P-62

Clinical Utility of Bulbar Subscore of K-ALSFRS-R for Predicting Swallowing & Respiratory Function

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Introduction

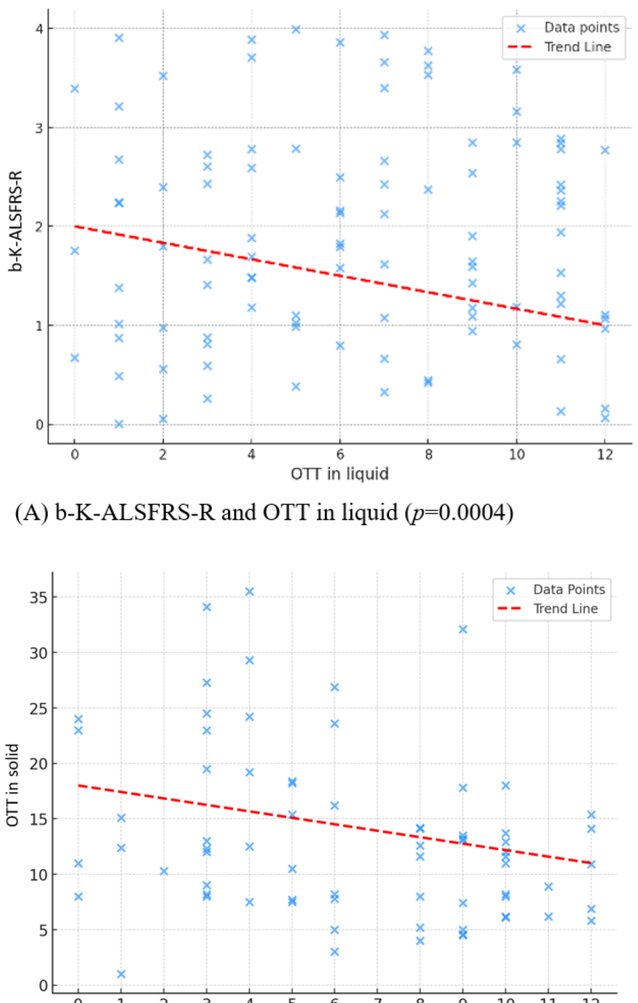
To evaluate the correlation between bulbar symptoms, swallowing, and respiratory function in patients with amyotrophic lateral sclerosis (ALS), and to determine the clinical utility of the Korean version of the ALS functional rating scale-revised (K-ALSFRS-R) in predicting objective swallowing and pulmonary function test results.

Methods

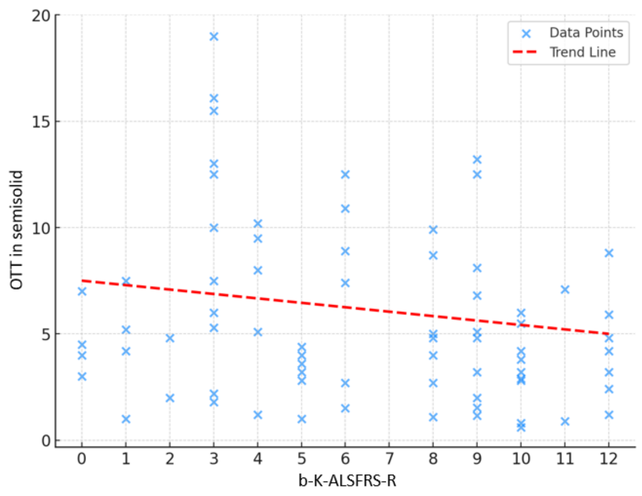
This retrospective cross-sectional study reviewed the medical records of 80 patients with ALS. Functional status was assessed using the K-ALSFRS-R, a patient reported outcome measure. In particular, bulbar symptoms were evaluated using the bulbar ALS functional rating scale-revised (b-K-ALSFRS-R), which comprises items related to speech, swallowing, and salivation. Swallowing function was assessed using video fluoroscopic swallowing studies (VFSS), specifically measuring oral transit time (OTT) and penetration-aspiration scale (PAS) scores for liquid, semisolid and solid consistencies. Respiratory function was evaluated through pulmonary function tests (PFT) measured in both supine and sitting positions. Pearson's correlation coefficients were used for statistical analysis.

Results

The mean age of the 80 patients with ALS was 60 years, with a male to female ratio of 1.8:1 (Table 1). The average disease duration was 2.7 years. The mean total scores for the K-ALSFRS-R and b-K-ALSFRS-R were 18.7 and 6.5, respectively. The b-K-ALSFRS-R score showed significant correlations with both PFT and VFSS parameters (OTT and PAS scores for liquid and solid diet) (Fig. 1). In contrast, while the total K-ALSFRS-R score was significantly correlated with PFT parameters, it was not significantly associated with VFSS results (Table 2).

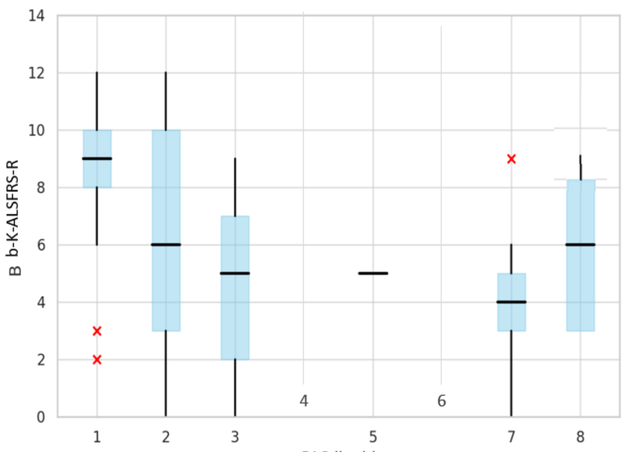


(A) b-K-ALSFRS-R and OTT in liquid (p=0.0004)

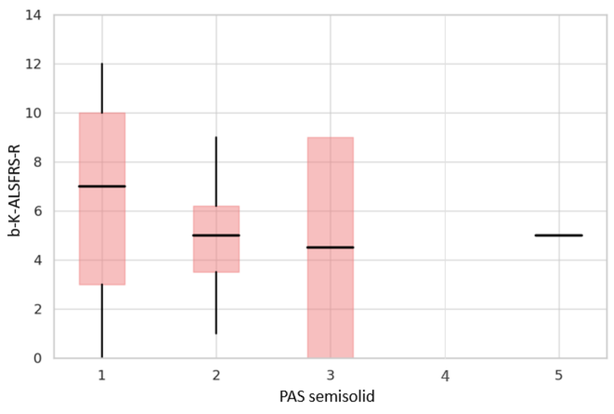


(B) b-K-ALSFRS-R and OTT in semisolid (p=0.07)

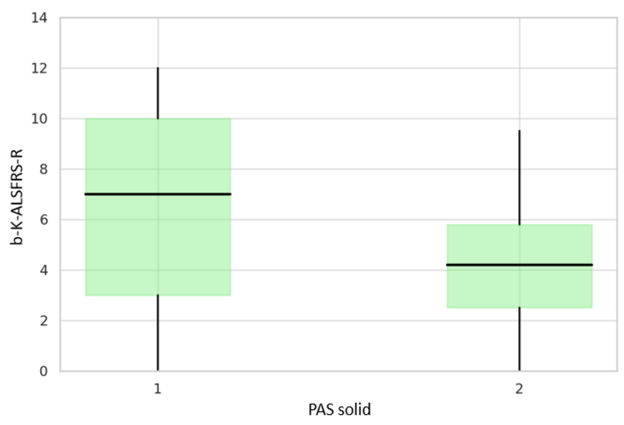
(C) b-K-ALSFRS-R and OTT in solid (p=0.003)



(D) b-K-ALSFRS-R and PAS in liquid (p=0.003)



(E) b-K-ALSFRS-R and PAS in semisolid (p=0.337)



(F) b-K-ALSFRS-R and PAS in solid (p=0.022)

Figure 1. Correlation between the b-K-ALSFRS-R score and variables of the video fluoroscopic swallowing study.

Table 1. Demographic and Clinical Characteristics of the Subjects (N=80)

Variables			N	%
Gender		Male	52	65
		Female	28	35
			Mean ± SD	
Age (years)			60.00 ± 11.00	
Disease duration (years)			2.70 ± 1.20	
K-ALSFRS-R			18.70 ± 11.70	
b-K-ALSFRS-R			6.50 ± 3.50	
VFSS	OTT (seconds)	Liquid 5cc	1.30 ± 1.00	
		Semisolid	5.90 ± 4.10	
		Solid	13.10 ± 7.40	
	PAS	Liquid 5cc	3.10 ± 2.40	
		Semisolid	1.20 ± 0.60	
		Solid	1.10 ± 0.30	
PFT	Supine Position	FVC (%)	32.50 ± 23.70	
		PCF (L/min)	114.10 ± 63.00	
		MIP (cmH2O)	13.40 ± 9.60	
		MEP (cmH2O)	19.00 ± 12.30	
	Sitting position	FVC (%)	38.20 ± 26.40	
		PCF (L/min)	135.10 ± 73.60	
		MIP (cmH2O)	13.70 ± 8.80	
		MEP (cmH2O)	20.10 ± 13.80	

K-ALSFRS-R; Korean version of the amyotrophic lateral sclerosis functional rating scale-revised, b-K-ALSFRS-R; bulbar domain of the K-ALSFRS-R, VFSS; video fluoroscopic swallowing study, PFT; pulmonary function test, OTT; oral transit time, PAS; penetration aspiration Scale, FVC; forced vital capacity, PCF; peak cough flow, MIP; maximal inspiratory pressure, MEP; maximal expiratory pressure, SD; standard deviation.

Table 2. Correlation between the b-K-ALSFRS-R score and PFT results

Variables			All patients	
			Correlation coefficient	p
Pulmonary function test	Supine position	FVC (%)	0.320	0.001*
		PCF (L/min)	0.360	0.000*
		MIP (cmH2O)	0.284	0.004*
		MEP (cmH2O)	0.344	0.000*
	Sitting position	FVC (%)	0.284	0.004*
		PCF (L/min)	0.356	0.000*
		MIP (cmH2O)	0.298	0.002*
		MEP (cmH2O)	0.316	0.001*

b-K-ALSFRS-R; bulbar domain of Korean version of the amyotrophic lateral sclerosis functional rating scale-revised, PFT; pulmonary function test, FVC; forced vital capacity, PCF; peak cough flow, MIP; maximal inspiratory pressure, MEP; maximal expiratory pressure, Asterisk means statistically significant (p<0.05).

Conclusion

Bulbar symptoms, as measured by the b-K-ALSFRS-R, may serve as a useful clinical indicator of both dysphagia and respiratory decline in patients with ALS.

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