Correlation between Symptoms and Urodynamic Findings in Thai Female Patients with Urinary Incontinence

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Objective: *To determine the accuracy of a urinary incontinence questionnaire in the diagnosis of various types of urinary incontinence classified according to the results of multichannel urodynamic testing.*
Material and Method: *Between May 2000 and April 2004, 129 women with symptoms of urinary incontinence were interviewed using a urinary incontinence questionnaire consisting of 12 urinary symptoms questions. Various patient demographic and other descriptive data were also collected. All patients underwent multichannel urodynamic testing, and classified using the International Continence Society criteria. Descriptive data and patient symptoms were tested for statistical association with the types of urinary incontinence. Sensitivity and specificity were used to measure the accuracy of the symptoms in distinguishing between the various urodynamic conditions.*
Results: *Of the 12 questions, only three questions (two stress incontinence symptoms and one overactive bladder symptom) were significantly associated with the urodynamic diagnoses of genuine Stress Urinary Incontinence (SUI) and Detrusor Overactivity (DO). The sensitivity and specificity for distinguishing between genuine SUI and DO from other urodynamic diagnoses or between each other were relatively low.*
Conclusion: *Symptoms of urinary incontinence were not sufficient to predict types of urinary incontinence. Therefore, the authors suggest that urodynamic testing is still essential in the diagnosis and management of female urinary incontinence.*

Keywords: *Urinary incontinence, Urodynamic findings*

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Campel et al[1] reported that females with urinary incontinence had prevalence rates ranging from 4.5%-53.0%. The report of Asia Pacific Continence Advisory Board (APCAB) after surveying 11 Asian countries revealed that female urinary incontinence is a common problem in all ages. Symptomatic illness affects women with a life time prevalence of 14.6%. A urinary incontinence prevalence of 19.5% was found in Thai females[2].

Over 30 years ago, the phrase of the "bladder being an unreliable witness" was coined and referred to the poor relationship between abnormal urinary symptoms and diagnosis made by objective criteria[3]. Generally, symptoms of urinary incontinence are not disease - a clinical diagnosis based on symptoms alone will be incorrect in about one in five cases[4]. Conditions other than disease may cause similar symptoms of urinary incontinence, such as chronic urinary retention, overflow, low bladder compliance and detrusor overactivity[5]. An unreliable predictor of underlying cause of urinary incontinence has repeatedly been the patient's history[6]. Attempts to arrive at reliable objective and inexpensive evaluation methods to identify women with genuine urinary incontinence have been made through many studies. Currently, accurate and objective diagnosis of urinary incontinence can only be made using urodynamics[7].

Urodynamic testing is invasive and expensive. It also needs to be carried out by experienced personnel who may not be available in all communities. Many physicians have suggested that it is necessary for

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every woman with urinary incontinence to have an accurate diagnosis in order to receive the appropriate treatment. Cantor and Bates cited the symptoms of nocturia, nocturnal enuresis and urge incontinence as important differentiating factors indicating the need for urodynamic evaluation, while patients with stress incontinence did not require such evaluation[8]. A low incidence of detrusor instability was found by Kaufman in his patients, including a group which had failed previous surgical treatment for stress incontinence. He concluded that urodynamics were unnecessary in most cases[9]. Hastie and Moisey showed that urodynamics are unnecessary in patients with stress incontinence with or without frequency of micturition[10]. On the other hand, Radley recommended that women with urinary incontinence should undergo urodynamic investigations before surgery in all cases[11]. Jarvis et al[12] also suggested that symptoms are a poor guide to the final urodynamic diagnosis and advocated urodynamic studies in all such cases. It was recommended by Chapple that urodynamics should not be used in isolation but should be part of a clinical evaluation which included history taking and examination of patients[6].

In view of the continuing controversy on the need for routine urodynamic assessment prior to therapy, the present study was conducted to determine the accuracy of a symptoms questionnaire and a set of stress tests in the diagnosis of various types of urinary incontinence as determined by multichannel urodynamic testing.

Material and Method

The present study was a retrospective review of 129 female patients with symptoms of urinary incontinence who were sent to a urology clinic at Ramathibodi Hospital from May 2000 to April 2004. All patients were interviewed by a urological nurse specialist using a urinary incontinence questionnaire (see the appendix for details of the questionnaire). There were 12 items in the questionnaire; two questions being related to stress urinary incontinence (SUI), and ten related to overactive bladder (OAB) symptoms. An extra item termed "mixed urinary incontinence" was added to record cases where both symptoms of SUI and OAB coexist. Demographic and baseline data were also collected during the interview. This included the age, marital status, number of pregnancies, menopausal status, familial history of urinary incontinence, previous abdominal surgery, and duration of symptoms (Table 1).

All patients underwent multichannel urodynamic testing with six channel recorders (Urolab Janus IV, Life-Tech, Inc.) and Nova pressure transducers (model 1888M). The testing began with an initial noninstrumented uroflowmetry, immediately followed by measurement of post-void residual urine volume by urethral catheterization. Water cystometry included medium filling of the bladder (50 cc per minute) with provocations (valsalva maneuver and forceful

Appendix

Urinary incontinence questionnaire.

The first part: symptoms of stress urinary incontinence (SUI)[6]

SUI 1. Do you experience a loss of urine when you are doing physical activities: lifting heavy objects or exercising?

SUI 2. Do you have a slight loss of urine when you sneeze, cough or laugh?

The second part: symptoms of overactive bladder (OAB)[13]

OAB 3. Do you frequently have strong, sudden urges to urinate?

OAB 4. Do you urinate more than 8 times in a 24 hour period?

OAB 5. Do you have uncontrollable urges to urinate that sometimes result in wetting accidents?

OAB 6. Do you leak urine on the way to the bathroom?

OAB 7. Do you frequently get up two or more times during the night go to the bathroom?

OAB 8. Do you avoid places you think won't have a nearby restroom?

OAB 9. Do you go to bathroom so often that it interferes with your activities?

OAB 10. Do you frequently limit your fluid intake when you're away from home so that you don't need to worry about finding a restroom?

OAB 11. When you are in an unfamiliar place, do you make sure you know where the restroom is?

OAB 12. Do you use absorbent pads to keep from wetting your clothes?

The third part: symptoms of mixed urinary incontinence (MUI)

Any item of symptoms of pure stress urinary incontinence and overactive bladder

Table 1. Associations between patient characteristics, symptoms and urodynamic findings

Variables*	Normal** n = 32	Gen SUI** n = 55	DO** n = 24	Mixed** n = 16	Overflow** n = 2	Total n = 129	p-value
Age (years)							
Mean (sd)	49.6 (9.7)	50.6 (8.5)	47.5 (15.2)	53.4 (11.2)	61.5 (4.9)	50.3 (10.7)	0.251
Married (yes)							
Number (%)	**30 (93.8)**	**53 (96.4)**	**18 (75.0)**	**14 (87.5)**	**2 (100)**	**117 (91.0)**	**0.043**
Pregnancy							
Median (range)	3 (1-8)	3 (1-7)	3.5 (1-8)	4.5 (2-6)	4 (3-5)	3 (1-8)	0.352
Menopause (yes)							
Number (%)	19 (59.4)	30 (54.5)	12 (50.0)	10 (62.5)	2 (100)	73 (56.6)	0.898
Incont His (yes)							
Number (%)	3 (9.4)	6 (10.9)	4 (16.7)	3 (18.8)	0 (0)	16 (12.4)	0.744
Prev Surgery (yes)							
Number (%)	6 (18.8)	9 (16.4)	6 (25.0)	1 (6.3)	0 (0)	22 (17.1)	0.624
Duration of symp							
Median (range)	18 (1-240)	24 (1-160)	24 (2-240)	12 (1-72)	3.5 (1-6)	24 (1-240)	0.082
SUI 1 (yes)							
Number (%)	**3 (9.4)**	**24 (43.6)**	**10 (41.7)**	**7 (43.8)**	**1 (50.0)**	**45 (34.9)**	**0.016**
SUI 2 (yes)							
Number (%)	**19 (59.4)**	**53 (96.4)**	**18 (75)**	**13 (81.3)**	**2 (100)**	**105 (81.4)**	**0.001**
OAB 3 (yes)							
Number (%)	**15 (46.9)**	**27 (49.1)**	**20 (83.3)**	**7 (43.8)**	**2 (100)**	**71 (55.0)**	**0.018**
OAB 4 (yes)							
Number (%)	16 (50.0)	21 (38.2)	9 (37.5)	2 (12.5)	1 (50.0)	49 (38.0)	0.165
OAB 5 (yes)							
Number (%)	13 (40.6)	28 (50.9)	17 (70.8)	5 (32.3)	1 (50.0)	64 (49.6)	0.109
OAB 6 (yes)							
Number (%)	9 (28.1)	23 (41.8)	13 (54.2)	10 (62.5)	1 (50.0)	56 (43.4)	0.156
OAB 7 (yes)							
Number (%)	13 (40.6)	16 (29.1)	9 (37.5)	6 (37.5)	2 (100)	46 (35.7)	0.283
OAB 8 (yes)							
Number (%)	13 (40.6)	28 (50.9)	10 (41.7)	9 (56.3)	1 (50.0)	61 (47.3)	0.793
OAB 9 (yes)							
Number (%)	12 (37.5)	21 (38.2)	13 (54.2)	7 (43.8)	1 (50.0)	54 (41.9)	0.712
OAB 10 (yes)							
Number (%)	10 (31.3)	23 (41.8)	11 (45.8)	7 (43.8)	1 (50.0)	52 (40.3)	0.808
OAB 11 (yes)							
Number (%)	21 (65.6)	36 (65.5)	16 (66.7)	9 (56.3)	1 (50.0)	83 (64.3)	0.946
OAB 12 (yes)							
Number (%)	8 (25.0)	22 (40.0)	11 (45.8)	7 (43.8)	1 (50.0)	49 (38.0)	0.499
Mixed symp (yes)							
Number (%)	**19 (59.4)**	**49 (89.1)**	**20 (83.3)**	**13 (81.3)**	**2 (100)**	**103 (79.8)**	**0.023**
Stress test L (yes)							
Number (%)	**5 (15.6)**	**34 (61.8)**	**10 (41.7)**	**11 (68.8)**	**0 (0)**	**60 (46.9)**	**<0.001**
Stress test S (yes)							
Number (%)	**11 (34.4)**	**49 (89.1)**	**11 (45.8)**	**14 (87.5)**	**0 (0)**	**85 (66.4)**	**<0.001**

* Pregnancy refers to number of pregnancies; Incont His refers to familial history of urinary incontinence; Prev Surgery refers to history of previous abdominal surgery; Duration of symp refers to duration of urinary symptoms in months; SUI 1 refers to urinary symptoms of Stress Urinary Incontinence question 1, etc. (see questionnaire); OAB 3 refers to urinary symptoms of Over-Active Bladder question 3, etc. (see questionnaire); Mixed symp refers to symptoms having a mixture of both SUI and OAB; Stress test L is the Marshall stress test while lying down; Stress test S is the Marshall stress test while standing

** These categories refer to urodynamic findings of normalcy (Normal); genuine SUI (Gen SUI); detrusor overactivity (DO); mixture of SUI and DO (Mixed); and overflow incontinence (Overflow)

p-values were obtained via appropriate statistical tests as mentioned in the text

Bold letters refer to significant association between variable and urodynamic finding at 5% level or less by Chi-square or Fisher's exact test

coughing) was done in supine and again in the sitting position. The pressureflow study was conducted while the patient sat on the uroflowmeter commode to record a voiding phase. At the end of testing each patient was asked to do a Marshall cough stress test without a retained catheter in the supine and upright positions, to observe leakage while the bladder was full, and then again a uroflowmetry was carried out.

The results of the urodynamic tests were read and interpreted by the one urologist (WK), using the criteria of the International Continence Society (ICS). Patients were classified according to urodynamic findings as normal, genuine (or pure) SUI, detrusor overactivity (DO), a mixture of both SUI and DO, or overflow incontinence. The percentages of patients in these categories were the main outcome measures of the study. The results of the Marshall stress tests were classified as either positive or negative.

Statistical analysis

Continuous data were summarized as mean and standard deviation (sd), or median and range as appropriate, for each urodynamic outcome category. Categorical data were summarized as counts and percentages. The number of pregnancies was summarized as median and range. Differences in continuous variables between the five urodynamic categories were tested using analysis of variance or Kruskall-Wallis test as appropriate. Discrete, ordinal variables such as number of pregnancies were tested using the Kruskall-Wallis test. Categorical variables were tested using chi-square test or Fisher's exact test as appropriate. Significant 2-sided p-values were set at 0.05 or lower. In addition, sensitivity and specificity were used to measure the accuracy of various symptoms questions and stress tests in distinguishing genuine SUI or DO from other urodynamic conditions. The 95% Confidence Intervals (95% CI) for the sensitivity and specificity measures were calculated using exact binomial confidence intervals. All statistical analyses were performed using STATA version 7 software (Stata Corp, Texas, USA).

No adjustments for multiple testing were made. Instead, all variables with statistically significant association with urodynamic findings were scrutinized for clinical significance and plausibility.

Results

Characteristics of the patients in the study are presented in Table 1. Urodynamic tests revealed that 19% (25 of 129) had normal findings, 43% (55 of 129) had genuine SUI, and 19% (24 of 129) had DO. 12% (16 of 129) of patients had mixed SUI and DO. Only 1.5% (2 of 129) had overflow incontinence, so most of the following discussion will exclude this last category of patients.

Of the variables describing the characteristics of the cohort, which included age, marital status, number of pregnancies, menopausal status, and previous abdominal surgery, only marital status was statistically associated with urodynamic findings. But this association was weak, and the only pattern noted was that patients having DO (according to urodynamics) were less likely to be married than those in other groups.

Each of the two questions (variables SUI 1 and SUI 2 in Table 1; see also the appendix for details of the questionnaire) used for distinguishing genuine SUI patients from other groups was statistically significant at the 5% level ($p = 0.05$). The largest difference in the response proportion was between the SUI group and the "normal" group, as may be expected. However, the ability of the questions to distinguish between the genuine SUI group and the DO group was limited. For the SUI 1 question (leakage of urine during physical activities) the sensitivity and specificity for distinguishing SUI from DO were 44% and 58%, respectively. The sensitivity and specificity for question SUI 2 (leakage of urine during coughing or sneezing) were 96% and 25%, respectively. While the question SUI 2 was very sensitive in picking up SUI patients, it was not sufficiently specific; question SUI 1 was slightly more specific, but its sensitivity was low. The sensitivity and specificity for distinguishing genuine SUI from DO, and their 95%CI's, are presented in Table 2.

Of the ten questions used for detecting DO patients (OAB 3 to OAB 12 in Table 1), only the OAB 3 question (strong, sudden urges to urinate) was able to significantly distinguish DO patients from others. The sensitivity of this question was good (83%) but the specificity for distinguishing between DO and SUI patients was quite low (51%). Symptoms of mixed SUI and OAB (defined as one or more positive SUI question(s) as well as one or more positive OAB question(s)) were unable to distinguish between SUI, DO or mixed urodynamic findings, as can be seen by similar prevalence of mixed symptoms between the groups (89%, 83%, and 81%, respectively). However, the mixed symptoms could just distinguish between normal and abnormal urodynamic findings (60%

Table 2. Sensitivity and specificity for distinguishing between genuine SUI and DO for various symptoms and stress tests

Symptoms and tests*	Sensitivity (n = 55)	(95%CI)	Specificity (n = 24)	(95%CI)
SUI 1**	43.6	(30.3 to 57.7)	58.3	(36.6 to 77.9)
SUI 2**	96.4	(87.5 to 99.6)	25.0	(9.8 to 46.7)
OAB 3	83.3	(62.6 to 95.3)	50.9	(37.1 to 64.6)
Stress test L**	61.8	(47.7 to 74.6)	58.3	(36.6 to 77.9)
Stress test S**	89.1	(77.8 to 95.9)	54.2	(32.8 to 74.4)

* For definitions of SUI 1 & 2, OAB 3 and stress tests L & S see footnotes for Table 1
** Sensitivity and specificity are for distinguishing genuine SUI from DO
Sensitivity and specificity are for distinguishing DO from genuine SUI

positive mixed symptoms vs over 80% positive symptoms, respectively).

Both Marshall stress tests were able to significantly distinguish between normal urodynamic findings, findings of genuine SUI, and DO. However, the sensitivity of the supine stress test was low (62%), as was the specificity for distinguishing genuine SUI from DO (58%). The sensitivity for the standing stress test was better (89%) although the specificity was similar (54%).

Discussion

In the present study the authors attempted to find associations between the patients' urinary symptoms, as determined by a urinary symptoms questionnaire and urinary stress tests, and the final diagnosis of urinary incontinence determined by multi-channel urodynamic testing.

Symptoms of SUI is the complaint of involuntary urinary leakage on effort or exertion or on sneezing or coughing that was described in the first part of the questionnaire. Urodynamic SUI is noted during filling cystometry and is defined by the ICS (2002) as the involuntary leakage of urine during increased abdominal pressure, in the absence of a detrusor contraction[14]. This definition is also referred to as genuine SUI[15]. In the present study, symptoms of leakage of urine during physical activity (SUI 1 in the questionnaire) did not correlate well with the diagnosis of genuine SUI, although the symptom of leakage during sudden straining such as coughing or sneezing (SUI 2) was very sensitive in detecting genuine SUI.

A general practice-based study on 110 women found that symptoms of stress urinary incontinence in the absence of symptoms of urge incontinence were 87% predictive of diagnosis of stress urinary incontinence (sensitivity 78%, specificity 84%), confirmed by urodynamic investigation[19]. The studies of Summitt, Walters and Shields and those of Cardozo and Stanton showed strong association between the symptoms of SUI and genuine SUI[5,16,17]. However, approximately 50% to 73% of urinary incontinence patients in these studies who had DO also complained of SUI symptoms. DeMuylder et al[18] reported that the symptoms of SUI was a sensitive detector of genuine SUI (94%) but was not very specific (65%). The results of most of these studies were similar to the present study, where the SUI 2 question was very sensitive for detecting genuine SUI (96%), but the specificity for differentiating genuine SUI from DO was low (25%).

The ICS subcommittee proposed that two terms be used in urinary urgency: overactive bladder (OAB), as a symptom syndrome without a definitive diagnosis, and detrusor overactivity (DO) to describe the typical urodynamic findings of involuntary detrusor contraction[14]. In the present study, only one OAB question in the second part of the questionnaire (OAB 3: strong, sudden urges to urinate) was significantly associated with urodynamic findings of DO. The key symptom of OAB is urgency, and monosymptomatic urgency is unusual but it is known to occur[14]. Hastie and Moisey reported that DO was seen in only half of the patients who had urgency of micturition in addition to symptoms of SUI[9]. Blaivas and Olsson reported that one half of their patients who had SUI complained of urinary urgency[20]. Cantor and Bates found that urgency occurred in 96% of patients with DO, but it was also present in 75% of patients with stable bladder, making it of little value in distinguishing between the two[7]. Here, we found that 49% of patients who had genuine SUI also had urgency symptoms.

Mixed urinary incontinence is a term that can be applied both to a combination of incontinence symptoms (SUI symptoms and OAB) and to a combination of urodynamic conditions (genuine SUI and DO) in the same individual[14]. As many as 55% of

women with genuine SUI and 38% with DO had mixed symptoms[17]. Bump et al[6] reported that the majority of women with mixed symptoms do not have mixed urodynamic conditions. Although the present study showed that 81% of patients who had mixed urodynamic findings had mixed symptoms, these symptoms were also found in 89% and 83% of genuine SUI and DO, respectively. This implies that symptoms of mixed urinary incontinence can not distinguish between any type of urodynamic abnormality.

From previous studies the volume of post-void residual urine and uroflowmetry did not correlate with continence status nor with the clinical type of urinary incontinence[21]. The uroflowmetry was not found to be helpful in distinguishing between continent and incontinent patients, but in the authors' clinical practice, uroflowmetry was helpful in identifying voiding and emptying problems.

The Marshall cough stress test used to demonstrate objective leakage of urine in supine and upright positions could significantly distinguish genuine SUI from other urodynamic conditions in the present study, but not significant difference. The Marshall cough stress test in the upright position was most sensitive in identifying genuine SUI (89%), but again, the test lacked sufficient specificity.

The accuracy of urinary incontinence assessment relies on the data collected and method of data collection. History of symptoms, physical examination and methods to arrive at objective diagnosis should all be included. Accurate history taking depends on how skillful the questioner is in asking questions and interpreting the patient's answers. Flisser and Blaivas have noted that in using urodynamic testing in female patients with urinary incontinence, it is important to acknowledge that variation in techniques and intrinsic variability of physical factors being tested can undermine the overall value of urodynamic testing[22].

The present results indicated that symptoms among Thai females with urinary incontinence were not highly predictive of the results of urodynamic testing.

Conclusion

Symptoms of urinary incontinence and urinary stress tests were not sufficient to predict types of urinary incontinence. Therefore, the authors suggest that urodynamic testing is still essential in the diagnosis and management of female urinary incontinence.

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ความสัมพันธ์ระหว่างอาการและการตรวจพบทางยูโรพลศาสตร์ในผู้ป่วยหญิงไทยที่มีภาวะปัสสาวะเล็ด

อุบลรัตน์ รุ่งเรืองศิลป์, ภานุวัฒน์ เลิศสิทธิชัย, วชิร คชการ, กฤษฎา รัตนโอฬาร

วัตถุประสงค์: *เพื่อหาความสัมพันธ์ระหว่างอาการและการตรวจพบทางยูโรพลศาสตร์ในผู้ป่วยหญิงไทยที่มีภาวะปัสสาวะเล็ด*

วัสดุและวิธีการ: *ระหว่างเดือนพฤษภาคม พ.ศ.2543 ถึง เดือนเมษายน พ.ศ.2547 ผู้ป่วยหญิงไทยที่มีอาการปัสสาวะเล็ดจำนวน 129 ราย ถูกสัมภาษณ์โดยใช้แบบสอบถามอาการปัสสาวะเล็ดอันประกอบด้วยคำถาม 12 ข้อ และข้อมูลพื้นฐานของผู้ป่วย ผู้ป่วยทุกคนได้รับการตรวจทางยูโรพลศาสตร์ ผลการตรวจแปลตามหลักเกณฑ์ของ International Continence Society ได้ทำการทดสอบความสัมพันธ์ทางสถิติระหว่างข้อมูลพื้นฐานของผู้ป่วย, อาการปัสสาวะเล็ดของผู้ป่วยกับการตรวจพบทางยูโรพลศาสตร์ ความแม่นยำของคำถามต่าง ๆ ในการแยกแยะภาวะปัสสาวะเล็ด วัดโดยใช้ค่าความไว (sensitivity) และความจำเพาะ (specificity)*

ผลการศึกษา: *จากคำถาม 12 ข้อมีพียง 3 ข้อเท่านั้นที่มีความสัมพันธ์กับภาวะปัสสาวะเล็ดประเภท genuine SUI และ DO อย่างมีนัยสำคัญทางสถิติ ความไวและความจำเพาะของคำถามเหล่านี้ในการแยกแยะ genuine SUI จาก DO หรือ แยกแยะ genuine SUI กับ DO ของภาวะปัสสาวะเล็ดอื่น ๆ มีค่าค่อนข้างต่ำ*

สรุป: *อาการของผู้หญิงที่มีปัสสาวะเล็ดไม่สามารถนำมาจำแนกประเภทของภาวะปัสสาวะเล็ดได้ ดังนั้นทีมผู้วิจัยแนะนำว่าการตรวจยูโรพลศาสตร์ยังมีความจำเป็นในการวินิจฉัยและการรักษาในผู้ป่วยหญิงที่มีภาวะปัสสาวะเล็ด*