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Does the pulmonary function affect the dietary levels of Subacute Stroke Patients?

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Objective
From 28% to 65% of stroke patients suffer from swallowing difficulty. Also stroke patients have difficulty in coughing, resulting in silent aspiration and pulmonary infection. Previous studies have reported that there is a relationship between the pulmonary function and deglutition. However, there is a lack of study identifying specific correlations between pulmonary function and dysphagia in patients with stroke. To efficiently treat and prevent dysphagia, this study aimed to clarify the correlation between the pulmonary function tests and parameters of videofluoroscopy.

Methods
The 36 stroke in-patients with dysphagia who hospitalized from June 2017 to October 2017 in the clinic of the department of rehabilitation medicine were retrospectively analyzed. At first, we checked up presence of aspiration in bedside evaluation, clinically. Also, we evaluated pulmonary function tests in sitting position, including vital capacity (VC) measured by spirometry and peak cough flow (PCF) measured by a cough flow meter. For assessment of dysphagia, we used videofluoroscopic swallowing study (VFSS). At admission and discharge, the patients were divided into 3 groups by dietary levels (G1, tube feeding; G2, dysphagia diet; G3, general diet). The correlation between dysphagia and pulmonary function was analyzed using Chi-square test with optimal points and one-way ANOVA.

Results
The optimal cutoff values of VC and PCF for presence of aspiration were analyzed (Figure 1. cutoff point of VC = 47.8 %, cutoff point of PCF = 155 mL/min). The lower the VC or PCF was than the optimal cutoff point, the higher the risk of aspiration on VFSS or bedside evaluations was. The correlation between VC or PCF and parameters of VFSS was analyzed by the chi-square test. It showed only one element of VFSS with liquid, 'Food propelling posteriorly', was significant difference of presence of aspiration at discharge by using the

cutoff value of VC (p=0.02). Additionally, there were significant differences of presence of aspiration at admission and discharge for 'Closure of larynx' element of VFSS with liquid by using the cutoff value of PCF (p=0.03). The dietary levels at admission had significant positive correlation coefficients with VC (r=0.57, P=0.0003) and PCF (r=0.35, P=0.03). The one-way ANOVA of VC among groups divided by three diet levels at admission showed statistically significant difference (p=0.001; Table 1). The independent t-test of VC between G1 and G3 dietary groups at discharge showed a significant difference (p=0.02; Table 2).

Conclusion

The purpose of this study was to investigate the relationship between respiratory function and dysphagia in patients with stroke. Furthermore, we could suggest whether the pulmonary function affects the dietary levels. The pulmonary function in dysphagia patients with stroke should be clinically emphasized. Also, large scale study is needed to correlate pulmonary function with swallowing difficulty.
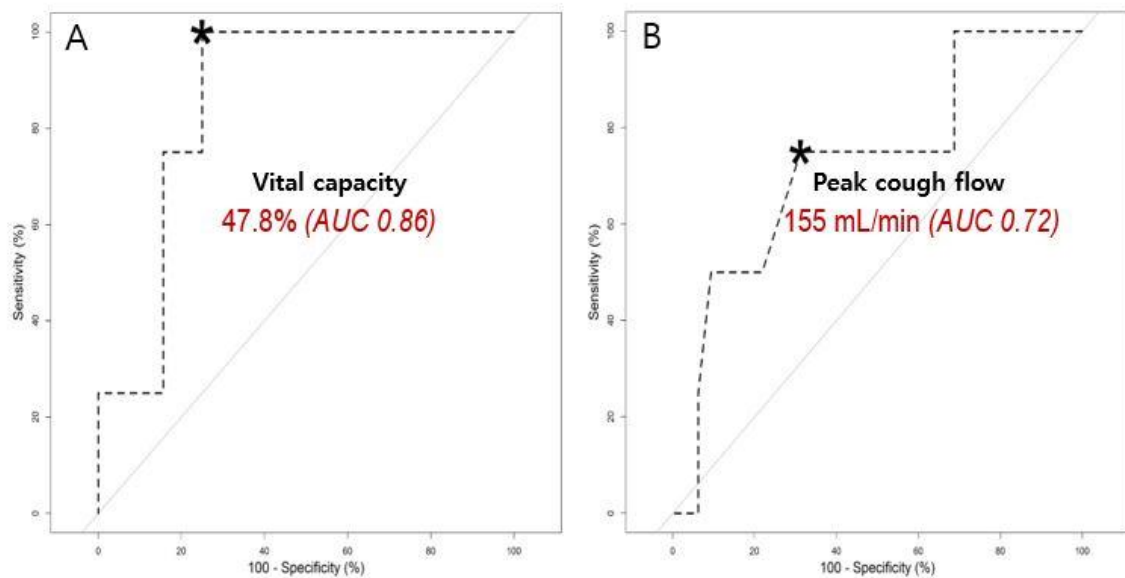

Figure 1. The ROC curve that identified the optimal cutoff score to VC and PCF to swallowing difficulty. Cutoff value, A) VC, 47.8 %, AUC(95% CI) 0.86; B) PCF, 155 mL/min, AUC(95% CI) 0.72

Table 1. The one-way ANOVA of VC or PCF between groups classified by three diet levels at admission

Variables	G1 (N=7) Mean±SD	G2 (N=12) Mean±SD	G3 (N=17) Mean±SD	overall p-value
VC	31.94±18.42	58.37±26.83	67.53±14.88	**0.001***
PCF	124.28±77.85	224.16±155.94	248.82±74.48	0.05

Table 2. Independent t-test of VC or PCF between groups classified by three diet levels at discharge

Variables	G1 (N=3) Mean±SD	G2 (N=1) Mean±SD	G3 (N=32) Mean±SD	p-value
VC	30.28±19.80	-	61.38±21.75	**0.02***
PCF	130.00±112.69	-	230.31±110.99	0.14