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# The Effect of Voiding in Sitting and Standing Positions on Uroflowmeter Parameters: Descriptive Research

## Oturma ve Ayakta Pozisyonlarda İşeme Yapmanın Üroflowmetri Parametrelerine Etkisi: Tanımlayıcı Araştırma

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**ABSTRACT Objective:** Uroflowmetry is one of the most commonly used assessment tools in patients with lower urinary tract symptoms (LUTS). However, uroflowmetric parameters can be affected by various factors. In this study, we aimed to examine the effects of different voiding positions on uroflowmeter parameters. **Material and Methods:** 105 patients aged 40-80 years who applied to the urology outpatient clinic with the complaint of LUTS were included in the Our Prospective study. Uroflowmetry measurements were performed on each of the participants in standing and sitting positions, one day apart. After uroflowmetry, residual urine was measured by transabdominal ultrasound in each patient. $Q_{max}$, $Q_{ave}$, voiding volume, voiding time and residual urine volumes of the patients in standing and sitting positions were compared. **Results:** The mean $Q_{max}$-$Q_{ave}$-voiding volume values of the patients were measured as 13. 8 mL/s-7 mL/s-336 mL in the sitting position and 11. 6 mL/s-6 mL/s-304 mL in the standing position respectivly. $Q_{max}$, $Q_{ave}$ values and voiding volume values were significantly higher in patients who voided in the sitting position ($p<0.001$). The residual urine amount of the patients after voiding was measured as 20 mL in the sitting position and 40 mL in the standing position, and it was observed that the amount of residual urine in the patients who voided while sitting position was significantly less ($p<0.001$). **Conclusion:** In our study, it was observed that voiding position had an effect on uroflowmetry parameters. Urinating, especially in a sitting position, has a positive effect on uroflowmetry parameters.

**Keywords:** Üroflowmetry; sitting position; standing position; lower urinary tract symptoms

**ÖZET Amaç:** Üroflowmetri alt üriner sistem semptomlu (AÜSS) hastalarda en sık kullanılan değerlendirme araçlarından biridir. Ancak üroflowmetrik parametreler çeşitli faktörlerden etkilenebilir. Bu çalışmada farklı işeme pozisyonlarının üroflowmetre parametreleri üzerine etkilerini incelemeyi amaçladık. **Gereç ve Yöntemler:** Prospektif çalışmamıza AÜSS şikâyeti ile üroloji polikliniğine başvuran 40-80 yaş arası 105 hasta dâhil edildi. Üroflowmetri ölçümleri her katılımcıya bir gün arayla ayakta ve oturur pozisyonda yapıldı. Üroflowmetri sonrasında her hastada trans abdominal ultrason ile rezidüel idrar ölçüldü. Hastaların ayakta ve oturur pozisyondaki $Q_{maks}$, $Q_{ort}$, işeme hacmi, işeme süresi ve rezidüel idrar hacimleri karşılaştırıldı. **Bulgular:** Hastaların ortalama $Q_{maks}$-$Q_{ort}$, işeme hacmi değerleri, sırasıyla oturur pozisyonda 13,8 mL/s-7 mL/s-336 mL, ayakta ise 11,6 mL/s-6 mL/s-304 mL olarak ölçüldü. Oturma pozisyonunda işeyen hastalarda $Q_{maks}$, $Q_{ort}$ değerleri ve işeme hacmi değerleri anlamlı olarak yüksekti ($p<0,001$). Hastaların işeme sonrası kalan idrar miktarı oturur pozisyonda 20 mL, ayakta 40 mL olarak ölçüldü ve oturur pozisyonda işeyen hastalarda kalan idrar miktarının anlamlı derecede daha az olduğu görüldü ($p<0,001$). **Sonuç:** Çalışmamızda işeme pozisyonunun üroflowmetri parametreleri üzerinde etkili olduğu görüldü. Özellikle oturur pozisyonda idrar yapmak üroflowmetri parametreleri üzerinde olumlu etki sağlamaktadır.

**Anahtar Kelimeler:** Üroflowmetri; oturma pozisyonu; ayakta pozisyon; alt üriner sistem semptomları

Lower urinary tract symptoms (LUTS) is an important problem for man who aged over 50 years. LUTS has two components: emptying and storage symptoms.

Hesitancy, intermittency, straining, prolonged micturition, feeling of incomplete bladder emptying, terminal dribbling are defined as emptying symptoms, while frequency, urgency, urge incontinence and nocturia are called storage symptoms.

Benign prostatic hyperplasia (BPH) is the most common cause of LUTS in the male population and it is also a common health problem worldwide that causes LUTS.

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Uroflowmetry is a simple and inexpensive method to evaluate LUTS.[1] However, uroflowmetry parameters can be affected by many physical and psychological factors.[2] Voiding position preferences of individuals may vary according to their physical capacities, social and cultural conditions.[1] In addition, it is thought that voiding position also affects uroflowmetry parameters in patients with BPH.[3] There are no recommendations regarding voiding position in patients with BPH in current guidelines.

In patients with BPH, uroflowmetry parameters are generally characterized by increased voiding time, low maximum urinary flow ($Q_{max}$) rate and increased post-mictional residue (PMR).[4] A systematic review and meta-analysis showed that patients suffered from LUTS urined in sitting position have better urodynamic results than standing position, however, similar results were found between the two groups in healthy men.[5] However, the results of studies examining the effects of voiding position on uroflowmeter parameters in the literature are contradictory and it is not clear which position is the best.[5,6] In this study, we aimed to examine the relationship between voiding position and uroflowmeter parameters and to contribute to the literature.

## MATERIAL AND METHODS

The study was performed at University of Health Sciences Şişli Etfal Research and Training Hospital from August 2023 to September 2023.

The sample size of the study was determined by using G-Power 3.1 (Düsseldorf University, Düsseldorf, Germany) program. 105 patients between the ages of 40-80 who applied to the urology outpatient clinic with LUTS included our study. The study was planned as prospective.

Şişli Etfal Hamidiye Research and Training Hospital's ethics committee approved our study (date: August 29, 2023, no: 2023/14059). The study was planned based on the Declaration of Helsinki. The patients were informed about the study and their written consent was obtained.

Detailed medical history of all participants was taken, urinalysis, prostate specific antigen (PSA) measurement and urinary ultrasonographic evaluation were performed. In addition to standing and sitting uroflowmetry, measurements were performed on the participants one day apart. In patients with a voiding volume of less than 150 cc, uroflowmetry measurement was repeated. Also, the amount of PMR was measured by transabdominal ultrasonography (USG) after uroflowmetry. Since uroflowmetric measurements were made on the same patient, it was not questioned whether the patients had BPH or whether they received medical treatment for BPH (Figure 1).

The results of both uroflowmetry measurements of the patients were recorded and evaluated comparatively. Patients with a history of urethral stenosis and prostate surgery and neurological disease that may cause voiding dysfunction were not included in the study. Also, patients with urinary bladder pathology (tumor, bladder stone) on urinary USG were excluded.

The analysis of the study was performed using SPSS software Version 25 (IBM Corp, Armonky, NY, USA). p value of less than 0.05 was considered statistically significant.

## RESULTS

The mean age was 60.5± 8.6 years, the mean PSA value was 1.3±0.9 ng/dL, and the mean prostate volume was 42.8±22.4 cc (Table 1).

The mean $Q_{max}$ was measured as 13.8 mL/s in the sitting position and 11.6 mL/sl in the standing position. The mean $Q_{ave}$ was 7 mL/s-336 mL in the sitting position and 6 mL/s in the standing position. The mean voiding volume values of the patients were measured as 336 mL in the sitting position and 304 mL in the standing position. $Q_{max}$, $Q_{ave}$ values and voiding volume values were significantly higher in patients who voided in the sitting position ($p<0.001$).

The residual urine amount of the patients after voiding was measured as 20 mL in the sitting position and 40 mL in the standing position, and it was observed that the amount of residual urine in the patients who voided while sitting position was significantly less ($p<0.001$).

However, the mean voiding time of the patients in the sitting position was longer, but this was not statistically significant ($p>0.001$), (Table 2).

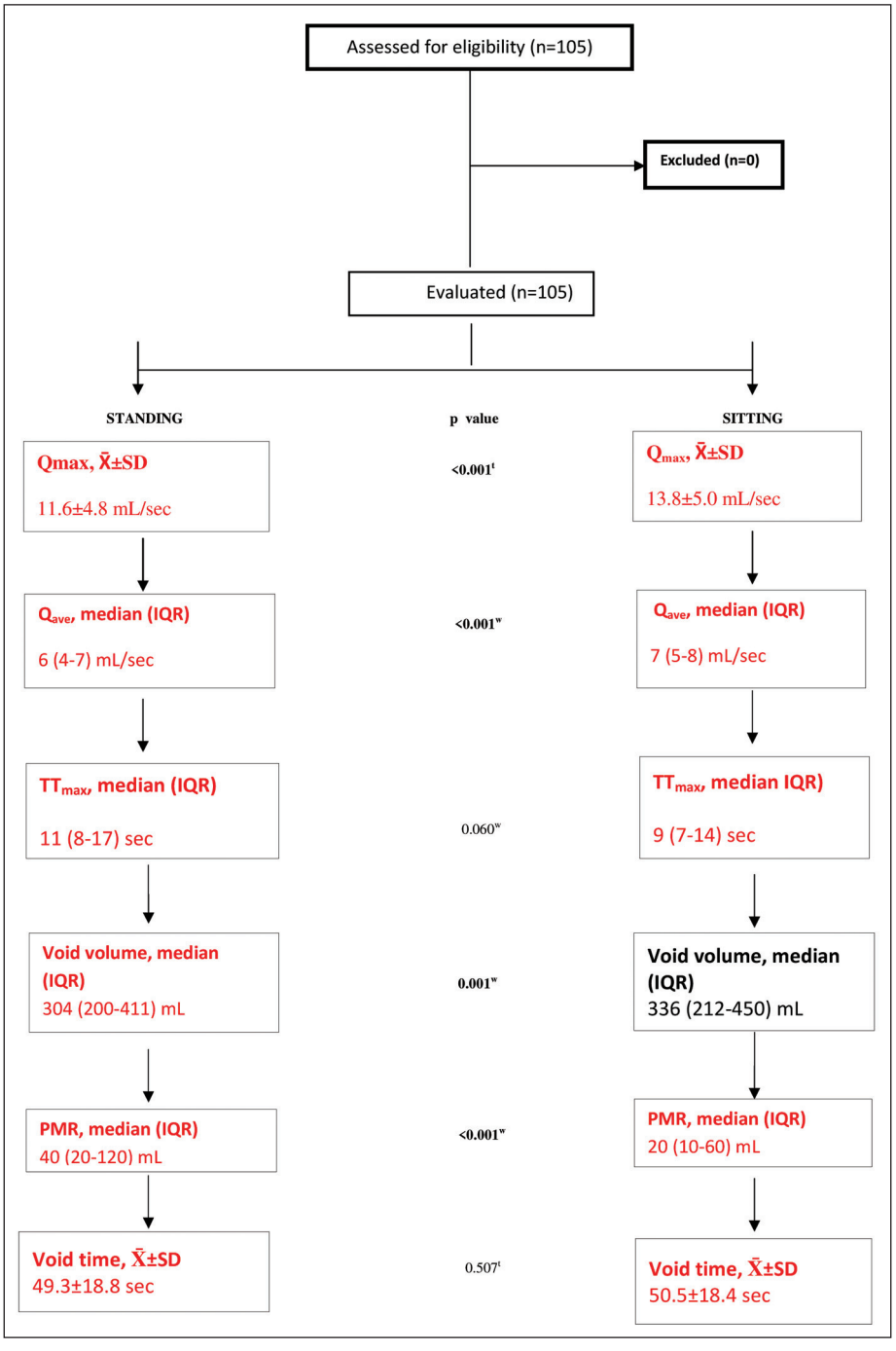


**FIGURE 1:** Consort flow chart.
SD: Standard deviation; IQR: Interquartile range; PMR: Post-mictional residue. t: Student-t test, w: Mann Whitney-U test.

## DISCUSSION

LUTS is a common health problem in middle-aged and older men. One of the most common known causes is BPH. Uroflowmetry is an inexpensive, non-invasive and easy-to-apply measurement used in the evaluation of LUTS. However, uroflowmetry measurements can be affected by various physical and psychological factors.[2,7] Current guidelines include lifestyle changes, medical treatment, and surgical

**TABLE 1:** Patient's characteristics.

| Variables | X̄±SD |
|---|---|
| Age (years) | 60.5±8.6 |
| BMI (kg/m²) | 28.7±4.2 |
| Prostate volume (cc) | 42.8±22.4 |
| PSA (mg/dL) | 1.3±0.9 |

SD: Standard deviation; BMI: Body mass index; PSA: Prostate specific antigen.

treatment options in the treatment management of BPH, but no recommendations are made regarding the voiding position. However, it is thought that changing voiding position may have an effect comparable to medical treatment.[3] In this study, we aimed to contribute to the literature by evaluating the effect of voiding position on uroflowmeter parameters.

Our study showed that men who voided while sitting position have higher $Q_{max}$, $Q_{ave}$, and lower PMR compared to those who voided while standing up. However, the results of studies on this subject in the literature are contradictory.[6,8] In the study conducted by Unsal and Cimentepe it was shown that $Q_{max}$ and PMR in healthy men were not affected by the position.[9] Similarly, Aghamir et al. reported that uroflowmetry parameters were not affected by voiding position in healthy men.[10] However, contrary to these studies, some authors think that voiding position affects uroflowmetry parameters in healthy individuals. In a study conducted by Eryıldırım et al, it was shown that urination in a sitting position increased $Q_{max}$ and $Q_{ave}$ in healthy young men, but did not change PMR.[11]

Studies in the literature have also examined the effect of voiding position on uroflowmetry parameters for BPH patients. In the study conducted by Yazici et al., it was shown that there was no statistically significant difference in the uroflowmeter parameters measured in standing and sitting positions in BPH patients.[8] Likewise, in the study conducted by Unsal and Cimentepe in patients with BPH, it was shown that uroflowmeter parameters were not affected by the voiding position.[6] Contrary to these studies, in our study, it was observed that $Q_{max}$ and $Q_{ave}$ were higher in the sitting position and PMR was lower in patients with LUTS. There are also studies in the literature that support our findings. In a meta-analysis by de Jong et al., it was reported that voiding position had no effect on uroflowmetry parameters in healthy men, but that $Q_{max}$ was higher and PMR lower in the sitting position compared to the standing position in men with BPH.[5] In addition, Haylen et al. showed a positive correlation between $Q_{max}$ and $Q_{ave}$ and voiding volume in men and women. In our study, it was observed that there was a statistically significant increase in voiding volume with $Q_{max}$ and $Q_{ave}$ in the sitting position.[12] The reason for this is thought to be the increase in intra-abdominal pressure and relaxation of the pelvic floor muscles in the sitting position.[13,14] Further urodynamic studies are needed in this regard.

There are some limitations of our study. The most important of these is the small number of patients. In addition, the fact that the prostate volumes of the patients are not completely homogeneous and that the patients are not separated according to whether they receive medical treatment due to lower urinary system symptoms are other limitations.

## CONCLUSION

In conclusion, our study showed that urination position and uroflowmetry parameters may be related to patients with LUTS. Urinating in a sitting position may provide better uroflowmetry parameters.

**TABLE 2:** Comparison of uroflowmetry results obtained as a result of standing and sitting urination of patients (n=105).

| Variables | Standing | Sitting | p value |
|---|---|---|---|
| $Q_{max}$, X̄±SD (mL/sec) | 11.6±4.8 | 13.8±5.0 | **<0.001**[t] |
| $Q_{ave}$, median (IQR) (mL/sec) | 6 (4-7) | 7 (5-8) | **<0.001**[w] |
| $TT_{max}$, median (IQR) (sec) | 11 (8-17) | 9 (7-14) | 0.060[w] |
| Void volume, median (IQR) (mL) | 304 (200-411) | 336 (212-450) | **0.001**[w] |
| PMR, median (IQR) (mL) | 40 (20-120) | 20 (10-60) | **<0.001**[w] |
| Void time, X̄±SD (sec) | 49.3±18.8 | 50.5±18.4 | 0.507[t] |

[t]Paired-samples t-test; [w]Wilcoxon test; SD: Standard deviation; IQR: Interquartile range; PMR: Post-mictional residue.

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*During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.*

### *Conflict of Interest*

*No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.*

### *Authorship Contributions*

***Idea/Concept:*** *Nihat Türkmen;* ***Design:*** *Nihat Türkmen, Emre Aykanlı;* ***Control/Supervision:*** *Nihat Türkmen;* ***Data Collection and/or Processing:*** *Nihat Türkmen;* ***Analysis and/or Interpretation:*** *Nihat Türkmen, Emre Aykanlı;* ***Literature Review:*** *Emre Aykanlı;* ***Writing the Article:*** *Emre Aykanlı;* ***Critical Review:*** *Nihat Türkmen.*

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