



TRANS-RECTAL ULTRASOUND HISTOGRAM ANALYSIS OF THE CYSTIC LESIONS OF THE PROSTATE GLAND

Radiodiagnosis

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ABSTRACT

Prostatic cyst is an entity incidentally diagnosed on imaging. These lesions have clinical relevance in relation with lower urinary tract symptoms, infertility, benign hyperplasia and malignant disorders. The widespread use of transrectal ultrasound (TRUS) in urological and andrological practice has increased the diagnosis of prostatic cysts. The aim of the study was to develop a non invasive method based on the quantitative image analysis using gray level Histogram values to characterize the cystic lesions in the prostate gland. The ultrasound devices have a histogram analysis tool that shows the distribution of gray-scale pixels in a region of interest (ROI) set on the B-mode image. The values were expressed as mean $\pm$ SD. In our study, a total of 52 prostatic cysts were identified on TRUS and histogram analyses were done to differentiate and classify them as simple, infected or cysts in malignant pathology. Our results indicated that histogram values are different for each of the cysts and thus can play an important role in aiding the diagnosis and planning for invasive procedures.

KEYWORDS

Trus; Transrectal; Roi; Quantitative Analysis

INTRODUCTION:

The advances in the field of ultrasonography has established transrectal ultrasonography (TRUS) as the preferred approach for primary assessment of the prostate gland, which is then followed with intervention procedures like biopsy and aspiration (1,2). With the advent of TRUS guided biopsy technique, aspiration of the cystic lesions of the prostate was then carried out. The widespread use of TRUS in urological and andrological practice has increased the incidental diagnosis of prostatic cysts.

Cysts are associated with prostate gland atrophy as well as with other well-known factors, such as congenital causes, inflammatory disease, benign prostatic hyperplasia, ejaculatory duct obstruction and malignancy (3). The aim of our study was to develop a non-invasive method based on quantitative image analysis, using the gray level Histogram values to characterize the cystic lesions in prostate. The ultrasound devices have a gray-level histogram that shows the distribution of gray-scale pixels in a region of interest (ROI) set on the B-mode image (4). A histogram is a simple graph that displays where all the brightness levels contained in the ROI are found, from the darkest to the brightest. The histograms represent the echo-distribution intensity if the ROI area. The horizontal axis represents 0 to 63 shades of gray and the vertical axis represents the distribution ratio of each shade. Here the number of picture elements (pixels) of the most common shade in the ROI areas were assumed to be 100%. All data were expressed as mean $\pm$ SD.

From our routine ultrasound abdomen examinations, 52 prostatic cysts were diagnosed; TRUS and histogram analyses were done and the values were recorded. Of these 52 patients, 24 underwent TRUS guided cyst aspiration and the cytological analyses were correlated with histogram values recorded previously. Our results indicated that the values were significantly different in simple cysts, infected cysts and malignancies with cystic degeneration.

MATERIALS AND METHODS

The study was conducted using a histogram compatible ultrasonogram machine with endorectal transducer of 7-9 MHz. The study included patients with lower urinary tract and andrological symptoms. An informed consent was obtained for both diagnostic and TRUS guided aspirations. During the procedure, the cysts were identified and the region of interest [ROI] was kept within the cyst for histogram

analysis. The values were recorded for correlation. Prophylactic oral antibiotics were given one day prior and on the day of procedure. The aspirated samples were sent for cytological analysis and the results were correlated with the obtained histogram values.

RESULTS:

During our study period, 52 patients were diagnosed with prostatic cysts and histogram analyses were done.

TRUS guided cyst aspiration was done in 24 patients. Among them 62.5% (n=15) showed clear physiological fluid, 12.5% (n=3) were hemorrhagic and pus was drained in 25% (n=6) of the patients. On comparing with previously recorded histogram values of these patients, those with the simple cysts had values between 1 and 10, those with pus had values around 20-40 and three patients in whom high values were recorded, hemorrhagic fluid was aspirated from them and they were secondary to malignant etiology.

The age distribution ranged from 20 years to 83 years. The commonest presenting symptom in patients with cystic lesions in the prostate was dysuria (41.5%), followed by straining to void (26.7%), frequent micturition (15.8%), poor urinary stream (11.1%) and infertility (4.9%). Apart from simple prostatic cysts, infected cysts and abscesses, the cystic changes were also documented in benign hyperplasia as well as in carcinoma of the prostate.

In 51.5% of the patients, the cysts were intraparenchymal in location, in the transition zone of the prostate gland. The remainder was distributed in the peripheral zone (44.6%), in the ejaculatory duct (1.9%) and in the central zone (2.0%).

The cysts were solitary in 73% of the patients. Most of these were simple cysts. In 27% of patients, multiple cysts were present. This included abscesses, degenerative and malignant lesions.

The nature of the wall of the cysts were either regular, smooth or irregular. 44% of the cysts had regular smooth walls. The remainder 56% were seen to have irregular walls, which include complex cysts, abscesses, cysts secondary to benign hyperplasia and malignancy.

The histogram values of the cysts ranged between 0 and 80. 34 patients had values ranging between 0 and 10 with an average value of 2. 15

patients with lower urinary tract infection symptoms had a value ranging from 20-40 with an average value of 26. Three patients had high histogram values ranging from 60-80.

DISCUSSION:

Prostatic cysts encompass a wide variety of pathologies which are most often incidentally picked up on imaging. Though asymptomatic in many patients, these cysts are of clinical relevance in few with lower urinary tract symptoms and infertility. The cysts can be simple or can be secondary to various pathologies like inflammation, malignancy and benign prostatic hyperplasia. With refinements in pathology, it is known that prostatic hyperplasia also can cause cysts. Trans-rectal ultrasound is the initial modality of choice for prostate imaging and for procedures like biopsy or aspiration of the cysts (5). The study was conducted to assess the role of histogram in transrectal ultrasonography in the detection and characterization of prostatic cystic lesions (6).

A prospective study of TRUS followed by guided aspiration was done in clinically indicated patients. Routine trans-abdominal ultrasound was done in patients with lower urinary tract and andrological symptoms. Prostatic cysts were identified in 52 patients and aspiration was performed in 24 patients.

The incidence of cystic lesions in the prostate was found to be 11.4%. The age distribution of the cystic lesions varied widely from 20 to 80 yrs, however the simple cysts were found in a lower age group of 20-39 years, abscesses were predominantly noted in the age group 40-49 years and the degenerative and malignant cystic degenerations were noted in the elderly patients.

In simple cysts, the histogram values were around 0-10 with a mean value of 2. In 26 out of 28 patients who did not undergo aspiration, the histogram values were all within this range suggesting that they are simple in nature.

Six out of eight patients with histogram values recorded between 20-40 underwent aspiration and pus was drained. Two patients did not consent for aspiration and were treated conservatively for lower urinary tract symptoms with antibiotics and responded well. Prostatic cysts are seen to more commonly involve the transitional zone.

TRUS guided aspiration of the three patients who had high histogram values ranging from 60-80, showed hemorrhagic fluid. In two patients in the 60-68 age group, this was due to cystic degeneration of prostatic adenocarcinoma. The third patient was a 27 year old and was diagnosed with cystic degeneration of rhabdomyosarcoma of prostate. Histopathological correlations were made in all the three cases.

From the above end results, we concluded that simple cysts consistently have histogram values between 0 and 10. The cysts with histogram values of 20-40 are infective in etiology and those with high histogram values of 60-80 consist of hemorrhagic contents.

CONCLUSION

Transrectal ultrasonography has a high diagnostic accuracy in detecting the cystic lesions of the prostate. USG Histogram analysis is a non invasive method that can be used as an adjunct to B mode imaging in characterizing the cystic lesions. This analysis is a simple real time procedure that can be performed using a histogram compatible ultrasound machine. The results of the present study validated the role of histogram analysis as a sensitive diagnostic method to aid in the evaluation of prostatic cysts. Moreover, the above study concluded that characterization of the prostatic lesions is possible even without interventions. The histogram analysis technique has good prospects in futuristic imaging and can aid in improving the diagnostic accuracy of prostatic lesions.

IMAGES

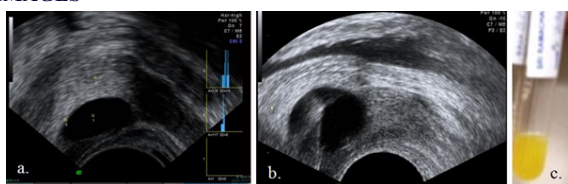


Figure 1: Selected TRUS image of prostate from a 39 year old man with complaints of oligospermia, ROI[1] was placed on a anechoic

cystic lesion in the base of the prostate gland. Figure 3.a shows the location of the cyst in the base. The histogram analysis value was 1. Figure 3.b shows the TRUS guided aspiration using the chiba needle. Figure 3.c shows the straw coloured aspirate. The cytology analysis came out as a simple cyst with normal prostatic secretions.



Figure 2: Selected TRUS image of prostate from a 45 year old man with complaints of LUTS, ROI [2] was placed on the anechoic cystic lesion in the left para-median region of the prostate gland. The histogram analysis value was 1, indicating the simple nature of the cyst. The cyst was aspirated and the cytology analysis came out as a simple cyst. [Note the calcific focus (ROI 3) in the adjacent parenchyma with a high histogram value of 227.]



Figure 3: Selected TRUS image of prostate from a 56 year old man with complaints of dysuria, ROI [1] was placed on a heterogeneous (predominantly anechoic) cystic lesion in the prostate gland. The histogram analysis value was 21, which is higher than that of a simple cyst. The cytology analysis came out as an abscess.

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COMPETING INTEREST

The author claims that there is no competing interest.

ETHICAL CLEARANCE:

This study has been approved by the ethical committee.

INFORMED CONSENT:

Informed consents were obtained from the patients, prior to the procedures.

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