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Pre-stroke Cardiopulmonary Fitness Level as a Predictor of Functional Outcome

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Objective

For individuals with stroke, physical activity gets significantly reduced and it might affect cardiopulmonary fitness level or peak oxygen consumption (peak VO2). Peak VO2 value is a gold standard for predicting metabolic cart through gas analysis, and this value can be used as an indicator to represent individual physical activity. For disabled patients after stroke, it is difficult to conduct an exercise test to assess peak VO2. Previously, Jurca et al. proposed a relatively simple and easy Method to obtain pre-stroke peak VO2 during subacute stroke hospital stay using non-exercise prediction equations. We hypothesized that pre-stroke peak VO2 is related with post-stoke respiratory function that could affect functional outcome. In this study, we investigated the effect of pre-stroke cardiopulmonary fitness level measured by non-exercise estimation equation (Jurca equation) on post-stroke respiratory function and functional outcome of the subacute stroke phase.

Methods

We enrolled 44 patients with first-ever stoke during the period of December, 2017 through May, 2018. All patients were admitted or transferred to our rehabilitation department within 6 months of onset. Patient with recent surgical procedure, disease of respiratory condition and tracheostomy status were excluded from the study. We assess pre-stroke peak VO2 using a non-exercise estimation equation including sex, age, body mass index (BMI), resting heart rate (rHR) and self-reported measure of physical activity. Respiratory function including post-stroke 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 measured on admission. Outcome measures were assessed before discharge using by berg balance scale (BBS) and functional independence measure (FIM) score. Partial correlation analysis was used to analyze the relationship between pre-stroke peak VO2 and respiratory function. Multiple regression analyses were performed to find out the effect of pre-stroke VO2 on discharge functional outcome. 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 post-stroke PCF and MEP were significantly correlated with pre-stroke peak VO2. The pre-stroke peak VO2 was a significant predictive value for BBS and FIM score at discharge in univariate linear regression (Table 3).

Conclusion

This Results show that pre-stroke cardiopulmonary fitness level (peak VO2) has a significant relationships with post-stroke respiratory function. Furthermore, estimated pre-stroke peak VO2 could affect sitting balance and functional level at discharge in stroke patients during subacute phase.

Table 1. Demographic Characteristics and Anthropometric Data of the Subjects

	Number of patient (n=44)	Men (n=26)	Women (n=18)
Age(years)	57.66±15.13	53.08±13.16	64.28±15.69
BMI(kg/m^2)	23.35±3.85	23.86±4.25	22.62±3.18
Subtype (Ischemic:Hemorrhagic)	16:28	7:19	1:1
MMSE-K	23.59±5.16	24.54±5.27	22.22±4.80
Albumin(g/dl)	3.88±0.26	3.90±0.31	3.86±0.15

Values are mean±standard deviation
BMI, Body mean index; MMSE-K, Korean version of the mini-mental mtate examination

Table 2. Partial Correlation Coefficient (r) between Pre-stroke Peak VO2 and Pulmonary Function adjusted for Age, Sex and BMI (n=44)

Variables	Partial Correlation(pre-stroke peak VO2)	
	r	P-value
PCF	0.364	0.010**
MIP	0.094	0.522
MEP	0.312	0.029*
FVC	0.275	0.056
FEV1	0.177	0.224
FEV1/FVC	0.101	0.491

*$P<0.05$, ** $P<0.01$
PCF, Peak cough flow; MIP, Maximal inspired pressure; MEP, Maximal expired pressure; FVC, Forced vital capacity; FEV1, Forced expiratory volume in 1 second

Table 3. Univariate Linear Regression Analyses for Functional Outcome (dBBS, dFIM)

	dBBS		dFIM	
Variable	β	P-value	β	P-value
Pre-stroke Peak VO2	0.386	0.005**	0.511	<0.0001**

*$P<0.05$, ** $P<0.01$
dBBS, Berg Balance Scale at discharge; dFIM, Functional Independence Measure at discharge