

Assessing Prostate Pathologies with Trans-abdominal Ultrasound

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Abstract: The aim of the current investigation is to elucidate the possibility of using trans-abdominal ultrasound to diagnose prostate pathologies. A total of 200 adult patients (age range of 20-90) who suffered from prostatic disorders, were scrutinized with trans-abdominal ultrasonography to evaluate the prostate pathologies as well as the renal system disorders. The results showed that 46.5% of the patients (n=93) had benign prostatic hyperplasia (BPH), 18% of the patients (n=36) had prostate cancer, 11.6% of the patients (n=5) suffered prostatitis. There was a high significant ($P < 0.001$) association between age and BPH, prostatic cancer and chronic prostatitis. The cancer of prostate was commonly observed in older patients (≥ 65 years). While BPH prevailed in the middle age group (40-65 years) and the prostatitis affected younger patients (≤ 40 years). Ultrasonic images showed a regular capsule that surrounded the prostate of most patients with BPH than those of prostatic cancer (51.8%, 4.9%, respectively). Furthermore, the incidence of bladder wall thickening was 20% (n= 40 patients), bladder stones was 6% (n=12 patients), stones in the kidneys were 10 % (n=20 patients) and those with renal cyst were 10% (n=20 patients). In conclusion, trans-abdominal ultrasound can be employed successfully to diagnose prostate pathologies as well as urinary system disorders. Furthermore, the study proved that prostate cancer is more common among patients over 65 years old and the BPH prevails among middle age patients.

Keywords: Prostate, pathologies, renal system disorders, trans-abdominal ultrasound.

I. Introduction

Prostate pathologies are very common in clinical practice and are expected to affect most men at some time during their life. They are associated with increased morbidity and mortality in older men. These pathologies include benign prostatic hyperplasia (BPH) which occurs in elderly men and is the most commonly encountered disorder [Roehrborn and McConnell 2007; Kirby and Lepor, 2007]. It can lead to various symptoms of urinary tract obstruction and consequently severe impairment of urine flow. Other prostatic disorders include carcinoma which is the second most common malignancy in adult males next only to lung cancer [Ogwuche et al., 2013]. Infectious disorders include prostatitis which is common in young adults and usually associated with genitourinary infections [Nickel, 2007; Bary and Mc Naughton-Collins 2007]. Other rare disorders include prostatic cysts and calcification. These pathologies press the prostatic urethra resulting in urine retention leading to ureters' dilatation and hydronephrosis. Prostate pathologies are commonly diagnosed with trans-rectal ultrasound (TRUS) [Jeffery et al., 2001]. Although the TRUS can give excellent results, however in Arabic countries many patients dislike it and sometimes refuse to be scrutinized with this technique. Additionally it is contraindicated in patients with anal hemorrhage, fistula and diabetic patients. By the advent and advancements that have been made in ultrasound equipment industry ultrasound machines with high-resolution can be produced. Therefore the modern ultrasound machines with trans-abdominal probes can be employed to diagnose prostate pathologies and satisfy the patients' needs.

The current study assessed the use of trans-abdominal ultrasound to diagnose prostate pathologies as well as the incident renal system disorders in human.

II. Material And Methods

Two hundred patients of a mean age of 56.4 ± 17.9 years, who suffered prostate disorders, were examined at the outpatient clinic in the urology department of King Khalid Hospital- Saudi Arabia and were confirmed to have prostate pathologies according to their history of urinary symptoms such as obstructive, irritating urinary canal and/or acute urine retention. Two ultrasound machines (General Electric Logic 9 and Toshiba ultrasound machines) with two trans-abdominal probes that emit 3.5MHZ to 5MHZ frequencies were employed to scrutinize prostate pathologies and the incident renal system disorders. The patients were requested to fill their urinary bladder prior screening to facilitate observing the prostate under a full urinary bladder. During screening the ultrasound machine was adjusted to measure the prostate size. The prostate size was recorded using the ellipsoid formula: Prostate size = $524 * H * W * L$. Where H represents height (anterior-posterior

length); W represents the transverse diameter and L is the cephalo-caudal length (Fig. 1). Additionally incidental findings of other urinary system pathologies were diagnosed.

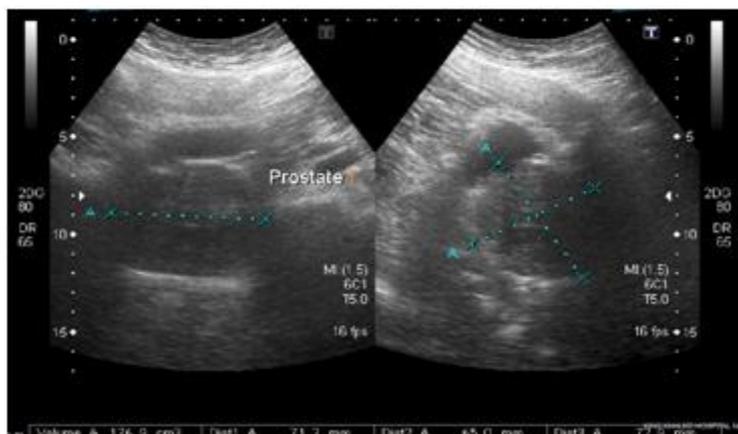


Fig.1. Dimensions used to measure prostate volume by trans-abdominal ultrasound.

III. Statistical Analysis

The data were analyzed with one-way analysis of variance (ANOVA) or Chi \times^2 test when necessary. Probabilities of $p < 0.05$ were considered statistically significant. The relation between age and prostate volume was determined using the linear regression analysis.

IV. Results

IV.1. Relation between age and prostate volume

The results of this study showed a positive moderate relation between age and prostate volume (Fig. 2). When the age increases the prostate volume increases ($R=0.373$). The mean prostate volume of the studied group of patients was $53.5 \pm 38 \text{ cm}^3$.

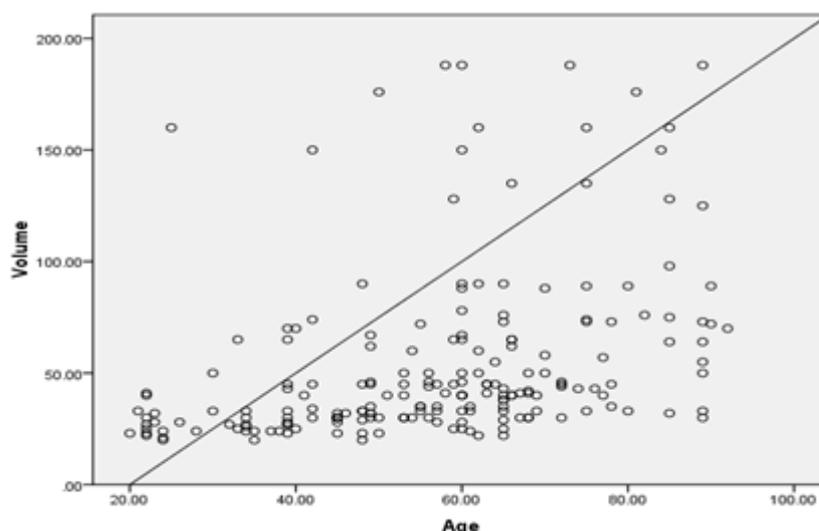


Fig. 2. The relation between the patient's age and prostate volume. When the age increases the prostate volume increases ($R=0.373$).

IV.2. Prostate pathologies

A significant high ($P < 0.001$) association between age and prostate pathologies was found. Ninety three of the patients (46.5%) scrutinized were diagnosed as having benign prostatic hyperplasia (BPH), 36 patients (18%) prostate cancer and five patients were diagnosed with prostatitis (11.6%). As shown in Fig. 3 and 4 BPH prevails in middle age group (41-60 years old), while prostate cancer prevails in elderly (age ≥ 60 years and prostatitis prevails in younger age (age ≤ 40 years). Furthermore, ultrasonic images showed that regular capsules surrounded the prostates of most patients with BPH (51.8%), while most of the patients (95.1%) who suffered prostatic cancer their prostates were surrounded with irregular capsule (Fig. 5, 6). No capsular irregularity was observed in prostatitis patients.

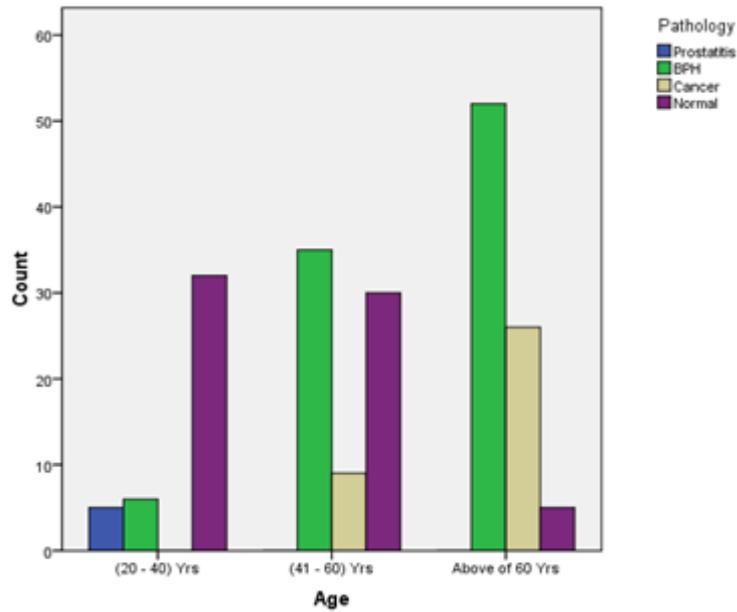


Fig. 3. The impact of age on the incidence of prostate pathologies among the patients examined.

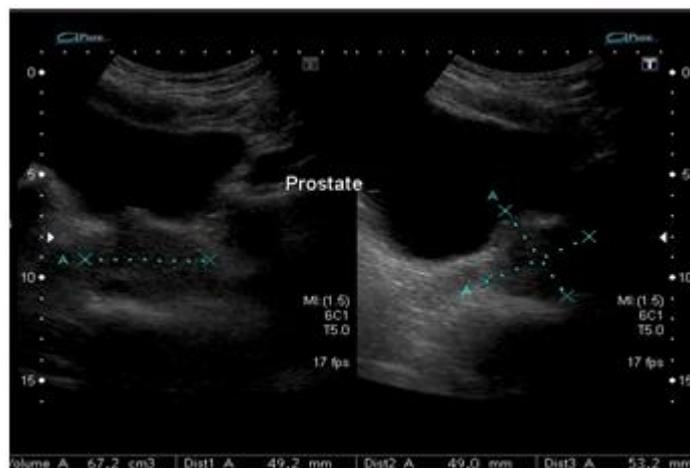


Fig. 4. A BPH in a middle age patient (volume of 67.2 cm3). Notice there is no irregularity in prostate capsule.

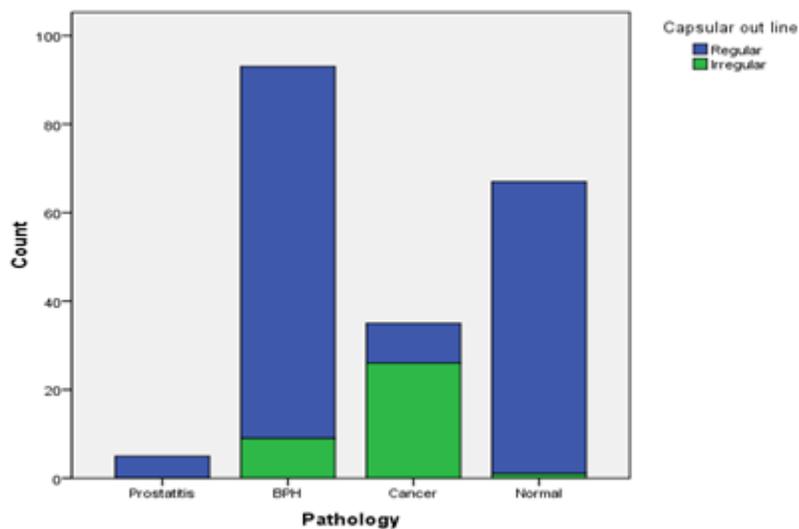


Fig. 5. Incidence of capsular irregularity among patients with different prostate pathologies.



Fig. 6. An image of prostatic cancer (volume 75 cm³). Notice the irregular capsule.

IV.3. The incidental findings

During prostate examination 40 patients (20%) were diagnosed with thick urinary bladder, 12 patients (6%) with urinary bladder stones and 6 patients (3%) suffered bladder diverticulum. Kidney stones were found in 20 patients (10%) and hydronephrosis was recorded in 10 patients (5%). No solid abnormal masses neither tumors were observed in the kidneys and urinary bladders of the patients (Fig. 7, 8).



Fig. 7. An image of urinary bladder stone.



Fig. 8. A trans-abdominal ultrasound image of a urinary bladder with a diverticulum.

V. Discussion

From the findings of the current study trans-abdominal ultrasound can be used successfully to diagnose prostate pathologies as well as renal system disorders. In the Arabic and Islamic world patients who suffer from prostate problems usually refuse to be examined with trans-rectal ultrasound. In the current study when the desire of the patients was considered and they were examined with trans-abdominal ultrasound high incidences of BPH, cancer and prostatitis were found. The incidences reported here are higher than those reported by Hameed (2013). This difference may be due to racial variation, life style and nutritional habits that may be behind the high incidences of prostate pathologies reported in the current study. Also no one can ignore the differences between the resolutions and the capabilities of the different ultrasound machines employed. The trans-rectal ultrasound can show the hypo echoic nodular phenomena, eighty percent of peripheral zone prostatic carcinoma and the zonal anatomy of the prostate better than trans-abdominal ultrasound (Ogwuche 2013; Hameed, 2013; Animashaun, 2013; Yeboah, 2000). Although both techniques (trans-abdominal and trans-rectal ultrasounds) can be used successfully to diagnose prostatic abnormalities particularly BPH and cancer, the diagnosis needs to be confirmed by biopsy and histopathological examination. This situation suggests that the patient's desire should not be ignored when he is examined since in both cases the diagnosis needs pathological examination. Therefore the patient's desire should be respected when examining him.

The incidental urinary bladder wall thickening reported in the present study is comparable to that reported by Franco (2010) and the bladder stones reported in this study are comparable to those reported by Al-Durazis (2003). These findings suggest that trans-abdominal ultrasound is a better tool to diagnose these pathologies although some researchers reported lower findings (Rafique, 2006). The additional findings of urinary bladder diverticulum and kidney problems reported in this study as well as those reported elsewhere (Quirinia et al. 1993; Ogwuiche et al. 2013) support the opinion of using trans-abdominal ultrasound as the main tool to diagnose prostate pathologies particularly when the patient refuses the trans-rectal examination and/or he suffers rectal pathologies.

VI. Conclusion

In conclusion, trans-abdominal ultrasound is a better tool to diagnose prostate pathologies as well as renal system abnormalities. Thus we recommend that the patient's desire must be respected when examining him and using trans-rectal ultrasound must be avoided unless deemed necessary. Also we recommend trans-abdominal ultrasound for patients with anal hemorrhage and/or rectal fistula as well as diabetic patients.

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