Experimental
&
Clinical Article

An Important Tool in Lymphedema Management: Validation of the Turkish Version of the Gynecologic Cancer Lymphedema Questionnaire

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ABSTRACT

OBJECTIVE: This study aimed to research the reliability and validity of the Turkish version of the gynecologic cancer lymphedema questionnaire for individuals with gynecologic cancer.

STUDY DESIGN: The study included 60 patients who underwent gynecologic cancer surgery with lower limb lymphedema in the lymphedema group and 30 who underwent gynecologic cancer surgery without lower limb lymphedema in the non-lymphedema group. The Turkish adaptation of the gynecologic cancer lymphedema questionnaire was completed by considering the cultural adaptation process. For the evaluation of lymphedema, circumference measurement, skin layer thickness, and lymphoscintigraphy assessments were performed. The intraclass correlation coefficient was calculated for gynecologic cancer lymphedema questionnaire test-retest reliability, the Cronbach alpha was calculated for internal consistency reliability and the criteria validity method was used for survey validity.

RESULTS: The symptom subsections and total score of the gynecologic cancer lymphedema questionnaire, the intraclass correlation values for test-retest points were 0.780, 0.968, 0.695, 0.945, 0.896, 0.945, and 0.947. The Cronbach α values for internal consistency were 0.928, 0.824, 0.656, 0.429, 0.923 and 0.948 for the subsections. Criteria validity was used for the validity analysis and statistically significant (p<0.05) positive correlations were determined between skin fold thickness measurements and total points on the scale in the lymphedema group for values at the midpoint of the right and left tibial shaft (r=0.336, r=0.284).

CONCLUSION: The gynecologic cancer lymphedema questionnaire was determined to be a reliable and valid scale to differentiate patients with lower limb lymphedema from those without lower limb lymphedema in a Turkish female population.

Keywords: Gynecologic cancer, Lymphedema, Validity

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Introduction

Lymphedema (LE) is a chronic condition formed by the accumulation of protein-rich fluid in subdermal tissue as a result of the failure of the lymph system. Primary LE occurs due to an anomaly in the development of the lymph system, while secondary LE develops as a result of later injury to lymph veins or lymph nodes (1).

Gynecologic cancer is a disease of the female genital organs and is among the diseases with the highest risk of morbidity and mortality in females after breast cancer. Although the risk factors for gynecologic cancer vary according to topography and histology, the most common are age, genetic predisposition, hormonal, environmental and individual factors, smoking-alcohol use, body mass index (BMI), specific viruses, sedentary lifestyle, perinatal development, occupa-

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tional exposure, and socioeconomic level (2). The removal of lymph nodes after gynecologic cancer increases the risk of lower limb LE (LLLE) development, while other risk factors are postoperative radiotherapy, injuries, trauma, thermal changes, infection in the lower limbs, weight gain, and reduced mobility (3).

LLLE is observed to have the highest incidence after vulva cancer treatment but may occur after ovarian, endometrium, and cervical cancer treatment (4). The probability of LE for uterus, ovarian, cervical, and vulva cancers is 1.3-38%, 4.7-21.1%, 3.6-49%, and 5.5-81.2%, respectively (5).

The Gynecologic Cancer Lymphedema Questionnaire (GCLQ) is one of the surveys used related to disease-specific health for individuals with LE. The GCLQ was developed as a symptom scale to assess LE in patients who developed LE in the lower extremities after gynecologic cancer surgery. The scale was first planned as a modification of the Lymphedema Breast Cancer Questionnaire by Dr. Suzy Lockwood in the USA (unpublished data). Later in 2010, Carter et al. performed efficacy and feasibility studies for the GCLQ (6). The GCLQ is a simple screening method to determine whether the patient has any risk of LE in the lower limbs, and it may show variations in the patient before and after LE treatment.

This study aimed to research the reliability and validity of the Turkish version of the Gynecologic Cancer Lymphedema Questionnaire.

Material and Method

The study included women attending Kayseri Private Dunyam Hospital Physiotherapy Unit from January 2019 to December 2019 after gynecologic surgery with a history of pelvic lymph node dissection, assessed by a clinician as not having LE or with LE diagnosed on lymphoscintigraphy. At least 6 months had passed since the gynecological surgery in all patients. Those with a difference of >2 cm between the lower limb circumference measurements were included in the LE group, and those with a <2 cm difference in lower limb circumference measurements were included in the non-LE group.

Patients were informed about the study in compliance with the Helsinki Declaration and all participants provided signed informed consent. Permission for the study was granted by Hacettepe University Non-Interventional Clinical Research Ethics Committee with decision number GO 18/1203, dated 18.12.2018.

Patients were excluded from the study if they had any mental problems preventing cooperation and understanding, were illiterate, had any orthopedic, rheumatological, or neurological disease, or were not willing to participate in the research (Figure 1).

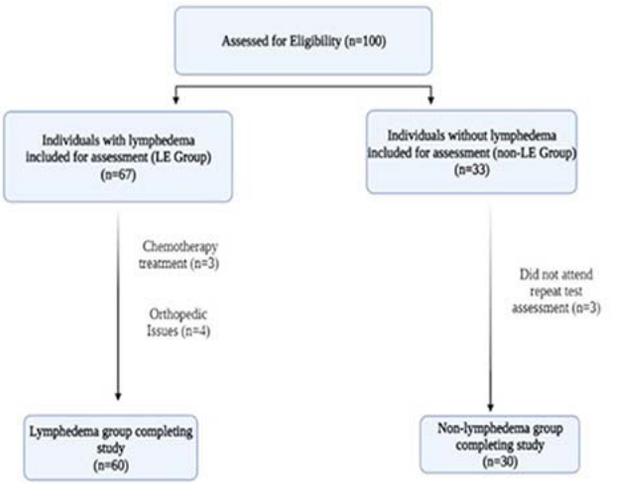


Figure 1: *Patient flow scheme*

Analysis: The physical characteristics (age, sex, height, weight, and BMI), demographic data (educational status), risk factors (smoking, alcohol, etc.), and gynecologic surgery types were recorded for each subject. The lower limb circumference measurements and skin fold thickness measurements were taken bilaterally and each patient was assessed for LE symptoms with the GCLQ.

Circumference measurement: Circumference measurements were taken in the supine position, advancing from the medial malleoli to the inguinal region at 5 cm intervals for both lower limbs. The difference between both limbs was recorded in cm. The circumference measurements were placed in the Frustrum formula (V=h(C2+Cc+c2/12ğ) ğ=3.14) for conversion to volumetric measurements (7). In this formula, h=height, C=the circumference measurement from the medial malleolus, and c=the circumference measurement from the inguinal region.

Skin fold thickness measurement: The validity of the GCLQ was assessed using skin fold measurements taken with a Holtain (UK) brand skinfold device applying 10 g pressure to 1 mm2 with each opening with ± 2 mm error without harming the skin. Measurements were taken at the midpoint of the dorsal foot, the midpoint of the tibia shaft, and the midpoint of the femur bilaterally on the lower extremities (8).

Gynecologic cancer lymphedema questionnaire (GCLQ): The GCLQ was developed as a symptom scale to assess LE in patients who developed LE after gynecologic cancer surgery. The questionnaire comprises a total of 20 items in seven symptom subsections of physical functioning (items 1-6), general swelling (items 8, 9, and 20), heaviness (item 14), limb swelling (items 18, 19), infection (items 10, 11, 13), pain (item 17) and numbness (items 7, 12, 15, 16). The ideal cut-off points for symptom section scores were determined using ROC analysis and the degree of differentiation for LE and non-LE groups of these cut-off points and fit to classification results were investigated.

The 20 items of the GCLQ assess the present and previous four-week period with points of 1 for yes and 0 for no. The items are easy to understand and the questionnaire takes a total of 5-10 minutes to complete, with a total score ranging from 0-20. In this study, the GCLQ was first adapted to Turkish, then applied to patients to assess LE symptoms observed after gynecologic cancer surgery, and reliability and validity studies were performed. For test-retest reliability, the GCLQ was applied twice at a 1-week interval to the same sample.

Statistical analysis

Data were analyzed statistically using SPSS vs. 25.0 software. It was observed that the effect size obtained for the reference study (original GCLQ) was very strong (d=2.2). From the power analysis performed assuming that an effect size would be reached at lower levels (d=0.7), it was calculated that 95% confidence levels and 80% power would be achieved with the inclusion of at least 52 subjects (at least 26 in each group). Continuous variables were stated as mean ± standard deviation, median (minimum-maximum) values, and categorical variables as number and percentage. The conformity of data to normal distribution was investigated with the Kolmogorov-Smirnov and Shapiro-Wilk tests. If parametric test assumptions were met, the comparison of differences in independent groups used the test of significance for the difference between two means, and if parametric test assumptions were not met, the Mann-Whitney U test was applied. Correlations between continuous variables were investigated with Spearman correlation analysis and Chi-square analysis was used for differences between categorical variables.

The ROC analysis method was used to investigate the method's performance. The Youden index value was used to determine the most appropriate cut-off point from the results of the ROC analysis. The performance outcomes of the most appropriate cut-off points obtained from Youden index values were investigated with sensitivity, specificity, positive predicted value, and negative predicted value, the McNemar test, and kappa fit coefficients. Test-retest reliability was investigated with the intraclass correlation (ICC) and kappa fit coefficients. The reliability of the scale in general and of each subsection was calculated with Cronbach's alpha coefficient.

Results

The study included 67 patients in the LE group and 33 patients in the non-LE group. In the LE group, 4 patients who started chemotherapy and 3 who did not repeat the tests were excluded from the analysis. In the non-LE group, 3 patients who started chemotherapy were excluded. The study was completed with a total of 60 subjects in the LE group and 30 in the non-LE group.

Demographic and physical characteristics: The mean age in the LE group was 59.15±11.57 years, and the mean age in the non-LE group was 55.97±11.25 years. The mean BMI was 33.81±5.84 kg/m2 in the LE group, and 30.21±5.69 kg/m2 in the non-LE group. When the sociodemographic characteristics were examined, a statistically significant difference was determined between the LE and non-LE groups in respect of body weight and BMI values.

When the distribution of cases was investigated according to gynecologic cancer type, ovarian cancer (4.17%) was mostly observed in the LE group, with lower rates for endometrium cancer (31.7%) and cervical cancer (26.7%). The volumetric measurements for the lower limbs of cases in the LE and non-LE groups were significantly different ($p<0.05$). The physical, demographic, and clinical features of the study cases are shown in table I.

Investigations of GCLQ items revealed significant differences between the LE and non-LE groups for all items, except numbers 11 and 19 ($p<0.05$). For all items, the incidence rates were significantly higher for the LE group. Scoring was made as 1 point for the answer yes and 0 for no. While yes was the highest response for questions 8 and 14 (98%) in the LE group, questions 17 and 15 showed the highest yes responses (30%) in the non-LE group. The assessment of GCLQ responses by cases is given in table II.

The intraclass correlation coefficient (ICC) values of the scale items obtained from the test-retest examinations showed that the ICC value of the total GCLQ was 0.947, and the total GCLQ Cronbach's alpha value was found to be 0.948. The characteristics of the symptoms sections of the GCLQ are shown in table III.

From the results of the ROC analysis for the GCLQ subsections and total scale points, it was seen that all subsections and total points were very successful in differentiating patients with LLLE and without LLLE. The most successful differentiation was observed for the general swelling subsection (1), followed by the total points (0.996) and heaviness subsection points (0.975). The ROC values for the GCLQ are shown in table IV.

The cut-off points for the symptom subscores after ROC analysis are shown in Table V. The kappa scores of the symptom sections were 1 (General Swelling), 0.754 (Numbness), 0.95 (Heaviness), 0.468 (Pain), 0.346 (Limb Swelling), 0.544 (Infection), 0.855 (Physical Functioning), and 0.951 (Total GCLQ).

No significant correlation was determined between the GCLQ total points and any of the right and left lower limb circumference measurements in the non-LE group. In the LE group, when the correlations between GCLQ total points and right lower limb circumference measurements, there were significant and positive correlations at 40 cm and 55 cm. For the left lower limb, there were significant positive correlations between the GCLQ total points and the measurements at 40 cm, 45 cm, 55cm, and 60 cm.

There was a statistically significant, positive correlation at a moderate level for the total points with the right tibia and right mid-femur skin fold values in the non-LE group. In the LE group, there were significant positive correlations between the total points and the right and left tibia skin fold values. The correlations between the GCLQ total points and the lower limb circumference measurements and skin thickness measurements are shown in tablo VI.

Table I: *Physical, demographic and clinical features of cases*

	Non-LE group (n=30)		LE group (n=60)		
	AM±SD	Med (min-max)	AM±SD	Med (min-max)	**Between group p**
Age (years)	55.97±11.25	58 (37-79)	59.15±11.57	60 (34-84)	0.218 (t=-1.242)
Height (cm)	159.03±4.44	160 (150-166)	160.40±5.8	160 (147 - 170)	0.26 (t=-1.134)
Weight (kg)	76.23±13.28	75.50 (57-104)	86.83±14.66	85 (50 - 135)	0.001* (z=-3.223)
BMI (kg/m^2)	30.21±5.69	28.80 (22.21-46.22)	33.81±5.84	32.96 (20.81-49.59)	0.002* (z=-3.133)
Right lower limb volume (mL)	8237.25±1901.72	7989.45 (4844.54-11919.28)	11271.53±3614.62	10469.7 (5998.81-27796.07)	0.0001* (z=-4.554)
Left lower limb volume (mL)	8334.33±1928.54	8006.11 (4868.52-12481.59)	11581.98±3779.29	10924.7 (6731.29-29571.7)	0.0001* (z=-4.733)
		N (%)		N (%)	**Between group p**
Educational status	Illiterate	7 (23.33%)		11 (18.33%)	0.268 (χ^2=5.19)
	Primary school	11 (36.67%)		36 (60%)	
	Middle school	3 (10%)		3 (5%)	
	High school	5 (16.67%)		7 (11.67%)	
	Certificate/university	4 (13.33%)		3 (5%)	
Marital status	Married	25 (83.33%)		52 (86.67%)	0.753δ
	Single	5 (16.67%)		8 (13.33%)	
Smoking	No	28 (93.33%)		56 (93.33%)	1 δ
	Yes	2 (6.67%)		4 (6.67%)	
Alcohol	No	30 (100%)		60 (100%)	-
	n	%		n	%
Endometrium	19	31.7		13	43.3
Cervix	16	26.7		7	23.3
Ovarian	25	41.7		10	33.3

**p<0.05 statistical significance; AM: Arithmetic mean; SD: Standard deviation; Med (min-max): Median (minimum-maximum values); χ^2: chi-square test; δ: Fisher exact chi-square test; t: independent groups t-test; z: Mann Whitney U test; LE: Lymphedema; BMI: body mass index; n: number of people*

Table II: *Assessment of GCLQ questions*

		Group		Total	Between group p
		non-LE	LE		
Is there movement limitation of your hip?	0	29 (96.67%)	17 (28.33%)	46 (51.11%)	0.0001* (χ^2=37.374)
	1	1 (3.33%)	43 (71.67%)	44 (48.89%)	
Is there movement limitation of your knee?	0	30 (100%)	10 (16.67%)	40 (44.44%)	0.0001* (χ^2=56.25)
	1	0 (0%)	50 (83.33%)	50 (55.56%)	
Is there movement limitation for your ankle?	0	30 (100%)	9 (15%)	39 (43.33%)	0.0001* (χ^2=58.846)
	1	0 (0%)	51 (85%)	51 (56.67%)	
Is there movement limitation of your foot?	0	30 (100%)	16 (26.67%)	46 (51.11%)	0.0001* (χ^2=43.043)
	1	0 (0%)	44 (73.33%)	44 (48.89%)	
Is there movement limitation of your toes?	0	30 (100%)	19 (31.67%)	49 (54.44%)	0.0001* (χ^2=37.653)
	1	0 (0%)	41 (68.33%)	41 (45.56%)	
Do you feel weakness in your leg or foot?	0	20 (66.67%)	12 (20%)	32 (35.56%)	0.0001* (χ^2=19.009)
	1	10 (33.33%)	48 (80%)	58 (64.44%)	
Did you experience sensitivity of your skin?	0	27 (90%)	26 (43.33%)	53 (58.89%)	0.0001* (χ^2=17.991)
	1	3 (10%)	34 (56.67%)	37 (41.11%)	
Did you experience swelling?	0	30 (100%)	1 (1.67%)	31 (34.44%)	0.0001* (χ^2=84.645)
	1	0 (0%)	59 (98.33%)	59 (65.56%)	
Did you experience pitting with swelling?	0	30 (100%)	11 (18.33%)	41 (45.56%)	0.0001* (χ^2=53.780)
	1	0 (0%)	49 (81.67%)	49 (54.44%)	
Did you experience reddening?	0	28 (93.33%)	37 (61.67%)	65 (72.22%)	0.002* (χ^2=9.997)
	1	2 (6.67%)	23 (38.33%)	25 (27.78%)	
Did you experience blistering on your skin?	0	30 (100%)	58 (96.67%)	88 (97.78%)	0.551 δ
	1	0 (0%)	2 (3.33%)	2 (2.22%)	
Did you feel firmness/tightness?	0	27 (90%)	5 (8.33%)	32 (35.56%)	0.0001* (χ^2=58.214)
	1	3 (10%)	55 (91.67%)	58 (64.44%)	
Did you experience increased temperature in your legs?	0	24 (80%)	14 (23.33%)	38 (42.22%)	0.0001* (χ^2=26.326)
	1	6 (20%)	46 (76.67%)	52 (57.78%)	
Did you experience a feeling of heaviness?	0	29 (96.67%)	1 (1.67%)	30 (33.33%)	0.0001* (χ^2=81.225)
	1	1 (3.33%)	59 (98.33%)	60 (66.67%)	
Did you experience numbness?	0	21 (70%)	15 (25%)	36 (40%)	0.0001* (χ^2=16.875)
	1	9 (30%)	45 (75%)	54 (60%)	
Did you experience stiffness?	0	29 (96.67%)	6 (10%)	35 (38.89%)	0.0001* (χ^2=63.210)
	1	1 (3.33%)	54 (90%)	55 (61.11%)	
Did you experience pain?		21 (70%)	13 (21.67%)	34 (37.78%)	0.0001* (χ^2=19.877)
		9 (30%)	47 (78.33%)	56 (62.22%)	
Did you experience swelling at the hip?		26 (86.67%)	21 (35%)	47 (52.22%)	0.0001* (χ^2=21.398)
		4 (13.33%)	39 (65%)	43 (47.78%)	
Did you experience edema in the groin region (genital, labia/vulva)?		24 (80%)	39 (65%)	63 (70%)	0.143 (χ^2=2.143)
		6 (20%)	21 (35%)	27 (30%)	
Did pockets of fluid form (edema accumulation)?		30 (100%)	2 (3.33%)	32 (35.56%)	0.0001* (χ^2=81.563)
		0 (0%)	58 (96.67%)	58 (64.44%)	

Table III: *Features of the gynecologic cancer lymphedema questionnaire symptom subsections*

	ICC	95% CI lower limit	95% CI upper limit	Cronbach's Alpha	Item numbers
General swelling	0.780	0.539	0.896	0.928	3
Numbness	0.968	0.934	0.985	0.824	4
Heaviness	-	-	-	-	1
Pain	0.695	0.359	0.855	-	1
Limb swelling	0.945	0.884	0.974	0.656	2
Infection	0.896	0.781	0.950	0.429	3
Physical functioning	0.945	0.885	0.974	0.923	6
Total GCLQ	0.947	0.888	0.975	0.948	20

CI: Confidence interval, ICC: Intraclass correlation coefficient, GCLQ: Gynecologic cancer lymphedema questionnaire

Table IV: *The area under the curve for gynecologic cancer lymphedema questionnaire total and symptom subsection scores*

	AUC	Std. error	*p*	95% CI	
				Lower limit	Upper limit
Physical functioning (Q1-6)	0.952	0.023	**0.0001***	0.906	0.997
General swelling (Q8, Q9, Q20)	1	0	**0.0001***	1	1
Infection (Q10, Q11, Q13)	0.811	0.047	**0.0001***	0.719	0.904
Numbness (Q7, Q12, Q15, Q16)	0.946	0.023	**0.0001***	0.901	0.991
Limb swelling (Q18, Q19)	0.717	0.055	**0.001***	0.609	0.825
Heaviness (Q14)	0.975	0.021	**0.0001***	0.933	1
Pain (Q17)	0.742	0.058	**0.0001***	0.628	0.855
Total GCLQ	0.996	0.004	**0.0001***	0.988	1

**p<0.05 statistical significance, AUC: Area under the curve, Std. Error: Standard error, CI: Confidence interval, GCLQ: Gynecologic cancer lymphedema questionnaire, Q: Question*

Table V: *Cut-off points for symptom subsections with ROC analysis*

	Cut-off point	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value	Total Accuracy Rate	McNemar *p*	Kappa *p*
General swelling	0.5	100	100	100	100	100	1.000	1 (*p*=0.0001*)
Numbness	1.5	90	86.67	93.1	81.25	88.89	0.754	0.754 (*p*=0.0001*)
Heaviness	0.5	98.33	96.67	98.33	96.67	97.78	1.000	0.95 (*p*=0.0001*)
Pain	0.5	78.33	70	83.93	61.76	75.56	0.523	0.468 (*p*=0.0001*)
Limb swelling	0.5	65	73.33	82.98	51.16	67.78	0.024	0.346 (*p*=0.001*)
Infection	0.5	80	76.67	87.27	65.71	78.89	0.359	0.544 (*p*=0.0001*)
Physical Functioning	1.5	91.67	96.67	98.21	85.29	93.33	0.219	0.855 (*p*=0.0001*)
Total GCLQ	7	96.67	100	100	93.75	97.78	0.500	0.951 (*p*=0.0001*)

**p<0.05 Statistically significant difference, GCLQ: Gynecologic cancer lymphedema questionnaire, Kappa: Kappa fit coefficient*

Table VI: Correlation between gynecologic cancer lymphedema questionnaire with lower limb circumference measurements and skin thickness measurements

Non-LE Group		Right 10 cm	Right 15 cm	Right 20 cm	Right 25 cm	Right 30 cm	Right 35 cm	Right 40 cm	Right 45 cm	Right 50 cm	Right 55 cm	Right 60 cm	Right inguinal
Total GCLQ	rho	0.313	0.330	0.241	0.210	0.320	0.195	0.230	0.263	0.261	0.230	0.191	0.226
	p	0.092	0.075	0.200	0.265	0.085	0.301	0.220	0.159	0.163	0.222	0.311	0.230
LE Group													
Total GCLQ	rho	0.193	0.193	0.235	0.202	0.242	0.225	0.277*	0.249	0.235	0.265*	0.234	0.169
	p	0.139	0.140	0.071	0.122	0.063	0.084	0.032	0.055	0.071	0.040	0.072	0.197
Non-LE Group		**Left 10 cm**	**Left 15 cm**	**Left 20 cm**	**Left 25 cm**	**Left 30 cm**	**Left 35 cm**	**Left 40 cm**	**Left 45 cm**	**Left 50 cm**	**Left 55 cm**	**Left 60 cm**	**Left inguinal**
Total GCLQ	rho	0.419*	0.360	0.241	0.197	0.283	0.246	0.212	0.229	0.224	0.209	0.201	0.219
	p	0.021	0.051	0.200	0.297	0.129	0.190	0.260	0.223	0.234	0.268	0.286	0.244
LE Group													
Total GCLQ	rho	0.162	0.152	0.160	0.189	0.170	0.203	0.256*	0.274*	0.251	0.297*	0.277*	0.175
	p	0.216	0.246	0.223	0.147	0.195	0.120	0.049	0.034	0.053	0.021	0.032	0.182
		Non-LE Group					**LE GroupLE Group**						
Skin fold thickness		**Left foot dorsal**	**Left foot dorsal**	**Right tibia**	**Left tibia**	**Right Mid-femur**	**Left Mid-femur**	**Right foot dorsal**	**Left foot dorsa**	**Right tibia**	**Left tibia**	**Right mid-femur**	**Left mid-femur**
Total GCLQ	rho	-0.049	0.118	0.381*	0.351	0.373*	0.326	0.219	0.192	0.336*	0.284*	0.250	0.222
	p	0.799	0.534	0.038	0.058	0.042	0.079	0.092	0.141	0.009	0.028	0.054	0.088

**p<0.05 statistically significant correlation, rho: Spearman correlation analysis, GCLQ: Gynecologic cancer lymphedema questionnaire, LE: Lymphedema*

Discussion

The GCLQ was designed as a symptom scale to assess LLLE in patients who develop LE after gynecologic cancer surgery. This study was performed to adapt the Turkish version of the GCLQ, which appears to be a reliable and valid survey to objectively assess differential symptoms for the diagnosis of LE. The results of this study were found to be consistent with the original English version of the scale (6).

Gynecologic cancers are the seventh most common cancers in women (10). Pelvic radiotherapy and surgical lymph node dissection are associated with LE risk in the lower limbs and genital region (11). The LLLE incidence has been reported to vary from 7% to 78% (11,12). Symptoms of pain, limited movement, the feeling of heaviness or tension, and stiffening of the skin may occur linked to LE. Especially with the thickening of the skin and increased LE, the life of patients may be greatly limited (13). Therefore, it is important to be aware of symptoms and to diagnose LE early. There are many diagnostic tests including soft tissue imaging, lymphoscintigraphy, genetic tests, bioimpedance spectroscopy, and circumference or volumetric measurements (14).

The reliability of the GCLQ was assessed using the internal consistency and test-retest methods. The Cronbach alpha coefficient was used to represent internal consistency. The internal consistency reliability for the total points on the GCLQ, which was developed in the USA, reached 0.95 demonstrating effective differentiation of patients with and without LE after gynecologic cancer. In the current study, the Cronbach alpha value for the total GCLQ was 0.948. The values for the symptom subsections were 0.928 for general swelling, 0.923 for physical functioning, 0.824 for numbness, 0.656 for limb swelling, and 0.429 for infection. Apart from the infection subsection (0.429), the internal consistency for the subsections was at generally acceptable levels. The reason for this may be the inclusion of low numbers of individuals with infection in the study. The internal consistency for the other symptom sections varied between medium and high values. Even if all symptoms are present, the sections and elements within them may not be consistent. In this study, the whole GCLQ was observed to have high internal consistency reliability with the Cronbach alpha value of 0.948.

The original GCLQ had internal consistency reliability of 0.95 for total points (6). The 95% confidence interval for the original GCLQ, in general, was shown to effectively differentiate patients with and without LE from 0.9-1.00. In studies in other countries, the validity of the questionnaire was studied in Korea and a short-form of the Korean version was prepared (5,9). The GCLQ-Korean version was found to have high-reliability values with a Cronbach α value of 0.83 and ICC of 0.96.

With the test-retest method, the ICC was used between two assessments. The results of this found the ICC values for the total GCLQ and symptom subsections between test and retest measures were 0.695 and above. For the total GCLQ, the ICC value was 0.947, which shows the GCLQ has very high test-retest reliability for LE patients. The Korean version of the GCLQ had an ICC value of 0.96, while in the current study, the ICC value for the total GCLQ was 0.947.

With the exceptions of question 11 (Did you experience blisters on your skin?) and question 19 (Did you experience swelling in the genital region?), significant differences were determined between the LE and non-LE groups for all the other questions. The incidence for all items in the LE group was significantly higher. Rates of 'yes' responses in the LE group reached 98% for question 8 (Did you experience swelling?) and question 14 (Did you experience a feeling of heaviness?). In the non-LE group, the incidence for all questions was very low, with only question 6 (Do you feel weakness in your leg or foot?) reaching 66%. A total of 8 questions were observed to not be answered positively by any patient in the non-LE group. These results show that the questionnaire can differentiate patients with LE from those without LE.

For the total score and symptom subsections, a ROC curve was drawn, and the area under the curve (AUC) value was used to identify the most differential items. When the ROC analysis results for the symptom subsections and total points on the GCLQ were investigated, it was seen that all subsections and total points can very successfully differentiate patients with LLLE from those without LLLE. The subsection providing the most successful differentiation was the general swelling section, followed by total points and the heaviness section. In other studies, related to the GCLQ, the sections with the highest points on the original GCLQ were the total points, general swelling section, and numbness section (9). In the Korean version of the GCLQ, the sections with the highest points were general swelling, total points, and heaviness sections (5). Therefore, the current study was seen to be consistent with previous studies and had the highest fit with the GCLQ-Korean version. The ideal cut-off points to distinguish LE and non-LE groups and classification of symptom sections from ROC analysis results were examined with the kappa fit coefficient. With a cut-off point of 7 for the total GCLQ, there was a very high success in the differentiation of patients with LLLE from those without LLLE and the total GCLQ kappa value was very high (0.951) At the same time, these results showed that the study population represented all gynecologic cancer patients in Türkiye.

While volumetric measurement results provide a clearer view of the volume difference between the two groups, skin fold thickness and circumference measurements are other clinical parameters used to assess lymphedema (15,16). A study by Thomis et al. showed that clinical assessments such as skin fold thickness and volumetric measurements were the most appropriate tools to identify dermal reflux in lymphedema compared to lymphofluoroscopic images (8). This shows that we used the correct methods to evaluate the criteria validity of the GCLQ.

In a 2019 study of 894 gynecological cancer patients, it was reported that lower extremity volume and GCLQ could be applied together (17). Do et al. assessed the efficacy of the Korean version of the GCLQ for complex rehabilitation administered to 40 LLLE patients after gynecologic cancer surgery in 2017 and reported that the GCLQ-K scores decreased; in other words, the LE symptoms reduced but not significantly (18). These results show that the GCLQ can be used to demonstrate the efficacy of complex decongestive physiotherapy, apart from its use to diagnose LE.

Beaulac et al. (19) emphasized the importance of assessing gripping power and shoulder ROM for upper limb functions in upper limb cancer patients. Similarly, assessing the joint movement of the lower limb in gynecologic cancer patients will be beneficial in the observation of lower limb functions. The physical function symptom section of the GCLQ assesses lower limb movement, which is an advantage of the questionnaire.

It is important to recognize LE as early as possible, as if left untreated, it may progress, treatment may become more difficult and the quality of life of the patient may be diminished. Even if most female patients attend health centers and receive information and treatment from LE therapists or physiotherapists, diagnosis is generally late as they attend after LE symptoms have emerged and treatment has been planned. Screening surveys and training programs by physiotherapists trained in this topic applied to the patient group at risk of LE development would be beneficial, especially before the onset of LE symptoms. It can also be considered that the repetition of lower limb circumference measurements to identify LE by patients or physiotherapists at certain time intervals will create early awareness for the detection of LE.

Limitations of this study can be said to be that it was a single-center study, and there was no Turkish diagnostic survey specific to LLLE available to perform construct validity. Strong aspects of the study were that test-retest analysis was performed based on the questionnaire sections with the kappa coefficient.

The results of this study demonstrated that the Turkish version of the GCLQ could be used in women's health studies and LE clinics as it can be administered in a short period and is easy to interpret. This study can be of guidance to other researchers evaluating different language versions of the GCLQ, reinforcing its validity and reliability. There is a need for advanced studies showing the applicability of the GCLQ to patients treated for LE and to research the correlation with other methods for LE diagnosis.

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References

1. Maclellan RA, Couto RA, Sullivan JE, Grant FD, Slavin SA, Greene AK. Management of Primary and Secondary Lymphedema: Analysis of 225 Referrals to Center Plast Surg. 2014;75(2):197-200. Doi:10.1097/SAP.0000000000000022. PMID: 24691335.
2. Alp Dal N, Ertem G. Jinekolojik kanserler farkındalık ölçeği geliştirme çalışması. İnsan ve Toplum Bilimleri Araştırmaları Dergisi. 2017;6(5):2351-67.
3. Beesley V, Janda M, Eakin E, Obermair A, Battistutta D. Lymphedema after gynecological cancer treatment: prevalence, correlates, and supportive care needs. Cancer. 2007;109(12):2607-14. Doi: 10.1002/cncr.22684. PMID: 17474128.
4. Ryan M, Stainton MC, Slaytor EK, Jaconelli C, Watts S, Mackenzie P. Aetiology and prevalence of lower limb lymphoedema following treatment for gynaecological cancer. Aust N Z J Obstet Gynaecol. 2003;43(2):148-51. Doi: 10.1046/j.0004-8666.2003.00040.x. PMID:1471297 2.
5. Lim MC, Lee JS, Joo J, Park K, Yoo HJ, Seo SS, et al. Development and evaluation of the Korean version of the Gynecologic Cancer Lymphedema Questionnaire in gynecologic cancer survivors. Gynecol Oncol. 2014;133(1):111-6. Doi:10.1016/j.ygyno.2014.01.040. PMID: 2452226 7.
6. Carter J, Raviv L, Appollo K, Baser RE, Iasonos A, Barakat RR. A pilot study using the Gynecologic Cancer Lymphedema Questionnaire (GCLQ) as a clinical care tool to identify lower extremity lymphedema in gynecologic cancer survivors. Gynecol Oncol. 2010;117(2):317. Doi: 10.1016/j.ygyno. 2010.01.022. PMID: 20163847, PMCID: PMC4847724.
7. Akbayrak T, Kaya S, Deligöz ED. Hacim değerlendirmesinde farklı iki yöntemin karşılaştırılması ve bu yöntemlerin araştırmacılar arası güvenirliği: pilot çalışma. Fizyoter Rehabil. 2007;18(3):217-22.
8. Thomis S, Dams L, Fourneau I, De Vrieze T, Nevelsteen I, Neven P, et al. Correlation between clinical assessment and lymphofluoroscopy in patients with breast cancer- related lymphedema: a study of concurrent validity. Lymphat Res Biol. 2020;18(6):539-48. Doi: 10.1089/lrb. 2019.0090. PMID: 32208953.
9. Kim SI, Kim N, Lee S, Lee S, Joo J, Seo SS, et al. Development of the short version of the Gynecologic Cancer Lymphedema Questionnaire: GCLQ-7. J Gynecol Oncol. 2017;28(2):e9. Doi: 10.3802/jgo.2017. 28.e9. PMID: 27819411, PMCID: PMC5323290.
10. World Health Organization. GLOBOCAN 2012: Estimated Cancer Incidence Mortality and Prevalence Worldwide: in 2012. Available from: http://globocan.iarc.fr/Pages/fact sheets population.aspx
11. Speck RM, Courneya KS, Mâsse LC, Duval S, Schmitz KH. An update of controlled physical activity trials in cancer survivors: a systematic review and meta-analysis. J Cancer Surviv. 2010;4(2):87-100. Doi: 10.1007/s11764-009-0110-5. Erratum in: J Cancer Surviv. 2011;5(1):112. PMID: 20052559.
12. Finnane A, Hayes SC, Obermair A, Janda M. Quality of life of women with lower-limb lymphedema following gynecological cancer. Expert Rev Pharmacoecon Outcomes Res. 2011;11(3):287-97. Doi: 10.1586/erp.11.30. PMID: 21671698.
13. Ahmed Rehana L, Prizment Anna DeAnnLazovich, Schmitz Kathryn H, Folsom Aaron R. Lymphedema and quality of life in breast cancer survivors: the Iowa Women's Health Study. J Clin Oncol. 2008;26(35):5689-96. Doi: 10.1200/JCO.2008.16.4731. PMID: 19001331, PMCID: PMC2600601.
14. International Society of Lymphology. The diagnosis and treatment of peripheral lymphedema: 2013 Consensus Document of the International Society of Lymphology. Lymphology. 2013;46(1):1-11. PMID: 23930436.
15. Devoogdt N, Lemkens H, Geraerts I, Van Nuland I, Flour M, Coremans T, et al. A new device to measure upper limb circumferences: validity and reliability. Int Angiol. 2010;29(5):401-7. PMID: 20924341.
16. Brorson H. Liposuction in arm lymphedema treatment. Scand J Surg. 2003;92(4):287-95. Doi: 10.1177/145749

690309200409. PMID: 14758919.

17. Carter J, Huang HQ, Armer J, Carlson JW, Lockwood S, Nolte S, et al. GOG 244 - The LymphEdema and Gynecologic cancer (LEG) study: The association between the gynecologic cancer lymphedema questionnaire (GCLQ) and lymphedema of the lower extremity (LLE). Gynecol Oncol. 2019;155(3):452-60. Doi: 10.1016/j.ygyno.2019.09.027. PMID: 31679787, PMCID: PMC6900449.

18. Do JH, Choi KH, Ahn JS, Jeon JY. Effects of a complex rehabilitation program on edema status, physical function, and quality of life in lower-limb lymphedema after gynecological cancer surgery. Gynecol Oncol. 2017;147(2):450-5. Doi: 10.1016/j.ygyno.2017.09.003. PMID:28941657.

19. Beaulac SM, McNair LA, Scott TE, LaMorte WW, Kavanah MT. Lymphedema and quality of life in survivors of early-stage breast cancer. Arch Surg. 2002;137(11):1253-7. Doi: 10.1001/archsurg. 137.11.1253. PMID: 12413312.