Ultrasound-Guided Prostate Biopsy: Indications, Morbidity and Outcome at University of Uyo Teaching Hospital.

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ABSTRACT

Background

Prostate cancer is a hormone-dependent malignancy with slow progression. Biopsy for histopathology of samples enables us to assert the diagnosis. Prostate biopsies are usually performed by the interventional radiologist in the office setting using a transrectal probe. The current standard of care involves obtaining 10-14 cores from different anatomical sections. These biopsies are usually not directed into a specific lesion as most prostate cancers are not visible on TRUS. Magnetic resonance imaging (MRI)-guided prostate biopsy has a higher sensitivity than the ultrasound-guided biopsy, but its realization requires a dedicated interventional MRI, specific material, which is not available in our context; hence, ultrasound-guided biopsy remains of great interest. Presently, ultrasound-guided biopsy is the gold standard for diagnosis of prostate cancer, outside of a clinical trial.

The objective of our work is to evaluate our practice of transrectal ultrasound-guided prostate biopsy using an endorectal probe by assessing the indications, describing the technique and evaluating the morbidity and histology results.

Methods

This is a descriptive study of ultrasound-guided prostate biopsies performed over a 2-year period. The parameters evaluated were age, rectal examination findings, total PSA level, frequency of the procedure, prostate biopsy morbidities and results.

Descriptive statistics were performed, and comparison of qualitative variables was made by the chi-square test with statistical significance set for $P \geq 0.0001$

Results

One hundred and fifty-six patients were included over a two-year period. The mean age of our patients was 63.5. Rectal examination finding was suspicious in 37.2% and the median total PSA was 11.2ng/ml (0.1 – 121ng/ml). 99.3% of patients reported their pathology results.

Prostatic adenocarcinoma was the most common finding accounting for 38.7% of results. Complications were observed in 11 patients (7%) with a predominance of initial hematuria, dysuria and rectal pain. The frequency of more than one procedure was 1.3%.

Conclusion

In our series, the cancer detection rate was significant and the complications rate was acceptable at 7%.

BACKGROUND

Prostate cancer rarely cause symptoms until it is advanced. Thus, suspicion of prostate cancer resulting in a recommendation for prostatic biopsy is most often raised by abnormalities found on digital rectal examination (DRE) or by serum prostate-specific antigen (PSA) elevations[1]. Prostate biopsy with pathology examination confirms the diagnosis of prostate cancer. This is an invasive procedure with an overall morbidity between 3 and 23% and an exceptional but not zero mortality[2]. For a long time, the procedure was digitally guided transrectally.

Transrectal ultrasound (TRUS)-guided, systematic needle biopsy is the most reliable method, at present, to ensure accurate sampling of prostatic tissue in men considered at high risk for harbouring prostatic cancer. In very rare circumstances, a biopsy of a metastatic site (bone lesion) or of a suspicious lymphnode may be easier and more advantageous[1]. Comparatively, there is a greater sensitivity of ultrasound-guided biopsy for the diagnosis of prostate cancer making that procedure recommended for the confirmation of prostate cancer[3,4].

Mbassi et al[5] had found in them a higher sensitivity of the ultrasound-guided biopsy compared to the finger-guided one [61.8 and 38.3 (p=0.006), respectively].

The objective of our study is to bring to the fore/highlight our practice of prostate biopsy using a transrectal probe in order to describe the technique and evaluate the morbidity and results of the ultrasound-guided prostate biopsy.

METHODS

This was a cross-sectional descriptive study of 156 patients who underwent an ultrasound-guided prostate biopsy between Nov 1 2019 and Oct 31 2021, in our centre. All patients who had transrectal ultrasound-guided prostate biopsy during the study period were included. Patients who underwent a digitally guided prostate biopsy and a transperineal biopsy were excluded. Each patient was informed of the importance and complications of the biopsy and consent was obtained. Antibiotic prophylaxis was given by a single IV third-generation cephalosporin 30 minutes before the procedure since all patients had previously received or were currently receiving antibiotic therapy. Rectal preparation with Dulcolax suppository and plain water enema the day before at 10pm and the morning of the biopsy at 6am was systematic.

The patient was given both saddle block (10 ml of 2% lignocaine) with local anaesthesia (5ml of 20% xylocaine gel infused rectally) 5 minutes before the biopsy and placed in the left lateral decubitus position. A logiq V5 brand ultrasound machine was used. The

ultrasound transrecta probe was in the range of 7 – 12MHz multiplanar electronic probe. A 25cm length, thin needle of 18G type "tru-cut" length and a metallic biopsy guide were used. The rest of the equipment included a core collection plastic bottle containing formalin 10%, sterile gloves, condoms and ultrasound jelly. Twelve biopsy cores were sampled at the following locations; two from the base, two from the middle, and two from the prostatic apex of each prostatic lobe. In addition, sampling of palpable nodules at the digital rectal examination and hypoechoic areas was also performed. In some cases where the total PSA level was markedly increased and locally advanced tumour suspected, the number of cores sampled was two in each lobe.

The parameters studied were frequency, age, digital rectal examination, total PSA level, histological results and morbidity. For the assessment of morbidity, patients were followed up for 2 weeks. Data analysis was done using descriptive statistical indices with median calculations (interquartile range) for quantitative variables. The comparison of qualitative variables was made by chi-square test. Statistical significance was considered for $p \geq 0.0001$

RESULTS

One hundred and fifty-six patients were included over a two-year period, with a mean annual frequency of 78. The median age of the patients was 63.5 years. The most represented age group was 61-70 years.

Lower urinary tract symptoms were the most frequent reason for referral followed by hematuria (Table 1). On digital rectal examination, 37.2% (58) of patients had a firm and multinodular prostate, an enlarged prostate with benign features in 55.1% (86) of patients and normal prostate gland in 7.7% (12) of patients. One hundred and thirteen patients (72.4%) had high total PSA levels. The median total PSA was 11.2ng/ml (range: 0.1-121 ng/ml). Out of the 156 patients, 155 (99.3%) had their pathology results brought in.

Prostatic adenocarcinoma was the most frequent diagnosis, accounting for 38.7% of the patients whose results were brought in (Fig.1). Adenocarcinoma was more frequent in the age group (61-70years) with invasive adenocarcinoma also more frequent but there was no statistically significant difference compared to the

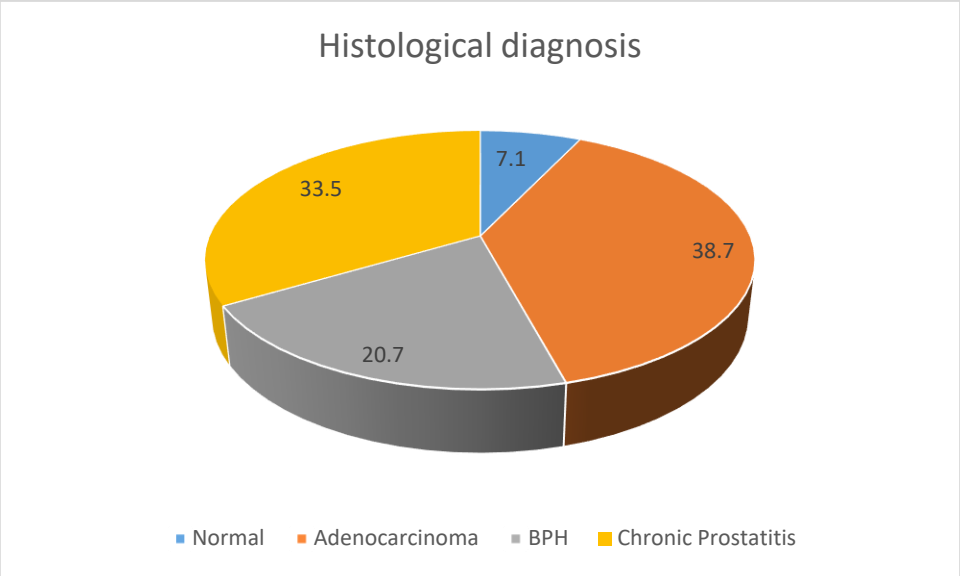
TABLE 1

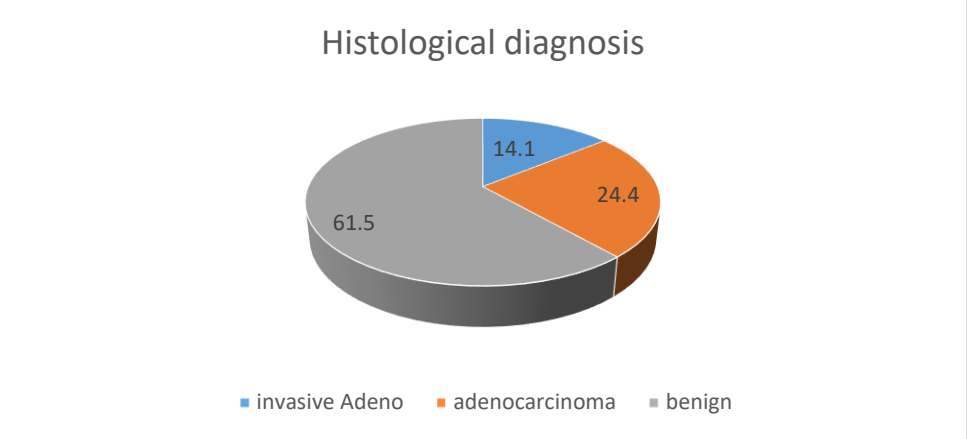
Frequency table

Variables	Frequency (n=156)	Percentage
Age (years)		
40 and below	17	10.9
41-50	18	11.5
51-60	29	18.6
61-70	53	34.0
71-80	26	16.7
81 and above	13	8.3
Median (range)	63.5 (32-101)	
Reason for referral		
LUTS	148	94.9
Haematuria	4	2.6
Bone pain	1	0.6
Back pain	1	0.6
Abdominal pain	1	0.6
Weight loss	1	0.6
Level of PSA		
Normal	43	27.6
High	113	72.4
PSA median (range)	11.2 (0.1-121)	
Histological diagnosis		
Invasive adenocarcinoma	22	14.2
Nodular hyperplasia	30	19.4
Nodular hyperplasia + chronic	52	33.5
Normal	11	7.1
Adenocarcinoma	38	24.5
Benign prostatic glandular	2	1.3
DRE		
Enlarged prostate with benign appearance		
Firm	86	55.1
Normal	15	9.6
Multinodular	12	7.7
	43	27.6
Morbidities		
Initia heamaturia	4	2.6
Dysuria	3	1.9
Rectorrhagia	3	1.9
Acute prostatitis	1	0.6
Nil	145	92.9

Year	Frequency	Percentage
2019	(n=26)	
Invasive adenocarcinoma	4	15.4
Adenocarcinoma	5	19.2
Normal	17	65.4
2020	(n=74)	
Invasive adenocarcinoma	12	16.2
Adenocarcinoma	17	23.0
Normal	45	60.8
2021	(n=56)	
Invasive adenocarcinoma	6	10.7
Adenocarcinoma	16	28.6
Normal	34	60.7

FIG 1





other age groups (p=0.541 (Table 2). The correlation between DRE and pathology type showed that the DRE influenced the pathology results (p=0.0001). Among the patients with high PSA levels, 57 patients (50.4%) had prostatic adenocarcinoma (Table 3). In patients with prostate adenocarcinoma, 92.98% had a PSA level greater than 20ng/ml.

TABLE 2

Variables	**Cancer n (%)**		**Statistical indices**
	Invasive Adeno (n=22)	**Adenoca (n=38)**	
Age group			
41-50	0 (0.0)	1 (100.0)	Df=4
51-60	6 (54.6)	5 (45.5)	P value=0.541
61-70	12 (37.5)	20 (62.5)	
71-80	2 (20.0)	8 (80.0)	
81 and above	2 (33.3)	4 (66.7)	

Mean (SD)	66.0 (7.9)	68.3 (10.5)	Df=58 Ttest=-0.8803 P value=0.3823
PSA level Normal High	 0 (0.0) 22 (38.6)	 3 (100.0) 35 (61.4)	Df=1 P value=0.292
Enlarged prostate with benign appearance Firm Multinodular	 3 (27.3) 2 (22.2) 17 (42.5)	 8 (72.7) 7 (77.8) 23 (57.5)	 Df=2 P value=0.519
Gleason score 7(3+4) (4+3) 8(3+5) (5+3)	 0 (0.0) 2 (9.1) 5 (22.7) 15(68.2)	 6 (15.8) 7 (18.4) 14 (36.8) 11 (28.9)	

The table shows that both age and level of PSA do not have statistical relationship on the type of cancer.
Statistical analysis showed a statistically significant correlation between the level of total PSA and pathology result (p=0.0001).
The Gleason score of 8(5+3) was more frequent and represented in 43.3% of positive biopsy (Table 2)
Post biopsy complications were observed in 11 patients (7%) after a 2 week follow up. These complications were:

- Dysuria in 3 patients who progressed well on analgesics
- Rectorrhagia in 3 patients which resolved spontaneously
- Initial hematuria in 4 patients who regressed after deliberate hydration.
- Acute prostatitis in 1 patient which resolved after antibiotic administration.
- No patient had a blood transfusion

TABLE 3

Variables	**Histological diagnosis n (%)**		**Statistical indices**
	Cancer (n=60)	**Benign (n=96)**	
Age (years) 32-40 41-50 51-60 61-70 71-80 81 and above Mean (SD)	 0 (0.0) 1 (5.6) 11 (37.9) 32 (60.4) 10 (38.5) 6 (46.1) 67.5 (9.6)	 17 (100.0) 17 (94.4) 18 (62.1) 21 (39.6) 16 (61.5) 7 (53.9) 57.9 (15.2)	 Df=5 P value<0.0001+ Df=153 Ttest=4.3782 P value<0.0001
PSA level Normal High	 3 (7.0) 57 (50.4)	 40 (93.0) 56 (49.6)	Df=1 P value<0.0001+
DRE Enlarged prostate with benign appearance Firm Normal Multinodular	 11 (12.8) 9 (60.0) 0 (0.0) 40 (93.0)	 75 (87.2) 6 (40.0) 12 (100.0) 3 (7.0)	 Df=3 P value<0.0001

The table shows that increase age is strongly associated with developing cancer, individual with high PSA were more likely to develop cancer

DISCUSSION

Transrectal ultrasound –guided prostate biopsy is an established method for obtaining prostate tissue for histological diagnosis[1]. The advent of prostate biopsy via a transrectal approach using ultrasound served as a welcome replacement for the previous blind approach, which was challenging for the practitioner to get the proper core from the suspected area in the prostate and painful for the patient[2,3]. Current guidelines recommend prostate biopsy for all patients with elevated serum prostatic specific antigen (PSA) or abnormal prostate morphology on digital rectal examination[4].

In our series, the rate of cancer detection in cases of an abnormal prostate on digital rectal examination (DRE) was higher than that obtained by Cros et al[5] and Barthelemy et al[6], who found prostate cancer in 61% and 67% of their patients respectively. In fact, DRE alone can show a suspicion of prostate cancer in more than 50% of cases, especially in locally advanced cases, but on the other end, 23% to 45% of cancers would be ignored if the indication for biopsies were based solely on the DRE because some

tumors do not cause palpable changes[7]. The value of total PSA remains the biological reference test for prostate cancer screening in our setting.

Biopsy prompted by a total PSA greater than 4ng/ml yielded a detection of cancer of nearly 50% with a positive predictive value of 32%[8]. By coupling the DRE and the total PSA, the cancer detection rate is almost 60% with a positive predictive value of 48%[8]. Total PSA is superior to DRE in terms of sensitivity (72.1% vs 53.2%), specificity (93.2% vs 83.6%) and positive predictive value (25.1% vs 17.8%) but the use of total PSA alone is less effective than the combination of the two[8.9]. These findings were supported by the findings of our series, which demonstrated that a prostate abnormality detected during a rectal examination and/or an increase in the level of total PSA had a substantial impact on the diagnosis provided by a prostate biopsy. The sign that a biopsy is necessary can be pinpointed with more accuracy when combined with a high total PSA and an abnormal DRE. The benefits of a transrectal ultrasound-guided biopsy include revealing suspicious lesions in the prostate and seminal vesicles, providing information on the size and shape of the prostate.

In addition to that, it enables accurate targeting of the biopsy. It is necessary to make use of an endorectal probe with a frequency of 5-10MHz. Comparative research on the efficacy of transrectal biopsy and transperineal biopsy has been conducted on multiple occasions. However, no research has demonstrated that one method is more effective than others. While Shinghal et al[10] found that transperineal ultrasound-guided biopsy is less accurate than the transrectal biopsy, Terriset[11] in their study concluded that the transperineal approach provided a visualization of the prostate and a calculation of its volume equivalent to that of the transrectal approach, but the hypoechoic suspicious areas were not detected by the transperineal route. In the event that the rectum cannot be accessed naturally, a transperineal ultrasound –guided biopsy may be performed as an alternative to a transrectal ultrasound-guided biopsy. The detection rate in our series was 51.3% and the sampling strategy that we used consisted of 12 cores. There is no discernible rise in the detection rate when one considers the possibility of carrying out an initial biopsy scheme consisting of more than 12 samples.

A study done by Eskew et al[12], however showed that their technique based on biopsy in five zones with 13-18 cores sampled increases the detection rate up to 35% compared to the standard protocol. Much research has been made to improve the performance of biopsy including the sampling of other areas. Fortunoff et al[13] identified 12.8% of cancer cases, whereas Hodge et al[14] and Rifkin et al[15] noted 53.5% and 39.3% of false negatives respectively. The complications of transrectal prostatic biopsy are generally of limited gravity, if prophylactic antibiotics are administered. In literature, absence of antibiotic prophylaxis results in about 4% and 25% of post-biopsy urinary tract infections and 0% to 7% of severe infections. With antibiotic prophylaxis, the proportion of all infections complications decreases to 0-9%[16].

The complication rate differs in literature but varies between 3% to 23% of cases[13,14,17]. Infections and hemorrhage are the main complications of prostate biopsy which was partly confirmed by our study. A 7% complication rate was found in our study, this rate is low compared to those found in the literature[15,18]. This disparity in infection rates may have been attributable to the fact that our patients routinely underwent rectal preparation and antibiotic prophylaxis.

CONCLUSION

Due to its high degree of pathologic accuracy and relatively low morbidity, ultrasound-guided transrectal prostate biopsy is an excellent modality for the detection of prostate cancer. In our study, the incidence of cancer diagnosis is significant, and the percentage of patients who experienced complications is acceptable at 7%

AVAILABILITY OF DATA AND MATERIALS

The data set used and analyzed during this study are available from the corresponding author.

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ABBREVIATION

PSA --Prostatic Specific Antigen
MRI --- Magnetic Resonance Imaging
LUTS ---- Lower Urinary Tract Symptoms
DRE ---- Digital Rectal Examination
TRUS --- Transrectal Ultrasound Scan
IV ---- Intravenous

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COMPETING INTERESTS

The authors declare that they have no conflict of interest,

ETHICS DECLARATION

This study was approved by the Ethics committee of the University of Uyo Teaching Hospital, since it was a retrospective review, consent was not required.

Contributions

AIG, MKK and EI contributed to data collection, article writing and approval of the version to be published. AMG and OOM contributed to data collection and analysis. All authors read and approved the final manuscript.

Consent for publication

Not applicable