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Sensitivity and Specificty of Transrectal Ultrasonography (TRUS) in Diagnosing Prostate Cancer

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ABSTRACT

Objective: To determine the sensitivity and specificity of detecting prostate cancer by TRUS when compared to histopathology report.

Subjects and Methods: This cross-sectional analytical study was carried out within six months from October 2010 to March 2011 in the Department of Radiology/Histopathology, Shaikh Zayed Hospital Lahore. One hundred and ten patients, age above 40 years having abnormal DRE finding and positive serum PSA value were included in the study. Patients with abnormal hemostasis, unfit for TRUS guided biopsy were excluded from the study. All patients underwent transrectal ultrasonography in evaluation of sonographically suspicious malignant lesions of prostate and histological confirmation of these lesions by taking TRUS guided transrectal biopsy were carried out.

Conclusion: TRUS continues to play an important role in the evaluation of the prostate when malignancy is suspected. Although the optimal method of prostate biopsy is controversial, ultrasound is critical in ensuring accurate sampling of the gland.

Key words: Transrectal ultrasonography, Digital rectal examination, Prostate specific antigen, Carcinoma of the prostate, Biopsy

INTRODUCTION

Prostate cancer is the most commonly diagnosed cancer in men, making this disease a significant public health issue. Unfortunately, the anatomic location of the prostate does not lend itself to straightforward examination[1,2]. It is responsible for 41,000 deaths in USA annually[3]. Currently it is the most common male malignancy in the United States of America and the majority of cases are diagnosed at a time when tumour has extended beyond the confines of the gland, making it incurable[4]. Carcinoma of prostate is becoming a common cancer problem in Pakistan due to increasing elderly population and improved methods of diagnosis[5]. According to first report from Karachi cancer registry, prostatic carcinoma ranks at number six among cancers in males in Pakistan with incidence rate of 5.4 per 100,000 person year[6].

Transrectal ultrasonography was first introduced by Watanabe and colleagues and later refined in technique and application by many investigators[7]. The lack of ionizing radiation to the patient or examiner, the availability of light weight handled probes, the relative ease of mastering the basics of the transrectal sonographic prostate biopsy technique, and the ability to image the gland with precise volumetric measurement have contributed to

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the wide spread clinical application of TRUS[8]. Prostate cancer is most often seen as hypoechoic area within the peripheral zone. Capsular bulging and irregularity and the obliterating of the fat plane posterior to the prostate and of the rectoprostatic angle are finding suggestive of extarcapsular extension on TRUS. In addition, seminal vesicle invasion by tumor can be observed on TRUS.[9] There is an exponential rise in the number of men undergoing prostate biopsy after prostate-specific antigen screening.[8] TRUS provides good quality images of the prostate gland because of high-frequency probe can be placed in the rectum close to the prostate.[9] The present study was planned to determine the sensitivity and specificity of TRUS in detecting prostate cancer and comparison with the results of histopathology.

SUBJECTS AND METHODS

This cross-sectional analytical study was carried out within six months from October 2010 to March 2011 in the Department of Radiology/Histopathology, Shaikh Zayed Hospital Lahore. It is a tertiary care hospital which gets referrals from small dispensaries and medical centers located all over the Punjab. One hundred and ten patients, age above 40 years having abnormal DRE finding and positive serum PSA value were included in the study. Patients subjected already to TRUS and TRUS guided biopsy with abnormal hemostasis and unfit for TRUS guided biopsies were excluded from the study. Digital rectal examination was performed at the beginning for

prostate examination and cleansing enema efficacy. All patients were undergoing TRUS using (Voluson 730, expert GE) ultrasound machine and high frequency(10MHz) endorectal probe and findings were recorded. Ultrasound study was including imaging in transverse and sagital planes by using gray scale. When TRUS did not depict a focal abnormality only sextant biopsy of the entire gland was performed. Sextant biopsy included bilateral base, mid gland and apical samples. Two core biopsy samples of each of the six sextants, totally 12 separate samples were obtained. The specimens were fixed in formalin in container labeled according to their location in right or left lobe of prostate. Histopathology reports were collected and findings and presence or absence of malignancy were recorded. All the data was entered and analyzed using SPSS 15. Frequency and percentage of serum PSA levels and Gleason score was noted. The sensitivity, specificity and positive predictive value and negative predictive value of TRUS was calculated and reported in percentage by taking histopathology as a gold standard.

RESULTS

The frequency of transrectal ultrasound findings were negative (68 patients) or positive (42 patients). Among positive findings persons, 18 (16.36%) patients had hypoechoic nodule of prostate and 24 (21.81%) patients had heterogeneous echo pattern and hypoechoic nodule of prostate. While among negative finding patients; 25 (22.72%) had normal prostate and 43 (39.09%) patients had heterogeneous echo pattern (Table 1).

Table 2 shows the PSA level according to Gleason's score. In 4.0-9.9 PSA level Two (40%) patients were from 2-5 Gleason's score, 2 (40)

patients had 7 Gleason's score and 1 (20%) patient with Gleason score >8. In group with PSA level 10-14.9, 3 (42.86%) patients had Gleason score 2-5,and 1(14.285) patient had Gleason score 6, 3 (42.86%) patients had Gleason sore of 7. In group with PSA level 15-19.9ng/ml 2(28.57%) patients, 2(28.57%) patients and 3 (42.86%) patients had Gleason sore of 2-5, 6 and 7 respectively. In PSA level of 20-29.9 two (40.0%) patient, 1(20%) and 2(40%) had Gleason score of 2-5, 6, 7 respectively. In patients with PSA of 30-39.9 one (50%) showed score of 6 and another one(50%) had score of 7 .Only one patient was in each group of patients with PSA of 40-49.9 and 50-100 ng/ml with Gleason score >8. In patients with PSA level more than 100 one patient (50%) had score of 7 and another one (50%) score of >8.

The sensitivity of TRUS in detecting the malignant lesion was 60% while its specificity 70%. The positive predictive value of ultrasonogrpahy in detecting the malignant lesions was 42.58% while its negative predictive value was 31.57%. The diagnostic accuracy of transrectal ultrasonography in detecting the suspicious malignant lesions is 67.27% (Table 3).

Table 1: Distribution of transrectal ultrasound (TRUS) findings (n=110)

TRUS Findings	No.	%
Negative		
Normal prostate	25	22.7
Heterogeneous echo pattern	43	39.2
Positive		
Hypoechoic nodule of prostate	18	16.3
Heterogeneous echo pattern and hypoechoic nodule of prostate	24	21.8

Table 2: Frequency of Gleason's Score and PSA Levels

Gleason's Score	PSA Level							
	4.0-9.9 (n=5)	10-14.9 (n=7)	15-19.9 (n=7)	20-29.9 (n=5)	30-39.9 (n=2)	40-49.9 (n=1)	50-100 (n=1)	>100 (n=2)
2-5	2 40%	3 42.8%	2 28.6%	2 40%	-	-	-	-
6	-	1 14.28%	2 28.6%	1 20%	1 50%	-	-	-
7	2 40%	3 42.8%	3 42.9%	2 40%	1 50%	-	-	1 50%
8 – 10	1 20%	-	-	-	-	1 100%	1 100%	1 50%
Total	5 100%	7 100%	7 100%	5 100%	2 100%	1 100%	1 100%	2 100%

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Table 3: Diagnostic accuracy of TRUS in malignant and benign lesions of prostate (n=110)

TRUS	Biopsy (Gold standard)		
	Malignant	Benign	Total
Positive	18	24	42
Negative	12	56	68
Total	30	80	110

Sensitivity: 60%   Specificity: 70%
Positive predictive value: 42.6%   Negative predictive value: 31.6%
Diagnostic accuracy: 67.3%

DISCUSSION

Benign prostatic hyperplasia and prostate carcinoma are the diseases of elderly male. Historically digital rectal examination has been the principal method of examination of the prostate. However, this technique has its own inherent limitations. The advent and refinement of ultrasound technology have provided a new important method to examine the prostate. Currently transrectal ultrasonography is one of the imaging modality used for prostate. These help to estimate the prostatic volume and to diagnose the prostate carcinoma. Iqbal[4] reported that the carcinoma of prostate is common cancer in Pakistan due to increasing elderly population and relatively better diagnostic method. Another study carried out by Franco the gold standard triad for diagnosing prostate cancer comprised digital rectal examination, prostate specific antigen level and transrectal ultrasonography[10].

Transrectal ultrasonography has a place as an important and easy to use real time imaging modality for radiologist. Volume measurement and ultrasound guidance for prostate biopsies are key applications of TRUS. However, the usefulness of conventional grey scale TRUS for prostate carcinoma detection is limited. Transrectal ultrasonography has a place as an important and easy to use real time imaging modality for radiologist. Volume measurement and ultrasound guidance for prostate biopsies are key applications of TRUS. However, the usefulness of conventional grey scale TRUS for prostate carcinoma detection is limited.[11] A study done by Brawley[12] the incidence of prostate carcinoma is also expected to increase with ageing of the population although in the United States, the number of newly detected prostate cancers has declined in recent years. Prostate carcinoma may be detected at an early stage because of developments in detection and screening methods.

Hsu[13] reported that the Gleason score was 7 (range 2-10) and median Gleason score was 7 (range 4-9). In the present study Gleason's score was range from 2-9 with mean±SD 6.33±1.24. Nine patients had well differentiated carcinoma with 2-5 Gleason score, 17 patients had moderately differentiated carcinoma with 6-7 Gleason score and only 4 patients were poorly differentiated in 8-10 Gleason score.

Ohori[14] found a sensitivity of 91% and positive predictive value of 79% for transrectal ultrasound combined with digital rectal examination in predicting extracapsular tumor extension. Another study done by Rorvik[15], he found an overall sensitivity of only 68% and a specificity of 63% for transrectal ultrasound in prostate cancer staging. Carter[16] also showed a sensitivity of 52% and specifity of 68% positive predictive value of 54% and negative predictive value of 66% for detecting of prostate cancer by transrectal ultrasound. Another study showed reported by Michael[17], the overall, TRUS had 31% sensitivity, 92% specificity, 58% positive predictive value, and 80% negative predictive value. Mricic and Valencic[18] also reported that sensitivity of transrectal sonography in the first period sensitivity was 62.57%, specificity 94.2%, accuracy 86.2%, positive predictive value 80.45% and negative predictive value 87.72%. In the second period sensitivity was 50.87%, specificity 91.93%, accuracy 73.84%, positive predictive value 83.24% and negative predictive value 70.39%. In the present study it was found that the sensitivity of transrectal ultrasound was 60% and its specificity was 70%. The positive predictive value of transrectal ultrasonography in detection of malignant lesions was 42.58% while the negative predictive value was 31.57%. The diagnostic accuracy rate was 67.27% in picking the malignant lesions. Now these results of present study showed that TRUS is a superior tool for the detection of malignant lesions which comparable with other studies.

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