



Antimuscarinic Agent Treatment Affecting Patient-Reported Outcomes in Overactive Bladder Syndrome With Depressive Symptoms

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Purpose: We investigated improvements in overactive bladder symptoms and depressive symptoms after solifenacin treatment in overactive bladder patients with or without depressive symptoms.

Methods: We performed a prospective study of patients who had been diagnosed with overactive bladder from July 2013 to June 2014. Based on the Beck Depression Inventory questionnaire, the test subjects were divided into group 1, without depressive symptoms (0–9 points), and group 2, with depressive symptoms (10 or more points). The patients were administered 5 mg of solifenacin for 3 months. The following outcomes were analyzed at the first visit, 4 weeks, and 12 weeks: the overactive bladder symptom score (OABSS), International Prostate Symptom Score (IPSS), patients' perceptions of their bladder condition, and the Beck Depression Inventory.

Results: A total of 72 patients participated, and 52 patients completed the study. Most outcome measures showed improvements in both groups at weeks 4 and 12. Especially in group 2, the questionnaires showed significant improvements from baseline to week 12, indicating that solifenacin was effective at treating overactive bladder symptoms (group 1 vs. group 2: OABSS, -2.67 ± 0.80 vs. -3.00 ± 0.77 ; $P < 0.01$; IPSS-total, -2.14 ± 2.15 vs. -4.94 ± 1.70 ; $P < 0.01$). Statistically significant decreases in the Beck Depression Inventory score from baseline to weeks 4 and 12 were observed in group 2 (group 1 vs. group 2: 1.43 ± 0.74 vs. -2.68 ± 4.05 at week 4, $P < 0.001$; 0.10 ± 3.37 vs. -5.52 ± 5.82 at week 12, $P < 0.001$).

Conclusions: In overactive bladder patients with depressive symptoms, solifenacin can help improve quality of life and depressive symptoms at the same time.


Keywords: Urinary Bladder, Overactive; Depression; Quality of Life

- **Fund Support:** This study received financial support from Astellas Pharm Korea, Inc.
- **Research Ethics:** This study was performed with the approval of the Institutional Review Board of the Hanyang University Guri Hospital (approval number: 2013-01-046), and informed consent was obtained from the patients.
- **Conflict of Interest:** No potential conflict of interest relevant to this article was reported.

INTRODUCTION

According to the definition of the International Continence Society, overactive bladder (OAB) includes symptoms of urinary

urgency with or without incontinence, often combined with urinary frequency and/or nocturia without any underlying disease, infection, or condition [1]. OAB is diagnosed in every age group, with similar prevalence in men and women, and its

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Submitted: July 3, 2016 / Accepted: August 12, 2016



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prevalence increases with age. The prevalence of OAB symptoms has been reported to be approximately 16%–27% and 33%–43% for men and women aged ≥ 40 years, respectively, in the United States [2]. The annual cost due to OAB in the United States in the community and institutions was estimated to be 12 billion United States dollars (USD) in 2000 and 65.9 billion USD in 2007, with total national costs expected to increase 25% by 2020, as the population ages [3]. OAB patients have a lower quality of life (QoL) due to their symptoms because patients not only tend to isolate themselves from social activities and personal relationships, but also experience impacts in the psychological, professional, physical, and sexual realms [4]. These decreases in QoL have an influence on mental health, and OAB patients often complain about depressive symptoms and concerns about increasing stress. Resources from the EPIC (European Prospective Investigation into Cancer and Nutrition) study, a multinational population-based survey performed in Europe and Canada, showed that the frequency of depression was high in OAB patients and that depression had a strong relationship with OAB diagnosis, regardless of incontinence status [5].

Treatments for OAB include lifestyle modifications, behavioral therapy, medication, botulinum toxin injection, neuromodulation, and surgical interventions [6]. Among these treatments, medication is widely used because of its rapid effectiveness and noninvasive nature. Antimuscarinic drugs are an important first-line drug therapy for OAB [7].

The frequency of depression in the general population is 2%–15%, and the lifetime prevalence of depression is 16.5%. Depression is predicted to become the second highest source of disease burden by the year 2020 [8]. Some studies have reported a relationship between depression and OAB, but little research has been performed regarding depressive symptoms in individuals with OAB. We investigated improvements in OAB symptoms and depressive symptoms after solifenacin treatment in OAB patients with and without depressive symptoms.

MATERIALS AND METHODS

Study Design

This study was a prospective investigation conducted at a single institution, targeting outpatients with OAB from July 2013 to June 2014. This study was performed with the approval of the Institutional Review Board of the Hanyang University Guri Hospital (approval number: 2013-01-046), and informed consent was obtained from the patients.

This study included female patients older than 20 years who did not have a medical history of taking antimuscarinic agents in the past 6 months, had an overactive bladder symptom score (OABSS) questionnaire question 3 (urgency) score higher than 2 points with a total score of over 3 points, were willing to participate in the clinical study, and consented to completing the questionnaires and an informed consent form. The following groups of patients were excluded: (1) patients for whom antimuscarinic agents were contraindicated, (2) patients who had received sustained treatment for OAB for more than 3 months during the previous year, (3) patients experiencing acute urinary tract infection symptoms during the study period, (4) patients who were diagnosed or suspected of having interstitial cystitis, (5) patients who received urinary tract catheterization or were in the training process for intermittent self-catheterization, (6) patients for whom the use of anticholinergic agents was prohibited due to an overactive reaction, (7) patients with a severe liver disorder (glutamic oxaloacetic transaminase or glutamic pyruvic transaminase levels higher than 100 IU/L) or renal failure (creatinine over 3 mg/dL), (8) patients who received treatment for existing depression or for whom depression treatment was expected to be performed in parallel with OAB treatment, (9) patients who had depressive symptoms unrelated to OAB, and (10) patients who were determined to be unsuitable for clinical testing by the personnel in charge of administering the study. Based on these standards, solifenacin at a dose of 5 mg in 1 tablet was administered to each participating patient with OAB 1 time every day, and patients were instructed to answer various questionnaires to assess symptom improvement at the first visit, week 4, and week 12. Based on the Beck Depression Inventory (BDI) questionnaire, test subjects were divided into group 1, without depressive symptoms (0–9 points), and group 2, with depressive symptoms (10 or more points).

Survey Questionnaire

Urinary scales

The OABSS, which is used to make a diagnosis by evaluating OAB symptoms [9]; the International Prostate Symptom Score-QoL (IPSS-QoL) score, which evaluates the severity of lower urinary tract symptoms (LUTS) [10]; and patient perception of bladder condition (PPBC) [11] were used to evaluate the outcomes.

Depression scale

The BDI questionnaire was used to measure the severity of depression. The BDI is a multiple-choice self-report inventory and is the tool most widely used to identify the level of depressive

symptoms in an individual [12]. It has 21 questions and assesses an individual's feelings over the past week. Based on total BDI score, an individual's depressive symptom status is determined as follows: normal, 0–9 points; mild, 10–15 points; moderate, 16–23 points; and severe, 24 or more points [13].

Statistical Analysis

All the data were recorded and analyzed using standard forms. The Student t-test was used to compare the results between the 2 groups. Between-group comparisons for continuous variables were performed using the parametric independent t-test. Statis-

tical analysis was performed in IBM SPSS Statistics ver. 22.0 (IBM Co., Armonk, NY, USA), and P-values < 0.05 were considered to indicate statistical significance.

RESULTS

A total of 72 patients participated in this clinical study, and 52 patients completed the study. Twenty patients were excluded: 13 due to loss to follow-up; 5 due to drug side effects related to constipation (2), xerostomia (2), and heartburn (1); 1 due to a hip joint operation; and 1 who voluntarily dropped out.

Table 1. Basic participant characteristics

Characteristic	Total (n = 52)	Group 1 (n = 21)	Group 2 (n = 31)	P-value
Age (yr)	61.22 ± 11.19	56.44 ± 11.37	64.0 ± 10.26	0.02
Height (cm)	156.63 ± 5.46	159.06 ± 5.27	155.23 ± 5.13	0.02
Weight (kg)	59.39 ± 9.40	60.33 ± 11.79	58.84 ± 7.87	0.60
Qmax (mL/sec)	22.10 ± 11.07	26.37 ± 11.61	19.62 ± 10.11	0.04
RU	22.89 ± 25.97	22.26 ± 26.94	23.25 ± 25.84	0.90
OAB-Total	9.02 ± 3.29	7.33 ± 2.75	10.16 ± 3.17	< 0.01
OAB No.3 ^{a)}	3.88 ± 1.08	3.29 ± 1.01	4.29 ± 0.94	< 0.01
IPSS1	2.29 ± 1.79	2.29 ± 1.77	2.29 ± 1.83	0.99
IPSS2	3.23 ± 1.69	2.90 ± 1.73	3.45 ± 1.65	0.25
IPSS3	1.17 ± 1.41	1.14 ± 1.24	1.19 ± 1.54	0.90
IPSS4	3.48 ± 1.52	3.00 ± 1.30	3.81 ± 1.58	0.59
IPSS5	1.88 ± 1.72	1.67 ± 1.68	2.03 ± 1.76	0.45
IPSS6	0.58 ± 1.36	0.29 ± 1.10	0.77 ± 1.50	0.20
IPSS7	2.52 ± 1.54	1.90 ± 1.38	2.94 ± 1.53	0.01
IPSS-Total	15.10 ± 7.09	13.14 ± 6.26	16.42 ± 7.41	0.10
IPSS storage ^{b)}	9.06 ± 3.68	7.81 ± 3.19	9.90 ± 3.80	0.04
IPSS voiding ^{c)}	4.87 ± 0.68	5.33 ± 4.08	6.55 ± 5.35	0.38
QoL	4.62 ± 1.01	4.33 ± 1.11	4.81 ± 0.91	0.09
PPBC	4.62 ± 0.93	4.29 ± 0.78	4.84 ± 0.97	0.03
BDI	14.46 ± 8.36	6.62 ± 1.56	19.77 ± 6.70	< 0.01
Chronic disease	14 (26.9)	8 (38.1)	6 (19.4)	< 0.90
Hypertension	6 (11.5)	4 (19.0)	2 (6.5)	
Diabetes	5 (9.6)	2 (9.5)	3 (9.7)	
Congestive heart failure	1 (1.9)	1 (4.8)	0 (0.0)	
Asthma	2 (3.8)	1 (4.8)	1 (3.2)	

Values are presented as mean ± standard deviation or number (%).

Group 1, nondepressive symptom (0–9 points); group 2, depressive symptom (10 or more points); IPSS, International Prostate Symptom Score; PPBC, patient perception of bladder condition; QoL, quality of life; OABSS, overactive bladder symptom score; BDI, Beck Depression Inventory; Qmax, maximum flow rate; RU, residual urine.

^{a)}Question No. 3 (urgency) of the OABSS. ^{b)}Sum of questions 2, 4, and 7 of the IPSS. ^{c)}Sum of questions 1, 3, 5, and 6 of the IPSS.

Table 2. Comparison of IPSS, OABSS, PPBC, QoL, and BDI mean scores at V1, V2, and V3 between groups 1 and 2.

Variable	Group 1 (n = 21)					Group 2 (n = 31)								
	V1	V2	V3	V1 vs. V2 difference	P-value	V1 vs. V3 difference	P-value	V1	V2	V3	V1 vs. V2 difference	P-value	V1 vs V3 difference	P-value
OABSS	7.33 ± 2.75	4.95 ± 2.60	4.67 ± 2.44	-2.38 ± 0.80	<0.01	-2.67 ± 0.80	<0.01	10.16 ± 3.17	8.48 ± 3.25	7.19 ± 3.06	-1.68 ± 0.82	0.04	-3.00 ± 0.77	<0.01
OABNo. 3 ^{a)}	3.29 ± 1.01	2.43 ± 0.87	2.38 ± 1.11	-0.86 ± 0.28	<0.01	-0.91 ± 0.32	<0.01	4.29 ± 0.94	3.77 ± 1.15	3.10 ± 1.22	-0.52 ± 0.27	0.06	-1.19 ± 0.26	<0.01
IPSS-1	2.29 ± 1.77	2.29 ± 1.55	2.14 ± 1.42	-0.00 ± 0.51	0.69	-0.14 ± 0.49	0.17	2.29 ± 1.83	1.97 ± 1.60	1.74 ± 1.32	-0.32 ± 0.44	0.43	-0.45 ± 0.41	0.28
IPSS-2	2.90 ± 1.73	2.19 ± 1.44	2.19 ± 1.44	-0.71 ± 0.49	0.15	-0.71 ± 0.50	0.15	3.45 ± 1.65	2.97 ± 1.62	2.06 ± 1.39	-0.48 ± 0.41	0.46	-1.30 ± 0.38	<0.01
IPSS-3	1.14 ± 1.24	1.43 ± 1.28	1.19 ± 1.33	0.29 ± 0.38	0.46	0.05 ± 0.41	0.90	1.19 ± 1.54	1.19 ± 1.49	1.10 ± 0.91	-0.00 ± 0.38	0.25	-0.16 ± 0.33	0.62
IPSS-4	3.00 ± 1.30	1.81 ± 1.03	2.05 ± 1.28	-1.19 ± 0.36	<0.01	-0.95 ± 0.40	0.02	3.81 ± 1.58	3.03 ± 1.64	2.32 ± 1.54	-0.77 ± 0.42	0.07	-1.55 ± 0.37	<0.01
IPSS-5	1.67 ± 1.68	1.48 ± 1.44	1.38 ± 1.36	-0.19 ± 0.45	0.70	-0.29 ± 0.47	0.55	2.03 ± 1.76	2.10 ± 1.54	1.45 ± 1.18	0.07 ± 0.41	0.87	-0.55 ± 0.38	0.16
IPSS-6	0.29 ± 1.10	0.48 ± 0.98	0.71 ± 1.38	0.19 ± 0.33	0.56	0.43 ± 0.40	0.27	0.77 ± 1.50	0.81 ± 1.40	0.74 ± 0.97	0.03 ± 0.36	0.93	-0.07 ± 0.32	0.84
IPSS-7	1.90 ± 1.38	1.52 ± 1.30	1.33 ± 1.39	-0.38 ± 0.40	0.36	-0.57 ± 0.44	0.19	2.94 ± 1.53	2.32 ± 1.40	2.03 ± 1.28	-0.61 ± 0.37	0.11	-0.94 ± 0.37	0.02
IPSS-total	13.14 ± 6.26	11.33 ± 6.45	11.00 ± 7.31	-1.81 ± 1.93	0.36	-2.14 ± 2.15	0.31	16.42 ± 7.41	14.39 ± 7.61	11.45 ± 5.37	-2.03 ± 1.86	0.29	-4.94 ± 1.70	<0.01
IPSS-voiding ^{b)}	5.33 ± 4.08	5.48 ± 3.79	5.29 ± 4.31	0.14 ± 1.18	0.09	-0.05 ± 1.32	0.97	6.55 ± 5.35	6.00 ± 4.62	4.97 ± 2.80	-0.55 ± 1.24	0.66	-1.55 ± 1.09	0.17
IPSS-storage ^{c)}	7.81 ± 3.19	5.62 ± 3.19	5.71 ± 3.64	-2.19 ± 0.97	0.03	-2.10 ± 1.07	0.06	9.90 ± 3.80	8.23 ± 4.10	6.39 ± 3.33	-1.68 ± 1.02	<0.01	-3.52 ± 0.93	<0.01
PPBC	4.29 ± 0.78	3.67 ± 0.78	3.43 ± 1.03	-0.62 ± 0.24	0.02	-0.86 ± 0.29	<0.01	4.84 ± 0.97	4.16 ± 1.13	3.61 ± 1.17	0.68 ± 0.27	0.10	1.19 ± 0.27	<0.01
QoL	4.33 ± 1.11	3.48 ± 1.33	3.14 ± 1.32	-0.86 ± 0.37	0.02	-1.19 ± 0.37	<0.01	4.81 ± 0.91	4.03 ± 1.40	3.35 ± 0.95	-0.77 ± 0.30	0.02	-1.45 ± 0.24	<0.01
BDI	6.62 ± 1.56	8.05 ± 2.91	6.71 ± 3.07	-1.43 ± 0.74	0.05	0.10 ± 0.74	0.90	19.77 ± 6.70	17.10 ± 5.50	14.68 ± 5.63	-2.68 ± 1.56	0.08	-5.52 ± 1.51	<0.01

Values are presented as mean ± standard deviation.

Group 1, nondepressive symptom (0–9 points); group 2, depressive symptom (10 or more points); IPSS, International Prostate Symptom Score; OABSS, overactive bladder symptom score; PPBC, patient perception of bladder condition; QoL, quality of life; BDI, Beck Depression Inventory; V1, visit 1; V2, visit 2; V3, visit 3.

^{a)}Question No. 3 (urgency) of the OABSS. ^{b)}Sum of questions 2, 4, and 7 of the IPSS. ^{c)}Sum of questions 1, 3, 5, and 6 of the IPSS.

Table 3. Effect of treatment with Solifenacin at the fourth and 12th weeks in patients with overactive bladder with depressive symptoms

Variable	Change from baseline at week 4 (n = 21)			Change from baseline at week 12 (n = 31)		
	Group 1	Group 2	P-value ^{d)}	Group 1	Group 2	P-value ^{d)}
OABSS	-2.38 ± 2.56	-1.68 ± 3.33	0.41	-2.67 ± 2.74	-2.97 ± 2.95	0.71
OAB No. 3 ^{a)}	-0.86 ± 1.01	-0.52 ± 1.18	0.29	-0.90 ± 1.18	-1.19 ± 0.79	0.30
IPSS-total	-1.81 ± 4.25	-2.03 ± 5.62	0.88	-2.14 ± 5.69	-4.97 ± 6.84	0.13
IPSS-voiding ^{b)}	0.14 ± 2.31	-0.55 ± 3.44	0.43	-0.05 ± 3.54	-1.58 ± 4.86	0.22
IPSS-storage ^{c)}	-2.19 ± 2.77	-1.68 ± 3.63	0.59	-2.10 ± 3.53	-3.52 ± 3.68	0.17
PPBC	-0.62 ± 0.74	-0.68 ± 0.68	0.79	-0.86 ± 0.79	-1.23 ± 0.76	0.10
QoL	-0.86 ± 1.46	-0.77 ± 1.31	0.83	-1.19 ± 1.50	-1.45 ± 0.81	0.42
BDI	1.43 ± 0.74	-2.68 ± 4.05	<0.001	0.10 ± 3.37	-5.52 ± 5.82	<0.001

Values are presented as mean ± standard deviation.

Group 1, nondepressive symptom (0–9 points); group 2, depressive symptom (10 or more points); OABSS, overactive bladder symptom score; IPSS, International Prostate Symptom Score; PPBC, patient perception of bladder condition; QoL, quality of life; BDI, Beck Depression Inventory.

^{a)}Question No. 3 (urgency) of the OABSS. ^{b)}Sum of questions 2, 4, and 7 of the IPSS. ^{c)}Sum of questions 1, 3, 5, and 6 of the IPSS. ^{d)}Between-group differences in median percentage changes.

No significant differences were found in patients' basic characteristics, except for age and maximal urinary flow rate, or the average measurements of the patients. However, when comparing the total averages of the questionnaires in groups 1 and 2, significant differences were found in OABSS-total (7.33 ± 2.75 vs. 10.16 ± 3.17, $P < 0.01$), OABSS Q3 (3.29 ± 1.01 vs. 4.29 ± 0.94, $P < 0.01$), IPSS-total (13.14 ± 6.26 vs. 16.42 ± 7.41, $P = 0.10$), IPSS-storage (7.81 ± 3.19 vs. 9.90 ± 3.80, $P = 0.04$), and BDI (6.62 ± 1.56 vs. 19.77 ± 6.70, $P < 0.01$), with the group showing depressive symptoms having higher values in each of these surveys (Table 1). The OABSS results were categorized as mild (3–5), moderate (6–11), moderate, and severe (12 or more). Participants with severe OABSS scores showed significantly higher values for all question items, including BDI, PPBC, IPSS-voiding, IPSS-QoL, IPSS-storage, and OABSS. In participants with mild, moderate, and severe OABSS scores, the BDI values were 9.82 ± 6.57, 14.11 ± 8.81, and 18.79 ± 6.85 ($P < 0.01$), respectively, showing that higher OABSS scores were associated with more depressive symptoms.

Symptom improvement status and variation after solifenacin treatment for 12 weeks were compared in groups 1 and 2. During treatment with solifenacin, at weeks 4 and 12, most patients in both groups showed improvements in OABSS, PPBC, IPSS, IPSS-QoL, and BDI. In group 1, significant improvement was also noted for OABSS (-2.67 ± 0.80, $P < 0.01$), OABSS Q3 (-0.91 ± 0.32, $P < 0.01$), PPBC (-0.86 ± 0.29, $P < 0.01$), and IPSS-QoL (-0.86 ± 0.37, $P < 0.01$). However, group 2 showed significantly greater improvement than group 1 for many items, includ-

ing OABSS (-3.00 ± 0.77, $P < 0.01$), OABSS Q3 (-1.19 ± 0.26, $P < 0.01$), IPSS-2 (-1.30 ± 0.38, $P < 0.01$), IPSS-4 (-1.55 ± 0.37, $P < 0.01$), IPSS-total (-4.94 ± 1.70, $P < 0.01$), IPSS-storage (-3.52 ± 0.93, $P < 0.01$), PPBC (-1.19 ± 0.27, $P < 0.01$), IPSS-QoL (-1.45 ± 0.24, $P < 0.01$), and BDI (-5.52 ± 1.51, $P < 0.01$) (Table 2). Solifenacin was associated with statistically significant decreases in the BDI score from baseline to weeks 4 and 12 in group 2 in comparison to group 1 (group 1 vs. group 2: 1.43 ± 0.74 vs. -2.68 ± 4.05, $P < 0.001$ at week 4; 0.10 ± 3.37 vs. -5.52 ± 5.82, $P < 0.001$ at week 12). Additionally, the BDI showed statistically significant differences at weeks 4 and 12 in both groups (Table 3). This finding indicates that solifenacin simultaneously relieved OAB symptoms and improved depressive symptoms.

DISCUSSION

In this study, we observed improvements in depressive symptoms and OAB symptoms, as assessed by questionnaires, in participants taking solifenacin. The participants were grouped according to whether a patient with OAB had depressive symptoms. OAB symptoms and QoL were improved by solifenacin treatment. These results showed that solifenacin was effective not only for moderating OAB symptoms, but also for improving depressive symptoms caused by OAB.

In the field of urology, urinary stone (calculus), incontinence, and LUTS are related with QoL and depression [14–16], and OAB also adversely affects QoL, including negative effects in areas such as emotional health, productivity at home or work,

sociality, sexuality, and physical ability [17]. OAB sometimes creates problems not only with QoL, but also has neuropsychiatric ramifications (i.e., depression, uneasiness, poor sleep, decreased sexual relations, a sense of shame, impaired family relationships, etc.) [18]. Depression affects personal health, family, and economic life and is associated with conditions such as diabetes, asthma, arthritis, and chronic obstructive disease [19]. According to the US National Institute of Mental Health, the lifetime incidence rate of depression is 16.5%, and it is forecasted to be the second most prevalent disease by 2020 [20]. Depression is a mental health problem frequently associated with decreased QoL in OAB patients. According to a previous study, OAB interferes with daily life, resulting in weight gain due to an inability to exercise and avoidance of social situations. Sleep disturbance caused by anxiety and nocturia, fatigue, and exhaustion in daily life have been proposed to induce depression [21]. In the study performed by Anger et al. [22], a guilty conscience was also found in OAB patients. It is highly likely that the occurrence of a guilty conscience may lead to depression. In this way, OAB and depression are closely related, and this relationship has been reported in several studies. The Epidemiology of Lower Urinary Tract Symptoms (EpiLUTS) study indicated that in patients with OAB symptoms, QoL was markedly lower, and anxiety and depression were higher [23]. A study performed in Korea reported that in patients with OAB, the depression rate was 39.3% [24]. In a study of the QoL of OAB patients, patients expressed constant worry about searching for and reaching a toilet in time to prevent urine leakage. For some patients, anxiety about constantly needing to go to the toilet created feelings of hopelessness and depression. Feelings of depression were also caused by nocturia, which interrupts sleep at night, resulting in exhaustion and fatigue and causing social isolation due to the avoidance of social situations [21]. OAB symptoms can lead to depressive symptoms, and related secondary behaviors have been found to contribute to depressive symptoms. In our study, the severity of OAB symptoms was directly related to more serious depressive symptoms, but we must also consider the effects of secondary behaviors. Depression and OAB are closely connected; however, information about whether depression improves as a result of treating OAB is not available.

In the EpiLUTS survey, the percentage of patients managing OAB symptoms with coping behaviors exceeded the percentage treated with medication. This finding indicates that some patients may prefer to self-manage OAB symptoms, and possibly that patients do not discuss their symptoms with their physi-

cian [23]. Self-controlling OAB symptoms may lead to a low QoL and cause depressive symptoms. Diagnosing OAB is very important, and treatment of OAB is needed to improve OAB symptoms and to prevent secondary problems such as anxiety and depression.

The treatment of OAB mainly involves anticholinergic agents, which are frequently used for patients with detrusor overactivity confirmed by a urodynamic study or only by symptoms [25]. Antimuscarinic agents play a significant role in improving the QoL of patients affected by OAB [26]. In some studies, compliance with these drugs was found to be relatively low for the treatment of OAB in spite of the excellent effectiveness of antimuscarinic agents, possibly due to the side effects of xerostomia, constipation, and blurred eyesight [27]. However, in cases where efficacy is excellent without any side effects, the satisfaction of the patients was relatively favorable.

A pilot study demonstrated improvement in depressive symptoms when LUTS patients were administered tamsulosin to treat concomitant benign prostatic hyperplasia. In that study, it was observed that after administering tamsulosin to patients with LUTS-associated depression, both LUTS and depression improved [28]. In the current study, during treatment with solifenacin in patients with OAB, not only were OAB symptoms alleviated, but QoL and depressive symptoms improved simultaneously. A limitation of this study was the small number of study participants and the fact that groups 1 and 2 differed with regard to certain basic characteristics. To clarify the relationship between pharmacological treatment for OAB and depression, a large-scale, random, blinded study will be required in the future.

Since OAB is very relevant for mental health-related conditions such as depression, QoL, and anxiety disorders, it will be necessary to elucidate the pathophysiology of OAB in detail and then to select customized therapeutic methods.

In conclusion, OAB symptoms reduced patients' QoL and were associated with depressive symptoms. In OAB accompanied by depressive symptoms, administering solifenacin to alleviate OAB symptoms simultaneously improved QoL and depressive symptoms.

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