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ROLE OF TRUS GUIDED BIOPSY IN PROSTATIC LESIONS AND ITS HISTOPATHOLOGICAL CORRELATION

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ABSTRACT

Background: Transrectal ultrasound-guided prostate biopsy (TRUS) has become essential in diagnostic investigation of prostatic lesions due to gland alterations resulting from abnormality on the digital rectal examination or rising of the prostatic specific antigen (PSA).It is considered as gold standard method to collect material for histopathological analysis

Aim of the study: To evaluate the role of transrectal prostate ultrasound in the screening for prostate lesions and in the guidance of prostate biopsies.

Materials and Methods: This study included 50 patients having symptoms suggestive of prostatic diseases. All these patients were subjected to DRE, serum prostate-specific antigen testing, transabdominal ultrasound examination and TRUS, as well as histopathological correlation

Results: Among the 50 patients studied, final diagnosis by TRUS-guided biopsy revealed benign prostatic hyperplasia in 26 patients , which was the most common pathology, precancerous lesions in 1 patient , prostatitis in 4 patients, and prostatic adenocarcinoma in 19 patients (10%). All the cases were correlated with PSA levels and histopathology.

Conclusion: TRUS guided biopsy in correlation with serum prostate-specific antigen levels and findings from DRE proves to be an effective modality in the diagnosis of prostatic lesions.

INTRODUCTION

Transrectal ultrasound (TRUS) was first developed in the 1970s. It is now the most widely accepted method to diagnose prostatic lesions. It enables accurate determination of prostate size.When a cancer is visualized by ultrasonography, it is usually hypoechoic relative to normal tissue. TRUS is mainly used to guide prostate biopsies. TRUS guided biopsy is considered as gold standard in correlation with digital rectal examination (DRE) findings and prostate-specific antigen (PSA) levels. [1]

MATERIALS AND METHODS

This study was carried out on 50 patients at Patna Medical college from June 2013 to Jan 2019. This is a prospective study with complete clinical evaluation, imaging and histopathological correlation.This study included patients with elevated PSA levels (>4 ng/ml) and abnormal findings on DRE. Informed consent was obtained from all participants, and a full explanation was given to them about the procedure. All the biopsies were subjected to histopathological examination. The grade of prostate cancer was evaluated on the basis of the Gleason score.

RESULTS

The age of the studied patients ranged from 48 to 88 years. The majority of patients were older than 60 years. (Table 1) Among the 50 patients, the most commonly presenting symptoms were obstructive and irritative lower urinary tract symptoms, followed by acute urine retention, increased frequency of micturition and hematuria. Findings of DRE are described in Table no.2 .

Table No.1 Age distribution of cases (n=50)

Age Range (yrs)	No. of Cases (n=50)
40-50	2
>51-60	8
>61-70	21
>71-80	15
>80	4
Total	50

Table No. 2 Digital Rectal examination findings in all the cases (n=50)

DRE findings	No. of patients
Palpable nodules	
Present (+)	10
Absent (-)	40
Consistency	
Soft	5
Hard	2
Firm	43
Surface	
Irregular	8
Regular	42

Note: BPH benign prostatic hyperplasia, PIN prostatic intraepithelial neoplasia Total PSA (tPSA) level was elevated in all patients (>4 ng/ml). It ranged from 10 to 20 ng/ml in 14 patients, including 10 patients with BPH, four patients with prostatitis. It ranged from 20 to 50 ng/ml in 27 patients, including 2 patients with BPH, one patient with PIN, and26 patients with prostatic adenocarcinoma. It was more than 100 ng/ml in 3 patients with prostatic adenocarcinoma and 1 with neuroendocrine differentiation.

Table No.3 Prostatic Antigen levels in all the cases (n=50)

PSA levels (ng/dl)	Total no. of cases	BPH	Prostatitis	Adenocarcinoma
4-10	6	6	0	0
>10-20	14	10	4	0
>20-50	27	2	0	26+1PIN
>100	3	0	0	2+1 Neuroendocrine

Among the 50 patients studied, final diagnosis by TRUS-guided biopsy revealed benign prostatic hyperplasia in 26 patients, which was the most common pathology, precancerous lesions in 1 patient , prostatitis in 4 patients, and prostatic adenocarcinoma in 19 patients (10%).

Benign prostatic hyperplasia (BHP) yields a heterogeneous sonographic pattern while glandular tissue shows a dense lamellar echopattern. Prostatic calculi yield an extremely dense echo pattern and cast acoustic shadow.Histopathology shows varying proportion of glandular proliferation and benign fibromyomatous stroma. Aggregates of small and large glands are seen, some dilated and others thrown into papillary infoldings of the epithelium. Lining columner cells have small basal nuclei without nucleoli and are surrounded

by a layer of flat cuboidal basal epithelium. The center is filled with corpora amylacea. **(Figure 1A,B,C,D)**

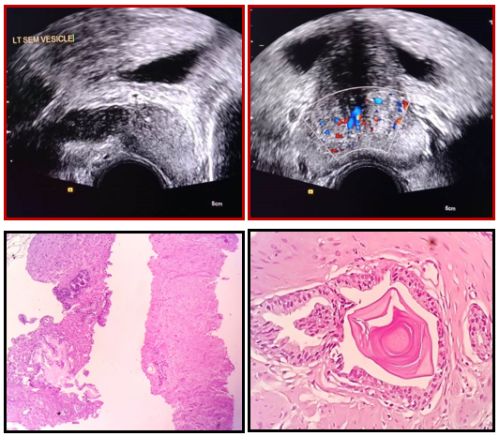

Figure 1A Transabdominal ultrasound showing enlarged transitional zone

Figure 1B same case as above on Colour Doppler study
Figure 1C Core biopsy showing back to back arrange ment of benign glands (H&E20x)

Figure 1D Deposition of corpora amylacea in a benign gland with preservation of myoepithelial layer (H&E40x)

Transrectal ultrasound depicts prostatic anatomy into two segments: the outer gland (peripheral and central zones) and the inner gland (transition zone). 80% of prostatic cancer grows in outer gland. Degree of hypoechogenicity varies directly with pattern of tumour growth. Histopathology describes the various patterns of neoplastic cells with gleasons scoring done on the basis of dominant pattern followed by addition of the second dominant pattern. Perineural invasion corresponds to poor prognosis. (Figure 2A,B,C,D)

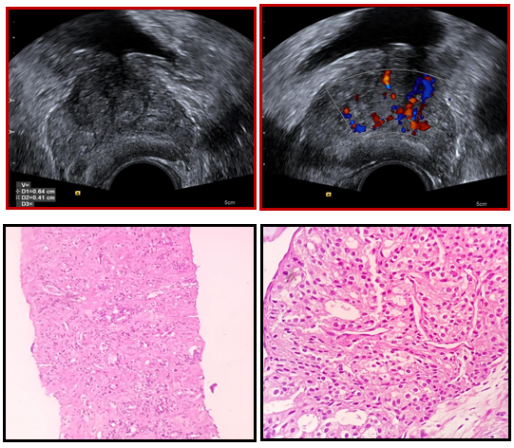

Figure 2A Transabdominal ultrasound showing heterog enous and irregular predominantly hypoechoic mass lesion in peripheral zone of prostate

Figure 2B same case as above on Colour Doppler study showing increased central vascularity

Figure 2C Core biopsy showing neoplastic cells in glandular pattern and single cell infiltration (H&E20x)

Figure 2D High power showing cribriform pattern of neoplastic cells Gleason score (3+4) (H&E40x)

This is one of the rare findings of prostate with neuroend ocrine differentiation which was confirmed on histopathology followed by positive immunohistochemistry of synapto physin, chromogranin and CD56. (Figure 3A,B,C)

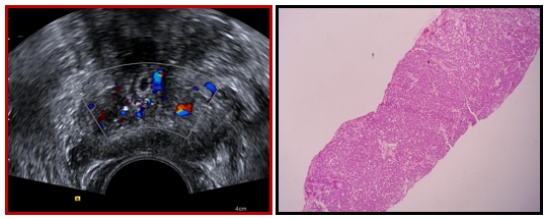

Figure 3A TRUS showing heterogenous pattern with increase in central vascularity on colour doppler

Figure 3B Section shows clusters of monomorphic cells with characteristic salt and pepper chromatin (H&E 20x)

DISCUSSION

TRUS has been considered as the gold standard imaging test for the prostate. In this study, the age of the patients ranged from 48 to 88 years. The majority of patients in this study were above the age of 60 years. This is in concordance with the high incidence of prostatic diseases during old age, as reported by Jemal *et al*[2]

Serum PSA level is the most sensitive test for early detection of prostatic cancer and is elevated in approximately 65% cases. This antigen is imperfect tumour marker because of insensitivity, approximately 35% false negative rate, and lack of specificity. The PSA level was elevated in all patients of this study (>4 ng/ml). Thompson *et al.* and Schroder *et al.* reported that, although a serum tPSA level of more than 4 ng/ml can imply the presence of prostate cancer, patients with BPH and inflammatory prostate disorders can also present with increased increased serum tPSA levels. The lack of specificity of serum tPSA measurements in prostate cancer screening has inevitably led to further efforts using the PSA ratio (free PSA to tPSA), which is more specific and decreases the number of biopsies taken.[3] Chung *et al*[4]. reported that the volume of the prostate was enlarged is a good indicator for prostate cancer.

BPH is a benign disease of the prostate gland and consists of nodular hyperplasia of the fibrous, muscular, and glandular tissue within the periurethral and transition zones. The exact pathophysiology of BPH is still unknown but it is probably associated with hormonal changes that occur as men age. BPH appears in TRUS as an echogenic and non-mobile mass. TRUS is mainly used to assess prostate volume, which is crucial for therapeutic strategies.

The three main pattern of tumour growth with corresponding sonographic depiction are as follows

1. Solid tumour (profoundly hypoechoic)
2. Solid tumour plus infiltrative tumour (moderately hypoechoic)
3. Infiltrating tumour (slightly hypoechoic).

The degree of hypoechogenicity is, therefore, directly proportional to the amount of tumour per unit area or inversely proportional to the amount of intervening noncancerous glandular tissue.[5,6]

The transrectal ultrasound features suggesting seminal vesicle involvement are as follows:

1. Obliteration or displacement of seminal vesicle beak by hypoechoic cancer most clearly visible on longitudinal scan.
2. Hypoechoic cancer extending into seminal vesicles.
3. Extraprostatic hypoechoic mass obliterating the seminal vesicle-prostate angle or bladder neck-prostate angle.
4. A hypoechoic halo around the ejaculatory duct on transverse scan
5. A hypoechoic linear band connecting the base of the gland to seminal vesicle, designated as adhesion sign

Sonographic criteria of inner gland cancer are as follows:[7]

1. Localized asymmetry of inner gland.
2. Presence of a diffusely homogeneous hypoechoic lesion with poorly defined margins.
3. Circumferential location, especially along the anterior fibromuscular stroma.
4. Comparative difference in size, echogenicity and echotexture from contralateral transition zone.

Different studies showed that findings of chronic prostatitis are as follows-

1. Heterogeneous echotexture of prostate.
2. Constant dilatation of periprostatic venous plexus
3. Dilated and elongated seminal vesicles with thickening of inner septa

In literature it has been described that the more the number of core biopsies obtained, the more accurate were the results and the lesser was the need to repeat the biopsy. Hence, the best results were obtained using the 15-core biopsy protocol. The sextant biopsies do not detect all clinically significant cancers, and efforts have been made to improve the sextant protocol by adding other biopsies and/or changing biopsy positions, so that the reliability of systematic biopsy for cancer detection relates to the number of cores, as well as to their placement. Using a systematic biopsy to sample all areas of the prostate regardless of the presence of hypoechoic lesions became strongly recommended and preferred by many urologists rather than the old method of searching for and biopsying each single lesions in addition to carrying out systematic biopsies. The most frequently used biopsy protocol was the sextant protocol; shifting of the sextant biopsies more laterally was proposed to better sample the peripheral zone where most of the cancers are located. Naughton *et al.* reported that a single set of sextant biopsies may miss clinically detectable prostate cancer in 15–34% of men and advised to increase the number of core biopsies taken.[8,9]

Although TRUS-guided prostate biopsy is relatively quick to perform and is carried out under local anesthesia, it is nevertheless an invasive procedure, which may cause significant anxiety and pain in patients. In the present study patients had no complications complications. Mild pain was controllable and self-limited. Vasovagal attacks were reported in two patients but it was controlled using diazepam. Othe complications could be perineal pain, gross hematuria, sepsis, rectal bleeding, hematspermia, infections etc.

To conclude correlating the PSA ratio (free PSA to tPSA) with findings from DRE and TRUS is considered to be the most useful method to improve the sensitivity of prostate cancer detection. The standard sextant biopsy scheme did not appear to be the best method of sampling the peripheral zone of the prostate and does not sample the transitional zone. Hence, the reliability of systematic biopsy for cancer detection is related to the number of cores, as well as their placement. Increasing the number of cores taken led to more accurate detection of prostate cancer, negating the need to repeat the biopsy. TRUS-guided prostate biopsy is generally considered safe and is commonly performed in an outpatient setting with minor controllable complications. There are limitations of transrectal ultrasound. Lymph node involvement cannot be determined by transrectal ultrasound. TRUS is also poor for assessment of inner gland tumours.[10,11]

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