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Original article

Hypoechoic versus hypervascular lesion in the diagnosis of prostatic carcinoma

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KEYWORDS
Prostate cancer;
Ultrasound;
Power Doppler;
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Abstract

Objective: The goal of this study was to get a better understanding the role of Power Doppler (PDUS) and conventional Gray Scale transrectal ultrasound (TRUS) in targeting prostatic biopsy in men with high prostate-specific antigen (PSA).

Patients and methods: A prospective comparative study of 100 men, categorized according to PSA level into two groups: Group (A) with a PSA level (4.0–10.0) ng/ml (Gray zone) and Group (B) with PSA >10.0 ng/ml, above Gray zone. Gray Scale scanning was done, followed by Color Doppler and Power Doppler to test the blood flow all over the prostate and suspicious foci. Twelve systematic TRUS-guided core needle biopsies were performed, and additional biopsies of abnormal lesions on Gray Scale TRUS and PD-TRUS. The demographic data, clinical data, imaging results, laboratory investigations, histopathological report and its correlation with pathological results and any complications during or post the procedure estimated.

Results: The age of the Group (A) ranged between 50 and 75 years with a mean ± S.D. of 65.7 ± 6.8 years, while in the Group (B), it ranged between 54 and 84 years with a mean ± S.D. of 69.5 ± 6.3 years. TRUS biopsy revealed prostate cancer in 11 (35.5%) out of 31 cases of the Group (A) and 35 (50.7%) out of 69 cases of the Group (B) ($p < 0.003$). Thirty out of 39 (76.9%) from Group (B) were hypervascular in PDUS ($p < 0.04$).

PDUS sensitivity, specificity, positive predictive value (PPV) and negative predictive values were 74.5%, 85.7%, 84.4% and 76.4%.

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Conclusion: Power Doppler ultrasonography (PDUS) increase the cancer detection rate diagnosis, PDUS combination with Gray Scale TRUS-guided biopsy increases the reliability of the diagnosis of cancer prostate.

Introduction

Color flow Doppler (CFD) and Power Doppler imaging (PDI) advanced and have accepted as a tool for prostatic carcinoma diagnosis. Vascularity assessment has two methods of using PDI: total vascularity (TV) and vascular density (VD), and estimate whether quantitative Doppler vascularity correlated with prostate cancer detection. They postulated that the gross total number of blood vessels (TV) in the prostate is diagnostic than the vascular density (VD) [1]. Histology literature integrates angiogenesis in cancer through using vessel density (number of vessels per unit area of the tissue) to ass's vascular activity. A series intended to understand the differences between TV and VD of the prostate and to evaluate their correlation to pathologic diagnosis. They review how TV and VD correlate with visual evaluation of vascularity on Doppler images, how TV and VD vary from the central zone versus peripheral zone, and, whether the differences in Doppler TV or VD be used to differentiate the prostatic lesions, especially, adenocarcinoma, benign prostatic hypertrophy (BPH) as well as intraepithelial neoplasia (PIN) [2]. Hypervascularity correlated with prostate cancer due to increased angiogenesis [3]. TRUS has a high sensitivity but associated with a low positive predictive value (PPV) in the diagnosis of early malignant lesions, which lowering its strength, because hypoechoic lesions detected in a benign lesion. Various modalities investigated to reduce the cost and morbidity and to avoid unnecessary biopsies. Hypoechoic lesion on Gray Scale ultrasound only has a deficiency in the diagnosis of the most prostate malignancies [4]. Color and Power Doppler ultrasound and Gray Scale TRUS when used together, they will increase the sensitivity of detecting prostate cancer, but the specificity is not decreasing. So, the lesions which seem positive Color and Power Doppler ultrasound findings are significant for cancer detection [5].

The goal of this study was to get a better understanding the role of Power Doppler (PDUS) and conventional transrectal ultrasound (Gray Scale TRUS) in targeting Prostatic lesion in a patient with high prostate-specific-antigen (PSA).

Patients and methods

Prospective comparative study of one hundred men from outpatient clinics of Urology and Ultrasonography Unit Al-Azhar University Hospitals in the period between November 2012 and May 2015. After approval of the Medical Research Ethical Committee, an informed written consent obtained. Patients were categorized according to serum prostate - specific antigen as two groups, Group(A)with a PSA level (4.0 -10.0) ng/ml. (Gray Zone), and Group (B), with PSA >10.0 ng/ml, above Gray Zone, included in this study, while the patient had an active urinary tract infection, before the examination; infection controlled. Patients on anticoagulant therapy are not a candid for examination until the anticoagulant dosage adjusted. Also, patients on finasteride therapy were excluded.

One day before examination patient received levofloxacin 750 mg once daily and metronidazole 500 mg three times per day, to continue for two days after the procedure. A cleansing enema performed before the procedure. And non-steroidal anti-inflammatory (NSAIDS) and aspirin stopped for 3 and 5 days before the procedure.

The procedure performed by using transrectal ultrasound (TRUS Gray Scale and Power Doppler) (B&K Medical, Denmark). Transrectal imaging of the prostate completed by using an endocavitary transducer (A 5.0–7.5 MHz). Gray Scale scans are done to the prostatic tissue in the axial and sagittal sections in all patients and its adjacent structures to detect any suspicious lesion (presence of an irregular contour and an asymmetric gland recorded as an abnormal finding). With TRUS, the prostate categorized into a peripheral zone (isoechoic) and a heterogeneous central gland, (transition zone). Calcifications (corpora amylacea) are common at the boundary between the peripheral zone and the central gland. The seminal vesicles visualized as convoluted hypoechoic cystic structures. Prostate cancers visualized as hypoechoic lesions within the isoechoic normal peripheral zone, but lesions appear as isoechoic, hyperechoic, or multifocal as well as TRUS, which recorded.

Color Doppler and Power Doppler ultrasound used to estimate the blood flow among the prostatic tissue and suspicious lesion. The signals from Color Doppler classified into normal vascular, hypovascular and hypervascular foci. Grading of PDUS categorized as follows: Grade 0, no abnormal vascularity; Grade 1, low focal vascular clustering; Grade 2, intensive focal vascular clustering; and Grade 3, diffuse vascular clustering.

Twelve core biopsies taken using TRUS-guided needle biopsies by an 18-gauge biopsy cutting needle driven through a biopsy gun. Extra biopsies from areas that showed abnormality (hypoechoic or hypervascular lesion). Management of complications if occurred, during and after the procedure and evaluation of the histopathological examination reports and the data collected for analysis.

Statistical analysis

The data analyzed using statistical package for social science (SPSS version 20.0) for Windows (SPSS IBM: Chicago, IL). The results expressed as mean ± SD with 95% confidence interval by using medians for quantitative variables, and using the frequencies and percentages for qualitative ones; a P-value < 0.05 is a statis-

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