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Transabdominal Ultrasonographic Evaluation of Enlarged Prostate with Histopathological Comparison

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Abstract **Original Research Article**

Introduction: The prostate is an accessory gland of the male reproductive system. It can be involved by a number of diseases ranging from inflammation to malignant diseases. Most common causes of prostatomegaly are benign prostatic hyperplasia, prostatitis, intraprostatic and periprostatic cyst, prostatic adenocarcinoma. ***Objectives:*** To evaluate the diagnostic usefulness of Transabdominal ultrasonography in enlarged prostate and compare the USG findings with the histopathological findings. ***Method:*** This cross sectional study was carried out in Radiology and Imaging Department of Sir Salimullah medical college and Mitford hospital, Dhaka, from January 2014 to December 2015 with clinically suspected enlarged prostate by department of Urology and referred to the Radiology and Imaging Department for proper evaluation whether benign or malignant by Trans-abdominal ultrasonography before treatment planning and further management. ***Results:*** In this study, mean age was 65. 8 years with standard deviation of mean ± 9. 7 years and the age ranged from 50 to 89 years. The most common symptoms associated with enlarged prostate were incomplete emptying 90%, frequency 84%, intermittency 80% urgency, 76%, weak stream, 70% straining 66%, nocturia 60%. Out of 50 patients, histopathological diagnosis of 44 (88%) was nodular hyperplasia, 2 (4%) was nodular hyperplasia with chronic prostatitis and rest of 4(8%) was adenocarcinoma of prostate. ***Conclusion***: Ultrasonography is a non-invasive, available, radiation free procedure, which is used as a first line preliminary diagnostic procedure.

Keywords*:* Ultrasonography, Enlarged Prostate.

INTRODUCTION

The prostate is an accessory gland of the male reproductive system. It is firm in consistency. Its firmness is due to the presence of a dense fibromuscular stroma in which the glandular elements are embedded [1]. Prostate can be involved by a number of diseases ranging from inflammation to malignant diseases. Most common causes of prostatomegaly are benign prostatic hyperplasia, prostatitis, intraprostatic and periprostatic cyst, prostatic adenocarcinoma. Benign prostatic hyperplasia is the most common disorder of prostate gland and most common diagnosis by urologist for males between the ages of 45 and 74. More than half of men in their sixties and as many as 90 percent in their eighties have some symptoms of BPH. Carcinoma of the prostate is the most common type of cancer diagnosed in men worldwide and the second leading cause of cancer death in men (after lung cancer). It is the fourth most common male malignancy worldwide. The peak incidence is primarily in men over 50 years. The incidence doubles with each decade after age 50 [2].

Benign hyperplasia of prostate (BPH) is disorder, which leads to urinary symptoms in elderly males. More than 90% of the males over 80 years of age have histological evidence of BPH. Worldwide more

that 25 million of elderly men suffer from moderate to severe degree symptoms of BPH. The symptoms of BPH include poor flow of urine, difficult micturation, intermittent flow, dribbling, poor bladder emptying, hesitancy, urinary frequency, nocturia, urge incontinence etc., which affects the physical activities, mental health leading to deterioration of the "quality of the life" of the patients [3]. In terms of clinical symptoms, 85% patients had reported frequent micturition and urgency of urination, 57% had progressive dysuria due to bladder outlet obstruction, 21% had gross hematuria, and 14% patients reported intermittent painless gross hematuria in case of prostatic malignancy [4].

Transabdominal ultrasound is the first line of investigation for the preoperative assessment of prostate size, residual urine, correlate the data with operative findings and get final opinion on the importance of USG in prostatic enlargement and to look for any malignancy. Transabdominal ultrasound has moderate accuracy in the detection of prostate pathology, but is very useful in the estimation of prostate volume [5].

Histopathology is the only way to make a definitive diagnosis of prostatic enlargement. Biopsies of the prostate can be performed in several ways as image (USG/MR) guided fine needle aspiration cytology (FNAC), TURP and biopsy and by open surgical procedures [6].

For the radiologist as well as clinicians it is necessary for choosing a method for efficient detection enlarged prostate due to BEP or carcinoma. Transabdominal ultrasound can help in early diagnosis, management plan, and thus help in better prognosis. For these reasons through this thesis recommend the use of transabdominal sonography as a useful modality of investigation in enlarged prostate through analysis of accuracy, sensitivity, specificity and predictive capacity against a gold standard procedure, histopathology in the current series.

MATERIALS & METHODS

This cross sectional study was attempted on 55 male patients aged 50-90 years, admitted in Urology Department of Sir Salimullah medical college and Mitford hospital, Dhaka, they were clinically suspected case of enlarge prostate having lower urinary tract symptoms and referred to the Radiology and Imaging Department for proper evaluation of prostate, whether benign or malignant by Trans-abdominal ultrasonography before treatment planning and further management. Out of 55 patients, 4 patients refused to have surgery and 1 patient's histopathology report was not available. Finally 50 patients were included in the study. The trans-abdominal sonographic examination was first performed by the investigator which was then subsequently confirmed by a skilled radiologist of the department of Radiology and Imaging of Sir Salimullah medical college and Mitford hospital, Dhaka.

INCLUSION CRITERIA

Clinically suspected patients of having enlarged prostate with symptoms of prostatism referred to radiology & imaging department.

EXCLUSION CRITERIA

Patients whose histopathology report was not available and who were not willing to undergo surgery as well as not fit for surgery.

After giving all the necessary information regarding the research study, data were collected in pre-designed structured data collection sheets (proforma) as mentioned in appendix-II data were collected from primary sources studying the clinical history, trans-abdominal ultrasonographic findings and finally, tissue diagnosis by histopathology were recorded.

All the relevant collected data were compiled on a master chart first, and then organized by using scientific calculator and standard statistical formula. Percentage was calculated to find out the proportion of the findings. Further 48 statistical analyses of the results were done by computer software devised in the statistical packages for social scientist (SPSS) version 20. 0 (IBM).

Prior to commencement of this study, the research protocol was approved by the local ethical committee. Written informed consent was taken from all patients. Gray scale Transabdominal ultrasonography was done by ultrasonography machine (GE machine) with curvilinear transducer (3. 5 MHz). After taking written consent from the patient with full bladder and supine in position, transducer was placed on supra pubic region in caudally directed and slightly tilled for proper evaluation of prostate size, median lobe protrusion into bladder, parenchymal 49 calcification and echogenicity. For measurement of prostate size longitudinal and transverse scan was taken for height (cranio-caudal length), transverse diameter and depth (A/P diameter) of prostate. The volume of prostate was calculated by the machine. After evacuation of bladder PVR will be also measured. The interpretation of the USG findings was done by researcher first that will be confirmed by a skilled radiologist who do not know the clinical and histological findings to eliminate observation bias.

The patient of enlarged prostate detected by transabdominal sonography were subsequently

underwent surgery and tissue sent for histopathological examination. Postoperative tissues were examined histopathologically in the respective histopathology department and then collected reports were correlated with trans- abdominal ultrasonographic findings.

OBSERVATIONS AND RESULTS

A total of 50 patients with clinically suspected enlarged prostate were included in the study who were admitted in the department of urology of Sir Salimullah medical college and Mitford hospital, Dhaka for proper management and planning of treatment and underwent trans-abdominal gray scale sonography. Subsequently surgery (TURP) was done followed by histopathological examination.

In the study, the patients were divided into four age groups. The age ranged from 50 to 89 years and the maximum patients were found in the age group of 60 - 69 years. The mean age was 65. 8 years with standard deviation of mean (SD) ± 9. 7 years. The age distribution of 50 patients was shown in table I.

Table-I: Distribution of Patients According to Age (n=50)

Age in Years	Number of Patients	Percentage
50-59	16	32%
60-69	20	40%
70-79	08	16%
80-89	06	12%
Total	**50**	**100%**

The most common symptomps associated with enlarged prostate was incomplete emptying 90%, Frequency 84%, Intermittency 80%, Urgency 76%, Weak stream 70%, Straining 66%, Nocturia 60% in table II.

Table-II: Frequency distribution of Clinical Features of the study subjects (n=50)

Clinical Features	Frequency	Percentage
Incomplete emptying	45	90%
Frequency	42	84%
Intermittency	40	80%
Urgency	38	76%
Weak stream	35	70%
Straining	33	66%
Nocturia	30	60%

Transabdominal ultrasonography was done for all 50 patients. Out of the 50 cases 47 (94. 0%) cases were suspected benign enlargement of prostate and rest of the 3 (6. 0%) cases were suspected carcinoma of prostate in table III.

Table-III: Distribution of patients by USG diagnosis (n=50)

USG findings	Number of Patients	Percentage
Benign enlargement of prostate (BEP)	47	94%
Prostatic carcinoma	03	06%
Total	**50**	**100%**

Among 50 cases, 44 cases were nodular hyperplasia of prostate, 2 cases were nodular hyperplasia with chronic prostatitis and 4 cases were adenocarcinoma detected by histopathological findings. It was observed that 44 (88%) cases were nodular hyperplasia, 4 (8. 0%) cases were carcinoma and 2 (4. 0%) cases were nodular hyperplasia with chronic prostatitis in histopathological evaluation. Their distribution according to histopathological findings are depicted in the following table IV.

Table-IV: Distribution of study subjects according to histopathological diagnosis (n=50)

Histopathological diagnosis	No. of Patients (frequency)	Percentage
Nodular hyperplasia of prostate	44	88%
Nodular hyperplasia with chronic prostatitis	02	04%
Adenocarcinoma of prostate	04	08%
Total	**50**	**100%**

Table V shows comparison between transabdominal ultrasound and histopathology test. Out of the 50 cases 47(94%) cases were diagnosed as benign enlargement of prostate by USG diagnosis and among them 46 (92. 0%) cases those were diagnosed by Histopathology, they are true positive and rest 1 (2%) cases were false positive. Out of 3 (6%) cases of carcinoma of prostate those were confirmed by histopatholgical diagnosis are true negative and 0(0%) cases were false negative.

Table-V: Comparison between USG diagnosis and histopathology diagnosis (n=50)

USG diagnosis	Histopathological diagnosis		Total
	BEP	Ca. Prostate	
Benign enlargement of prostate	46 (TP) 92%	1 (FP) 2%	47 (94%)
Carcinoma of prostate	0 (FN) 0%	3 (TN) 6%	03 (06%)
Total	**46 (92%)**	**4 (8%)**	**50 (100%)**

The validity of gray scale trans-abdominal ultrasonographic evaluation and histopathological findings were correlated by calculating sensitivity, specificity, positive and negative predictive values by using the standard formula. The result is shown table VI.

Table-VI: Validity test results.

Validity Test	Percentage
Sensitivity	100%
Specificity	75%
Accuracy	98%
Positive predictive Value	97%
Negative predictive value	100%

DISCUSSION

This cross sectional study was conducted to evaluate the diagnostic accuracy of transabdominal ultrasonography in diagnosis of enlarged prostate enrolling 50 patients of 50 to 89 years of age range during the period of January 2014 to December 2015 in the Department of Radiology and Imaging, Sir Salimullah medical College and Mitford Hospital. After taking informed consent, data was collected in a pretested questionnaire, the findings and interpretation of ultrasonography and histopathological reports. Histopathological diagnosis was considered as gold standard of diagnostic criteria. Total 50 patients were included in this study.

In the present study, the patients were divided into four age groups. Maximum patients were found in the age group of 60 – 69 years. The mean age was 65.8 years with standard deviation of means (SD) ± 9.7 years with ranged from 50 – 84 years and the maximum 20 (40%) patients were found in the age group of 60 – 69 years. According to the study done by Songra & Kumar, mean age of the patients were 72.6 years and ranged from 50 – 91 years and the maximum patient were found in the age of group 61 – 70 years. In another study Roehrborn & McConnell, found that 20% for men in their 40s, 50- 60% for men in their 60s develop enlarge prostate due to benign prostatic hyperplasia [7, 8]. So my study finding according to age ranges correlate with previous studies.

Patients with enlarged prostate had been found to present a wide variety of presentation. The most common symptoms were incomplete emptying 90% and frequency 84%. As the patients having prostatic lesion, general symptoms of lower urinary tract were experienced by most of the patients. Among other presenting complaints urgency, intermittency, weak stream, straining and nocturia were 76%, 80%, 70%, 66% and 60% respectively. Hamilton *et al*. showed most of the cases in his study had a lower urinary tract symptoms and this was the main reason that their diagnosis of enlarged prostate due to benign or malignant cause was uncovered [9]. Four of these symptoms frequency, hesitancy, nocturia, incomplete emptying probably represents enlargement of prostate gland.

In this study out of 50 patients 44 cases were nodular hyperplasia of prostate, 2 cases were nodular hyperplasia with chronic prostatitis and 4 cases were adenocarcinoma of prostate, in histopathological evaluation. Similar study finding carried out by Burdak *et al.* [10]. Study includes 775 cases of prostatic biopsy from Dec 2003 to Jan 2009. Histopathology of prostate biopsy was done and out of 775 patients specimens studied non neoplastic lesions were common accounted for 92.4% and neoplastic lesion accounted for 7.6%.

In the present study sensitivity of transabdominal ultrasound in diagnosis of enlarged prostate was 100% and sensitivity was 75%, predictive

value for positive test was calculated 97% and predictive value for negative test was 100%. Overall diagnosis of enlarged prostate was 98%. Maricic *et al*. reported that sensitivity of transabdominal ultrasound in diagnosis of enlarged prostate was 94.57%, specificity 84.2%, accuracy 86.2%, positive predictive value 80.45%, and negative predictive value 87.72% [11]. These findings of previous study are more or less close to the findings of present study.

CONCLUSION

Ultrasonography is a non-invasive, available, radiation free procedure, which is used as a first line preliminary diagnostic procedure. For the radiologist as well as clinicians it is necessary for choosing a method for efficient detection of enlarged prostate due to BEP or carcinoma. Transabdominal ultrasound can help in early diagnosis, management plan, and thus help in better prognosis. For these reasons through this thesis recommend the use of transabdominal sonography as a useful modality of investigation in enlarged prostate through analysis of accuracy, sensitivity, specificity and predictive capacity against a gold standard procedure, histopathology in the current series.

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