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THE SIGNIFICANCE OF THE AMERICAN UROLOGICAL ASSOCIATION SYMPTOM INDEX SCORE IN THE EVALUATION OF WOMEN WITH BLADDER OUTLET OBSTRUCTION

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ABSTRACT

Purpose: The American Urological Association (AUA) symptom index was originally designed to assess the severity of lower urinary tract symptoms in men with benign prostatic hyperplasia. Data concerning the clinical application of the AUA symptom index to women are sparse. We evaluated the significance of the AUA symptom index in women with urodynamically defined bladder outlet obstruction.

Materials and Methods: From a urodynamic database of 587 consecutive women 38 (6.5%) were identified with bladder outlet obstruction, defined as a maximum flow rate of less than 12 ml. per second on repeat noninvasive uroflowmetry studies with a detrusor pressure at a maximum flow of greater than 20 cm. water on pressure flow study. All patients underwent a complete clinical and urodynamic evaluation, and completed the AUA symptom index questionnaire. Results in women with urodynamic obstruction were compared with those in 2 control groups, including women without obstruction but with sphincteric incontinence and asymptomatic healthy women.

Results: Mean symptom score was significantly higher in women with obstruction than in those with sphincteric incontinence or no symptoms (15.8 ± 8.4 versus 10.3 ± 6.4 and 2.1 ± 2.7, respectively). Likewise, scores were classified as severe in 34% of women with obstruction compared with only 7% of those with sphincteric incontinence. However, no correlation was noted between symptom index scores and objective urodynamic parameters, which is similar to data already reported in male populations.

Conclusions: The AUA symptom index score may be useful as a bothersomeness index in women with bladder outlet obstruction. However, subjective symptoms associated with bladder outlet obstruction are nonspecific and a complete urodynamic evaluation is essential for making the diagnosis.

KEY WORDS: bladder, bladder neck obstruction, urodynamics, questionnaires

The American Urological Association (AUA) symptom index was originally designed to assess the severity of lower urinary tract symptoms and measure changes in symptom severity with time in men with benign prostatic hyperplasia (BPH).[1] The index proved to be reliable and valid for these purposes, and it became a popular clinical tool in daily practice and academic research. The index comprises 7 questions concerning incomplete emptying, frequency, intermittent stream, urgency, weak urinary stream, straining and nocturia. Several studies demonstrated lack of specificity of the AUA symptom index in BPH as well as a poor correlation between subjective symptoms and various objective measurements.[2–5]

Data concerning the clinical application of the AUA symptom index to women are sparse. A few studies comparing the distribution of AUA symptom index scores in men and women failed to reveal any gender differences.[6–8] To our knowledge there has been no previously published study on the role of the AUA symptom index in evaluating women with bladder outlet obstruction.

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Bladder outlet obstruction in women appears to be more common than previously recognized. The availability and increased use of various treatment modalities as well as new imaging techniques have recently revived clinical awareness and interest in this voiding dysfunction.[9,10] We determine whether there are any differences in the distribution of AUA symptom index scores in women with versus without obstruction and examine the possible correlation of scores with objective urodynamic parameters in women who have bladder neck obstruction.

MATERIALS AND METHODS

Patients. We reviewed a urodynamic database of 587 consecutive women referred for the evaluation of urinary symptoms and selected 38 (group 1) who met our urodynamics criteria of bladder outlet obstruction. These patients were compared with 27 women without obstruction who had isolated sphincteric incontinence (group 2). Group 2 did not include any patients with concomitant genitourinary prolapse, detrusor overactivity, or any other clinical or urodynamic evidence of bladder outlet obstruction.

To ensure that the AUA symptom index questions were relatively specific to bladder outlet obstruction in women 50 asymptomatic nurses from the Lis Maternity Hospital were also recruited into our study (group 3). These nurses voluntarily completed the Hebrew translation of the AUA symptom index questionnaire. They denied any urinary problems and, therefore, probably represent healthy asymptomatic women.

Investigations. Patients in groups 1 and 2 underwent clinical evaluation, including a complete history and physical examination, urinary questionnaire, AUA symptom index questionnaire, voiding diary, pad test, urine culture, noninvasive uroflowmetry, post-void residual urine determination, video urodynamics and urethrocystoscopy. Group 3 subjects completed history and urinary questionnaires as well as the AUA symptom index questionnaire. Due to ethical reasons urodynamics were not performed in the asymptomatic women.

The AUA symptom index questionnaire consists of 7 questions. For the purpose of this study questions 2, 4 and 7 were assigned to irritative symptoms, while questions 1, 3, 5 and 6 were assigned to obstructive symptom subscores. Total scores were classified as mild—0 to 7, moderate—8 to 19 and severe—20 to 35 symptoms, as recommended by the AUA measurement committee.[1] Since to our knowledge no standard urodynamic definitions for bladder outlet obstruction in women have been established, we considered urodynamic evidence of obstruction as a maximum flow rate of less than 12 ml. per second on repeat noninvasive uroflowmetry studies with detrusor pressure at maximum flow greater than 20 cm. water on pressure flow study.

Before evaluation all patients voided in private using a standard toilet. To avoid test induced dysfunctional voiding noninvasive uroflowmetry was repeated at least twice to ensure consistency. Only the best flow pattern was analyzed. Post-void residual urine was measured by ultrasound immediately after bladder emptying.

Multichannel video urodynamics were performed according to the recommendations of the International Continence Society except for cystometry.[11] Contrary to these recommendations patients were not instructed to inhibit voiding during the filling phase, but rather to report sensations to the examiner. At capacity patients were asked to void, and pressure flow studies with simultaneous video fluoroscopy of the bladder outlet and electromyography were performed. The site of obstruction was defined as the narrowest point in the urethra visualized on voiding cystourethrography.

Main outcome measures. End points for the assessment of the AUA symptom index were the analysis of the symptom index scores in groups 1 versus 2 versus 3, correlation of the scores and urodynamic parameters in group 1, and sensitivity, specificity and predictive values of severe symptoms (total score 20 or greater) for predicting bladder outlet obstruction in groups 1 and 2. Results were analyzed statistically using Student's t and chi-square tests with $p < 0.05$ considered significant. Data are presented as the mean plus or minus standard deviation or percent according to the variables.

RESULTS

Patient characteristics. Groups 1 and 2 patients were comparable with respect to mean age, while subjects in group 3 were significantly younger (63.9 ± 17.5, 64.7 ± 10.4 and 50.9 ± 6.4 years, respectively). Mean parity of groups 1 to 3 was 1.9 ± 1.3, 2.7 ± 1.1 and 2.4 ± 1, respectively. As expected, mean parity in group 2 was significantly higher ($p = 0.01$) than in group 1.

Group 1 patients represent 6.5% of our database population. The etiology of bladder outlet obstruction in these patients included previous anti-incontinence surgery in 10 (26%), severe grade 3 or 4 genital prolapse in 9 (24%), idiopathic bladder outlet obstruction in 6 (16%), urethral stricture or narrowing in 5 (13%), primary bladder neck obstruction in 3 (8%), external detrusor-sphincter dyssynergia in 2 (5%), learned voiding dysfunction in 2 (5%) and a urethral diverticulum in 1 (3%). This series is based on the application of a newly developed database of consecutive women and does not represent our previous experience. In fact, many of the most severe cases of bladder outlet obstruction were detected and some were reported previously. However, we did not estimate the prevalence rate in the previous series.

In group 1 urodynamics revealed concomitant detrusor instability in 13 patients (34%), sphincteric incontinence in 3 (8%) and mixed urinary incontinence in 2 (5%). Mean maximum flow rate on noninvasive uroflowmetry was 9.4 ± 3.9 ml. per second and mean detrusor pressure at maximum flow was 37.2 ± 19.2 cm. water. As expected, all noninvasive uroflowmetry and pressure flow parameters were significantly different in group 1 compared with those in group 2 (table 1).

AUA symptom index scores. Mean AUA symptom index score was significantly higher ($p = 0.004$) in group 1 than in group 2 patients. Each group had a significantly higher mean AUA symptom index score than group 3 (15.8 ± 8.4 and 10.3 ± 6.4 versus 2.1 ± 2.7, respectively). Table 2 shows specified scores in each group.

There was no statistically significant difference in answers given to questions 1 (feeling of incomplete bladder emptying), 2 (frequency) and 4 (urgency) in group 1 compared with group 2, although a clear trend of higher scores was evident in group 1. Obviously since questions 2 and 4 represent irritative symptoms, the irritative subscores in each group were likewise similar (7.6 ± 3.8 and 6.2 ± 3.3, respectively, $p = 0.07$). Most "obstructive questions" as well as the matched obstructive subscores were significantly higher in group 1 than in group 2 (8.4 ± 5.9 versus 4.1 ± 3.7, respectively, $p = 0.0009$).

AUA symptom index scores versus urodynamics. To compare urodynamic data with AUA symptom index scores we

TABLE 1. *Urodynamic parameters in groups 1 and 2*

	Mean ± SD		p Value
	Group 1 (38 pts.)	Group 2 (27 pts.)	
Noninvasive uroflowmetry:			
Peak flow rate (ml./sec.)	9.4 ± 3.9	25.1 ± 12.1	<0.0001
Flow time (sec.)	28.5 ± 18.6	17.2 ± 10.4	0.004
Voided vol. (ml.)	144.9 ± 72.7	217.5 ± 118.8	0.002
Post-void residual urine (ml.)	86.1 ± 98.8	40.3 ± 41.5	0.01
Cystometric bladder capacity (ml.)	375 ± 143.2	419.1 ± 149.6	Not significant
Pressure flow:			
Detrusor pressure at max. flow (cm. water)	37.2 ± 19.2	18.3 ± 13.2	<0.0001
Max. detrusor pressure during voiding (cm. water)	47.2 ± 21.7	38.3 ± 18.1	0.0001
Voided vol. (ml.)	153.2 ± 136.3	232.5 ± 146.5	0.02

TABLE 2. *AUA symptom index scores*

	Mean Score ± SD		
	Group 1 (38 pts.)	Group 2 (27 pts.)	Group 3 (50 pts.)
Total Score	15.8 ± 8.4*	10.3 ± 6.4	2.1 ± 2.7
Emptying	2.3 ± 1.9	1.6 ± 1.7	0.12 ± 0.47
Frequency	2.8 ± 1.6	2.7 ± 1.7	0.5 ± 1.2
Intermittent stream	2.5 ± 1.8*	0.7 ± 1.4	0.04 ± 0.2
Urgency	2.3 ± 1.8	2.0 ± 1.7	0.7 ± 1.5
Weak stream	2.3 ± 1.8*	1.4 ± 1.7	0.04 ± 0.2
Strain	1.2 ± 1.5*	0.3 ± 0.6	0.06 ± 0.2
Nocturia	2.5 ± 1.7*	1.5 ± 1.2	0.6 ± 0.7

* Significantly different from groups 2 and 3 ($p < 0.05$).

divided group 1 according to the severity of symptoms as mild in 7 patients (18%), moderate in 18 (48%) and severe in 13 (34%). Each parameter of urodynamic evaluation was then analyzed separately according to these 3 categories (table 3). Most noninvasive uroflowmetry parameters as well as all urodynamic parameters were similar in severe, moderate and mildly affected patients. Only post-void residual urine significantly ($p = 0.02$) correlated with severity of symptoms (severe, moderate and mild 148.5 ± 118.3, 62.7 ± 73.8 and 7.8 ± 6.9 ml., respectively).

Sensitivity, specificity and predictive value of severe symptoms. We analyzed the sensitivity, specificity and predictive value of severe symptoms for predicting bladder outlet obstruction in groups 1 and 2. Using AUA index categories 18% of group 1 versus 41% of group 2 had mild symptoms, 48% versus 52% had moderate symptoms and 34% versus 7% had severe symptoms. Using the cutoff point of a score of 20 or greater resulted in 34.2% sensitivity for the AUA symptom index in women with urodynamic obstruction and 92.6% specificity in those without obstruction enrolled in our study. Positive and negative predictive values were 86.7% and 50%, respectively.

DISCUSSION

The AUA symptom index score is widely used for measuring the severity of symptoms associated with BPH. Since its initial presentation in 1992, numerous studies have been published discussing its advantages and drawbacks. The index has proved to be reliable and valid for assessing symptom severity and management outcomes in BPH.[1] However, concerns have been raised regarding whether the index discriminates BPH from other lower urinary tract disorders[2,3,12] and whether there is any correlation of symptom index score with various objective measurements.[4,5] Furthermore, it was shown that the index is not gender specific, and elderly men and women have similar voiding symptom scores.[6,7]

Data concerning the validity of the AUA symptom index in women with lower urinary tract symptoms are sparse. Chancellor and Rivas studied 38 women with voiding symptoms, of whom only 3 had bladder outlet obstruction, as defined by urodynamic criteria.[13] Mean AUA symptom index score in the 35 nonobstructed cases was 17.6 before and 9.4 after therapy. In the 3 women with bladder outlet obstruction the mean score was 22.7 before and 11.0 after therapy. These data suggest that the AUA symptom index has a certain value for monitoring the response to treatment in women with voiding dysfunction. However, the number of women with obstruction in that series was too small to allow any conclusions concerning this specific subgroup.

Most recently Madersbacher et al evaluated 67 women and 70 age matched men referred for the evaluation of voiding symptoms.[8] Mean AUA symptom index score was higher in men than in women (15.7 ± 0.8 versus 13.0 ± 0.8, $p = 0.02$). Although only 6 women (9%) had urodynamically documented bladder outlet obstruction, no correlation was observed between the degree of obstruction and the obstructive subscore of the symptom index. Madersbacher et al stated that due to the small number of women with bladder outlet obstruction in their series, which correlated with that in the literature, data regarding obstruction in women must be interpreted with caution. Contrary to these previous reports, we evaluated a relatively large series of women with urodynamically defined bladder outlet obstruction. To our knowledge our study represents the first report assessing the role of the AUA symptom index in these patients.

The prevalence of bladder outlet obstruction in women is unknown and in all probability has been underestimated. In large retrospective reviews of women referred for the evaluation of lower urinary tract symptoms 2.7% to 8% had urodynamic evidence of bladder outlet obstruction.[14–16] Recent studies reported much higher prevalence rates.[9,10] The most likely reason for this wide variation in reported prevalence rates is the lack of standard definitions for diagnosing bladder outlet obstruction in women,[15–18] which was recently addressed. Chassagne et al reported that the best pressure flow cutoff values for predicting bladder outlet obstruction in their study population were maximum flow less than 15 ml. per second and detrusor pressure at maximum flow greater than 20 cm. water.[9] However, in that study maximum flow values, which were obtained with a urethral catheter in place during the pressure flow studies, could be associated with test induced dysfunctional voiding. Nitti et al defined bladder outlet obstruction as radiographic evidence of obstruction between the bladder neck and distal urethra in the presence of a sustained detrusor contraction with no strict pressure flow criteria.[10] Of their patients 29% met these radiographic criteria.

Noninvasive uroflowmetry is widely used as a screening tool in male voiding disorder. However, measuring flow at a urodynamics laboratory has limitations. We minimized these limitations by providing our patients with complete personal privacy during voiding and repeating the test in those with abnormal results. Only 2 abnormal results were considered as objective evidence suggesting voiding difficulty. These measures facilitated the minimization of artifacts associated with the testing environment. We considered a maximum flow rate of less than 12 ml. per second to be abnormal, while previous studies usually used a cutoff value of 15 to 20 ml. per second.[15,19–21] We then analyzed pressure flow parameters to distinguish between bladder outlet obstruction and an underactive detrusor. Only patients with low free flow and elevated detrusor pressure at maximum flow were considered to have obstruction. The site of obstruction was localized by video urodynamics and urethrocystoscopy. As previously claimed, it is clear that urodynamic criteria to define bladder outlet obstruction fail to diagnose patients with normal pressure flow parameters despite relative obstruction.[10] These patients may be diagnosed using simultaneous fluoroscopic imaging of the bladder outlet during voiding. However, the clinical significance of abnormal radiographic findings in these patients remains unclear.

Our data suggest that the AUA symptom index may be used as a bothersomeness index in women with bladder outlet obstruction, similar to its use in men. Mean symptom score was significantly higher in women with obstruction than in those with stress incontinence or no symptoms (15.8 ± 8.4 versus 10.3 ± 6.4 and 2.1 ± 2.7, respectively). Likewise, 34% of women with obstruction had severe scores compared with only 7% of those with stress incontinence. The finding that some patients without obstruction had severe symptoms emphasizes the suboptimal specificity and positive predictive value of severe symptoms (92.6% and 86.7%, respectively). Furthermore, 7 women with obstruction on urodynamics had a mild score of 0 to 7. They presented with urinary incontinence or urogenital prolapse as the main symptom neither of which is included in the AUA symptom index score.

TABLE 3. *Comparison of urodynamic parameters according to symptom severity categories in group 3*

	Mean Score ± SD		
	Mild (7 pts.)	Moderate (18 pts.)	Severe (13 pts.)
AUA symptom index score*	5.2 ± 1.7	13.4 ± 3.7	25.6 ± 4.0
Noninvasive uroflowmetry:			
Peak flow rate (ml./sec.)	9.2 ± 4.2	9.1 ± 1.9	10.2 ± 4.7
Flow time (sec.)	16.5 ± 3.9	31.8 ± 23.9	29.3 ± 11.6
Voided vol. (ml.)	123.0 ± 35.9	146.5 ± 86.7	157.9 ± 61.5
Post-void residual urine (ml.)	7.8 ± 6.9	62.7 ± 73.8	148.5 ± 118.3†
Cystometric bladder capacity (ml.)	377.0 ± 32.4	375.1 ± 145.9	434.0 ± 145.1
Pressure flow:			
Detrusor pressure at max. flow (cm. water)	30.0 ± 6.1	33.9 ± 12.1	45.5 ± 30.3
Max. detrusor pressure during voiding (cm. water)	44.2 ± 15.4	42.1 ± 12.2	50.3 ± 31.8

* Mild 0 to 7, moderate 8 to 19 and severe 20 to 35.
† Significantly different from mild and moderate values ($p < 0.05$).

The 2 control groups in our study included women without obstruction but with sphincteric incontinence (group 2) and asymptomatic healthy women (group 3). These control groups were chosen to evaluate the relative contribution and importance of irritative and obstructive symptoms in women with obstruction. However, these symptoms, which were mainly of the irritative type, were also reported by some controls. This finding is in accordance with the well-known phenomenon that lower urinary tract symptoms in women are nonspecific and urodynamics are essential for diagnosing voiding difficulties.[15, 20, 22] Nevertheless, the mean AUA symptom index score for each of the 7 questions was notably lower in asymptomatic women (range 0.04 to 0.74).

Only 2 previous studies evaluated the AUA symptom index in nonreferred women.[6, 7] Each series involved elderly women and demonstrated a mean AUA symptom index score of 7.5 and 5.8, respectively. The asymptomatic control women in our series with a mean age of 51 years were an average of 17 to 20 years younger than those in the other 2 reports. Madersbacher et al reported age related changes in bladder function as well as histological changes within the bladder wall.[23] The correlation of these changes with urodynamic, age related changes is unclear. Furthermore, estrogen deficiency in postmenopausal women usually causes atrophic changes in the urogenital tract and may be associated with urinary tract infections and urinary incontinence. To our knowledge no data are available concerning a possible association of estrogen deficiency with bladder outlet obstruction.

The results of our study further support the lack of correlation of the AUA symptom index with objective parameters of bladder outlet obstruction. Most noninvasive uroflowmetry parameters as well as all urodynamic parameters were similar in severely, moderately and mildly affected women. Only post-void residual urine weakly ($p = 0.02$) correlated with symptom severity. These results are comparable to previously reported data in men[4, 5, 24, 25] and may be only partially explained by the lack of well-defined criteria for diagnosing bladder outlet obstruction.

If neither symptoms nor symptom scores correlate with urodynamic findings, one may ask about the value of urodynamics, and symptoms and symptom scores. Symptoms indicate to the physician what bothers the patient and what needs treatment. Urodynamics define the underlying pathophysiology. We believe that treating the underlying pathophysiology treats symptoms, which is why urodynamics are important. When symptoms are treated empirically, there is no need for urodynamics but "if the only tool you have is a hammer, everything looks like a nail." Probably symptoms due to outlet obstruction represent several pathophysiological processes. Exploring these processes, and quantifying subjective and objective findings remain a clinical challenge. Today as new therapies emerge, it is likely that different pathophysiological conditions will be treated differently.

CONCLUSIONS

The results of our study suggest that the AUA symptom index score may be useful as a bothersomeness index in women with bladder outlet obstruction. However, we did not demonstrate a correlation of the index score with objective urodynamic parameters, similar to data already reported in male populations. Thus, this index should not be used as a reliable measure of clinical severity. The correct and timely diagnosis of bladder outlet obstruction in women may be difficult, since clinical features are similar to those of other voiding disorders and diagnostic modalities are often inconclusive or even misleading. A complete urodynamic evaluation is essential for making the diagnosis, although standard urodynamic definitions are still lacking. Further epidemiological and pathophysiological investigations are needed to evaluate the causes of and the main risk factors for bladder outlet obstruction in women. Better understanding the pathophysiological mechanisms associated with bladder outlet obstruction in women may provide the possibility of using appropriate diagnostic and treatment modalities, thus, avoiding any unnecessary intervention.

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