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Relationship Between Visual Prostate Symptom Score and Maximum Urine Flow: A Scale-Based Cross-Sectional Research

Görsel Prostat Semptom Skoru ile Maksimum İdrar Akışı Arasındaki İlişki: Ölçek Tabanlı Kesitsel Araştırma

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ABSTRACT Objective: The Visual Prostate Symptom Score (VPSS) is a simple tool developed to evaluate lower urinary tract symptoms (LUTS), particularly in individuals with low educational levels. This study investigated the relationship between the urinary stream image in the first question of the VPSS and the maximum urinary flow rate (Q_{max}). The aim was to estimate Q_{max} in patients unable to undergo testing and to reduce unnecessary uroflowmetry procedures. **Material and Methods:** A total of 93 patients over the age of 40 who had completed the VPSS form and undergone at least two uroflowmetry tests were included. Patients with diabetes, neurological diseases, a history of prostate or urethral surgery, and those with a voided urine volume of less than 150 mL were excluded. Based on the image in the first VPSS question, patients were divided into five groups. The relationship between this image and Q_{max} was analyzed using Pearson correlation. Variables such as age, voided volume, and presence of a median lobe were evaluated using multivariate regression analysis. **Results:** A strong negative correlation was found between the first VPSS question and Q_{max} ($r=-0.942$, $p<0.001$). While Q_{max} was within normal limits in the first two groups (24.33 mL/s and 16.21 mL/s), it was lower in the fourth and fifth groups (7.26 mL/s and 5.22 mL/s). The third group fell within a gray zone (11.11 mL/s). **Conclusion:** The urinary stream image in the VPSS shows a significant correlation with Q_{max} and may serve as a practical evaluation tool, especially in patients who are unable to undergo uroflowmetry.

Keywords: International Prostate Symptom Score; Visual Prostate Symptom Score; uroflowmetry

ÖZET Amaç: Görsel Prostat Semptom Skoru (GPSS), özellikle düşük eğitim düzeyine sahip bireylerde alt üriner sistem semptomlarını değerlendirmek için geliştirilmiş basit bir ölçektir. Bu çalışmada, GPSS'nin birinci sorusundaki idrar akım görseli ile maksimum idrar akış hızı (Q_{max}) arasındaki ilişki araştırılmıştır. Amaç, test yapılamayan hastalarda Q_{max} hakkında öngörü sağlamak ve gereksiz üroflowmetri testlerini azaltmaktır. **Gereç ve Yöntemler:** VPSS formunu doldurmuş ve en az iki kez üroflowmetri uygulanmış, 40 yaş üzeri 93 hasta incelendi. Diyabet, nörolojik hastalık, prostat/üretra cerrahisi öyküsü olanlar ve idrar hacmi <150 mL olanlar dışlandı. VPSS'nin birinci sorusundaki görsele göre hastalar 5 gruba ayrıldı ve görsel ile Q_{max} arasındaki ilişki Pearson korelasyon analizi ile değerlendirildi. Yaş, işeme hacmi ve median lob varlığı gibi değişkenler çok değişkenli regresyon ile analiz edildi. **Bulgular:** VPSS'nin birinci sorusu ile Q_{max} arasında güçlü bir negatif korelasyon saptandı ($r=-0,942$, $p<0,001$). İlk iki grupta Q_{max} normal düzeyde iken (24,33 mL/sn ve 16,21 mL/sn), dördüncü ve beşinci gruplarda düşüktü (7,26 mL/sn ve 5,22 mL/sn). Üçüncü grup gri bölgede yer almaktaydı (11,11 mL/sn). **Sonuç:** GPSS'nin idrar akış görseli, Q_{max} ile anlamlı ilişki göstermekte olup, özellikle üroflowmetri yapılamayan hastalarda pratik bir değerlendirme aracı olarak kullanılabilir.

Anahtar Kelimeler: Uluslararası Prostat Semptom Skoru; Görsel Prostat Semptom Skoru; üroflowmetri

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Lower urinary tract symptoms (LUTS) are highly prevalent among aging men, often significantly impacting their quality of life.[1] A primary contributing factor to LUTS is an increased prostate volume, which can result in bladder outlet obstruction (BOO) and reduced urinary flow.[2] However, LUTS is now recognized as a multifactorial condition influenced by various factors, including body composition, dietary habits, fluid and alcohol consumption, aging, and cardiovascular pathologies. Additionally, certain medications may exacerbate LUTS.[3,4]

The International Prostate Symptom Score (IPSS) is a widely used tool for assessing LUTS in men with BOO, typically caused by benign prostatic hyperplasia, prostate cancer, or urethral stricture.[5-7] While the IPSS provides a structured approach to translating subjective symptoms into objective numerical parameters, its reliance on patient interpretation introduces variability. This limitation can complicate comparisons between patients and may reduce the utility of the IPSS in populations with limited health literacy. Nonetheless, the IPSS remains essential for categorizing LUTS severity (minimal, moderate, or severe) and monitoring treatment outcomes over time.[8]

Patients with lower educational levels often struggle to complete the IPSS questionnaire due to the complexity of its questions, requiring assistance from healthcare providers. This dependency not only introduces potential bias in responses but also highlights the need for simpler tools.[9,10] It was also shown that men with limited education could complete the Visual Prostate Symptom Score (VPSS) questionnaire without any assistance. This finding highlights one of the most significant advantages of the VPSS over the IPSS: Its simplicity and user-friendly design. The VPSS replaces text-heavy questions with visual representations, making it more accessible for individuals with low literacy or language barriers. Unlike the IPSS, which often requires clarification or assistance from healthcare providers, the VPSS allows patients to independently evaluate and report their symptoms. This self-sufficiency reduces potential biases introduced by external explanations and ensures that the patient's own perception of their symptoms is accurately captured. Furthermore, the visual nature of the VPSS aligns with the principle of health literacy, promoting equitable healthcare by accommodating diverse educational backgrounds and cognitive abilities.[11]

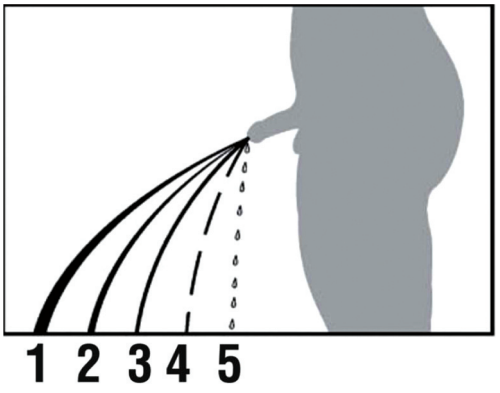

FIGURE 1: VPSS-UF question

This study aimed to build upon the utility of the VPSS by focusing on its first question (Figure 1), which visually assesses urine flow. Specifically, we sought to determine whether this visual assessment correlates with maximum urinary flow rate (Q_{max}), an objective urodynamic parameter. By establishing this relationship, we aimed to evaluate whether the VPSS-urine flow (VPSS-UF) image could serve as a reliable and practical surrogate marker for Q_{max}, particularly in clinical settings where uroflowmetry testing is unavailable or impractical. Additionally, the study explored the potential of the VPSS to improve patient assessment and streamline diagnostic processes, especially in resource-limited environments.

MATERIAL AND METHODS

After obtaining approval from the institutional ethics committee (approval number: IUEK-24-121), this retrospective study evaluated the medical records of adult male patients over the age of 40 who presented with LUTS and visited the urology outpatient clinic between August 2023 and 2024. The study was conducted in accordance with the principles of the Declaration of Helsinki. Patients who had undergone uroflowmetry testing at least twice and had completed the VPSS form were included in the study. The reason for including patients who underwent

uroflowmetry twice was to reduce potential error and increase the reliability of the measurements. Patients with a history of diabetes, neurological disorders, or prior prostate or urethral surgery were excluded. Additionally, individuals whose voided urine volume during the uroflowmetry test was less than 150 cc or who were unable to complete the VPSS form due to cognitive impairments were also excluded from the study.

In our clinic, it is routine practice to administer the VPSS form alongside the uroflowmetry test to ensure standardized assessment of urinary symptoms. In addition to demographic and clinical characteristics, variables such as prostate specific antigen levels, history of medication use, prostate volume, and the presence of a median lobe were documented. The correlation between the visual UF assessment in VPSS (Question 3) and Q_{max} values obtained from uroflowmetry was analyzed. The VPSS-UF images are scored from 1-5, and based on these visual scores, patients were categorized into 5 distinct groups.

All statistical analyses were performed using SPSS Statistics software (version 26.0, IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize the demographic and clinical characteristics of the participants, and results were expressed as means, standard deviations, medians, and ranges, where appropriate.

Normality of continuous variables (Q_{max}, voided volume, age) was assessed using the Shapiro-Wilk test. Since the distribution of Q_{max} was not normal, non-parametric methods were considered. However, given the large enough sample and continuous nature of the variables, Pearson's correlation analysis was used to evaluate the linear relationship between the VPSS-UF image scores (treated as ordinal categorical values from 1-5) and Q_{max} values. Additionally, Pearson correlation was used to assess relationships between Q_{max} and other continuous variables such as age and voided volume, while the association between Q_{max} and median lobe presence (a categorical variable) was also examined using point-biserial correlation.

Multivariate linear regression analysis was performed to determine the independent effect of VPSS-UF image score on Q_{max}, while adjusting for potential confounders, including age, voided volume, and presence of a median lobe. A p value <0.05 was considered statistically significant for all tests.

RESULTS

A total of 93 participants were included in the study. The ages of the study participants ranged from 44-83±10 years. The mean Q_{max} was 12.6±7.07 mL/sec. The mean voided volume recorded for the study participants was 293.4±148.5 mL (Table 1). Pearson correlation analysis revealed a strong negative correlation between VPSS Question 1 and Q_{max} (r=-0.942, p<0.001). Furthermore, multivariate regression analysis demonstrated a significant association between VPSS Question 1 and Q_{max} after adjusting for age, voided volume, and the presence of the median lobe (p<0.001, Table 2).

TABLE 1: Descriptive data

n=93	Age	Q_{max} (ml/sn.)	VV	PVR
Mean	64.3	12.6	293	96.0
Standard deviation	10.3	7.07	148	95.5
Minimum	44	3.00	127	0
Maximum	83	29.0	820	500

Q_{max}: Maximum urinary flow rate; VV: Voided volume; PVR: Postvoidal residual volume

TABLE 2: Clinical data of subgroups

VPSS-UF	n	$\bar{X}$	Median	SD	Minimum	Maximum
1	18	24.33	23.50	2.808	21.00	29.00
2	17	16.21	16.00	1.619	13.50	20.00
3	20	11.11	10.70	1.441	9.80	14.00
4	19	7.26	7.40	0.874	5.00	8.00
5	19	5.22	6.00	1.619	3.00	7.00

SD: Standard deviation; VPSS-UF: Visual prostate symptom score-urine flow

TABLE 3: Pearson correlation between Q_{max} and VPSS-UF, age and median lobe existence (*p value is significant is under 0.05)

Q_{max}	VPSS-UF	Age	Median lobe existence
Pearson's r value	-0.942	-0.346	-0.366
p value	<0.001	<0.001	0.004

Q_{max}: Maximum urinary flow rate; VPSS-UF: Visual prostate symptom score-urine flow

When the mean Q_{max} values in the 1st and 2nd groups were examined, urinary flow was found to be within normal limits (24.33 mL/sec and 16.21 mL/sec, respectively). In contrast, the 4th and 5th groups had clearly reduced Q_{max} values (7.26 mL/sec and 5.22 mL/sec), indicating objectively poor urinary flow.

The 3rd group, however, had a mean Q_{max} of 11.23 mL/sec, which does not clearly fall into the normal or abnormal range. This intermediate value makes it difficult to definitively classify the urinary flow as normal or impaired based solely on VPSS visual selection. Therefore, this group was identified as a gray zone, representing a borderline range in which subjective visual assessment and objective uroflowmetry results do not fully align. In clinical practice, patients who select the 3rd VPSS image may require additional diagnostic evaluation, including uroflowmetry, to clarify their urinary status more precisely (Table 3).

DISCUSSION

This retrospective study showed a significant negative correlation between the 1st question of the VPSS and Q_{max}. These results are consistent with findings from similar studies and suggest that the VPSS may be a practical tool for assessment.

For example, Park et al. investigated the correlation between the total VPSS score and Q_{max} and found a significant negative association. Our study supports these findings; however, it uniquely focuses on the 1st question of the VPSS and examines its specific relationship with Q_{max} in more detail.[12]

Similarly, a retrospective study by Selekman et al. showed that the VPSS may be a valid tool in clinical practice for assessing urinary symptoms in patients. Their study found statistically significant associations between the total VPSS score and various subgroups. Our study also suggests that even a single component of the VPSS (visual assessment in the 1st question) may serve as a clinical indicator on its own.[13] The purpose of developing the VPSS is to understand the complaints of patients with low education levels more objectively.[14] It is thought that illiterate individuals in particular are unlikely to understand or respond to the questionnaire accurately without the assistance of trained medical personnel.[15] In a study conducted by Park and Lee on 240 patients, a significant negative correlation was found between the VPSS and Q_{max} values.[12]

Although the VPSS has proven to be a practical and easy-to-use tool, especially in populations with low literacy, it has some limitations. Its visual nature may lead to subjective interpretations that do not always correlate with objective parameters like Q_{max}. In certain cases, patients may choose an image based on perception rather than actual symptom severity. Previous studies have shown moderate correlations between VPSS and uroflowmetry suggesting that while VPSS is useful for screening, it should not be considered a complete substitute for objective testing methods when available.[10] Furthermore, the absence of validated cutoff values for VPSS components may limit its diagnostic precision.[15]

To our knowledge, there is no previous study investigating the relationship between the UF image of the VPSS and Q_{max}. In developing countries, evaluating patients with low education levels with the IPSS form may cause loss of time. In addition, crowded hospitals and the inability of elderly patients to collect sufficient urine constitute obstacles to uroflowmetry testing. Therefore, the relationship between the VPSS-UF image and Q_{max} may provide useful information for patients who cannot be tested.

The most important point of this study is that those who marked the 1st and 2nd flow rates in the image had normal UF averages, while those who marked the 4th and 5th flow rates had low urine flows. Those who marked the 3rd image fell between these 2 groups. Accordingly, in patients who cannot undergo uroflowmetry, those with low or normal UF can be identified using the VPSS-UF image. A more detailed

evaluation and uroflowmetry are required for patients who choose image number 3. The shortcoming of this study can be seen as the lack of IPSS values of the patients, but our aim in this study was to obtain information about UF rather than LUTS. We believe that the most important shortcoming of this study is the lack of patient education.

LIMITATIONS

This study has several limitations. First, its retrospective design may introduce selection bias and limit control over data completeness. Additionally, although patients with low voided volumes were excluded, other factors such as hydration status, time of day, and patient anxiety may have affected the uroflowmetry results. The sample size was also relatively limited, and all data were collected from a single center, which may reduce generalizability.

Furthermore, the IPSS, a widely used and validated tool for assessing lower urinary tract symptoms, was not included in this study. The absence of IPSS data limits the ability to compare VPSS with a well-established subjective scoring system, and thus represents an additional constraint in fully evaluating the clinical utility of the VPSS.

CONCLUSION

This study showed that there is a significant negative correlation between the VPSS form UF rate visual and Q_{max}. This visual can be helpful in evaluating UF rate in patients who cannot perform uroflowmetry for any reason. According to this study, performing uroflowmetry especially in the 3rd group of patients may provide more clarity in clinical decision-making.

In conclusion, the findings of this study highlight the potential benefit of VPSS as a useful and practical tool, especially in clinical settings. Future prospective, multicenter studies with larger populations are needed to validate these findings and further explore the role of VPSS in assessing urinary flow.

Source of Finance

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: *Abdulmecit Yavuz;* ***Design:*** *Abdulmecit Yavuz;* ***Control/Supervision:*** *Göksel Bayar;* ***Data Collection and/or Processing:*** *Abdulmecit Yavuz, Göksel Bayar;* ***Analysis and/or Interpretation:*** *Abdulmecit Yavuz;* ***Literature Review:*** *Abdulmecit Yavuz, Göksel Bayar;* ***Writing the Article:*** *Abdulmecit Yavuz;* ***Critical Review:*** *Göksel Bayar.*

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