

Key Messages of Urodynamic Studies in Cases of Urinary Incontinence and Pelvic Organ Prolapse: A Retrospective Review

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ABSTRACT

Objectives: There is conflicting evidence regarding the indications of urodynamic studies (UDS) and various guidelines. American urogynecologic Society (AUGS), National Institute of Health and Care Excellence (NICE), and WHO provide variant indications for UDS testing. For developing countries, there are no data to support the usefulness of UDS. Considering the cost, invasiveness, and expertise required for UDS, we planned to review UDS performed at Aga Khan University and Hospital (AKUH) from 2007 to 2014. Our purpose of study was to derive important conclusive messages as a guideline for future practices.

Study design: This is a cross-sectional retrospective review of 500 patients undergoing UDS from 2007 to 2014.

Results: Comparison between clinical diagnoses and urodynamic diagnoses was done and frequencies were computed. The mean age of the patients was 61.1 years, the mean body mass index was 25 and mean parity was 4.1. There was a matching between clinical and urodynamic findings of stress urinary incontinence (SUI) and overactive bladder (OAB), but disparity was observed in cases of mixed urinary incontinence (MUI) and lower urinary tract symptoms (LUTS). Occult SUI was found in 33% of patients with POP.

Conclusion: Key messages were derived for future practice stating that for cases of SUI and OAB, UDS are not required, but patients with complex MUI, chronic LUTS, and neurogenic bladder warrant UDS.

Keywords: Pelvic organ prolapse, Stress urinary incontinence, Urodynamic studies.

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INTRODUCTION

Urodynamics are functional tests of the bladder that are commonly requested for the evaluation of urinary

incontinence (UI) and pelvic organ prolapse (POP). The only benefit of urodynamic study is when it changes clinical diagnosis and the final diagnosis based on UDS requires an entirely different line of treatment.¹ As a diagnostic test that also can provide prognostic information, urodynamics are requested when there is a specific question that needs to be answered. Urodynamic studies (UDS) are used to help in the diagnosis of storage or emptying problems (urinary incontinence, voiding dysfunction, obstruction, etc.). The clinical applications of UDS can be broad. Consensus is lacking on which patients and for which voiding symptoms UDS should be routinely performed² and various guidelines, e.g., NICE have reflected on the issue.³ As UDS are invasive, they should be used after detailed history, physical examination, and noninvasive testing. It is generally accepted that UDS are not needed before conservative, empiric, noninvasive treatments for stress urinary incontinence or urinary incontinence in general.⁴

In a large health care claim study in the United States of more than 16,000 UDS, the most common clinical indications for urodynamics included: Stress urinary incontinence (SUI 34%), urge urinary incontinence (UUI; 16%), urinary retention (12%), pelvic organ prolapse (9%), other urinary incontinence (7%), mixed incontinence (7%), and neurogenic bladder (7%).²

According to the NICE guidelines 2006 and AUA/SUFU guidelines 2012, there is no need to perform multichannel filling and voiding cystometry in the small group of women where pure SUI is diagnosed based on a detailed clinical history and examination.^{3,4} The National Institute for Health and Clinical Excellence advised against routine urodynamic testing before surgery "in women with a clearly defined clinical diagnosis of pure stress urinary incontinence."^{5,6}

The other clinical condition requiring UDS before POP surgery is to exclude occult SUI, particularly in cases where *de novo* SUI is anticipated as well. Surgery for POP demands counseling for occult SUI and *de novo* SUI, and UDS is required in some cases of POP with or without UI. In a study by Al-Mandeel H, occult SUI (OSUI) was found in up to 80% of women with advanced POP and he concluded that counseling symptomatically continent women with POP concerning the potential risk for developing SUI postoperatively cannot be overstated.⁷

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There is conflicting evidence regarding the indications of UDS and various guidelines AUGS, NICE, WHO provide variant indications for UDS testing. For developing countries, there are no data to support the usefulness of UDS. Considering the cost, invasiveness, and expertise required for UDS, we planned to review UDS performed at AKUH from 2007 to 2014. The purpose of our study was to derive important conclusive messages as a guideline for future practices.

MATERIALS AND METHODS

We planned a retrospective study to review files of all patients visiting urodynamic clinics at AKUH from 2007 to 2014 (n = 500). A formal exemption was obtained from institution’s Ethical Review Committee.

The patient files were reviewed using ICD-10 from hospital HIMS. A study performa was developed, which included all the questions related to UI, POP, and demographic features. Only valid confidential files were included. Study data were computed using Statistical Package for the Social Sciences (SPSS) version 21 and statistical analysis was performed using frequency percentages (%).

RESULTS

Our search identified 500 valid files to include in our study and retrieve all information regarding UDS from 2007 to 2014.

Table 1 shows the demographic characteristics of the study patients. The mean age of the patients was 61.1 years, the mean BMI was 25, and mean parity was 4.1.

Overall, there were eight major indications of UDS: Stress urinary incontinence (SUI), mixed urinary incontinence (MUI), urge urinary incontinence (UUI), overactive bladder (OAB), neurogenic bladder (NB), chronic LUTS, polysymptomatic nocturnal enuresis (NE), and pelvic organ prolapse with and without UI.

Table 2 summarizes the clinical and urodynamic diagnoses of the 500 patients included in the study. There was a matching between clinical diagnoses of SUI alone or in combination with MUI with urodynamic diagnosis, as in 38% of patients USI was found; however, we found a gross disparity in 28% of patients who were diagnosed as having detrusor overactivity (DO) on UDS.

Table 2: Clinical diagnoses and frequencies of Urodynamic diagnoses in study participants

<i>Number (n)</i>	<i>Clinical diagnosis</i>	<i>Urodynamic diagnosis n (%)</i>
32	SUI	USI= 12 (38%) DO=9 (28.5%) Neurogenic bladder= 3 (9.5%) Normal study= 6 (19%) Low bladder compliance= 2 (4.7%)
45	OAB	DO=27 (60%) USI= 1 (3.3%) Normal study= 7 (16%) Low bladder compliance= 7 (13.3%) Neurogenic bladder= 1 (3.3%) DO/USI= 1 (3.3%) Painful bladder syndrome= 1 (3.3%)
54	Neurogenic bladder	Neurogenic bladder= 20 (38.8%) USI= 3 (5.5%) DO=9 (16.5%) USI/DO= 9 (16.6%) DSD= 2 (2.7%) Low bladder compliance= 6 (11.1%) BOO= 2 (2.7%) Detrusor underactivity= 3 (5.5%)
20	POP with UI	BOO= 6 (28%) Neurogenic bladder= 4 (21.4%) DO= 3 (14%) USI/DO= 3 (14%) Normal study= 3 (14%) Low bladder compliance= 1 (7%)
14	POP without UI	OCCULT SUI= 5 (33.33%) Normal= 9 (66.66%)
94	LUTS	BOO= 16 (16.1%) USI/DO= 13 (14%) DO= 15 (15.9%) Low bladder compliance= 11 (11.2%) USI= 14 (14.6%) Neurogenic bladder= 7 (8%) Painful bladder syndrome= 5 (4.8%) DSD= 2 (1.6%) Normal= 11 (11.2%)
245	MUI	DO/USI= 75 (31%) DO= 53 (21.7%) USI= 58 (23.6%) Normal study= 37 (14.9%) Neurogenic bladder= 5 (1.8%) Painful bladder syndrome= 2 (0.6%) BOO= 9 (3.7%) Low bladder compliance= 6 (2.4%)

Table 1: Demographic characteristics of study participants

<i>Characteristics</i>	<i>Number (n) = 500</i>
Age (mean)	61.1 years
BMI (mean)	25.6
Parity (mean)	4.3
<i>Clinical diagnosis</i>	
SUI	32 (6.4%)
OAB	45 (9.1%)
Neurogenic bladder	54 (10.9%)
Nocturnal enuresis	3 (0.6%)
Chronic LUTS	94 (18.9%)
MUI	245 (49%)
POP with UI	20 (4%)
POP without UI	14 (2.9%)

Patients with OAB on UDS were also found to have a great degree of matching between their clinical and urodynamic findings (60%).

Patients undergoing UDS for a clinical diagnosis of MUI had good correlation with UDS findings (31%), but many were found to have isolated DO or USI after the procedure (21.7 and 23.6% respectively). (The UDS diagnoses of patients with a clinical picture of chronic LUTS showed great disparity, with 16.1% showing BOO and similar percentages showing USI and DO (14.6–15.9% respectively). The patients who were clinically diagnosed as having neurogenic bladder, great differences were found as diagnosis changed to USI, DO, and low bladder compliance in a large number of patients.

Patients planned for POP surgery were subjected to UDS for diagnosis of occult SUI and a majority showed the presence of the hidden pathology warranting a second incontinence procedure simultaneously with the prolapse surgery (33.33%).

DISCUSSION

The latest evidence regarding use of UDS includes limited indications regarding patients with SUI as echoed by the new AUA/SUFU guidelines.³

A majority of patients proved the diagnosis to be right by demonstrating USI on UDS (38%). This is similar to a study by James et al who reported that patient history has a positive predictive value of identifying USI ranging between 52 and 100%.⁸ These findings are similar to a recently published Urinary Incontinence Treatment Network multi-center trial, which concluded that urodynamics studies did not enhance the predictive value regarding treatment outcomes when compared to office assessment alone.⁹ Still, DO was identified in 11 to 16% of women with pure stress incontinence symptoms, and our study showed DO in 28.5% of these patients.

With reference to the patients with a clinical diagnosis of OAB, our study showed that 60% demonstrated DO and therefore there was no need of UDS prior to starting medication in OAB cases as a first line of treatment. According to the AUA/SUFU guideline 2012, clinicians may perform multichannel filling cystometry when it is important to determine if altered compliance, DO, or other urodynamic abnormalities are present in patients with urgency incontinence when invasive or irreversible treatments are considered.⁴ Digesu et al¹⁰ conducted a large study of 4,500 women with clinical symptoms of OAB. As much as 30% had DO on UDS testing, with only 28% having OAB symptoms. The investigators argued that without UDS testing, some women could have been treated with anticholinergic medications and made worse and other asymptomatic women would

not have been treated. An alternative conclusion is that, besides documenting the poor correlation between DO and OAB, to initiate anticholinergic medications only on urodynamic evidence of DO leads to delay in care. The study by Hashim and Abrams¹¹ of patients with OAB found 30% of women with no OAB symptoms had DO on testing. For urinary urgency and frequency, the distinction between OAB and DO does not appear to make a rational difference in the treatment approach.

A patient with refractory urgency incontinence may have concomitant urodynamic diagnoses of SUI or BOO, and correction of these associated conditions may greatly improve the symptoms related to urinary urgency. In our study, only one patient with clinical OAB was diagnosed to have USI on UDS (3.3%).

Neurogenic bladder dysfunction is a functional disturbance caused by neural lesion or neuropathy, which is associated with the urethral functional disturbance and functional dysfunction of the bladder and urethra.¹² According to a study by Dong et al, the urodynamic study is irreplaceable in the classification, diagnosis, treatment, and prognosis of neurogenic bladder caused by intervertebral disk hernia. In our study, in patients with NB, the clinical diagnosis was proven in 38.8% of patients on UDS; out of which, 16.6% had DO, 5.5% had USI, 16.6% had USI/DO, and 2.7% had DSD on UDS. As much as 38% of patients were unable to void, and metabolic, iatrogenic, and systemic causes were investigated along with spinal causes as the spinal cord is the primary nerve center of urination to control the function of the detrusor muscle and the urethral sphincter muscle, and it is also the pathways of the ascending nerve fibers, which transmit the sense impulse from bladder and urethra to the micturition center above the spinal cord, and the descending nerve fibers, which transmit the impulse from the micturition center above the spinal cord to the primary micturition center in the spinal cord (Jieping 2004).¹³ In a study done on patients of multiple sclerosis (MS), the most frequent cystometric picture was DO (mean occurrence of 65%, 34 to 99%), followed by detrusor underactivity (mean occurrence of 25%, 0 to 40%) and poor bladder compliance (2–10%). Detrusor-sphincter dyssynergia (DSD) was estimated with a prevalence of 83% and a mean of 35%.¹⁴

In our study, patients with chronic LUTS and voiding dysfunction were 62 (18.9), out of which, majority had BOO (16.1%). The AUA/SUFU guidelines state that clinicians can perform PVR in patients with LUTS as a safety measure to rule out significant urinary retention.⁴ For BOO in men, UDS are the gold standard, but the urodynamic diagnosis of obstruction in females is not well established.

No relevant studies have been identified regarding the usefulness of cystometry for guiding clinical management

in patients with LUTS. For some conditions associated with LUTS, cystometry is the diagnostic standard. However, cystometry often fails to explain symptoms,¹⁵ and the reproducibility of finding DO in the same patient can be different, depending on whether the studies are performed consecutively¹⁶ or on different days.¹⁷

In a study to evaluate correlation between history and urodynamic findings by Rizvi and Chughtai,¹⁸ concordance findings of MUI was observed in 27 (35.06%) cases.

For cases of POP, it is recommended that clinicians should reduce the prolapse before stress testing as it increases the detection rate. A significant proportion of women are found to have occult SUI on prolapse reduction.^{19,20} This is possible independently or during UDS. In our study, occult SUI was detected on UDS in 33.33% of patients and this high figure prompts us to recommend detailed counseling of the possibility of *de novo* or occult SUI before embarking on a surgical procedure for POP and addition of a sling procedure simultaneously. This conclusion is seconded by the CARE trial in 322 stress-continent women with stages II-IV prolapse who underwent standardized urodynamics and concluded that preoperative USI leakage during reduction testing is associated with a higher risk for postoperative stress incontinence at 3 months.²¹

Much has been published regarding when and if multichannel UDS should be done in the settings of female urinary incontinence and POP. Controversy exists over whether routine urodynamic testing in this context renders net patient benefit.

CONCLUSION

This study aims to arrive at some key messages, which have been outlined as follows, regarding the net patient benefit of routine UDS in the settings of female urinary incontinence and POP.²² Based on our experience, following are six key messages derived from this study to provide a guideline for future practice.

1. For simple cases of SUI, clinical diagnosis along with cough test, uroflowmetry, and postvoid residual volume measurement (UFM and PVR), UDS probably are not indicated as USI terminology defined by ICS is still debatable.
2. In complicated neurogenic bladder, UUI/MUI, our study concluded that isolated DO occurred in about 30% of patients therefore UDS are required before embarking any intervention.
3. In old menopausal women presenting with LUTS, our data showed that 12.9% are diagnosed as having DO, 11.2% with low bladder compliance, and 5% with neurogenic bladder, hence for pertinent treatment, UDS are justified.

4. UDS before surgery for POP revealed USI in 33.33% of patients who were asymptomatic for stress incontinence, therefore concluding that preoperative counseling should include occult and *de novo* SUI and UDS can be offered.
5. Cases of recurrent UTI (RUTI) with long-term effects of recurrent cystitis and its associated urinary incontinence requires either cystoscopy or UDS. The indications of UDS in such patients need to be individualized.
6. For patients presenting with voiding dysfunction or painful urethral/bladder syndrome, cystoscopy is the investigation of choice and rarely the need for UDS would arise.

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