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The Effect of Voiding Position on Uroflowmetry Findings and Postvoiding Residual Urine in Patients with Benign Prostatic Hyperplasia

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ABSTRACT

INTRODUCTION: The purpose of the present study was to determine whether sitting or standing positions had an effect on voiding in patients with bladder outflow obstruction due to benign prostatic hyperplasia.

METHODS: The authors studied 100 male patients over the age of 45 years with benign prostatic hyperplasia. All underwent uroflowmetry and prevoiding and postvoiding estimation of the residual urine in standing and sitting positions. Patient group 1 had uroflowmetry maximum flow rate (Qmax) ≤ 10 mL/sec.; Group 2 had Qmax 10-15 mL/s. All parameters of uroflowmetry (eg, Qmax, average flow rate, time to maximum flow, and postvoiding residual) were compared for both groups in both positions.

RESULTS: Comparison of all parameters of uroflowmetry and postvoiding residual showed statistically significant differences in favor of sitting more than standing. This result was found for all patients and all variables except one: there was no statistically significant difference in the time to maximum flow in sitting and standing positions for patients in group 2.

CONCLUSION: Voiding in the sitting position in patients with benign prostatic hyperplasia is preferred due to a decrease in obstructive parameters shown by uroflowmetry and postvoiding residual urine volume. As a result, fewer complications such as UTI and bladder stone formation are expected.

KEYWORDS: Voiding Position; Uroflowmetry; Benign prostatic hyperplasia

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INTRODUCTION

Uroflowmetry tests are usually done in the standing position in male patients. Few studies in the literature have addressed the impact of position on uroflowmetric results. Most of these studies have involved healthy participants, rather than patients with bladder outflow obstruction [1,2].

Micturition is dependent on a synchronized interaction of the bladder and urethra under control of the central nervous system [3]. There are many factors affecting micturition including pressure of abdominal muscles and viscera, and relaxation of the pelvic floor muscles and adductor and anterior muscles of the thigh [4].

Changes in voiding position may have significant impact on the above-mentioned factors and subsequently on micturition. In eastern countries, males are accustomed to voiding in the sitting or crouching position due to habitual or religious issues, in contrast to western countries where

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Table 1. Uroflowmetric Parameters in the Sitting and Standing Positions (N = 100). doi: 10.3834/uij.1944-5784.2009.06.07t1

Variable	Sitting Position			Standing Position			*P*
	Mean	SD	Range	Mean	SD	Range	
Qmax (mL/s)	11.1	3.7	7-21	5.2	4.2	3-15	< .001
Qavg (mL/s)	7.2	5.5	6-18	4.3	6.1	1-8	.012
Time to Maximum Flow (sec)	15.1	13.5	0-113	23.2	9.4	0-123	< .001
Residual Urine (mL)	40.5	73.6	0-259	96.2	77	0-278	< .001

voiding is usually achieved in the standing position. The aim of the present investigation was to compare the results of uroflowmetry and postvoiding residual urine in the standing and sitting position in patients with benign prostatic hyperplasia (BPH).

METHODS

Participants

The participants were 100 male patients over age 45 years (mean = 59 years; SD = 8.3 years) with symptoms of bladder outlet obstruction (BOO) due to BPH.

All patients provided a detailed medical history. Physical examination included digital rectal examination, routine blood testing (serum creatinine), urinalysis, urine culture and sensitivity (C/S) and estimate of total PSA level. All patients had an ultrasound of the urinary tract with a full bladder, uroflowmetry, and estimation of post-voiding residual urine.

Patients suspected to have obstruction due to causes other than BPH were excluded. Other exclusion criteria were prostate cancer, stricture of the urethra, bladder stones, neurogenic bladder dysfunction, and UTI proven by urinalysis and C/S.

Procedures

Patients that met the criteria for inclusion (N = 100) had uroflowmetry using a weight transducer uroflowmeter device (Urocap-11™ Flow Analyzer, version V5.02, Laborie Medical Technologies, Quebec, Canada).

Patients were asked to urinate without increasing abdominal pressure. Every patient had 2 uroflowmetric studies in standing and sitting positions. Fifty patients started in the standing position; 50 started in the sitting position. The order was then reversed. After uroflowmetry was completed, all patients immediately had an ultrasound for estimation of the postvoiding residual urine (PVR). All patients with maximum flow rate (Qmax) > 15 mL in the standing position were considered nonobstructive.

Patients who had voided volume less than 150 mL were asked to repeat the test later when they held more urine and had larger voided volume. Those who could not hold more than 150 mL were excluded from the study.

Data Analysis

Uroflowmetric parameters of Qmax, average flow rate (Qavg), time to maximum flow, and PVR were recorded in the standing and sitting positions. Patients were divided into 2 groups according to the maximum flow rate in the standing position: Group 1 (n = 69) had Qmax ≤ 10 mL/s; Group 2 (n = 31) had Qmax 10-15 mL/s.

Uroflowmetric parameters in the sitting and standing positions in the two groups were analyzed and compared. Paired *t* tests were used for statistical analyses; differences with $P < 0.05$ were considered significant.

RESULTS

Results of the uroflowmetric parameters in the sitting and standing positions are shown for all patients in Table 1. There was a statistically significant difference between uroflowmetric parameters in the sitting and standing positions in all patients, as tested by multiple paired *t* tests. The probability levels for each tested variable are contained in Table 1. Patients had higher mean values in the sitting position for Qmax and Qavg, and lower mean values in the sitting position for time to maximum flow and PVR.

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Table 2. Uroflowmetric Parameters in the Sitting and Standing Positions for Group 1: Patients with Maximum Flow Rate ≤ 10 mL/s in the Standing Position (n = 69). doi: 10.3834/uij.1944-5784.2009.06.07t2

Variable	Sitting Position			Standing Position			*P*
	Mean	SD	Range	Mean	SD	Range	
Qmax (mL/s)	10.3	3.7	5-15	5.8	3.2	3-10	< .001
Qavg (mL/s)	6.2	5.5	4-13	3.5	6.1	1-8	< .001
Time to Maximum Flow (s)	16.2	12.5	0-110	25.6	9.4	0-123	< .001
Residual Urine (mL)	90	73.6	0-259	156	77	0-278	< .001

Table 2 and Table 3 show results of the uroflowmetric parameters in the sitting and standing positions for patients in groups 1 and 2, respectively. Results of multiple paired *t* tests showed that all of the uroflowmetric variables in the sitting and standing positions were significantly different for patients in group 1. All of the uroflowmetric variables in the sitting and standing positions were significantly different for patients in group 2, with the exception of time to maximum flow. Patients in both groups had higher mean values in the sitting position for Qmax and Qavg, and lower mean values in the sitting position for time to maximum flow and PVR, although the time to maximum flow had an insignificant decrease in the sitting position for group 2.

A power analysis was not calculated. Therefore, there is a possibility that some of the statistical comparisons showed statistically significant differences due to chance.

DISCUSSION

There is currently a direction toward more conservative management of bladder outflow obstruction due to BPH, so proper diagnosis is essential to define the degree of obstruction. Uroflowmetry (together with PVR urine volume estimation) is a simple, noninvasive, reliable tool for evaluation of patients with infravesical obstruction. Many variables can affect uroflowmetry including patient age, residual urine, presence or absence of infection, degree of obstruction, the voided volume, and voiding position [5-7].

Voiding position is one of the most important variables influencing the uroflowmetry result. The best position is the one which can achieve satisfactory evacuation with the least PVR volume. Eryildirim et al [8] reported that urinary flow rates are affected by the voiding position.

Some patients prefer to void in a standing position; others prefer sitting. The seated position is considered a religious matter in some eastern countries. Riehmann et al [9] compared uroflowmetric parameters and PVR both in the standing and recumbent positions. They reported that the urinary flow rate decreased in the recumbent position. They concluded that bedridden residents may be predisposed to urinary tract infections because of alterations in voiding dynamics in the supine position. Eryildirim et al [8] found no statistically significant difference in PVR between different voiding positions among healthy volunteers. El-Bahnasawy and Fahd [10] reported that voiding in the sitting position showed significantly better flow rates than during standing in patients with high flow and younger age.

Table 3. Uroflowmetric Parameters in the Sitting and Standing Positions for Group 2: Patients with Maximum Flow Rate of 10-15 mL/s in the Standing Position (n = 31). doi: 10.3834/uij.1944-5784.2009.06.07t3

Variable	Sitting Position			Standing Position			*P*
	Mean	SD	Range	Mean	SD	Range	
Qmax (mL/s)	18.2	4.2	7-21	13.1	3.3	3-15	< .001
Qavg (mL/s)	9.2	7.2	6-18	5.1	4.9	2-8	< .001
Time to Maximum Flow (s)	15.1	12.8	0-110	19.2	5.7	0-123	.091
Residual Urine (mL)	40.2	65.4	0-150	89.4	70	0-243	< .001

Results of the present study showed that the urinary flow rate and PVR urine volumes were affected by the voiding position (standing or sitting) in patients with BPH; all parameters of uroflowmetric measurements and postvoiding residual volume were better in the sitting position. These results are in contrast with those of Unsal and Cimentepe [2], who found that urinary flow rates and PVR volumes were not affected by voiding position in either patients with BPH or healthy men.

Patients in the current study with severe obstruction according to their flow rate and PVR urine ($Q_{max} \leq 10$ mL/s) in the standing position had moderate obstruction (Q_{max} = 10-15 mL/s) in the sitting position. Those with moderate obstruction (Q_{max} = 10-15 mL/s) in the standing position had nonobstruction ($Q_{max} >$ 15 mL/s) in the sitting position.

Bladder emptying/voiding requires a coordinated contraction of the bladder smooth musculature of adequate magnitude and duration, a concomitant lowering of resistance at the level of the smooth and striated sphincter, and an absence of anatomic (as opposed to functional) obstruction. The *smooth sphincter* refers to the smooth musculature of the bladder neck and proximal urethra. This is a physiologic but not an anatomic sphincter and one that is not under voluntary control. The *striated sphincter* is divided into 2 parts: The *intrinsic or intramural striated sphincter* refers to the striated musculature that is a part of the outer wall of the proximal urethra in both the male and the female; the *extrinsic or extramural striated sphincter* refers to the bulky skeletal muscle group that closely surrounds the urethra at the level of the membranous portion in the male and primarily the middle segment in the female. The extramural portion is the classically described *external urethral sphincter* and is under voluntary control.

The authors of the present study suggest that increased obstructive symptoms in patients with BPH forced most of the patients to micturate in the sitting position because of hesitancy. The sitting position enables them to stay on toilet for a longer period of time without exhaustion, which results in a more complete evacuation. In addition, more relaxation of the pelvic floor muscles leads to decreased resistance of the bladder outlet and better micturition.

CONCLUSIONS

Flow of urine in the sitting position is better than in the standing position in patients with bladder outflow obstruction due to BPH. It is considered a simple solution for patients with severe obstruction and marked hesitancy. The PVR urine volume following sitting is much less than following standing, which decreases the possibility of complications such as UTI and bladder stone formation. Further studies should be done to compare other micturition positions and the uroflowmetric parameters in patients with BOO and healthy volunteers. Further studies should also be done to evaluate the impact of the preferred patient position on the uroflowmetric parameters.

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