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Usefulness of Maximal Expiratory Pressure in Evaluating Stroke induced Dysphagia

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Objective
Peak cough flow(PCF) is a useful factor in evaluating the risk of aspiration in dysphagia patients. Maximal expiratory pressure(MEP) reflects respiratory muscle strength and it can predict effective coughing when penetration or aspiration is present in swallowing. However, there was lack of study for correlation between respiratory muscle strength and dysphagia. In this study, we evaluated the usefulness of MEP in evaluating ischemic stroke induced dysphagia.

Subjects and Methods
This study included patients who were diagnosed with actue ischemic stroke and underwent videofluoroscopic swallowing study(VFSS) from May 2017 to February 2018. Patients with a history of pulmonary tuberculosis, chronic obstructive lung disease, asthma, tracheostomy or active lung disease were excluded. VFSS was performed within 3 weeks after diagnosis of ischemic stroke. At the same time, MEP was measured at 5 minute intervals and the average of the two values were used. VFSS was done with 3cc thin liquid and described as dysphagia when aspiration or penetration was observed. VFSS results were classified into control and dysphagia groups. Maximal inspiratory pressure(MIP), modified barthel index(MBI), PCF, forced expiratory volume for one second(FEV1), forced vital capacity(FVC) and FEV1/FVC were measured for baseline characteristics of each group (Table 1).

Results
A total of 50 patients were included in this study. 35 were males and the median age was 70.8 ±9.7. In VFSS, 26 patients had dysphagia. Mean age of control and dysphagia groups were not significant in Student t-test (Table 1). Mean values of MEP, MIP, PCF, MBI in control group were higher than those of in dysphagia group and statistically significant in student t-test (Table 2). In logistic regression, the odds ratio of MEP was -1.097 (p=0.006) and the odds ratio of PCF was -1.011 (p=0.041) (Table 2). MIP and MBI were not statistically significant.

Conclusion

In patients with ischemic stroke, MEP can predict effective coughing and is a useful factor in evaluating dysphagia. In this study, mean value of MEP in control group was higher than that of in dysphagia group and Odds ratio of MEP was statistically significant.Therefore, measuring MEP is important for risk evaluation of aspiration pneumonia in patients with ischemic stroke.

Table 1. Baseline characteristics of patients with ischemic stroke

Variables	Control(N=24)	Dysphagia(N=26)	P value
Age(years)	68.8±9.7	72.5±9.6	0.797
Sex			0.203
Male	19(79%)	16(61%)	
Female	5(21%)	10(39%)	
FEV1(L)	1.96±0.72	1.54±0.75	0.802
FVC(L)	2.57±0.90	2.07±0.97	0.908
FEV1/FVC(%)	76.85±9.88	74.38±9.56	0.681

Values are presented as mean ± standard deviation or number(%)

FEV1 : forced expiratory volume in one second, FVC : forced vital capacity

Table 2. Clinical data of patients with ischemic stroke

Variables	Control	Dysphagia	P value
Maximal inspiratory pressure(cmH_2O)	29.8±15.9	17.1±5.8	0.088
Maximal expiratory pressure(cmH_2O)	48.4±27.1	24.5±9.8	**<0.05**
Peak cough flow(L/min)	211.3±85.3	132.3±65.0	**<0.05**
Modified barthel index	82.5±18.1	66.9±23.5	**<0.05**

Values are presented as mean ± standard deviation

Table 3. Logistic regression results for dysphagia

Dependent variable	Independent variable	OR(95% CI)	p-value
Dysphagia	Maximal expiratory pressure	-1.073(1.024-1.107)	**<0.01**
	Maximal inspiratory pressure	-1.063(0.893-1.266)	0.217
	Peak cough flow	-1.011(1.001-1.023)	**<0.05**
	Modified barthel index	-1.003(0.999-1.012)	0.729

OR : odds ratio, CI : confidence interval