

## Is cystourethroscopy alone enough to diagnose bladder outlet obstruction in post-menopausal female patients? A comparative analysis with urodynamic and radiological evaluation

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### Article History

*Received: 10.09.2017*

*Accepted: 16.09.2017*

*Published: 30.09.2017*



**Abstract:** The diagnosis and management of bladder outlet obstruction among postmenopausal patients is a complex process with various modalities available for its diagnosis. Cystourethroscopy is an important tool for the same and we intend to study if it is enough in the diagnosis of the presence and degree of bladder outlet obstruction in post-menopausal female patients with lower urinary tract symptoms. Post-menopausal female patients with voiding symptoms were subjected to urodynamic study, micturating cystourethrogram and cystourethroscopy to see if the findings of the cystourethroscopy correlated with the other two modalities of diagnosis and grading of bladder outlet obstruction. Fifty four patients were recruited in the study. The American Urological Association symptom scores and their grades of severity were obtained and compared with their urodynamic study, cystoscopy and micturating cystourethrography findings. There was positive correlation between the worsening symptom grades and increasing scores with respect to the higher grades of the urodynamic and cystoscopic findings and urethrography findings for bladder outlet obstruction. Also, the cystoscopy findings not only correlated well with the urodynamic findings but also, it was able to identify patients with severe bladder outlet obstruction earlier than urodynamic study. Cystourethroscopy is a significant tool in both the diagnosis of bladder outlet obstruction and its grading among post-menopausal females with voiding lower urinary tract symptoms and it may be alone enough for the same especially in situations where urodynamic study is difficult due to logistic reasons.

**Keywords:** Bladder outlet obstruction, post-menopausal female patients, urodynamic study, cystourethroscopy, micturating cystourethrography

## INTRODUCTION

Lower urinary tract symptom (LUTS) is one of the important causes of worsening quality of life among the ageing population. Symptomatic changes in the lower urinary tract occur as part of ageing, and it is often difficult to distinguish these from those due to estrogen deficiency [1]. Older women experience a reduced flow rate along with incomplete emptying of the bladder, and usually present with voiding LUTS [2]. There is increased fibrosis and reduced muscle fibers and density with ageing in the bladder [3].

Though bladder outlet obstruction (BOO) in women is an uncommon condition in clinical practice, yet it is a distinct entity among post-menopausal females because of the physiological changes of the lower urinary tract with decreasing estrogen levels. The

etiologies for BOO in women are diverse and represent a combination of functional and anatomic issues. There are also various complexities in the management of BOO in females, and so is in its initial diagnosis and determination of the degree of obstruction[4].

Evaluation of the female patient with BOO requires a relatively high level of suspicion by the examining physician. It is often the significant symptoms in these patients that take them to seek medical consultation; and as in men, the time course of symptom evolution may be variable. Physical examination is of utmost importance. Care should be taken to document the presence and degree of concomitant vaginal prolapse; the presence and degree of urethral hypermobility; the degree of anterior vaginal wall fibrosis if BOO is present after surgery; and any

associated neurological abnormalities like loss or change of perineal sensations, decrease in anal sphincteric tone and bulbocavernous reflex.

Along with the diagnosis of BOO, it is also important to quantify the degree of BOO in post-menopausal females. It is imperative to diagnose the BOO in the early stages and provide with the necessary therapy to prevent bladder decompensation and hence prevent subsequent complications. There are various modalities in the armamentarium for assessing BOO among post-menopausal patients. Non-urodynamic assessment modalities include postvoid residual urine (PVR) assessment by ultrasonography, cystoscopy, radiographic techniques such as the micturating cystourethrography (MCU), and occasionally advanced assessments, such as magnetic resonance imaging (MRI) of the bladder outlet and urethra. Initial radiologic investigation in the form of ultrasound is useful in the evaluation of BOO in women. The post void residual urine volume, though does not confirm the diagnosis of BOO, yet is a fairly good indicator of BOO in women [5]. Yip and colleagues noted significant correlation values between PVR estimated by ultrasound and by catheterized volumes in a group of postpartum women [6].

However in routine clinical practice, there are mainly three methods of diagnosing the BOO, the urodynamic study (UDS), MCU and the cyatourethroscopic (CPE) evaluation of the bladder. Traditionally, many authors agree that a diagnosis based only on a pressure-flow study (PFS) is difficult [7-9]. Cystourethroscopy, however, provides visual assessment of the urethra and bladder. It gives an insight into the cause of the BOO and also the structural deterioration of the bladder wall thus providing us with the idea of degree of obstruction.

Hence, in this study we intend to investigate whether CPE alone is enough to diagnose BOO as well as the degree of obstruction in post-menopausal patients presenting with voiding LUTS. We compared the most suitable correlation between the voiding LUTS with the various investigative modalities (cysto-urethroscopy vs. urodynamic study vs. radiological imaging)

## MATERIAL AND METHODS

This study was conducted among postmenopausal female patients who presented with complaints of voiding LUTS at the urology department at a tertiary care centre in India, between March 2016 and February 2017. This was a prospective observational study with a total of fifty four post-menopausal female patients being enrolled in the study presenting with varying grades of voiding LUTS. However, post-menopausal females with neurological disorders or malignancies located in bladder or cervix

or on drugs like alpha-blockers, anti-cholinergics, hypnotics and diuretics or who are not ambulatory or who are already catheterized have been excluded from the study. Informed consent was taken from all the patients.

The symptoms and the clinical findings of the patients were recorded along with a focused neurological examination, abdominal examination, local examination and gynecological and digital rectal examination.

As no established index scoring exist for lower urinary symptoms of females, the patients were subjected to the American Urology Association Symptoms Score (AUASS) questionnaire for lower urinary tract symptoms and subsequently the scores were classified as mild, moderate and severe based on the severity of the scores as per International Prostate Symptom Score (IPSS) grading.

Subsequently the patients underwent three modalities of investigations, an initial urodynamic study, a radiological investigation in the form of micturating cysto-urethrogram and finally a cysto-urethroscopy for assessing the condition of the urethra and the bladder. The CPE was performed as the last investigation so that the procedure itself does not alter the findings of the other investigative modalities.

Before performing the above modalities of investigations a sterile urine culture was ensured. The MCU was done under strict sterile condition and the findings suggestive of bladder outlet obstruction were documented. The usual findings in the MCU suggestive of BOO are trabeculations or irregular bladder wall.

Initially a noninvasive uroflowmetry measurement was done. This was repeated twice and the best flow pattern was taken into consideration. Subsequently, multi-channel urodynamics were performed next according to the recommendations of the International Continence Society after taking proper informed consent. The UDS parameters were recorded and based on these findings, the voiding LUTS were classified into three stages of urodynamic bladder outlet obstruction[10].

- Early ( $Q_{max}$  of  $>15$  mL/s and  $P_{det}Q_{max}$  of  $<30$  cm  $H_2O$ )
- Compensated ( $Q_{max}$  of  $>15$  mL/s and  $P_{det}Q_{max}$  of  $>30$  cm  $H_2O$ )
- Late ( $Q_{max}$  of  $<15$  mL/s and  $P_{det}Q_{max}$  of  $>30$  cm  $H_2O$ ).

Finally, with the CPE, the condition of the urethra and the bladder were directly visualized and any anatomical abnormality and obstructive changes were noted. The obstructive changes were recorded as per

previous studies. Trebaculations are a constant feature of bladder outlet obstruction and assessing the grades of this cystoscopic finding can correlate well with the degree of BOO in patients with voiding LUTS. According to the study Jae Hyun Jung *et al.*, the severity of trabeculation can be grouped into four grades: 0 (none), 1 (mild), 2 (moderate), and 3 (severe) [11]. In this method, there are two criteria seen in the bladder wall for allotting grades of obstructive changes. The first is the formation of the muscle layers: grade 0 if normal; grade 1 (mild) if only one layer seen; grade 2 (moderate) if two layers are seen and less than 50 % involvement; and grade 3 if either more than two layers are involved or more than 50 % involvement. The second criteria are the ratio of the height to width: grade 2 (moderate) if height is less than width and grade 3 (severe) if height is more than width.

In urodynamic study and the CPE, the grades of obstruction were recorded as per predefined criteria in the above mentioned previous studies. In MCU, whether feature of BOO present or not was noted. Subsequently, a comparative analysis of these grades of obstruction was compared to their AUASS severity grades and scores to see the results of which of these modalities of investigations correlated better.

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analysed by SPSS 20.0.1. Data have been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. The median and the interquartile range have been stated for numerical variables that are not normally distributed. Student's independent sample's t-test was applied to compare normally distributed numerical variables between groups; unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate. One-way analysis of variance (one-way ANOVA) was used to compare means of three or more samples for numerical data. Correlation was calculated by Pearson correlation analysis.  $p$ -value  $\leq 0.05$  was considered for statistically significant.

## RESULTS

### Demographic profile

A total of fifty four post-menopausal female 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 the hospital and were fulfilling the inclusion criteria. The history and clinical findings were noted. The majority of the patients (44.4%) had clinically varying degrees of pelvic organ prolapse either in the form of cystocele, or rectocele or complete uterine prolapse. Twenty one patients (39%) patients presented urethral stricture. Four patients were post

hysterectomy status, two patients had urethral sling surgery for stress urinary incontinence and three patients had past history of some urethral surgeries [Table No: 1]. All these patients presented with predominant voiding LUTS. The patients with neurogenic bladder were excluded from the study as per the exclusion criteria.

### AUA Symptoms index scores

The American urological association symptom index scores for LUTS among these patients were analyzed. The scores could be classified into IPSS grades: mild (scores  $\leq 7$ ), moderate (scores between 8 and 19) and severe (scores of 20 or more). There were ten patients with mild, thirty two patients with moderate and rest twelve patients with severe AUASS for LUTS [Table No: 1].

### Urodynamic findings

All the fifty four patients were subjected to urodynamic study for conventional approach of diagnosis of bladder outlet obstruction. Of the fifty four patients, sixteen patients had urodynamically early BOO, eighteen patients had compensated BOO, and rest twenty patients had late BOO. The worsening grades of urodynamic bladder outlet obstruction correlated well with the increasing AUA symptom index score grades ( $p < 0.008$ ). When the numeric AUA symptom index score were taken into consideration alone, they were even more were significantly correlating with the grades of urodynamic obstruction ( $p < 0.0001$ ). Hence, urodynamic studies, as in the literature, can be a diagnostic modality for BOO in post-menopausal females.

### Maturing cyst urethrogram

MCU is often used as a modality to check for anatomic details in cases of bladder outlet obstruction in female population. In this study, we grouped the patients into two groups: (1) patients with radiological features of BOO and (2) patients with MCU findings inconclusive of BOO. Of the total patients presenting with voiding symptoms twentyfive patients (46.3%) had a positive finding suggestive of BOO in their MCU and the rest twenty nine patients (53.7%) had normal MCU findings.

These two groups were compared with the presenting AUA symptom index scores and grades. A positive MCU finding for BOO correlated well with higher AUA symptom index grade ( $p = 0.009$ ) and also with a higher individual score ( $p < 0.001$ ). In our study population, although MCU may not be a diagnostic modality in early BOO, yet in the presence of positive findings, it correlated well with the voiding symptoms. [Table No:1]

**Cystourethroscopy**

Cystourethroscopy is a novel technique in determining the cause as well as the degree of bladder outlet obstruction. There are mainly three grades of obstructive changes that can be seen in the bladder: When compared with the worsening AUA-SS symptom

index scores and grade for symptoms in patients with voiding LUTS, the grades of obstructive changes in the bladder correlated well ( $p < .0001$ ). Hence cystoscopy alone may be enough in confirming the diagnosis and also categorise the patients into various degrees of bladder outlet obstruction. [Table No:1]

**Table-1: Clinical findings along with their IPSS grades and AUA-SS**

| CLINICAL FINDINGS                 | IPSS GRADE |    |    |       | AUA   |      |       |        |
|-----------------------------------|------------|----|----|-------|-------|------|-------|--------|
|                                   | 1          | 2  | 3  | TOTAL | Mean  | SD   | Range | Median |
| Bladder neck obstruction          | 0          | 6  | 5  | 11    | 18.64 | 3.88 | 13-25 | 18.00  |
| Post hysterectomy                 | 1          | 3  | 0  | 4     | 9.00  | 2.16 | 6-11  | 9.50   |
| Previous urethral sling surgeries | 0          | 1  | 1  | 2     | 17.00 | 5.66 | 13-21 | 17.00  |
| Complete prolapse                 | 2          | 10 | 1  | 13    | 15.08 | 4.91 | 6-24  | 16.00  |
| Rectocele                         | 1          | 2  | 1  | 4     | 11.50 | 6.35 | 5-20  | 10.50  |
| Cytocele                          | 2          | 4  | 1  | 7     | 12.00 | 5.16 | 5-21  | 12.00  |
| Urethral Stricture                | 2          | 5  | 3  | 10    | 18.50 | 7.83 | 8-35  | 18.00  |
| Previous urethral surgery         | 2          | 1  | 0  | 3     | 8.67  | 3.05 | 6-12  | 8.00   |
| <b>TOTAL</b>                      | 10         | 32 | 12 | 54    |       |      |       |        |

**Comparison of the CPE grades with UDS findings and MCU findings**

Cystourethroscopic evaluation reveals the morphological patterns in the bladder wall and that seems to be the most definitive indicator in diagnosing the BOO. In this study the higher urodynamic grades of BOO correlated well with worse CPE grades of BOO ( $P=0.0037$ ) But among the patients having early grades of urodynamic BOO, there were a distinct number of patients with higher CPE grades of BOO. In fact, among sixteen patients with urodynamically early

BOO, six patients (26%) had grade 2 and one patient (6.3%) had grade 3 CPE changes of BOO. Hence, CPE picks up BOO changes even in early urodynamic BOO. [Table No:2]

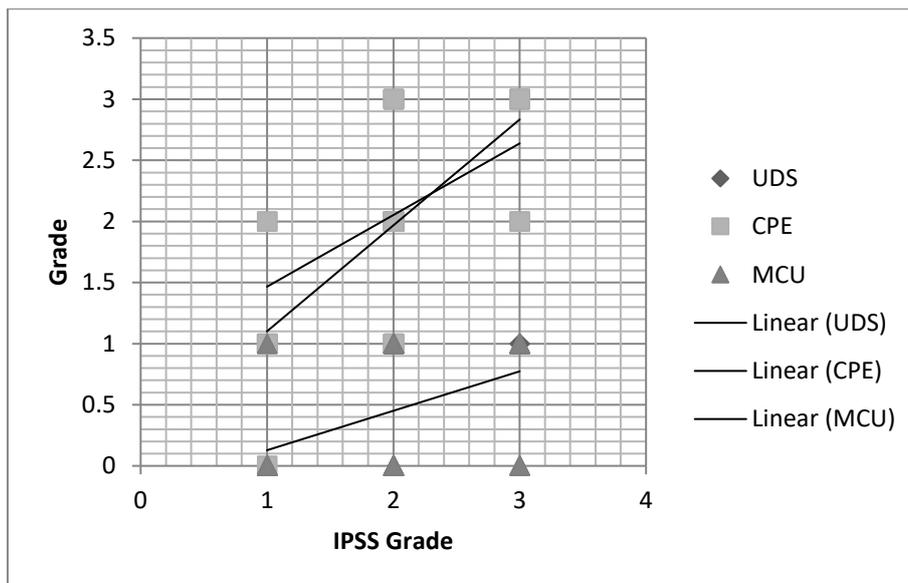
Comparing the findings of MCU, of the total twenty nine patients with no abnormality in the MCU, a significant number of thirteen (44%) patients had grade 2 and two patients (12.5%) had grade 3 CPE changes of BOO, thus making cystoscopy a better modality than MCU in diagnosing early BOO. [Table No:2].

**Table-2: Comparison of UDS and MCU findings with CPE findings**

|     |        | CPE |    |    |    |       | Chi-square value | p-value |
|-----|--------|-----|----|----|----|-------|------------------|---------|
|     |        | 0   | 1  | 2  | 3  | TOTAL |                  |         |
| UDS | Grade1 | 1   | 8  | 6  | 1  | 16    | 19.2867          | 0.0037  |
|     | Grade2 | 0   | 6  | 8  | 4  | 18    |                  |         |
|     | Grade3 | 0   | 0  | 9  | 11 | 20    |                  |         |
|     | TOTAL  | 1   | 14 | 23 | 16 | 54    |                  |         |
| MCU | 0      | 1   | 13 | 13 | 2  | 29    | 20.4932          | 0.0001  |
|     | 1      | 0   | 1  | 10 | 14 | 25    |                  |         |
|     | TOTAL  | 1   | 14 | 23 | 16 | 54    |                  |         |

When IPSS grade was taken as a independent variable, all the three modalities (MCU, CPE and UDS) had a significant positive correlation with their worsening grades, however best correlation was seen with the CPE grades (Correlation Coefficient (r) value =

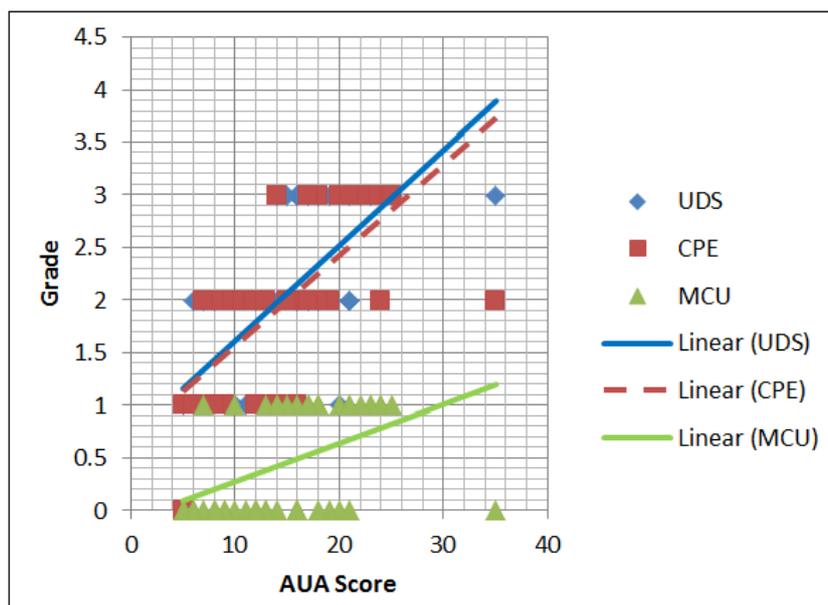
0.6959) [Figure:1]. In contrast when the numeric AUASS was considered then it was the UDS grades of obstruction that had the best correlation (Correlation Coefficient (r) value = 0.6785) [Figure: 2].



**Fig-1: Scatter diagram shows relation of IPSS Grade according to UDS, CPE and MCU Grade**

With IPSS grade a positive correlation was found with UDS grade, CPE grade and positive MCU findings. The Correlation Coefficient (r) value were 0.4593, 0.6959 and 0.4123 respectively for UDS

grading, CPE grading and MCU findings with respective P- value of 0.000477, < 0.00001 and 0.001949. Correlation Coefficient of CPE was higher than others (UDS and MCU).



**Fig-2: Scatter diagram shows relation of AUA Score according to UDS, CPE and MCU Grade**

With increasing AUA-SS score a positive correlation was seen with UDS grade, CPE grade and positive MCU findings. The Correlation Coefficient (r) value were 0.6785, 0.6685, and 0.4471 respectively for UDS grading, CPE grading and MCU findings with respective P- value of <0.00001, <0.0001 and 0.0007. Correlation Coefficient of UDS was higher than others (CPE and MCU).

**DISCUSSION**

Bladder outlet obstruction in women is an uncommon condition in clinical practice but its prevalence among post-menopausal females is significant. Determining outlet obstruction in females still remains a difficult task. Besides, the management of bladder outlet obstruction in females is as complex as is its diagnosis. In post-menopausal females, voiding LUTS is common and usually because of the physiological declining levels of oestrogen having

histological and functional changes of the vulva, vagina and lower urinary tract together.

Although urinary symptoms generally have a limited value in the clinical diagnosis of outlet obstruction, voiding symptoms such as poor urinary stream, hesitancy, straining and sense of incomplete emptying are clearly suggestive of outlet obstruction in women [12]. Clinically, palpable distended urinary bladder points towards the diagnosis. Urethral stricture is generally not felt on vaginal palpation, but conditions like urethral caruncle, uterine prolapse and carcinoma should be obvious [13].

Although presence of residual urine volume (PVR) does not necessarily give away the diagnosis of BOO in women, yet it should be looked upon as an important criterion in the presence of relevant symptoms. Traditionally the gold standard for the assessment of BOO is urodynamic investigation with pressure flow studies. A high pressure and a low uroflow is a characteristic of the urodynamically diagnosed BOO [14, 15]. Until very recently, there were no universally accepted criteria laid down to diagnose urodynamic BOO. The incidence of obstructive changes in the cystoscopy in urodynamically detected BOO varied considerably [16]. Ching-Chung Liang *et al.*, however showed that in post-menopausal female patients with bladder trabeculation on cystoscopy had greater prevalence of BOO than those patients without it [17]. Inui *et al.* had reported that bladder hypertrophy along with bulking of detrusor muscle as a consistent feature of BOO in both animal models and men [18]. Bai *et al.* in his study, demonstrated that BOO is a risk factor for bladder trabeculations [16]. Liang *et al.* had shown a clinical correlation between the bladder trabeculations and pelvic organ prolapse in females. Although they did not have any objective method, they did classify the bladder trabeculations into four grades [17]. Similarly el Din *et al.* used nonobjective criteria for grading bladder trabeculation [19]. Hence, various grades of bladder trabeculations can be utilized as a surrogate marker for grades of BOO in CPE.

With this background, in this study we intended to see if CPE could be used as a first-line investigation to diagnose as well as grade the BOO among post-menopausal female patients with voiding LUTS, especially where urodynamic study is a difficult option because of logistic reasons. As discussed in the results, the CPE findings in these patients correlated well with the AUASS and IPSS grades. There was a definite positive correlation between the grades of obstruction found in CPE with that of the severity of the voiding LUTS as demonstrated in their AUASS ( $p < 0.001$ ). Moreover, significant number of patients had a higher grade of obstructive changes in CPE when compared to their simultaneously lower grades of

urodynamic BOO grades. CPE is also able to pick up obstructive changes earlier than the MCU, as demonstrated with those having obstructive changes in CPE with non-conclusive MCU findings. Therefore CPE can be considered a sensitive tool in diagnosing BOO among postmenopausal females and can be safely used not only as an initial but also as a sole diagnostic modality where urodynamic evaluation is not possible.

## CONCLUSIONS

The physiological effects of the decreasing level of estrogen along with the aging process make the postmenopausal females at higher risk for BOO. Cystourethroscopy is a significant tool in both the diagnosis of bladder outlet obstruction and its grading among post-menopausal females with voiding LUTS and it may be more important where urodynamic study is difficult or unavailable due to logistic or economic reasons.

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