



The Severity and Distribution of Nonurologic Pain and Urogenital Pain in Overactive Bladder are Intermediate Between Interstitial Cystitis and Controls

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OBJECTIVES	(1) To compare the severity and distribution of nonurologic and urogenital pain between overactive bladder (OAB), interstitial cystitis/bladder pain syndrome (IC/BPS) and controls, and (2) To examine the relationships between the severity of urogenital pain and severity of urinary symptoms among patients with OAB.
SUBJECTS AND METHODS	Fifty-one OAB patients, 27 IC/BPS patients, and 30 controls were recruited. Nonurologic pain was assessed using a whole body map and Brief Pain Inventory. Urologic pain was assessed using the Interstitial Cystitis Symptom and Problem indexes, Genitourinary Pain Index, and 0-10 pain scale. Urogenital pain was assessed using a genital map, and report of pain related to bladder filling and urination.
RESULTS	Among OAB patients, 6% reported pelvic pain only while 28% reported pelvic pain and beyond. 18% reported widespread pain. The distribution of nonurologic pain and urogenital pain in OAB patients were intermediate between IC/BPS and controls (IC/BPS>OAB>controls, P all <.05). The intensity of pain reported by OAB patients was intermediate between controls and IC/BPS (average 2.3 vs 0.8 vs 4.3 out of 10, P <.001). Among OAB patients, the pain severity (GUPI-pain, ICSI-pain, ICPI-pain) was positively correlated with urinary severity (UDI-6, IIQ-7, OABq-SS, OABq-QOL, P all <.05). OAB patients with pelvic pain have worse urinary symptoms and psychosocial health (anxiety, depression) compared to OAB patients without pelvic pain.
CONCLUSION	A subset of OAB patients has pain inside and/or outside the pelvis. The intensity and distribution of pain in OAB was intermediate between IC/BPS and controls. Systemic processes such as central sensitization should be examined in this population. UROLOGY 130: 59–64, 2019. © 2019 Elsevier Inc.

Interstitial cystitis/bladder pain syndrome (IC/BPS) and overactive bladder (OAB) are clinical syndromes defined primarily by patient-reported symptoms.^{1,2} It has been accepted that the absence of pain can help to distinguish OAB from IC/BPS.³ The distinction works in many “index” patients, but there is growing evidence in literature that there may be overlap between the two conditions.⁴⁻⁸

Our group has previously reported the symptom overlaps between OAB and IC/BPS; 46% of IC/BPS patients

reported urinary incontinence, while 33% OAB patients reported pain in the bladder.⁹ The description of pain in OAB is intriguing, since it has recently been hypothesized that OAB patients can develop central sensitization.^{10,11} To our knowledge, the intensity and distribution of nonurologic pain and urogenital pain have not been systematically evaluated in OAB. In this study, we expanded the characterization of pain in OAB to include both nonurologic and urogenital pain. We also examined the relationships between the severity of urogenital pain and severity of urinary symptoms among patients with OAB.

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SUBJECTS AND METHODS

Participants

Between October 2012 and July 2014, patients aged 18 or above who had OAB, IC/BPS, and controls were recruited. For OAB,

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participants must have urgency, with or without urgency incontinence, usually with frequency and nocturia, in the absence of other causes, in accordance with the 2002 ICS (International Continence Society) definition of OAB.¹² For IC/BPS, participants must have pain, pressure or discomfort perceived to be related to the bladder, associated with lower urinary tract symptoms for more than 6 weeks, in the absence of other causes, in accordance to the 2011 AUA Guideline on IC/BPS.² Participants with a history of incontinence surgery, prostate surgery, urethral stricture, neurogenic bladder, retention, pelvic radiation, tuberculosis cystitis, cyclophosphamide cystitis, genitourinary cancer, urinary stones, positive urine culture in the past 6 weeks, or residual volume ≥ 150 mL were not eligible. Controls were recruited by advertisement, and from Washington University healthy volunteer research registry. Control participants had no prior diagnosis of OAB or IC/BPS, no significant urinary symptoms (AUA symptom index < 7), and no active urinary infection. The control group was age-matched to the OAB group. All participants signed an informed consent. The Washington University Institutional Review Board approved this study.

Assessment

The intensity of nonurologic pain was assessed using the Brief Pain Inventory (BPI) which inquired about the subjects' worst pain, least pain, and average pain in the past week, and the current pain intensity on 0–10 numeric rating scales (NRS). The pain interference of daily activities was assessed by the BPI.¹³

The distribution of pain was assessed using a whole body map as previously described.¹⁴ On the body map (see [Appendix 2](#)), participants were asked to check any of 45 body sites where they experienced pain in the past week. Those reporting pain in sites 14, 15 or 16 only were considered to have “pelvic pain only”. Those reporting pain in any of the 7 body regions in color in addition to the pelvic areas were considered to have “pelvic pain and beyond”. Those reporting pain in 3-7 boarder body regions (colored) outside the pelvis was further classified as having “widespread pain”.¹⁴

The intensity of urogenital pain was assessed using the pain questions on the Interstitial Cystitis Symptom (ICSI-pain) and Problem indexes (ICPI-pain),¹⁵ the pain score of the Genitourinary Pain Index (GUPI-pain),¹⁶ and a 0-10 numeric rating scale of “pain associated with your bladder.”

The distribution of urogenital pain was assessed using a sex-specific genital map. This map inquired about the presence of urogenital pain in males (glans, shaft of penis, scrotum, perineum) and in females (vulva, anterior vagina, posterior vagina, perineum).

The characteristics of urogenital pain were examined by asking the participants if they experienced pain or burning: (1) as the bladder fill; (2) during urination; (3) during and after intercourse; and (4) whether the pain or burning was reduced by voiding.

Urinary symptoms were assessed using the following validated questionnaires: (1) OAB-q symptom severity (OABq-SS) scale;¹⁷ (2) OAB-q health-related quality of life (OABq-HRQOL);¹⁷ (3) Urogenital Distress Inventory Short Form (UDI-6);¹⁸ and (4) Incontinence Impact Questionnaire Short Form (IIQ-7).¹⁸

Regarding psychosocial health, the Hospital Anxiety and Depression Scale (HADS) was used to assess anxiety and depression,¹⁹ and the Perceived Stress Scale (PSS) was used to assess psychological stress.²⁰

Statistical Analysis

Three-group trend tests were used to test if the responses from OAB were intermediate between IC/BPS and controls, ie, to test for IC/BPS $>$ OAB $>$ controls, or IC/BPS $<$ OAB $<$ controls. For categorical variables, the Cochran-Armitage test for trend was used.²¹ For continuous variables, the Jonckheere-Terpstra trend test was used.²² Post-hoc comparisons were performed using chi-square tests (or Fisher's exact tests for < 5) for categorical data, and Wilcoxon sum-rank tests for continuous data. All comparisons were adjusted for sex. To examine the relationships between urinary symptoms and pain symptoms among OAB participants, Spearman's correlation analyses were performed. $P < .05$ was considered significant. All statistical analyses were completed using the open source statistical package R v3.3.1.

RESULTS

Fifty-one OAB, 27 IC/BPS, and 30 controls participated in this study. [Table 1](#) showed their demographics, medical comorbidities, and urinary symptoms. As expected, OAB participants had the worst OAB and urinary incontinence symptoms (OABq-SS, OABq-HRQOL, UDI-6, IIQ-7) while IC/BPS had the most intense bladder pain (ICSI-pain, ICPI-pain, GUPI-pain).

Nonurologic Pain

One-third of OAB participants (33.3%) reported pelvic pain. Among them, 5.9% had “pelvic pain only” and 27.5% had “pelvic pain and beyond”. About one-sixth of OAB participants (17.6%) had “widespread pain” (see [Appendix 2](#) for the classification scheme). The most common locations of nonurologic pain in OAB were: lower back (41.2%), left lower extremity (37.3%), and right lower extremity (31.4%).

Comparing the three groups, IC/BPS was most likely, OAB was intermediate, and controls were least likely to report any pelvic pain (IC/BPS $>$ OAB $>$ controls, trend test $P < .001$). IC/BPS was also most likely, OAB was intermediate, and controls were least likely to report widespread pain (IC/BPS $>$ OAB $>$ controls, trend test $P = .002$).

On the whole body map, IC/BPS participants reported the greatest numbers of pain sites, controls reported the least numbers of pain sites, while OAB were intermediate between the 2 groups (IC/BPS 5.6 ± 5.1 vs OAB 4.8 ± 7.8 vs controls 0.9 ± 2.1 , trend test $P < .001$). OAB were intermediate between IC/BPS and controls in terms of the numbers of non-pelvic regions with pain (IC/BPS $>$ OAB $>$ controls, $P < .001$).

With respect to the intensity of nonurologic pain, there were significant trends (IC/BPS $>$ OAB $>$ controls) in terms of: (1) worst pain in the past week ($6.0 > 3.1 > 1.2$, $P < .001$); (2) least pain in the past week ($2.7 > 1.9 > 0.3$, $P < .001$); (3) average pain in the past week ($4.3 > 2.3 > 0.8$, $P < .001$); and (4) current pain intensity ($4.4 > 2.1 > 0.1$, $P < .001$). A similar 3-group trend was noted for BPI pain interference ($4.6 > 3.0 > 0.8$, $P < .001$).

Overall, the results showed that the intensity and systemic distribution of nonurologic pain in OAB were intermediate between IC/BPS and controls.

Urogenital Pain

On the genital map, IC/BPS participants reported the greatest numbers of urogenital pain sites. Controls reported the least numbers of urogenital pain sites, while OAB was intermediate between the two groups (IC/BPS $0.9 >$ OAB $0.5 >$ controls 0.1 ,

Table 1. Comparison of nonurologic and urogenital pain between OAB, IC/BPS, and controls

	IC/BPS	OAB	Controls	P Value (3 Group Trend)	Post-hoc Comparison, P
Demographics and questionnaires data					
No. of patients (n)	27	51	30		
Age (mean ± SD)	44.8 ± 16.6	53.8 ± 11.9	54.2 ± 12.3	.047	*(.027)
Sex (% Females)	100%	75.5%	56.7%	-	*(.002)
OABq-SS (mean ± SD)	14.2 ± 7.4	18.7 ± 6.7	2.2 ± 2.8	<.001	*(.009),**(<.001)
OABq-HRQOL	26.1 ± 15.2	30.2 ± 16.6	1.9 ± 2.9	<.001	**(<.001)
UDI-6	11.0 ± 5.3	12.7 ± 5.6	0.9 ± 1.4	<.001	**(<.001)
IIQ-7	4.9 ± 7.0	8.8 ± 8.2	0.1 ± 0.4	.009	*(<.001)
Medical comorbidities:					
Back pain	48.1%	37.3%	3.0%	.001	**(.008)
Depression	37.0%	31.4%	16.7%	.392	
Anxiety	37.0%	19.6%	6.7%	.040	
Asthma	22.2%	15.7%	3.3%	.201	
Diabetes	7.4%	15.7%	6.7%	.986	
Distribution of nonurologic pain					
No. of sites with pain on the whole body map (0-45), mean ± SD	5.6 ± 5.1	4.8 ± 7.8	0.9 ± 2.1	<.001	**(<.001)
No. of nonpelvic regions with pain (0-7)	2.3 ± 2.1	2.0 ± 2.0	0.7 ± 1.2	<.001	**(<.001)
% with any pelvic pain	77.8%	33.3%	0%	<.001	*(<.001),**(<.001)
% with "pelvic pain only"	11.1%	5.9%	0%		
% with pelvic pain plus pain outside the pelvis ("pelvic pain and beyond")	66.7%	27.5%	0%		
% with widespread pain, see Appendix for classification scheme	29.6%	17.6%	0%	.002	*(.006),**(.004)
Intensity of nonurologic pain					
Worse pain in the past week (BPI, 0-10)	6.0 ± 2.6	3.1 ± 3.1	1.2 ± 2.7	<.001	*(<.001),**(.006)
Least pain in the past week (BPI, 0-10)	2.7 ± 2.3	1.9 ± 2.5	0.3 ± 1.3	<.001	**(.003)
Average pain in the past week (BPI, 0-10)	4.3 ± 2.4	2.3 ± 2.5	0.8 ± 2.1	<.001	*(.002),**(.006)
Currently pain intensity ratings (BPI, 0-10)	4.4 ± 3.2	2.1 ± 2.5	0.1 ± 0.3	<.001	*(<.001),**(<.001)
BPI Pain interference (0-10)	4.6 ± 2.7	3.0 ± 2.7	0.8 ± 1.7	<.001	*(.008),**(<.001)
Distribution of Urogenital Pain					
No. of urogenital sites with pain on the genital map (0-4)	0.9 ± 1.0	0.5 ± 0.8	0.1 ± 0.3	<.001	*(.040),**(.011)
Data for males	NA	0.6 ± 1.1	0.2 ± 0.4	NA	
Date for females	0.9 ± 1.0	0.5 ± 0.7	0.1 ± 0.2	<.001	*(.034),**(.023)
% with urogenital pain on the genital map	63.0%	35.3%	10.0%	<.001	*(.030),**(.017)
Intensity of urogenital pain					
ICSI pain question (0-5)	3.4 ± 1.3	0.8 ± 1.6	0.1 ± 0.4	<.001	*(<.001),**(.007)
ICPI pain question (0-4)	3.1 ± 1.5	1.0 ± 1.2	0.0 ± 0.2	<.001	*(<.001),**(<.001)
GUPI pain score (0-23)	13.6 ± 6.6	5.9 ± 4.8	0.2 ± 0.8	<.001	*(<.001),**(<.001)
Rate the pain associated with the bladder (NRS, 0-10)	6.6 ± 2.1	2.0 ± 2.6	0.0 ± 0.0	<.001	*(<.001),**(<.001)
Characteristics of urogenital pain					
% with pain or discomfort as the bladder filled ("painful bladder filling")	77.8%	32.7%	0%	<.001	*(<.001),**(<.001)
% with pain or discomfort was reduced by voiding	81.5%	29.2%	0%	<.001	*(<.001),**(.001)
% with pain or burning during urination	69.2%	22.0%	0%	<.001	*(<.001),**(.006)
% with pain or discomfort during or after sex	63.6%	16.3%	0%	<.001	*(.001),**(.006)

BPI, brief pain inventory; GUPI, genitourinary pain index; HRQOL, health-related quality of life; IC/BPS, interstitial cystitis/bladder pain syndrome; ICPI: interstitial cystitis problem index; ICSI: interstitial cystitis symptom index; IIQ: incontinence impact questionnaire; NRS: numeric rating scale; OAB, overactive bladder; UDI: urogenital distress inventory.

* $P < .05$ for IC/BPS vs OAB. ** $P < .05$ for OAB vs controls. P values inside () if $P < .05$. Comparisons were adjusted for sex and age.

trend test $P < .001$). Of note, over one-third (35.3%) of OAB participants reported any urogenital pain on the genital map. The most common locations of urogenital pain among male OAB participants were: scrotum (21.4%), perineum (14.3%), glans (14.3%), and shaft of the penis (7.1%). The most common locations of urogenital pain among female OAB participants were: posterior vagina (29.8%), perineum (13.5%), vulva (2.7%), and anterior vagina (0%).

With respect to the intensity of urogenital pain, there were significant trends (IC/BPS > OAB > controls) in terms of: (1) the GUPI-pain score (13.6 > 5.9 > 0.2, $P < .001$); (2) the ICSI pain question (3.4 > 0.8 > 0.1, $P < .001$); (3) the ICPI pain problem question (3.1 > 1.0 > 0.0, $P < .001$); and (4) on the 0-10 NRS of "pain associated with your bladder" (6.6 > 2.0 > 0.0, $P < .001$).

Regarding urogenital pain characteristics, one out of 3 OAB participants (33%) reported pain or discomfort as the bladder filled

(“painful bladder filling”). Twenty-nine percent reported their pain or discomfort was reduced by voiding. One out of 4 OAB participants (22%) reported pain or burning during urination. One out of 6 OAB participants (16%) reported pain or discomfort during or after sex. As shown in **Table 1**, the responses from OAB participants were intermediate between IC/BPS and controls.

Overall, the results showed that the intensity, distribution, and characteristics of urogenital pain in OAB were intermediate between IC/BPS and controls.

Correlations Between Pain Symptoms and Urinary Symptoms in OAB

Table 2 showed the correlation coefficients between the severity of pain symptoms and urinary symptoms among participants with OAB.

For urogenital pain, the GUPI-pain, ICSI-pain, and ICPI-pain scores were each positively correlated with UDI-6, IIQ-7, OABq-SS, and OABq-HRQOL ($P < .05$ for all). High correlation coefficients were noted between GUPI-pain and UDI-6 ($r = 0.51$, $P < .001$), GUPI-pain and IIQ-7 ($r = 0.62$, $P < .001$), GUPI-pain and OABq-HRQOL ($P = 0.50$, $P < .001$). Positive correlations were also observed between the numbers of genital pain sites and IIQ-7 ($r = 0.51$, $P < .001$), and with UDI-6 ($r = 0.38$, $P = .006$).

For nonurologic pain, positive correlations were observed between BPI pain interference and IIQ-7 ($r = 0.40$, $P < .005$), and between BPI pain interference and OABq-HRQOL ($r = 0.30$, $P = .04$). Positive correlation was also observed between the numbers of pain sites and UDI-6 ($r = 0.30$, $P = .03$).

Appendix 1 shows the scatterplots between some of these pain and urinary measures. The scatterplots appear to show two subsets of OAB patients, those with no to minimal GUPI pain scores (blue circle), and those with higher GUPI pain scores (red circle).

Comparison Between OAB Patients With Versus Without Pelvic Pain

Next we compared the urologic symptoms and psychosocial health between OAB patients with versus without pelvic pain (**Table 3**). OAB patients with pelvic pain had worse urinary symptoms (OAB-q SS: 21.7 vs 17.2, $P = 0.025$; OAB-q HRQOL: 39.7 vs 25.4, $P = .015$; UDI-6: 16.5 vs 10.8, $P = .004$; IIQ-7: 16.2 vs 5.1, $P < .001$), anxiety (HADS-A, 10.1 vs 6.1, $P = .003$) and depression (HADS-D, 7.6 vs 4.1, $P = .004$)

compared to OAB patients without pelvic pain. The P value for psychological stress (PSS) almost reached statistical significance, $P = .05$.

DISCUSSION

There are a few notable findings from this study: (1) A significant percentage of OAB patients reported pain in the bladder, pelvic pain, urogenital pain, and systemic pain outside the referral zone of a bladder condition; (2) the intensity and distribution of nonurologic and urogenital pain in OAB were intermediate between IC/BPS and controls (IC/BPS > OAB > controls); (3) there were positive associations between the severity of pain symptoms and urinary symptoms among patients with OAB; and (4) OAB patients with pelvic pain have worse urinary symptoms and psychosocial health compared to OAB patients without pelvic pain.

The report of systemic pain in a subset of OAB patients is surprising. Reynolds et al postulated that central sensitization might be a contributing factor in some OAB patients.¹¹ Central sensitization refers to a pathologic state of neuronal hyperexcitability at the level of the central nervous system that facilitates amplification of signals from afferent nerves. Central sensitization is a recognized mechanism of centrally amplified pain perception that underlies conditions such as fibromyalgia and irritable bowel syndrome.²³ Once central sensitization develops, normally subthreshold signals from A-delta afferent fibers (eg, that relay the urgency signal from the bladder) can be amplified at the central nociceptive neurons to become suprathreshold, causing pain to be perceived without peripheral tissue injury or nociceptive stimulation. This may explain the positive correlation between the severity of pain and urinary symptoms in OAB.

The presence of nonurologic pain and widespread pain in OAB suggests that a subset of OAB patients might have central sensitization. The degree of central sensitization in OAB might be intermediate between IC/BPS and control, since the intensity and distribution of nonurologic pain in OAB was intermediate between IC/BPS and controls.

Table 2. Correlations between pain symptoms and urinary symptoms in OAB

OAB Patients only Correlation Coefficients * $P < .05$. P values inside ()		Severity of Urinary symptoms			
		UDI-6	IIQ-7	OABq-SS	OABq-HRQOL
Severity of pain symptoms	GUPI pain score	0.51 *(<0.001)	0.62 *(<0.001)	0.37 *(0.012)	0.50 *(<0.001)
	ICSI pain question	0.35 *(0.011)	0.37 *(0.008)	0.33 *(0.018)	0.31 *(0.028)
	ICPI pain question	0.41 *(0.003)	0.49 *(<0.001)	0.34 *(0.016)	0.42 *(0.002)
	BPI pain interference	0.17 (0.25)	0.40 *(0.005)	0.19 (0.20)	0.30 *(0.04)
	No. of pain sites on the whole body map	0.30 *(0.03)	0.31 *(0.028)	0.07 (0.64)	0.19 (0.18)
	No. of pain sites on the genital map	0.38 *(0.006)	0.51 *(<0.001)	0.19 (0.18)	0.18 (0.20)

Table 3. Comparison of OAB with pain versus without pelvic pain, **P* < .05, *P* values inside ()

OAB Patients Only	OAB Without Pelvic Pain	OAB With Pelvic Pain	<i>P</i> Value
Demographics and urinary symptoms			
No. of patients (n)	34	17	
Age (mean ± SD)	53.4 ± 11.4	54.4 ± 13.3	(.86)
Sex, % Females	76.5%	64.7%	(.51)
OABq-SS	17.2 ± 6.5	21.7 ± 6.0	*(.025)
OABq-HRQOL	25.4 ± 12.7	39.7 ± 19.6	*(.015)
UDI-6	10.8 ± 4.3	16.5 ± 6.2	*(.004)
IIQ-7	5.1 ± 5.3	16.2 ± 7.9	*(<.001)
AUA-SI voiding symptoms (males only, sum of incomplete emptying, straining, weak stream, and intermittent flow)	7.3 ± 5.2	12.3 ± 5.1	*(.028)
Medical comorbidities:			
Back pain	29.4%	52.9%	(.10)
Depression	29.4%	35.3%	(.67)
Anxiety	23.5%	11.8%	(.46)
Asthma	20.6%	5.9%	(.24)
Diabetes	14.7%	17.6%	(1.00)
Psychosocial health			
Anxiety (HADS-A, 0-21)	6.1 ± 4.2	10.1 ± 4.0	*(.003)
Depression (HADS-D, 0-21)	4.1 ± 3.1	7.6 ± 4.2	*(.004)
Psychological stress (PSS, 0-40)	15.9 ± 8.5	20.0 ± 6.9	(.05)

Reynolds et al recently performed quantitative sensory testing on female OAB patients who failed oral medications, which showed evidence of central sensitization in OAB.¹⁰ They also showed that some OAB participants have central sensitivity syndromes characteristics of central sensitization.²⁴ The studies had limitations since they did not have comparison groups (IC/BPS or controls), and none of the participants underwent a clinical evaluation to ascertain their diagnosis of OAB.²⁴ Here we recruited patients who had a clinical evaluation, and compared the results of OAB to IC/BPS and controls.

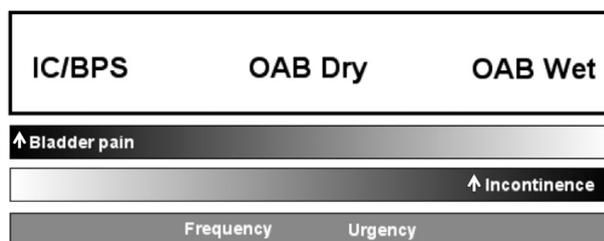
There may be 2 subsets of OAB patients (those with central sensitization and those without), which might have therapeutic implications. Pharmacologic treatments of OAB target the peripheral organ or nerves (eg, anticholinergics, beta-agonists, onabotulinum toxin A). One might hypothesize that these treatments could be less effective on subset of OAB with central sensitization (ie, refractory OAB). The concept of central sensitization needs to be examined more thoroughly in OAB, and whether central sensitization impacts treatment success needs to be further studied.

Although central sensitization has been hypothesized to explain our findings, we do not have objective quantitative sensory testing, biomarkers or neuroimaging data to fully test this hypothesis. There may be others explanation also. For example, male OAB patients with pelvic pain have higher voiding symptoms (eg straining) on the AUA-SI than male OAB patients without pelvic pain (12.3 ± 5.1 vs 7.5 ± 5.2, *P* = .028, Table 3), so the “pain” might be related to difficulties with urination.

Our study provides evidence that OAB and IC/BPS should be considered a continuum with overlapping features (see Fig. 1).⁹ The data suggested that it may be difficult to draw a line in the sand where OAB ends and IC begins.²⁵ Therefore, it is important to reassess the working

diagnosis if patients fail conventional treatments. In “refractory OAB” cases, the diagnosis of IC/BPS should be considered particularly if the symptoms are urgency-frequency instead of incontinence. It is also possible OAB and IC/BPS are distinct disorders, and there is a commonality affecting a percentage of patients in each group. It is also possible that some patients in each group are misdiagnosed. However the risk of misdiagnosis is deemed small since OAB participants reported higher incontinence impact (IIQ-7) and urgency incontinence (UUI) scores on OAB-q, while IC/BPS patients reported higher nonurologic and urogenital pain scores.

This study has several strengths: (1) The use of clinically diagnosed patients for our OAB and IC/BPS groups; (2) a control group; (3) validated questionnaires were used in all three groups. Potential weaknesses include: (1) relatively smaller sample size, even though the comparisons have reached significance; (2) the possibility that some patients might have both conditions but were included; (3) the possibility that some OAB patients with pain truly had IC/BPS (misdiagnosis), since neither syndromes have definitive diagnostic tests and biomarkers. We recognize that the number of patients in this study

**Figure 1.** Conceptual model of a continuum between OAB and IC/BPS. IC/BPS, interstitial cystitis/bladder pain syndrome; OAB, overactive bladder.

was small, so validation using a larger cohort of participants in multiple centers and adding objective assessment tools are needed to further understand the relationships between OAB and IC/BPS, and the pathophysiology underlying the overlaps.

CONCLUSION

A subset of overactive bladder patients had pain inside and/or outside the pelvis. The intensity and distribution of pain in OAB was intermediate between IC/BPS and controls. Systemic processes such as central sensitization should be examined in this population.

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SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at <https://doi.org/10.1016/j.urology.2019.03.030>.

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