Validation of the Turkish version of the Urticaria Control Test: Correlation with other tools and comparison between spontaneous and inducible chronic urticaria

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A R T I C L E   I N F O

Keywords:
Chronic urticaria
Inducible urticaria
Urticaria control test (UCT)
Minimal clinically important difference (MCID)
Reliability
Validity
Quality of life
Patient reported outcomes

A B S T R A C T

Background: The urticaria control test (UCT) is a questionnaire designed to determine if chronic urticaria (CU) is controlled or not and to aid therapeutic decision-making. It collects retrospective information about the symptoms and quality of life impairment over the last 4 weeks. The current study aimed to investigate the validity, reliability and sensitivity to change of the Turkish version of the UCT. We also evaluated its correlation with other tools and compared the UCT results of patients with chronic spontaneous urticaria (CSU) and patients with chronic inducible urticaria (CINDU).

Methods: Following forward/backward translation and cognitive debriefing, the Turkish version of the UCT was used in 81 CSU and 78 CINDU patients. Dermatology life quality index (DLQI), Chronic urticaria quality of life questionnaire (CU-Q2oL), urticaria activity score (UAS), patients’ and physicians’ global assessment visual analog scores and Likert scales were used at baseline and after four weeks to assess quality of life impairment, disease activity and disease control. Statistical analysis to determine the validity and reliability of the Turkish version of the UCT as well as comparison between CINDU and CSU patients were performed.

Results: Duration of disease was longer, disease control was poorer and severe complaints were more frequent in CINDU patients (duration of disease: 36.3 (24) vs 31.5 (9) (9) ± 67.9, p = .007, UCT baseline: 8.4 (8) ± 3.4 vs 10.4 (11) ± 3.9, p = .001 and patient's global assessment Likert scale severe complaints: 6 vs 15, p < .001, respectively). The UCT showed excellent internal consistency for CSU and a minimally acceptable consistency for CINDU (Cronbach’s α 0.89 for CSU versus 0.68 for CINDU). It showed strong correlation with CU-Q2oL but a moderate correlation with DLQI (r = −0.649, P < .001 and r = −0.545, P < .001, respectively). It was able to discriminate between patients with different disease control and was sensitive to detect changes in the disease control in both groups. The minimally important difference of the UCT was found to be 3.

Conclusions: The Turkish version of the UCT is a valid and reliable tool for the management of CU patients and can be used both in CSU and CINDU patients to determine if the treatment is sufficient and if disease activity and quality of life impairment are under control or not.

Introduction

Chronic urticaria (CU) is a common skin disorder characterized by recurrent pruritic hives (wheals) and/or angioedema that occur for more than 6 weeks affecting up to 1% of the total population. It is classified as chronic inducible urticarias (CINDUs) and chronic spontaneous urticaria (CSU) depending on whether a specific trigger can be identified or not.¹ The clinical signs and symptoms of CU patients are unpredictable and show waxing and waning. Thus, the clinical picture of a patient at the time of presentation is only rarely representative of the actual current...
disease status. This makes it difficult for physicians to estimate patients’ disease activity and disease burden, and to adjust treatment accordingly. To overcome this obstacle, several patient-reported outcome (PRO) measures have been developed for CU patients in the recent years, including the Urticaria Activity Score (UAS),10–12 the Angioedema Activity Score (AAS),13 the Chronic Urticaria Quality of Life questionnaire (CU-QoL),4–6 the Angioedema Quality of Life Questionnaire,11,12 the Urticaria Activity and Impact Measure,14 and the Urticaria Control Test (UCT).15–21 Among these tools, UCT is the easiest and least time-consuming. It was specifically designed to retrospectively assess the level of disease control in CU patients and thereby aid to evaluate the control of various types of urticaria and decision of treatment change.13 In addition, it overcomes some of the limitations of the UAS and AAS. First, it is a retrospective instrument that works in all types of physician consultations (largely independently of patient compliance). Second, it is a tool for all types of chronic urticaria (not only for CSU), and third, it can also be used in urticaria patients with recurrent angioedema.

The UCT includes four simple questions that assess the control of signs and symptoms of the disease, quality of life (QoL) impairment, efficacy of treatment and overall disease control, over the prior 4 weeks. It is completed by the patient and can be evaluated by both the patient and the physician. The questions are rated from 0 to 4, and the total score is calculated by summing the four individual question scores. The lowest UCT score possible is 0 (no control) and the highest score possible is 16 (complete control). A score of ≥12 indicates well-controlled urticaria, while a score of <11 indicates poor disease control.14

The current study aimed to investigate the validity, reliability and sensitivity to change of the Turkish version of the UCT in both CSU and CINDU. We also compared the UCT results of patients with CSU and patients with CINDU.

**Methods**

**Patients**

Turkish patients with CU (N = 159, 18–75 years, 67.9% females) attending the Urticaria Clinic of the Urticaria Centre of Reference and Excellence22 at the Department of Dermatology Okmeydani Training and Research Hospital participated in this study. A total of 81 CSU and 78 CINDU patients were included and the subtypes of CINDU were symptomatic dermographism (56), cholinergic urticaria,2 aquagenic urticaria and mixed CINDU (eg; symptomatic dermographism plus cold urticaria in a patient).5

All patients were assessed at three visits in 4-week intervals; baseline, 1st and 2nd visit. The flow of the study and the questionnaires given are shown in Fig. 1. During each visit, the participants received appropriate treatment according to their disease activity and control as recommended by the EAACI/ GA2LEN/EDF/WAO guideline.1 The study was approved by the ethics committee of Okmeydani Training and Research Hospital and it was performed in line with institutional guidelines and regulations. Informed consent to be included in the study and consent to publish pseudonymized data were taken from the participants.

**Translation and linguistic validation of the Turkish UCT version**

To obtain a linguistically validated Turkish version of the UCT, a structured forward-backward translation was performed. The original English version of the UCT was independently translated into Turkish by two native Turkish speakers with a command of English language. Then, these two Turkish versions were reviewed for comprehensibility by dermatologists specializing in treating urticaria patients (Kocatürk, Kızıltacı, Can). After these dermatologists reached consensus, the final Turkish version was back-translated into German by two independent bilingual translators. The back-translated versions were then reviewed against the original by the original authors. Potential misconceptions or misinterpretations introduced in the translation process were discussed between the Turkish research team and the original authors. After consensus on the final Turkish version was achieved, the Turkish version of UCT was tested in 10 CU patients (cognitive debriefing interviews). Here, it was recognized that the patients were incapable of understanding the third question of the UCT “How often was the treatment for your urticaria in the last 4 weeks not enough to control your urticaria symptoms?” which was answered as “very often”, “often”, “sometimes”, “seldom” and “not at all”. This was attributed to the reverse nature of the question and then it was changed as “How successful was the treatment for your urticaria in controlling your urticaria symptoms in the last 4 weeks?” with the answers “not at all”, “a little”, “somewhat”, “well” and “very well”. Subsequently, the final Turkish version of UCT was used for this study.

**Fig. 1.** Study flow. Urticaria Activity Score 28 (UAS28), Chronic Urticaria Quality of Life Questionnaire (CU-QoL), Physician’s global assessment-visual analog scale (PhysGA-VAS), Patient’s global assessment of disease severity-visual analog scale (PatGA-VAS), Patient’s global assessment of disease severity - Likert scale (PatGA-LS), Physicians global assessment of disease control Likert-scale (PhysGA-LS), Patient’s assessment of treatment Response (Pat-ATR), Physician’s assessment of treatment response (Phys-ATR), Patient’s assessment of change in disease activity (Pat-CDa), Patient’s assessment of change in quality of life (Pat-CQoL).
The weekly Urticaria Activity Score (UAS7): The UAS7 is a prospective diary-type tool to assess disease activity of CU patients for one week. It is based on the once-daily assessment of itch intensity/severity and numbers of hives over a period of 7 days. It sums up the number of wheals and the intensity of pruritus on a four-point scale (0–3) with a minimum and maximum score of 0 and 6 points per day, respectively. The UAS7 ranges from 0 to 42. The UAS28 is the sum of the UAS7 scores of 4 consecutive weeks (range from 0 to 168).12

The validated Turkish version of the Chronic Urticaria Quality of Life Questionnaire (CU-Q2oL): The CU-Q2oL was specifically designed for the assessment of health-related quality of life impairment in patients with CU, including the physical, psychosocial and practical aspects of this condition. A total of 23 questions were found to cover six key CU-specific domains: itch, swelling, impact on life activities, sleep problems, looks and limits. For each question, patients were asked to choose between five response options (scored 0–4) indicating the intensity of each item in the last two weeks. A total score across all questions was calculated and transformed into scores ranging from 0 to 100, with a score of 100 indicating the worst possible health related quality of life impairment. Dermatology Life Quality Index (DLQI) was used for the CINDU patients since the CU-Q2oL was specifically designed for CU patients.

The Physician's global assessment of disease control - visual analog scale (PhyGA-VAS) is a physician evaluation instrument for assessing urticaria control during the last four weeks. It is a 10-cm unmarked line which ranges between 0 cm (not at all under control) and 10 cm (completely under control).

The Physician's global assessment of disease control - Likert-scale (PhyGA-LS) was used to assess disease control on a 5-point scale (1 complete control, 2 good control, 3 moderate control, 4 little control, 5 no control).14

The Patient's global assessment of disease severity-visual analog scale (PatGA-VAS) was used to assess disease severity during the previous four weeks.
Complaints were more frequent in CINDU patients. The internal consistency for CSU and CINDU patients was minimally acceptable, 0.70 acceptable, 0.80 respectable, 0.90 excellent. But when analysed separately, the Cronbach’s α was found 0.89 versus 0.68 for CSU and CINDU patients respectively (Table 2).

### Results

#### Duration of disease, disease control and patients’ complaints

Duration of disease was longer, disease control was poorer, severe complaints were more frequent in CINDU patients. The demographic characteristics of the patients and the scores of the instruments used through the study are shown in Table 1. The table shows significant differences between the two groups; CSU and CINDU. See also Table 4 for details of PatGA-LS, PhyGA-LS, Pat-ATR, Phy-ATR distributions between CSU and CINDU.

The internal consistency for CSU and CINDU

The UCT showed excellent internal consistency for CSU and a minimally acceptable internal consistency for CINDU. When calculated for the total patient population (both CSU and CINDU), the Cronbach’s α was found 0.81. But when analysed separately, the Cronbach’s α was found 0.89 versus 0.68 for CSU and CINDU patients respectively (Table 2).

### Correlations of UCT with other tools

The UCT showed strong correlation with CU-Q2oL but a moderate correlation with DLQI. The UCT scores of the total patient population (CSU and CINDU) showed strong correlations with disease severity (PatGA-VAS, PhyGA-VAS, Pat-ATR, Phy-ATR). UCT scores of the total patient population showed strong negative correlation with disease severity (PatGA-LS, PhyGA-LS) and disease control (PhyGA-VAS, PhyGA-LS). UCT scores of CSU patients showed a strong negative correlation with disease control.

### Table 1

Demographic characteristics and comparison between CSU and CINDU.

|                  | Total  | CSU Mean (median)±SD | CINDU Mean (median)±SD | P  |
|------------------|--------|----------------------|------------------------|----|
| Gender           |        |                      |                        |    |
| Female n (%)     | 108 (67.9%) | 57 (70.4%) | 51 (65.4%) | 0.501 |
| Age (years)      | 39.1 (39) ± 13.3 | 40.5 (38) ± 14 | 37.7 (39) ± 12.5 | 0.328 |
| Min-max          | 14.75  | 14.75  | 17.72 |          |
| Disease duration (mo) | 33.8 (12) ± 59.3 | 21.5 (9) ± 67.9 | 26.3 (5) ± 49.1 | 0.007 |
| Min-max          | 2.480  | 2.480  | 2.240 |          |
| UAS28-Baseline   |        | 42.7 ± 36.4 | – |          |
| Min-max          | 0.127  |          | – |          |
| UAS28-1st        |        | 34.3 (23) ± 37.6 | – |          |
| Min-max          | 0.165  |          | – |          |
| UCT-1st          | 9.5 (9) ± 3.8 | 10.4 (11) ± 3.9 | 8.48 ± 3.4 | 0.001 |
| Min-max          | 1-16   | 1-16   | 1-16 |          |
| UCT-2nd          | 11.6 (12) ± 3.3 | 11.7 (12) ± 3.4 | 11.4 (12) ± 3.2 | 0.379 |
| Min-max          | 2-16   | 2-16   | 2-16 |          |
| CU-Q2oL-1st      | 22.7 (17.3) ± 19.5 | – | – |          |
| Min-max          | 0.7934 |          | – |          |
| CU-Q2oL-2nd      | 18.5 (14.1) ± 18.0 | – | – |          |
| Min-max          | 0.7390 |          | – |          |
| PatGA-VAS-1st    | 4.0 (4.5) ± 2.8 | 3.1 (2) ± 2.7 | 4.95 ± 2.5 | <0.001 |
| Min-max          | 0-10   | 0-10   | 0-10 |          |
| PatGA-VAS-2nd    | 3.1 (2) ± 2.7 | 2.5 (1.5) ± 2.7 | 3.83 ± 2.7 | 0.001 |
| Min-max          | 0-10   | 0-10   | 0-10 |          |
| PhyGA-VAS-1st    | 6.8 (6) ± 5.6 | 8.1 (8) ± 7.4 | 5.55 ± 2.2 | <0.001 |
| Min-max          | 1-7    | 2-7    | 1-10 |          |
| PhyGA-VAS-2nd    | 7.2 (8) ± 2.6 | 7.7 (9) ± 2.4 | 6.6 (7.5) ± 2.6 | 0.003 |
| Min-max          | 1-10   | 1-10   | 1-10 |          |
| Pat ATR-1st n,% treatment sufficient | 82 (51.6%) | 75 (65.4%) | 29 (37.2%) | <0.001 |
| Pat ATR-2nd n,% treatment sufficient | 105 (66%) | 77 (67.9%) | 50 (64.1%) | 0.613 |
| PHY ATR-1st n,% treatment sufficient | 94 (47.4%) | 72 (44.7%) | 19 (24.4%) | <0.001 |
| PHY ATR-2nd n,% treatment sufficient | 106 (66.7%) | 106 (66.7%) | 50 (64.1%) | 0.501 |
| DLQI-1st m (md:SD) | 3.87 ± 6.3 | 8.57 ± 6.3 | 3.87 ± 6.3 | 0.27 |
| Min-max          | 0.24   |          | – |          |
| DLQI-2nd m (md:SD) | 5.74 (4) ± 6.26 | 8.57 ± 6.3 | 3.87 ± 6.3 | 0.27 |

Pearson Chi-Square, Mann-Whitney U.

UAS28-Baseline: the 4-weekly UAS score between the 1st visit, UAS28, UAS28-1st: the 4-weekly UAS score between the 1st and 2nd visit, UCT-1st: Urticaria control test score at the 1st visit, UCT-2nd: Urticaria control test score at the 2nd visit, CU-Q2oL-1st: Chronic urticaria quality of life questionnaire score at the 1st visit, CU-Q2oL-2nd: Chronic urticaria quality of life questionnaire score at the 2nd visit, PatGA-VAS-1st: Patient’s global assessment of disease severity-visual analog scale at the 1st visit, PhyGA-VAS-1st: Physician’s global assessment of disease control - visual analog scale at the 1st visit, PhyGA-VAS-2nd: Physician’s global assessment of disease control - visual analog scale at the 2nd visit, PhyGA-LS-2nd: Dermatology Life Quality Index Score at the 1st visit, DLQI-2nd: Dermatology Life Quality Index Score at the 2nd visit.

The standard deviation (SD) of the baseline UCT scores was by 2.12,16,25. Besides the MID, the smallest detectable change of the UCT score was also calculated.2,36 The SDC was analysed as 1.96 times the SD of the UCT’s score changes between two visits in patients whose Phy-GA-LS was stable.

### Correlations of UCT with other tools

The UCT showed strong correlation with CU-Q2oL but a moderate correlation with DLQI. The UCT scores of the total patient population (CSU and CINDU) showed strong correlations with disease severity (PatGA-VAS, PatGA-LS) and disease control (PhyGA-VAS, PhyGA-LS). UCT scores of CSU patients showed a strong negative correlation with disease severity.

### Table 2

Internal consistency of the Turkish UCT.

| Item   | Mean | S.D | N | Cronbach’s Alpha |
|--------|------|-----|---|-----------------|
| CSU    |      |     |   | 0.891           |
| UCT-1  | 2.33 | 1.19| 81| 0.891           |
| UCT-2  | 2.73 | 1.17| 81| 0.891           |
| UCT-3  | 2.81 | 1.09| 81| 0.891           |
| UCT-4  | 2.70 | 0.98| 81| 0.891           |
| CINDU  |      |     |   | 0.684           |
| UCT-1  | 1.94 | 1.17| 78| 0.684           |
| UCT-2  | 2.10 | 1.21| 78| 0.684           |
| UCT-3  | 2.36 | 1.23| 78| 0.684           |
| UCT-4  | 2.03 | 1.16| 78| 0.684           |
| TOTAL  |      |     |   | 0.817           |
| UCT-1  | 2.14 | 1.19| 159| 0.817          |
| UCT-2  | 2.42 | 1.23| 159| 0.817          |
| UCT-3  | 2.59 | 1.18| 159| 0.817          |
| UCT-4  | 2.37 | 1.12| 159| 0.817          |

Cronbach’s α coefficient: < 0.60 unacceptable, 0.60–0.65 undesirable, 0.65–0.70 minimally acceptable, 0.70–0.80 respectable, 0.80–0.90 excellent and > 0.90 excessive consistency.
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The correlations between change in UCT scores and UAS28, CU-Q2oL, PhyGA-VAS, PatGA-LS, PAT-ATR and DLQI were moderate (0.5 < r < 0.7) in CINDU patients. The UCT was sensitive to detect changes in disease activity and quality of life. The UCT showed similar known groups validity for CSU and CINDU patients. The known group validity for UCT increased as correlation coefficient values of <0.3, 0.3–0.6, and >0.6 respectively.

The known group validity for UCT

Table 4

| Known groups validity of the UCT (CSU and CINDU). |
|-------------------------------|-------------|-----------|-----------------|-----------------|
|                               | N           | Mean      | SD               | Kruskal-Vallis Test |
|                              |             |           |                 | p                |
| PatGA-LS-1st CSU             | No complaints: 16 | 15.13     | 2.062            | 16.00            | 47.178 <0.001 |
|                              | Mild complaints: 34 | 11.09     | 2.690            | 12.00            | 34.226 <0.001 |
|                              | Moderate complaints: 25 | 8.04     | 2.336            | 8.00             | 23.868 0.001 |
|                              | Severe complaints: 6 | 4.33      | 3.204            | 3.50             | 4.330 0.001 |
| PatGA-LS-1st CINDU           | No complaints: 3 | 13.67     | 1.155            | 13.00            | 34.226 <0.001 |
|                              | Mild complaints: 20 | 11.25     | 2.826            | 12.00            | 20.123 0.001 |
|                              | Moderate complaints: 40 | 7.80      | 2.662            | 8.00             | 7.800 0.001 |
|                              | Severe complaints: 15 | 5.27      | 2.086            | 6.00             | 5.270 0.001 |
|                       PHYGA-LS-1st CSU | Complete control: 19 | 14.16     | 2.651            | 15.00            | 43.629 <0.001 |
|                              | Good control: 34 | 11.24     | 2.742            | 12.00            | 34.226 <0.001 |
|                              | Moderate control: 23 | 7.65      | 2.367            | 7.00             | 23.760 0.001 |
|                              | Little control: 2 | 7.00      | 1.414            | 7.00             | 2.760 0.001 |
|                              | No control: 3 | 1.67      | 0.577            | 2.00             | 1.670 0.001 |
|                       PHYGA-LS-1st CINDU | Complete control: 18 | 12.78     | 1.396            | 12.50            | 18.780 0.001 |
|                              | Good control: 36 | 7.89      | 1.997            | 8.00             | 36.890 0.001 |
|                              | Moderate control: 20 | 5.85      | 2.277            | 6.00             | 20.580 0.001 |
|                              | Little control: 3 | 3.33      | 2.082            | 4.00             | 3.330 0.001 |
|                       PAT-ATR-1st CSU | Treatment not sufficient: 53 | 12.19     | 3.051            | 12.00            | 196.000 0.000 |
|                              | Treatment sufficient: 28 | 7.14      | 3.147            | 7.00             | 28.710 0.001 |
|                       PAT-ATR-1st CINDU | Treatment not sufficient: 49 | 6.53      | 2.399            | 6.00             | 49.630 0.000 |
|                              | Treatment sufficient: 29 | 11.62     | 2.321            | 12.00            | 29.1160 0.001 |
|                       PHY-ATR-1st CSU | Treatment not sufficient: 52 | 12.31     | 3.052            | 12.00            | 52.1230 0.000 |
|                              | Treatment sufficient: 29 | 7.10      | 2.920            | 7.00             | 29.710 0.001 |
|                       PHY-ATR-1st CINDU | Treatment not sufficient: 59 | 6.92      | 2.336            | 7.00             | 59.692 0.000 |
|                              | Treatment sufficient: 19 | 13.11     | 1.329            | 13.00            | 19.1310 0.001 |

Kruskal-Vallis.

The reproducibility of the Turkish UCT

The Turkish UCT showed excellent reproducibility. Seventy patients (34 CSU patients and 36 CINDU patients) who had stable PatGA-LS scores during the four-week interval between the 1st and 2nd visits were included into analysis of test-retest reliability. ICC of UCT in CSU and CINDU were analysed separately and also totally. The ICCs of UCT in patients with CSU and CINDU were 0.89 (95% confidence interval = 0.79–0.95) and 0.74 (95% confidence interval = 0.50–0.87), respectively, that demonstrated excellent reproducibility of both UCTs. ICC was 0.83 (95% confidence interval = 0.72–0.89) showing excellent reproducibility of Turkish UCT when it is determined totally.
on how the disease impacted the quality of life of the patient. Twenty-

Table 5
Cut-off values for the UCT for screening patients for well controlled disease.

| Total UCT score | Phy-GA-LS | Total UCT score | Phy-GA-LS |
|-----------------|-----------|-----------------|-----------|
| UCT score       | 1st visit | Well-controlled urticaria (n=72) | 2nd visit | Well-controlled urticaria (n=101) |
| Cut-off value   | Sensitivity (%) | Specificity (%) | Cut-off value | Sensitivity (%) | Specificity (%) |
| 8.5–9           | 91.7      | 73.6            | 8.5–9      | 98          | 55.2          |
| 9.5–10          | 84.7      | 85.1            | 9.5–10     | 98          | 69           |
| 10.5–11         | 79.2      | 89.7            | 10.5–11    | 96          | 81           |
| 11.5–12         | 70.8      | 95.4            | 11.5–12    | 93.1        | 91.4         |
| 12.5–13         | 48.6      | 100             | 12.5–13    | 69.3        | 100          |
| 13.5–14         | 33.3      | 100             | 13.5–14    | 47.5        | 100          |
| AUC (95% CI)    | 0.925 (0.883–0.966) |                  | 0.967 (0.943–0.992) |                  |

Abbreviations: AUC (95% CI): area under the curve (95% confidence interval).

On the ROC curve analysis, UCT score change was determined by improved disease versus not improved disease. AUC was 0.896 (0.841–0.950) (95% CI) and UCT change score that identifies improved disease was 2.5 (sensitivity 82.5%, specificity 87.5%). Sixty-seven patients had stable Phy-GA-LS between two visits and the SD of the UCT’s score changes in patients with stable Phy-GA-LS was 2.2 and SDC was 4.3.

Discussion

The UCT is a simple and easy to use patient-reported outcome (PRO) tool which was originally developed to determine disease control in CU patients. The linguistic adaptation and validation studies have been performed in Thai, Arabic and Spanish. We performed the recommended steps for validation of PRO-tools rigorously for the Turkish UCT and we determined the reliability, validity, sensitivity to change and minimally important difference (MID) of the tool.

We found that UCT scores were lower in the CINDU group at referral (8.4 in CINDU vs 10.4 in CSU, p < .001) and Phy-GA-VAS was also lower in the CINDU group compared to CSU group (5.5 vs 8.1, p < .001). Pat-GA-VAS were higher (4.9 vs 3.1; p < .001) and Pat-ATR and Phy-ATR were lower in CINDU compared to CSU (29 vs 53, p < .001 and 19 vs 52, p < .001, respectively). Most of the CSU patients rated their disease activity as mild (34 patients) while most of the CINDU patients rated as moderate (40 patients), severe activity was rated by 6 of the CSU patients while 15 of CINDU patients rated themselves as severe. Nineteen patients with CSU reported complete control of urticaria while only one patient with CINDU reported complete control. These findings suggest a higher disease impact and poorer control of urticaria in CINDU patients which might be associated with the longer disease duration in these patients (36.3 vs 31.5 months in CINDU and CSU patients, respectively). Since we had to use different QoL measures to assess QoL impairment in CSU and CINDU patients we are not able to make a direct comparison between the QoL impairment of CSU and CINDU patients but we could get some information from the second question of UCT which provides information on how the disease impacted the quality of life of the patient. Twenty-four patients with CINDU while 13 patients with CSU reported to have their quality of life impairment as “much and very much effected” by urticaria which are in parallel to the findings of O'Donnell et al. and Poon et al. who described poorer quality of life in patients with delayed pressure urticaria and cholinergic urticaria and with Schoepke et al. who reported that quality of life significantly impaired in 44% and normal life not possible in 7% of symptomatic dermographism patients.

The Turkish version of UCT showed excellent consistency for CSU which was higher than the original tool (Cronbach's α original versus Turkish 0.84 vs 0.89) and a minimally acceptable consistency for CINDU (Cronbach's α 0.89 vs 0.68). The reason for this might be the nature of CINDU that shows exaggeration with exposure to the specific trigger and moderation with avoidance which makes it hard to assess the disease
activity without making the critical trigger threshold (CTT) measurement. It is unfortunate that by employing the short version of UCT, we missed the chance to ask the question of “How much, in the last 4 weeks, did you have to avoid physical exercise or stimuli such as heat, cold, pressure light or friction because of your urticaria?” to CINDU patients which is included in the long version of the UCT. By asking this question, maybe we could get a thorough assessment of the activity of the disease.

The evaluation for the correlation between other tools revealed that the UCT showed strong negative correlations with the UAS28, CU-Q2oL, Pat-GA-VAS, Phy-GA-VAS and Pat-LS and a strong positive correlation with Phy-GA-LS which is because higher scores of the former tools are linked to higher disease activity and poor control. The DLQI showed a moderate negative correlation with the UCT. We believe this is again due to the difficulty to assess disease impact in CINDU patients and could also be linked to the differences in the period of assessment times which assesses the last 4 weeks in UCT and the last week for DLQI. Although a study from Japan showed good correlation with UCT and DLQI in CU,13 since DLQI is not a disease specific tool which is designed specifically for CINDU, it might not be able to show the real impact on QoL impairment of CINDU patients. As the CU-Q2oL has been reported to be more sensitive in comparison with DLQI to reflect QoL impairment in certain disease specific questionnaires are needed to assess QoL in patients with CINDU14.

UCT also showed to be sensitive to changes in disease activity in both CSU and CINDU patients. The test-retest reliability showed excellent reproducibility for both CSU and CINDU patients but there was a clear superiority for CSU patients (first visit UCT 12.4 vs 12.2 for CSU, 8.9 vs 10.9 for CINDU, respectively). At baseline, the mean UCT scores of CINDU patients were lower than the CSU patients (8.4 vs 10.4, respectively) but after treatment, the total scores clearly increased at the follow up visit (11.7 for CSU and 11.4 for CINDU, respectively). The lower reproducibility of UCT for CINDU could be attributed to its changeability according to avoidance behaviours.

Here we report that the UCT is also suited to determine changes in disease control over time and to assess treatment effects (that it is responsive to change). Our results demonstrate that changes in the UCT score strongly correlate with disease-specific assessments of changes in urticaria activity (UAS7) and HR-QoL (CU-Q2oL), while the correlation with changes in the less-specific DLQI are less strong (but still good). Importantly, the change of UCT ratings from “poorly controlled” to “well-controlled” was well in accordance with the change of the patients’ self-assessment of treatment efficacy, with the physicians’ global assessment of the treatment response, and with the UAS7-based assessment of treatment response. This supports the appropriateness of the current UCT cut-off value of >12 points to detect patients with well-controlled urticaria.

MID is the smallest change in a score that can be considered clinically relevant and the knowledge of the MID of an outcome measure is important for the interpretation of changes in its score by time or after treatment.16 By using the mean change method we found an MID of 4 and with the ROC curve analysis UCT change score that identifies improved disease was found 2.5. Like the other investigators17,18,19, we regarded an MID 3 points as the most appropriate for UCT score changes.

We unfortunately have some limitations in this study; even though the test-retest reliability analysis should be done in patients without change in disease activity, since we could not keep patients without treatment. For one month, we had to give treatment and the disease activities decreased. For this reason, test-retest reliability could only be performed in 34 CSU and 42 CINDU patients. And by using the long version of UCT we could have evaluated the avoidance behaviours of the CINDU patients and thoroughly assess the impact and activity of CINDU. Another point is using SF-36 instead of DLQI could be more effective in showing the QoL impairment in patients with CINDU because it has a physical functioning domain which measures the repercussion of possible physical limitations on daily activities such as taking a bath, dressing, walking moderate distances, running, climbing stairs, carrying bags, bending over and kneeling.32

As a conclusion, the UCT is a valuable tool which aids in treatment decisions, allowing to assess whether the disease is controlled by two aspects; namely both in severity and quality of life impairment and the Turkish version of UCT is shown to be valid and reliable for both CSU and CINDU patients.

Authors’ contributions*

Conceived and designed the study: Emek Kocatürk and Karsten Weller.

Data collection, patient inclusion and follow up: Emek Kocatürk, Utkan Kızıltan, Kübra Kızıltan, Pelin Can, Nagihan Sahilliğlu, Rabia Öztaş Kara, Teoman Erdem, Aslı Gelincik.

Wrote the manuscript: Emek Kocatürk and Utkan Kızıltan.

Statistical analysis: Pelin Can.

Critically reviewed and revised the manuscript: Marcus Maurer.

Final language editing: Marcus Maurer, Emek Kocatürk.

Agreement with manuscript and conclusions: all.

Designed the figures and tables: Pelin Can, Emek Kocatürk.

All authors read and approved the final manuscript.

Conflicts of interest

None of the authors have conflicts of interest regarding the content of this manuscript.

Ethics approval and consent to participate

Letter of ethical clearance was secured from ethical review board of Okmeydani Training and Research Hospital. Privacy and confidentiality of medical information was ensured. Informed consent of patients was obtained prior to inclusion.

Funding

There was no external source of funding obtained. All expenses related to this research work were covered by the authors.

Availability of data and materials

The datasets generated during the current study are available from the corresponding author on reasonable request.

Acknowledgements

Not applicable.

List of abbreviations

AAS: Angioedema Activity Score
AUC: Area under the curve
CINDU: Chronic inducible urticaria
CU: Chronic urticaria
CU-Q2oL: Chronic Urticaria Quality of Life questionnaire
DLQI: Dermatology Life Quality Index
HRQoL: Health related quality of life
ICC: Intraclass correlation coefficient
MID: Minimal important difference
Pat-ATR: Patient’s assessment of treatment response – Likert scale
Pat-CDA: Patient’s assessment of change in disease activity – Likert scale
Pat-CQoL: Patient’s assessment of change in quality of life – Likert scale
Pat-GA-VAS: Patient’s global assessment of disease severity-visual analog scale
Pat-LS: Patient’s global assessment of disease severity - Likert scale
Pat-ATR: Patient’s assessment of treatment response – Likert scale
Pat-CDA: Patient’s assessment of change in disease activity – Likert scale
Pat-CQoL: Patient’s assessment of change in quality of life – Likert scale
Pat-GA-VAS: Patient’s global assessment of disease severity-visual analog scale
Pat-LS: Patient’s global assessment of disease severity - Likert scale
**PhyGA-VAS**  Physician's global assessment of disease control - visual analog scale

**PhyGA-LS**  Physician's global assessment of disease control - Likert-scale

**Phy-ATR**  Physician's assessment of treatment response

**PRO**  Patient-reported outcome

**QoL**  Quality of life

**SDC**  Smallest detectable change

**SD**  Standard deviation

**UAS**  Urticaria Activity Score

**UCT**  Urticaria Control Test

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