게시일시 및 장소 : 10 월 18 일(금) 08:30-12:20 Room G(3F)

질의응답 일시 및 장소 : 10 월 18 일(금) 10:00-10:45 Room G(3F)

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Hemiplegic and non-hemiplegic diaphragmatic motion and thickness in subacute stroke patients

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Background

Diaphragm excursion and thickness are measured using sonography to assess diaphragm function and predict successful mechanical ventilation weaning. Pulmonary function is known to be reduced in stroke patients. Diaphragmatic sonography revealed reduced diaphragmatic movements and relationship with pulmonary functions. There was a significant positive correlation between diaphragmatic excursion and inspired volume in hemiplegic patients. The movement of hemiplegic and non-hemiplegic diaphragm could be differently altered in hemiplegic patients. We aimed to investigate whether diaphragmatic movements and thickness ratio could be differently related with stroke severity, functional level, pulmonary functions.

Methods

A total of 22 subacute stroke patients with unilateral hemiplegia within 6 months after onset were enrolled. Diaphragm movement amplitude (cm) during quiet breathing (QB), deep breathing (DB), voluntary sniffing (VS), and voluntary coughing (VC) were measured in bilateral diaphragm using M-mode sonography. Diaphragm thickness at maximal inspiration and end expiration was measured using B-mode sonography, and thickness ratio was calculated. Percent predicted forced vital capacity (FVC%pred), percent predicted forced expiratory volume in 1 second (FEV1%pred), maximum inspiratory pressure (MIP), maximum expiratory pressure (MEP), and peak cough flow (PCF) were measured for respiratory function. National Institutes of Health Stroke Scale (NIHSS) and modified Barthel Index (MBI) were assessed for stroke severity and functional level.

Results

Subjects with pneumonia event were negatively correlated with VC (rho=-0.424, $p<.05$) and DB (rho=-0.449, $p<.05$) of hemiplegic diaphragm and DB (rho=-0.449, $p<.05$) of non-hemiplegic diaphragm. MIP was significantly related with thickness ratio of hemiplegic diaphragm (rho=.560, $p<.05$). MEP was significantly related with hemiplegic side VS (rho=.560, $p<.05$). PCF was significantly related with thickness ratio and DB of hemiplegic diaphgram (rho=.625, $p<0.01$; rho=.601, $p<0.01$). FVC%pred and FEV1%pred were

significantly related with non-hemiplegic side VC (rho=.674, p<.05; rho=.674, p<.05). NIHSS score was not significantly related the sonographic diaphragmatic thickness ratio and movements. MBI score was significantly related with thickness ratio, QB, VS, VC, and DB of hemiplegic diaphragm, and DB of non-hemiplegic diaphragm.

Conclusion

Pneumonia events were related with reduced diaphragmatic movements in both hemiplegic and non-hemiplegic diaphragm. Inspiratory and expiratory pressures were related with hemiplegic diaphragm measurements, while vital capacity and expiratory volume in 1 second were related with non-hemiplegic diaphragm movements. We recommend sonographic diaphragmatic evalution of both hemiplegic and non-hemiplegic side for stroke patients.

Table 1. Spearman correlation coefficients

	Hemiplegic side diaphragm					Non-hemiplegic side diaphragm				
	Thickness ratio	QB	VS	VC	DB	Thickness ratio	QB	VS	VC	DB
Pneumonia	-0.212	-0.399	-0.332	-.424*	-.449*	-0.037	-0.125	0.296	0.100	-.449*
MIP	.560*	0.021	0.291	0.485	0.485	0.320	0.077	-0.194	0.377	0.227
MEP	0.427	0.160	.560*	0.481	0.501	0.190	0.276	0.007	0.467	0.293
PCF	.615**	0.313	0.271	0.394	.601**	0.310	0.245	-0.123	0.314	0.318
FVC %pred	0.420	0.110	0.078	0.133	0.522	0.151	0.059	0.142	.604*	0.444
FEV1 %pred	0.210	0.121	-0.073	0.027	0.246	0.205	0.255	0.155	.674*	0.346
NIHSS	-0.333	-0.241	-0.340	-0.394	-0.346	-0.087	-0.100	-0.109	-0.172	-0.299
MBI	.477*	.433*	.478*	.657**	.600**	0.378	0.270	0.051	0.337	.647**