Adaptation to Turkish and Reliability Study of the Revised Amyotrophic Lateral Sclerosis Functional Rating Scale (ALSFRS-R)

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ABSTRACT

Introduction: Amyotrophic lateral sclerosis (ALS) is a fatal disease characterized by progressive degeneration of the motor neurons. It is difficult to define the severity of the clinical findings of this destructive disease owing to its rapid progression, which presents serious alterations in a short time even in the same patient. The present study was designed to evaluate the validity of the Turkish version of the Revised Amyotrophic Lateral Sclerosis Functional Rating Scale (ALSFRS-R), which has been used in various countries for measuring the functional status of ALS patients.

Methods: The ALSFRS-R scores of 41 ALS patients (24 male), in any stages of illness, were simultaneously assessed by two physicians. The functional status of the patients (motor system, bulbar, and pulmonary functions) was evaluated under 12 titles. In every subtitle, the functional status was evaluated as 0 for the worst functional status and 4

for the best functional status. The mean differentials for both subtitles and global scores and the 95% confidence bounds of these means were detected. The coherence was defined as the states in which the coefficient is above 0.80 and is statistically significant

Results: From the data obtained, the correlation between the two physicians was found to be statistically significant ($p=0.000$) in terms of the means of both subtitles and total scores.

Conclusion: It was shown in the present study that in the clinical follow-up of the disease, the Turkish version of ALSFRS-R is a simple, reliable, and easily applicable.

Keywords: ALS, functional status, ALSFRS-R, Turkish version

INTRODUCTION

Recent developments in neurological sciences have made us comprehensively think about clinically well-defined motor neuron diseases (MNDs) with unclear etiopathogenesis and treatment. Amyotrophic lateral sclerosis (ALS) is a fatal disease characterized by the involvement of the lower and upper motor neurons and has a degenerative and progressive course that has been tried to be explained by many causes (1). It is characterized by the involvement of motor neurons in the motor cortex, brain stem, and spinal cord (2,3).

The initial symptoms of the disease are generally asymmetrical weakness and atrophy, which may be localized to a certain part of an extremity and usually begin in the distal regions. These findings usually begin in the upper extremity in 30%–50% of cases, lower extremity in 20%–40% of cases, and bulbar muscles in 20%–30% of cases (4). Initial symptoms may include cramps, fasciculations, and feeling of muscle stiffness. Fasciculation first involves the hand and arm muscles. Other important findings of the disease are spasticity, pathological reflexes, and some pyramidal signs such as clonus (5,6,7). In this neurodegenerative disease, the main diagnostic basis is clinical features and electromyography (EMG) findings.

The Revised Amyotrophic Lateral Sclerosis Functional Rating Scale (ALSFRS-R) is used in various countries in the evaluation and follow-up of patients with ALS, and provides predictive information to physicians regarding the functional deterioration of patients (8,9,10). In the present study, we aimed to make a Turkish translation of ALSFRS-R, which has been previously translated to English, Spanish, Japanese, and Korean, and to test its reliability and validity in the Turkish language and make it available for Turkish patients with ALS (11,12,13).

METHODS

After approval from the Çukurova University Faculty of Medicine Ethics Committee (dated 09.01.2007-Meeting no:1-Decision no:14), a total of 41 patients (24 males, 58.53%; 17 females, 42.47%) who had been diagnosed with ALS according to modified El Escorial diagnostic criteria and who were seen at any stage of the disease were enrolled in the study. The mean age of the patients was 56.3 ± 12.9 years (23–81).

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First, ALSFRS-R was translated to Turkish independently by 3 teaching fellows who knew English very well. The resultant three different texts were transformed to a common text by two neurologists who knew English very well. This common text was again translated to English by two teaching fellows who were good at English. This resultant Turkish scale was applied to a group of 10 patients with ALS and then tested for its comprehensibility. This resultant Turkish version was applied to the test cases by two physicians (a 2nd year assistant doctor in the department of neurology and a teaching fellow experienced in neuromuscular diseases) in the same session but independently (Table 1).

ALSFRS-R consists of 12 parameters, such as speaking, saliva, swallowing, hand writing, eating, dressing and self-care, turning in the bed and covering up, walking, climbing stairs, dyspnea, orthopnea, and respiratory insufficiency, with a maximum score of 48. Each question is scored between 0 and 4 points. Patients with normal functions are given 4 points. Scores drop down from 4 with increasing functional deterioration, with the worst functional status being scored as 0 points.

Statistical Analysis

In statistical evaluation, the scoring results performed by two physicians were summarized with descriptive statistics in terms of both sub-headings and global scores. The average difference between the evaluations of the two physicians and the 95% confidence intervals of this average were found. Following this, a reliability evaluation was performed by calculating the correlation (Pearson) coefficients for the inter-physician scorings. In the case of a coefficient higher than 0.80 and statistical significance, 'consistence' was accepted to be present. The Statistical Package for the Social Sciences packaged software version 19 (SPSS Inc; Chicago, IL, USA) was used in statistical analyses, and the level of critical significance was accepted as 0.05.

RESULTS

Averages of the evaluations made by the two physicians for the sub-headings are shown in Table 2. Score differences for the sub-headings between the two evaluators who applied the scale varied between -0.14 and 0.62. The difference was found to be 2.14 for the total score. It could be noted that there was generally a high level of correlation between the two evaluators with regard to the 12 sub-headings and total scores.

Among the sub-headings, only saliva, swallowing, eating (with gastrostomy), and dyspnea evaluations were found to be significantly different.

The correlation coefficient score (by the Pearson's test) for the total scores of the two evaluators was calculated as $r=0.972$, with $p=0.000$. Correlations in the sub-headings were generally higher than 0.80 (0.689 for respiration), and all coefficients were found to be significant (Table 3).

DISCUSSION

The clinical findings of ALS are related to the loss of neurons located in all levels of the motor system, from the cortex to the anterior horn of the spinal cord. The disease may begin as a spinal or bulbar form. In the bulbar form, the clinical signs may initially appear also as dysarthria, dysphagia, or as both, and may present with lower motor neuron findings (bulbar palsy), upper motor neuron findings (pseudobulbar palsy), or both. Bulbar palsy is characterized by tongue weakness, fasciculation, and a decrease in the blink reflex, while pseudobulbar palsy is characterized by emotional lability, which involves pathological laughing and crying, active jaw reflex, and dysarthria.

When symptoms begin in the upper extremity, the disease characterized by a difficulty in carrying out activities requiring grasping and fine skills distally and in carrying out shoulder-abduction-related activities (e.g., hair washing) proximally. In the case of initiation in the lower extremity, the disease presents with difficulty in foot dorsiflexion (foot drop) and in climbing stairs (proximal weakness) (14).

Around 5%–10% of cases have a genetic origin, while 90%–95% occur sporadically. The genetic form mostly occurs in an autosomal dominant pattern, while the autosomal recessive form is commonly seen in Northern Africa societies in which consanguineous marriage is common (15). In 10%–20% of patients with the autosomal dominant inheritance form, there is a copper/zinc superoxide dismutase mutation localized on chromosome 21. The incidence of sporadic ALS is 1.5–2/100000 and its prevalence is 6/100000. The disease is more common in males than in females (1.6:1). As it is known, ALS has the same prevalence in all parts of the world, except for in some particular geographical regions, such as the Western Pacific Islands and the Kii Peninsula (16). In total, 50% of ALS patients die within three years after the appearance of initial signs.

Diagnosis is based on history, neurological examination, electrophysiological studies, and modified El Escorial diagnostic criteria. El Escorial diagnostic criteria were proposed at the end of the 1980s and were later modified (17,18). In our study, patients who had been diagnosed with ALS according to modified El Escorial criteria were enrolled.

There are some different ways to determine the severity of the symptoms and signs of ALS and its course, such as the Medical Research Council (MRC) scale evaluating muscle strength, Tufts quantitative neuromuscular examination, the Norris and Appel scale, and ALSFRS-R (19,20,21). ALSFRS-R is one of the most commonly used scales in clinical studies to assess the neurological and functional status of patients with ALS. Reliability studies of the scale have been performed in many languages, such as Japanese, Korean, and Spanish. The results of these reliability studies have shown that ALSFRS-R is a quite useful test to show the functional status of the patients, for each of the various languages it has been translated into (11,12,13). In a Korean language reliability study, 51 patients who had been diagnosed with ALS according to El Escorial criteria were enrolled. Besides ALSFRS-R being translated to the Korean language, these subjects were also applied the Norris scale and Appel ALS status scale tests. The tests were applied twice with 7 days intervals, and it was shown that there was a statistically significant correlation between the Norris scale, the Appel ALS status scale, and the results of ALSFRS-R. From this point of view, it was reported that ALSFRS-R was a useful and reliable scale in the evaluation of the functional status of the tested Korean patients with ALS (13).

In another study conducted in Spain, ALSFRS-R was translated to the Spanish language. Four evaluators applied the Spanish version of ALSFRS-R, the Amyotrophic Lateral Sclerosis Assessment Questionnaire including 40 questions (ALSAQ-40), and the SRI scale evaluating respiratory status to 73 Spanish patients with ALS. It was reported that the scores of the Spanish version of ALSFRS-R were correlated to the scores obtained from ALSAQ-40 and the SRI scale evaluating respiratory status, indicating that ALSFRS-R could be safely used in ALS patients who speak Spanish (11). In an ALSFRS-R scale study by Ohashi et al. (12), in which the scale was translated to the Japanese language and applied to 27 Japanese patients, similar results were obtained. The number of patients enrolled in our present study was almost the same as the patient numbers of the Korean, Spanish, and Japanese studies. Results obtained with the use of the scales in our language and in the other three languages mentioned here overlap,

Table 1. Amyotrophic Lateral Sclerosis Functional Rating Scale (ALSFRS)

The evaluated finding	Score	The evaluated finding	Score
1- Speech		Needs attendant for self-care	1
Normal speech processes	4	Total dependence	0
Detectable speech disturbance	3	7- Turning in bed	
Intelligible with repeating	2	Normal	4
Speech combined with nonvocal communication	1	Somewhat slow and clumsy, but no help needed	3
Loss of useful speech	0	Can turn alone or adjust sheets, but with great difficulty	2
2- Salivation		Can initiate, but not turn or adjust sheets alone	1
Normal	4	Helpless	0
Slight but definite excess of saliva in mouth; may have nighttime drooling	3	8- Walking	
Moderately excessive saliva; may have minimal drooling	2	Normal	4
Marked excess of saliva with some drooling	1	Early ambulation difficulties	3
Marked drooling requires constant tissue or handkerchief	0	Walks with assistance	2
3- Swallowing		Nonambulatory functional movement only	1
Normal	4	No purposeful leg movement	0
Early eating problems, occasional choking	3	9- Climbing stairs	
Dietary consistency changes	2	Normal	4
Needs supplemental tube feeding	1	Slow	3
Exclusively parenteral or enteral feeding	0	Mild unsteadiness or fatigue	2
4- Handwriting		Needs assistance	1
Normal	4	Cannot do	0
Slow or sloppy; all words are legible	3	10- Dyspnea	
Not all words are legible	2	None	4
Able to grip pen but unable to write	1	Occurs when walking	3
Unable to grip pen	0	Occurs with one or more of the following: eating, bathing, dressing	2
5A- Cutting food without gastrostomy		Occurs at rest, difficulty in breathing when either sitting or lying	1
Normal	4	Significant difficulty, considering using mechanical respiratory support	0
Somewhat slow and clumsy, but no help needed	3	11- Orthopnea	
Can cut most foods, although clumsy and slow; some help needed	2	None	4
Food must be cut by someone but can still feed slowly	1	Some difficulty in sleeping at night due to shortness of breath. Does not routinely use more than two pillows	3
Needs to be fed	0	Needs extra pillow in order to sleep (more than two)	2
5B- Cutting food with gastrostomy		Can only sleep sitting up	1
Normal	4	Unable to sleep	0
Clumsy but able to perform all manipulations independently	3	12- Respiratory insufficiency	
Some help needed with closures and fasteners	2	None	4
Provides minimal assistance to caregiver	1	Intermittent use of BiPAP	3
Unable to perform any aspect of task	0	Continuous use of BiPAP during the night	2
6- Dressing and hygiene		Continuous use of BiPAP during the night and day	1
Normal	4	Invasive mechanical ventilation by intubation or tracheostomy	0
Independent and complete self-care with effort or decreased efficiency	3	Total score	/48
Intermittent assistance or substitute methods	2		

and it is remarkable that the total scores obtained with ALSFRS-R and the findings of the sub-headings, especially the findings of the bulbar symptoms, were good indicators of disease survival (22,23). In addition, when twelve sub-headings of ALSFRS-R were evaluated individually, a high level consistency was detected between two physicians, in terms of both the total scores and sub-headings, which demonstrates

that ALSFRS-R is a reliable and easy-to-apply test for daily practice. Although there was some inconsistency between the two appliers, the bulbar findings were found to be higher when compared to the other sub-headings, and the obtained findings were accepted to be statistically significant. The total score data were also found to be statistically significant ($p=0.00$).

Table 2. Evaluating the scores and differences between two specialists

	First specialist				Second specialist				Difference			t	Sig.
	Median score	Standard deviation	Minimum	Maximum	Median score	Standard deviation	Minimum	Maximum	Median	Confidence interval			
										Lower	Upper		
Speech	2.67	1.16	0	4	2.81	1.32	0	4	-0.14	-0.44	0.16	-1.000	0.329
Salivation	3.24	1.22	0	4	2.90	1.33	0	4	0.33	0.00	0.67	2.092	0.049
Swallowing	2.81	1.36	0	4	2.52	1.43	0	4	0.29	0.03	0.54	2.335	0.030
Handwriting	2.05	1.56	0	4	2.14	1.65	0	4	-0.10	-0.29	0.10	-1.000	0.329
Gastrostomy	2.57	1.83	0	4	1.95	1.74	0	4	0.62	0.11	1.13	2.540	0.020
Dressing	1.57	1.50	0	4	1.48	1.53	0	4	0.10	-0.22	0.41	0.623	0.540
Lying	1.95	1.62	0	4	1.76	1.64	0	4	0.19	-0.18	0.56	1.073	0.296
Walking	2.52	1.43	0	4	2.24	1.41	0	4	0.29	-0.14	0.61	1.826	0.183
Climbing stairs	1.62	1.65	0	4	1.48	1.60	0	4	0.14	-0.16	0.44	1.000	0.329
Dyspnea	3.05	1.24	1	4	2.86	1.23	1	4	0.19	0.01	0.37	2.169	0.042
Orthopnea	3.24	1.13	1	4	3.05	1.07	1	4	0.19	-0.04	0.42	1.706	0.104
Respiration	3.95	0.21	3	4	3.90	0.30	3	4	0.05	-0.05	0.15	1.000	0.329
Score	31.23	11.30	14	48	29.09	12.02	10	48	2.14	0.83	3.44	3.423	0.003

Table 3. Sub-headings and total correlation coefficients

	n	Compatibility	p
Speech	41	0.870	0.000
Salivation	41	0.841	0.000
Swallowing	41	0.921	0.000
Handwriting	41	0.965	0.000
Gastrostomy	41	0.806	0.000
Dressing	41	0.894	0.000
Lying	41	0.876	0.000
Walking	41	0.873	0.000
Climbing stairs	41	0.920	0.000
Dyspnea	41	0.947	0.000
Orthopnea	41	0.894	0.000
Respiration	41	0.689	0.001
Score	41	0.972	0.000

In conclusion, we aimed to make a Turkish version study of this scale, which was developed to determine the functional status of Turkish patients with ALS and disease prognosis. In conclusion, considering this reliability study, a more extensive use of ALSFRS-R may make a significant contribution to developing a common language for the follow-up of the functional status of patients. In addition, we suggest that determining the functional deterioration of patients with this scale will enable patients and their relatives to get ready for disease progression (making the home environment suitable, providing psychiatric support, preparations for gastrostomy, etc.).

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Çukurova University Faculty of Medicine Ethics Committee (dated 09.01.2007-Meeting no:1-Decision no:14).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

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