Original Article

Is urodynamic study is a necessity for evaluation of lower urinary tract symptoms in postmenopausal female patients? Result of a prospective observational study

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Abstract

Aim: The aim of this study is to evaluate the causes of lower urinary tract symptoms (LUTS) in postmenopausal female patients (PMFP) and correlate their symptoms with their urodynamic study (UDS) findings.

Materials and Methods: A prospective observational study analyzing the clinical and UDS findings of PMFP presenting with LUTS. A detailed history including history of diabetes, neurological disease, drug history, and pelvic surgeries was taken, followed by physical examination and urodynamic assessment.

Results: A total of 100 patients were classified according to their predominant symptoms into three categories: (1) voiding dysfunction (45 patients), (2) storage symptoms (30 patients), and (3) urinary incontinence (25 patients). The patients with voiding LUTS could be categorized urodynamically into three grades of bladder outlet obstruction (BOO): (a) early (37.8%) (maximal flow [Qmax] >15 mL/s and detrusor pressure at maximal flow [PdetQmax] >30 cm of water), (b) compensated (31.1%) (Qmax <15 mL/s and PdetQmax >30 cm of water), and (c) late (31.1%) (Qmax <15 mL/s and PdetQmax <30 cm of water). The patients with storage symptoms could be categorized into two with either the presence of demonstrable idiopathic detrusor contractions (53.3%) or not (46.7%). The patients with incontinence were of three types: (a) stress incontinence (44%), (b) urge incontinence (28%), and (c) mixed incontinence (28%). UDS showed no demonstrable leak in nine patients (36%) and the rest had UDS findings corroborative to their symptoms.

Conclusions: Thus, the major LUTS in PMFP were BOO, storage symptoms, and incontinence. Proper evaluation of LUTS necessitates UDS and along with good physical examination can help us in reaching a correct diagnosis and plan respective treatment.

Keywords: Bladder outlet obstruction, lower urinary tract symptoms, postmenopausal female patients, urinary incontinence, urodynamic study

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INTRODUCTION

The lower urinary tract and the genital tract, embryologically, are in proximity to each other and arise from the primitive urogenital sinus in the first trimester. The squamous epithelium of the urethra and the trigone of the bladder along with the genital epithelium of the females express

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estrogen receptors; and synchronize under the hormonal effects. With menopause, there is a significant fall in the level of estrogen and hence the impact on all estrogen-sensitive tissues.[1] There are both histological and functional changes associated with menopause due to the falling levels of circulating estrogen, both in the genital tract as well as the lower urinary tract.[2]

Lower urinary tract dysfunction is a major cause of decreased quality of life in aging population. Although many patients avoid discussing their problems, postmenopausal women constitute a large population who undergoes urodynamic study (UDS) for lower urinary tract symptoms (LUTS).[3] Usually, they present with symptoms of bladder outlet obstruction (BOO) or with storage symptoms or urinary incontinence (UI). Proper clinical evaluation and appropriate UDS are an integral part of the evaluation of these problems and will help in proper therapeutic approach for the patient.

MATERIALS AND METHODS

This study on the LUTS in postmenopausal female patients was conducted in a tertiary care hospital in India, from February 2015 to October 2016. This was a prospective observational study with a total of 100 postmenopausal female patients with LUTS that were included in the study. However, patients with diabetes, neurological disorders, and malignancies located in bladder or cervix, those on drugs such as alpha-blockers, anticholinergic, hypnotics, and diuretics or those who were not ambulatory or were already catheterized have been excluded from the study.

The symptoms and the clinical findings of the patients were recorded along with a focused neurological, abdominal, local, gynecological, and digital rectal examinations. This was followed by a detailed UDS. Before UDS, the patients were confirmed to have a sterile urine culture and were asked to maintain a voiding diary.

The noninvasive uroflow measurement was done and repeated twice, and the best free flow pattern was analyzed. Multichannel urodynamics was performed next according to the recommendations of the International Continence Society after obtaining proper informed consent.

Results were analyzed using Student's *t*-test and Chi-square test. The values of $P < 0.05$ were considered statistically significant. Data are presented as mean, median, and range or percentage, according to the variables.

RESULTS

A total of 100 patients were recruited into the study. A majority of the patients (54%) belonged to the age group between 50 and 60 years of age. All patients were ambulatory first-time care seekers to this hospital and were fulfilling the inclusion criteria.

Analysis of the presenting symptoms of these patients revealed that increased frequency of urine being the most common symptom with 93% of patients, followed by urgency and obstructive voiding symptoms in the form of a poor stream and sense of incomplete voiding. Twenty-five percentage of patients presented with incontinence either in the form of stress related or urge or mixed incontinence [Table 1].

The patients could be grouped into three main categories based on their predominant presenting symptoms: the first group comprises forty-five patients with mainly voiding LUTS - the "clinically obstructed" group, the second group of thirty patients with storage LUTS - the clinically "overactive bladder" group and the third group of 25 patients with incontinence.

All these patients underwent UDS evaluation for confirmation of their presumptive diagnosis. The first group of patients with voiding symptoms, that is, the clinically obstructed patient can be divided urodynamically into three grades of BOO as mentioned in a study by Elmissiry *et al*.[4]

- Early (Qmax of >15 mL/s and PdetQmax of >30 cmH_2O)
- Compensated (Qmax of <15 mL/s and a PdetQmax of >30 cmH_2O)
- Late (Qmax of <15 mL/s and a PdetQmax of <30 cmH_2O).

Of the total 45 patients with voiding symptoms, seventeen patients had UDS findings of early BOO and fourteen each in the compensated and late stages of BOO [Table 2]. The peak flow rates (Qmax) were significantly lower with the

Table 1: Symptoms-wise distribution of the total 100 patients

Symptoms	Percentage
Frequency	93
Urgency	64
Dysuria	50
Sense of incomplete voiding	39
Poor stream	41
Nocturia	44
Incontinence	
Stress	16
Urge	12
Mixed	7

worsening stage of the outlet obstruction ($P < 0.0001$). The residual volume was less in the early stages of BOO as compared to the patients with compensated and late BOO combined together as a group ($P < 0.0001$). The physical findings associated with the patients with BOO were genital prolapse, urethral stricture, and urethral caruncle.

There were a total of thirty patients who presented with predominant storage symptoms. Of these, 53.3% of patients had demonstrable idiopathic detrusor contractions (IDC) present in their UDS results. The patients with demonstrable IDC had a significantly higher maximal detrusor pressure (Pdetmax) ($P < 0.0001$) and lower Qmax ($P < 0.05$) and postvoid residual (PVR) ($P < 0.05$); however, there was no significant difference in the PdetQmax [Table 3].

There were 25 patients who presented with UI of which 9 (36%) patients had a completely normal UDS findings with no demonstrable leak during the evaluation, 7 (28%) of them had urodynamic stress incontinence, 4 (16%) had urodynamic urge incontinence, and 5 (20%) had mixed incontinence. Pelvic floor prolapse along with posthysterectomy status were the main associated findings with these patients with incontinence [Table 4].

DISCUSSION

The LUTS due to estrogen deficiency develop overtime and may present after years of attaining menopause. With age, the urogenital complaints increase in females, and although nearly half of elderly women will be symptomatic, they often delay seeking treatment for several years.[5]

In a study done by Ostergard and McCarthy,[6] the mean age of menopause is 59.3 years. In our study population, the majority of the patients belong to the sixth decade of life.

There is large number of females among Indians who presents with genitourinary symptoms, and this can be

Table 2: Urodynamic study findings of patients with bladder outlet obstruction

Type of BOO, actual numbers (percentage among BOO patients)	Qmax (mL/s)	Maximum voided volume (mL)	Postvoid residual volume (mL)	Pdetmax (cm of H_2O)	PdetQmax (cm of H_2O)
Early BOO, 17 (37.7%)					
Mean	18.70	297.88	77.23	43.82	36.176
Median	19.00	265.00	79.00	42.00	36.00
Range	16-22	215-400	31-143	36-54	31-46
Compensated BOO, 14 (31.1%)					
Mean	9.43	217.21	242.07	51.5	43.285
Median	9.50	192.00	165.50	49.50	40.50
Range	4.3-14	67-430	86-600	38-68	31-64
Late BOO, 14 (31.1%)					
Mean	6.81	252.71	204.50	32.98	21.5
Median	7.0	236.00	190.00	31.00	21.50
Range	3.5-10	110-426	158-260	26-42	16-27

BOO: Bladder outlet obstruction, PdetQmax: Detrusor pressure at maximal flow, Pdetmax: Maximal detrusor pressure

Table 3: Urodynamic study findings of patients with storage symptoms

Total patients (30), actual numbers (percentage of patients)	Qmax (mL/s)	Maximum voided volume (mL)	Postvoid residue (mL)	PdetQmax (cm of H_2O)	Pdetmax (cm of H_2O)
Normal, 14 (46.66%)					
Mean	22.64	302.42	24.85	25.85	31.64
Median	22.00	377.00	24.50	26.00	31.50
Range	19–28	256–377	0–50	22–29	28–36
IDC positive, 16 (53.33%)					
Mean	22.64	350.87	14.68	25.93	40.25
Median	26.50	430.00	15.50	26.00	38.00
Range	16–37	200–430	0–31	21–36	31–56

IDC: Idiopathic detrusor contractions, PdetQmax: Detrusor pressure at maximal flow, Pdetmax: Maximal detrusor pressure

Table 4: Urodynamic study findings in the patients with symptomatic incontinence

Symptoms (actual numbers)	Urodynamic findings (actual numbers with associated clinical findings)		
	Stress incontinence	Detrusor instability	No abnormality
Stress incontinence (11)	7 (prolapse=2; post-TAH=2; post-TAH and pelvic floor prolapse=3)	0	4 (normal=2)
Urge incontinence (7)	0	4 (normal=2; post-TAH and pelvic floor prolapse=2)	3 (normal=2; post-TAH=1)
Mixed incontinence (7)	5 (post-TAH=2; prolapse=3)	5	2 (normal=2)

TAH: Total abdominal hysterectomy

extrapolated in the postmenopausal group of patients too. The symptoms are predominantly that of obstructive voiding, storage symptoms, and UI. Symptoms of voiding dysfunction in women are often mixed, and it is not uncommon for disorders of voiding to be missed on initial evaluation. 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; however, overall symptoms and voiding scores seem to be higher in women with voiding dysfunction.[7] In our study, a significant number (45%) of patients presented with symptoms predominantly of voiding dysfunction. The most common symptoms were frequency (93%), followed by the sense of incomplete voiding, nocturia, and poor stream of urine. Furthermore, the voiding scores and overall symptoms were higher in voiding dysfunction group in comparison to storage group.

In men, the quantitative evaluation of the voiding function is done by a pressure-flow analysis of the micturition cycle.[8] 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.[9,10] In females, however, with normal voiding pressure being significantly lower, these nomograms may not be applicable.

In large retrospective reviews of women referred for evaluation of LUTS, 2.7%–8% had urodynamic evidence of BOO.[11,12] However, in our study, we found that 45% of patients were categorized as clinically obstructed and UDS showed 62% of those have got established BOO (compensated and late group). All of the patients in storage group have Qmax >15 mL/s.

Diokno *et al*.[13] suggested that detrusor pressure in excess of 60 cm of water and peak flow rate of <15 mL/s should be accepted as obstruction in women provided there is video evidence of funneling of the bladder neck and relaxation of the urethral sphincter during voiding. Blaivas and Groutz[14] first tried to introduce a nomogram for the diagnosis of bladder outflow obstruction in women. In their study, Qmax of the free uroflow was plotted on the X-axis and the PdetQmax on the Y-axis. Thus, Qmax of free uroflow of <12 mL/s and PdetQmax of >20 cm were thought to constitute obstruction. The nomogram also classified the degree of obstruction in the form of mild, moderate, and severe. Despite these pieces of work, there is still no agreement on the precise determination of bladder outflow obstruction in women. Chassagne *et al*.[11] analyzed pressure-flow parameters of 35 "clinically obstructed" women. Maximum flow rate of 15 mL/s and PdetQmax of >20 cmH_2O were found to be reasonable parameters for the urodynamic definition of BOO. The classical picture of obstruction, by pressure-flow study, thus, is a low maximum urinary flow rate and a high voiding detrusor pressure. There are several studies evaluating the values of these two parameters in BOO. The threshold for Qmax reported in women with BOO is <11–15 mL/s while that for PdetQmax is >20–50 cmH_2O.[4,15-18] Some investigators believe that low flow in the presence of a normal or low detrusor pressure might be an indication of relative obstruction.[19] There is an agreement that neither pressure-flow data only nor clinical symptoms alone are sufficient for diagnosing BOO in females. In the study by Elmissiry *et al*.,[4] two thresholds in accordance with the study of Chassagne *et al*.[11] were used and they showed that the best threshold for Qmax and PdetQmax derived from receiver operating characteristic curves to define obstruction in women was 15 mL/s and 30 cmH_2O, respectively, with a sensitivity of 80% and a specificity of 70%. Postvoid residue was also an important parameter in the urodynamic assessment of the patients with BOO. In combination with PVR, the clinically obstructed patients can be grouped into three categories:

- Group A (early obstruction) has obstructive symptoms with normal Qmax and insignificant PVR, but they void with a high voiding pressure
- Group B (compensated obstruction) has obstructive symptoms, a low urinary flow rate, and high voiding pressure, with a significant PVR (>100 mL)
- Group C (late decompensated obstruction) has obstructive symptoms, a low flow rate, and a low or normal voiding pressure but with a significant PVR.

In our study also the postmenopausal patients could be segregated into these three groups: 37.1% patients belonging to early BOO, 31.1% each in compensated BOO, and decompensated BOO each. There was a significant correlation in the urodynamic parameters (Qmax and PdetQmax) with worsening grades of BOO. Furthermore, the differences in the PVR between early BOO patients and the rest of the patients were significant.

The prevalence of postmenopausal UI is between 16% and 29%[20] and urge UI, in particular, occurs more frequently after the menopause.[21] Aging is clearly a significant factor in the pathogenesis of UI, but the evidence seems to indicate that menopause and estrogen deficiency are also implicated.[22,23]

Majority of women perceive the development of urinary symptoms and specifically UI as a normal part of aging,

rather than a pathological process. Nocturia increases in prevalence from 10% at 50 years of age to 50% at the age of 80 years. The bladder also becomes less efficient with age. Older women experience a reduced flow rate, incomplete emptying of the bladder, a higher first sensation to void, and decreased detrusor pressures. Histology reveals an increase in fibrosis and a reduction in muscle fibers and density in the aging bladder. In the study done by Valentini *et al*.,[3] UI is the main motive for urodynamics in that postmenopausal population. Mixed UI increases with aging, probably due to the association of a decreased urethral sphincter function and occurrence of detrusor overactivity. In that population of postmenopausal females, the lack of adaptation of the sphincter to bladder filling could explain the complaint of incontinence; the role of aging 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.

In our study, UDS did not show any demonstrable leak in 36% of patients, highlighting the role of detailed physical and pelvic examinations. In rest, UDS precisely diagnosed the cause of incontinence which helped in management plan. The clinical findings associated with these patients in our study population were mainly prolapse and posthysterectomy status; however, a significant number of eight patients were normal on physical examination.

CONCLUSION

The physiological effects of the decreasing level of estrogen along with the aging process make the postmenopausal females at higher risk for LUTS. Urodynamic evaluation of these symptoms in this population is necessary in reaching a proper diagnosis as proved in our study and should be combined with detailed physical examination to formulate proper management plan.

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Conflicts of interest
There are no conflicts of interest.

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