

Correlation between voiding dysfunction symptoms and uroflowmetry in women suffering from stress urinary incontinence

Katelyne Hubeaux^{1,2}, Xavier Deffieux^{2,3}, Marylène Jousse^{1,2}, Gérard Amarenco^{1,2}

¹Department of Neurological Rehabilitation, Urodynamic and Neurophysiology Laboratory, Tenon Hospital, ²ER6, Université Pierre et Marie Curie, Paris, ³Department of Obstetrics and Gynecology, Clamart, France

ABSTRACT

Objectives: To determine whether the completion of a voiding dysfunction (VD) questionnaire could have a good predictive value for uroflowmetry findings, in a population of stress urinary incontinence (SUI) women.

Materials and Methods: From a urodynamic database of 415 SUI women, 93 with isolated SUI who underwent urodynamic investigations were eligible for this study. Patients with obvious etiologies of obstruction were excluded. VD symptoms were analyzed using the Bristol Female Lower Urinary Tract Symptoms Questionnaire. Bladder outlet obstruction (BOO) was defined as a maximal flow rate under 15 ml/s for a urine volume > 200 ml, or a post-void residual volume greater than 50 ml, or an abnormal pattern of the flow curve. The sensitivity, specificity, positive and negative predictive value of questioning VD were calculated. Statistical analysis was done using a Wilcoxon test for continuous data and Fisher exact test for categorical data, and multivariate analysis.

Results: Reported VD had a poor specificity (41%) and positive predictive value (32%) of BOO on uroflowmetry. No statistical correlation was found between VD symptoms and BOO defined on uroflowmetry ($P=0.64$) in this specific SUI population showing no obvious etiologies of obstruction.

Conclusions: No correlation was found between obstructive symptoms and BOO as defined on uroflowmetry, in a specific population of SUI women. Our results suggest that uroflowmetry may be necessary rather than multichannel urodynamics.

Key words: Bladder outlet obstruction, mid-urethral sling, tension free vaginal tape, urinary stress incontinence, urodynamics, voiding dysfunction

INTRODUCTION

Urinary retention and voiding dysfunction (VD) symptoms (hesitancy, straining to void, difficulty in starting micturition, diminished stream, and sensations of incomplete emptying of the bladder) are common and

problematic features occurring after surgery for stress urinary incontinence (SUI), especially following a mid-urethral sling placement (retropubic or trans-obturator procedure).

These obstructive complications often induce quality of life impairment after surgery. They can lead to urinary infections, and can also require self-catheterization or sling section. The prevalence of urinary retention varies from 2.2–16% after surgery for SUI.^[1-3] Preexisting voiding dysfunction is known to be a predictive factor for post-surgery urinary retention. In 2003 Hong *et al.*,^[4] showed that the best predictive factor for obstructive complications was the maximum flow rate, with which it was shown to be directly correlated. It is thus important to screen women suffering from SUI for emptying symptoms before such surgery.

The purpose of this study was to determine whether the completion of a VD questionnaire could have a good predictive value for uroflowmetry findings, in a population of SUI women showing no obvious etiologies of obstruction.

For correspondence: Dr. Xavier Deffieux, Service de Gynécologie Obstétrique et Médecine de la Reproduction Hôpital Antoine Bécclère. 157 rue de la Porte de Trivaux. F-92140 Clamart, France
E-mail : xavier.deffieux@abc.aphp.fr

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MATERIALS AND METHODS

Population

We analyzed 415 SUI women from the urodynamic database, who had undergone a filling cystometry in the department, and whose uroflowmetry indicated a total urine volume greater than 200 ml. SUI was defined by a positive bladder stress test. Women with neurological disorders, pelvic organ prolapse, urge or mixed urinary incontinence, detrusor overactivity or previous SUI surgery were excluded. With these exclusion criteria, only 93 of the 415 women were eligible for this study. These 93 women were divided into two groups: Those who complained of VD symptoms (VDS group) according to the Bristol Female Lower Urinary Tract Symptoms (BFLUTS) questionnaire, and those without VD symptoms (non-VDS group). We investigated the parity, age, menopausal status, and concomitant anorectal disorders of each woman.

Questionnaire

The women were interviewed on the presence of emptying symptoms, and completed the BFLUTS questionnaire [Table 1], which is systematic in our department. We screened for five items related to voiding difficulties: hesitancy, slow or intermittent stream, straining, or sensations of incomplete emptying. For the purposes of data analysis, those women who answered “never” to all five items were classed in the non-VDS group. Those women for whom one or more of the answers was positive (i.e.: “occasionally, sometimes, most of the time or all the time”), were classified in the VDS group.

Urodynamics

The clinical examination included a physical examination, urodynamic testing and a “free flow” uroflowmetry and filling cystometry at a rate of 50 ml per minute (Duet, Medtronic). The urodynamic evaluation methods complied with the standards recommended by the International Continence Society.^[5] The filling cystometry parameters studied were: compliance, detrusor overactivity (DO), detrusor sensation. None of the patients presented with abnormal compliance, DO, or abnormal detrusor sensation. Both a quantitative and a qualitative analysis of bladder outlet obstruction (BOO) was made by uroflowmetry. Quantitatively, a patient was considered to have BOO when a maximum flow rate of less than 15 ml/sec was observed for a urine volume greater than 200 ml,^[6] and/or the post-void residual was greater than 50

ml,^[5,7] as measured with a bladder scan or by catheterization. The urine flow was also analyzed in terms of average flow rate, urine volume, voiding time and acceleration (defined as the maximum flow rate divided by the time taken to reach maximum flow rate). The qualitative analysis dealt with the flow patterns: A standard “bell-shaped” curve was a normal pattern. Three pathologic patterns were considered: Intermittent or continuous polyphasic curves, and flat curves [Figures 1a-c]. We determined the sensitivity and specificity as well as the positive and negative predictive value of the VDS questionnaire using the uroflowmetry data.

Statistical analysis

A comparison of the clinical characteristics and uroflowmetry of the two groups was made using a Wilcoxon test for continuous data and a Fischer test for categorical data. Logistic regression models were used for multivariate analysis (Statview software). The sample size was not calculated before initialization of the study. Fisher’s test was used because the sample size was small. All of the factors were considered simultaneously using logistic regression.

Ethics

As the BFLUTS questionnaire and urodynamics were identical to those systematically used for the routine evaluation of SUI women in our department, the study did not require specific ethics committee approbation.

RESULTS

Among the 93 women eligible for the study, 61% (57/93) complained of VD symptoms on the BFLUTS questionnaire (VDS group) and 39% (36/93) had no VD symptoms (non-VDS group). BOO on uroflowmetry was founded in 27 women (29%). Patients’ characteristics are detailed in Table 2. No difference was observed between the two groups concerning age, parity, menopausal status, concomitant anorectal disorders and uroflowmetry parameters. In the VDS group, only 18 women (18/57, 32%) had an abnormal uroflowmetry. 75% (27/36) of the women in the non-VDS group had normal uroflowmetry, and 25% (9/36) an abnormal one without symptoms. Consequently, the sensitivity of emptying symptoms was 66.7% and specificity 40.9%. The positive predictive value of the VDS questionnaire was 32% and the negative predictive value was 75% [Table 3]. There was no statistical correlation between symptoms and the defined

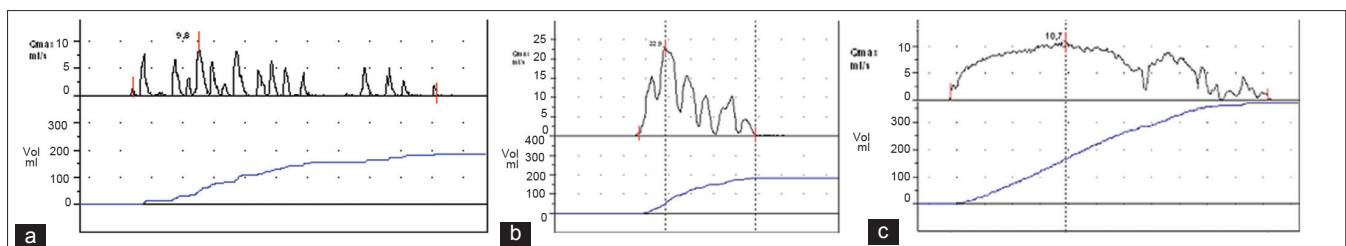


Figure 1: (a) Intermittent polyphasic curve (b) Continuous polyphasic curve (c) Flat curve

Table 1: Bristol Questionnaire BFLUTS (urinary symptoms questionnaire): The five items concerning voiding dysfunction

12. Is there any delay before you can start to urinate?
- never
- Occasionally (less than one-third of the time)
- Sometimes (between one and two-thirds of the time)
- Most of the time (more than two-thirds of the time)
- All of the time
- How much of a problem is this for you?
- Not a problem
- A bit of a problem
- quite a problem
- a serious problem
13. Do you have to strain to urinate?
- Never
- Occasionally
- Sometimes
- Most of the time
- All of the time
- How much of a problem is this for you?
- Not a problem
- A bit of a problem
- Quite a problem
- A serious problem
14. Do you stop and start more than once while you urinate without meaning to?
- Never
- Occasionally
- Sometimes
- Most of the time
- All of the time
- How much of a problem is this for you?
- Not a problem
- A bit of a problem
- Quite a problem
- A serious problem
16. Would you say that the strength of your urinary stream is...
- Not reduced
- Reduced a little
- Quite reduced
- Reduced a great deal
- No stream
- How much of a problem is this for you?
- Not a problem
- A bit of a problem
- Quite a problem
- A serious problem
19. How often do you feel that your bladder has not emptied properly after you have urinated?
- Never

- Occasionally
- Sometimes
- Most of the time
- All of the time
- How much of a problem is this for you?
- Not a problem
- A bit of a problem
- Quite a problem
- A serious problem

Table 2: Characteristics of women with and without voiding difficulties' symptoms in terms of age, menopausal status, parity, anorectal disorders and uroflowmetry parameters

	VDS group (57 women)	Non-VDS group (36 women)
Age	54.9 ± 10.9	52.1 ± 10.0
Post-menopausal women	60% (34/57)	53% (19/36)
Parity	2,0 ± 0.96	2.28 ± 1.34
Concomitant anorectal disorders	60% (34/57)	42% (15/36)
Maximum flow rate (ml/s)*	30.3 ± 12.3	33.5 ± 11.6
Medium flow rate (ml/s)*	16.4 ± 8.5	19.0 ± 7.6
Urine volume (ml)*	370 ± 111	401 ± 89
Acceleration (ml/s ²)*	6.5 ± 7.7	5.2 ± 3.6
Voiding time (sec)*	35 ± 43	28 ± 18
Time to maximum flow*	11.4 ± 17.2	10.9 ± 17.0

**"Free flow" uroflowmetry parameters

criteria of BOO on uroflowmetry (Fischer test: $P=0.64$). Among the 42 women who complained of a sensation of incomplete emptying, only one had a real post-void residual greater than 50 ml. In this SUI population without severe pelvic organ prolapse (Baden and Walker staging system ≤ 1), previous SUI surgery, or neurological disorders (the most frequent etiologies of voiding dysfunction in women) we found a 29% (29/93) rate of abnormal uroflowmetry.

Multivariate analysis (using multiple logistic regression method) demonstrated no correlation between symptoms and quantitative uroflowmetry parameters (maximum and average flow rate, acceleration, urine volume, time to maximum flow and voiding time), and no correlation was found between VDS and age, menopausal status, parity or concomitant anorectal disorders [Table 4].

DISCUSSION

Our results show that 25% of SUI women without obstructive symptoms, i.e. without an obvious cause for bladder outlet obstruction (no severe genital prolapse ($> \text{Grade } 1$)), having had no previous surgery for SUI, and with no neurological disorders, have an abnormal uroflowmetry, and thus a higher risk of post-surgery obstructive disorders.

Table 3: Sensitivity, specificity, positive and negative predictive value of voiding dysfunction symptoms on BFLUTS

Symptoms:	Sensitivity	Specificity	Positive predictive value	Negative predictive value
Voiding dysfunction symptoms	66.7%	40.9%	32%	75%

Table 4: Logistic regression method for multivariate analysis of urodynamic parameters (maximal and average flow rate, time to void and acceleration), age, menopausal status, parity, concomitant anorectal disorders with respect to voiding difficulties' symptoms Univariate analysis of multiple factors with respect to voiding difficulties' symptoms

	OR (95%IC)	P value
Maximum flow rate	1.02 (0.99 - 1.06)	0.208
Average flow rate	1.04 (0.99 - 1.10)	0.137
Time to void	1.00 (0.98 - 1.02)	0.910
Acceleration	0.96 (0.89 - 1.04)	0.365
Urine volume	1.03 (0.99 - 1.01)	0.165
Age	0.97 (0.93 - 1.01)	0.199
Menopausal status	1.3 (0.57 - 3.07)	0.515
Parity	1.25 (0.86 - 1.82)	0.249
Concomitant anorectal disorders	0.48 (0.027 - 1.13)	0.093
Maximum flow rate	1.00 (0.92-1.08)	0.895
Average flow rate	1.03 (0.92-1.16)	0.563
Urine volume	1.00 (1.00-1.01)	0.373
Age	0.98 (0.94-1.02)	0.317
Concomitant anorectal disorders	0.53 (0.22-1.27)	0.156

Multivariate analysis using multiple logistic regression method (only the P values ≤ 0.2 were included in the analysis)

Our study clearly demonstrates the poor predictive value of the VDS questionnaire, when compared with urodynamic data. VDS are not correlated with abnormal uroflowmetry parameters as defined on a free uroflowmetry. The prevalence of voiding dysfunction symptoms among women is not easy to determine, in contrast to storage symptoms, which are more often related and analyzed. The prevalence of VDS among elderly women was about 10.9%.^[8] Stress urinary incontinence and bladder outlet obstruction (BOO) can coexist in women; Bradley found 19 cases of BOO out of 104 (18%), defined on the basis of pressure flow studies among women presenting with SUI.^[9] In our study, we found a high prevalence of VDS (61%), probably because in the VDS group we included women with any level of positive response, even those who gave one 'occasionally' response to the VD items (BFLUTS questionnaire).

Urodynamic evaluation of the voiding phase in SUI women before surgery is useful in order to predict the risk of VD and urinary retention, and to inform women about these potential complications. Surgical treatments of SUI using mid-urethral sling procedures are known to affect

the voiding phase: The spontaneous flow curve changes to a more obstructive pattern in 40% of cases, and the maximum and mean flow rates decrease significantly after one year.^[10] The incidence of urinary retention after such procedures ranges from 2.2–16%.^[1-3] Postoperative VD induces a decrease in global satisfaction after surgery, and leads to an impairment of the quality of life. Factors which correlate highly with a postoperative voiding dysfunction include a preoperative peak flow rate < 15 ml/s (several studies), and an abnormal uroflow pattern or detrusor pressure < 12 cm H₂O.^[3,11-14] Therefore, screening for such factors among SUI women is critical.

One of the main limitations of the current study is the lack of a standard definition for BOO in urodynamics for women. Since voiding cystometry had not been performed, BOO cannot be defined urodynamically in the current study. Farrar *et al.*,^[6] defined obstruction as Q_{max} < 15 ml/s with a voided volume of 200 ml. Further study should assess this point. We chose this definition because it is based on "free flow" uroflowmetry, which is close to physiological micturition. We added the flow curve pattern criteria, because a pathological pattern with a normal maximal flow rate can reflect voiding difficulties. Moreover, in pressure flow studies in women, the transurethral catheter has a significant impact on the urine flow.^[14-18] However, "free flow" uroflowmetry is a composite interaction between the detrusor pressure and the resistance produced by the urethra. Bladder outlet obstruction as well as impaired detrusor contractility can perturb uroflowmetry. In our population, we needed to detect voiding difficulties, whatever their origin, because among SUI women both these causes of voiding disorders can promote obstructive complications after surgery.

Chassagne *et al.*,^[13] prospectively studied 35 clinically obstructed women and 124 control patients. They determined cutoff values for the pressure flow studies as: Q_{max} < 15 ml/s and P_{det}. Q_{max} > 20 cm H₂O, with a sensitivity of 74.3% and a specificity of 91.1%. No information was provided regarding the clinical criteria used to select the "clinically obstructed" patients. Groutz *et al.*,^[14] combined Q_{max} < 12 ml/s in "free flow" uroflowmetry with a high detrusor pressure at maximal flow (P_{det}. Q_{max} > 20 cm H₂O) during detrusor pressure uroflow studies. Among the 38 women considered as obstructed within this definition, 29% had no obstructive symptoms. They concluded that micturition symptoms relevant to bladder outlet obstruction are non-specific, and that a complete urodynamic evaluation is essential. The correlation between obstructive symptoms and objective urodynamic findings is known to be poor, but has never been studied in this specific population of SUI women, for which all cases with a POP-Q > Stage 1, previous surgery for SUI, or neurological disorders, were excluded. Indeed, we excluded the most common etiologies of urodynamic assessment of bladder outlet obstruction.

Groutz *et al.*,^[15] reported 26% of prior anti-incontinence surgery and 24% of severe genital prolapse in a population of 38 women presenting with urodynamically assessed obstructive criteria.

Wyndaele *et al.*, recently confirmed the poor correlation between symptoms and urodynamic data, and a high prevalence of VDS in women, whether it be considered to have a pathological origin or not.^[19] The absence of voiding symptoms is not a guarantee of normal micturition, since we found that almost one-third of the women not complaining of any voiding difficulty were actually shown to have an abnormal uroflowmetry. Previous studies^[14-21] have clearly demonstrated the lack of correlation between symptoms and urodynamic diagnoses, especially for obstructive symptoms. We found the same results, but in a particular population of SUI women, with no obvious reasons for obstruction. Even in this selected population, in which voiding dysfunctions should be less frequent than in the general population, we found that almost 30% of the patients had an abnormal uroflowmetry.

CONCLUSION

No correlation was found between obstructive symptoms and BOO as defined on uroflowmetry, in a specific population of SUI women. Our results suggest that uroflowmetry may be necessary rather than multichannel urodynamics.

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