

Clinical evaluation of the computerized Chronic Urticaria-Specific Quality of Life questionnaire in Korean patients with chronic urticaria

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Summary

Background. Chronic urticaria (CU) is a common skin disorder that affects the well-being and quality of life (QOL) of patients. Recently, we developed and validated a questionnaire for measuring QOL in Korean patients with CU, called the Chronic Urticaria-Specific Quality of Life (CU-QOL) questionnaire.

Aim. To evaluate the clinical significance of a computerized version of the CU-QOL, in adult patients with CU.

Methods. This was a cross-sectional observational study that enrolled 249 Korean patients with CU from five university hospitals and measured computerized CU-QOL scores and Urticaria Activity Score (UAS) simultaneously. The internal consistency of the computerized CU-QOL was analysed using Cronbach α . To identify clinical correlations between the CU-QOL and patient characteristics, the atopic status and serum autoantibodies, including antinuclear, antithyroglobulin and antimicrosome antibodies, were measured. Multiple linear regression models were used to identify CU-QOL predictors.

Results. Cronbach α was 0.94 for the overall computerized CU-QOL score. The CU-QOL scores correlated significantly with the UAS ($r = -0.49$, $P < 0.001$). Of the factors aggravating CU, delayed pressure, sunlight exposure and emotional stress significantly influenced the overall CU-QOL scores in the univariate analysis. Multivariate regression models indicated that UAS and emotional stress were significant predictors of the four domains and of the total CU-QOL scores.

Conclusions. The computerized CU-QOL is a convenient and valid tool for measuring QOL in patients with CU. This study suggests that UAS, dermatographism and emotional stress are strong CU-QOL predictors in Korean patients with CU.

Introduction

Chronic urticaria (CU) is a common skin disorder characterized by persistent or recurrent weals and pruritus, with or without angio-oedema, which occurs

almost daily for at least 6 weeks. An epidemiological study of the general population found a lifetime urticaria prevalence rate of 8.8% for all urticaria types and 1.8% for CU.¹ Although knowledge of the pathogenic mechanisms underlying CU has progressed, its aetiology is unclear, and there are no reliable biomarkers for monitoring disease activity.

Although CU is not serious or life-threatening, it can reduce the health-related quality of life (HR-QOL) of patients because of its chronic, unpredictable nature and difficulties in treatment. Baiardini *et al.*² developed

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a questionnaire to measure QOL in patients with CU, the Chronic Urticaria Quality-of-Life Questionnaire (CU-Q2oL), which has been validated in several languages in Western countries,^{3,4} but not in East Asia. The HR-QOL depends both on the disease condition and the culture in which patients live. Furthermore, there have been few reports on QOL determinants in patients with CU.

We recently developed and evaluated a psychometric QOL questionnaire for Korean patients with CU, the Chronic Urticaria-Specific Quality of Life (CU-QOL) questionnaire,⁵ consisting of 17 items covering four domains: emotional distress, stigma. For the study reported here, we developed a computerized version of the CU-QOL, which uses an electronic touchscreen. We investigated the relationships between the individual CU-QOL and the demographic factors, aggravating factors and disease-related variables [including the Urticaria Activity Score (UAS), autoantibodies and atopy] in Korean patients with CU.

Methods

Subjects

We enrolled 249 patients with CU [102 men (41%), 147 women (59%); mean $\pm$ SD age 42.7 ± 13.2 years, range 18–83; mean disease duration 56.5 ± 96.5 months] who attended outpatient allergy clinics at Ajou, Yonsei Severance, Yonsei Wonju, Hallym and Korea University Hospitals, South Korea, between March and November 2009. Inclusion criteria were age > 18 years, articulation in Korean, and presence of current urticaria symptoms, such as weals and itching, almost daily for at least 6 weeks. Patients with other chronic skin diseases or conditions were excluded. The subjects were examined for factors aggravating CU, including dermatographism, pressure, cold, sunlight, emotional stress and fatigue or overwork, and presence of angio-oedema.

Measurements of total IgE, antinuclear antibody, antithyroid antibody and atopy

Total IgE levels were measured (ImmunoCAP; Pharmacia Diagnostics, Uppsala, Sweden), following the manufacturer's instructions. Anti-nuclear antibodies (ANA) were detected using an indirect fluorescent antibody technique with HEp-2 cells (Fluoro HEPANA test; Medical and Biological Laboratories, Nagoya, Japan). Anti-thyroglobulin and antithyroid microsomal antibodies were detected by radioimmunoassay (BRAHMS

Aktiengesellschaft AG, Hennigsdorf, Germany). Atopy was determined with a positive skin test response to at least one common inhalant allergen or a raised level of serum-specific IgE to *Dermatophagoides farinae* or *Dermatophagoides pteronyssinus*.

Questionnaires

The computerized CU-QOL was based on a printed CU-QOL questionnaire developed and validated specifically for Korean patients with CU.⁵ Based on our experience setting up and operating a computerized QOL measurement for patients with asthma,⁶ the system was designed to detect input data using a touchscreen, which consisted of an electronic visual display that detected the presence and location of a touch within the display area. The touchscreen was connected to a server that collected the data for subsequent analyses. Patients answered the questionnaires on the touchscreen, and the data automatically accumulated on the server. This enabled investigators to monitor patient CU-QOL simultaneously during office visits. The CU-QOL questionnaire consisted of 17 items in four domains: emotional distress, stigma, urticaria symptoms and food or environmental distress.

Chronic urticaria disease activity was assessed by the UAS, which scored the quantity (0 = no weal; $1 \leq 10$ weals; $2 = 10\text{--}50$ weals; $3 \geq 50$ weals), distribution range [0 = none; $1 \leq 25\%$ of body surface area (BSA); $2 = 25\text{--}50\%$ of BSA; $3 \geq 50\%$ of BSA], mean weal diameter (0 = none; $1 \leq 10$ mm; $2 = 10\text{--}30$ mm; $3 \geq 30$ mm), weal duration (0 = none; $1 \leq 4$ h; $2 = 4\text{--}12$ h; $3 \geq 12$ h) and intensity of pruritus (0 = none; 1 = mild; 2 = moderate; 3 = severe) within the previous week of outpatient clinic visits. We added three further parameters (distribution range, mean weal diameter and weal duration) to the published 6-point UAS⁷, yielding a total score up to 15 points.

Statistical analyses

Cronbach α was used to test the CU-QOL reliability. First, we conducted exploratory univariate analyses of the relationships between the CU-QOL total and domain scores and the demographic factors, history of allergic or thyroid disease, aggravating factors and UAS. The mean CU-QOL scores were analysed using the Student *t*-test by gender, factors aggravating urticaria, and family history of thyroid or allergic disease. Spearman ρ was used for the comparisons of the CU-QOL and UAS items. A multivariate analysis was used for linear regression to determine the predictors, in addition to the UAS, that

influenced CU-QOL. Five models were constructed with the total CU-QOL and four domain scores as dependent variables. The independent variables were selected based on the significance of associations with the CU-QOL scores in the univariate analysis. $P < 0.05$ was considered significant for the independent variables in the regression model. All statistical analyses were performed using SPSS for Windows, (version 12; SPSS Inc., Chicago, IL, USA).

Results

Clinical characteristics of the study subjects

Of the 115 patients with available serological data, 39 (31.3%) had detectable autoantibodies. Angio-oedema was accompanied by urticaria in 74 (29.7%) patients. Of the aggravating factors, physical and emotional stress were reported most often, at 51.3% and 41.5%, respectively, followed by food, cold exposure, and delayed pressure (Table 1). The mean total UAS was 9.4. There was no significant difference in the total UAS with regard to gender, autoantibody presence, individual aggravating factors, including stress (physical and emotional), physical stimuli (such as cold contact, delayed pressure, exercise and sunlight) or ingestion of

aspirin, food or alcohol (Table 2). Although the statistical significance of the association was weak, dermatographism was the only aggravating factor that affected the mean UAS. Therefore, dermatographism was selected as a variable in the multiple linear regression models.

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The average response time to complete the computerized CU-QOL was 1.7 min (an average of 6 s per question). Cronbach α was 0.94 for the total CU-QOL, which exceeded the commonly used criterion of 0.70, thus implying consistent internal reliability.

There were no significant differences in the mean CU-QOL values with regard to gender, history of allergic or thyroid diseases, or presence of atopy (Table 2). Patients who reported that their urticaria symptoms were exacerbated or triggered by delayed pressure, sunlight exposure or emotional stress had poor CU-QOL values for each (2.3 ± 1.2 vs. 2.7 ± 1.0 for delayed pressure, $P = 0.04$; 2.3 ± 1.1 vs. 2.7 ± 1.0 for sunlight exposure, $P = 0.03$; 2.4 ± 1.1 vs. 2.7 ± 0.9 for emotional stress, $P < 0.01$) (Table 2). Patients with accompanying angio-oedema had significantly lower CU-QOL scores than those with weals only (2.4 ± 1.1 vs. 2.7 ± 1.0 , $P = 0.03$) (Table 2). The total CU-QOL and factor values significantly correlated with the total UAS (Table 3), and the five UAS items significantly correlated with the CU-QOL. Furthermore, the correlation coefficients for the quantity (UAS1) and distribution ranges (UAS2) of weals and the intensity of pruritus (UAS5) were higher than those for the other two items.

To test the other CU symptom scores, excluding UAS1 and UAS5, which are the two UAS symptoms recommended by the EAACI/GA²LEN/EDF guidelines,⁷ we compared the UAS and CU-QOL score correlations with the best two-item score (number of weals + intensity of pruritus; 0–6 points) and three-item score (number of weals + distribution range of weals + intensity of pruritus; 0–12 points). The three-item score had the highest correlation, being higher than the two-item score and the total UAS, which was the sum of the five-item scores ($r = -491$ for the total UAS, $r = -460$ for the two-item score, $r = -501$ for the three-item score) (Table 3). However, the comparisons of correlations between CU-QOL and total UAS, two-item and three-item scores of UAS were not significant ($P > 0.05$). Both the CU-QOL and UAS did not correlate significantly with age or urticaria duration (data not shown).

Table 1 Clinical characteristics of the 249 study subjects.

Characteristic	Subjects, n (%) [*]
History	
Allergic disease	105 (63.6)
Thyroid disease	18 (10.9)
Family history of CU and allergic diseases	76 (46.1)
Atopy (n = 205)	102 (49.8)
Total IgE, kU/L (mean $\pm$ SD)	220.9 $\pm$ 295.7
Autoantibodies (n = 115)	39 (31.3)
Antinuclear antibody	14 (12.2)
Anti-thyroid antibodies	30 (26.1)
Aggravating factors	
Cold contact	52 (23.2)
Dermatographism	39 (17.4)
Aspirin/NSAIDs	43 (19.2)
Physical stress	115 (51.3)
Alcohol	61 (27.7)
Delayed pressure	49 (21.9)
Exercise	30 (13.4)
Food	94 (42.0)
Sunlight	45 (20.1)
Emotional stress	93 (41.5)
Presence of angio-oedema	74 (29.7)
Total UAS (mean $\pm$ SD)	9.4 $\pm$ 4.1

CU, chronic urticaria; NSAIDs, nonsteroidal anti-inflammatory drugs; UAS, Urticaria Activity Score. ^{*}Unless otherwise stated.

Table 2 Comparison of mean CU-QOL and UAS according to demographics and aggravating factors.

	<i>n</i>	Total CU-QOL	<i>P</i>	Domain 1 (ED)	<i>P</i>	Domain 2 (DG)	<i>P</i>	Domain 3 (US)	<i>P</i>	Domain 4 (FE)	<i>P</i>	UAS	<i>P</i>
Gender													
Male	102	2.6 ± 0.9	0.81	2.7 ± 1.1	0.71	3.2 ± 1.0	0.77	1.7 ± 1.2	0.14	3.0 ± 1.1	0.62	9.8 ± 3.5	0.14
Female	147	2.6 ± 1.1		2.6 ± 1.2		3.2 ± 1.1		1.9 ± 1.4		2.9 ± 1.2		9.0 ± 4.4	
Atopy													
Positive	102	2.5 ± 0.9	0.50	2.5 ± 1.1	0.27	3.2 ± 1.0	0.10	1.7 ± 1.2	0.23	2.8 ± 1.1	0.59	9.4 ± 3.9	0.48
Negative	103	2.5 ± 1.0		2.3 ± 1.1		3.0 ± 1.2		1.9 ± 1.4		2.8 ± 1.2		9.0 ± 4.6	
History of allergic disease													
Yes	105	2.6 ± 1.1	0.64	2.8 ± 1.2	0.55	3.2 ± 1.0	0.64	1.9 ± 1.4	0.52	3.0 ± 1.2	0.74	9.0 ± 4.3	0.63
No	60	2.7 ± 1.0		2.7 ± 1.2		3.3 ± 1.0		1.8 ± 1.3		3.0 ± 1.2		9.4 ± 4.3	
Thyroid disease													
Yes	18	2.4 ± 1.1	0.23	2.6 ± 1.2	0.52	2.8 ± 1.3	0.15	1.7 ± 1.2	0.58	2.5 ± 1.4	0.05	9.9 ± 4.1	0.45
No	147	2.7 ± 1.0		2.7 ± 1.2		3.3 ± 1.0		1.9 ± 1.4		3.1 ± 1.1		9.1 ± 4.3	
Angio-oedema													
Yes	74	2.4 ± 1.1	0.03	2.4 ± 1.3	0.09	3.0 ± 1.1	0.16	1.7 ± 1.4	0.27	2.9 ± 1.2	0.46	9.7 ± 4.3	0.34
No	175	2.7 ± 1.0		2.8 ± 1.1		3.2 ± 1.0		1.9 ± 1.3		3.0 ± 1.1		9.2 ± 4.0	
Aggravating factors													
Cold													
Positive	52	2.6 ± 1.1	0.69	2.5 ± 1.2	0.57	3.3 ± 1.0	0.29	1.7 ± 1.3	0.69	2.8 ± 1.2	0.50	8.8 ± 4.3	0.28
Negative	172	2.6 ± 1.0		2.6 ± 1.2		3.1 ± 1.1		1.8 ± 1.4		3.0 ± 1.2		9.5 ± 4.0	
Dermatographism													
Positive	39	2.3 ± 1.1	0.09	2.5 ± 1.2	0.53	3.0 ± 1.3	0.30	1.5 ± 1.4	0.19	2.8 ± 1.3	0.48	7.9 ± 5.0	0.05
Negative	185	2.6 ± 1.0		2.6 ± 1.2		3.2 ± 1.0		1.8 ± 1.3		3.0 ± 1.1		9.6 ± 3.8	
NSAIDs													
Positive	43	2.6 ± 1.2	0.76	2.7 ± 1.2	0.63	3.1 ± 1.1	0.66	1.9 ± 1.4	0.46	3.0 ± 1.2	0.83	9.9 ± 4.1	0.30
Negative	181	2.6 ± 1.0		2.6 ± 1.2		3.1 ± 1.0		1.8 ± 1.3		2.9 ± 1.2		9.2 ± 4.1	
Physical stress													
Positive	115	2.5 ± 1.1	0.11	2.5 ± 1.2	0.10	3.1 ± 1.1	0.42	1.8 ± 1.3	0.97	2.8 ± 1.2	0.03	9.6 ± 3.8	0.43
Negative	109	2.7 ± 1.0		2.8 ± 1.1		3.2 ± 1.0		1.8 ± 1.3		3.1 ± 1.1		9.1 ± 4.4	
Delayed pressure													
Positive	49	2.3 ± 1.2	0.04	2.3 ± 1.3	0.02	2.8 ± 1.2	0.04	1.6 ± 1.5	0.23	2.5 ± 1.3	0.01	10.2 ± 3.6	0.10
Negative	175	2.7 ± 1.0		2.7 ± 1.1		3.2 ± 1.0		1.9 ± 1.3		3.1 ± 1.1		9.1 ± 4.2	
Exercise													
Positive	30	2.5 ± 1.0	0.50	2.3 ± 1.2	0.15	3.0 ± 1.0	0.58	1.7 ± 1.4	0.79	2.6 ± 1.2	0.12	9.2 ± 3.9	0.87
Negative	194	2.6 ± 1.0		2.7 ± 1.2		3.1 ± 1.1		1.8 ± 1.3		3.0 ± 1.2		9.4 ± 4.1	
Food													
Positive	94	2.5 ± 1.1	0.24	2.7 ± 1.3	0.53	2.9 ± 1.1	< 0.01	1.8 ± 1.4	0.82	2.9 ± 1.2	0.60	9.7 ± 4.1	0.35
Negative	130	2.7 ± 0.9		2.6 ± 1.1		3.3 ± 1.0		1.8 ± 1.3		3 ± 1.2		9.1 ± 4.1	
Sunlight													
Positive	45	2.3 ± 1.1	0.03	2.4 ± 1.2	0.09	2.8 ± 1.2	0.05	1.7 ± 1.4	0.55	2.5 ± 1.4	0.02	9.4 ± 4.6	0.86
Negative	179	2.7 ± 1.0		2.7 ± 1.2		3.2 ± 1.0		1.8 ± 1.3		3.1 ± 1.1		9.3 ± 4.0	
Emotional stress													
Positive	93	2.4 ± 1.1	< 0.01	2.3 ± 1.2	< 0.01	2.9 ± 1.1	0.02	1.8 ± 1.4	0.69	2.6 ± 1.4	0.001	9.3 ± 4.3	0.84
Negative	131	2.7 ± 0.9		2.8 ± 1.1		3.3 ± 1.0		1.8 ± 1.3		3.2 ± 1		9.4 ± 3.9	

P-value was determined using the independent *t*-test. DG, stigma; ED, emotional distress; FE, food and environmental distress; NSAIDs, non-steroidal anti-inflammatory drugs; UAS, urticaria activity score; US, urticaria symptom.

Multiple regression analysis for predicting the Chronic Urticaria-Specific Quality of Life questionnaire scores

Based on the results of the univariate analyses, the following variables were included in the regression models: history of thyroid disease (food and environmental distress domain model); symptoms of urticaria (UAS and angio-oedema; overall CU-QOL model); and aggravating or triggering factors: delayed pressure, dermatographism, emotional stress, sunlight exposure (overall CU-QOL model) and food (stigma model).

UAS was the most significant factor associated with the total and four separate domain CU-QOL scores influenced by emotional stress (Table 4). To predict the total CU-QOL, a regression model was constructed, composed of six variables: UAS, angio-oedema, delayed pressure, sunlight exposure, dermatographism and emotional stress ($r = 0.49$, adjusted $r^2 = 0.22$, $F = 11.63$ and $P < 0.001$) (Table 4). Emotional stress and dermatographism had significant and distinct influences on the total CU-QOL scores. The UAS was the major predictor (standardized coefficient, -0.41) of

Table 3 Correlation between the computerised CU-QOL and UAS.

	UAS1	UAS2	UAS3	UAS4	UAS5	Total UAS	UAS 1 + 5	UAS 1 + 2 + 5
Total CU-QOL	-0.35**	-0.41**	-0.19**	-0.29**	-0.39**	-0.49**	-0.46**	-0.50**
Domain 1	-0.26**	-0.31**	-0.11	-0.24**	-0.22**	-0.36**	-0.30**	-0.35**
Domain 2	-0.24**	-0.27**	-0.13*	-0.15*	-0.18**	-0.30**	-0.27**	-0.30**
Domain 3	-0.39**	-0.47**	-0.20**	-0.35**	-0.55**	-0.58**	-0.58**	-0.61**
Domain 4	-0.23**	-0.24**	-0.11	-0.17**	-0.23**	-0.30**	-0.29**	-0.31**

*, **Significance for Spearman rho at $P = 0.05$ and $P = 0.01$, respectively. UAS, urticaria activity score; UAS1, quantity of weals; UAS2, distribution range of weals; UAS3, mean weal diameter; UAS4, duration of weals; UAS5, intensity of pruritus within the past week for outpatient clinic visit; CU-QOL, chronic urticaria specific quality of life questionnaire; CU-QOL domain 1, emotional distress; domain 2, stigma; domain 3, current urticaria symptoms; domain 4, food and environmental distress.

Table 4 Multivariate analysis for CU-QOL scores.

Model	<i>P</i>	<i>B</i> *	β †	95% CI	
				Lower	Upper
Total CU-QOL score, <i>R</i> = 0.49, <i>F</i> = 11.63, <i>P</i> < 0.001					
UAS	< 0.001	−1.59	−0.40	−2.06	−1.12
Dermatographism	0.04	−5.36	−0.13	−10.42	−0.30
Angio-oedema	0.16	−2.97	−0.09	−7.10	1.15
Emotional stress	0.01	−5.79	−0.18	−9.67	−1.91
Delayed pressure	0.07	−4.33	−0.11	−8.95	0.29
Sunlight exposure	0.10	−3.97	−0.10	−8.72	0.78
Emotional distress domain (domain 1), <i>R</i> = 0.40, <i>F</i> = 10.47, <i>P</i> < 0.001					
UAS	< 0.001	−0.42	−0.30	−0.59	−0.25
Dermatographism	0.16	−1.32	−0.09	−3.17	0.54
Emotional stress	0.00	−2.50	−0.22	−3.91	−1.09
Delayed pressure	0.06	−1.65	−0.12	−3.34	0.03
Stigma domain (domain 2), <i>R</i> = 0.40, <i>F</i> = 8.14, <i>P</i> < 0.001					
UAS	< 0.001	−0.30	−0.25	−0.46	−0.15
Dermatographism	0.01	−1.38	−0.10	−3.00	0.25
Emotional stress	0.00	−1.93	−0.19	−3.17	−0.69
Delayed pressure	0.05	−1.47	−0.12	−2.96	0.01
Food	0.01	−1.58	−0.16	−2.82	−0.34
Urticaria symptom domain (domain 3), <i>R</i> = 0.53, <i>F</i> = 43.89, <i>P</i> < 0.001					
UAS	< 0.001	−0.66	−0.53	−0.80	−0.52
Dermatographism	0.02	−2.17	−0.16	−3.69	−0.66
Food and environmental distress domain (domain 4), <i>R</i> = 0.43, <i>F</i> = 5.16, <i>P</i> < 0.001					
UAS	< 0.001	−0.23	−0.30	−0.34	−0.13
Dermatographism	0.24	−0.74	−0.09	−1.97	0.50
Thyroid disease	0.20	−1.01	−0.10	−2.28	0.55
Emotional stress	0.01	−1.34	−0.20	−2.35	−0.33
Physical stress	0.26	−0.77	−0.09	−2.13	0.58
Sunlight exposure	0.04	−1.24	−0.16	−2.43	−0.05

*Unstandardized coefficients, †standardized coefficients. The above variables were entered into the multiple linear regression models based on the findings from bivariate analyses.

overall CU-QOL. Dermatographism with UAS was the main predictor of domain 3 (urticaria symptoms). Conversely, emotional stress was the most significant predictor of the emotional, food and environmental distress CU-QOL domains. For the stigma domain scores,

specific food ingestion, UAS and emotional stress were significantly associated with poor QOL.

Discussion

Substantially impaired QOL is common in patients with CU. Understanding QOL in patients with CU is necessary to improve patient management and clinical research. This multicentre study using a Korean cohort showed that the computerized CU-QOL was reliable and correlated well with the UAS. Moreover, the UAS and aggravating factors, including emotional stress and dermatographism, were identified as important CU-QOL predictors.

The CU-QoL is the only disease-specific measurement for CU, but it is used mainly in Europe.^{2,3} Health-related QOLs are generally influenced by culture and disease, and therefore it is reasonable to develop culture- and language-specific QOL measurements for specific diseases. However, until recently, there was no reliable CU-specific QOL index developed or adapted for Korea. We created a computerized version of the CU-QOL using a touchscreen monitor for automated data capture, as described previously.^{5,6} The electronic questionnaire results can be accumulated automatically in a database, and are available immediately for clinical practice and research. The computerized CU-QOL was accepted well by patients, with no missed responses, and an average complete response time of 1.7 min. The computerized CU-QOL was very reliable, with Cronbach α being 0.90 for all dimensions and for the overall score, which is the recommended threshold for questionnaires used for individual patients.⁸

Patients with CU experience energy loss, sleep disturbance and emotional upset.² Social functioning and emotions are the aspects of QOL that are most affected in patients with CU.⁹ Based on the computerized CU-QOL, the problems caused by urticaria symptoms and emotional distress were marked. As expected, other

domains, such as food, environmental distress and stigma, were also impaired.

With respect to clinical relevance, the total CU-QOL and individual factor values correlated significantly with the total UAS, particularly the three-item score of UAS, which included numbers and distribution of weals and intensity of pruritus. Significant correlations at the individual level were moderate for domain 3 (urticaria symptoms), and were < 0.3 for the other domains. This corroborates a previous report that UAS correlated positively ($r^2 = 0.3$) with QOL impairment as measured by the Dermatology Life Quality Index in patients with CU.¹⁰ Therefore, a more efficient measurement strategy should account for difficulties caused by urticaria symptoms and for the overall CU-QOL, as new CU guidelines state that HR-QOL is essential as a primary endpoint in clinical trials in order to achieve a comprehensive evaluation of disease effects.¹¹

The characteristics of urticaria can have an effect on the degree of QOL impairment in patients with CU.^{9,12} Approximately 35% of CU cases are triggered by physical stimuli, such as symptomatic dermatographism and cholinergic urticaria. Delayed-pressure urticaria often coexists with CU.¹³ Although the study population and QOL measurements in previous studies were different from those we used, delayed pressure is a common trigger that greatly impairs QOL in patients with CU.^{12,14}

Our main finding was that UAS, dermatographism and emotional stress are important predictors of CU-QOL in Korean patients with CU. Univariate analyses showed that the overall CU-QOL was significantly lower in patients with angio-oedema and in those whose urticaria was aggravated by delayed pressure, sunlight exposure or emotional stress. However, UAS, dermatographism and emotional stress remained significant in the multiple linear regression model for predicting overall CU-QOL. By contrast, delayed pressure and angio-oedema did not retain significance in the regression analysis, indicating that their effects on CU-QOL might have been masked by UAS and dermatographism.

Patients with CU often have psychiatric disorders, such as depression, anxiety or somatoform disorders.¹⁵ Although we did not evaluate psychiatric comorbidities in our patients with CU, emotional stress was independent of UAS, and significantly affected the overall score and most of the individual domains of CU-QOL. Because ingestion of certain foods significantly influenced the stigma domain of the CU-QOL, patients might feel daunted and restricted in their social functioning, not only because of the urticaria symptoms, but also

because of fear or shame of unexpected symptom development. This suggests that there is an unmet need for total control of CU in these patients if the treatment goal is aimed at controlling symptoms.

This study had several limitations. There is no generally accepted measurement for emotional stress, and we did not use challenge tests for individual physical stimuli. However, patients' subjective feelings can be measured objectively by the UAS and CU-QOL using semiquantitative assessments of urticaria symptoms, and can be validated with disease- and population-specific QOL indexes, respectively. Moreover, the computerized CU-QOL is a convenient and valid measurement of the QOL of patients with CU.

Conclusion

Identification of primary CU-QOL predictors will help design interventions to improve the overall QOL of patients with CU. In Korean patients with CU, UAS, dermatographism and emotional stress were found to be important predictors of the CU-QOL. The computerized CU-QOL can be used to evaluate the burden of CU and compare the clinical efficacy of treatments in Korean patients. Further studies are necessary to evaluate other laboratory and clinical parameters related to the CU-QOL.

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