P 3-59

Pulmonary Function Test as a Functional Outcome Predictor of Stroke Patients

Hyun Im Moon[1†], Yoon Jeong Jeong[1*], Tae Im Yi[1], Joo Sup Kim[1], Seo Yeon Yoon[1]

Bundang Jesaeng General Hospital, Department of Rehabilitation Medicine[1]

Objective
Stroke patients may experience pulmonary dysfunction that reduce respiratory muscle movement such as diaphragm, intercostal and abdominal muscles. These phenomena lead to the weakness of intercostal and abdominal muscle, the reduction of pulmonary function, which makes it difficult to control posture and which can Result in functional movement disorders. The quality of life after stroke depends on their ability to ambulate and perform activities of daily living(ADL), predicting functional outcomes during the initial stage is important. We think that post-stroke pulmonary function indirectly reflects the trunk control ability of patients who are not able to maintain sitting balance. We tried to check the core muscle strength by using pulmonary function test because it was difficult to check directly. Therefore, we investigated the relationship between short-term clinical outcomes and pulmonary function test in subacute stroke patients.

Methods
We prospectively recruited 52 patients with first-ever stroke during the period of August, 2017 through April, 2018. All patients were enrolled inpatient referred to our rehabilitation department within 6 months of onset and cognitive capability of complying with pulmonary function test. Patient with recent surgical procedure, disease of respiratory condition and tracheostomy status were excluded from the study. To evaluate respiratory function including peak cough flow(PCF), maximal inspired pressure(MIP), maximal expired pressure(MEP), forced vital capacity(FVC) and forced expiratory volume in 1 second(FEV1) and FEV1/FVC were performed at baseline and 4 weeks after conventional rehabilitation. Trunk balance was checked by using trunk impairment scale(TIS). To evaluate correlation of respiratory function, trunk balance and functional outcomes (Berg Balance Scale (BBS) and functional independence measure(FIM)) were also checked. Spearman's correlation analysis was used to analyze the correlation between respiratory function, trunk balance and functional outcome. Multiple regression analyses were performed. Data analyses involved use of SPSS v18.0 for Windows. $P < 0.05$ was considered statistically significant.

Results
Table 1 showed demographic characteristics of patients. Table 2 revealed initial PCF, FVC and FEV1 were correlated with those of TIS at admission. The initial PCF and FVC is a significant predictive value for TIS score only in multivariable linear regression. Table 3 reveals that initial PCF is a significant predictive value for follow up BBS and FIM score at discharge in multivariable linear regression.

Conclusion

This study demonstrated that initial respiratory function has a significant correlation with trunk balance and functional outcome. Therefore, the availability of pulmonary function test data for stroke patients could be useful for evaluating the response after the initial stage of rehabilitation. This can be used as a predictor for functional outcome.

Table 1. Demographic Characteristics and Anthropometric Data of the Subjects

	Number of patient (n=52)
Age(years)	57.46±14.72
Gender(Male:Female)	34:18
Height(cm)	165.55±8.99
Weight(kg)	65.21±13.13
BMI(kg/m²)	23.52±3.75
Subtype (ischemic:hemorrhagic)	21:31
MMSE-K	23.46±5.33
Albumin(g/dl)	3.88±0.29
Days since stroke onset	68.83±44.32
TIS	13.38±5.45
BBS	23.25±19.54
FIM	61.42±23.65

Values are mean ± standard deviation
BMI, Body mean index; MMSE-K, Korean version of the mini-mental estimtate examination; TIS, Trunk impairment xcale; BBS, Berg balance scale; FIM, Functional independence measure

Table 2. Partial correlation coefficient(r) adjusted for Age, Height and Weight and Multiple Linear Regression adjusted for sex, age, body mean index, mini-mental state examination(MMSE) and albumin between the Pulmonary Function and iTIS (n=52)

Variables	Partial Correlation(iTIS)		Regression(iTIS)	
	r	*p*-value	β	*p*-value
PCF	0.646	<0.0001**	0.733	<0.0001**
MIP	0.007	0.959	0.040	0.445
MEP	0.171	0.239	0.056	0.704
FVC	0.446	<0.001**	0.341	0.019*
FEV1	0.317	0.026*	0.235	0.110
FEV1/FVC	0.064	0.662	0.021	0.884

*P<0.05, ** P<0.01
PCF, Peak cough flow; MIP, Maximal inspired pressure; MEP, Maximal expired pressure; FVC, Forced vital capacity; FEV1, Forced expiratory volume in 1 second; iTIS, Trunk impairment scale at baseline

Table 3. Multiple Linear Regression Analyses for Functional Outcome(dBBT, dFIM) adjusted for Sex, Age, Body Mean Index, Mini-Mental State Examination(MMSE) and Albumin

	dBBT		dFIM	
Variable	**β**	***p*-value**	**β**	***p*-value**
PCF	0.513	0.001**	0.283	0.025*
MIP	0.225	0.113	0.153	0.177
MEP	0.217	0.145	0.051	0.672
FVC	0.387	0.008**	0.054	0.658
FEV1	0.280	0.062	0.024	0.845
FEV1/FVC	0.028	0.851	0.017	0.889

*P<0.05, ** P<0.01

PCF, Peak cough flow; MIP, Maximal inspired pressure; MEP, Maximal expired pressure; FVC, Forced vital capacity; FEV1, Forced expiratory volume in 1 second; dBBS, Berg balance scale at discharge; dFIM, Functional independence measure at discharge