

## **Clinical Effect of pulmonary rehabilitation for acute stroke patients**

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### **Introduction**

People with a cerebrovascular accident have a greater risk of associated pneumonias, which involve increased morbidity and mortality. A restrictive pulmonary impairment occurs in stroke, because their lung capacity decrease due to respiratory muscle weakness. Nonpharmacological treatment and therapeutic exercise training have been shown to improve cough effectiveness and are essential for the prevention of stroke-associated pneumonia. The aim of this study is to evaluate the effects of pulmonary rehabilitation (PR) on pulmonary function in acute stroke patients.

### **Method**

Twenty-seven subjects with stroke who admitted to stroke rehabilitation center were recruited at OOOO Hospital from August 2016 to May 2018. Eligibility criteria included 1) First onset of acute stroke patients over 18 years of age, 2) Within two weeks onset, 3) Hemiparesis, 4) Normal cognitive function. All subjects were asked to participate in the pulmonary rehabilitation (PR) program after an explanation on the need for PR and the program content. The authors enrolled patients who wanted to participate in the PR program. Patients who underwent PR were classified into PR group (19 patients), those who didn't participate were labeled control group (8 patients). The PR group subjects underwent the PR program 5 days a week, during 4 weeks. The PR program was composed of air stacking exercise, manually assisted cough, inspiratory and expiratory muscle strengthening, cough exercise and respiratory re-education. The control group received conventional stroke rehabilitation. The pulmonary functions were evaluated by various means, before and after one-month PR. Pulmonary function parameters were peak cough flow (PCF), maximal voluntary ventilation (MVV), forced vital capacity (FVC), forced expiratory volume in 1 second (FEV<sub>1</sub>), peak expiratory flow (PEF), maximum inspiratory pressure (MIP), and maximum expiratory pressure (MEP). The Korean version of Modified Barthel Index (K-MBI) and hand grip power were also evaluated as tools for evaluating physical function.

### **Results**

Both groups significantly improved in MVV and PCF after 1 month. Although, MVV and PCF had no significant intergroup difference, the change rate in PR group (MVV: 40.47%, PCF: 42.3%) was significantly greater than 30.29% and 28.2% in the control group. FEV<sub>1</sub> showed a trend towards statistically significant improvement only in PR group (p=0.080). And MIP, and MEP had significant intragroup difference only in the PR group.

## Conclusion

This study showed that MVV, PCF and strength of respiratory muscle were significantly increased when PR program were performed in stroke patients. In other words, PR can improve lung capacity and cough effectiveness to help patients achieve effective airway excretion, and may help reduce the morbidity of respiratory complications such as pneumonia.

Characteristic		Total ( n = 27)	PR ( n = 19)	Control ( n = 8)
Gender	M	15	10	4
	F	16	9	4
Age		71.30 ± 2.49	72.16 ± 3.14	69.25 ± 4.08
Type of stroke	Ischemic	19	11	7
	Hemorrhagic	12	8	1
MBI		40.78 ± 4.52	34.74 ± 4.99	55.13 ± 7.88
Grip strength	Rt	16.74 ± 2.01	14.14 ± 1.95	23.43 ± 4.44
	Lt	14.86 ± 2.11	12.94 ± 2.22	19.79 ± 4.69
Onset		43.26 ± 15.28	32.58 ± 11.21	68.63 ± 45.02

Table1. Values are presented as mean ± standard deviation unless otherwise indicated. K-MBI, The Korean version of Modified Barthel Index

Variables	PR ( n = 19)	Control ( n = 8 )	Between group p value
<b>MVV</b>			
Baseline	27.48 ± 4.11	42.78 ± 9.25	0.221
4-weeks later	38.60 ± 4.54	55.74 ± 12.45	0.317
Intra-group p value	0.004*	0.025*	
<b>FVC</b>			
Baseline	1.86 ± 0.17	2.26 ± 0.25	0.171
4-weeks later	2.04 ± 0.17	2.50 ± 0.30	0.222
Intra-group p value	0.106	0.123	
<b>FEV<sub>1</sub></b>			
Baseline	1.41 ± 0.14	1.79 ± 0.20	0.130
4-weeks later	1.58 ± 0.14	1.88 ± 0.24	0.243
Intra-group p value	0.080	0.401	
<b>PEF</b>			
Baseline	2.56 ± 0.35	3.42 ± 0.42	0.086
4-weeks later	2.95 ± 0.29	2.91 ± 0.57	0.739
Intra-group p value	0.221	0.293	
<b>PCF</b>			
Baseline	178.82 ± 19.78	212.50 ± 18.49	0.152
4-weeks later	254.47 ± 21.62	272.50 ± 25.41	0.629
Intra-group p value	0.000*	0.030*	
<b>MIP</b>			
Baseline	21.89 ± 4.49	35.06 ± 9.23	0.230
4-weeks later	33.89 ± 4.62	37.31 ± 6.14	0.811
Intra-group p value	0.030*	0.400	
<b>MEP</b>			
Baseline	23.47 ± 4.15	40.44 ± 6.47	0.066
4-weeks later	35.95 ± 5.39	47.56 ± 8.49	0.325
Intra-group p value	0.005*	0.204	

Table2. Values are presented as mean ± standard deviation unless otherwise indicated. PCF, peak cough flow; MVV, maximal voluntary ventilation; FVC, forced vital capacity; FEV<sub>1</sub>, forced expiratory volume in 1 second; PEF, peak expiratory flow; MIP, maximum inspiratory pressure; MEP, maximum expiratory pressure; \* Significant Results (P<.05)