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Original Article

Surgery Section

Association between Urodynamic and Cystoscopic findings in Women with Bothersome Lower Urinary Tract Symptoms: A Prospective Observational Study

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ABSTRACT

Introduction: Lower Urinary Tract Symptoms (LUTS) are responsible for negative impact on quality of life of women. Urodynamic Study (UDS) is gold standard objective investigation in evaluating bothersome LUTS. Cystoscopy is important where UDS is difficult or unavailable. Despite vital role and unique properties of UDS and cystoscopy, the role of UDS and cystoscopy in the assessment of bothersome LUTS in young females continues to be heavily debatable subject as there is limited study in this age group.

Aim: To evaluate causes of LUTS in young female patients and associate them with urodynamic and cystoscopic findings.

Materials and Methods: This was a prospective observational study conducted in IPGMER and SSKM Hospital, Kolkata, West Bengal, India, from July 2019 to December 2020. A total of 100 female patients from adulthood to menopause were evaluated having decreased quality of life due to LUTS called bothersome LUTS in the form of history taking, clinical examination, basic biochemical tests, ultrasonography followed by urodynamic and cystoscopic examination. Patients were classified according to their LUTS into three groups: storage dysfunction, urinary incontinence and bladder emptying dysfunction. Association of UDS parameters like Idiopathic Detrusor Overactivity (IDO), IDO with detrusor underactivity, Compensated Bladder Outlet Obstruction (CBOO) was made with cystoscopic findings like dilated veins with cystitis, lax urethra, bladder trabeculations, diverticula, urethral stricture. Results were analysed using Microsoft Excel spreadsheet and International Business Machines (IBM) Statistical Package for the Social Sciences (SPSS) version 27.0.

Results: In storage dysfunction group, frequency with nocturia (53.3%) and in urinary incontinence group, stress urinary incontinence (58.3%) was predominant bothersome symptom. In storage dysfunction group 73.3% patients had IDO and 26.7% patients had normal UDS findings. In these patients on cystoscopic examination, 83.3% patients had dilated veins with cystitis changes. In urinary incontinence group 70.8% patients had IDO and 29.2% patients had IDO with detrusor underactivity on UDS examination. In these patients cystoscopic examination 54.2% had lax urethra with cystitis changes. In bladder emptying dysfunction group on UDS examination, all patients had CBOO and 75% had urethral stricture on cystoscopy.

Conclusion: Significant association exists between UDS and cystoscopic findings on evaluation of LUTS in young females patients. Storage dysfunction symptoms were the most common in young age group followed by urinary incontinence symptoms. Bladder emptying dysfunction symptoms were least common.

Keywords: Adulthood, Bladder emptying dysfunction, Menopause, Quality of life, Storage symptoms, Urinary incontinence

INTRODUCTION

The LUTS are major cause of decreased quality of life in female population [1,2]. Women constitute a large population who undergoes UDS for LUTS [2-4]. UDS is gold standard objective investigation in evaluating bothersome LUTS [5]. Cystoscopy is important where UDS is difficult or unavailable due to logistic economic reasons for diagnosing LUTS. Cystoscopy however, provides visual assessment of the urethra and bladder. It gives an insight into the cause of the LUTS, the structural deterioration of the bladder wall provide us with an idea of degree of bladder outlet obstruction [6]. It is imperative to diagnose the bothersome LUTS in the early stages and provide with the necessary therapy to prevent bladder decompensation and hence prevent subsequent complications [6,7]. There are no literature available which have measured bothersome LUTS prevalence in young females in the general population and association with these symptoms with UDS and cystoscopy. So, present study has estimated bothersome LUTS in specific age group of female patients and associate these symptoms with UDS and cystoscopic examination.

MATERIALS AND METHODS

This was a prospective observational study conducted in a tertiary care hospital, IPGME&R and SSKM Hospital, Kolkata, India, from July 2019 to December 2020. Ethical permission for the study was obtained from Institution Ethical Committee with memo no. IPGME&R/IEC/2020/278. All the patients with bothersome LUTS who came during the study period formed the sample population.

Inclusion criteria: All female patients between adulthood to menopause who came with LUTS and decreased quality of life due to that symptoms were included during the study period in outpatient department of urology.

Exclusion criteria: Patients with less than 18 yrs of age and after menopause, patients having diabetes mellitus, neurological disorders and malignancies located in bladder or cervix, patients on drugs such as antipsychotics, antidepressants, anticonvulsants, anticholinergics, alfa-adrenergic agonists or those who were not ambulatory have been excluded from the study.

Study Procedure

In present study, authors have strictly followed recommendations given by International Continence Society (ICS) for performing UDS [3]. American Urological Association (AUA) symptom index was taken as reference guide for evaluation of symptoms during initial assessment and follow-up [6]. The symptoms and the clinical findings of the patients were recorded along with a focused

neurological, abdominal, local, gynaecological and digital rectal examinations. Patients with bothersome LUTS were divided into three groups as storage dysfunction symptoms group (n=60), urinary incontinence symptoms group (n=24) and bladder emptying dysfunction symptoms group (n=16). Radiological investigations were done as required. This was followed by a detailed UDS and cystoscopic examination. Before UDS, the patients were confirmed to have a sterile urine culture. The non invasive uroflow measurement was done and repeated twice and the best free flow pattern was analysed. Multichannel urodynamics was performed next according to the recommendations of the ICS after obtaining proper informed consent. As per UDS findings, BOO can be classified into three groups, (a) Early (Q_{max} of >15 mL/s and $P_{det}Q_{max}$ of <30 cm H_2O); (b) Compensated (Q_{max} of >15 mL/s and $P_{det}Q_{max}$ of >30 cm H_2O); (c) Late (Q_{max} of <15 mL/s and $P_{det}Q_{max}$ of >30 cm H_2O) [7]. After that cystoscopy was done under local anaesthesia in sterile urine culture with proper informed consent in dorsal lithotomy position by 21 French cystoscopic sheath. Details of cystoscopic findings noted like urethral stenosis, urethral mucosa, urethral length, bladder mucosa, bladder diverticula, trabeculations, bladder capacity, bladder neck, foreign body in bladder [7]. Bothersome LUTS are to those patients who had LUTS with decreased quality of life [8].

STATISTICAL ANALYSIS

Descriptive statistics was performed as means, standard deviations and ranges using Microsoft excel. For categorical variables percentage were used. IBM SPSS-Software version 27.0 and Chi-square test was used for statistical analysis. The values of p<0.05 will be considered statistically significant.

RESULTS

A total 148 patients who fulfilled inclusion criteria were initially selected between adulthood to menopause for this study. Out of these 148 patients, 48 patients were lost to follow-up, so finally this study result was obtained in total 100 patients. Mean age of study population (total 100 patients) was 34.7 years (SD±9.7). Majority (70%) of these patients belonged to mean age 39.47 years (SD±4.3) and rest 30% patients were belonged to mean age 31.6 years (SD±4.8). Bothersome LUTS were categorised into three main groups. On analysis of those symptoms it was found that storage dysfunction symptoms (60%) was the most common symptom group followed by urinary incontinence symptoms group (24%). Bladder emptying dysfunction symptoms group (16%) was least common.

In storge dysfunction symptoms group, out of 60 patients, 32 (53.3%) patients had frequency with nocturia, 18 (30% patients had frequency with urgency, 10 (16.7%) patients had frequency with urgency with nocturia. In incontinence group out of 24 patients, 14 (58.3%) patients had stress urinary incontinence as a predominant symptom, 7 (29.2%) patients had mixed urinary incontinence followed by 3 (12.5%) patients had urge urinary incontinence. Bladder emptying dysfunction symptom like sense of incomplete voiding with poor stream comprises 16 (16%) out of total 100 patients.

The UDS findings in incontinence symptoms group showed, 17 (70.8%) patients had IDO and 7 (29.2%) patients had idiopathic detrusor overactivity with detrusor under activity (Late BOO) [Table/Fig-1].

Cystoscopic examination in groups found that in storge dysfunction group, 3 (5.0%) patients had bladder granulations. In incontinence group, 7 (29.2%) patients had cystitis with urethral diverticula, 13 (54.1%) patients had lax urethra with cystitis changes. In bladder emptying dysfunction symptoms group, 12 (75.0%) patients had multiple bladder diverticula with trabeculations with urethral stricture, 3 (18.8%) patients had periurethral mass impinging in urethral lumen and 1 (6.2%) patients had ureterocele with bladder trabeculations as shown in [Table/Fig-2].

	Group			
UDS findings	Storge dysfunction	Incontinence	Bladder emptying dysfunction	Total
Compensated BOO	0	0	16	16
IDO	44	17	0	61
IDO with detrusor underactivity (Late BOO)	0	7	0	07
Normal UDS finding	16	0	0	16
Total	60	24	16	100

[Table/Fig-1]: Association between UDS findings and groups.
UDS: Urodynamic study; BOO: Bladder outlet obstruction; IDO: Idiopathic detrusor overactivity; Chi-square value=128.4699; p-value=0.0001

	Group			
Cystoscopic findings	Storge dysfunction	Incontinence	Bladder emptying dysfunction	Total
Bladder granulations	3 (5%)	0	0	3
Bladder stone	5 (8.3%)	0	0	5
Cystitis with urethral diverticula	0	7 (29.2%)	0	7
Cystitis with urethritis	0	1 (4.2%)	0	1
Dialated veins in bladder wall with cystitis change	50 (83.3%)	0	0	50
Lax urethra with cystitis changes	0	13 (54.1%)	0	13
Multiple bladder diverticula with trabeculations with urethral stricture	0	0	12 (75%)	12
Periurethral mass impinging in urethral lumen	0	0	3 (18.8%)	3
Suture piercing the bladder wall	2 (3.3%)	0	0	2
Ureterocele with bladder trabeculation	0	0	1 (6.2%)	1
VVF	0	3 (12.5%)	0	3
Total	60	24	16	100

[Table/Fig-2]: Association between cystoscopic findings and groups.
VVF: Vesicovaginal fistula; Chi-square value: 137.9742; p-value=0.0001

No significant association of UDS with cystoscopic findings in storage dysfunction group was found (p-value=0.2248). On association of urodynamic and cystoscopic examination in incontinence group a significant association (p-value=0.0324) was found. In bladder emptying dysfunction group in UDS all patients 16 (100%) had CBOO and on cystoscopy of these patients 12 (75.0%) patients had multiple bladder diverticula with trabeculations with urethral stricture, 3 (18.8%) patients had periurethral mass impinging in urethral lumen and 1 (6.2%) patient had ureterocele with bladder trabeculation. These findings not only showed significant association between UDS examination and cystoscopy but also detected actual cause of bladder emptying dysfunction symptoms (p-value=0.0001) [Table/Fig-3].

DISCUSSION

The LUTS term was introduced in 1994 to describe patient's symptoms without describing the cause of the symptoms [1,2]. LUTS have a negative impact on a patient's quality of life from social, physical and psychological aspects, in addition to the high impact on health costs [2]. In women, the prevalence of LUTS and urinary incontinence were reported to be upto 50% in some studies [3]. Stress urinary incontinence represent ~50% of urinary incontinence cases, urge urinary incontinence accounts for almost 10%, while mixed urinary incontinence represents almost 40% [3,4]. The role of ageing clearly appears from the increasing of complaint of urgency and occurrence of both detrusor overactivity and detrusor hypocontractility in the older age group of patients.

UDS findings in storage dysfunction group						
	Findings	IDO	Normal UDS finding	Total	Chi-square	p-value
Cystoscopic findings in storage dysfunction group	Bladder granulations	3	0	3 (5%)	4.3636	0.2248
	Bladder stone	5	0	5 (8.3%)		
	Dialated veins in bladder wall with cystitis change	34	16	50 (83.4%)		
	Suture piercing the bladder wall	2	0	2 (3.3%)		
	Total	44 (73.3%)	16 (26.7%)	60 (100%)		
UDS findings in incontinence group						
	Findings	IDO	IDO with detrusor under activity	Total	Chi-square	p-value
Cystoscopic findings in incontinence group	Cystitis with urethral diverticula	3	4	7 (29.1%)	6.2841	0.0324
	Cystitis with urethritis	1	0	1 (4.2%)		
	Lax urethra with cystitis changes	11	2	13 (54.2%)		
	Vesicovaginal fistula	2	1	3 (12.5%)		
	Total	17 (70.8%)	7 (29.2%)	24 (100%)		
UDS findings in bladder emptying dysfunction group						
	Findings	Compensated BOO	-	Total		p-value
Cystoscopic findings in bladder emptying dysfunction group	Multiple bladder diverticula with trabeculations with urethral stricture	12	-	12 (75.0%)	47.1593	0.0001
	Periurethral mass impinging in urethral lumen	3	-	3 (18.8%)		
	Ureterocele with bladder trabeculation	1	-	1 (6.2%)		
		16 (100%)	-	16 (100%)		

[Table/Fig-3]: Association between cystoscopic and UDS findings in groups.
UDS: Urodynamic study; BOO: Bladder outlet obstruction; IDO: Idiopathic detrusor overactivity

In a large European population-based survey of LUTS (EPIC study), 66% of women reported atleast one LUTS, with nocturia being the most common at 54.5%, followed by urinary incontinence (13.1%) and urgency (12.8%), with an overall prevalence of 11.8% having overactive bladder syndrome [5]. There are large number of females among Indians between adulthood to menopause who presents with genitourinary symptoms. The symptoms are predominantly that of storage dysfunction symptoms, urinary incontinence and bladder emptying dysfunction symptoms. Women with disorders affecting the bladder outlet, such as dysfunctional voiding, large anterior vaginal wall prolapse, and detrusor-external sphincter dyssynergia have nearly identical storage symptom scores as women with LUTS that are secondary to other causes, such as detrusor overactivity [6,7]. Cystoscopy precisely diagnose the bladder wall pathology causing storage dysfunction symptoms [9].

Adulthood age by definition defined as age at beginning of 20 yrs [10]. Mean age of menopause is 59.3 years [11]. In present study population patients were between adulthood to menopause with mean age was 34.7 yrs and most of the patients belonging to the 4th decade of life. Population-based, randomised, cross-sectional study recruited by Timur-Taşhan S et al., showed that 766 women aged 20 years and older from the province of Malatya, Turkey had incidence of urgency, urinary incontinence, nocturia, and frequency symptoms was 36.1%, 32.4%, 27.1%, and 22.8%, respectively [12]. Another study done by van Breda HM et al., on hidden prevalence of LUTS in healthy nulligravid young women showed that LUTS were found in 67.3% of the women. In those out of 67.3% women, urgency was found in 14.5%, hesitancy was found in 14.5%, nocturia was found in 18.2% and urinary incontinence (UI) was found in 20.1% women. In a presumably healthy population of young nulligravid women the prevalence of LUTS and UI was high, but with relatively low bother [13]. Limitations of these two studies are that they have not mentioned about bothersome LUTS and symptoms were not correlated with UDS and cystoscopic examination. As compared to above studies, in our study, a significant number (60%) of patients presented with bothersome symptoms predominantly of storage dysfunction symptoms. The most common symptoms were frequency with nocturia (53.3%), followed by frequency with urgency (30%) followed by frequency with urgency with nocturia (16.7%). On UDS examination of these storage dysfunction symptoms patients 73.33% patients have IDO and on cystoscopy of these patients 83.33% patients have dilated veins in bladder wall with cystitis changes. The role of urodynamic study in incontinence patients is valuable [14]. Women with complaints of urinary incontinence, especially those for whom surgery is contemplated, should undergo complete urodynamic evaluation when it is available [15]. Cystourethroscopy can facilitate important anatomic and functional assessments of the lower urinary tract that can lead to diagnosis of abnormality in urethra and bladder while cystoscopy and vaginoscopy can be used to determine the site, size, number, and location of genitourinary fistula relative to the ureteric orifices. In present study, 24 patients had urinary incontinence out of which 58.3% patients had stress urinary incontinence followed by 29.2% patients had mixed urinary incontinence and 12.5% patients had urge urinary incontinence. In UDS examination of all these patients, 70.8% patients had IDO detected and 29.2% patients had IDO with underactivity (Late BOO) and on cystoscopy 54.2% patients had lax urethra with cystitis changes in bladder followed by 29.2% patients with urethral diverticula, 12.5% patients with vesicovaginal fistula and 4.2% patients with cystitis with urethritis only. UDS and cystoscopic findings precisely diagnosed the cause of incontinence which helped in management plan.

In men, the quantitative evaluation of the voiding function is done by a pressure-flow analysis of the micturition cycle. The maximum flow rate (Qmax) and detrusor pressure at maximum flow rate (PdetQmax) are the two urodynamic parameters that are used in various nomograms for the diagnosis of BOO [16]. In females, however, due to normal voiding pressure being significantly lower, these nomograms may not be applicable. In females, the voiding LUTS were classified into three stages of urodynamic BOO [17]. In large retrospective reviews of women referred for evaluation of LUTS, 2.7-8% had urodynamic evidence of BOO [18]. However, in present study, patients between adulthood to menopause 16% were categorised as clinically obstructed in which UDS examination of these patients showed all had CBOO and on cystoscopy of these patients all had multiple bladder trabeculations and nearly 75% patients had urethral stricture. In these patients urodynamic

and cystoscopic findings consistently associate with their findings. Urethral stricture is generally not seen on vaginal palpation, but conditions like urethral caruncle, uterine prolapse and carcinoma should be obvious [19].

Cystoscopy should be used as a first-line investigation to diagnose LUTS among young female patients with bothersome LUTS, especially where UDS is a difficult option because of logistic reasons. As discussed in the results, the cystoscopic findings in these patients associate well with the UDS findings. There was a definite positive association between the UDS and cystoscopic in storage symptom group and bladder emptying dysfunction group. Patients with bothersome LUTS between adulthood to menopause needs good history, physical examination along with UDS followed by cystoscopic examination for proper evaluation of patients which helps in appropriate diagnosis and management.

Limitation(s)

Limitations of this study was patients before menarche and after menopause were not considered. Patients were considered only having bothersome symptoms. Study population could be increased beyond 100 patients. This study was done only in single centre tertiary care hospital. In future, we need to be much more specific about each symptom and associate the UDS and cystoscopic finding for that symptom.

CONCLUSION(S)

Major bothersome LUTS in patients between adulthood to menopause were storage symptoms followed by incontinence followed by bladder emptying dysfunction symptoms. Storage and bladder emptying dysfunction symptoms associate well with urodynamic and cystoscopic findings. UDS followed by cystoscopic examination of these patients not only helped in identifying the actual cause of bothersome LUTS but also revealed the proper diagnosis which further helped in formatting definitive treatment plan of these patients.

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