

Responsiveness of the Korean Version of the Disabilities of the Arm, Shoulder and Hand Questionnaire (K-DASH) after Carpal Tunnel Release

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Background: The Korean version of the Disability of the Arm, Shoulder and Hand Questionnaire (K-DASH) was recently validated, but its responsiveness, which is the degree to which an instrument is sensitive to change, has not been thoroughly evaluated in a specific condition in Koreans. We evaluated the responsiveness of the K-DASH in a homogenous cohort of patients with carpal tunnel syndrome (CTS) and we compared it with that of the disease-specific Carpal Tunnel Questionnaire (CTQ).

Methods: Fifty-six patients with CTS prospectively completed the K-DASH and CTQ before and 6 months after surgery. The responsiveness statistics were assessed for both the K-DASH and CTQ by using the standardized response mean (SRM) and the effect size (ES). Pearson correlation coefficients were calculated between the K-DASH and CTQ.

Results: The SRM and ES of the K-DASH were all 0.8. The SRM of the symptom and function part of the CTQ was 1.5 and 1.1, and the ES was 1.5 and 1.1, respectively. The K-DASH had moderate correlations with the symptom and function parts of the CTQs, but the postoperative K-DASH had a weak correlation with the symptom part of the postoperative CTQ.

Conclusions: The K-DASH was found to have a large degree of responsiveness (SRM, $ES \geq 0.8$) after carpal tunnel release in Korean patients with CTS, which is comparable to the other language versions of the DASH. Although it was less responsive than the CTQ, which is disease-specific, the region-specific K-DASH can be used as an effective outcome measurement tool for CTS, and especially for research that compares CTS with other upper limb conditions.

Keywords: *Responsiveness, K-DASH, Carpal Tunnel Questionnaire*

The assessment of the outcome after medical treatment or surgery for the hand has largely relied on objective tools such as range of motion, grip power and sensibility tests. But objective measurements can't reflect the opinions of patients nor do they give enough information about

the status of the practical functions of the treated hands. Regarding this, several self-administrated questionnaires have been introduced to assess a subjective outcome, including a more general health tool like SF-36 or a region-specific tool such as the Disability of the Arm, Shoulder and Hand Questionnaire (DASH). DASH is an outcome assessment tool that measures the symptoms and the functional status of patients with upper extremity disorders and it is used to compare the relative impacts of those disorders.¹⁾

The use of DASH has rapidly increased in clinical trials and other studies of upper-extremity disorders, and

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the instrument is now available in several languages.²⁻⁹⁾ DASH has also been translated into Korean, and the validity and the reliability of the Korean version of DASH (K-DASH) were recently assessed for arm, shoulder and hand musculoskeletal conditions.¹⁰⁾ However, the responsiveness of K-DASH, which is the degree to which an instrument is sensitive to change, has not been thoroughly evaluated for a specific condition in Koreans.

Carpal tunnel syndrome (CTS) is the most common compressive neuropathy in the upper extremity.¹¹⁾ The Carpal Tunnel Questionnaire (CTQ) is a disease-specific tool that was developed specifically for patients with CTS. The Korean version of the CTQ has been used in a few international papers and it was found to be responsive to carpal tunnel release.^{12,13)} The purpose of this study was to evaluate the responsiveness of the Korean version of the DASH and to compare it with that of the CTQ in a homogenous cohort of patients with CTS.

METHODS

Subjects

One hundred patients were prospectively recruited for the study, but incomplete preoperative responses, concurrent upper limb disorder and loss of follow-up led to forty-four patients being excluded from the final data analysis. Data analysis was performed for the remaining fifty-six patients who had filled out the preoperative and postoperative questionnaires, including the K-DASH and the Boston CTQ.

The data of fifty-six patients was analyzed. They consisted of 6 men and 50 women and their ages ranged from 32 to 77 (average, 55 years). A diagnosis of CTS was based on the clinical manifestations such as a tingling sensation, hand paresthesia along the distribution of the median nerve, a positive Phalen test or Tinel's sign. Electrodiagnostic studies were conducted for all patients to confirm the diagnosis and only those with positive electrodiagnostic study findings were included in this study.

The patients underwent either unilateral or simultaneous bilateral open carpal tunnel release by a single surgeon with the patients under local anesthesia. Evaluations were performed preoperatively and six months postoperatively. The six-month period was chosen because a previous study has shown that patients who have carpal tunnel release tend to plateau in functional and symptom improvement six months after surgery when assessed via a questionnaire.¹⁴⁾

K-DASH and CTQ

DASH quantifies the general disabilities related to the upper extremity. The questionnaire consists mainly of a 30-item scale concerning the patient's health status during the preceding week. The items ask about the degree of difficulty in performing various physical activities because of an arm, shoulder or hand problem (21 items), the severity of each symptom of pain, activity-related pain, tingling, weakness and stiffness (5 items), the problem's effect on social activities, work and sleep and its psychological impact (4 items). Each item has 5 response options, ranging from 1 to 5. If at least 27 of the 30 items are completed, then a score ranging from 0 (no disability) to 100 (the most severe disability) can be calculated. The 2 optional scales of DASH (sport/music and work) were excluded from this study.

The CTQ is a patient-based outcome measure that was specifically developed for patients with CTS. It has two distinct scales: 1) the symptom severity scale (symptom CTQ) that has 11 questions and it uses a five-point rating scale, and the 2) functional status scale (function CTQ) and it contains 8 items that have to be rated for the degree of difficulty on a five-point scale. Each scale generates a final score (sum of the individual scores divided by the number of items) that ranges from 1 to 5, with a higher score indicating greater disability. The CTQ has been used as an outcome measure in clinical studies, and it has also undergone extensive testing for validity, reliability and responsiveness in other languages.^{15,16)} The Korean version of the CTQ has been used in a few international papers and it was found to be responsive to carpal tunnel release.^{12,13)}

Data Analysis

Statistical analysis was performed using SPSS ver. 13.0 (SPSS Inc., Chicago, IL, USA). Paired *t*-tests were used when comparing the preoperative versus postoperative scores. The level of significance was chosen as $p = 0.05$.

Responsiveness statistics were assessed for both scores by using the standardized response mean (SRM) and the effect size (ES).¹⁷⁾ The SRM is defined as the mean change in the scores between baseline and follow-up, and this change is divided by the standard deviation (SD) of the individual changes in the scores. The ES is defined as the mean change in the score between baseline and follow-up, and this mean change is divided by the SD of the baseline score. The higher the SRM or ES, the greater the responsiveness is. Values ≤ 0.5 , between 0.5 and 0.8, and ≥ 0.8 were considered to represent small, moderate and large degrees of responsiveness, respectively.¹⁵⁾ Pearson correlation coefficients were calculated between the K-DASH

Table 1. Data of K-DASH, CTQ and Responsiveness Statistics

Instrument	Preoperative		Postoperative		Change		Responsiveness	
	Mean	SD	Mean	SD	Mean	SD	SRM	ES
K-DASH	39.2	19.7	23.4	18.7	-15.8	19.3	0.8	0.8
Symptom CTQ	2.9	0.8	1.5	0.7	-1.4	1.0	1.5	1.4
Function CTQ	2.5	0.8	1.4	0.6	-0.9	1.0	1.1	0.9

K-DASH: Korean version of the Disability of the Arm, Shoulder and Hand Questionnaire, CTQ: Carpal Tunnel Questionnaire, SD: standard deviation, SRM: standardized response mean, ES: effect size.

Table 2. Preoperative and Postoperative Correlations of K-DASH with CTQ

		Symptom CTQ	Function CTQ
Preoperative correlation	K-DASH	$r = 0.501$ $p < 0.001$	$r = 0.559$ $p < 0.001$
Postoperative correlation	K-DASH	$r = 0.264$ $p = 0.05$	$r = 0.4$ $p = 0.002$

K-DASH: Korean version of the Disability of the Arm, Shoulder and Hand Questionnaire, CTQ: Carpal Tunnel Questionnaire.

score and the CTQ.

RESULTS

The mean preoperative K-DASH score was 39.2 (SD, 19.7) and this decreased postoperatively to 23.4 (SD, 18.7). The SRM was 0.8 and the ES was 0.8. The mean preoperative scores of the symptoms and functions of the CTQ were 2.9 (SD, 0.8) and 2.5 (SD, 0.8), respectively, and these decreased postoperatively to 1.5 (SD, 0.7) and 1.4 (SD, 0.6), respectively. The SRMs of the symptoms and functions of the CTQ were 1.5 and 1.1, respectively, and the ESs of these scores were 1.5 and 1.1 (Table 1), respectively.

The preoperative K-DASH had a significant correlation with the preoperative symptom part of the CTQ (correlation coefficient $r = 0.5$, $p < 0.001$) and with preoperative function part of the CTQ ($r = 0.56$, $p < 0.001$). The postoperative K-DASH had also a significant correlation with the postoperative function part of the CTQ ($r = 0.5$, $p = 0.002$). However, the postoperative K-DASH was found to have a weak correlation with the postoperative symptom part of the CTQ ($r = 0.26$, $p = 0.05$) (Table 2).

DISCUSSION

This study demonstrated that the K-DASH was found to have a large degree of responsiveness (SRM and ES ≥ 0.8)

after carpal tunnel release in Korean patients with CTS, although it is less responsive than the CTQ.

A few studies have been performed on the responsiveness of the DASH scores for patients with CTS. Preoperatively and 3 months after carpal tunnel release in 57 patients, Greenslade et al.¹⁸⁾ found a moderate degrees of responsiveness of the DASH score with a SRM of 0.66, which was less than that of the symptom part of the CTQ (SRM, 1.07) and it was similar to the function part of the CTQ (SRM, 0.62). On the contrary, Gay et al.¹⁹⁾ reported a large degree of responsiveness of the DASH score with a SRM of 1.13 in 34 CTS patients 3 months after their surgery. In addition, several studies have evaluated the responsiveness of the translated versions of the DASH. De Smet et al.²⁰⁾ reported that the SRM and ES of the Dutch version of the DASH were 0.69 and 0.87, respectively, in 119 patients who were undergoing surgery for CTS. Studies have found that the Japanese version of DASH had a small degree of responsiveness and the Spanish version of DASH had a moderate degree of responsiveness in terms of the SRM and ES for the patients with CTS (Table 3).^{21,22)} Compared with these studies, the K-DASH was found to have a larger degree of responsiveness (SRM, 0.8; ES, 0.8) for Korean patients with CTS. The reason that the K-DASH had a larger responsiveness is not clear. One possibility is that our follow-up evaluation was done at 6 months postoperatively, while most of the other studies evaluated the postoperative DASH at 3 months. Symptoms and functions can further improve by 6 months,¹⁴⁾ resulting in greater responsiveness. The study by De Smet et al.,²⁰⁾ which assessed the postoperative DASH at 12 months, demonstrated responsiveness similar to that of our study. One exception was the study by Gay et al.,¹⁹⁾ in which the DASH was assessed at 3 months postoperatively, but high responsiveness (SRM, 1.13; ES, 1.01) was observed. The fact that a relatively larger number of male patients were included in the Gay et al.'s study may have affected the outcomes.

Table 3. The Responsiveness of Various Language Versions of the DASH after Carpal Tunnel Release

Language	Authors	Male:Female	Mean age (range)	Follow-up point (mo)	SRM/ES
English	Greenslade et al. (2004) ¹⁸⁾	16:41	57 (49-65)	3	0.66/-
	Gay et al. (2003) ¹⁹⁾	18:24	55 (31-81)	3	1.13/1.01
Dutch	De Smet et al. (2007) ²⁰⁾	21:98	51 (26-60)	12	0.69/0.87
Japanese	Uchiyama et al. (2007) ²¹⁾	11:49	60 (21-88)	3	0.46/0.47
Spanish	Rosales et al. (2008) ²²⁾	6:36	54 (34-63)	3	0.51/0.7
Korean	Current study	6:50	55 (32-77)	6	0.8/0.8

DASH: Disability of the Arm, Shoulder and Hand Questionnaire, SRM: standardized response mean, ES: effect size.

For conditions other than CTS, Fayad et al.²³⁾ analyzed the responsiveness of the French version of DASH (F-DASH) scores in two groups: an orthopedic group of 47 patients with nonsurgical impacted proximal humeral fracture and a medical group of 26 patients with degenerative shoulder disorders. The sensitivity of the F-DASH was excellent, with SRM and ES values of 1.7 and 1.2 for the orthopedic group and 1.2 and 1.3 for the medical group, respectively.

In our study, the ES of the K-DASH was 0.8, the symptom part of the CTQ was 1.4 and the function of the CTQ was 0.9. All had a large degree of responsiveness. The ES of the symptom part of the CTQ was much higher than that of K-DASH and the function part of the CTQ. The K-DASH and the function part of the CTQ had similar ES values, which is likely because both scores assess disability and dysfunction rather than subjective symptoms. This finding may be correlated with the fact that the patients generally experience a rapid resolution of paresthesia and night cry (subjective symptoms) after carpal tunnel release, while the functional improvement such as weakness is slow.

In the current study, the postoperative K-DASH had a weak correlation with the postoperative symptom part of the CTQ. We suspect that because the K-DASH has more questions about physical function than questions about

symptoms (21 vs. 6), the postoperative change represented by K-DASH correlates better with the function part of the CTQ than with the symptom part of the CTQ.

Our study has several limitations that require consideration. First, because a higher proportion of women were enrolled in this study, the results may not be generalized to the general population with CTS. Second, we lacked other general health measurement questionnaires that can be compared to, and we did not analyze any clinical factors such as the physical findings or the electrodiagnostic testing that may influence the responsiveness of each score.

In conclusion, the K-DASH was found to have a large degree of responsiveness after carpal tunnel release for Korean patients with CTS, which is comparable to the other language versions of the DASH. Although it was less responsive than the disease specific CTQ, the region-specific K-DASH can be used as an effective outcome measurement tool for CTS, and especially for research that compares the CTS with other upper limb conditions.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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