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Overactive Bladder Syndrome and Detrusor Overactivity: Is There a Strong Relation between the Symptoms and Urodynamic Findings?

Aim: Overactive bladder (OAB) and detrusor overactivity (DO) may interfere because one may cause the other. Not all patients with OAB have DO, neither do all patients with DO have OAB. In our study the correlation between OAB symptoms and DO was investigated.

Materials and Methods: In the present study, 190 patients with OAB and/or DO were investigated. Patients were divided into 3 groups: OAB with DO group (group 1, n = 63), DO without OAB group (group 2, n = 34), and OAB without DO group (group 3, n = 93). The symptoms and urodynamic findings of the patients from these 3 groups were compared between each other with the independent t-test and Mann-Whitney U test. For prediction of DO, a logistic regression model was performed.

Results: There were 156 patients having OAB syndrome. Of them, 63 patients (40%) had involuntary contractions on urodynamic studies. DO was present in 97 patients; among these patients, OAB was observed in 63 (65%) patients. Nocturia and urge incontinence (UI) were the significant predictors of DO in female and male patients, respectively.

Conclusions: There is not an exact correlation between OAB symptoms and DO. In our study nocturia and UI were the predicting symptoms for DO in female and male patients, respectively. But to make exact comments, these results must be verified by epidemiologic studies.

Key Words: Overactive bladder syndrome, detrusor overactivity, nocturia, urgency, urge urinary incontinence

Aşırı Aktif Mesane Sendromu ve Detrusor Aşırı Aktivitesi: Semptomlar ve Ürodinamik Bulgular Arasında Güçlü Bir İlişki Var mı?

Amaç: Aşırı aktif mesane (AAM) ve detrusor aşırı aktivitesi (DAA) birbiri ile karışabilmektedir; çünkü genelde biri diğere sebep olabilmektedir. Her AAM'li hastada DAA olmayabileceği gibi, her DAA'li hastada da AAM bulunmayabilir. Bu çalışmada AAM semptomları ile DAA arasındaki ilişki araştırıldı.

Yöntem ve Gereç: AAM ve/veya DAA'sı olan 190 hasta incelendi. Hastalar AAM ve DAA mevcudiyetine göre 3 gruba ayrıldı: AAM ve DAA'lı hastalar (grup 1, n = 63), AAM'siz DAA'lı hastalar (grup 2, n = 34) and DAA'sız AAM'li hastalar (grup 3, n = 93). Her üç gruptaki hastaların semptom ve ürodinamik bulguları independent t-test ve Mann-Whitney U testi ile karşılaştırıldı. DAA'sini bildirici semptomların tespiti için logistic regression analizi yapıldı.

Bulgular: AAM sendromu olan 156 hasta tespit edildi. Bunlardan, 63'ünde (% 40) ürodinamik inceleme sırasında istemsiz detrusor kasılması saptandı. DAA 97 hastada tespit edildi. Bunlardan 63'ünde (% 65) AAM izlendi. Nokturi ve sıkışma tipi idrar kaçırma sırasıyla kadınlarda ve erkeklerde DAA ile ilişkili bulundu.

Sonuç: AAM semptomları ile DAA arasında kesin bir ilişki yoktur. Çalışmamızda nokturi ve sıkışma tipi idrar kaçırma sırasıyla kadınlarda ve erkeklerde DAA'yı bildirici semptomlar olarak tespit edildi. Ancak kesin bir ilişkiden bahsedebilmek için bu sonuçlar epidemiyolojik çalışmalar ile doğrulanmalıdır.

Anahtar Sözcükler: Aşırı aktif mesane, detrusor aşırı aktivitesi, nokturi, sıkışma, sıkışma tipi idrar kaçırma

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Introduction

Detrusor instability and unstable bladder were thought to be the reason and result of each other and even sometimes they were used as synonyms. However, after the report of the Standardisation Sub-committee of the International Continence Society in 2002 (1), overactive bladder (OAB) was accepted as a syndrome and detrusor overactivity (DO) as an urodynamic definition.

OAB is a symptomatic diagnosis and defined as urgency (\pm urge urinary incontinence (UUI)), usually with frequency (>8 micturations/24 h) and nocturia (1). Urgency is generally accepted as the main symptom in this syndrome. Initial studies on OAB used "either alone or in combination" for OAB symptoms (2). However, the ICS committee revised the definition in 2002, and now at least 2 symptoms must be present (3).

OAB is believed to be resulted from the involuntary contractions of the detrusor muscle, which causes urgency and other mentioned symptoms. However, it has been well documented that only 40%-60% of patients with OAB are actually found to have DO (4-8). These studies were performed before the ICS 2002 report; thus, they were based on older definitions.

Patients with 2 different entities meeting the latest definitions presented at our clinical practice. However, it is hard to differentiate these 2 diagnoses; because, one of them (OAB) suggested the other's (DO) existence, and it is also possible to have DO without OAB symptoms.

The association of these clinical and urodynamic diagnoses were investigated in order to emphasize the correlation between OAB symptoms and DO.

Materials and Methods

Patients referred to our urodynamic unit with lower urinary tract symptoms within the last 2 years were retrospectively evaluated with previous history, urinary symptoms, and physical examination. The ones with neurologic or metabolic (e.g. diabetes mellitus) or local disorders (e.g. urinary tract infection, interstitial cystitis, and urinary stones) or who are under the age of 18 years were not included in the study.

The urine samples of the patients were analyzed and those with positive leukocyte esterase or nitrite test were deferred until the urinary tract infection was eliminated. The urodynamic studies were performed with a MMS Solar Video Urodynamic system. Our methodology for performing the urodynamic procedure starts with the patient in the lithotomy position with a 7Fr double-lumen transurethral catheter through which normal saline at room temperature is infused at the physiological filling rate (≤ 20 ml/min) via a peristaltic pump and a 9Fr rectal balloon catheter placed into the rectum to measure the abdominal pressure. Before the examination, patients

were asked to void and post-void residual urine was measured with the double-lumen catheter. Patients were asked neither to void nor to inhibit micturition but just to say their sensations during cytometry. Detrusor pressure was electronically calculated by subtracting the abdominal pressure from the intravesical pressure. Patients were diagnosed with DO after spontaneous and uninhibited increases in detrusor pressure were detected during bladder filling, whether these were phasic or terminal.

Patients with symptoms of OAB (urgency \pm UUI and at least one of the other OAB symptoms: frequency, nocturia) and DO, defined during urodynamic evaluation, were selected.

The study included 130 female and 60 male patients with DO and/or OAB. The mean age of the patients was 51.50 ± 15.86 years old (18-86 years old). The patients were divided into 3 groups: OAB with DO (group 1, $n = 63$), DO without OAB (group 2, $n = 34$), and OAB without DO (group 3, $n = 93$). Age, gender, symptoms, and urodynamic findings were compared between individuals in these groups to determine if any significant difference related to the presence of OAB symptoms or DO exists. Furthermore, urodynamic parameters were compared between patients with phasic and terminal DO. Statistical analyses were performed with the independent t-test and Mann-Whitney U test. For prediction of DO, a logistic regression model was performed with DO as the dependent and the 4 symptoms as the possible predictor covariates for all of the cases, and separately for male and female cases.

Results

Mean age of the patients in groups 1, 2, and 3 were 54.44 ± 17.40 , 47.12 ± 16.64 , and 51.11 ± 14.16 , respectively. The only significant difference was between groups 1 and 2. Male patients' age was significantly higher in group 3 ($P = 0.013$); in the other groups there was no statistically significant difference between the ages of males and females.

Except urgency and UUI, other symptoms of OAB were seen significantly different between groups 1 and 3 (frequency; $P = 0.025$, nocturia; $P=0.001$). Urgency was the main symptom in all of the patients with OAB syndrome; frequency was the accompanying symptom in 59 (94%) and 93 (100%) patients in groups 1 and 3, respectively ($P = 0.025$). Nocturia was one of the

accompanying symptoms in 23 (37%) and 8 (9%) patients in groups 1 and 3, respectively ($P = 0.001$). UUI was seen in 52 (82%) and 67 (72%) patients in groups 1 and 3, respectively ($P = 0.187$) (Table 1). Leading symptoms in group 2 were frequency (as monosymptom) and enuresis nocturna. Stress urinary incontinence coexisted in 76% of the patients with UUI in group 3. In another point of view; 47% of the patients with urgency had DO, 42% with frequency had DO, 75% with nocturia had DO, and 44% with UUI had DO.

Eighty four percent of the female patients with nocturia had DO and 61% of the male patients with nocturia had DO. Forty one percent of the female patients with UUI had DO and 57% of the male patients with UUI had DO. Male frequency was only higher in group 2.

As a result of the logistic regression analysis including each OAB symptoms; it was found that nocturia was the only significant predictor variable of DO. UUI was the strongest predictor after nocturia. The significant predictor was UUI in male and nocturia in female patients (Table 2).

After urodynamic evaluation, maximal cystometric capacity and first desire volume were observed in patients with OAB who did not show uninhibited detrusor contractions at the urodynamic trace (Group 3). There was a statistically significant difference between the first 2 groups and group 3 in terms of cystometric capacities and first sensation volumes (Table 3). The lowest compliance and the highest maximum detrusor pressure were in the second group. Uninhibited detrusor contractions caused statistically significant differences in all of the urodynamic parameters evaluated (first sensation volume, cystometric capacity, compliance, and maximum detrusor pressure) except in the compliance between groups 2 and 3.

Of the patients with DO ($n = 97$), phasic and terminal overactivity were observed in 57 (59%) and 40 (41%) patients, respectively. Gender distribution was similar in the phasic and terminal DO groups. Mean age of the patients with terminal DO was higher compared to the ones with phasic DO. The only significant difference according to urodynamic parameters was in first

Table 1. Age, Gender, and symptoms of the 3 groups.

Groups	n	Gender (%)	Age	U (%)	F (%)	Noc (%)	UUI (%)
I	63	F 47(75%)	54.4 ± 17.2	47 (100%)	44 (94%)	16 (34%)	40 (85%)
		M 16(25%)	54.3 ± 18.3	16 (100%)	15 (94%)	7 (44%)	12 (75%)
II	34	F 14(41%)	43.4 ± 16.7	8 (57%)	2 (14%)	0 (0%)	0 (0%)
		M 20(59%)	49.7 ± 16.5	12 (60%)	6 (30%)	1 (5%)	0 (0%)
III	93	F 69(74%)	49.1 ± 13.7	69 (100%)	69 (100%)	3 (4%)	58 (84%)
		M 24(26%)	56.6 ± 14.1	24 (100%)	24 (100%)	5 (21%)	9 (37%)

F: Female. M: Male, U: Urgency, F: Frequency, Noc: Nocturia, UUI: Urge urinary incontinence

Table 2. Logistic regression analysis of the overactive bladder symptoms and detrusor overactivity.

	Overall		Male		Female	
	P	Odds ratio	P	Odds ratio	P	Odds ratio
URGENCY	0.998	0.000	0.999	0.000	0.999	0.000
FREQUENCY	0.997	0.000	0.998	0.000	0.998	0.000
NOCTURIA	0.001	6.112	0.128	0.695	0.001	9.511
URGE URINARY INCONTINENCE	0.058	2.364	0.026	1.229	0.679	1.274

Table 3. Mean values of first sensation, bladder capacity, compliance, maximum detrusor pressure.

	GROUP	Mean ± SD	GROUP	P
First sensation	Gr. 1 "oab+do+"	98.8 ± 53.7	oab-do+	0.499
			oab+do-	0.001
	Gr. 2 "oab-do+"	90.9 ± 51.5	oab+do+	0.499
			oab+do-	0.001
	Gr.3 "oab+do-"	140.9 ± 72.2	oab+do+	0.001
			oab-do+	0.001
Capacity	Gr. 1 "oab+do+"	244.2 ± 149.0	oab-do+	0.052
			oab+do-	0.001
	Gr. 2 "oab-do+"	186.1 ± 116.2	oab+do+	0.052
			oab+do-	0.001
	Gr.3 "oab+do-"	427.6 ± 117.5	oab+do+	0.001
			oab-do+	0.001
Compliance	Gr. 1 "oab+do+"	22.4 ± 22.7	oab-do+	0.413
			oab+do-	0.020
	Gr. 2 "oab-do+"	15.6 ± 11.6	oab+do+	0.413
			oab+do-	0.236
	Gr.3 "oab+do-"	57.0 ± 97.8	oab+do+	0.020
			oab-do+	0.236
Pdet max	Gr. 1 "oab+do+"	57.1 ± 31.4	oab-do+	0.532
			oab+do-	0.006
	Gr. 2 "oab-do+"	72.2 ± 59.5	oab+do+	0.532
			oab+do-	0.040
	Gr.3 "oab+do-"	37.2 ± 35.5	oab+do+	0.006

* The mean difference is significant at the 0.05 level.

sensation volumes of the individuals between the terminal and phasic DO groups ($P = 0.018$).

Discussion

The terms OAB and DO have been used in the neurourology practice for the past 5 years. They may imply each other but OAB and DO represent 2 different patient populations. In a significant proportion of patients with OAB syndrome, no correlation was found between OAB symptoms and urodynamic findings. In some previous studies, the correlation between OAB symptoms and DO were investigated but they used some other terms instead of OAB. DO existence was found to be varied from 19% to 76% in patients with OAB symptoms in these studies (9-11).

In our study, 60% of the patients with OAB symptoms had normal urodynamic findings. There is an effort for predicting DO according to the symptoms of OAB; however, OAB symptoms may misguide the physician in the diagnosis of DO. Urgency, UUI, and nocturia symptoms are the conspicuous ones in predicting DO.

In the logistic regression analysis of all OAB symptoms for the prediction of DO, nocturia was found to be a significant predictor. In the male patients, UUI was the only significant predictor of DO, and in the females nocturia was the only significant predictor. UUI was not assessed as an independent factor in females; interference of the stress and UUI patterns in females' complaints may be the reason. Nocturia, which has a multifactorial etiology, was not found as a significant predictor in males. In our study male patients with nocturia and DO

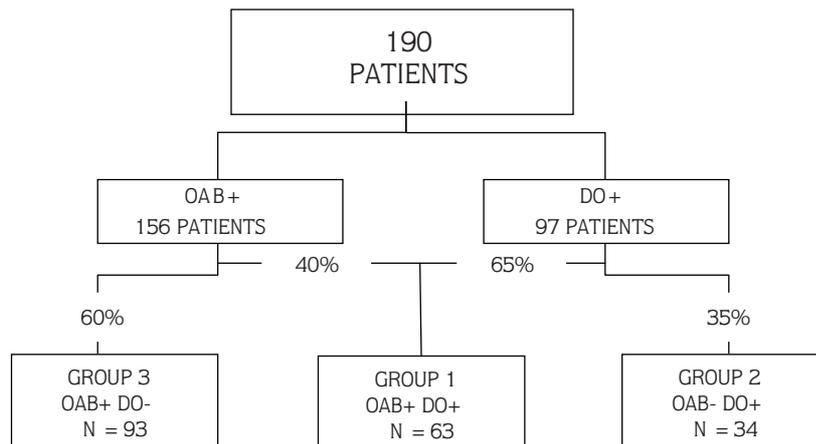


Figure 1. Configuration of the patients due to existence of OAB and DO.

had a mean age of 51.75 and, in the epidemiologic studies, prevalence of LUTS (Lower Urinary Tract Symptoms) due to benign prostate hyperplasia was found 30%-50% at these ages (12,13). Symptoms of a significant number of cases complaining about nocturia in males were thought to be originating from the storage symptoms of the prostate enlargement rather than DO.

DO was assessed in 75% of the patients with nocturia. More than a third of the patients with OAB and also DO had nocturia; but only approximately 10% of the patients with OAB and without DO had nocturia. Patients with nocturia and/or UUI may have high risk of DO in urodynamic evaluation; and thus may respond to antimuscarinic drugs better than patients without these symptoms.

Similar associations with DO and OAB symptoms were reported in the literature recently published. Hashim and Abrams stated nocturia, urgency, and UUI as the predictors of DO in their study (11). UUI and nocturia were also found to be associated with DO in the study of Khan et al. (14).

In the group of patients with OAB without DO, symptoms appear to have no pathophysiological basis or negative urodynamic findings may be deriving from our cystometry performing method. The urodynamic study without reproducing patients' symptoms may be the cause of not assessing DO during urodynamics. Therefore, it is important to inquire about the reproduction of symptoms during urodynamics and correlate this with findings during the test (11) or it

would be better to use ambulatory urodynamics instead of conventional urodynamics in these patients.

Not in all cases, but in general, it is not wrong to say that DO causes OAB. In our study, majority of the patients with DO had OAB. In patients with DO and without OAB symptoms, the probable reason may be the lack of negative impulses from the upper centers during urodynamic investigations because the patients are told not to try to hold their urine and just tell what they feel. However, in normal life practice these patients are used to inhibit their miction almost 99% of the time except during the time they spend in the toilet (15). So, while the symptoms occur in their daily activities, we are not able to observe them during conventional urodynamics. Symptomatic DO during urodynamics is a very valuable sign in the etiology of the OAB. Furthermore, technological advancements, ability to measure the central detrusor inhibition, and evaluating the status of the perineal floor synchronously with the multichannel video-Urodynamic study will expand the value of the sign of DO during urodynamics.

Without any bothersome symptom, is it right to treat DO? Without considering the severity of symptoms, determining DO may not have any importance. It does not sound logical to start an antimuscarinic in the presence of DO without any symptoms.

After the evaluation of the urodynamic parameters, statistically significant differences in bladder capacities were observed in both patients with and without DO. In the presence of DO, existence or absence of OAB did not

make any statistically significant difference in the urodynamic parameters. Presence of DO is one of the key factors affecting the bladder capacity. According to our results, we assume that the relation claimed to be between OAB symptoms and parameters of filling cystometry is an indirect relation through the existence of DO rather than a direct relation. Presence of DO in OAB syndrome can significantly decrease the patients' quality of life compared to the ones without DO. Patients with OAB and DO may regain their previous quality of life with antimuscarinic treatment compared to the patients with overactive bladder without DO. Maybe it is more reasonable to manage OAB symptoms with antimuscarinic agents if they are due to DO.

The term OAB does not distinguish patients with lower urinary tract symptoms who have demonstrable findings on cystometry (such as unstable contractions or hypersensitivity) from those who have normal cystometric findings. It does not address causes or varieties of incontinence (9). Therefore, it is not right to see OAB symptoms as a target of treatment but just the signs of an underlying cause.

Such patients with terminal DO appear to lose both warnings of impending micturition and the ability to inhibit what turns out to be a voiding contraction. Incontinence is often disastrous, as patients empty their bladders on the way to the bathroom or even before they can get out of their chair or bed on their way to the toilet (3). As we detected in our study, uninhibited terminal detrusor contractions occur at the cystometric capacities and these patients had lower cystometric capacity than patients with phasic DO. However, the only significant difference was in the first sensation volumes.

There is not an exact correlation between DO and OAB symptoms. According the statistical results of our study, nocturia and UUI were the predicting symptoms for detrusor overactivity in female and male patients, respectively. Urgency and frequency were found as unreliable symptoms in predicting DO in our study. However, to make more exact comments, more detailed epidemiologic studies are needed.

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