

# Can We Predict Which Patients will Experience Resolution of Detrusor Overactivity after Transurethral Resection of the Prostate?

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## Abbreviations and Acronyms

BCI = bladder contractility index  
BOO = bladder outlet obstruction  
BPH = benign prostatic hyperplasia  
DO = detrusor overactivity  
IIEF = International Index of Erectile Function  
LUTS = lower urinary tract symptoms  
MCC = maximum cystometric capacity  
OAB = overactive bladder  
PSA = prostate specific antigen  
Q<sub>max</sub> = maximum flow rate  
QOL = quality of life  
TURP = transurethral prostate resection

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**Purpose:** We determined which clinical and urodynamic variables may be related to persistent detrusor overactivity after transurethral resection of the prostate.

**Materials and Methods:** We studied 46 patients with bladder outlet obstruction due to benign prostatic hyperplasia who were treated with transurethral prostate resection from 2011 to 2012. All patients underwent urodynamic analysis preoperatively and 12 months postoperatively. Clinical and urodynamic variables in the preoperative period were correlated with the resolution of detrusor overactivity postoperatively.

**Results:** Patients with detrusor overactivity in the preoperative period were older (65.2 vs 61.1 years,  $p = 0.041$ ) and had a higher I-PSS (International Prostate Symptom Score) (25.2 vs 19,  $p = 0.014$ ) and higher maximum flow rate (8.6 vs 6.6 ml per second,  $p = 0.039$ ). Patients with persistent detrusor overactivity were statistically older than those with resolution (69 vs 63 years,  $p = 0.043$ ). Detrusor overactivity persisted in 63.6% of patients with maximum cystometric capacity less than 250 ml compared to 20% of those with greater than 250 ml ( $p = 0.024$ ). When analyzing urodynamic variables together, we found a 66.7% chance of persistent detrusor overactivity in patients with maximum cystometric capacity less than 250 ml and detrusor overactivity amplitude greater than 40 cm H<sub>2</sub>O ( $p = 0.041$ ). When these characteristics were associated with early detrusor overactivity, the chance of persistent detrusor overactivity was 83.3% ( $p = 0.013$ ).

**Conclusions:** Advanced patient age together with low maximum cystometric capacity, and early and high detrusor overactivity amplitude are the most important predictors of persistent detrusor overactivity after relief of bladder outlet obstruction.

**Key Words:** urinary bladder, overactive; urinary bladder neck obstruction; prostatic hyperplasia; transurethral resection of prostate; age factors

MALE LUTS are a prevalent age dependent condition. Moderate or severe LUTS are found in about a quarter of men at ages 40 to 49 and in half at ages 70 to 79.<sup>1</sup> These symptoms are strongly

associated with decreased QOL<sup>2</sup> and substantial health care costs.<sup>3</sup>

The most common cause of LUTS in aging men is BPH. LUTS due to BPH are primary caused by BOO and by

secondary bladder dysfunction such as alterations in sensitivity, decreased compliance, detrusor underactivity or DO. DO is present in about 45% to 50% of men with BOO and it is one of the major causes of storage LUTS in aging men.<sup>4-6</sup>

Unfortunately after relief of obstruction DO persists in about 20% to 40% of patients.<sup>7,8</sup> These cases may be explained by definitive bladder damage due to chronic obstruction or by a primary bladder disorder with no relation to BOO. The latter condition is supported by the fact that DO develops in some men without BOO.<sup>9</sup> To date no clinical factor has correlated well with DO resolution postoperatively.<sup>10,11</sup>

We determined which clinical variables may be related to DO and to persistent DO after TURP for relief of obstruction in patients with BPH.

## METHODS

We performed a prospective study in 46 patients diagnosed with BPH in whom medical treatment had failed and who underwent TURP. In all patients BOO was confirmed by urodynamics. Our study exclusion criteria were an indwelling bladder catheter, previous prostatic surgery, history of pelvic surgery, bladder surgery, neurogenic bladder, diabetic neuropathy, Parkinson disease, medication that could change lower urinary tract function, pelvic radiotherapy, urethral stenosis, suspected prostate cancer, previous bladder cancer, vesical calculus and urinary tract infection symptoms.

Patients underwent anamnesis, including medical history and I-PSS, and physical examination, including digital prostate examination. Certain tests were performed, including PSA, creatinine, total cholesterol, blood glucose, urinalysis type I, abdominal and pelvic ultrasound, and complete urodynamics in the preoperative and postoperative periods. Urodynamics were done in accordance with ICS (International Continence Society) standards.<sup>12</sup> Three months postoperatively all patients returned for clinical review, when physical examination, blood tests and uroflowmetry were done. If results were positive, the next review was done 12 months postoperatively. All patients underwent urodynamics preoperatively and 12 months postoperatively.

The urodynamic variables assessed were bladder sensitivity, DO, vesical compliance, MCC, opening detrusor pressure and Qmax. DO was analyzed and categorized according to the number of contractions (1 vs 2 or more), amplitude (40 cm H<sub>2</sub>O or less vs greater than 40) and period (first vs second half of bladder filling). The filling rate was 50 ml per minute in all patients to avoid any influence on DO number and amplitude. All participants provided informed consent to participate and the study received institutional ethics board approval.

Statistical analysis was performed with SPSS®, version 19.0. To compare clinical variables between the groups we used the Student t-test and the chi-square test for homogeneous variables, and the Mann-Whitney U test for nonhomogeneous variables with significance considered at 5% ( $p < 0.05$ ).

## RESULTS

Supplementary table 1 (<http://jurology.com/>) lists the characteristics of the 46 patients treated with TURP. Mean  $\pm$  SD age was  $63.3 \pm 6.75$  years. Arterial hypertension and diabetes were diagnosed in 54.3% and 28.2% of cases, respectively. The mean duration of urinary symptoms was  $45.7 \pm 33.8$  months, mean I-PSS was  $22.9 \pm 7.1$ , mean PSA was  $2.9 \pm 2.2$  ng/dl and mean prostate volume was  $54 \pm 17.7$  gm. All patients had confirmed BOO with a mean detrusor pressure at Qmax of 79 cm H<sub>2</sub>O. Preoperatively and postoperatively Qmax was 7.7 and 19.7 ml per second, respectively.

Table 1 compares patients with and without DO in the preoperative period. Patients with DO were older (65.2 vs 61.1 years,  $p = 0.041$ ) and had a higher I-PSS (25.2 vs 19,  $p = 0.014$ ) and higher Qmax (8.6 vs 6.6 ml per second,  $p = 0.039$ ). The symptom of urgency was present in 87.5% of patients with DO vs only 28.6% of those without DO ( $p = 0.000$ ). The other clinical variables (symptom duration, tobacco use, IIEF, QOL score, body mass index, PSA, ultrasound, detrusor pressure at Qmax, BOO index and Qmax) did not statistically differ between the groups.

Table 2 lists clinical characteristics in patients with and without DO resolution after TURP. Patients with persistent DO were statistically older than those with resolution (69 vs 63 years,  $p = 0.043$ ). Mean prostate volume on ultrasound was greater in those with persistent DO but this did not attain statistical significance (61 vs 48 gm,  $p = 0.098$ ). The difference between patients with DO persistence and resolution was only 13.1 gm, which was also clinically nonsignificant. The other clinical variables did not differ between the groups. Although twice as many men with persistent DO used tobacco, this variable also did not attain statistical significance.

**Table 1.** Values in 26 patients with and 20 without DO preoperatively

	Mean $\pm$ SD DO	Mean $\pm$ SD No DO	p Value (Student t-test)
Age	65.20 $\pm$ 6.82	61.14 $\pm$ 6.12	0.04
Symptom history (mos)	48.20 $\pm$ 37.01	42.71 $\pm$ 30.33	0.59
I-PSS	25.20 $\pm$ 5.4	19.00 $\pm$ 8.05	0.01
IIEF	12.61 $\pm$ 6.11	17.80 $\pm$ 4.6	0.09
QOL score	4.47 $\pm$ 0.7	4.27 $\pm$ 0.91	0.50
Body mass index (kg/m <sup>2</sup> )	26.98 $\pm$ 3.99	28.19 $\pm$ 4.27	0.34
PSA (ng/ml)	2.93 $\pm$ 2.26	2.90 $\pm$ 2.36	0.96
Ultrasound (gm)	54.17 $\pm$ 19.63	53.70 $\pm$ 15.55	0.93
BOO index	61.48 $\pm$ 26.21	66.47 $\pm$ 36.36	0.59
Qmax (ml/sec):	20.54 $\pm$ 7.06	18.61 $\pm$ 6.11	0.36
Preop	8.64 $\pm$ 2.9	6.65 $\pm$ 3.44	0.04
Postop — preop	11.90 $\pm$ 6.74	9.30 $\pm$ 8.9	0.27
Detrusor pressure at Qmax (cm H <sub>2</sub> O)	78.76 $\pm$ 22.91	79.76 $\pm$ 34.01	0.91

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