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Dysphagia Screening Using MASA and mMASA in Brain Injured Patients with Cognitive Impairment

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Introduction

Dysphagia is one of the common and important complications of brain injured patients. Since early diagnosis of dysphagia and proper dietary control are emphasized for improving rehabilitation outcome, screening tools are routinely used to assess the risk of dysphagia and aspiration. However, cognitive impairment which is frequently accompanied with brain injured patients makes it difficult to evaluate the patient's performance in accordance with the instruction during dysphagia screening. In other words, we do not know if these tests are reliable when it is applied to a patient with a cognitive impairment. Therefore, this study was designed to reveal the impact of cognitive status on the Result of dysphagia screening tools, MASA and mMASA.

Methods

The medical records of 146 patients with brain injury from various causes were evaluated (Table 1). Dysphagia was assessed with VFSS, MASA, and mMASA. According to the VFSS Results, patients were divided into two groups, one with aspiration (aspirator) and the other without aspiration (nonaspirator). Cognitive function was assessed by K-MMSE Result, of which scores less than 24 are considered abnormal; classifies 20-24 as mild, 10-20 as moderate and <10 as severe cognitive impairment. The correlation between the MASA and mMASA according to cognitive status, and the difference of MASA and mMASA between aspirators and nonaspirators were analyzed. The sensitivity, specificity, positive predictive value and negative predictive value of MASA and mMASA for prediction of aspiration were also calculated.

Results

MASA and mMASA score showed significant correlation ($r=0.911$, $P<0.01$). When patients are grouped according to cognitive status, MASA and mMASA also showed significant correlation in all groups. There were significant differences between aspirators and nonaspirators in MASA and m MASA scores (Table 2). However, normal cognition group did not show statistical difference of MASA and mMASA between aspirators and nonaspirators. The mMASA of moderate cognitive impairment group showed no statistical difference between aspirators and nonaspirators, either. The sensitivity and specificity of MASA for the prediction of aspiration was 82.5 % and 58.4% respectively.

On the other hand, mMASA showed higher sensitivity, 93.0% and lower specificity, 34.8 than MASA. In the analysis of subgroups according to cognitive status, the patients with more severely impaired cognitive function showed the trend of high sensitivity and positive predictive values, and low specificity and negative predictive value (Table 3).

Conclusions

The sensitivity and specificity of MASA and mMASA may vary depending on the cognitive status of brain injured patients. Therefore, the test Results should be interpreted carefully while perceiving the impact of cognitive status on the Results of MASA and mMASA.

table1. Demographics and clinical characteristics of patients

Parameters	
Age (years)	63.4±15.9
Etiology (n, M/F)	146, 90/56
Cerebral infarction	51, 24/27
Cerebral hemorrhage	28, 41/17
Traumatic brain injury	21, 17/4
Brain tumor	16, 8/8
Onset to evaluation (day)	67.0±89.3
K-MMSE (n, scores)	13.5±9.5
Normal	24, 27.2±1.6
Mild impairment	22, 21.5±1.2
Moderate impairment	46, 15.1±3.1
Severe impairment	54, 2.8±3.0

Values are presented as mean ± standard deviation (SD).

table2. Comparison of MASA and mMASA according to aspiration

	MASA			mMASA		
N (total, aspiration/non aspiration)	Aspiration	Non Aspiration	*p*	Aspiration	Non Aspiration	*p*
Total (146, 57/89))	114.5±40.3	182.7±13.8	0.000**	60.2±20.3	86.6±11.4	0.000**
Normal (24, 4/20)	167.5±48.0	185.2±13.7	0.816	84.8±17.2	89.2±11.8	0.697
Mild impairment (22, 3/19)	162.0±20.1	185.1±13.6	0.044*	74.0±14.9	91.6±9.0	0.044*
Moderate impairment (46, 18/28)	150.7±33.2	178.7±19.3	0.001**	77.8±14.6	82.9±11.8	0.201
Severe impairment (54, 32/22)	106.2±47.9	149.7±35.4	0.012*	54.9±22.7	71.7±16.3	0.031*

Values are presented as mean± standard deviation (SD).

*$p < 0.05$, **$p < 0.01$

table3. Accuracy of MASA and mMASA for prediction of aspiration according to cognitive status

	MASA					mMASA				
	Total	Normal	Mild	Moderate	Severe	Total	Normal	Mild	Moderate	Severe
Sensitivity	82.5	25.0	66.7	77.8	93.7	93.0	50.0	100	94.4	96.9
Specificity	58.4	75.0	78.9	57.1	27.3	34.8	50.0	57.9	32.1	4.5
Positive predictive value	65.2	16.7	33.3	53.8	65.2	59.6	16.7	27.3	47.2	59.6
Negative predictive value	75.0	83.3	93.8	80.0	75.0	50.0	83.3	100	90.0	50.0