

Original Research Article

Effectiveness of transabdominal ultrasonography in assessing benign versus malignant nature of prostatomegaly

Saad Shareef, Anil Joshi*

Department of Radiology, Bharati Vidyapeeth Medical College and Hospital (Deemed to be University), Sangli, Maharashtra, India

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***Correspondence:**

Dr. Anil Joshi,

E-mail: saad777shareef@gmail.com

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ABSTRACT

Background: Benign prostatic hyperplasia is closely related with ageing. The present study was conducted to assess the ability of transabdominal ultrasonography in diagnosing benign and/or malignant hypertrophy of the prostate.

Methods: An observational study was done in the Department of Radiology, Bharati Vidyapeeth Medical College and Hospital (Deemed to be University), Sangli, Maharashtra, India of patients who had prostatomegaly on transabdominal ultrasound examination and underwent histopathological confirmation of the lesions from 1 October 2018 till 31 December 2018. The prostate gland was assessed for volume, echotexture, morphology, focal lesions and median lobe.

Results: Out of 155 patient's benign prostatic disease was diagnosed in 116 patients, while malignancy was detected in the rest of the 39 cases. Prostate specific antigen levels were significantly higher among malignant cases (18.39 ± 7.44 ng/ml) as compared to that of benign cases (7.51 ± 3.22 ng/ml), p value < 0.01 . Benign lesions were predominantly inner glandular, while malignant cases were mainly peripheral. Moderate vascularity was found in 76.9% of the malignant cases. Focal vascular asymmetry was found in 74.4% of the malignant cases and only 12% of the benign cases. Sensitivity of transabdominal ultrasonography in diagnosing malignant prostatic lesions was 94.8%, specificity was 75% with an overall accuracy of using transabdominal ultrasonography in the diagnosis of malignant prostatic lesions in this study population was 80%.

Conclusions: Transabdominal ultrasound evaluation of prostate is a simple, economical, non-invasive technique of choice due to its high accuracy in detecting size, nature of pathology as benign or malignant with fair accuracy.

Keywords: Benign prostatic hyperplasia, Prostate gland cancer, Prostate volume, Ultrasonography

INTRODUCTION

Benign prostatic hyperplasia is a condition closely related with ageing. Although, it is not life threatening, its clinical manifestation as lower urinary tract symptoms have the potential to reduce patient's quality of life.¹ Prostate cancer is one of the most important causes of death from cancer in men. Transrectal ultrasonography (TRUS) is frequently used in the diagnosis of prostate cancer. Studies have been conducted worldwide proving the sensitivity and specificity of TRUS in prostatic

evaluation, it delineates the prostatic architecture so clearly that some refer to TRUS as an extension of the urologist finger.² Color Doppler ultrasonography increases the predictive value of transrectal ultrasonography (62%-75%) but has low sensitivity.³ As a result, TRUS has assumed an important role in the evaluation of prostate gland pathologies worldwide, some controversies exist with contrasting reports from various studies.⁴ Comparative studies estimating prostate volume by transrectal and transabdominal ultrasonography have been published by numerous authors previously.⁵ Also,

the accuracy of transabdominal ultrasound as the standard clinical tool for a rapid, simple and non-invasive screening of the prostate volume has been described.

Though very studies from India have evaluated the accuracy of using transabdominal ultrasonography for diagnosing prostatic lesions. The present study was conducted to assess the ability of transabdominal ultrasonography in diagnosing benign and /or malignant hypertrophy of the prostate.

METHODS

Authors conducted an observational study in the Department of Radiology, Bharati Vidyapeeth Medical College and Hospital (Deemed to be University), Sangli, Maharashtra, India of patients referred by the Department of Urology from 1 October 2018 till 31 December 2018.

Authors included all patients who had prostatomegaly on ultrasound examination and underwent histopathological confirmation of the lesions. Patients who refused to undergo surgery and/or histopathology examination were excluded from the study. A thorough clinical examination was performed in the Department of Urology to assess for prostatomegaly.

A pre-operative ultrasonography was performed in the department to arrive at a diagnosis of prostatomegaly. Follow up was scheduled when these patients underwent surgical. The resected portion of the gland was sent to the Department of Pathology for histopathology examination for confirmation of the diagnosis. Patients were explained the purpose of the study and an informed written consent was obtained from them.

Ultrasonography protocol

The equipment used for the study Philips HD 15, Philips Affiniti 30, Affiniti 50 and Convex probe 2-5 MHz. The prostate gland was evaluated transabdominally after adequate bladder distension. The prostate gland was assessed for volume, echotexture, morphology, focal lesions and median lobe. The prostate volume was calculated by using Prolate ellipsoid formula.

Anteroposterior x Transverse x Cranio-caudal x 0.52.

Trasbdominal ultrasound was preferred over transrectal ultrasound examination since transrectal ultrasonography is invasive compared to transabdominal ultrasound. The median lobe enlargement was measured separately by obtaining both in longitudinal and transverse planes. The median lobe volume was added to the total prostatic gland volume.

The urinary bladder was scanned for assessment of prevoid urine volume, wall thickness, mucosal regularity, calculi, diverticuli and post void assessment for the residual urine. The kidneys and ureters were also scanned

for the pathology. Doppler color flowmetry studies were done for the extent of vascularity (mild/moderate) and vascular asymmetry (focal or diffuse).

After the study was approved by the institutional ethics committee, patient related data were collected from the hospital records. Histopathology diagnosis was taken as the reference standard, against which the diagnosis obtained by ultrasonography was compared.

Data were analysed in SPSS version 21. Descriptive data were tabulated as mean and standard deviation and frequency distribution tables. Means were compared using student’s t-test. Diagnostic accuracy of transabdominal ultrasonography in the diagnosis of malignancy was evaluated.

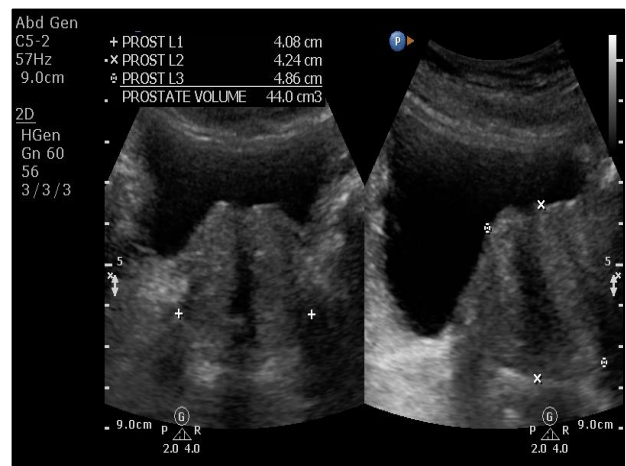


Figure 1: Transabdominal ultrasound image of prostate suggestive of benign prostatic hypertrophy.



Figure 2: Transabdominal ultrasound image of prostate suggestive of benign prostatic hypertrophy with cyst.

Figure 1 shows transabdominal sonography image of prostate shows a symmetrically enlarged gland with fairly homogeneous echotexture and an intact capsule protruding into bladder neck, suggestive of Benign

Prostatic Hypertrophy (BPH). Figure 2 is a transabdominal sonography image showing an enlarged prostate gland with a small well defined anechoic lesion suggesting BPH with cyst.

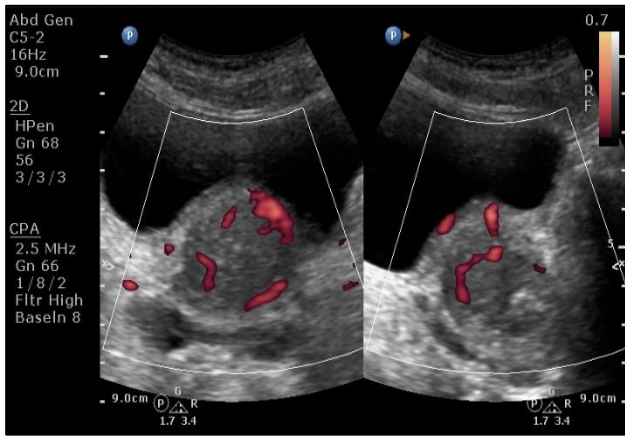


Figure 3: Transabdominal ultrasound image of prostate showing heterogenous echotexture with a malignant central nodule.

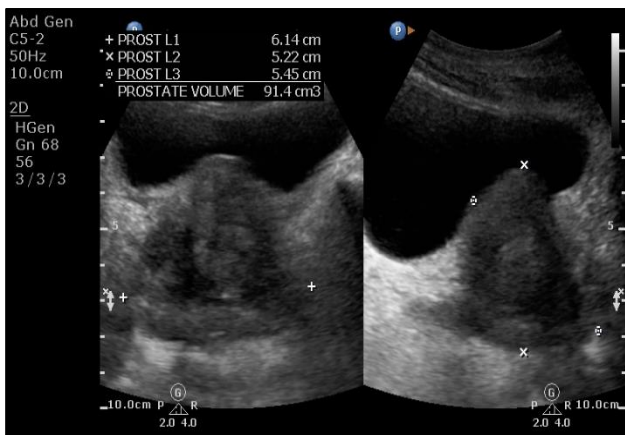


Figure 4: Transabdominal ultrasound image of prostate showing increased vascularity of the gland.

Figure 3 shows transabdominal sonography image of prostate in transverse and longitudinal planes of a grossly enlarged prostate gland with a heterogenous echotexture

showing an echogenic nodule centrally which turned out to be malignant on histopathological examination. Figure 4 shows prostate with increased vascularity of the gland and Figure 5 shows the heterogeneous gland echotexture due to echogenic nodule.

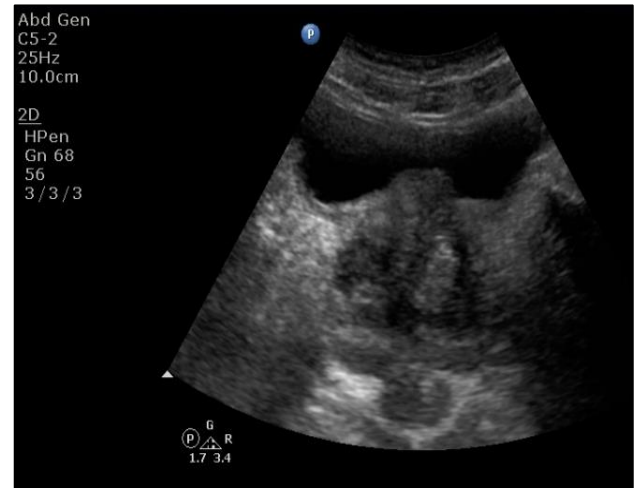


Figure 5: Transabdominal ultrasound image of prostate showing heterogenous echotexture due to echogenic nodule.

RESULTS

In the present study, a total of 155 patients were included in the study. Patients were classified as benign and malignant based on the confirmation received by histopathological reports.

Benign prostatic disease was diagnosed in 116 patients, while malignancy was detected in the rest of the 39 cases. Mean age of the patients was 68.5 ± 4.55 and 69.2 ± 5.81 years in patients with benign and malignant disease respectively (Table 1).

Prostate specific antigen levels were significantly higher among malignant cases (18.39 ± 7.44 ng/ml) as compared to that of benign cases (7.51 ± 3.22 ng/ml), p value < 0.01 . Prostatic volume and lesion size were comparable between the two patient groups.

Table 1: Characteristics of the patients included in the study.

Variable	Benign cases (n=116)	Malignant cases (n=39)	P value
Mean age (in years)	68.5 ± 4.55	69.2 ± 5.81	0.87
Prostate specific antigen level (ng/ml)	7.51 ± 3.22	18.39 ± 7.44	< 0.01
Prostate volume (cm ³)	48.03 ± 11.28	42.19 ± 7.55	0.52
Lesion size (cm)	0.91 ± 0.6	1.35 ± 0.4	0.07

Table 2 describes the ultrasonographic findings of the patients included in the study. Location of the lesions was

predominantly inner glandular among benign cases (68%), while peripheral lesions were more common

among malignant cases. Hypoechoic lesions were more common among both benign and malignant cases. Hypoechoic and hyperechoic lesions were present in 23% of the benign and 31% of the malignant cases. Moderate vascularity was found in 76.9% of the malignant cases, while only 42.2% of the benign had moderate vascularity. Focal vascular asymmetry was found in 74.4% of the malignant cases while only 12% of the benign cases had vascular asymmetry. Transabdominal ultrasonography diagnosed 66 patients with malignancy and 89 with benign lesions. Table 3 describes the operating characteristics of transabdominal ultrasonography in the

diagnosis of malignant prostatic lesions. Sensitivity of transabdominal ultrasonography in diagnosing malignant prostatic lesions was 94.8% (95% confidence interval 82.6% to 99.3%), specificity was 75% (95% CI 66.1% to 82.5%). Positive and negative likelihood ratios were 3.79 and 0.07 respectively. Positive and negative predictive value was 56% and 97.75% respectively. Overall accuracy of using transabdominal ultrasonography in the diagnosis of malignant prostatic lesions in our study population was 80%.

Table 2: Ultrasonographic findings of the patients included in the study.

Lesion characteristics	Benign cases (n=116)	Malignant cases (n=39)
Location of the lesion		
Inner glandular	79 (68%)	04 (10%)
Inner glandular+peripheral	19 (16%)	04 (10%)
Peripheral	18 (16%)	31 (80%)
Echogenicity of the lesion		
Hypoechoic	69 (60%)	24 (62%)
Hypoechoic+ hyperechoic	27 (23%)	12 (31%)
Mixed	20 (17%)	03 (07%)
Vascularity		
Moderate	49 (42.2%)	30 (76.9%)
Focal vascular asymmetry	14 (12.1%)	29 (74.4%)

Table 3: Operating characteristics of transabdominal ultrasonography in the diagnosis of malignant prostatic lesions.

Transabdominal ultrasonography result for malignancy	Histopathological result for malignancy		
	Yes	No	
Yes	37	29	66
No	02	87	89
	39	116	155
	Value	95% confidence intervals	
Sensitivity	94.8%	82.6% to 99.3%	
Specificity	75%	66.1% to 82.5%	
Positive Likelihood Ratio	3.79	2.75 to 5.24	
Negative Likelihood Ratio	0.07	0.02 to 0.26	
Positive Predictive Value	56%	48.1% to 63.8%	
Negative Predictive Value	97.75%	91.8% to 99.4%	
Accuracy	80.00%	72.83% to 85.9%	

DISCUSSION

Accurate estimation of prostate volume constitutes an important guide in management of men with prostatic enlargement. TRUS is a recommended rather than a standard approach because of the invasive nature and the inconvenience it causes. Transabdominal ultrasonographic assessment of prostatic enlargement is

more convenient but its accuracy has been less studied. In the present study 155 patients were included of which 66 were diagnosed as having benign prostatic enlargement and 89 as having malignant disease on transabdominal ultrasonography. Histopathology was taken as the reference standard for the diagnosis and revealed 116 having benign disease and 39 with malignant disease. Transabdominal ultrasound was 94.8% sensitive and 75%

specific in diagnosing malignant prostatic disease in our patient population. Positive and negative predictive value was 56% and 97.7% respectively.

Basawaraj N et al, correlated sonologically measured prostate volume and Prostate Specific Antigen (PSA) levels in blood.⁶ Among 115 individuals, 35 patients (30.4%) had prostate volume 20 to 30 cc and 20.9% had the volume more than 50 cc. The PSA mean value was 2.2 ± 1.89 ng /ml. The authors found a significant correlation of prostate volume with blood PSA ($r=0.415$, p value <0.0001). When transrectal and transabdominal techniques were compared by Ajayi et al, transition zone (TZ) volume estimation on both transrectal and transabdominal ultrasound showed positive correlation with the post-operative enucleated adenoma ($r=0.594$, $p <0.001$) but the transrectal method was more accurate.⁷ Malik et al assessed the accuracy of TRUS for diagnosing benign and malignant prostatic lesions and compared with histopathological diagnosis.⁸ They found the sensitivity of TRUS for diagnosis of carcinoma prostate to be 86.96% with specificity of 71.43%. The percentage of false positive was found to be 28.57% and percentage of false negative was found to be 13.04%.

There are a few limitations of this study. First, ultrasound results can vary with the operator's experience and technique. While did not factor in this while collecting the data. Secondly, the reproducibility of the ultrasonographic assessments were not evaluated in this study. Finally, we did not compare the accuracy of transabdominal technique with transrectal or other newer techniques. Rahmouni et al, claimed contoured MRI volumetric analysis to be superior to linear MRI or TRUS.⁹ However, these results are not completely confirmed by other studies.¹⁰ The accuracy of newer techniques like microbubble contrast-enhanced ultrasonography which can detect tissue flow of both macrovasculature and microvasculature is being assessed.¹¹ Furthermore, preliminary studies suggest that the use of ultrasonographic contrast agents enhances visualization of neo-vascularity associated with prostatic cancer.¹²

CONCLUSION

Transabdominal ultrasound evaluation of prostate is a simple, economical, noninvasive technique of choice due to its high accuracy in detecting size, nature of pathology as benign or malignant with fair accuracy. The predictability of malignancy detection was 42%, which histologically proved to be only 19% inaccurate. Hence, recommended as routine examination for prostatomegaly.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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