

Usefulness of Transrectal Ultrasound for Predicting Carcinoma of Prostate

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A B S T R A C T

Introduction: Incidence of prostatic carcinoma is increasing globally over the past few years and it is also on the rise in India. The enlarged prostate on TRUS shows variable features based on the pathology. In the present study we attempted to look at the usefulness of transrectal ultrasound (TRUS) to detect and to predict the presence of prostatic carcinoma. Study aimed to know the usefulness of transrectal ultrasound (TRUS) modality in predicting prostatic carcinoma.

Material and Methods: This was a prospective hospital based study in which 64 patients with enlarged prostate underwent transrectal ultrasound examination along with collection of trucut biopsy for tissue diagnosis. The sensitivity, specificity, positive predictive value and negative predictive value were calculated.

Results: The study group consisted of 64 patients with age ranging from 48 to 87 years. Carcinoma prostate was present in 35 (54.6%) and BPH was present in 29 (45.3%) cases respectively. The mean age for carcinoma and BPH were almost same, being 69.5 years and 68.4 years respectively. The sensitivity and specificity of TRUS to detect prostatic malignancy was 85.7% and 72.4% respectively. The positive predictive value and negative predictive value of TRUS to detect prostate malignancy was 78.9% and 80.7% respectively.

Conclusion: Carcinoma of the prostate is common in the sixth and seventh decades of life. Transrectal ultrasound is a useful modality to detect carcinoma of prostate and has a sensitivity of 85.7% with positive predictive value of almost 80%. Mixed echogenicity or variable echogenic patterns on TRUS are more common in carcinoma than in BPH.

Keywords: Transrectal Ultrasound, Prostate Carcinoma, Sensitivity and Specificity of TRUS, PPV of TRUS

INTRODUCTION

Incidence of prostatic carcinoma is increasing globally over the past few years and it is also on the rise in India.¹ Prostatic carcinoma is so common that it is the second most common cancer and also a common cause of cancer death worldwide.² The incidence of prostatic cancer is more in the western world as compared to India but recent trends show a rising incidence in our country as well.³ In all the suspected cases of prostatic cancer a three prong approach of digital rectal examination (DRE), serum PSA testing and biopsy of the prostate are to be performed. The final diagnosis is based on the histopathological findings on a trucut biopsy which is obtained by transrectal ultrasound guided biopsy.⁴

The enlarged prostate on TRUS shows variable features based on the pathology. In the present study we attempted to look at the usefulness of transrectal ultrasound (TRUS) to detect and to predict the presence of prostatic carcinoma.

Study aimed to know the usefulness of transrectal ultrasound (TRUS) modality in predicting prostatic carcinoma.

MATERIAL AND METHODS

This was a prospective hospital based study carried out in the department of Radiodiagnosis at Fathima Institute of medical Sciences, Kadapa, Andhra Pradesh over a period of two and half years. A total of 64 male patients were included in the study with age ranging from 48 to 87 years.

Inclusion criteria

1. Patients having features of lower urinary symptoms
2. Positive DRE findings of prostatomegaly
3. Patients with symptoms suggestive prostatic carcinoma

Exclusion criteria

1. Already known cases of prostatic carcinoma were excluded
The TRUS procedure was carried out in the Ultrasound section of the department of Radiodiagnosis. The patient was put in the left lateral position and then a digital rectal examination was done to estimate the anal sphincter and rectal space. Then sufficient amount of lubricant was applied and the US probe was inserted gently. The prostate was assessed in the sagittal and transverse planes. The echogenicity of the gland, the volume of the gland, any parenchymal irregularities,

intactness of the capsule were noted. Those patients who had abnormal DRE, or suspicious TRUS findings or elevated serum PSA levels were subjected to TRUS guided biopsy procedure. On an average, 6 to 12 core biopsies were taken and dropped into 10% neutral buffered formalin and the department of Pathology for histopathological processing of the tissue specimens. The patients in whom biopsy was done were given adequate antibiotic cover.

The pre-biopsy serum prostate specific antigen (PSA) levels were noted from the patients or from department of Biochemistry.

RESULTS

Most of the cases with enlarged prostate were seen in the 60-79 years age group. The mean age for carcinoma of prostate 69.5 years and for BPH was 68.4 years (table-1).

Mixed echogenicity pattern was the most common pattern and was seen in 41 (64%) cases.

Prostate gland outline irregularities on TRUS: The margin

or outline irregularities were seen in 20/35 cases of carcinoma whereas 27/29 cases of BPH showed regular smooth outlines. In the two cases of BPH that showed irregularities there was a history of previous TURP procedures and recurrent urinary tract infections/prostatitis.

The mean prostate volume on TRUS: The mean volume of the prostate gland in malignancies was 81.5 cm³ with a range of 15.0 to 295 cm³.

Table 3 Ultrasound findings and Histopathology findings: Most of the mixed echogenicity pattern cases were diagnosed as adenocarcinoma on histopathology (table-3).

Sensitivity and specificity of TRUS

Sensitivity = TP/TP+FN * 100 = 30/38 * 100 = 85.7%

Specificity = TN/TN+FP * 100 = 21/29 * 100 = 72.4%

PPV = TP/TP+FP * 100 = 35/43 * 100 = 78.9%

NPV = TN/TN+FN * 100 = 29/34 * 100 = 80.7%

Complications: Mild to moderate pain at the site of puncture was present in 42/64 patients in the first three to four days

Age (in years)	No. of cases (Carcinoma)	No. of cases (BPH)	Total no. of cases (%)
40-49	-	2	2 (3.1%)
50-59	2	8	10 (15.6%)
60-69	14	13	27 (42.1%)
70-79	15	3	18 (28.1%)
80-89	4	3	7 (10.9%)
Total	35	29	64 (100%)

Table-1: Age-wise distribution of the patients with prostatomegaly

Variable	Ultrasound findings	No. of cases	Percent (%)
Echogenicity	Mixed	41	64%
	Isoechoic	10	15.6%
	Hypoechoic	8	12.5%
	Hyperechoic	5	7.8%
	Total	64	100%
Ultrasound diagnosis	BPH	29	45.3%
	Carcinoma	35	54.6%
	Total	64	100%

Table-2: Ultrasound findings

Echogenicity	No. of cases	BPH	Carcinoma
Mixed	41	17	24
Isoechoic	10	4	6
Hypoechoic	8	3	5
Hyperechoic	5	5	-
Total	64	29	35

Table-3: Ultrasound findings and Histopathology findings

	Biopsy positive	Biopsy negative	Total
TRUS positive for malignancy	30 TP	8 FP	38
TRUS negative for malignancy	5 FN	21 TN	26
Total	35	29	64

Table-4: Sensitivity and specificity of TRUS for carcinoma prostate

as they came to collect the biopsy report and had urological consultation. Apart from pain, none of the patients had any major complication post-procedure that needed immediate surgical intervention.

STATISTICAL ANALYSIS

Statistical test of significance: chi square test; "p value": <0.0001 (significant). The sensitivity and specificity of TRUS to detect prostatic malignancy was 85.7% and 72.4% respectively. The positive predictive value and negative predictive value of TRUS to detect prostate malignancy was 78.9% and 80.7% respectively.

DISCUSSION

Transrectal ultrasound (TRUS) was initially used to evaluate rectal pathology only. Watanabe et al⁵ for the first time in 1967 obtained clinically applicable images of the prostate gland and since then TRUS has found its place in evaluating prostatic pathology.

In the current clinical practice, TRUS guided biopsies are preferred to manual biopsies. Manual biopsies based on digital palpation method have the disadvantage of missing localized pathologic lesions.⁶ In TRUS biopsies the biopsy needle can be visualized and are better as they pick up representative material. In TRUS guided biopsy specimens the rate of detection of malignancy is higher as compared to digitally guided biopsy.⁷ In our study all the biopsies were TRUS guided biopsies.

TRUS biopsy is considered the gold standard method to obtain representative biopsy material. However, in rare cases where the patients have a previous history of rectal amputation, a transperineal approach can be followed.⁸

It is recommended that for a gland volume of 30 to 40 ml, a minimum of eight cores should be sampled. For any first time testing, not more than 12 cores are to be sampled.⁹ A total of 18 cores can be collected for glands that are more than 55 ml so as to increase the cancer detection rate.¹⁰ There is another technique called as Prostate saturation biopsy wherein, a total of 20 to 40 cores are collected but this technique is to be employed only when the initial biopsy comes negative in a patient in whom there is a very high index of suspicion for malignancy. This technique is time consuming for both the radiologist and the pathologist and also has higher rate of complications due to the increased number of punctures.¹¹

The most recent prostate biopsy technique is a comprehensive 3-dimensional mapping biopsy (3DMB) technique that samples the entire gland. TRUS guided biopsies can be missed in almost 25-30% cases but in the 3DMB technique the risk of missing any cancer is minimal.¹² Other newer technique is using an MRI-ultrasound fusion method to guide prostate biopsy.¹³

Age: In our study, the mean age of carcinoma of prostate was 69.5 years. This compares well with the findings of Hariharan et al,³ Korti et al¹⁴ and Ghagane et al¹⁵ who reported the mean age in their studies as above 65 years, 66 and 70 years respectively.

TRUS findings: The mean volume of prostate in malignant cases in our study was 81.5 cm³. Various authors have

reported the mean prostatic size as 66.8g and 58 ml.^{16,17}

In our study, most of the carcinoma cases had mixed echogenicity pattern on ultrasound. Isiwele et al¹⁸ in their study observed 85% cases of carcinoma prostate to have mixed echogenicity on TRUS. In their study 'Mixed echogenicity' on TRUS correlated more with a histologic diagnosis of carcinoma prostate as 71.9% of their 32 patients with mixed echogenic features showed carcinoma on biopsy report. In our study, of the 41 cases with mixed echogenicity, 24 (59%) showed carcinoma on the biopsy. In our study none of the hyperechoic lesions on TRUS were diagnosed as carcinomas on histopathology which is similar to the observation of Isiwele et al.¹⁸

We observed 5 cases with hypoechoic nodules, 4 of which were located in the peripheral areas. This is similar to the observations of Pinto et al¹⁹ who reported that hypoechoic nodules in the peripheral region have the highest predictive value in the detection of prostate cancer.

Hara et al⁸ in their study reported the specificity and sensitivity of suspicious nodules to be 88% and 31%, respectively and the positive predictive value to detect prostatic carcinoma on TRUS as 74%.

Complications: The common complications of TRUS guided biopsy are vasovagal attack, pain at the puncture site, hematuria, urinary tract infections, hematospermia and hematochezia in the first few days post-procedure. In our study, none of the patients had any major complication necessitating surgical intervention.

CONCLUSION

Carcinoma of the prostate is common in the sixth and seventh decades of life. Transrectal ultrasound is a useful modality to detect carcinoma of prostate and has a sensitivity of 85.7% with positive predictive value of almost 80%. Mixed echogenicity or variable echogenic patterns on TRUS are more common in carcinoma than in BPH. We conclude that TRUS is a simple and useful modality to detect prostatic malignancy and has the added benefit of collecting tissue by a guided biopsy.

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