Original Article

Urodynamic Study in Voiding Dysfunction in Young Adults

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ABSTRACT

BACKGROUND

Voiding dysfunction defined by the International Continence Society and International Urogynecological Association as"abnormal, slow, and/or incomplete micturition" as diagnosed by symptoms and urodynamic investigations. Chronic Lower Urinary Tract Symptoms (LUTS) in young men are often misdiagnosed. Urodynamic evaluation is very useful in establishing the correct diagnosis and ultimately in delivery of appropriate therapy. This study utilizes Urodynamic study (UDS) for diagnosis of voiding dysfunctions and help in proper treatment.

METHODS

The study was conducted in Nepal Mediciti Hospital, Lalitpur Nepal in 2024. Urodynamic study (UDS) of 148 young adults 40 years of age or less with chronic voiding dysfunction, were performed and analyzed prospectively to identify the etiology.

RESULTS

Out of 148 patients, 122 (82.4%) were male and 26 (17.6%) were female. The most common disorder diagnosed after urodynamic study (UDS) was Detrusor Underactivity seen in 46 (31.1%) followed by Neurogenic Bladder seen in 17(11.5%).

CONCLUSIONS

While the exact causes of voiding dysfunction in young men remain unclear, it is a common issue. Uroflowmetry provides a valuable screening tool for patients experiencing symptoms. UDS can diagnose various Lower Urinary Tract diseases and appear to influence treatment decisions made by clinicians in determining treatment pathways.

KEYWORDS

Voiding; urodynamic; diagnosis; treatment.

BACKGROUND

Voiding dysfunction defined by the International Continence Society and International Urogynecological Association as"abnormal, slow, and/or incomplete micturition" as diagnosed by symptoms and urodynamic investigations.1 Lower Urinary Tract Symptoms (LUTS) are divided into 3 groups: (i) storage symptoms, (ii) voiding symptoms, and (iii) post micturition symptoms, while related symptoms are classified into 4 additional main categories: (iv) symptoms associated with sexual intercourse, (v) symptoms associated with pelvic organ prolapse, (vi) genital and lower urinary tract pain, and (vii) symptom syndromes. It is confirmed that LUTS are defined from the individual's (mostly the patient's) perspective.2 Voiding dysfunction among young men is common. Chronic L UTS in young men are often attributed to misdiagnosed chronic nonbacterial prostatitis. Urodynamic evaluation is useful in establishing the correct diagnosis and ultimately in delivery of appropriate therapy.3

The aim of this study is to utilize Urodynamic study (UDS) for diagnosis of voiding dysfunctions to guide targeted treatment.

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METHODS

This prospective observational cross-sectional study was conducted at Nepal Mediciti Hospital, Lalitpur, Nepal, in 2024, focusing on young adults aged 40 years or younger experiencing chronic voiding dysfunction. Ethical approval was obtained from the Institutional Review Committee (Reference number: 2305). The study aimed to diagnose voiding dysfunction using urodynamic studies (UDS), allowing for targeted treatment based on precise etiological identification.

Patients with voiding dysfunction presenting symptoms were recruited following informed consent. Exclusion criteria included individuals with acute urinary tract infections, active genitourinary malignancies, and those who previously received targeted treatments for voiding dysfunction to avoid confounding factors.

The sample size was calculated by formula:

n =z2 pq/d2; (z =1.96 taken at 95% of confidence interval)

n = Required sample size; p = prevalence of dysfunctional voiding; q=100-p; d=4% (Maximum tolerable error); Z2 =1.96×1.96=3.8

Using the formula mentioned above:

p = 2% (prevalence of voiding dysfunction)4

q= 98%; d = 4%; z=3.8; n=47

Therefore the target sample size was 47.

Using these parameters, the required sample size was determined to be 47. However a total of 148 patients, surpassing the calculated sample size, were enrolled to ensure adequate representation and statistical power. Data collection involved: 1.Symptom Assessment: A standardized questionnaire was used to record lower urinary tract symptoms (LUTS), classifying symptoms into storage, voiding, and post-micturition categories, as defined by the International Continence Society. 2.Medical History: Details on any history of trauma, comorbid conditions or previous surgeries were recorded, as these could influence UDS findings. 3.Urodynamic Study (UDS): Each participant underwent a comprehensive UDS, including non-invasive and invasive tests: Non-invasive Tests: Uroflowmetry and post-void residual measurement, Invasive Tests: Cystometry, pressure-flow studies. 4.Uroflowmetry Analysis: Flow rates and voiding patterns were observed to distinguish between obstructive and non-obstructive dysfunctions. 4.Categorization of Voiding Dysfunction: Based on UDS findings, patients were categorized according to specific diagnoses, such as Detrusor overactivity (DO), Bladder outlet obstruction (BOO), Reduced compliance, Detrusor underactivity, Neurogenic Bladder, Reduced Bladder Capacity, Urge urinary incontinence, Detrusor overactivity with BOO, Reduced compliance with DO, DO with stress incontinence.

This methodology enabled the identification of specific voiding dysfunction subtypes, contributing to a better understanding of the prevalence and characteristics of voiding dysfunctions in the young adult population.

RESULTS

Out of 148 patients, 122 (82.4%) were male and 26 (17.6%) were female (Table 1). Most common age group with chronic voiding dysfunction under going Urodynamic study were from 31 - 40 years of age and the number of the patients were 64 (43.2%). The least common age group with chronic voiding dysfunction under going Urodynamic study were less than 10 years of age and the number of the patients were 5 (3.4%) (Table 2).

114 (77%) patients did not have any history of trauma, medical comorbidities or history of surgery in the past where as 12 (8.1%) patients were known to have lumbar fracture and 8 (5.4%) patient were known case of Vesico ureteric reflux/Posterior urethral valve (Table 3).

The most common disorder diagnosed after UDS was Detrusor Underactivity seen in 46 (31.1%) patients, out of which 39(32%) were male patients and 7(26.9%) were female. Neurogenic Bladder was seen in 17(11.5%) patients, out of which 13 (10.7%) were male and 4 (15.4%) were female (Table 4). Detrusor Underactivity was seen most commonly in age group 31 to 40 years of age and the number of patients were 26 (40.6%) whereas Neurogenic Bladder was seen most commonly in age group 21 to 30 years of age and the number of patients were 8 (13.3%) (Table 5).

DISCUSSION

Urodynamic study (UDS) is the measurement of the relevant physiological parameters of the Lower Urinary Tract (LUT) to assess its function and dysfunction. Clinicians can perform urodynamics noninvasively and invasively.5 It includes non-invasive UDS like uroflowmetry, Post-void residuals (PVR) and invasive UDS like Cystometry, Pressure-flow study, Electromyography, Urethral pressure studies. Aims of urodynamic investigations are to reproduce the patient's symptoms, answer specific clinical questions, establish a precise diagnosis, determine the severity of the condition, plan further investigations or therapies.6

The addition of tests such as concurrent electromyography (EMG) of pelvic floor muscles and urethral pressure profiles can supplement the investigation for further clinical detail.7 Video urodynamics is when standard urodynamics is combined with fluoroscopic imaging with radiographic contrast used in bladder filling. This form of assessment is particularly more informative in neurological patients who have neurogenic bladders and in patients who have had previous surgery or trauma-related anatomical defects.8 Standard urodynamic testing is useful where there is an unclear diagnosis if surgical interventions are a consideration, in the presence of multiple coexisting pathologies and a decision is necessary regarding which symptoms to manage first, or in patients with complex urological/anatomical issues.9

Risks of invasive urodynamic testing includes dysuria, hematuria,

urinary tract infection, urinary retention, inability to catheterize the bladder, failure of diagnosis.10,11

UDS provide objective information on the occurrence of lower urinary tract symptoms (LUTS) and enable determination of a person's lower urinary tract (LUT) performance in relation to what is known about normal or abnormal urinary tract physiology.12 Most of the times the treatment of voiding dysfunction in young adult is not targeted and rather it is empirical. This leads to unsatisfactory results.13 Here comes the role of UDS to diagnose the disease so that the patient can get targeted treatment. The findings of this study emphasize the significant role of Urodynamic Study (UDS) in accurately diagnosing voiding dysfunction in young adults. This aligns with prior research on the utility of UDS for identifying specific lower urinary tract dysfunctions, particularly in cases of chronic Lower Urinary Tract Symptoms (LUTS) where symptoms alone are insufficient for a targeted diagnosis and therapy.

The reliance on UDS for objective assessment of voiding dysfunction also highlights its importance in avoiding the pitfalls of empirical treatment. While empirical approaches are sometimes used, they risk ineffective or unsatisfactory outcomes due to a lack of specific pathology-targeted therapy. Here, UDS has demonstrated its value in accurately guiding treatment choices, potentially improving patient outcomes by identifying conditions like Detrusor Underactivity and Neurogenic Bladder, which require specific management strategies.

Dysfunctional Voiding (DV) is a relatively prevalent urodynamic diagnosis accounting for almost a quarter of young men presenting with LUTS. Its presentation varies, from retention to interrupted flowrate, with varying detrusor pressures. No effective treatment exists for DV when symptoms resist pelvic floor physiotherapy. Determining the root cause for the DV presentation may allow for better selection of current treatment options or the development of novel interventions.14 Young men with chronic LUTS and a negative four-glass test should undergo urodynamic studies for accurate diagnosis and treatment of bladder dysfunction.15

Urodynamic studies (UDS) are now a standard approach in assessing infants and children with either neurogenic or non-neurogenic bladder issues. Children of all ages, often presenting with a range of related conditions, are referred for UDS to identify the causes of urinary incontinence or ongoing lower urinary tract symptoms. Modifications of UDS tailored for pediatric cases have enabled accurate evaluations of lower urinary tract function and support the development of evidence-based therapeutic interventions. The value of UDS extends beyond diagnostics, offering guidance for effective treatment plans and facilitating initial use of noninvasive techniques to identify which children may require more invasive UDS assessments.16

Urodynamic study (UDS) is widely considered the gold standard for diagnosing neurogenic bladder dysfunction (NBD) in children. It helps identify those at risk for urinary tract complications without timely intervention. UDS is also beneficial for children with lower urinary tract symptoms unresponsive to standard treatments, as it provides valuable insights, particularly when anatomical anomalies are suspected in cases of incontinence. The International Children's Continence Society recommends UDS for evaluating non-neurogenic bladder dysfunction (NNBD) and ruling out NBD in these cases. However, there are currently no validated guidelines specifically for pediatric UDS procedures, aside from the "Good Urodynamic Practices" report by the International Continence Society, which primarily addresses adult care.17 In neurogenic bladder dysfunction (NBD), considerations around UDS focus on determining when to repeat evaluations and when to adjust treatments, as bladder function can change over time, even with stable therapeutic regimens. Regardless of the NBD cause, treatment aims to maintain a bladder that is appropriately sized, compliant, and able to fully empty, all while safeguarding upper urinary tract health. Urodynamic evaluation is essential for guiding treatment decisions, as neurological exams, clinical symptoms, and imaging alone cannot fully capture lower urinary tract function.16

The EPIC (European Prospective Investigation of Cancer and Nutrition) study, an international,

cross-sectional study of 19,165 men and women, showed that the prevalence of slow stream was 3.9% in men aged <40 years, 7.4% in men aged 40 - 59 years, and 18.9% in men aged >59 years and overall prevalence of LUTS, 62.5% of the surveyed population reported at least one LUTS, with men at 60% and women at 64.3%.18 Thus,LUTSs in young men are less common than in older men but are not rare in young men. This study reinforces the need for young adults with persistent LUTS to undergo urodynamic evaluations, particularly when symptoms are resistant to initial conservative or empirical management. The findings align with the EPIC study, which reported a relatively high overall prevalence of LUTS in younger populations. Consequently, early and accurate diagnosis through UDS may help optimize management and improve quality of life for young adults with chronic voiding dysfunction.

In a large prospective study of 456 men (18-40 years old) with chronic LUTSs,Primary Bladder Neck Obstruction(PBNO) was found in 96 cases (21%), Dysfunctional Voiding (DV) was seen in 69 (15%), and underactive detrusor in 11 (2.4%).15 However, in this study, the most common disorder diagnosed was Detrusor Underactivity seen in 46 (31.1%) patients followed by Neurogenic Bladder seen in 17(11.5%) patients suggesting that regional, demographic, or methodological factors may influence the prevalence of specific dysfunctions.

Interestingly, Detrusor Underactivity was most commonly observed in the 31-40 age group in this study, which contrasts with studies showing a gradual increase in LUTS prevalence with age. This reinforces that age-related LUTS trends seen in older populations may not apply to younger adults, suggesting a need for tailored diagnostic and therapeutic approaches in

this demographic. Additionally, the study's finding of Neurogenic Bladder in 11.5% of cases, particularly in the 21-30 age group, underscores the need for clinicians to consider neurological assessments in younger adults presenting with LUTS, especially where UDS findings indicate neurogenic involvement.

This study provides further evidence supporting the International Continence Society and International Urogynecological Association's definition of voiding dysfunction, illustrating that abnormal or incomplete voiding is frequently detectable in young adults with chronic LUTS using urodynamic investigations. LUTS, a key component of voiding dysfunction, can manifest as storage, voiding, and post-micturition symptoms, alongside other associated symptoms like pelvic pain and sexual dysfunction, which often complicate diagnosis and management. This complexity underscores the value of a detailed urodynamic assessment, as it allows clinicians to dissect and accurately categorize symptoms, enabling a more nuanced understanding of the underlying pathology and need for broader education and awareness around these diagnoses, ensuring that clinicians are equipped to consider a full spectrum of potential causes when encountering young adults with chronic voiding dysfunction.

CONCLUSIONS

Voiding dysfunction constitutes a significant health concern for young men. While the exact causes of voiding dysfunction in young men remain unclear, it is not an uncommon condition for young men. Uroflowmetry is crucial for screening the patients experiencing the symptoms. Characteristic features of various types of lower urinary tract symptoms can be identified by UDS. Thus, UDS can diagnose various Lower Urinary Tract diseases and appear to influence treatment decisions made by clinicians in determining treatment pathways.

Tables:

Table 1.Sex wise distribution of patients

Sex	Frequency	Percent (%)
Male	122	82.4
Female	26	17.6
Total	148	100

Table 2.Age-wise distribution of patients

Age Group	Frequency	Percent (%)
10	5	3.4
11 – 20	19	12.8
21 - 30	60	40.5
31 - 40	64	43.2
Total	148	100

Table 3.Disease-wise distribution of patients

Disease	Frequency	Percent (%)
Hypertension (HTN)	1	0.7
Diabetes mellitus (DM)	1	0.7
Hypothyroid	1	0.7
Benign enlargement of prostate (BEP)	1	0.7
Normal	114	77
Lumbar fracture	12	8.1
Testicular failure	1	0..7
Recurent Urinary Tract Infection (UTI)	4	2.7
Vesico ureteric reflux/ Posterior urethral valve	8	5.4
Genitourinary Tuberculosis	1	0.7
Meningomyelocele	3	2
Multiple sclerosis	1	7
Total	148	100.0

Table 4.Diagnosis after Urodynamic study

Diagnosis	Male	Female	Total
Detrusor overactivity (DO)	3(2.5%)	2(7.7%)	5(3.4%)
Bladder outlet obstruction(BOO)	10(8.2%)	2(7.7%)	12(8.1%)
Reduced compliance	7(5.7%)	2(7.7%)	9(6.1%)
Detrusor underactivity	39(32%)	7(26.9%)	46(31.1%)
Normal	23(18.9%)	2(7.7%)	25(16.9%)
Neurogenic Bladder	13(10.7%)	4(15.4%)	17(11.5%)
Reduced Bladder Capacity	11(9%)	3(11.5%)	14(9.5%)
Urge urinary incontinence	1(0.8%)	2(7.7%)	3(2%)
Detrusor overactivity with BOO	4(3.3%)	0(0%)	4(2.7%)
Reduced compliance with DO	7(5.7%)	2(7.7%)	9(6.14%)
DO with stress incontinence	4(3.3%)	0(0%)	4(2.7%)
Total	122(100%)	26(100%)	148(100%)

Table 5.Diagnosis after UDS divided Age-wise

Diagnosis	Age Group				Total
	≤10	11-20	21-30	31-40	
Detrusor overactivity	0(0%)	0(0%)	3(5%)	2(3.1%)	5(3.4%)
Bladder outlet obstruction	2(40%)	1(5.3%)	5(8.3%)	4(6.3%)	12(8.1%)
Reduced compliance	0(0%)	0(0%)	4(6.7%)	5(7.8%)	9(6.1%)
Detrusor underactivity	1(20%)	4(21.1%)	15(25%)	26(40.6%)	46(31.1%)
Normal	0(0%)	3(15.8%)	9(15%)	13(20.3%)	25(16.9%)
Neurogenic Bladder	0(0%)	5(26.3%)	8(13.3%)	4(6.3%)	17(11.5%)
Reduced Bladder capacity	0(0%)	2(10.5%)	8(13.3%)	4(6.3%)	14(9.5%)
Urge urinary incontinence	1(20%)	2(10.5%)	0(0%)	0(0%)	3(2%)
Detrusor overactivity with BOO	0(0%)	0(0%)	1(1.7%)	3(4.7%)	4(2.7%)
Reduced compliance with DO	1(20%)	1(5.3%)	6(10%)	1(1.6%)	9(6.1%)
DO with stress incontinence	0(0%)	1(5.3%)	1(1.7%)	2(3.1%)	4(2.7%)
Total	**5(100%)**	**19(100%)**	**60(100%)**	**64(100%)**	**148(100%)**

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