Original Article

Effect of the Pelvic Floor Relaxed Voiding Position on Uroflowmetry in Men with Lower Urinary Tract Symptoms Due to Benign Prostatic Hyperplasia

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Objectives: To investigate the effect of pelvic floor relaxed voiding position on uroflowmetric variables in patients with lower urinary tract symptoms (LUTS) due to benign prostatic hyperplasia (BPH).

Materials and Methods: Men with LUTS due to BPH were enrolled. The uroflowmetry (UFM) were performed with comfortably full bladder. Each patient performed two voids into uroflowmeter in both standing and pelvic floor relaxing position. The UFM parameters were compared between the two different voiding positions.

Results: A total of 71 men with a median age of 69 (43, 85) years were evaluated. The median void volume for the standing and pelvic floor relaxing positions in the patient group were 277.5 (150.8, 744) and 291.2 (156.4, 866.2) ml, respectively with no statistically significant difference between groups. The median Qmax were significantly higher in pelvic floor relaxing position than standing position (Qmax: 16.4 (5.3, 45.9) versus 15 (6.1, 44.2) ml/sec, respectively; *p*-value = 0.041). The mean PVR were significantly higher in pelvic floor relaxing position than standing position (PVR: 63.56±72.28 versus 50.60±68.07 ml, respectively; *p*-value = 0.002).

Conclusion: The UFM parameters seem to be affected by the voiding position in men with LUTS due to BPH. It can be assumed that some benign prostatic hyperplasia patients might have some components of pelvic floor muscle dysfunction. Therefore, pelvic floor relaxing voiding position may be applied in these patients. Furthermore, physician may advise patient with LUTS due to BPH practice pelvic floor relaxing exercise to improve the symptoms.

Keywords: Benign prostatic hyperplasia (BPH), Uroflowmetry, pelvic floor relaxing position

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Micturition is a complex system, complete process is depended on several factors including age, gender, voided volume, mental status and voiding position[1]. Uroflowmetry (UFM) is an electronic measurement of urine flow rate and urine volume. A UFM report include the curve description, voided volume, maximum flow rate (Qmax), average flow rate (Qave) and post-void residual urine (PVR)[2]. Accordingly, insufficient previous literatures of varying position in UFM contribute to fluctuate and inconsistent result[3-10]. Some existent literatures published higher maximum flow rates in a standing position[1,3], whereas others published higher flow rate in sitting[4-6] or squatting position[1]. The best position for voiding would allow an adequate urinary flow and small amount of post-void residual urine.

Uroflowmetric parameters are useful testing to determine upon pharmacological treatment or surgical treatment in the management of benign prostatic hyperplasia (BPH)[11]. To date, there is still a lack of certainty which is the best position for BPH patients for better urination. There is a recognized relationship between difficulty urination and pelvic floor dysfunction[12]. Non relaxing pelvic floor muscle may lead to more difficulty urination in BPH patients. However, in the English language literature, the role of pelvic floor relaxing voiding positions on uroflowmetric parameters in patients with BPH has not previously been defined. Therefore, we hypothesized that Pelvic floor relaxing voiding position might improve voiding quality in BPH patients. The aim of this study was to compare the pelvic floor relaxing position and standing position on urinary flow rates and the PVR in patients with lower urinary tract symptoms (LUTS) due to BPH.

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Materials and Methods

A cross sectional study was conducted in Ramathibodi hospital between May 2017 and January 2018 after receiving ethical approval approved by the institutional ethics Committee. The study included men with LUTS due to BPH. This population consisted of men between 43 and 85 years old. Informed consent was obtained from

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participants in the study. Benign prostatic hyperplasia was diagnosed from the history, symptoms and physical examination. All patients reported lower urinary tract symptoms. Exclusion criteria included previous urinary tract infection, history of lower urinary tract stone, postural instability and void volume less than 150 ml. We performed UFM using a weight transducer urodynamic device (Urocap II Flow Analyzer, Version V5.02; LaborieMedical Technologies, Canada). All participants were performed in an isolated room to ensure complete privacy and minimize psychological inhibition[1]. Each participant was advised to void in standing and pelvic floor relaxing position. The sequence of positions was randomized in each patient. After finishing of this first cycle of testing, the participants were asked to go through voiding in the alternative position. We recorded Uroflowmetric parameters included maximum flow rate (Qmax), average flow rate (Qave), voided volume (VV) and post-void residual urine (PVR) and compare theses parameters among two positions. The post-void residual urine (PVR) was measured using a portable ultrasound bladder scanner after each voiding.

We sought advice from expert Physiatrists and they gave suggestion about relaxing pelvic floor using hip abduction and knee flexion. We adjusted the posture to make it comfortable for patients to void by spread up one hip and flex the same side of knee as in Figure 1. Statistical analyses were done using Stata 14.1®. Paired t-test and Paired sign test were done for parametric and nonparametric comparisons, respectively; $p<0.05$ was considered significant.

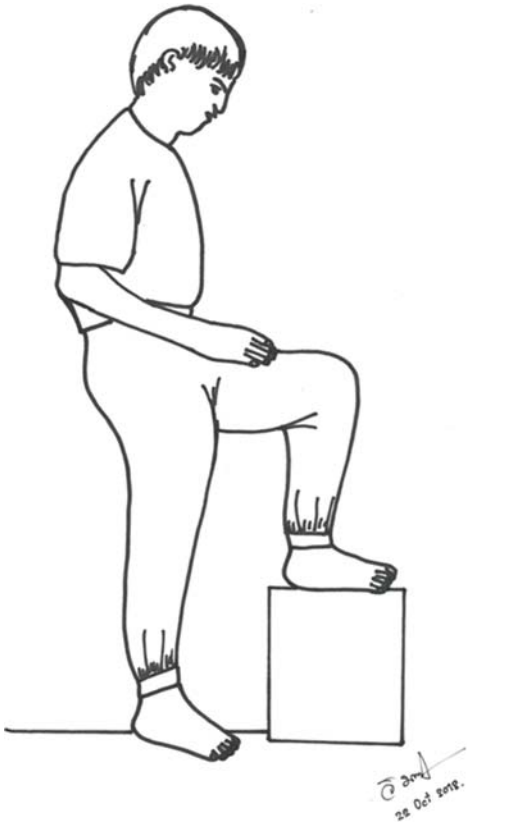

Figure 1. Pelvic floor relaxing position.

Results

A total of 150 participants were enrolled in the study. Seventy-nine men who had Previous UTI, history of lower urinary tract stone, postural instability and void volume less than 150 ml were excluded. The remaining 71 men were included in the analysis. The overall median age was 69 years (43, 85) and a mean body mass index was 25.81±4.04 kg/m^2 (range, 15.8 to 36.7 kg/m^2). The median VV for the standing and pelvic floor relaxing positions in the patient group were 277.5 (150.8, 744) and 291.2 (156.4, 866.2) ml respectively with no statistically significant difference between groups. The median Qmax values for the standing and pelvic floor relaxing position in the patient group were 15 (6.1, 44.2) and 16.4 (5.3, 45.9) ml/s, respectively which reach statistical significance (p-value = 0.041). The median Qave values were 8.4 (4, 19) and 8.3 (4.5, 20.9) ml/s respectively. The mean PVR values were 50.30±68.07 and 63.56±72.28 ml respectively (p-value = 0.002). Comparison of UFM results in both positions showed statistical differences for higher Qmax and larger residual urine volume in the pelvic floor relaxing position relative to the standing position. The uroflowmetric parameters in the standing and pelvic floor relaxing positions are shown in Table 1.

Discussion

Benign prostatic hyperplasia is a global public health issue in elderly male. Nowadays, the large number of patients with BPH can be treated by the medications like alpha-blockers and 5-alpha-reductase inhibitors. Nonetheless, conservative treatment with lifestyle modifications can be managed in some patients with mild lower urinary tract symptoms[13]. Appropriate voiding position might have an outcome that is identical to the outcomes of medical management[14]. Our study was conducted to investigate the effect of pelvic floor relaxing position on voiding using uroflowmetric parameters in patients with LUTS due to BPH. A number of studies have been performed addressing the voiding position; however, no consensus has yet been established on which position is better. Eryildrim et al[4] found a significant difference ($p<0.0001$) in flow rates improvement in sitting position (31.3±1.2 ml/sec) as compared to standing (26.8±1.3 ml/sec). Khan et al[15] found a significant difference between uroflowmetric parameter in both standing and sitting positions in healthy people, and reported higher flow rate in standing position as compared to sitting.

In 2014, a systematic review and a meta-analysis to determine the beneficial effects of voiding position on an individual's urodynamic profile which is conducted by de Jong et al[16] concluded that LUTS patients urinated better in the sitting voiding position than in the standing position. However, no voiding position for healthy men was found superior. A major limitation of this review that may have left

Table 1. Uroflowmetric parameters of BPH patients with normal and relaxing voiding position.

Uroflowmetric parameters	Standing position (n = 71)	Relaxing position (n = 71)	*p*-value
Qmax (ml/sec): median (min, max)	15 (6.1, 44.2)	16.4 (5.3, 45.9)	0.041**
PVR (ml): mean ± SD	50.34±68.56	64.26±70.54	0.002*
Qave (ml/sec): median (min, max)	8.4 (4, 19)	8.3 (4.5, 20.9)	0.228
Voiding time (sec): median (min, max)	40.85 (14, 307.8)	43.3 (6.8, 387)	0.091
Flow time (sec): median (min, max)	35.1 (12.4, 123)	34.5 (8.3, 109)	0.282
Time to max flow (sec): median (min, max)	8.9 (1.3, 198.2)	8.55 (1.3, 232.3)	0.114
Void volume (ml): median (min, max)	277.5 (150.8, 744)	291.2 (156.4, 866.2)	0.120

Data are presented as mean ± standard deviation if variables have normal distribution and median (min, max) if variables don't have normal distribution.
The *p*-value denotes statistical significance ($p<0.05$).
* Comparison of groups by the paired t-test as variables have normal distribution
** Comparison of groups by the paired sign test as variables do not have normal distribution

the results prone to be misinterpreted was the small number of studies[16].

Our results demonstrated that BPH patients generated significant higher Qmax in pelvic floor relaxing position compared to normal position. However, postvoid residual urine was significant higher in pelvic floor relaxing position compared to normal position. We found no statistical difference in either voided volumes or voiding time among the two positions. Our findings of higher urinary flow rates in the pelvic floor relaxing position can be explained by previous studies. Rad et al[17] suggested that the average angle between rectum and anal canal becomes higher when the patient gets to squatting (abduct hip and flex knee) position. This change in angle may lead to the relaxation of puborectalis muscles leading to an easier micturition. El-Bahnasawy and Fadl[5] concluded that Uroflowmetric parametric parameters depend on positional changes of the pelvic floor and thigh muscles which are greater relaxed in the sitting rather than the standing. Salem T, et al[18] proposed that contraction of the pelvic muscles is related to diminished urinary flow; relaxation of these muscles is better achieved by urinating in a sitting position and by supporting the feet in a comfortable position[19,20]. Furthermore, contraction of the pelvic floor musculature inhibits the activity of the detrusor muscle[21].

Our results showed that patients who voided in a standing position had lower PVR volumes. This may have been owing to participants felt more comfortable in the standing position that in pelvic floor relaxing position. Variation in PVR may be explained from personal preference in position. The increase in maximum urinary flow rate (Qmax) of 1.4 ml/s may seem low. However, compared to existing medical treatments of LUTS, this increasing is compatible and reaching statistical significance. A Phase 3 multicenter placebo-controlled of tamsulosin found an increase in Qmax by 1.32 ml/sec (95% CI: 1.07 to 1.57)[22].

Strength of our study is this study was cross sectional study. Limitation of this study is the small sample size. We also did not ask the patient about their preferred voiding position. UFM with surface EMG of pelvic floor muscle may provide proper voiding position.

Conclusion

The uroflowmetric parameters seem to be affected by the voiding position in men with lower urinary tract symptoms due to benign prostatic hyperplasia. It can be assumed that some benign prostatic hyperplasia patients might have some components of pelvic floor muscle dysfunction. Therefore, pelvic floor relaxing voiding position may be applied in these patients. Furthermore, physicians may suggest LUTS patients from BPH to practice pelvic floor relaxing exercise to improve their symptoms. More research is needed to further study in the patient with pelvic floor dysfunction.

What is already known on this topic?

Micturition is a complex system, complete process is depended on several factors including age, gender, voided volume, mental status and voiding position. The best position for voiding would allow an adequate urinary flow and small amount of post-void residual urine. Uroflowmetric parameters are useful testing to determine upon pharmacological treatment or surgical treatment in the management of benign prostatic hyperplasia (BPH). To date, there is still a lack of certainty which is the best position for BPH patients for better urination. There is a recognized relationship between difficulty urination and pelvic floor dysfunction.

What this study adds?

This study demonstrated that uroflowmetric parameters seem to be affected by the voiding position in men with lower urinary tract symptoms due to benign prostatic hyperplasia. It can be assumed that some benign prostatic hyperplasia patients might have some components of pelvic floor muscle dysfunction. Therefore, pelvic floor relaxing voiding position may be applied in these patients. More research is needed to further study in the patient with pelvic floor dysfunction.

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Potential conflicts of interest

The authors declare no conflicts of interest.

References

1. Choudhury S, Agarwal MM, Mandal AK, Mavuduru R, Mete UK, Kumar S, et al. Which voiding position is associated with lowest flow rates in healthy adult men? role of natural voiding position. Neurourol Urodyn 2010;29:413-7.
2. Malik MA, Khan JH, Gondal WS, Bajwa I AJAoKEMU. Role of uroflowmetry in lower urinary tract symptoms evaluation due to benign prostatic hyperplasia (BPH). Annals of KEMU Special Edition Annals 2010;16:34-8.
3. Riehmann M, Bayer WH, Drinka PJ, Schultz S, Krause P, Rhodes PR, et al. Position-related changes in voiding dynamics in men. Urology 1998;52:625-30.
4. Eryildirim B, Tarhan F, Kuyumcuoglu U, Erbay E, Pembegul N. Position-related changes in uroflowmetric parameters in healthy young men. Neurourol Urodyn 2006;25:249-51.
5. El Bahnasawy MS, Fadl FA. Uroflowmetric differences between standing and sitting positions for men used to void in the sitting position. Urology 2008;71:465-8.
6. Aghamir SM, Mohseni M, Arasteh S. The effect of voiding position on uroflowmetry findings of healthy men and patients with benign prostatic hyperplasia. Urol J 2005;2:216-21.
7. Amjadi M, Madaen SK, Pour-Moazen H. Uroflowmetry findings in patients with bladder outlet obstruction symptoms in standing and crouching positions. Urol J 2006;3:49-53.
8. Yazici CM, Turker P, Dogan C. Effect of voiding position on uroflowmetric parameters in healthy and obstructed male patients. Urol J 2014;10:1106-13.
9. Unsal A, Cimentepe E. Effect of voiding position on uroflowmetric parameters and post-void residual urine volume in patients with benign prostatic hyperplasia. Scand J Urol Nephrol 2004;38:240-2.
10. Goel A, Kanodia G, Sokhal AK, Singh K, Agrawal M, Sankhwar S. Evaluation of impact of voiding posture on uroflowmetry parameters in men. World J Mens Health 2017;35:100-6.
11. Madsen FA, Bruskewitz RC. Clinical manifestations of benign prostatic hyperplasia. Urol Clin North Am 1995;22:291-8.
12. Hut J, van der Heide WK, Kollen BJ, Messelink EJ, Blanker MH, Dekker JH. Pelvic floor muscle therapy or alpha-blocking agents for treatment of men with lower urinary tract symptoms: An exploratory randomized controlled trial. Int J Urol 2017;24:473-4.
13. Moyad MA, Lowe FC. Educating patients about lifestyle modifications for prostate health. Am J Med 2008;121(8 Suppl 2):S34-42.
14. Norg RJC, Portegijs PJM, van Schayck CP, van de Beek C, Knottnerus JA. Please be seated? Position-related differences in voiding in men with lower urinary tract symptoms. In: Norg RJC, editor. A general practitioner's approach to lower urinary tract symptoms [Internet]. Maastricht: Maastricht University; 2008 [cited 2019 Jan 13]. p. 55-69. Available from: http://arno.unimaas.nl/show.cgi?fid=21523.
15. Khan RN, Zaidi SZ. Comparison of position-related changes on uroflowmetric parameters in healthy young men. J Pak Med Assoc 2017;67:839-42.
16. de Jong Y, Pinckaers JH, ten Brinck RM, Nijeholt AA, Dekkers OM. Urinating standing versus sitting: position is of influence in men with prostate enlargement. A systematic review and meta-analysis. PLoS One 2014;9:e101320.
17. Rad S. Impact of ethnic habits on defecographic measurements. Arch Iranian Med 2002;5:115-7.
18. Salem TA, Abbas HH, Ali MH, Al Robigi A. The effect of voiding position on uroflowmetry findings and postvoiding residual urine in patients with benign prostatic hyperplasia. UIJ 2009;2:1-4.
19. Wennergren HM, Oberg BE, Sandstedt P. The importance of leg support for relaxation of the pelvic floor muscles. A surface electromyograph study in healthy girls. Scand J Urol Nephrol 1991;25:205-13.
20. Uluocak N, Oktar T, Acar O, Incesu O, Ziylan O, Erkorkmaz U. Positional changes in voiding dynamics of children with non-neurogenic bladder dysfunction. Urology 2008;72:530-4.
21. Okada N, Igawa Y, Ogawa A, Nishizawa O. Transcutaneous electrical stimulation of thigh muscles in the treatment of detrusor overactivity. Br J Urol 1998;81:560-4.
22. Lepor H. Phase III multicenter placebo-controlled study of tamsulosin in benign prostatic hyperplasia. Tamsulosin Investigator Group. Urology 1998;51:892-900.