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ORIGINAL ARTICLE

# Implication of ultrasound bladder parameters on treatment response in patients with benign prostatic hyperplasia under medical management



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## KEYWORDS

Benign prostatic hyperplasia;  
Uroflowmetry;  
Tamsulosin;  
Ultrasonography;  
Prostatic urethral angle

**Abstract** *Objective:* The prevalence of benign prostatic hyperplasia (BPH) rapidly increases after the 4th decade of life. The combination of tamsulosin and dutasteride is a well established therapy for BPH of  $\geq 40$  g. Non-invasive urodynamic parameters can predict the outcome of medical therapy in patients with BPH. We aimed to correlate these parameters with treatment responses in BPH patients under medical management.

*Methods:* A prospective study was conducted in the Department of Urology in our hospital from May 2014 to April 2015. A total of 100 patients with BPH  $\geq 40$  g who fulfilled our inclusion criteria were included. Treatment responses were determined by the International Prostate Symptom Score (IPSS) and uroflowmetry. Transabdominal ultrasonography with Doppler was performed to measure prostate volume, intravesical prostatic protrusion (IPP), detrusor wall thickness (DWT), the prostatic capsular artery resistive index (RI) and prostatic urethral angle (PUA) before and 3 months after combination therapy of tamsulosin and dutasteride. Treatment responses were correlated with non-invasive urodynamic parameters.

*Results:* The IPSS, uroflow, age, prostate volume, RI, IPP, DWT and PUA were correlated before and after treatment. Of the 100 patients, 70 (70%) showed significant improvement and 30 (30%) showed no improvement with therapy.

*Conclusion:* Ultrasound bladder parameters are useful tools for measuring the treatment response in BPH patients. Our study shows that RI and DWT significantly correlate with the treatment response in BPH patients. More importantly, pretreatment values of increased IPP and PUA determines the non-improvement of symptoms in BPH patients. Our study suggests the importance of transabdominal ultrasonography (KUB–P) with Doppler for evaluating treatment responses to medical management.

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## 1. Introduction

The prevalence of benign prostatic hyperplasia (BPH) increases rapidly after the 4th decade of life, reaching nearly 100% in the 9th decade [1]. The American Urological Association (AUA) symptom score index is widely used and is validated as an important means of assessing men with lower urinary tract symptoms (LUTS) [1]. The original AUA symptom score is based on answers to seven questions concerning frequency, nocturia, a weak urinary stream, hesitancy, intermittency, incomplete bladder emptying, and urgency. The International Prostate Symptom Score (IPSS) includes these seven questions, as well as a global quality-of-life question. The total symptom score ranges from 0 to 35, with scores of 0–7, 8–19, and 20–35, indicating mild, moderate, and severe LUTS, respectively. The IPSS is a helpful tool for the clinical management of men with LUTS and in research studies regarding medical and surgical treatment of men with voiding dysfunction due to BPH. Uroflowmetry is recommended by the AUA during evaluation of a patient with BPH. Uroflowmetry is the best non-invasive urodynamic test to detect lower urinary tract obstruction [2]. The combination of tamsulosin and dutasteride is a well established therapy for BPH greater than 40 g. Non-invasive urodynamic parameters such as intravesical prostatic protrusion (IPP), detrusor wall thickness (DWT), the prostatic capsular artery resistive index (RI) and prostatic urethral angle (PUA) can predict the outcome of medical therapy in patients with BPH. This study is aimed to correlate these non-invasive urodynamic parameters with treatment responses in patients with BPH under medical management.

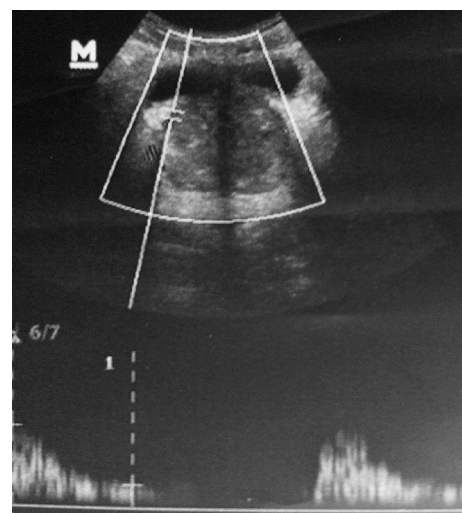
## 2. Materials and methods

We conducted a prospective study in the Department of Urology in our hospital from May 2014 to April 2015. Informed consent was taken from the subjects. The inclusion criteria of the patients were an IPSS >15, prostate weight  $\geq$ 40 g, uroflowmetry <15 mL/s, serum prostate specific antigen (PSA) levels <4 ng/mL. Exclusion criteria were other causes of LUTS, such as neurogenic bladder, stricture urethra, urinary tract infection, serum PSA levels >4 ng/mL, prostate weight <40 g and serum creatinine >1.5 mg/dL. A total of 103 patients with BPH greater than 40 g who fulfilled our inclusion criteria were included in the study. A thorough clinical evaluation and laboratory and radiological investigations were performed in all of the patients. Of the 103 patients, three patients were lost to follow up and were excluded from the study.

Treatment responses were determined by the IPSS and uroflowmetry. Transabdominal ultrasonography (KUB–P) with Doppler was performed to measure the prostate

weight, prostatic capsular artery RI, DWT, PUA and IPP at the time of starting the combination therapy. The RI of the capsular artery of the prostate was calculated as (peak systolic velocity – end diastolic velocity)/peak systolic velocity, measured by ultrasound Doppler (Fig. 1). A cut-off value of 0.69 was considered abnormal in our study population. DWT was the thickness of the hypoechoic muscle between two hyperechoic layers corresponding to the serosa and mucosa. Three measurements of the anterior bladder wall were taken at a filling volume of 250 mL and the average of these was used to measure the DWT (Fig. 2). A cut-off value of more than 2.9 mm was considered abnormal in our study population. The PUA was the angle formed by the proximal prostatic urethra with the distal prostatic urethra in sagittal section of ultrasonography at a bladder volume of 250 mL (Fig. 3). Patients with a PUA  $\geq$ 35° were considered abnormal. IPP was measured by the length from the tip of the protruding prostate into the bladder, to the bladder circumference at the base of the prostate (Fig. 4). A cut-off value of more than 5 mm was considered abnormal in our study population.

Combination therapy with tamsulosin 0.4 mg and dutasteride 0.5 mg daily was started in all of the patients for three months. After 3 months of combination therapy, we repeated KUB–P with Doppler to measure the above-mentioned parameters. Treatment responses that were determined by the IPSS and uroflowmetry were correlated with the non-invasive urodynamic parameters. Correlation of the prognostic variables was analyzed with the Z-test.  $p < 0.05$  was considered significant.



**Figure 1** Representative ultrasound image that was used for measurement of the resistive index (RI) of capsular artery of the prostate  $RI = (PSV - EDV) / PSV$ ; PSV, peak systolic velocity; EDV, end-diastolic velocity.

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