Original Article

Are 18-core Transrectal Ultrasound-guided Prostate Biopsies Feasible for Prostate Cancer Detection?

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Objective: To determine the value of 18-core biopsies for prostate cancer detection.

Materials and Methods: A cross sectional study was conducted. Men with abnormal PSA were enrolled. Every patient was subjected to 18-core TRUS biopsy. Parameters such as PSA, free PSA, prostate volume, PSA density and pathological results were recorded and compared between the 12-core group and 18-core group.

Results: A total of 43 men with a mean age of 69.44 years was evaluated. The mean PSA was 99.09 ng/mL, mean Free PSA was 4.29 ng/ml, mean prostate volume was 56.50 ml and a mean PSAD was 2.31 ng/ml/ml. 13 were diagnosed with prostate cancer. The 18-sample biopsy procedures yielded a diagnosis of prostate cancer in 30.23% compared with 27.91% of patients on the basis of 12 biopsies and detected a higher Gleason score disease than those in the 12-core group. The 18-sample procedure improved the diagnosis yield by 7.69%. Significant differences in the Cancer detection core numbers were observed. No serious complications occurred.

Conclusion: 18-core TRUS biopsy seemed to improve detection rates of prostate cancer and detected higher grade disease without causing any significant complications. Therefore, patients with suspected prostate cancer should be considered for 18 extended schemes.

Keywords: 18-core transrectal ultrasound-guided prostate biopsies, Prostate cancer detection

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Prostate cancer can be suspicious by abnormality in the digital rectal examination or rising of the prostatic specific antigen (PSA). Men who meet these irregularities usually undergo Transrectal ultrasound-guided prostate biopsies to find out if they have prostate cancer or not.

Transrectal ultrasound-guided (TRUS) prostate biopsy is a main tool for diagnosing prostate cancer. This procedure is performed by most urologists, outpatient case. The accuracy of TRUS biopsy depends on many factors such as location of specimen, number of specimen, labelling method and pathologic interpretation process[1].

Currently, Double sextant TRUS biopsy guided by transrectal ultrasound is the most widely accepted sampling technique involving 12-core covering all parts of the gland. However, there is no clear consensus regarding optimal number of cores. Thus, TRUS guided biopsies are somewhat limited. Some papers published that repeat TRUS biopsy improved the chance to find prostate cancer[2] or additional core biopsies increased the cancer detection rate[3-5]. Therefore, we hypothesized that if there were a greater number of biopsy cores performed then more accuracy in detecting prostate cancer would result. In the present study, we propose 18-core biopsies so participants can tolerate the procedure well, the same as 12-core biopsies.

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Objective

The present study was to determine the value of 18-core biopsies for prostate cancer detection.

Materials and Methods

A cross sectional study was conducted in Ramathibodi Hospital between March 2018 and October 2018 after receiving ethical approval approved by the institutional ethics committee. 43 patients were enrolled. Informed consent was taken from each participant. All patients reported abnormal PSA. Exclusion criteria included men who had coagulopathy, History of acute Prostatitits, Immunucompromise, previous history of prostate surgery or treatment for prostate cancer and patients who were contraindicated to lithotomy position. Each core was examined by single expert uro-pathologist and reported in terms of core length, Gleason score, high-grade prostatic intraepithelial neoplasia (HGPIN), atypical small acinar proliferation (ASAP), benign and inflammation.

Every patient was subjected for 18-core TRUS

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biopsies, which was performed by urology residents. 18-core TRUS biopsies were performed in the operating room with the patient in the dorsal lithotomy position under local anesthesia. All patients received perioperative antibiotics. Each patient was instilled with povidine plus KY jelly rectally. The prostate gland was scanned from the level of the base of the prostate gland to the apex. A volumetric ultrasound imaging was evaluated using the formula length x width x height x 0.5236 to determine prostate size[6]. The biopsies were obtained through template apertures corresponding to the 18 regional biopsy locations as outlined in Figure 1. Compared to standard 12-core TRUS biopsies, 18-core TRUS biopsies add 6 cores to the biopsy at both right and left lateral sites. Sites A, B, C represent the right lateral prostate. Sites P, Q, R represent the left lateral prostate. Sites A, D, G, J, M and P represent the base regions, sites B, E, H, K, N and Q represent the mid gland and the apex is represented by sites C,F, I, L, O and R. For each of the 18 regions, 1 biopsy core was obtained using an 18-gauge 25-cm Max-Core® biopsy needle. For each patient the parameters such as PSA, free PSA, BMI, prostate volume assessed by TRUS, calculated PSA density and pathological results detail including Gleason score, number, location and percent of positive biopsy cores were recorded.

Results

Patient demographics and characteristics are shown in Table 1 for all 43 patients undergoing an 18-core TRUS biopsy procedure. The mean patient age was 69.44 years. The mean BMI was 24.73 with a mean pre-TRUS biopsy PSA of 99.09 ng/mL and mean Free PSA of 4.29 ng/ml. At the time of procedure, the mean volumetric prostate volume was 56.50 ml and a mean PSAD was 2.31 ng/ml/ml. Of the 43 patients, 13 (33.3%) were diagnosed with prostate cancer. 3 patients were diagnosed with HGPIN, 1 was diagnosed with ASAP. Of the 13 patients with prostate cancer, 9 (52.94% of cancer) were diagnosed with a Gleason score ≥7. Overall, the 18-sample biopsy procedure yielded a diagnosis of prostate cancer in 30.23% of the patients compared with 27.91% of patients on the basis of 12 biopsies. The 18-sample procedure improved the diagnosis yield by 7.69% compared with double sextant biopsies. Significant differences in the cancer detection core numbers were observed between Group A and Group B (p<0.001). Patients in the 18-core group had higher Gleason score disease than those in the 12-core group, but not of statistical significance (Table 2).

Cancer distribution was evaluated and stratified by the 18-sample biopsy sites within the gland by geographic distribution as shown in Table 3. All prostate cancer patients, both Gleason score <6 and ≥7 groups most likely involved the apex. HGPIN had a predilection toward more involved basal gland.

In logistic regression analysis of the 18-core positive group, overall prostate cancer diagnosis was best predicted by prostate volume cutpoint of 40 ml. Neither age nor the number of TRUS biopsy cores predicted a diagnosis of prostate cancer (Table 4).

Clinical variables (age, prostate volume, PSA level, PSAD) in positive core biopsies were analyzed between groups. There were no significant differences between the groups according to biopsy core numbers (Table 2).

Significant complications that required surgical, endoscopic or radiological intervention as a sequence of the biopsy did not occur. 1 patient who had prostate volume of 112 ml encountered urinary retention and required a urinary

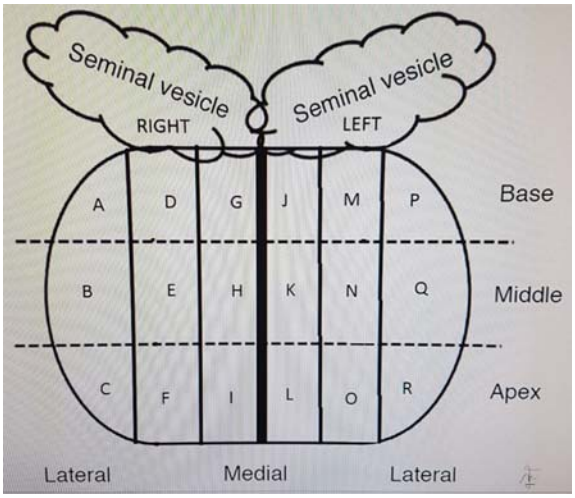

Figure 1. Location of biopsies in 18-sample procedure.

Table 1. Characteristics and clinical parameters of patients

Variables (n = 43)	Mean ± SD
Age	69.44±6.98
PSA, ng/mL	99.09±406.33
Free PSA	4.29±10.26
PSAD	2.31±10.78
VOL	56.50±23.18
BMI	24.73±3.03
Underlying disease	**n (%)**
Dyslipidemia	4 (10.26)
Hypertension	15 (38.46)
Diabetes mellitus	6 (15.38)
Benign prostatic hyperplasia	3 (7.69)
Osteoarthritis knee	2 (5.13)
Chronic Kidney Disease	2 (5.13)
Ischemic heart disease	1 (2.56)
Obstructive sleep apnea	1 (2.56)

Variables are presented as mean ± standard deviation. Underlying disease are presented n (%).
PSA = Prostate-specific antigen; PSAD = Prostate-specific antigen density; VOL = Total prostate volume; BMI = Body mass index

Table 2. Cancer detection rates between group A versus group B

Variables	Group A (12-cores) (n = 43)	Group B (18-cores) (n = 43)	*p*-value
Biopsy core numbers	11.93±0.26	17.93±0.26	N/A
Cancer detection rate, n (%)	12 (27.91)	13 (30.23)	0.812
Cancer detection core numbers	7±4.81	10.3±6.81	0.0002*
Location core positive (right and left)			
Base	9 (20.93)	9 (20.93)	>0.999
Midgland	8 (18.60)	10 (23.26)	0.596
Apex	11 (25.58)	12 (27.91)	0.808
Biopsy Gleason score (right and left)			
≤6	3 (20.00)	4 (21.05)	0.999
≥7	8 (53.33)	9 (47.37)	
High grade pin	3 (20.00)	5 (26.32)	
ASAP	1 (6.67)	1 (5.26)	
Volume of core positive			
<40	6 (50.00)	7 (53.85)	0.848
≥40	6 (50.00)	6 (46.15)	
Age of core positive			
≤65	4 (33.33)	5 (38.46)	0.790
>65	8 (66.67)	8 (61.54)	
PSA of core positive			
4 to 10	5 (41.67)	6 (46.15)	0.975
>10 to 20	3 (25.00)	3 (23.08)	
>20	4 (33.33)	4 (30.77)	
PSAD of core positive			
<0.15	2 (16.67)	2 (15.38)	0.930
≥0.15	10 (83.33)	11 (84.62)	

* Dependent test, ** Chi-square test

catheter. One patient complained of mild hematuria. There were no hospitalizations and no episodes of urosepsis.

Discussion

Several Previous literatures reported on varying procedure of TRUS biopsies but there is no consensus regarding the number of cores. This has been contributing to conflicting conclusions in diagnosis of prostate cancer. Generally, Detection rate of prostate cancer following double sextant trus biopsies was approximately 33.9 to 42.2%[7]. Many studies have trials to determine this number. The study by Scattoni et al[8] showed higher prostate cancer detection rates of 14-core biopsies compared with 10-core biopsies. Ceylan et al[9] revealed that a benefit of increasing the core number elevates the cancer detection rate. James J. Chang[10] reported the addition of lateral biopsies to 12-core biopsies increased sensitivity of prostate cancer detection rates to 95% 9. Eskew et al[11] demonstrated that lateral and midline biopsy with double sextant biopsy scheme improves the detection of clinically significant tumors. In the standard biopsy, the posterolateral aspects of the prostate were not sampled. Guichard et al[12] demonstrated that detection of prostate cancer influenced by posterolateral guided biopsies. However, Jones et al[13] reported that Prostate Cancer positivity rates compared 10 cores with 24 cores were not different. Naughton et al[14] performing a prospective randomized trial in a screening population comparing 6 to 12 Peripheral Zone tissue cores observed that the cancer detection rates were almost identical in both groups.

In the present study, we compared 12-core systematic biopsies with 18-core biopsies which included 12 schemes plus an additional 6 sextant cores from both right and left lateral using transrectal ultrasound and found that 18-core biopsies increased the cancer detection rate by 7.69% over 12-core systematic biopsies. 18-core biopsies group also resulted in higher GS compared with the standard group. However, the difference in cancer detected rates was insignificant. There were no significant differences between the groups according to biopsy core numbers considering age, prostate volume, PSA level, and PSA density. The diagnostic rate was influenced by the prostate volume, as the volume of the prostate increases more than 40 ml, and yield of positive biopsy decreases significantly, corresponding with result from Karakiewicz et al[15].

In our series, the apex most likely harbored prostate cancer in all patients, High grade intraepithelial neoplasia had a predilection toward more involved basal gland.

Concerning complications, there were no serious events. Only 1 patient who had marked prostate enlargement needed a urinary catheter from urinary retention.

Our study had several limitations. First limitation was small number in the study. Second, procedure was not performed by one urologist. Third, we did not assess patients' pain level and patient satisfaction. Strengths of our study include this study was cross-sectional design, all pathology slides were reviewed by a single pathologist with expertise in

Table 3. Cancer distribution (18-cores positives)

Cores positive	n (%)
Right core	
R1 base	
≤6	0
≥7	5 (83.33)
High grade pin	1 (16.67)
ASAP	0
R1 mid	
≤6	1 (16.67)
≥7	5 (83.33)
High grade pin	0
ASAP	0
R1 apex	
≤6	0
≥7	7 (100.00)
High grade pin	0
ASAP	0
R2 base	
≤6	1 (14.29)
≥7	6 (85.71)
High grade pin	0
ASAP	0
R2 mid	
≤6	0
≥7	6 (85.71)
High grade pin	0
ASAP	1 (14.29)
R2 apex	
≤6	0
≥7	7 (100.00)
High grade pin	0
ASAP	0
R3 base	
≤6	0
≥7	5 (100.00)
High grade pin	0
ASAP	0
R3 mid	
≤6	1 (14.29)
≥7	6 (85.71)
High grade pin	0
ASAP	0
R3 apex	
≤6	2 (20.00)
≥7	7 (70.00)
High grade pin	0
ASAP	1 (10.00)

≤6 = Gleason score ≤6; ≥7 = Gleason score ≥7; ASAP = Atypical Small Acinar Proliferation

Table 3. Cont.

Cores positive	n (%)
Left core	
L1 base	
≤6	1 (11.11)
≥7	6 (66.67)
High grade pin	2 (22.22)
ASAP	0
L1 mid	
≤6	0
≥7	7 (87.50)
High grade pin	1 (12.50)
ASAP	0
L1 apex	
≤6	1 (12.50)
≥7	7 (87.50)
High grade pin	0
ASAP	0
L2 base	
≤6	0
≥7	7 (100.00)
High grade pin	0
ASAP	0
L2 mid	
≤6	1 (11.11)
≥7	7 (77.78)
High grade pin	0
ASAP	1 (11.11)
L2 apex	
≤6	2 (22.22)
≥7	7 (77.78)
High grade pin	0
ASAP	0
L3 base	
≤6	1 (20.00)
≥7	4 (80.00)
High grade pin	0
ASAP	0
L3 mid	
≤6	1 (11.11)
≥7	8 (88.89)
High grade pin	0
ASAP	0
L3 apex	
≤6	2 (20.00)
≥7	7 (70.00)
High grade pin	1 (10.00)
ASAP	0

≤6 = Gleason score ≤6; ≥7 = Gleason score ≥7; ASAP = Atypical Small Acinar Proliferation

prostate cancer.

Conclusion

According to our results, we concluded that 18-core TRUS biopsies seemed to improve detection rate of prostate cancer and detected higher grade disease without causing any significant complications. Therefore, patient with suspected prostate cancer should be considered for 18 extended schemes. Further studies are necessary in order to approach an optimal number beyond systematic biopsy.

What is already known on this topic?

Transrectal ultrasound-guided (TRUS) prostate biopsy is a main tool for diagnosing prostate cancer. This procedure is performed by most urologists, outpatient case. The accuracy of TRUS biopsy depends on many factors

Table 4. Logistic regression analysis for the identification of significant factors during TRUS biopsy (18-cores positives)

Variables	OR	95% CI	*p*-value
Age (≤65 vs. >65)	0.80	0.207 to 3.088	0.746
PSA (≤4 vs. >4)	1.00	-	-
Total prostate volume (<40 vs. ≥40)	0.17	0.04 to 0.733	0.017*
Biopsy core number (<18 vs. ≥18)	0.86	0.071 to 10.379	0.904

TRUS = Transrectal ultrasound; OR = Odd ratio; CI = confidence interval; PSA = Prostate-specific antigen

such as location of specimen, number of specimen, labelling method and pathologic interpretation process[1].

Currently, Double sextant TRUS biopsy guided by transrectal ultrasound is the most widely accepted sampling technique involving 12 cores covering all parts of the gland. However, there is no clear consensus regarding optimal number of cores. Thus, TRUS guided biopsies are somewhat limited.

What this study adds?

This study demonstrated that 18-core TRUS biopsies seemed to improve detection rate of prostate cancer and detected higher grade disease without causing any significant complications. Therefore, patients with suspected prostate cancer should be considered for 18 extended schemes. Further studies are necessary in order to approach an optimal number beyond systematic biopsy.

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Potential conflicts of interest

The authors declare no conflicts of interest.

References

1. Bjurlin MA, Carter HB, Schellhammer P, Cookson MS, Gomella LG, Troyer D, et al. Optimization of initial prostate biopsy in clinical practice: sampling, labeling and specimen processing. J Urol 2013;189:2039-46.
2. Lee KS, Koo KC, Cho KS, Lee SH, Han WK, Choi YD, et al. Indications for a second prostate biopsy in patients suspected with prostate cancer after an initial negative prostate biopsy. Prostate Int 2017;5:24-8.
3. Djavan B, Remzi M, Schulman CC, Marberger M, Zlotta AR. Repeat prostate biopsy: who, how and when?. a review. Eur Urol 2002;42:93-103.
4. Canto EI, Singh H, Shariat SF, Kadmon D, Miles BJ, Wheeler TM, et al. Effects of systematic 12-core biopsy on the performance of percent free prostate specific antigen for prostate cancer detection. J Urol 2004;172:900-4.
5. Jo JK, Hong SK, Byun SS, Lee SE, Jeong SJ. Do additional cores from cancer-suspicious lesions on transrectal ultrasound improve prostate cancer detection including index tumors over 12-core systematic biopsy? Cancer Manag Res 2018;10:1125-31.
6. Hong SJ, Ko WJ, Kim SI, Chung BH. Identification of baseline clinical factors which predict medical treatment failure of benign prostatic hyperplasia: an observational cohort study. Eur Urol 2003;44:94-9.
7. Huang IS, Lin AT, Wu HH, Chung HJ, Kuo JY, Lin TP, et al. Prostate cancer detection and complication rates with transrectal ultrasound-guided prostate biopsies among different operators. Urol Sci 2012;23:78-81.
8. Scattoni V. Systematic prostate biopsies are more and more often becoming saturation biopsies. Eur Urol 2006;50:202-4.
9. Ceylan C, Doluoglu OG, Aglamis E, Baytok O. Comparison of 8, 10, 12, 16, 20 cores prostate biopsies in the determination of prostate cancer and the importance of prostate volume. Can Urol Assoc J 2014;8:E81-E85.
10. Chang JJ, Shinohara K, Bhargava V, Presti JC Jr. Prospective evaluation of lateral biopsies of the peripheral zone for prostate cancer detection. J Urol 1998;160:2111-4.
11. Eskew LA, Bare RL, McCullough DL. Systematic 5 region prostate biopsy is superior to sextant method for diagnosing carcinoma of the prostate. J Urol 1997;157:199-202.
12. Guichard G, Larre S, Gallina A, Lazar A, Faucon H, Chemama S, et al. Extended 21-sample needle biopsy protocol for diagnosis of prostate cancer in 1000 consecutive patients. Eur Urol 2007;52:430-5.
13. Jones JS, Patel A, Schoenfield L, Rabets JC, Zippe CD, Magi-Galluzzi C. Saturation technique does not improve cancer detection as an initial prostate biopsy strategy. J Urol. 2006;175:485-88.
14. Naughton CK, Miller DC, Mager DE, Ornstein DK, Catalona WJ. A prospective randomized trial comparing 6 versus 12 prostate biopsy cores: impact on cancer detection. J Urol 2000;164:388-92.
15. Karakiewicz PI, Bazinet M, Aprikian AG, Trudel C, Aronson S, Nachabe M, et al. Outcome of sextant biopsy according to gland volume. Urology 1997;49:55-9.