

# Correlation between lower urinary tract symptoms and objective measures of uroflowmetry

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## Summary

**Introduction:** Benign prostate hyperplasia (BPH) is the most commonly diagnosed benign adenoma which causes serious clinical symptoms by bladder outlet obstruction. BPH patients suffer from negative changes in their quality of life and restriction of their daily activities due to the disease symptoms. Our main objective in this study is to evaluate the relationship between BPH and LUTS as described by International Prostate Symptoms Score and objective non-invasive parameters related to BPH.

**Materials and methods:** 238 Patients over 40 years with clinical BPH, LUTS and/or prostate volumes greater than 25 ml who presented to urology department were included in the study. All patients included in the study were subjected to a standardized diagnostic panel which included patient history, physical examination, biochemistry panels and urinalysis.

**Results:** Results showed an increase in symptom scores with age. As symptom scores go from mild to severe;  $Q_{max}$  values showed a decrease meanwhile prostate volume, PSA and post-void residue increased. Again, in terms of erectile dysfunction, erectile dysfunction complaints increased with increased IIEF symptom scores. When all these results were evaluated, a positive correlation was seen between uroflowmetry parameters with patient symptoms, PSA and IIEF scores.

**Conclusion:** From our study results, we can conclude that uroflowmetry is a very useful tool in monitoring lower urinary system complaints.

**KEY WORDS:** Prostate volume; Erectile dysfunction; Uroflowmetry; Urinary system complaints.

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## INTRODUCTION

Benign prostate hyperplasia (BPH) is the most commonly diagnosed benign adenoma which causes serious clinical symptoms by bladder outlet obstruction (BOO). About 40% of all men are under the risk of developing BPH during their lifetime (1). BPH patients suffer from negative changes in their quality of life and restriction of their daily activities due to the disease symptoms. Although not life-threatening, increased symptoms characterized by decreased quality of life, slow urine flows, increased prostate size and acute urinary retention cause this disease to be a major public health issue (2). BOO was diagnosed in 60% of symptomatic and 52% of asymptomatic patients (3, 4). There was no significant connection between prostate enlargement, BOO and lower urinary tract symp-

toms (LUTS) (5, 6). Uroflowmetry gives enough information in diagnosing BOO. Our main objective in this study is to evaluate the relationship between BPH and LUTS as described by International Prostate Symptoms Score (IPSS) and objective non-invasive parameters related to BPH.

## MATERIALS AND METHODS

238 Patients over 40 years with clinical BPH, LUTS and/or prostate volumes greater than 25 ml who presented to urology department of Dumlupınar University Evliya Celebi Research and Training Hospital between 20 May 2015 and 13 November 2016 were included in the study. All patients included in the study were subjected to a standardized diagnostic panel which included patient history (including IPSS), physical examination (including digital rectal examination), biochemistry panels (including prostate-specific antigen) and urinalysis. IPSS and The International Index of Erectile Function Questionnaire (IIEF-5) were filled by all the patients. 113 patients who did not fill out these forms were excluded from the study. BMI of all patients were calculated by measuring their heights and weights. In addition, uroflowmetry (Uroscan Aymed) was performed in all patients. Transabdominal prostate volume prior to uroflowmetry and PVR following voiding were measured using USG (LOGIQ 200 PRO (GE) 7.5 MHz linear Probe) (1/2 x transverse x anteroposterior x cephalocaudal diameter). Patients on alpha blockers and 5 $\alpha$ -reductase inhibitors, with acute urinary retention history, neurological disease, instrumental intervention history, urinary system or pelvic surgery history, recently catheterized and with clean intermittent catheterization history were all excluded from the study. All the other patients who met the inclusion criteria, following obtaining their consent to participate in the study, were included in the study. Ethical approval for the study was obtained from the Local Ethics Committee. Statistical analysis was performed using Statistical Package for Social Sciences 20.0 (SPSS Inc, Chicago, USA). Independent t-test was done for continuous variables whereas categorical variables were assessed using chi-square analysis and ANNOVA regression analysis. Significance level was determined as  $p < 0.005$ .

No conflict of interest declared.

## RESULTS

The mean age of the patients was calculated as  $60.83 \pm 12.1$ . 35 (12.3%) patients were included in Group 1 (IPSS 0-7), 142 (50.2%) in Group 2 and 106 (37.4%) in Group 3. The patients were divided into 3 groups per their symptom scores. Results showed an increase in symptom scores with age. As symptom scores go from mild to severe;  $Q_{\max}$  values showed a decrease meanwhile prostate volume, PSA and post-void residue increased. Again, in terms of erectile dysfunction (ED), erectile dysfunction complaints increased with increased IIEF symptom scores (Table 1). In our review, we did not detect a direct relationship between body mass index (BMI) and patient symptoms. When all these results were evaluated, a positive correlation was seen between uroflowmetry parameters with patient symptoms, PSA and IIEF scores.

urology for assessing LUTS (14). Although there is a significant interest in the past decades for correlating uroflowmetry results with IPSS scores, there is only a couple of studies that showed a significant but weak correlation between those two entities (14, 15).

Out of all uroflowmetry parameters, maximum flow rate is thought to be the most important variable in assessing LUTS. Likewise, we also saw a significant correlation between IPSS and uroflowmetry parameters in our study. With increased IPSS scores, we detected a decrease in  $Q_{\max}$  values and total urine volume and an increase in post-void residue volume. Therefore, we concluded that uroflowmetry can be used as an effective tool in MLUTS assessment of the patients.

Most community-based studies showed that age and symptom scores showed a positive correlation (16-20) as

**Table 1.**

Parameters of three groups of patients divided according to IPSS score (mild, moderate, and severe).

Parameters	Total	Group 1 (IPSS 0-7)	Group 2 (IPSS 8-19)	Group 3 (IPSS 20-35)	P value univariate analysis	P value multivariate analysis
Number of Patients (n) (%)	283	35 (12.3)	142 (50.2)	106 (37.4)		
Urine Volume (mean) (ml)	380	446	347	323	< 0.01	0.038
Age	60.8	59.8	60.2	62.1	0.01	0.01
$Q_{\max}$ (mean) (ml/sec)	11.1	15.7	10.3	8.7	< 0.001	0.01
QoL (mean)	4	2	4	5	< 0.001	0.01
Prostate volume (mean) (ml)	38.2	33	40.1	42.3	< 0.01	0.161
Postvoid residue (mean) (ml)	101	78.1	110.3	124.2	< 0.01	0.155
Significant postvoid residue (n) (ml)	283	5	40	41	< 0.001	0.01
PSA (mean) (ng/ml)	1.6	1.2	1.9	2.6	< 0.01	0.072
IIEF (mean)	15	20	14	12	< 0.01	0.02
BMI (mean) ( $\text{kg}/\text{m}^2$ )	29.2	29.8	29.6	28.9	0.07	

$Q_{\max}$ : Maximum flow; QoL: Quality of Life

## DISCUSSION

Today, we see an increase in male lower urinary tract symptoms (MLUTS) with increased life expectancy. This is starting to become important for both medical and socio-economical aspects (7). MLUTS include symptoms such as frequent urination, sudden urgency, difficulties in urinating, dysuria, straining to void, terminal dribbling and nocturia. Although most of those symptoms are seen in prostate enlargement, they can also be caused by other conditions such as neurogenic bladder, urethral stricture or urinary tract infections (8-9). A large number of studies showed a correlation between MLUTS and prostate volume, peak flow speed, residual volume and PSA (10, 11). However, there are also a few studies that say otherwise (i.e. No connection) (12, 13).

In our study, our main objective was to evaluate the relationship between MLUTS and some non-invasive BPH-related parameters. LUTS severity was measured using IPSS questionnaire, which consisted of 7 questions. Patients with other severe diseases which might cause potential risk factors that might affect urinary symptoms were excluded from the study. In addition, patients who were treated for BPH with medication were required to stop their treatments 3 months prior to the study for inclusion.

Uroflowmetry is the most commonly used tools today in

well as an increase in LUTS severity with age. Despite some studies showing a negative correlation between age and symptom indexes (11, 21), the majority of the studies including ours showed an increase in symptom scores with age.

Patients often complaint about more severe symptoms as their daily-life activities are disrupted and consequently, their quality of life is reduced (22, 23). Our study results were in accordance with the previous study results, with the strongest association between IPSS and all variables assessed in uroflowmetry detected as quality of life.

When total IPSS scores and IPSS severity were reviewed, we saw a global statistically significant association with a high post-void residue with IPSS severity. Moreover, we also found statistically significant correlations with increased post-void residue with the severity of symptoms in IPSS questionnaire. Likewise, another study in the literature showed a significant relationship between IPSS and post-void residue (11).

When IPSS scores and prostate volume and PSA were compared, we detected a significant correlation between those parameters. However, there is a slight difference in our study results. A study done by Wang *et al.* on 803 patients showed no significant relationship between IPSS, prostate volume and PSA (26). Other studies did not show a relationship between those parameters at

all (27). The reason for discrepancy is still unclear. Even though a correlation between IPSS and objective parameters can be detected, it is still difficult to use those parameters as predictive factors for symptom severity assessment since they show a great overlap in groups with different IPSS severity categories.

MLUTS and sexual dysfunction complaints are commonly seen in aging males. Both of those two clinical situations which affect the patient's quality of life share common etiological risk factors such as age, obesity and diabetes and their pathophysiological mechanisms are thought to be similar to each other. MLUTS itself is considered as an independent risk factor for ED (28). *Multinational Aging Male Study (MSAM-7)* is one of the most important studies which show the multifaceted epidemiological relations between MLUTS and ED in Western male populations (29). The study, which included 14254 males from 7 different countries, reported that, contrary to popular belief, the aging males are indeed sexually active, however, MLUTS severity affected sexual activity rates, independent of age. The same study design, this time performed on Asian countries, included 1155 males from 5 different countries and also reported that MLUTS severity affected sexual activity rates regardless of patient's age (30). Cologne study reviewed risk factors in ED patients such as MLUTS, diabetes, hypertension, pelvic surgery and such and reported that MLUTS was the most commonly seen risk factor for ED in 72% of ED group and 37% in control (non-ED) group patients (31).

In the past, most lower urinary tract symptoms seen in males were thought to be related to benign prostate hyperplasia. However, recent studies showed that chronic diseases such as heart disease, diabetes and metabolic syndrome components, in addition to lifestyle risk factors such as smoking, alcohol consumption and lack of physical activity played important roles in lower urinary system symptom development (32-36). The cohort study of *Rohrmann et al.* reported that there was a positive correlation between the increase in BMI and lower urinary tract symptoms in patients over 25 and there was an increase in frequency of lower urinary tract symptoms with increased BMI (32). BACH study done by *Kupelian et al.* on 1899 male patients assessed the relationship between metabolic syndrome components and lower urinary tract symptoms, and reported that there is a more significant relationship with voiding symptoms rather than filling symptoms in metabolic syndrome components (37). In our study, we were unable to show a significant relationship between BMI and IPSS symptom scores. However, this is probably since our number of patients was low and we did not assess other parameters such as Waist-to-hip ratio in our patients.

Some of the limitations of our study are the heterogenous patient population, that it is a single-center study and low number of patients. However, it is also one of the few studies that reflect the global population treated in urology departments with a prospective design.

## CONCLUSION

From all the data obtained in our study, we can argue that there are several significant correlations between

symptom severity and objective BPH-related parameters such as age, prostate volume, urine volume, residual urine, peak flow rate, IIEF and PSA. Yet still, it is quite difficult to use these parameters as predictive factors in symptom severity. From our study results, we can conclude that uroflowmetry is a very useful tool in monitoring lower urinary system complaints.

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