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Title

Cross-cultural adaptation and validation of the Korean Toronto Extremity Salvage Score for extremity sarcoma

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Abstract

Background: Toronto Extremity Salvage Score (TESS) is the most widely used disease-specific patient-reported questionnaire for assessing physical function of patients with extremity sarcoma. However, in order to use an English questionnaire in non-English speaking countries, the questionnaire needs to undergo a process of cross-cultural validation in terms of its ability to take into account culture-specific conditions prior to their administration. Moreover, given the need for multinational studies for rare cancers such as a sarcoma, multiple language versions of the validated questionnaires are needed for standardization of study outcome measurements. To date, only 2 different language versions of the TESS have been validated. Moreover no language version from a non-Western population has been reported.

Questions/Purposes: This study aimed 1) to translate and cross-culturally adapt the TESS into Korean, and 2) to examine its comprehensibility, reliability and validity for use in patients with extremity sarcoma.

Patients and Methods: Patients who visited our outpatient clinic between March 2014 and November 2014 were asked to participate in the study, if they met the following criteria at the time of the visit; 1) underwent curative surgery for histologically confirmed extremity sarcoma, 2) age over 18 years, 3) at least 12 months after last surgery and 4) without complications related to surgery. Of the 129 patients who were eligible, 3 refused, and 126 patients participated in the study. The mean age at the time of administration of the TESS questionnaire was 47 years (range, 18–80 years). The most common histological types were liposarcoma (n=13) and undifferentiated pleomorphic sarcoma (UPS, n=10) for soft tissue sarcoma, osteosarcoma (n=32) and chondrosarcoma (n=19) for bone sarcoma. Of the 34 upper extremity patients, dominant side was involved in 14 patients (42%). The mean time from the last surgery to the questionnaire was 46 months (range, 13-112).

Two bilingual translators whose mother tongue was Korean independently translated the original version of

the TESS questionnaire. The two versions were analyzed and merged by the translators and orthopedic surgeons who specialize in extremity sarcoma after a consensus was reached. The consensus version was back-translated into English independently by two bilingual translators who had not participated in the forward translation. All versions of the translation were analyzed by the review committee, which was made up of the 4 translators, 2 orthopedic surgeons, and a Korean professional translator. The committee evaluated semantic, idiomatic, and conceptual equivalence of all items and answers. All elements of the questionnaire were analyzed, and discrepancies between members were discussed until consensus was reached.

The Korean version of TESS was administered to 126 patients to examine its comprehensibility, reliability (test-retest reliability and internal consistency) and validity (construct validity and descriptive analyses). To examine the test-retest reliability, the first 34 consecutive patients were asked to answer the same TESS questionnaire again one week after the first visit. Internal consistency was calculated to measure to what extent items of a questionnaire represent common underlying task. For construct validity, which measures the extent to which scores of the TESS questionnaire relate to other widely accepted measures, Musculoskeletal Tumor Society Rating Scale (MSTS) and Quality of Life Questionnaire Core 30 of European Organization for Research and Treatment of Cancer (EORTC QLQ-C30) were administered along with the TESS. Descriptive analyses were used to examine the ability of the TESS to demonstrate different levels of scores according to the anticipated profile of disabilities. Patients were analyzed according to the following criteria: 1) sarcoma tissue type (soft tissue sarcoma or bone sarcoma); 2) performance of bone resection as part of the surgery; and 3) limb salvage status (limb salvage or amputation).

Test-retest reliability was assessed using intraclass correlation coefficient (ICC). Internal consistency was measured by Cronbach's alpha, which provides a measurement of the strength of the relationship among the questions of the questionnaire. A Cronbach's alpha ≥ 0.80 was considered acceptable¹⁴. Construct validity was assessed by calculating the Spearman rank correlation coefficients between the TESS and either the EORTC QLQ-C30 or the MSTS. Strength of agreement for the correlation coefficient and the ICC was expressed as follows: strong (≥ 0.70), moderate ($>0.5- <0.7$) and weak (≤ 0.50).

Results: Patients' comprehensibility was high, as the patients rated questions as 'easy' or 'very easy' in 96% for the TESS lower extremity (LE) and in 97% for the TESS upper extremity (UE). Test-retest reliability with ICC (0.884 for LE and 0.979 for UE) and internal consistency with Cronbach's alpha (0.980 for LE and $r=0.990$ for UE)

were excellent (Table 1). The Korean TESS correlated with the MSTS score ($r=0.730$ for LE and $r=0.421$ for UE), and Physical functioning ($r=0.847$ for LE and $r=0.667$ for UE), Role Functioning ($r=0.770$ for LE and $r=0.614$ for UE), Social Functioning ($r=0.639$ for LE and $r=0.703$ for UE) and Quality of Life ($r=0.792$ for LE and $r=0.615$ for UE) domains of EORTC-CLQ C30, which suggested construct validity (Table 2). The descriptive analyses produced the anticipated profile of TESS scores according to the criteria in the lower extremity cases, as the mean TESS score of the patients with bone sarcoma was lower than that of the patients without soft tissue sarcoma [72.9 (range, 31-98) vs. 86.2 (range, 33-100), $p=0.001$]. Moreover, the mean TESS score of the patients who had bone resection as part of their surgery were lower than that of the patients without bone resection [71.4 (range, 31-98) vs. 88.6 (range, 37-100), $p<0.001$].

Conclusions: Our study suggests that Korean version of the TESS is a comprehensible, reliable and valid instrument to measure patient-reported functional outcome in patients with extremity sarcoma. The Korean version of the TESS can be utilized for future cross-cultural international studies of extremity sarcoma.

Table 1. Reliability of the Korean TESS

	R*	Alpha†	Correlation‡
TESS-lower extremity	0.874	0.978	0.582-0.888
TESS-upper extremity	0.979	0.989	0.654-0.976

*Test–retest reliability (intraclass correlation coefficient); n=20.

†Internal consistency (Cronbach’s alpha).

‡Correlations between one item and the total score excluding that item using Spearman rank correlation coefficient.

Table 2. Construct validity of the Korean TESS

	TESS-lower extremity (n=92)		TESS-upper extremity (n=34)	
	r	P value	r	P value
MSTS	0.772	p<0.001	0.635	p<0.001
EORTC QLQ-C30				
Physical functioning	0.840	p<0.001	0.630	p<0.001
Role functioning	0.762	p<0.001	0.591	p<0.001
Social functioning	0.548	p<0.001	0.515	p<0.001
Quality of life	0.791	p<0.001	0.584	p<0.001

TESS: Toronto Extremity Salvage Score; r: Spearman rank correlation coefficient

QLQ-C30: quality of life questionnaire core 30