E-ISSN 2250-0944

ISSN 2250-1150
doi: 10.48047/ijprt/15.02.227

Correlation of Prostate Volume with Lower Urinary Tract Symptoms Using Transabdominal Ultrasound in Men Over 50

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Abstract

Lower urinary tract symptoms (LUTS) are common in aging men and are often attributed to benign prostatic enlargement (BPE) secondary to benign prostatic hyperplasia (BPH). Accurate assessment of prostate size is crucial for evaluating the severity of LUTS, determining therapeutic strategies, and predicting treatment outcomes. This study aimed to determine the correlation between prostate volume measured by transabdominal ultrasound and the severity of LUTS in men over 50 years. A prospective observational study was conducted on 220 men presenting with LUTS, who underwent detailed clinical assessment, International Prostate Symptom Score (IPSS) evaluation, and prostate volume measurement using transabdominal ultrasound. The mean prostate volume was 46.7 ± 15.2 mL, with 68% of patients having a volume >40 mL. Symptom severity was categorized as mild (IPSS 0–7), moderate (8–19), and severe (20–35). A significant positive correlation ($r = 0.62$, $p < 0.001$) was observed between prostate volume and IPSS. Patients with larger prostate volumes had higher symptom scores, greater post-void residual urine, and poorer quality of life indices. However, variability in symptom severity among patients with similar prostate sizes highlighted the multifactorial etiology of LUTS. These findings support the use of transabdominal ultrasound as a noninvasive, accessible tool to assess prostate volume and guide clinical decision-making, though symptom evaluation should remain holistic.

Keywords: prostate volume, lower urinary tract symptoms, transabdominal ultrasound, benign prostatic hyperplasia, IPSS

Introduction

Lower urinary tract symptoms (LUTS) in aging men represent one of the most prevalent and impactful urological conditions worldwide. As men age beyond 50 years, the prevalence of LUTS increases steadily, contributing to significant morbidity, impaired quality of life, and rising healthcare utilization. LUTS are typically grouped into storage, voiding, and post-micturition symptoms, encompassing frequency, urgency, nocturia, weak stream, intermittency, incomplete emptying, and dribbling. Among the various etiological factors, benign prostatic hyperplasia (BPH) and subsequent benign prostatic enlargement (BPE) remain the most commonly implicated contributors.1-4

The pathophysiology of BPE is complex, involving stromal and epithelial proliferation within the transition zone of the prostate. This progressive enlargement can lead to bladder outlet obstruction, thereby causing voiding symptoms, elevated intravesical pressure, and compensatory changes in bladder detrusor function. While prostate enlargement is a major determinant of LUTS, symptom severity often varies, suggesting that additional factors such as detrusor overactivity, bladder compliance, and neurological modulation play significant roles. Nevertheless, quantifying prostate volume remains essential, as it guides therapeutic decisions including medical therapy, minimally invasive techniques, or surgical intervention.5-7

The International Prostate Symptom Score (IPSS) provides a standardized method of quantifying LUTS severity and impact on quality of life. However, it is inherently subjective, depending on patient recall and perception. Conversely, imaging modalities such as ultrasound provide objective and reproducible measurements of prostate size, which can complement clinical evaluation. Transrectal ultrasound (TRUS) has traditionally been considered the gold standard for prostate volume assessment due to its high accuracy. However, its invasive nature, requirement of rectal preparation, and limited patient acceptability reduce its routine applicability in many outpatient settings.8-10

Transabdominal ultrasound offers a noninvasive alternative that is widely available, relatively inexpensive, and better tolerated by patients. It allows simultaneous evaluation of prostate size, bladder wall thickness, and post-void residual urine. Although less precise than TRUS in small gland measurement, transabdominal ultrasound has demonstrated adequate accuracy for clinical practice, especially in larger prostates where precision differences are less clinically significant. Given the accessibility of this technique, it is often the first-line imaging modality in urological practice, particularly in resource-limited settings.

The correlation between prostate volume measured by transabdominal ultrasound and LUTS severity in men over 50 years has important clinical implications. Establishing a strong association reinforces the utility of prostate size estimation as a predictive tool for symptom burden and progression. Moreover, it informs decisions regarding pharmacological therapy, as patients with larger prostate volumes are more likely to benefit from 5-alpha reductase inhibitors, whereas those with smaller prostates may respond adequately to alpha-blockers alone.

This study was designed to explore the relationship between prostate volume measured by transabdominal ultrasound and LUTS severity assessed using IPSS in men aged over 50 years. By providing data from a prospective real-world cohort, it aims to enhance understanding of the interplay between anatomical enlargement and symptomatology, ultimately guiding more individualized and evidence-based management of BPH-related LUTS.

Methodology

This prospective observational study was carried out in the urology of Al Syed Hospital, Taxila. A total of 220 men aged above 50 years presenting with LUTS were enrolled after obtaining informed consent. Exclusion criteria included known prostate cancer, previous prostate surgery, chronic urinary retention requiring indwelling catheterization, neurogenic bladder, or active urinary tract infection.

All patients underwent detailed clinical history and physical examination, including digital rectal examination. LUTS severity was quantified using the validated International Prostate Symptom Score (IPSS) questionnaire, which categorizes symptoms as mild (0–7), moderate (8–19), or severe

(20–35). Quality of life related to urinary symptoms was assessed using the IPSS quality of life question.

Prostate volume was measured using transabdominal ultrasound (Siemens ACUSON X150 with 3.5 MHz convex probe). The ellipsoid formula (length × width × height × 0.52) was applied for volume calculation. Post-void residual urine volume was also recorded.

Statistical analysis was performed using SPSS v26. Pearson's correlation coefficient was applied to assess the relationship between prostate volume and IPSS. Mean differences were analyzed with ANOVA and t-tests, with $p < 0.05$ considered statistically significant. Ethical approval was obtained from the institutional review board.

Results

Table 1. Baseline Characteristics

Variable	Value (n=220)
Mean age (years)	63.4 ± 8.7
Mean prostate volume (mL)	46.7 ± 15.2
Mean IPSS score	17.8 ± 6.3
Mean residual urine (mL)	68.4 ± 22.6

Table 2. Symptom Severity and Prostate Volume

IPSS Category	Patients (%)	Mean Prostate Volume (mL)
Mild (0–7)	19%	33.6 ± 8.9
Moderate (8–19)	52%	45.8 ± 12.3
Severe (20–35)	29%	56.2 ± 14.7

Table 3. Correlation Analysis

Variable	Correlation with Prostate Volume	p-value
IPSS score	r = 0.62	<0.001

Variable	Correlation with Prostate Volume	p-value
Residual urine volume	r = 0.58	<0.001
QoL score	r = 0.54	<0.001

Prostate volume correlated positively with LUTS severity, residual urine, and quality of life impairment, though variability existed among individuals.

Discussion

This study demonstrated a significant correlation between prostate volume measured via transabdominal ultrasound and LUTS severity assessed with IPSS in men over 50 years. The findings confirm that as prostate volume increases, symptom burden and quality of life impairment also escalate. Importantly, residual urine also correlated with prostate size, supporting the concept of bladder outlet obstruction due to enlarged glands.11-13

The correlation coefficient of 0.62 between prostate volume and IPSS suggests a moderate to strong relationship, consistent with existing clinical understanding. However, the variability of symptoms among patients with similar prostate sizes underscores the multifactorial etiology of LUTS. Detrusor overactivity, bladder compliance changes, and psychosocial factors all contribute to the symptom experience, emphasizing that prostate volume alone should not be the sole determinant in management decisions.14-16

Transabdominal ultrasound proved to be a valuable tool for noninvasive assessment of prostate size. Its utility in routine clinical practice is reinforced by its accessibility, patient acceptability, and ability to provide additional information such as post-void residual urine. Although TRUS remains more accurate, particularly in small prostates, the clinical relevance of minor measurement differences is limited when stratifying patients for therapy.17-20

From a therapeutic standpoint, patients with larger prostate volumes are more likely to require combination therapy with alpha-blockers and 5-alpha reductase inhibitors or surgical intervention if symptoms are refractory. Conversely, those with smaller glands and mild symptoms may

respond adequately to monotherapy or lifestyle modifications. Thus, integrating ultrasound-derived prostate volume with IPSS provides a pragmatic framework for individualized treatment.

The study's real-world design enhances its generalizability, reflecting the heterogeneity of patients encountered in daily practice. Unlike highly controlled clinical trials, the inclusion of unselected men presenting with LUTS mirrors actual clinical scenarios, making the findings more applicable.

Nevertheless, limitations must be acknowledged. The cross-sectional design precludes conclusions regarding causality or progression over time. Additionally, urodynamic evaluation was not performed, which could have clarified the contribution of bladder dysfunction independent of prostate size. Future longitudinal studies are warranted to assess how prostate volume trajectories influence LUTS progression and treatment outcomes.

Overall, this study supports the clinical utility of transabdominal ultrasound in assessing prostate volume and highlights its correlation with LUTS severity. When combined with symptom scoring, it provides a robust and accessible approach to guiding management decisions in men over 50 years presenting with urinary complaints.

Conclusion

Prostate volume measured by transabdominal ultrasound correlates significantly with LUTS severity in men over 50 years. While prostate size is an important determinant, symptoms remain multifactorial, requiring integrated evaluation for optimal management.

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