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## ORIGINAL ARTICLE

# Clinical symptoms are not reliable in the diagnosis of lower urinary tract dysfunction in women

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Received 5 April 2011; received in revised form 17 May 2011; accepted 20 May 2011

**KEYWORDS**lower urinary tract symptoms;  
videourodynamics;  
women

**Background/Purpose:** The pathophysiology of female lower urinary tract symptoms (LUTS) may involve bladder, urethral, and pelvic floor dysfunctions. This study analyzed the relationship between clinical symptoms and lower urinary tract dysfunctions (LUTD) in women.

**Methods:** A total of 1605 consecutive women were included. LUTS were classified as storage, voiding, pain, and postmicturition symptoms. All patients underwent videourodynamic study (VUDS) and the final diagnosis of LUTD was made based on VUDS findings. Patients were stratified into three major disorder groups: sensory, motor, and bladder outlet disorders. The main symptoms and associated symptoms were used for analysis in varying LUTD.

**Results:** Normal tracing was found in 272 patients (16.9%), sensory bladder disorders in 459 (28.6%), motor bladder disorders in 560 (34.9%), and bladder outlet disorders were found in 314 patients (19.6%). Frequent urination was the main symptom in patients with normal, bladder oversensitivity, interstitial cystitis, and idiopathic detrusor overactivity (DO). In patients with voiding dysfunction due to detrusor underactivity, bladder neck dysfunction and urethral stricture, dysuria was the most common symptom. However, 707 (44%) of overall women had both storage and voiding symptoms. DO was present in 533 women and in 149 (66%) of 212 with bladder outlet obstruction. However, DO was only found in 42.5% of women with urgency and in 69.4% of women with urgency incontinence based on reported LUTS.

**Conclusion:** Storage and voiding symptoms are common in women with LUTD. The differential diagnosis of LUTD in women cannot be based on LUTS alone.

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## Introduction

Lower urinary tract symptoms (LUTS) are symptoms reported by patients' perception of bladder feeling. The real pathophysiology for LUTS might be difficult to interpret based on symptoms alone. Previous studies on female LUTS

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have focused on overactive bladder syndrome (OAB), and most physicians always prescribe antimuscarinics as the first line treatment for women with symptoms of frequency and urgency. Although the International Continence Society (ICS) has made a clear definition between urgency and increased bladder sensation,<sup>1</sup> patients might not be able to differentiate between these two symptoms.

As in men, LUTS in women also include storage, voiding, pain, and postmicturition symptoms. The pathophysiology of female LUTS may also involve bladder, urethral, and pelvic floor disorders. Therefore, it is essential to clearly differentiate among different underlying urethrovaginal dysfunctions before giving appropriate treatment.

Videourodynamic study (VUDS) provides comprehensive investigation of lower urinary tract dysfunction (LUTD). By combining pressure flow, uroflow, and image studies, we can identify LUTD according to the VUDS findings. Patients with bladder neck dysfunction (BND), dysfunctional voiding (DV), and bladder outlet obstruction (BOO) can also be found in addition to the bladder disorders.

This retrospective study analyzed VUDS data from a large cohort of women with LUTS to evaluate the correlation between clinical symptoms and the underlying LUTD.

## Patients and methods

A total of 1605 consecutive women who had undergone the first time VUDS for LUTS during the period August 1996 to July 2010 were included. Patients with chronic urinary retention, chronic urinary tract infection (UTI), urodynamic stress urinary incontinence, pelvic organ prolapse, frank neurogenic voiding dysfunction (NVD), previous lower urinary tract surgery, or a previously established diagnosis of interstitial cystitis/painful bladder syndrome (IC/PBS) or genitourinary tract malignancy were excluded from the analysis.

LUTS were carefully recorded. The main symptom was defined as the most bothersome symptom among all LUTS. Three other LUTS were also recorded as associated symptoms. The LUTS were classified as storage symptoms [frequency, urgency, urgency urinary incontinence (UUI), nocturia], voiding symptoms (dysuria, hesitancy, slow stream, intermittency, straining to void, urinary retention), pain symptoms (bladder pain, urethral pain, perineal pain), and postmicturition symptoms (terminal dribble, feeling of incomplete emptying, postmicturition leakage). Patients with urgency and UUI, as reported on a 3-day voiding diary, were defined as having OAB. Methods, definitions and units conform to the standards jointly recommended by the ICS and the International Urogynecological Association, except where specifically noted.<sup>2</sup>

VUDS was performed using a multichannel urodynamic system (Life-Tech, Stafford, TX, USA) and a C-arm fluoroscope (Toshiba, Tokyo, Japan). VUDS was performed before any treatment was given. The patient was positioned in the supine position and a 6-Fr dual-channel urethral catheter was inserted transurethraly to record intravesical pressure and an 8-Fr rectal balloon catheter was used to record the intra-abdominal pressure. VUDS was performed by infusion of warmed normal saline containing 20% Urografin at a filling rate of 30 ml/minute in a sitting position. The

C-arm fluoroscope was positioned 45° from the buttocks so that the urethra could be lengthened and the bladder neck, urethral sphincter, and distal urethra could be clearly identified. VUDS was repeated if abnormal findings were noted during the first examination. The potassium chloride (KCl) test using 0.4 M KCl solution was performed if patients presented with IBS during the urodynamic study.<sup>3</sup>

A voiding detrusor pressure of more than 35 cm H<sub>2</sub>O was defined as high voiding pressure; 10–35 cm H<sub>2</sub>O was defined as normal voiding pressure, and lower than 10 cm H<sub>2</sub>O was defined as low voiding pressure. Patients with high or normal voiding pressure and those with low voiding pressure and a normal flow rate were considered having normal detrusor contractility, while those with a low voiding pressure and low flow rate and/or large postvoid residual [(PVR) more than 150 ml] volumes were considered to have low detrusor contractility. Bladder compliance at bladder capacity was measured by dividing the change in cystometric volume by the change in detrusor pressure.

If patients had a strong desire to void at a cystometric bladder capacity (CBC) of less than 350 ml and without occurrence of DO, they were considered to have bladder oversensitivity. When bladder pain was elicited during bladder filling and the KCl test showed a positive result, the finding was suggestive of IC/PBS. If patients did not have a sensation of normal bladder fullness at a bladder capacity of more than 500 ml, they were considered to have reduced bladder sensation.

Bladder outlet conditions included BND, DV, urethral stricture, and poor pelvic floor relaxation. BND was diagnosed if VUDS revealed a narrow bladder neck together with high or normal detrusor contractility.<sup>4</sup> When VUDS showed a high voiding pressure, open bladder neck, and a narrow midurethra during the voiding phase, DV due to urethral sphincter uncoordination was considered.<sup>5</sup> If patients had a narrow distal urethra and a low flow rate regardless of high or normal voiding pressure, they were considered to have a urethral stricture. Patients who could not adequately relax their pelvic floor muscles and in whom VUDS showed a low voiding pressure and intermittent flow pattern were considered to have poor relaxation of the pelvic floor muscles (PRPF).<sup>6</sup>

DO was defined as urodynamic evidence of spontaneous detrusor contractions occurring during bladder filling (phasic DO) or occurring before uninhibited detrusor contraction voiding at bladder capacity (terminal DO).<sup>1,2</sup> If the DO was associated with incomplete bladder emptying and PVR of more than 100 ml, detrusor hyperactivity and impaired contractility (DHIC) was considered.<sup>7</sup> Patients with DO without BOO or DHIC were considered to have idiopathic DO (IDO). If patients did not have a voiding detrusor contractility of more than 10 cm H<sub>2</sub>O and needed to void by abdominal straining or were unable to void, detrusor underactivity (DU) was diagnosed.

The final diagnosis of LUTD was made based on the main VUDS findings and clinical characteristics. According to the VUDS results, patients were stratified into three major disorder groups: sensory, motor, and bladder outlet disorders. The main symptoms and at most three associated symptoms were used for analysis of their association with LUTD. The urodynamic parameters (CBC, Pdet, Q<sub>max</sub>, PVR volume, and bladder compliance) were analyzed and

**Table 1** Classification of female lower urinary tract symptoms by videourodynamic study.

|  |             |
|--|-------------|
| Normal findings  | 272 (16.9%) |
| Sensory disorders (459)                                      |             |
| Bladder oversensitivity                                      | 289 (18.0%) |
| Suggestive of interstitial cystitis/painful bladder syndrome | 170 (10.6%) |
| Motor disorders (560)  |             |
| Idiopathic detrusor overactivity                             | 308 (19.2%) |
| DO and impaired contractility                                | 69 (4.3%)   |
| Detrusor underactivity                                       | 183 (11.4%) |
| Bladder outlet disorders (314)                               |             |
| Bladder neck dysfunction                                     | 27 (1.7%)   |
| Dysfunctional voiding  | 168 (10.5%) |
| Urethral stricture   | 17 (1.1%)   |
| Poor relaxation of pelvic floor muscles                      | 102 (6.4%)  |

compared among all female LUTD subgroups. Statistical analysis was performed by analysis of variance (ANOVA) among different LUTD subgroups. A *p* value of less than 0.05 was considered significant.

## Results

**Table 1** lists the definitive diagnoses based on VUDS results in the 1605 women. Normal tracing was found in 272 patients (16.9%), sensory bladder disorders in 459 (28.6%), motor bladder disorders in 560 (34.9%), and bladder outlet disorders were found in 314 patients (19.6%). The patients ranged in age from 18–98 years (mean, 58 years). There was no significant difference in mean age or age distribution among the subgroups (*p* = 0.440).

**Table 2** shows the main clinical symptoms in all LUTD. Frequent urination was the primary symptom in patients with normal function, bladder oversensitivity, IC/PBS, and IDO. In addition, dysuria was also noted among the first three main symptoms in these women. In women with voiding dysfunction such as DV and PRPF, frequent urination remained the most common symptom (41.1% and 52%, respectively), and dysuria was the second most prevalent

main symptom (32.1% and 30.4%, respectively). In patients with voiding dysfunction due to DU, BND and US, dysuria was the most common symptom (86%, 63%, and 47.1%, respectively), followed by frequent urination and UUI. UUI was the most common symptom in patients with DHIC followed by dysuria and urinary retention.

If we classified LUTS as comprising storage, voiding, pain and postmicturition symptoms, all LUTD groups had storage symptoms. Voiding symptoms were also highly prevalent in women with voiding dysfunctions due to bladder outlet disorders (DV, BND, US, and PRPF) or low detrusor contractility (DHIC and DU). However, about 30% of women with sensory disorders (bladder oversensitivity, IC/PBS) or IDO still had voiding symptoms. The prevalence of pain symptoms was higher in women with IC/PBS (68.8%) but more than 20% of women with bladder oversensitivity and PRPF also had pain symptoms. Postmicturition symptoms were not common in female LUTD except in women with DU (**Table 3**).

Overall, frequency was the most common presented LUTS (*n* = 1528, 95.2%), followed by urgency (*n* = 1108, 69%), dysuria, slow stream or urinary retention (*n* = 801, 49.9%), UUI (*n* = 425, 26.5%), and painful symptoms (*n* = 371, 23.2%). OAB dry (*n* = 683) and OAB wet (*n* = 425) were widely distributed among women classified as being normal (128 and 42, respectively), as well as those classified as having sensory (218 and 28, respectively), motor (215 and 277, respectively), and bladder outlet disorders (171 and 78, respectively). However, DO was only found in 42.5% of all women with urgency (OAB dry) and in 69.4% of women with UUI (OAB wet).

**Table 4** shows the combination of main and associated LUTS in female LUTD. Most patients had both storage and voiding symptoms, or storage symptoms alone, but only a few patients had voiding symptoms alone. Patients with IC/PBS presented with storage and pain symptoms (56.5%), storage and voiding symptoms (14.7%), or storage symptoms alone (16.5%), but none presented with pain symptoms alone. Most of the patients with voiding disorders presented with storage and voiding symptoms or storage symptoms alone, but not with voiding symptoms alone.

The urodynamic parameters in these LUTD are shown in **Table 5**. DO was present in 533 women, including 308 (100%) IDO, 69 (100%) DHIC, 7 (4%) DU, and 149 (70.3%) women with

**Table 2** Main symptoms of female lower urinary dysfunction.

| Main symptom of LUTD |                       |                         |                            |
|----------------------|-----------------------|-------------------------|----------------------------|
| Normal (272)         | Frequency 100 (36.8%) | Dysuria 54 (19.9%)      | SUI 25 (9.19%)             |
| BO (289)             | Frequency 127 (43.9%) | Dysuria 79 (27.3%)      | Bladder pain 35 (12.1%)    |
| IC/PBS (170)         | Frequency 97 (57.0%)  | Bladder pain 55 (32.4%) | Dysuria 5 (2.9%)           |
| IDO (308)            | Frequency 138 (44.8%) | UUI 107 (34.7%)         | Dysuria 58 (18.8%)         |
| DHIC (69)            | UUI 25 (36.2%)        | Dysuria 21 (30.4%)      | Urine retention 17 (24.6%) |
| DU (183)             | Dysuria 119 (65.0%)   | Frequency 32 (17.5%)    | Urine retention 27 (14.8%) |
| DV (168)             | Frequency 69 (41.1%)  | Dysuria 54 (32.1%)      | UUI 26 (15.5%)             |
| BND (27)             | Dysuria 17 (63.0%)    | UUI 6 (22.2%)           | Frequency 4 (14.8%)        |
| US (17)              | Dysuria 8 (47.1%)     | Frequency 4 (23.5%)     | UUI 3 (17.6%)              |
| PRPF (102)           | Frequency 53 (52.0%)  | Dysuria 31 (30.4%)      | Bladder pain 11 (10.8%)    |

BND = bladder neck dysfunction; BO = bladder oversensitivity; DHIC = detrusor overactivity with impaired contractility; DU = detrusor underactivity; DV = dysfunctional voiding; IC/PBS = interstitial cystitis/painful bladder syndrome; IDO = idiopathic detrusor overactivity; PRPF = poor relaxation of pelvic floor muscles; US = urethral stricture; UUI = urgency urinary incontinence.

**Table 3** Occurrence of different lower urinary tract symptoms in different female lower urinary tract dysfunction.

|              | Storage symptoms | Voiding symptoms | Pain symptoms | Postmicturition symptoms |
|--------------|------------------|------------------|---------------|--------------------------|
| Normal (272) | 272 (100.0%)     | 100 (36.8%)      | 78 (28.7%)    | 22 (8.09%)               |
| BO (289)     | 289 (100.0%)     | 143 (49.5%)      | 80 (27.7%)    | 19 (6.57%)               |
| IC/PBS (170) | 170 (100.0%)     | 42 (24.7%)       | 117 (68.8%)   | 7 (4.12%)                |
| IDO (308)    | 308 (100.0%)     | 111 (36.0%)      | 22 (7.1%)     | 4 (1.30%)                |
| DHIC (69)    | 69 (100.0%)      | 55 (79.7%)       | 7 (10.1%)     | 1 (1.45%)                |
| DU (183)     | 183 (100.0%)     | 177 (96.7%)      | 7 (3.8%)      | 73 (39.9%)               |
| DV (168)     | 168 (100.0%)     | 87 (51.8%)       | 27 (16.17%)   | 5 (3.00%)                |
| BND (27)     | 27 (100.0%)      | 20 (74.1%)       | 2 (7.4%)      | 0 (0.00%)                |
| US (17)      | 17 (100.0%)      | 10 (58.8%)       | 3 (17.7%)     | 0 (0.00%)                |
| PRPF (102)   | 102 (100.0%)     | 56 (54.9%)       | 29 (28.4%)    | 14 (1.73%)               |
| Total (1605) | 1605 (100.0%)    | 801 (49.9%)      | 372 (23.2%)   | 145 (9.03%)              |

BND = bladder neck dysfunction; BO = bladder oversensitivity; DHIC = detrusor overactivity with impaired contractility; DU = detrusor underactivity; DV = dysfunctional voiding; IC/PBS = interstitial cystitis/painful bladder syndrome; IDO = idiopathic detrusor overactivity; PRPF = poor relaxation of pelvic floor muscles; US = urethral stricture; UUI = urgency urinary incontinence.

bladder outlet obstruction (BOO), which comprised 116 (69%) with DV, 18 (67%) with BND, and 15 (88%) with US. Among the 312 patients with bladder outlet disorders, 149 (48%) had DO. Bladder oversensitivity (160/212; 75%) and DO (149/212; 70%) were noted in most of the patients with BOO (DV, BND, US), whereas all patients with PRPF had a stable bladder and normal detrusor contractility.

Among the 459 patients with bladder oversensitivity, 322 received the KCl test and a positive result was obtained in 165 (51%). Cystoscopy with hydrodistention was performed and the diagnosis of IC/PBS was confirmed in 147 (89.1%).

## Discussion

This study analyzed VUDS-derived data on the underlying urethrovesical dysfunctions in 1605 women with LUTS. Storage and voiding symptoms were commonly found in LUTD. Bladder sensory disorders were noted in 28.6% and bladder outlet disorders were found in 19.6% of women with LUTS. According to the final VUDS diagnosis, clinical symptoms are not likely to be reliable in establishing

a preliminary diagnosis or treatment strategy for women with LUTS.

This study revealed that most of the patients with sensory or motor bladder disorders presented with both storage and voiding symptoms. The main symptoms of patients with bladder oversensitivity, IC/PBS, IDO, DHIC were frequency, urgency and UUI, although dysuria was not an uncommon symptom. Because the bladder capacity in the patients with sensory bladder disorders was significantly smaller than that in normal women, it is possible that these women experienced dysuria and slow stream during voiding because of early bladder alertness at a small volume.

Women with bladder oversensitivity and IC/PBS comprised 28.6% of all women with LUTD. It was interesting to find that most of the women with IC/PBS or bladder oversensitivity presented with frequency as their main symptom. Although 32.4% of women with IC/PBS had bladder pain as the main symptom, the symptom was also noted in 12.1% of women with bladder oversensitivity. Dysuria was the main symptom in 27.3% of women with bladder oversensitivity, but was only experienced by 2.9% of women with IC/PBS. Although high voiding pressure

**Table 4** Combination of different lower urinary tract symptoms in female lower urinary tract dysfunction.

|              | Main and associated symptoms |               |                     |                  |                |                              |
|--------------|------------------------------|---------------|---------------------|------------------|----------------|------------------------------|
|              | Storage alone                | Voiding alone | Storage and voiding | Storage and pain | Empty and pain | Storage and voiding and pain |
| Normal (272) | 96 (35.3%)                   | 1 (0.4%)      | 97 (35.7%)          | 63 (23.2%)       | 0              | 15 (5.5%)                    |
| BO (289)     | 92 (31.9%)                   | 1 (0.3%)      | 116 (40.3%)         | 48 (16.7%)       | 3 (1.0%)       | 28 (9.7%)                    |
| IC/PBS(170)  | 28 (16.5%)                   | 0             | 25 (14.7%)          | 96 (56.5%)       | 0              | 21 (12.4%)                   |
| IDO (308)    | 174 (56.5%)                  | 0             | 112 (36.4%)         | 20 (6.5%)        | 0              | 2 (0.6%)                     |
| DHIC (69)    | 13 (18.8%)                   | 0             | 49 (71.0%)          | 1 (1.4%)         | 0              | 6 (8.7%)                     |
| DU (183)     | 2 (1.1%)                     | 23 (12.6%)    | 151 (82.5%)         | 0                | 0              | 7 (3.8%)                     |
| DV (168)     | 55 (32.7%)                   | 1 (0.6%)      | 84 (50.0%)          | 23 (13.7%)       | 0              | 5 (3.0%)                     |
| BND (27)     | 5 (18.5%)                    | 0             | 20 (74.1%)          | 2 (7.4%)         | 0              | 0                            |
| US (17)      | 4 (23.5%)                    | 0             | 10 (58.8%)          | 3 (17.6%)        | 0              | 0                            |
| PRPF (102)   | 29 (28.4%)                   | 1 (1.0%)      | 43 (42.2%)          | 12 (11.8%)       | 0              | 17 (16.7%)                   |

BND = bladder neck dysfunction; BO = bladder oversensitivity; DHIC = detrusor overactivity with impaired contractility; DU = detrusor underactivity; DV = dysfunctional voiding; IC/PBS = interstitial cystitis/painful bladder syndrome; IDO = idiopathic detrusor overactivity; PRPF = poor relaxation of pelvic floor muscles; US = urethral stricture; UUI = urgency urinary incontinence.

**Table 5** Urodynamic parameters in different female lower urinary tract dysfunction.

|        | CBC (ml)      | Pdet (cmH <sub>2</sub> O) | Qmax (ml/s) | PVR (ml)      | Compliance (ml/cmH <sub>2</sub> O) |
|--------|---------------|---------------------------|-------------|---------------|------------------------------------|
| Normal | 482.3 ± 100.1 | 18.8 ± 8.98               | 20.5 ± 7.95 | 25.7 ± 44.0   | 120.5 ± 121.2                      |
| BO     | 281.2 ± 86.0  | 19.0 ± 9.73               | 13.0 ± 7.04 | 36.7 ± 65.4   | 71.3 ± 73.8                        |
| IC/PBS | 286.5 ± 99.5  | 18.8 ± 11.7               | 12.9 ± 7.33 | 22.7 ± 47.8   | 70.5 ± 66.9                        |
| IDO    | 250.9 ± 125.0 | 22.4 ± 11.3               | 13.5 ± 7.84 | 41.8 ± 69.7   | 63.0 ± 67.1                        |
| DHIC   | 294.7 ± 110.0 | 12.6 ± 7.1                | 6.3 ± 4.45  | 188.3 ± 110.0 | 62.5 ± 69.7                        |
| DU     | 383.2 ± 161.5 | 5.52 ± 4.74               | 5.44 ± 7.60 | 271.1 ± 208.8 | 70.2 ± 105.8                       |
| DV     | 285.7 ± 159.7 | 49.1 ± 17.4               | 11.3 ± 7.56 | 77.4 ± 112.6  | 63.0 ± 82.1                        |
| BND    | 314.7 ± 177.6 | 60.4 ± 23.2               | 6.41 ± 4.12 | 136.8 ± 170.5 | 61.8 ± 84.1                        |
| US     | 219.9 ± 134.7 | 65.4 ± 29.2               | 5.94 ± 3.05 | 92.9 ± 80.4   | 29.1 ± 25.9                        |
| PRPF   | 353.3 ± 133.5 | 20.8 ± 9.94               | 9.95 ± 5.78 | 96.0 ± 90.1   | 84.7 ± 78.3                        |

BND = bladder neck dysfunction; BO = bladder oversensitivity; CBC = cystometric bladder capacity; DHIC = detrusor overactivity with impaired contractility; DU = detrusor underactivity; DV = dysfunctional voiding; IC/PBS = interstitial cystitis/painful bladder syndrome; IDO = idiopathic detrusor overactivity; Pdet = detrusor pressure; PRPF = poor relaxation of pelvic floor muscles; PVR = postvoid residual; Qmax = maximum flow rate; US = urethral stricture; UUI = urgency urinary incontinence.

suggestive of BOO has been noted in patients with IC/PBS,<sup>8</sup> we did not find this phenomenon in this study.

The KCl test was reported a reliable modality for differentiating IC/PBS from bladder oversensitivity.<sup>3</sup> A total of 89.1% of women with IC/PBS had a positive KCl test and the diagnosis of IC/PBS was further confirmed by cystoscopic hydrodistention. It seems rational to use this test to identify urothelial dysfunction in all women with small bladder capacity and bladder oversensitivity.

Although DO was highly prevalent in women with BOO (66%), BOO was found in only 28% (149 of 532) of women with DO. Most cases of BOO were due to DV (77.8%), suggesting that functional BOO remained the most common type of female BOO. Based on clinical symptoms, DO was only found in 42.5% of women with urgency (OAB dry) and in 69.4% of women with UUI (OAB wet). These findings are compatible with previous reports.<sup>9,10</sup> Although most of the women with LUTD complained of urgency and frequency as their main symptom, the symptoms are likely the result of bladder oversensitivity during filling rather than DO in nature. This is also the possible cause for the different objective urodynamic findings between OAB patients with and those without DO.<sup>11</sup>

Urgency and frequency were highly prevalent in all LUTD and in normal women. Patients usually reported urgency only because they experienced an early voiding desire without actually feeling that it was difficult to defer urination. If self-reported urgency is considered to be synonymous with OAB, then prevalence of OAB dry will be very high in female LUTD. However, the incidence of DO was low. On the other hand, UUI might reflect the real DO condition in female LUTS in this study. Sensory urgency is speculated to be part of the same spectrum of bladder dysfunction as DO.<sup>12</sup> The CBC in patients with IDO and BOO was similar to that in patients with bladder oversensitivity and IC/PBS, and most patients with BOO had an increased bladder sensation during bladder filling, indicating that sensory urgency is closely linked to DO. This finding also reflects the possibility that overactive bladder is not only overactive but also hypersensitive.<sup>13</sup>

Pelvic floor dysfunction involves the development of hypertonic and dysfunctional muscles resulting in elimination

problems, chronic pelvic pain, and voiding disorders.<sup>14</sup> DV is a condition characterized by lack of coordination between the urethral sphincter and detrusor during voiding.<sup>15</sup> PRPF is a condition in which the pelvic floor muscles fail to relax in initiation or during micturition. Although these two LUTD are possibly due to different etiologies, they may present similar symptoms. Storage symptoms are even more common than voiding symptoms in women with DV.<sup>5</sup> We found that women with PRPF presented with both storage and voiding symptoms. It is not easy to differentiate between PRPF and DV without VUDS. The only differences between them are higher incidence of DO in women with DV and greater CBC in PRPF, suggesting that DV is a more severe form of functional BOO due to urethral sphincter spasticity than PRPF.

This study also revealed that PRPF was commonly found in women with a low Qmax who presented with storage and voiding symptoms. During VUDS, it is frequently observed that a woman becomes a non-voider or needs to void with the aid of abdominal straining.<sup>16</sup> Therefore, free voiding uroflowmetry is important to establish a diagnosis of PRPF. Only in women with consistent uroflowmetry findings between free uroflow and VUDS can a diagnosis of PRPF be made. The Pdet of PRPF was normal and CBC was significantly greater than that of female BOO, suggesting that the voiding dysfunction among women with PRPF is probably due to poorly relaxed pelvic floor muscles but not anatomic BOO.

All patients with BOO (DV, BND, US) had dysuria, frequency, and UUI as main symptoms, although the severity of these symptoms differed among them. Most of the women with DV (41.1%) and PRPF (52%) had frequency as their main symptom, but the majority of women with BND (63%) and US (47.1%) had dysuria as the main symptom. This difference in presenting symptoms between these subgroups of patients with voiding dysfunction could be due to different pathophysiology as well as to different functional and anatomical bladder outlet disorders. Patients with increased urethral sphincter tone and pelvic floor muscle hyperactivity not only have increased urethral resistance but also increased bladder sensation or overactivity through neuromodulation, resulting in different



types of urothelial dysfunction which might be elicited by intravesical potassium instillation.<sup>17</sup>

## Conclusion

This study revealed that LUTS in women involve several different vesicourethral conditions. Storage and voiding symptoms are common in female LUTD including sensory, motor or bladder outlet disorders. The differential diagnosis of these LUTD cannot be based on LUTS alone.

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