respectively; for abnormal DRE, these were 90.1%, 87.9% and 85.5%, respectively; and for PSA ≥ 4 ng/mL with abnormal DRE these were 88.3%, 92.9% and 90.7%, respectively. The major complications were seen in 5% (most were infectious complication) and minor complications 9% (most were difficult urination, dysuria and urinary retention) of patients.

Conclusion: Finger-guided transrectal prostate needle biopsy using an Iowa trumpet is equally as effective as the standard TRUS-guided diagnosis of prostate cancer. Its complications are acceptable and comparable to the standard TRUS-guided methods.

Keywords: Finger guided, transrectal prostate biopsy, Iowa trumpet

INTRODUCTION

Prostate cancer is the second most frequently diagnosed cancer and the fifth leading cause of cancer death in men worldwide. Its incidence is increasing in Thailand, where prostate-specific antigen (PSA) testing began later than in European countries¹. Prostate cancer is ranked the 6th most common cancer in men

in Thailand. Its incidence is low before the age of 40 years and increases rapidly with the age after 50 years². The diagnosis and detection of prostate cancer has undergone profound changes due primarily to the development and widespread clinical use of PSA testing³.

Prostate cancer diagnosis is established by prostate

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biopsy. Ferguson performed the first transperineal prostate needle biopsy in 1930. Later, Astraldi performed the first finger-guided transrectal prostate biopsy. In 1988, Radge and colleagues reported good results in using an 18-gauge spring-loaded biopsy gun. Lee and colleagues reported good results in using the transrectal ultrasound (TRUS). In 1989, Hodge described TRUS-guided sextant (6-core) biopsy and demonstrated higher detection rate than finger-guided biopsy. In the late 1990s, several studies observed high false-negative rates with the sextant biopsy, and recommended obtaining more cores. Currently, systematic, random sampling, TRUS-guided biopsy with 10 to 12 cores is the gold standard for prostate cancer diagnosis³.

The Thai Urological Association Under Royal Patronage recommends TRUS-guided prostate biopsy with at least 8 cores in the patients who present with either high PSA level (≥ 4 ng/mL) or abnormal findings on digital rectal examination (DRE) for the diagnosis of prostate cancer⁴. However, in some remote areas of Thailand such as Tak province, many hospitals lack TRUS. The present study aims to show that systematic, 10-core, finger-guided transrectal prostate needle biopsy using an Iowa trumpet can be an effective alternative to standard TRUS-guided biopsy in clinical practice.

MATERIAL AND METHODS

A ten-year retrospective study was performed. Data were collected from the medical records of Somdej Phrachao Taksin Maharaj Hospital. Between January 2006 and December 2015, patients who underwent 10-core, systematic, finger-guided transrectal prostate biopsy using an Iowa trumpet, who had complete information on the pathology, serum prostate specific antigen (PSA) level, and digital rectal examination (DRE) results, were included.

Prostate biopsy was performed in both outpatients and inpatients setting by one urologist. Indications for prostate biopsy in this study were high serum PSA level (≥ 4 ng/mL) or abnormal findings on digital rectal examination (hard consistency, nodularity or irregularity). Repeat biopsies were taken in patients with persistently rising PSA (more than 0.85 ng/mL/year). Patients with urinary tract infection and bleeding tendency were excluded.

All patients were informed about the transrectal prostate biopsy and all potential complications before they were scheduled for the procedure. All patients consented to the procedure. Pre-procedure preparations, including antibiotic prophylaxis (ofloxacin, 200 mg oral bid, and metronidazole, 400 mg oral tid one day before the procedure) and bowel preparation with unison enema (one night before procedure) were provided to all patients.

The prostate biopsies were performed either in the left lateral decubitus position with flexion of both hips and knees (standard digital rectal examination position), or in the lithotomy position (simultaneously with cystoscopy). All patients were given lidocaine jelly (10 mL) rectal suppository for anesthesia, and povidone-iodine was used for rectum cleansing immediately prior to the procedure.

Prostate tissue specimens were obtained using an 18-gauge needle with a spring loaded biopsy gun, finger-guided with an Iowa trumpet. Ten random biopsies were taken from the base and midline positions in the mid-lobar parasagittal planes of both prostatic lobes, and at the apex, at a more lateral position than the mid-lobar parasagittal planes. If there were any abnormal areas detected by DRE, these were incorporated into one of the ten cores.

All patients received instructions on potential post-procedural complications. They were advised to return to the hospital if any abnormal symptoms such as fever or bleeding occur. At one month after the procedure, the patient would return for a follow-up visit where the pathologic report would be provided and the occurrence of complications recorded.

RESULTS

A total of 252 patients were included in the present study. The mean age was 69.5 years, with a range from 51 to 93 years. There were 286 biopsies done on these patients, with 34 repeated biopsies analyzed separately. Of the initial 252 biopsies, prostate cancer was found in 111, giving a cancer detection rate of 44%. Of the 34 repeated biopsies, 30 were first repeat and 4 were second repeat biopsies. Of 30 first repeat biopsies, prostate cancer was found in 5, giving a cancer detection rate of 17%. The initial and repeated biopsies are compared in Table 1.

The average PSA level in this series was 129.42

ng/mL with a range from 0.54 to 6,497 ng/mL. The association between PSA level and cancer detection is shown in Table 2. Of the 9 patients with PSA level < 4

Table 1 Cancer detection rate among initial, first repeat and second repeat biopsies

Variable	Initial	First repeat	Second repeat
Number of biopsies	252	30	4
Number of positive biopsies	111	5	0
Cancer detection rate (%)	44	17	0

Table 2 Association between PSA level and cancer detection, on initial biopsy

PSA level (ng/mL)	Number of biopsies	Number of positive biopsies	Cancer detection rate (%)
< 4	9	2	22
4 -10	92	12	13
> 10 - 20	59	14	24
> 20 - 50	33	24	73
> 50 - 100	13	13	100
> 100	46	46	100
Total	252	111	44

Table 3 Association between digital rectal examination (DRE) result, PSA level, and cancer detection, on initial biopsy

Grouping	Number of biopsies	Number of positive biopsies	Cancer detection rate (%)
DRE negative	135	11	8
- PSA < 4 ng/mL	0	0	0
- PSA 4-10 ng/mL	82	4	5
- PSA >10 ng/mL	53	7	13
DRE positive	117	100	89
- PSA < 4 ng/mL	9	2	22
- PSA 4-10 ng/mL	10	8	80
- PSA >10 ng/mL	98	90	92

ng/mL, 2 were found to have spindle cell sarcoma (detection rate 22%). In the remaining 243 patients with PSA level ≥ 4 ng/mL, 109 were found to have adenocarcinoma (detection rate 45%). All of patients with PSA level > 50 ng/mL had prostate cancer (detection rate 100%).

The association between DRE results, PSA level and cancer detection, is shown in Table 3. Of the 135 patients with clinically benign DRE, 11 were found to have cancer (detection rate 8%). Of the 117 patients with abnormal DRE, 100 were found to have cancer (detection rate 89%). Patients with abnormal DRE and PSA level ≥ 4 ng/mL had a 96% rate of prostate cancer (104 cancers in 108 patients)

The sensitivity, specificity, positive predictive value and negative predictive value of various PSA levels and DRE findings are shown in Table 4. Approximately 96% of patients was positive for PSA ≥ 4 ng/mL. The positive predictive value was 44.9% for PSA ≥ 4 ng/mL in detecting prostate cancer. About 60% of patients was positive for PSA >10 ng/mL. The positive predictive value was 64.2% for PSA >10 ng/mL in detecting prostate cancer. Overall, 46% of patients had abnormal findings on DRE. The positive predictive value for DRE in detecting prostate cancer was 85.5%. The positive predictive value rose to 90.7% if both abnormal DRE and PSA ≥ 4 ng/mL were used for detecting prostate cancer.

Complications which followed finger-guided transrectal prostate biopsy are shown in Table 5. In 13 (5%) biopsies major complications occurred which required hospitalization. Infection was the most common major complication. There was no mortality in this study. Minor complications occurred in 27 (9%) biopsies. Thus, 246 biopsies (86%) in the present study were complication-free.

Table 4 Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of PSA level and digital rectal examination (DRE) results in the diagnosis of prostate cancer

	Number (%)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
PSA ≥ 4 ng/mL	243 (97)	98.2	5.0	44.9	77.8
PSA >10 ng/mL	141 (56)	87.4	61.7	64.2	86.1
DRE positive	117 (46)	90.1	87.9	85.5	91.9
DRE positive with PSA > 4 ng/mL	108 (43)	88.3	92.9	90.7	91.0

Table 5 Major and minor complications following prostate biopsy

Complications	Number (%)
Number of biopsies = 286	
Major complications	13 (5)
Infection	
- Urinary tract infection with fever	4 (31)
- Prostatitis	4 (31)
- Epididymitis/ Epididymo-orchitis	2 (15)
- Urosepsis	1 (8)
Hemorrhage	
- Massive gross hematuria	0
- Massive hematochezia	1 (8)
Vasovagal syncope	1 (8)
Minor complications	27 (9)
- Dysuria and difficult urination	9 (33)
- Hematuria	4 (15)
- Hematospermia	2 (7)
- Anorectal discomfort	4 (15)
- Acute urinary retention	8 (30)

DISCUSSION

In a study of prostate cancer screening, Mistry and Cable⁵ found an overall cancer detection rate of 1.8%. The pooled sensitivity, specificity and positive predictive value for PSA level were 72.1%, 93.2% and 25.1%, respectively. For DRE, the corresponding numbers were 53.2%, 83.6% and 17.8%, respectively. In the study by Wiwanitkit⁶, the prevalence of prostate cancer was 10.8%, while the sensitivity and specificity for PSA were 95.8% and 66.2% respectively, with positive predictive value in the range 11.5 to 27.1%.

In the present study, the cancer detection rate on initial biopsy was 44%. The sensitivity, specificity and positive predictive value for PSA ≥ 4 ng/mL were 98.2%, 5.0% and 44.9%, respectively; for PSA level > 10 ng/mL, these were 87.4%, 61.7% and 64.2%, respectively; for abnormal DRE these were 90.1%, 87.9% and 85.5%, respectively; and for PSA ≥ 4 ng/mL in combination with abnormal DRE, the numbers were 88.3%, 92.9% and 90.7%, respectively. The reason these values are different from those of previously reports could be due to the nature of patients seen in our hospital, which are mainly symptomatic patients, while values obtained from previous reports were of community-based or population-based screening population.

The present results compare favourably with those reported by Udomphot et al⁷. The 10-year result of prostate biopsy at Maharaj Nakorn Chiang Mai Hospital revealed an overall detection rate of 35.7%, with sensitivity, specificity and positive predictive value for PSA level > 4 ng/mL of 97.8%, 10% and 37.9%, respectively. For PSA level > 10 ng/mL these numbers were 81.3%, 56.6% and 50.9%, respectively.

These values were in agreement with those of Tze Kiat Ng⁸. In that study, the cancer detection rate was 52% on initial biopsy, and 31% for the first repeat biopsy. The sensitivity, specificity and positive predictive value for PSA > 4 ng/mL were 97.4%, 8.1% and 52.8%, respectively; and for PSA level > 10 ng/mL, these were 77.8%, 76.1% and 67.7%, respectively. In the same study, the sensitivity, specificity and positive predictive value for abnormal DRE were 59.4%, 75.5% and 72.2%, respectively; and for PSA > 4 ng/mL with abnormal DRE, the numbers were 57%, 82.5% and 77.7%, respectively. The present values are higher than those in Ng's report, possibly due either to a larger number of core biopsy obtained (10 cores vs. 8 cores), or the occurrence of more advanced disease, or both, in our study.

Major complications occurred in 5% (most were infectious complication) and minor complications occurred in 9% (most were difficult urination, dysuria, and urinary retention), of patients in the present study. This incidence of major complications are comparable to those of a recent systematic review⁹, as well as those of Santanapipatkul¹⁰, who found major complications to occur in 3.9% (most were infectious complication as well) of their patients. However, in the latter study, minor complications were seen in 92.6% (most were gross hematuria and anorectal discomfort). The much lower rate of minor complications in our study could be because we obtained less number of cores, we did not use periprostatic nerve block, and we did not use TRUS, which would cause more anorectal discomfort than the finger.

CONCLUSION

The 10-core, finger-guided transrectal prostate needle biopsy via an Iowa trumpet is as effective as the standard TRUS-guided needle biopsy in the diagnosis of prostate cancer. Its complications are acceptable and comparable to those of the standard TRUS-guided

biopsy. The 10-core, finger-guided transrectal prostate needle biopsy can be an effective alternative to standard TRUS-guided biopsy in clinical practice.

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บทคัดย่อ ผลของการเจาะชิ้นเนื้อต่อมลูกหมากผ่านทางทวารหนักโดยใช้นิ้วมีระบุตำแหน่ง และใช้ Iowa trumpet นำทางเข็มเจาะ

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บทนำและวัตถุประสงค์: แนวทางปฏิบัติล่าสุดในการวินิจฉัยโรคมะเร็งต่อมลูกหมากทำโดยการเจาะชิ้นเนื้อต่อมลูกหมากอย่างน้อย 8 จุดโดยใช้เครื่องมืออัลตราซาวด์ผ่านทางทวารหนักระบุตำแหน่งและนำทางเข็มเจาะ แต่เนื่องจากโรงพยาบาลสมเด็จพระเจ้าตากสินมหาราชไม่มีเครื่องมืออัลตราซาวด์ผ่านทางทวารหนัก การวินิจฉัยโรคโดยการเจาะเนื้อต่อมลูกหมากจึงทำโดยใช้นิ้วมีระบุตำแหน่ง และใช้ Iowa trumpet นำทางเข็มเจาะ การศึกษานี้เพื่อทบทวนผลของการตัดชิ้นเนื้อดังกล่าวว่าสามารถช่วยในการวินิจฉัยโรคได้ดีเพียงไร

วิธีการศึกษา: ทบทวนเวชระเบียนย้อนหลัง 10 ปี ตั้งแต่เดือนมกราคม 2549 ถึงธันวาคม 2558 ผู้ป่วยที่มารับการเจาะชิ้นเนื้อต่อมลูกหมากมีข้อบ่งชี้คือ มีค่า PSA สูง (≥ 4 ng/mL) หรือตรวจพบลักษณะสงสัยมะเร็งต่อมลูกหมากจากการตรวจทวารหนัก การเจาะชิ้นเนื้อซ้ำทำในรายที่ยังคงมีค่า PSA สูงต่อเนื่องมากกว่า 0.85 ng/mL/ปี ข้อห้ามในการเจาะชิ้นเนื้อได้แก่ มีการติดเชื้อทางเดินปัสสาวะ หรือเสี่ยงต่อเลือดหยุดยาก บันทึกข้อมูลได้แก่ผลการตรวจต่อมลูกหมากผ่านทางทวารหนัก ผลค่า PSA รายงานผลชิ้นเนื้อ และภาวะแทรกซ้อนที่พบ แล้วนำข้อมูลที่ได้ไปคำนวณทางสถิติ

ผลการศึกษา: ผู้ป่วยทั้งหมด 252 คน ได้รับการเจาะชิ้นเนื้อทั้งหมด 286 ครั้ง พบ Cancer detection rate ในการเจาะชิ้นเนื้อครั้งแรกและการเจาะซ้ำครั้งต่อมร้อยละ 44 และ 17 ตามลำดับ ประเมินค่า Sensitivity (SENS), Specificity (SPEC) และ positive predictive value (PPV) สำหรับการวินิจฉัยโรคมะเร็งจากผลผิดปกติต่างๆ ได้ดังนี้ ที่ระดับ PSA ≥ 4 ng/mL พบ SENS ร้อยละ 98.2 SPEC ร้อยละ 5.0 PPV ร้อยละ 44.9, ที่ระดับ PSA > 10 ng/mL พบ SENS ร้อยละ 87.4 SPEC ร้อยละ 61.7 PPV ร้อยละ 64.2 สำหรับการตรวจทวารหนักผิดปกติ พบ SENS ร้อยละ 90.1 SPEC ร้อยละ 87.9 PPV ร้อยละ 85.5 สำหรับการตรวจทวารหนักผิดปกติและมีค่า PSA ≥ 4 ng/dl พบ SENS ร้อยละ 88.3 SPEC ร้อยละ 92.9 PPV ร้อยละ 90.7 พบภาวะแทรกซ้อนรุนแรงจากการตรวจดังกล่าวร้อยละ 5 (ส่วนใหญ่เป็นการติดเชื้อ) และพบภาวะแทรกซ้อนไม่รุนแรงร้อยละ 9 (ส่วนใหญ่เป็นอาการปัสสาวะขัด ปัสสาวะลำบาก และปัสสาวะไม่ออก)

สรุป: การเจาะชิ้นเนื้อต่อมลูกหมากผ่านทางทวารหนักโดยใช้นิ้วมีระบุตำแหน่ง และใช้ Iowa trumpet นำทางเข็มเจาะ สามารถใช้ในการวินิจฉัยโรคมะเร็งต่อมลูกหมากได้ดีและมีภาวะแทรกซ้อนที่ยอมรับได้ เทียบเคียงกับการเจาะชิ้นเนื้อโดยใช้เครื่องมืออัลตราซาวด์ผ่านทางทวารหนัก

คำสำคัญ: เจาะชิ้นเนื้อต่อมลูกหมากผ่านทางทวารหนัก