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CLASSIFICATION OF NOCTURIA BASED ON BLADDER CAPACITY AND NOCTURNAL POLYURIA AND ITS ASSOCIATION WITH LOWER URINARY TRACT SYMPTOMS AND SLEEP DISORDER

Hypothesis / aims of study

Nocturia, waking at night 1 or more times to void, is a multifocal condition with many possible contributing etiological factors. The possible causes may include OverActive Bladder (OAB), Bladder Outlet Obstruction (BOO), Interstitial Cystitis (IC), cancer, neurogenic detrusor over activity, sleep problems, diabetes mellitus, nocturnal polyuria, excessive evening fluid/ caffeine intake, renal or cardiac dysfunction. However, precise etiology is deceptively difficult. Core Lower urinary tract Symptom Score (CLSS) questionnaire addresses 10 core symptoms ; daytime frequency, nocturia, urgency, urgency incontinence, stress incontinence, stream, straining, incomplete emptying, bladder pain, and urethral pain (1). Recently we demonstrated the clinical significance of CLSS to evaluate male and female lower urinary tract symptoms (LUTS) in various diseases (2).The aim of study is to examine the correlations among frequency volume chart (FVC) data and symptom profiles assessed by CLSS and Athens Insomnia Scale (AIS) in men and women with nocturia.

Study design, materials and methods

Consecutive treatment naïve 301 (226 male and 75 female) nocturnal patients recorded CLSS questionnaires, AIS, and FVC for two days. Clinical diagnosis were BPH (n=100), OAB wet (n=55), prostate cancer (n=12), prostatitis (n=13), underactive bladder (n=5), and others (n=41) in men, OAB (n=28), stress incontinence (n=3), mixed incontinence (n=16), pelvic organ prolapse (n=13), underactive bladder (n=3), IC (n= 2), and others (n=10) in women. We divided these patients into four groups according to their bladder capacity (BC) and with or without nocturnal polyuria (NP); Group 1: normal BC and without NP, Group 2: normal BC and NP, Group 3: reduced BC and without NP, and Group 4: reduced BC and NP. A maximum capacity less than 4 time of their body weight [BW (kg)] was defined as reduced BC (3). NP index (NPi) larger than 33 % or nocturnal voided volume larger than 10 times of BW (kg) were regarded as NP. Correlations between nocturia and clinical characteristics were statistically analyzed. The study was approved by our institutional ethical committee.

Results

The number of men and women distributed as follows; group 1: 45 (19%), 17 (23%), group 2: 109 (48%), 40 (53%), group 3: 25(11%), 11 (15%), and group 4: 47 (20%), 3 (4%), respectively (Table). Sleep disorder, urinary incontinence, and urethral pain were correlated with nocturnal severity in Group 1. Men in Group 2 had higher prevalence of cardiovascular or metabolic diseases than other groups and also complained of urgency symptom. Sleep, storage, and voiding dysfunction were mixed in men with group 4. Prostate volume of group 4 was the highest of all nocturia ≥ 3 patients (group 1:24.1±14.2, group 2: 26.6±15.9, group 3: 24.2±14.9, group 4: 36.8±22.2) (1 vs. 4; p=0.029, 2 vs. 4; p=0.037, 3 vs. 4; p=0.032).On the other hand, in women, group 1 patients also had significantly higher score of stress incontinence than other groups. Women in group 4 complained straining symptom and mixed kinds of sleep disorders.

Interpretation of results

NP was the major cause in both men (69%) and women (57%), which may be associated with metabolic and cardiovascular diseases. Stress incontinence and urethral pain had significant impact on nocturia in group 1. Pelvic floor weakness was common reason of nocturia in both men and women. Group 4 would be a complicated type of NP, LUTS, and sleep disorders in both sexes.

Concluding message

Our simplification may be useful for the assessment and treatment choice of men and women with nocturia.

Patient's characteristics subdivided into four groups according to bladder capacity and nocturnal polyurine index (Npi)											
	Grouping in male (n=226)					Grouping in female (n=75)					
	1	2	3	4		1	2	3	4		
	Normal BC without NP (n=45)	Normal BC with NP (n=109)	Low BC without NP (n=25)	Low BC with NP (n=47)	p	Normal BC without NP (n=17)	Normal BC with NP (n=40)	Low BC without NP (n=11)	Low BC with NP (n=3)	p
Uroflowmetry *											
Voiding volume (ml)	172±86.3	184±104	164±91.4	132±87.7	a	236±204	189±162	90.6±47.4	102±97.5		
Peak flow rate (ml/sec)	12.8±6.28	12.6±6.27	9.35±4.38	8.67±4.84	b	19.8±12.2	21.0±15.2	12.4±6.94	11.2±11.5		
Residual volume (ml)	38.8±39.9	42.7±34.8	48.5±44.7	41.4±36.3	c	54.6±104	58.6±95.8	27.2±32.8	76.3±81.9		
EGFR# (ml/min/1.73m^2)	69.1±14.2	64.6±14.6	61.9±15.3	64.1±18.6	d	55.6±27.4	67.2±26.2	56.5±28.9	47.3±18.9		
Charlson comorbidity index	0.80±0.21	1.49±0.14	1.08±0.28	0.91±0.20	e	0.72±1.18	0.55±0.85	1.15±1.06	0.50±0.58	l	
CLSS (selected symptom)											
Stress urinary incontinence	0.3±0.6	0.1±0.4	0.2±0.6	0.1±0.4	f	1.6±0.9	0.9±1.2	0.6±0.8	1.0±1.2	m	
Straining	1.2±1.2	1.0±1.1	1.5±1.1	1.1±1.2		1.1±1.3	0.6±0.9	1.0±1.3	1.8±1.3	n	
Incomplete emptying	1.5±1.2	1.0±1.1	1.4±1.0	1.4±1.1	g	1.0±1.2	1.4±1.3	1.5±1.1	1.5±1.3		
Urethral pain	0.5±0.9	0.1±0.4	0.2±0.4	0.3±0.8	h	0.2±0.4	0.2±0.7	0.5±1.0	0.3±0.5		
AIS (selected symptom)											
Sleep induction	0.8±0.9	0.7±1.0	0.6±0.9	0.9±0.8	i	0.7±0.8	0.7±0.9	0.5±1.1	1.0±0.8		
Awakenings during the night	0.9±0.8	0.9±0.8	0.8±0.8	1.1±0.7		0.6±0.7	0.6±0.6	0.5±0.8	1.5±0.6	o	
Total sleep duration	0.7±0.8	0.7±0.7	1.0±0.7	1.0±0.8	j	0.8±0.5	0.7±0.7	0.8±0.7	1.8±0.5	p	
Total scores	6.0±4.6	6.2±4.8	6.1±4.0	7.7±4.2	k	5.7±2.9	5.8±3.9	6.2±5.5	10±2.8	q	

BC: bladder capacity. NP: nocturnal polyuria. * * mean ± S.D. # Estimated glomerular filtration ratemean ± S.D.

a: 1 v.s. 4: 0.0235, 2 v.s. 4: 0.006. **b**; 1 v.s. 3: 0.0171,1 v.s. 4: 0.0021, 2 v.s.3: 0.041, 2 v.s. 4: 0.0007. **c**; 2 vs. 3:<0.0001, 2 vs. 4:<0.0001, 1 vs. 2: 0.02, 1 vs. 3: 0.002, 1 vs. 4: 0.004.**d**: 1 v.s. 2: 0.047. **e**; 1 v.s. 2: 0.024, 2 v.s. 4: 0.048.**f**; 1 v.s. 2: 0.043. **g**; 1 v.s. 2: 0.02. **h**; 1 v.s. 2: 0.0025. **i**; 2 v.s. 4: 0.038. **j**; 2 v.s. 4: 0.041. **k**; 1 v.s. 4: 0.032, 2 v.s. 4: 0.022, 3 v.s. 4: 0.049

l; 2 v.s. 3: 0.0379. 29; 1 v.s. 4:0.0185, 2 v.s. 4: 0.0065. **m**; ; 1 v.s. 2: 0.0258, 1 v.s. 3: 0.0078. **n**; 2 v.s. 4: 0.0438. **o**; 1 v.s. 4:0.0304, 2 v.s. 4: 0.0183, 3 v.s. 4: 0.044. **p**; 1 v.s. 4: 0.0091, 2 v.s. 4: 0.0077, 3 v.s. 4: 0.0349. **q**; 1 v.s. 4: 0.0233, 2 v.s. 4: 0.0347

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