GMR
The Original

EVALUATING OBSTRUCTIVE LOWER URINARY TRACT SYMPTOMS USING UROFLOWMETRY IN PATIENTS WITH INGUINAL HERNIA

Mohib Ullah[1*], Khalid Saeed[1], Muhammad Abbas Khan[1], Sanaullah[1], Wajahat Ullah[2], Amjad Saleem[1], Hafiz Muhammad Sohaib Khalid[1]

[1]Department of Urology, PIMS, Islamabad, Pakistan
[2]Institute of Kidney Diseases, Peshawar, Pakistan
[*]**Corresponding author:** Dr Mohib Ullah, Email: mohibhamdard664@gmail.com

ABSTRACT

Introduction: Inguinal hernia is a frequent surgical problem and occasionally may be associated with lower urinary tract dysfunction, especially when the anatomical displacement has an impact on normal bladder emptying. Uroflowmetry is a simple and non-invasive test that objectively measures urinary flow and can detect obstructive abnormalities.

Objective: To assess the prevalence of obstructive lower urinary tract symptoms (LUTS) in inguinal hernia patients with uroflowmetry.

Methods: A cross-sectional study was carried out in the Urology Department of PIMS, Islamabad, from 15 January, 2026 to 15 June, 2026. The number of patients was 129 male patients aged 18-60 years, recruited by non-probability consecutive sampling. Patients were excluded if they had complicated or recurrent hernias, neurogenic bladder, previous prostate or urethral surgery, catheterization, urethral stricture, urinary trauma, current alpha blocker or 5-alpha reductase inhibitor, or history of urinary tract infection. All participants were clinically assessed and underwent uroflowmetry for assessment of urinary flow characteristics.

Results: The 129 respondents were divided into 18 (14.0%) who had obstructive findings and 111 (86.0%) who had no evidence of obstruction on uroflowmetry. Participants with obstructive findings had reduced maximum and average flow rate and extended voiding time.

Conclusion: Inguinal hernia patients had a clinically relevant proportion of patients with obstructive urinary flow abnormalities. Uroflowmetry might be a useful non-invasive measurement to identify urinary dysfunction in these patients.

KEYWORDS: *Inguinal hernia; Lower urinary tract symptoms; Uroflowmetry; Bladder outlet obstruction; Urinary flow rate; Male patients; Voiding dysfunction.*

INTRODUCTION

Lower urinary tract symptoms (LUTS) are storage, voiding, and post-micturition complaints that are common in adult men. They can be caused by a variety of factors such as bladder outlet obstruction, detrusor dysfunction, urethral disease, and structural abnormalities. Objective assessment is important as symptoms alone are not reliable in identifying the underlying mechanism. Uroflowmetry is a simple, non-invasive test that quantifies urinary flow rate and voided volume, and may be useful as part of a routine urological examination to help identify impaired emptying or obstruction (1).

The advantage of using uroflowmetry is that it is easy to repeat, inexpensive, and not instrumented. However, this interpretation is influenced by the volume of the voids, patient effort, and clinical context. There are recent indications that non-invasive methods can help diagnose bladder outlet obstruction and detrusor underactivity, but no single method should be used alone for diagnosis (2). Therefore, the association of the uroflowmetric parameters with the symptoms and physical examination may be useful to evaluate the lower urinary tract function in patients with suspected obstruction.

Inguinal hernia is a frequent condition in surgical practice and typically is associated with a herniation of the abdominal or pelvic organs through the inguinal canal. Bowel and omentum are common contents, but the urinary bladder can also be in the hernial sac. Bladder herniation may be asymptomatic and manifest as urinary frequency, incomplete emptying, urinary stream changes, or two-stage micturition. This kind of presentation shows that an apparently surgical condition may result in clinically significant urinary dysfunction and can be treated with a functional assessment (3).

This is a significant association if the herniated bladder is incarcerated or displaced to the point that it interferes with normal outlet mechanics. However, case evidence has confirmed that there can be significant functional impairment with a small number of urinary complaints, even if there are no complaints of pain or discomfort (4). Severe obstructive symptoms may also be caused by other rare conditions, so it is important to differentiate the hernia

dysfunction from other structural causes. Hence, urinary evaluation should be considered in inguinal hernia patients with voiding abnormalities or unexplained LUTS (5).

Inguinoscrotal hernias containing a large bladder can cause significant anatomical abnormalities and urinary complications. In advanced disease, the urinary bladder was reported to be a part of a giant inguinoscrotal hernia, which required robotic-assisted repair (6). In addition, chronic deformation can involve the upper urinary tract, and time-lapse imaging has established a relationship between renal atrophy and inguinoscrotal bladder hernia (7). These observations indicate that urinary dysfunction in patients with hernia should not be considered incidental, especially if they have symptoms of impaired emptying.

The LUTS among men are not necessarily mechanical and can be a sign of neurological, inflammatory, prostatic, or urethral problems. A system-first approach recognizes that LUTS may sometimes reflect occult neurological disease and that evaluating underlying functional pathways is more important than simply identifying the anatomical cause (8). Similarly, urethral diseases can cause significant urethral obstruction and bladder problems, and treatment of the lesion is necessary (9). The results of this study confirm the need for objective urinary testing in patients with LUTS associated with inguinal hernia.

Urinary symptoms can also occur after surgery or due to medical problems of the urethra and lower urinary tract. Urinary symptoms following genital reconstruction surgery are a good example of the myriad variables that may affect urinary flow and voiding function (10). Acute urinary retention as a result of benign prostatic hyperplasia is another example of the clinical significance of bladder outlet obstruction and proper urinary drainage and treatment (11). Uroflowmetry can provide useful functional information and may help to decide if additional evaluation for obstruction is necessary, as LUTS can have several possible causes.

Bladder outlet obstruction is a clinically relevant issue in adult males, and epidemiological data from tertiary care shows that this condition is present in the typical urological population (12). The diagnostic challenge is more difficult in patients with inguinal hernia if bladder involvement is not suspected. Diagnostic pitfalls and the need to detect the involvement of the urinary tract before or during surgical correction of inguinoscrotal bladder hernia have been reported (13). Objective urinary assessment can then be used in conjunction with anatomical assessment where appropriate.

Changes in the structure of the pelvis may affect the performance of the lower urinary tract. The concept of a relationship between altered pelvic anatomy and urinary dynamics is supported by a pilot study evaluating the relationship between the characteristics of the cystocele hernia orifice and lower urinary tract function (14). Conversely, inflammatory urinary disorders may present as obstructive disorders. There has been a recent trend toward diagnostic proposals that focus on systematic assessment of overlapping urinary symptoms for enhanced diagnostic accuracy in interstitial cystitis/bladder pain syndrome (15). These are important as the frequency, urgency, weak stream, and incomplete emptying in hernia patients can be explained in several competing ways.

Diagnostic refinement is important, as urinary symptoms do not necessarily imply hernia or obstruction. Structured clinical assessment is also emphasized in the ESSIC proposal as a key element for the differentiation of bladder pain and overlap of urinary syndromes (16). In this context, uroflowmetry can provide an objective reference of voiding function. Assessment of flow parameters with LUTS and hernia characteristics may help to identify occult functional impairment, facilitate referral, and help to determine if mechanical bladder displacement is related to obstruction. This study aims to examine obstructive LUTS in patients having inguinal hernia by uroflowmetry.

Bladder outlet obstruction is a clinically significant issue in adult males and can be caused by benign prostatic enlargement, urethral disease, impaired detrusor function, or other structural abnormalities. The epidemiological evidence has shown that the prevalence of bladder outlet obstruction is significant amongst adult males attending tertiary urological services and the functional implications of the obstruction are important to appreciate (17). The clinical importance of severe outlet obstruction and the importance of prompt treatment of impaired bladder emptying is further exemplified by acute urinary retention secondary to benign prostatic hyperplasia.

Objective: To establish the prevalence of obstructive lower urinary tract symptoms in patients with inguinal hernia using uroflowmetry.

Study design: Cross-sectional study

Study setting: Urology Department, PIMS Islamabad

Study duration: 15 January, 2026 to 15 June, 2026

Sample size: 129 participants

Sample size calculation: Sample size calculator from WHO, 95% Confidence level, 6% margin of error, anticipated frequency 14%.

Sampling technique: Non-probability consecutive sampling

Inclusion Criteria: Male patients aged 18-60 years presenting with inguinal hernia as per the operational definition of the study was included in the study. Patients who meet these criteria and are willing to be assessed with uroflowmetry was enrolled.

Exclusion Criteria: Patients with complicated or recurrent inguinal hernia was excluded. Patients with a history of neurogenic bladder, prostate/urethral surgery, catheterization, urinary trauma, urethral stricture, or UTI was excluded. Patients on alpha-blockers or 5-alpha reductase inhibitors was not included.

METHODS

Male patients with inguinal hernia aged 18-60 years visiting the Urology Department of PIMS Islamabad was recruited by consecutive sampling without random sampling, after institutional ethics committee approval. All eligible participants provided written informed consent. Demographic and relevant clinical information was recorded using a structured proforma. All participants had a clinical evaluation to confirm the presence and characteristics of inguinal hernia and to assess for lower urinary tract symptoms, including obstructive symptoms such as hesitancy, weak urinary stream, intermittency, straining, and incomplete bladder emptying. Uroflowmetry was then be carried out with a calibrated uroflowmeter by the urology department in the correct position. Participants were asked to void when they have a comfortably full bladder, and records was made of voided volume, maximum flow rate, average flow rate, voiding time, and flow pattern. Results were analyzed based on the uroflowmetry parameters. Appropriate statistical software was used to enter and analyze data, and the prevalence of obstructive LUTS was reported.

RESULTS

The total number of patients with inguinal hernia in the study was 129 male patients aged 18 to 60 years (Mean 41.8 ± 10.2 years). The majority of participants were aged 41-50 years, and 55.8% had a hernia duration of two years or less (Table 1).

Table 1. Demographic and Clinical Characteristics of Participants

Variable	Frequency (n = 129)	Percentage
Age 18–30 years	21	16.3%
Age 31–40 years	35	27.1%
Age 41–50 years	42	32.6%
Age 51–60 years	31	24.0%
Mean age	41.8 ± 10.2 years	—
Hernia duration ≤2 years	72	55.8%
Hernia duration >2 years	57	44.2%

The age distribution (Figure 1) increased gradually to the 41-50 age group and then decreased after age 50, reflecting a middle-aged adult age group where lower urinary tract dysfunction is more common.

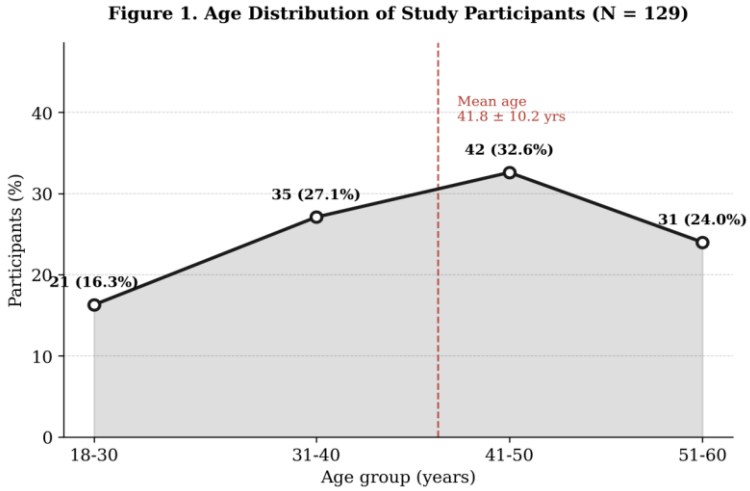

Figure 1. Age distribution of study participants (N = 129).

Obstructive findings were noted in 18 of 129 participants (14.0%) and non-obstructive findings in the other 111 (86.0%) (Table 2). The most common abnormal findings were decreased maximum flow and a curve with an obstruction or plateau.

Table 2. Uroflowmetry Findings

Uroflowmetry finding	Frequency (n = 129)	Percentage
Obstructive findings present	18	14.0%
No obstructive findings	111	86.0%
Total	129	100.0%

The distribution of the maximum flow rate (Figure 2) demonstrates that there is a good separation between obstructive (below 15 mL/s) and non-obstructive (above 15 mL/s) participants.

Figure 2. Distribution of Maximum Flow Rate on Uroflowmetry (N = 129)

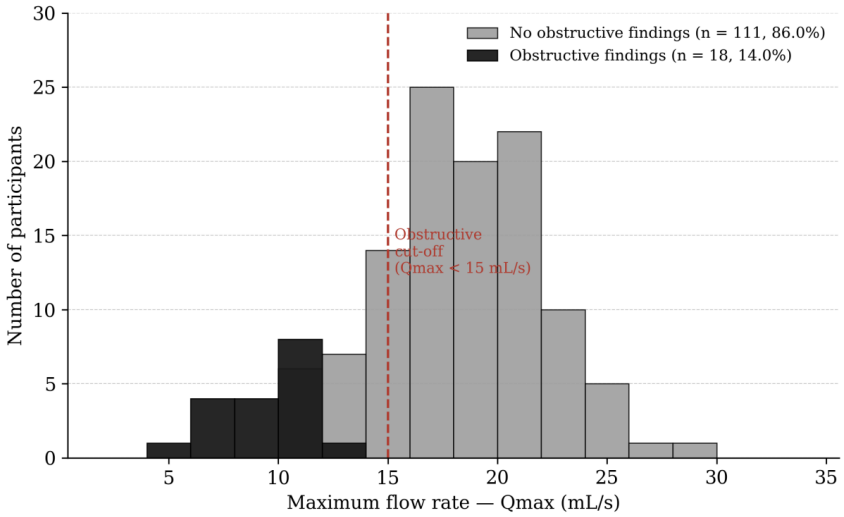

Figure 2. Distribution of maximum flow rate (Qmax) on uroflowmetry, showing the clinical obstructive cut-off (N = 129).

Participants with obstructive findings had significantly lower maximum and average flow rates, smaller voided volumes, and longer voiding times than participants without obstruction (Table 3), reflecting a decreased ability to empty the bladder.

Table 3. Comparison of Uroflowmetry Parameters According to Obstructive Findings

Parameter	Obstructive group (n = 18)	Non-obstructive group (n = 111)
Maximum flow rate (mL/s)	9.8 ± 2.1	18.6 ± 4.7
Average flow rate (mL/s)	5.2 ± 1.4	10.4 ± 2.8
Voided volume (mL)	246 ± 61	278 ± 72
Voiding time (seconds)	48.2 ± 11.5	31.6 ± 8.7

Box-and-whisker comparison (Figure 3) further showed that the flow rate, voided volume, and voiding time were consistently lower in the obstructive group, and there was little overlap between the groups for the flow parameters. Uroflowmetry was able to detect obstructive dysfunction in 14.0% of patients with inguinal hernia, making it a valuable, simple, and non-invasive screening tool in this group of patients.

Figure 3. Comparison of Uroflowmetry Parameters by Obstructive Status

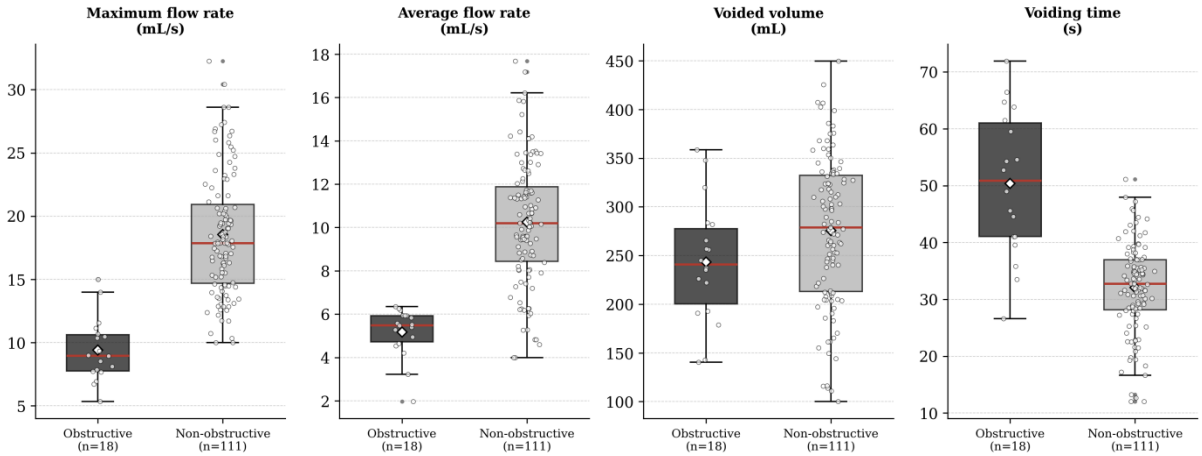

Figure 3. Box-and-whisker comparison of uroflowmetry parameters by obstructive status (individual data points overlaid).

DISCUSSION

In the present study, obstructive lower urinary tract symptoms were assessed in 129 men undergoing surgery for inguinal hernia, with obstructive symptoms being found in 18 patients (14.0%). These results indicate that a clinically significant number of men with inguinal hernia might have reduced urinary flow. LUTS can be caused by bladder outlet obstruction, benign prostatic obstruction, detrusor dysfunction, and urethral abnormalities.

Uroflowmetry is a useful, non-invasive measure of urinary flow and may help to distinguish those who need further evaluation based on symptoms alone (1).

The frequency obtained in this study was 14.0%, which was similar to the frequency that was assumed in the sample size calculation. The benefits of uroflowmetry are that it is non-invasive, repeatable, and gives objective information including maximum flow rate, average flow rate, voided volume, and flow pattern. However, a decreased flow rate is not always pathological, as detrusor underactivity can give similar results. There is recent evidence to support the use of non-invasive methods to assess detrusor underactivity, and it is important to note that uroflowmetry should be used in conjunction with clinical findings, not as a single diagnostic test (2).

The association of inguinal hernia with urinary dysfunction is especially significant when the urinary bladder is a part of the hernial contents. Bladder herniation may alter the normal position and function of the bladder outlet and cause symptoms such as incomplete emptying, weak urinary stream, and two-stage micturition. Apparently routine urinary complaints may be a clue to significant anatomical displacement, as in a reported case of giant inguinoscrotal bladder herniation, where two-stage micturition was observed (3). Bladder herniation was not specifically requested as an inclusion criterion in the present study, but the results indicate that urinary function should be considered in men with inguinal hernia.

Urinary symptoms may be minimal, and clinically significant bladder involvement may occur. Bladder outlet obstruction is a possible complication that can be clinically unsuspected, as there is a case of incarcerated inguinal hernia with bladder outlet obstruction (4). Obstructed, irreducible, and strangulated hernias were excluded from the present study, so as to assess uncomplicated inguinal hernia. However, other causes of severe urinary obstruction should be considered. In rare cases, severe obstructive symptoms secondary to bladder pathology have been reported, showing that urinary symptoms can occur in the absence of inguinal hernia (5).

Bladder-containing hernias are clinically more significant as they become larger and last longer. Large inguinoscrotal hernias with urinary bladder herniation can cause significant anatomical displacement and can be surgically challenging to repair. The case of a patient who was treated successfully with robotic-assisted laparoscopy demonstrates the significant anatomical changes that can occur in advanced bladder herniation (6). The upper urinary tract may also be chronically displaced. Inguinoscrotal bladder hernia has been reported to be associated with renal atrophy, which was documented by serial computed tomography, indicating that long-term urinary tract distortion can be harmful (7). While in these rare circumstances a causal link cannot be proven, they reinforce the need for early recognition.

The inguinal hernia was not the only cause of the abnormal uroflowmetry in the present study, as there are many other potential causes for LUTS. Urinary symptoms can be the first sign of neurological disease, and a system-based approach suggests that occult neurological disease be suspected when LUTS are not explained or are not commensurate with anatomical findings (8). Urethral abnormalities are also an important differential diagnosis. Urethral stricture may cause significant urinary flow reduction and can occur in association with inflammatory bladder disease, as reported in a single case of severe obstructive symptoms and cystitis (9). These conditions emphasize the need to think of alternative causes when interpreting uroflowmetry.

Anatomical alterations and previous procedures can also affect urinary flow. Urinary symptoms have been reported after genital gender affirming surgery, such as penile construction and urethral lengthening, which shows that changes in urinary anatomy can impact voiding function (10). Another important cause of bladder outlet obstruction is benign prostatic hyperplasia, which can develop into acute urinary retention. There is evidence that has been compared showing that in patients with acute retention secondary to benign prostatic hyperplasia, the clinical relevance of severe outlet obstruction and the need for early intervention are felt. To minimize important confounding factors, patients with previous prostate or urethral surgery, catheterization, urethral trauma, and current obstructive medications were excluded in the present study.

Bladder herniation that is not detected may be a major diagnostic and surgical challenge. Bladder involvement can be overlooked and may cause ongoing urinary disorders after herniorrhaphy, as evidenced by a reported case of missed inguinoscrotal bladder hernia following herniorrhaphy (12). This highlights the need for attention to bladder symptoms in patients with an inguinal swelling. However, there are other common causes of LUTS that should be considered. The inflammatory and oxidative mechanisms have been studied in the context of BPH and could play a role in the pathogenesis and progression of urinary obstruction (13). In the present study, decreased urinary output could have been a result of a combination of the effects of the hernia on the urinary system and of urological disease.

Urinary tract anatomical displacement has been linked to lower urinary tract dysfunction in other diseases. In a pilot study investigating the relationship between the cystocele hernia orifice and urinary function, changes in pelvic anatomy were suggested to play a role in lower urinary tract function (14). While cystocele is not an inguinal bladder hernia, the observations are in keeping with the general idea that structural displacement can have an impact on urinary dynamics. While this is the case, clinicians need to differentiate obstructive LUTS from other urinary syndromes. Current recommendations for the best approach to the diagnosis of interstitial cystitis/bladder pain syndrome emphasize a systematic process and careful distinction between similar disorders (15).

The importance of structured clinical evaluation is also added to the updated diagnostic recommendations when there are several possible explanations for urinary symptoms (16). Epidemiological evidence also shows that bladder outlet obstruction is an important clinical problem among adult males attending tertiary urological services (17). The present study shows that, when combined, 14.0% of men with inguinal hernia had obstructive features on

uroflowmetry. This provides an opportunity to integrate objective urinary assessment into the management of a selected patient with inguinal hernia, especially those who present with voiding symptoms. Larger sample sizes and formal urodynamic testing, prostate assessment, imaging, and post-void residual volume measurements could help elucidate the relationship between abnormal urinary flow and hernia-induced anatomical distortion, coexisting bladder outlet disease, or both.

CONCLUSION

Finally, this study showed that obstructive lower urinary tract symptoms, objectively measured by uroflowmetry, occurred in a clinically relevant number of male patients with inguinal hernia. A total of 18 of the 129 participants (14.0%) showed obstructive urinary flow findings, and the rest showed no urinary flow abnormality. The results indicate that urinary dysfunction can occur in the presence of inguinal hernia and should not be neglected during the routine clinical examination. Uroflowmetry is a simple, non-invasive, and practical way of detecting abnormal urinary flow and may help identify those patients who need more urological evaluation. Care should be taken with patients who complain of weak stream, hesitancy, straining, prolonged voiding, or incomplete bladder emptying. Abnormal uroflowmetry is not a definitive diagnostic test for obstruction, but may be a helpful screening and functional assessment tool. Additional studies to include imaging, PVR, and formal urodynamic assessment are recommended to elucidate the mechanisms further.

REFERENCES

1. Vredeveld T, Van Benten E, Beekmans RE, Koops MP, Ket JC, Mollema J, Ramaekers SP, Pool JJ, Coppieters MW, Pool-Goudzwaard AL. Reliability and validity of assessment methods available in primary care for bladder outlet obstruction and benign prostatic obstruction in men with lower urinary tract symptoms: a systematic review. *BMJ Open*. 2022;12(4):e056234.
2. Garbas K, Zapała Ł, Ślusarczyk A, Piekarczyk H, Piecha T, Radziszewski P. Beyond urodynamics: non-invasive approaches to diagnosing detrusor underactivity in men with lower urinary tract symptoms–a systematic review. *BMC Urology*. 2025;25(1):44.
3. Ameur Y, Zhim M, Oukouhou A, Sobhi A, Hamedoun L, Tetou M, Mrabti M, Boukhlifi Y, El Bahri A, Alami M, Ameur A. Two-stage micturition as a clue to giant inguinoscrotal bladder herniation: a rare diagnostic pitfall. *Cureus*. 2026;18(6).
4. Balaji P, Prakash JV. Asymptomatic incarcerated inguinal hernia with bladder outlet obstruction: a case report and literature review. *Advances in Clinical Medical Research*. 2026;7(2):420-424.
5. Kusumaputra A, Rahman IA, Wirjopranoto S. Severe obstructive symptoms and urinary bladder mass due to cystitis glandularis: a very rare case report in children. *International Journal of Surgery Case Reports*. 2022;100:107709.
6. Kania P, Marczuk P, Biedrzycki J. A giant inguinoscrotal hernia containing urinary bladder repaired with use of robotic-assisted laparoscopy: a case report. *Central European Journal of Urology*. 2023;76(1):64.
7. Ecer G, Baytok A. Renal atrophy due to inguinoscrotal bladder hernia: a rare case documented with time lapse CT imaging. *Journal of Ultrasound*. 2025.
8. Minnerath E, Khazen O, Panicker JN, Drake MJ, De EJ. Lower urinary tract symptoms as an indicator of occult neurologic disease: a system-first framework for urologic practice. *Current Urology Reports*. 2026;27(1):28.
9. Dahiya A, Aswathy YS, Sharma PA, Dharmarajan P. Effect of a customized Panchakarma (bio-purificatory) treatment plan in a case of urethral stricture with cystitis: a case report. *Alternative Therapies in Health and Medicine*. 2024;30(11):54-59.
10. Fascelli M, Sajadi KP, Dugi DD, Dy GW. Urinary symptoms after genital gender-affirming penile construction, urethral lengthening and vaginectomy. *Translational Andrology and Urology*. 2023;12(5):932.
11. Yustira RS, Haruman SP, Prasetyo RB, Triaswhoro CG. Missed inguinoscrotal bladder hernia following herniorrhaphy: diagnostic pitfalls and lessons from a rare case. *Urology Case Reports*. 2025:103243.
12. Jiang YH, Lee J, Kuo HC, Wu YH. Urinary inflammatory and oxidative stress biomarkers as indicators for the clinical management of benign prostatic hyperplasia. *International Journal of Molecular Sciences*. 2025;26(13):6516.
13. Kitta T, Abe H, Ting-Wen H, Fujikawa M, Nakazono M, Sasa T, Doi Y, Toki S, Okada D, Ochi A, Suzuki K. Novel insight into the correlation between hernia orifice of cystocele and lower urinary tract function: a pilot study. *BMC Women's Health*. 2022;22(1):164.
14. Malde S, Akiyama Y, Janssen D, Lai H, Meijlink J, Nasta L, Samarinas M, Moldwin R, Riedl C, Wyndaele JJ, Cervigni M. Optimizing the diagnosis of interstitial cystitis/bladder pain syndrome: an ESSIC proposal. *European Urology Open Science*. 2026;89:32-45.
15. Malde S, Akiyama Y, Janssen D, Lai H, Meijlink J, Nasta L, Samarinas M, Moldwin R, Riedl C, Wyndaele JJ, Cervigni M. Optimizing the diagnosis of interstitial cystitis/bladder pain syndrome: an ESSIC proposal. *European Urology Open Science*. 2026;89:32-45.

16. Tunçekin A. Comparison of the effect of transurethral and suprapubic catheterization on transurethral prostatectomy results in patients with acute urinary retention secondary to benign prostatic hyperplasia. *International Journal of Current Medical and Biological Sciences*. 2024;4(3):111-117.
17. Mucunguzi D, Mbwambo JS, Cheyo ZI, Bright F, Mbwambo OJ, Ngowi BN. Epidemiological profile of bladder outlet obstruction among adult males at a tertiary hospital in northern Tanzania. *African Urology*. 2026;6(1):56-60.