IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 19, Issue 11 Ser.12 (November. 2020), PP 25-30
www.iosrjournals.org

The Role of TransrectalUltrasonography (TRUS) in Detection of Prostate Cancer

Md. Saiful Islam[1], Md.Tarikul Islam[2], Halima Khatun[3]
[1]*Associate Professor, Department of Radiology and Imaging, Rajshahi Medical College, Rajshahi, Bangladesh*
[2]*Assistant Professor, Department of Burn & Plastic Surgery, Khulna Medical College Hospital, Khulna, Bangladesh*
[3]*Junior Consultant, Department of Obstetrics &Gynecology, Rajshahi Medical College Hospital, Rajshahi, Bangladesh*
Corresponding author:*MD. Saiful Islam*

Abstract
Introduction: *Prostatic cancer is the fourth most common male malignancy worldwide. It is the commonest human cancer found at autopsy in 30% of men at age of 50 and almost 90% at age 90. To decrease the mortality caused by prostate cancer much attention has given to its early detection. Transrectal ultrasonography (TRUS) appeared to increase the sensitivity and help identify appropriate sites for biopsy.*
Aim of This Study: *The aim of this study was to determine the role of TransrectalUltrasonography in the diagnosis of prostate cancer.*
Methods: *Thiscross-sectional study was conducted in the Urology Department of Bangladesh Institute of Research and Rehabilitation of Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Bangabandhu Sheikh Mujib Medical University (BSMMU) and Dhaka Medical College hospital (DMCH), Bangladesh during the period from July 2005 to June 2007.The study was attempted on 52 male patients aged 40-70 years. From them 36 patients were selected. Further statistical analysis of the results was done by computer software devised in the statistical packages for social scientist (SPSS-10) and MS excel-16.*
Result: *The patients having prostatic lesions suspected as malignant or benign by gray scale TRUS were correlated with histopathological diagnosis following collection of reports from the respective cases. Out of the 36 cases 20(55.6%) cases were malignant and 16 (44.4%) cases were benign in histopathological findings. Of the total 36 cases, 28(77.87%)) cases were suspected as malignant and rest of 8(22.2%) cases were suspected as benign in gray scale TRUS. Among the 28 cases, which were suspected as malignant by gray scale TRUS, 15 cases were malignant and 13 cases were found to be benign in histopathological examination. On the other hand, 5 cases were found as malignant and 3 cases were found as benign in histopathology among the suspected benign cases, which were diagnosed by gray scale TRUS. The validity of gray scale TRUS were evaluated by calculating sensitivity 75.0%, specificity 18.8%, accuracy 50.0%, positive and negative predictive values were 53.6% and 37.5% respectively.*
Conclusion:*TRUS has a poor accuracy in detection and staging of prostate cancer. Contrast-enhanced ultrasonography shows promising results allowing an assessment of the vascularity of lesion, but further trials are in progress to evaluate its role. There need to use more technique with gray scale TRUS to appears to increase the sensitivity and to help identify sites for biopsy.*
Key words:*Prostatic Cancer, Transrectal Ultrasonography, Male Malignancy, Benign Lesion, Malignant Lesion, Gray Scale.*

Date of Submission: 16-11-2020 Date of Acceptance: 02-12-2020

I. Introduction

Over 35000 new cases of prostate cancer are diagnosed per annum in the UK and there are over 10000 deaths annually[1-4]. It is the most common cancer in males in the UK, and causes 13% of all cancer deaths in males. The lifetime risk of being diagnosed with prostate cancer is one in nine. It has been estimated from post-mortem data that approximately half of all males in their fifties have prostate cancer, which increases to 80% by the age of 80 years, but only 1 in 26 men will die from their disease supporting the fact that males are more likely to die with prostate cancer than from it[5,6]. Risk factors for prostate cancer include age, a positive family history, abnormal digital rectal examination (DRE), raised prostatic specific antigen level and ethnicity[7].Transrectal ultrasound (TRUS) became widely available in 1970s, most patients presented with cancer specific symptoms owing to locally advanced disease[7]. Rifkin et al. 1993[8] showed that of 132 cancers diagnosed in 619 patients, 93% had abnormalities on gray scale imaging and 86% showed abnormal flow on color Doppler

sonography, whereas 7% had no identifiable abnormality on gray scale imaging but abnormal flow on color Doppler sonography. Although the development of transrectal ultrasonography (TRUS) has improved the detection of prostate cancer lesions, the positive predictive value of TRUS is low, despite its relatively high sensitivity. Recently, several studied have found that color Doppler ultrasonography increases the usefulness of TRUS for detecting prostate cancer. However, the positive detection rate in those with positive transrectal ultrasonography (TRUS) findings with both positive hypoechoic lesions on gray scale TRUS and increased vascularity on color Doppler images increased to 71%[9]. TRUS will be performed with the help of siemens 7 MHZ probe. Digital rectal examination should precede TRUS. With the transrectal probe the prostate is imaged in the transverse axial section, moving the probe cranially and caudally within the rectum using the anal sphincter as a fulcrum. By turning the probe 90° sagittal sections are obtained by manipulating the transducer laterally within the rectum again using the sphincter as fulcrum[10]. The present study is aimed at determining the role of TransrectalUltrasonography (TRUS) in the diagnosis of prostate cancer.

II. Objectives

a) General Objectives:

- To find out the accuracy, sensitivity, specificity, positive & negative predictive values of transrectalultrasonography (TRUS) in the detection of prostate cancer.

b) Specific Objectives:

- To elucidate the correlation of gray scale TRUS findings with histopathological diagnosis of prostate lesions.

III. Methodology & Materials

This was a cross-sectional study conducted in Urology Department of Bangladesh Institute of Research and Rehabilitation of Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Bangabandhu Sheikh Mujib Medical University (BSMMU) and Dhaka Medical College hospital (DMCH), Bangladesh during the period from July 2005 to June 2007.The study was attempted on 52 male patients aged 40-70 years. They were suspected of having prostate cancer clinically and referred to the Radiology and Imaging department of BIRDEM for proper evaluation of prostate, whether benign or malignant by transrectalultrasonography before treatment planning & further management. During transrectal gray ultrasonography examination ten of these patients were diagnosed normal and confirmed by follow up clinical and biochemical findings and were excluded from the study group Another two cases found to have rectal or anal stricture were also excluded from the study group. Four patients were excluded from the study as dropout cases. Finally, 36 patients were included in the study. The lesions were discriminated as benign or malignant before treatment. Tissue of prostate of all 36 patients either by biopsy or after prostatectomy operation were sent to the respected pathology departments for histopathological diagnosis. Histopathological diagnosis of each case was correlated with TRUS findings. Data were collected from primary sources studying the clinical history, physical examination, biochemical finding. TRUS gray scale findings, tissue diagnosis by histopathology were recorded. All the relevant collected data were compiled on a master chart first, then organized by using scientific calculator and standard statistical formula. Percentage was calculated to find out the proportion of the findings. Further statistical analysis of the results was done by computer software devised in the statistical packages for social scientist (SPSS-10) and MS excel-16.

IV. Result

In our study, the patients were divided included into three age groups. The age ranged from 45 to 70 years and the maximum patients were found in the age group of 60-70 years. The mean age was 56.7 years with standard error of mean (SE) ±1.7 years in benign lesions whereas in malignant lesions the mean age was 59.6 years with standard error of mean (SE) 1.4 years according to histopathological findings [Figure-I].From the suspected benign lesions in gray scale TRUS examination there found prostate volume of these benign lesions varied from 28 to 38 cc and the mean± SE of these lesions was 31.9±1.37 cc. Fifty percent of the prostate volume was found up to 30 cc and rest 50% was between 31- 40 cc. Size of these benign lesions varied from 5.9 to 8.4 mm and the mean± SE of these lesions was 6.93±0.75 mm. Majority (62.5%) patient's size of lesions was not detected. It was observed that 5(62.5%) cases were isoechoic, 3(37.5%) cases were hypoechoic and none was found in hyperechoic in gray scale TRUS findings. It was observed that 7(87.5%) cases had parenchymal calcification and rest 1(12.5%) cases had no parenchymal calcification. It was found that the peripheral zone involved in 3(37.5%) cases, transition zone in 1(12.5%) case, and in between two zone (no identifiable zone) 4(50.0%) cases in gray scale TRUS findings. PSA value of these benign lesions varied from 4.9 to 12.4 ng/ml and the meant± SE of these lesions was 8.21+0.99 ng/ml. Majority (37.5%) of the PSA value was found up to 6 ng/ml and 6.1 10.0 ng/ml[Table-I]. Prostate volume of these malignant lesions varied from 28 to 45 cc and the meant± SE of these lesion was 35.7+0.89 CC. Majority (67.9%) of the prostate volume was found between 31-

40 CC. Size of these malignant lesions varied from 2.3 to 9.8 mm and the mean± SE of these lesions was 6.40+0.42 mm. Majority (39.3%) size of lesion was not detected. It was observed that 3(10.7%) cases were isoechoic, 18(64.3%) cases were hypoechoic, and 6 (21.5%) cases were hyperechoic in gray scale TRUS findings. It was observed that 20(71.4%) cases had parenchymal calcification and rest 8(28.6) cases had no parenchymal calcification. It was found that the peripheral zone involved in 24(85.7 %) cases, transition zone was none and in between two zone (no identifiable zone) 4(14.3 %) cases in gray scale TRUS findings. PSA value of these malignant lesions varied from 7.44 to 0.36 ng/ml and the mean± SE of these lesion was 8.21+0.99 ng/ml. Majority (53.6%) of the PSA value was found between 6.1 10.0 ng/ml [Table-II].The patients having prostatic lesions suspected as malignant benign by gray scale TRUS were correlated with histopathological diagnosis following collection of reports from the respective cases. Out of the 36 cases 20(55.6%) cases were malignant and 16 (44.4%) cases were benign in histopathological findings. Of the total 36 cases, 28(77.87%)) cases were suspected as malignant and rest of 8(22.2%) cases were suspected as benign in gray scale TRUS. Among the 28 cases, which were suspected as malignant by gray scale TRUS, 15 cases were malignant and 13 cases were found to be benign in histopathological examination. On the other hand, 5 cases were found as malignant and 3 cases were found as benign in histopathology among the suspected benign cases, which were diagnosed by gray scale TRUS[Table-III].The validity of gray scale TRUS were evaluated by calculating sensitivity 75.0%, specificity 18.8%, accuracy 50.0%, positive and negative predictive values were 53.6% and 37.5% respectively[Figure-II].

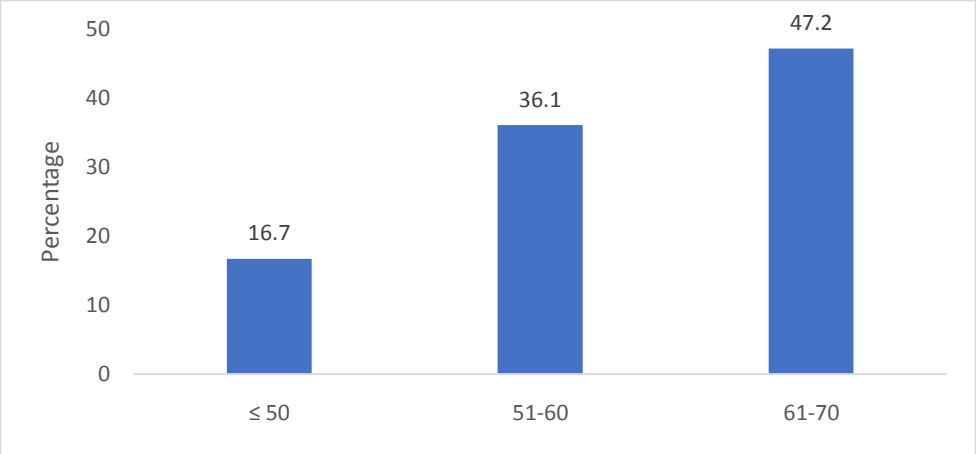

Figure-I: Bar diagram showing the age distribution of patients (N=36)

Table-I: Benign lesions in grayscale TRUS examination (N=8)

Suspected benign lesions in grayscale TRUS		**n**	**%**
prostate volume (cc)	Up to 30	4	50
	31-40	4	50
	41-45	0	0
Size of lesion	< 5	0	0
	5.0- 7.0	2	25
	> 7	1	12.5
	Not detected	5	62.5
Echogenicity of the lesion	Isoechoic	5	62.5
	Hypoechoic	3	37.5
	Hyperechoic	0	0
Parenchymal classification	Present	7	87.5
	Absent	1	12.5
site of lesion	Peripheral zone	7	37.5
	Transition zone	1	12.5
	In between two zone/ No identification	8	50
PSA value(ng/ml)	Up to 6	3	37.5
	6.1- 10	3	37.5
	> 10	2	25

Table-II: Malignant lesions in grayscale TRUS examination (N=28)

Suspected malignant lesions in grayscale TRUS		n	%
prostate volume (cc)	Up to 30	4	14.3
	31-40	19	67.9
	41-45	5	17.9
Size of lesion	< 5	5	20
	5.0- 7.0	5	17.9
	> 7	9	32.1
	Not detected	11	39.3
Echogenicity of the lesion	Isoechoic	3	10.7
	Hypoechoic	19	67.8
	Hyperechoic	6	21.5
Parenchymal classification	Present	20	71.4
	Absent	8	28.6
site of lesion	Peripheral zone	24	85.7
	Transition zone	0	0
	In between two zone/ No identification	4	32.1
PSA value(ng/ml)	Up to 6	24	28.6
	6.1- 10	0	53.6
	> 10	4	17.8

Table-III: Gray scale TRUS and histopathological correlation of prostatic lesions (n=36)

Gray scale	Histopathological diagnosis		Total
	+ ve for Malignancy	- ve for Malignancy	
Suspected for Malignant	15	13	28
Suspected for benign	5	3	8
Total	20	16	36

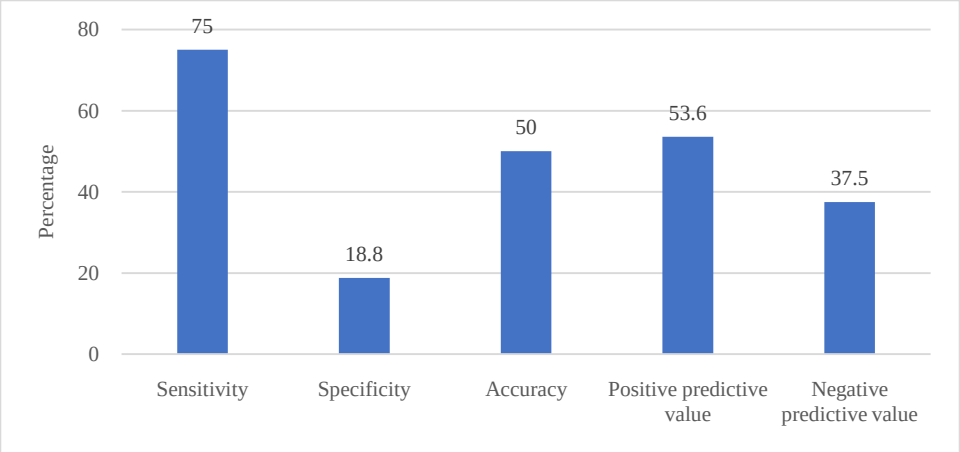

Figure-II: Bar diagram showing the sensitivity, specificity, positive and negative predictive values of the gray scale TRUS in diagnosis of prostatic lesion (N=36)

V. Discussion

To decrease the mortality caused by prostate cancer much attention has given to its early detection. The development of technologically advanced transrectalultrasonogram (TRUS) examination has allowed the earlier detection of prostate cancer. Although a high level of PSA can increase suspicion for prostate cancer, even high levels and abnormal findings at transrectal gray scale yield unspecific diagnoses and cannot identify all patients with prostate cancer. This cross sectional study was carried out with an objective to elucidate the Correlation of transrectalultrasonogram (TRUS) examination findings with histopathological diagnosis of prostatic lesions, evaluate the resistive index (RI) in benign and malignant prostatic lesions and also to find out the correlation between serum prostatic specific antigen (PAS) level and transrectalultrasonogram (TRUS) findings in different prostatic lesions. The present study findings discussed and compared with previously published relevant studies. Sakarya et al. (1998)[11] have shown in their series, the mean age of the patients with prostate cancer was 66.4± 7.7 years ranged from 45 to 70 years. Similarly, Halpern and Strup (2000)[12] have observed in their study on 251 patients, the mean age was 64.6 years ranged from 37 to 87 years. On the other hand, Lavoipierre et al. (1998)[13] has observed identical mean age of the patients having prostate cancer, which was 64.0 years with ranged from 37 to 87 years on 256 consecutive patients. In another study Shigeno et al. (2000)[14] has observed on 278 patients with mean age 71.2 years range from 48 91 years. The higher age range of their study may be due to increased

life expectancy in their country. Prostate volume was measured in this study and found the mean± SE were 31.9± 1.37cc ranged from 28 to 38 cc and 35.7± 0.89 cc ranged from 28 to 45 cc in suspected benign and malignant lesions respectively by gray scale TRUS evaluation. The prostate volume of patients according to histopathological examination was observed. In benign lesions majority 12(75.0%) of the patients' prostate volume was belong to 31- 40 cc. The mean± SE of these lesions were 34.9+1.03cc varied from 28 to 42 cc. In malignant lesions majority 11 (55.0%) of the patients' prostate volume was found between 31- 40 cc. The mean± SE of these lesion was 34.8± 1.19 cc varied from 28 to 45 cc. In the present study size of lesion was measured by gray scale TRUS evaluation. The mean± SE size of lesion were 6.93± 0.75mm which varied from 5.9 to 8.4 mm and 6.40± 0.42 mm ranged from 2.3 to 9.8 mm in suspected benign and malignant lesion respectively. Majority 5(62.5%) patients in suspected benign lesion and 11(39.3%) in Suspected malignant lesion size were not detected due to lesions varied from 5.9 to 8.4 mm and the mean± SE of these lesions was 6.93±0.75 mm. Majority 6(37.4%) of the patients the size of lesions was not detected. in malignant lesions the mean± SE was 7.02+0.36 mm which, varied from 3.4 to 9.8 mm and. Majority 9(45.0%) of the patients the size of lesions was not detected. Sakarya et al. (1998)[11] studied 36 patients and found 28 were positive in gray scale imaging, out of which 21(75.0%) patients had hypoechoic and rest 7(25.0%) were either hyperechoic in appearance. The echogenicity in suspected malignant lesion by gray scale TRUS evaluation in this study was found 19(67.8%) were hypoechoic, 6(21.5%) were hyperechoic and 3(10.7 %) cases were isoechoic. In another study Lavoipierre et al. (1998)[13] observed in patients with hypoechoic lesions 54.0% of 93 did have cancer and 6.0% having either equivocal findings or a prostatic intraepithelial neoplasm which is higher than the present study. The present study found hypoechoic 5(31.3%), hyperechoic 5(31.3%) and isoechoic 6(37.4%) in benign lesions and in malignant lesions hypoechoic 17(85.0%), hyperechoic 1(5.0%) and isoechoic 2(10.0). In this current series, the site of suspected benign lesion by gray scale TRUS evaluation it was observed 3(37.5%) in peripheral zone, 1(12.5%) in transition zone and 4(50.0%) between two zone (ho identifiable zone). In suspected malignant lesion according to gray Scale TRUS evaluation the site was localized 24(85.0%) in peripheral zone, none was found in transition zone and 4(14.3%) between two zone (no identifiable zone). In this study the validity of gray scale TRUS in evaluation of suspected malignant lesion sensitivity 75.0%, specificity 18.8%, accuracy 50.0% positive predictive value 53.6% and negative predictive value 37.5%. The validity of transrectal power Doppler in evaluation of suspected malignant lesion sensitivity 90.0%, specificity 75.0%, accuracy 83.3%, positive predictive value 81.8% and negative predictive value 85.7%. Okihara (2000)[15] found the PDI characterized by high sensitivity (98.0%) and negative predictive value 99.0% in detecting prostate cancer, which is resemble with the present study. Lavoipierre et al. (1998)[13] in gray scale evaluation in detecting prostate cancer the sensitivity 75.0%, specificity 40.0%, positive predictive value 45.0% and negative predictive value 72.0%.

Limitations of the study

Small sample size due to slightly expensive and semi invasive modality. The study was conducted in three (3) tertiary hospitals, which may not represent the whole population.

VI. Conclusion And Recommendations

TRUS remains the first modality of choice to image and biopsy in detecting the prostate cancer. However, TRUS has a poor accuracy in detection and staging of prostate cancer. Contrast-enhanced ultrasonography shows promising results allowing an assessment of the vascularity of lesion, but further trials are in progress to evaluate its role. There need to use more technique with gray scale TRUS to appears to increase the sensitivity and to help identify sites for biopsy. These new techniques may help target prostate cancer, allowing fewer biopsy cores to be performed and facilitating the detection of the important life-threatening aggressive cancers rather than indolent cancers.

References

[1]. Northern Ireland Cancer Registry. Cancer incidence and mortality. Belfast, UK: NICR; 2010.
[2]. Welsh Cancer Intelligence and Surveillance Unit. Cardiff, UK: WCISU; 2010.
[3]. ISD Online Information and Statistics Division, NHS Scotland. Edinburgh, UK: ISD Scotland; 2010.
[4]. Office for National Statistics. Registrations of cancer diagnosed in 2008, England. Series MB1 no. 39. London, UK: National Statistics; 2010
[5]. Sakr WA, Grignon DJ, Haas GP, Heilbrun LK, Pontes JE, Crissman JD. Age and racial distribution of prostatic intraepithelial neoplasia. EurUrol1996; 30:138–44.
[6]. Burford DC, Kirby M, Austoker J. Prostate Cancer Risk Management Programme information for primary care: PSA testing for asymptomatic men. Sheffield, UK: NHS Cancer Screening Programmes; 2008.
[7]. C J HARVEY, M. F. J. P. M. F. J. R. M. F. U. P. M. F. a. F. F. M., 2012. Applications of transrectal ultrasound in prostate cancer. The British Journal of Radiology, Volume 85, p. S3–S17.
[8]. Rifkin, MD, Sudakoff, GS, Alexander, AA 1993, 'Prostate: Techniques, Results, and Potential Applications of color Doppler US Scanning', Radiology, vol. 186. pp. 509-513.

[9]. Hak JL, Kwang, GK, Sang, EL, Seok, SB, Sung, Il H, Sung, J, Sung, KH, Seung, HK 2006, J Utrasound Med, vol. 25, pp. 815- 821.
[10]. Hylton M, Devid C, Keith D, Pat F (editors) 2001, clinical ultrasound, 2 edition, Churchil Livingston, pp. 595-604.
[11]. Sakarya, ME, Arslan, H, Unal, O, Atila, MK and Aydin, S 1998, The role of power Doppler ultrasonography in the diagnosis of prostate cancer a preliminary study, British journal of Urology, vol. 82. pp. 386-388.
[12]. Halpern, EJ, Strup, Stephan, E 2000, 'Using Gray-Scale and color and power Doppler Sonography to Detect prostatic cancer', AJR vol. 174, pp. 623-627. Halpern, EJ, Ferdinated, F, Flemming, F, Stephen, E, Levon, N Nazarian, Leonard, G, Gomella, M 2002, 'High Frequency Doppler US of the prostate: Effect of patient position, Radiology, vol. 222 pp. 634-639
[13]. Lavoipierre, AM, Snow RM, Frbdenberg, M, Gunter, D, Reisner, G, Royce, P, Lavoipierre, GT 1998, 'Prostatic Cancer Role of color Doppler Imaging in TransrectalSonography, AJR, vo. 1/1, pp. 205-210
[14]. Shigeno, K, Igawa, M, Shina, H, Wada, H and Yoneda, T 2000, The role of colour Doppler ultrasonography in detecting prostate cancer, BJU International, vol. 86. pp. 229-233. 98
[15]. Okihara, K; Kojima, M, Nakanouchi, T, Okada, K, Miki, T 2000, TransrectalPöwer Doppler Imaging in the detection of prostate cancer, BJU Int, vol. 85, pp. 1053-1057.

MD. Saiful Islam, et. al. "The Role of Transrectal Ultrasonography (TRUS) in Detection of Prostate Cancer." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 19(11), 2020, pp. 25-30.