심폐재활

발표일시 및 장소 : 10 월 18 일(금) 13:45-13:55 Room C(5F)

OP3-1-4

Diaphragm ultrasonography in subacute stroke patients with various cooperative functions

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Objective
In general, high proportion of stroke patients has cognitive dysfunction. While performing diaphragm ultrasonography, examiner should ask deep breathing, sniffing, or coughing to examinee. Patient's cooperation could influence on accuracy or reliability of ultrasonography. There has been little description about the utility related with patient's cooperative function. This study purposed to verify the utility of diaphragm ultrasonography in stroke patients with their good or poor cooperative function.

Methods
A total of 22 subacute stroke patients with unilateral hemiplegia within 6 months after onset were enrolled. Patients were classified into 2 groups as 'Good' and 'Poor' by their cooperation. Patients who had 1) MMSE<20, 2) delirious state with impaired orientation, 3) severe aphasia, or 4) altered mentality, were classified as 'Poor' group. Characteristics such as dysphagia, comorbidities, location of brain lesion, alcohol use and smoking history were reviewed. Modified Barthel Index (MBI), Mini Mental State Examination (MMSE), Berg Balance Test (BBT), National Institutes of Health Stroke Scale (NIHSS), Short-form Mini Nutritional Assessment (MNA-SF), and Simplified Nutritional Appetite Questionnaire (SNAQ) score were measured. Pulmonary functions by spirometry and peak cough flow (PCF) were also assessed. Diaphragmatic excursions were recorded as quite breathing (QB), voluntary sniffing (VS), voluntary coughing (VC) and deep breathing (DB). Diaphragm thickness at maximal inspiration and end expiration was measured and diaphragm thickness fraction (DTF) was calculated.

Results
Patients were divided into 'Good' group (n=11) and 'Poor' group (n=11). 'Poor' group showed severer impairment (MBI, $p<0.001$; MMSE, $p<0.001$; BBT, $p=0.003$; NIHSS, $p<0.001$) and poorer nutritional status (MNA score, $p=0.003$; SNAQ score, $p=0.004$). No significant difference was observed between groups in other characteristics including pulmonary functions. Hemiplegic diaphragm movements in QB, VS, VC and DB showed greater excursions in 'Good' group than 'Poor' group (QB, $p=0.04$; VS, $p=0.03$; VC, $p=0.04$; D, $p=0.04$). Non-hemiplegic diaphragm movements of 'Poor' group were more reduced only during DB compared to 'Good' group ($p=0.04$). Excursion of non-hemiplegic diaphragm during QB, VS, and VC was not significantly different between 'Good' and 'Poor' group. Diaphragm thickness did not show significant differences between groups.

Conclusion
Depending on the cooperative function of stroke patients, neurologic, functional, and nutritional status were more impaired in poor cooperative group. Pulmonary function results were not different between groups. Diaphragmatic excursion during DB was significantly impaired in non-

hemiplegic side in 'Poor' group, and examinee's cooperative function could have influence on DB. Diaphragm ultrasonography during QB, VS and VC could be more reliably used in patients with poor cooperative function.

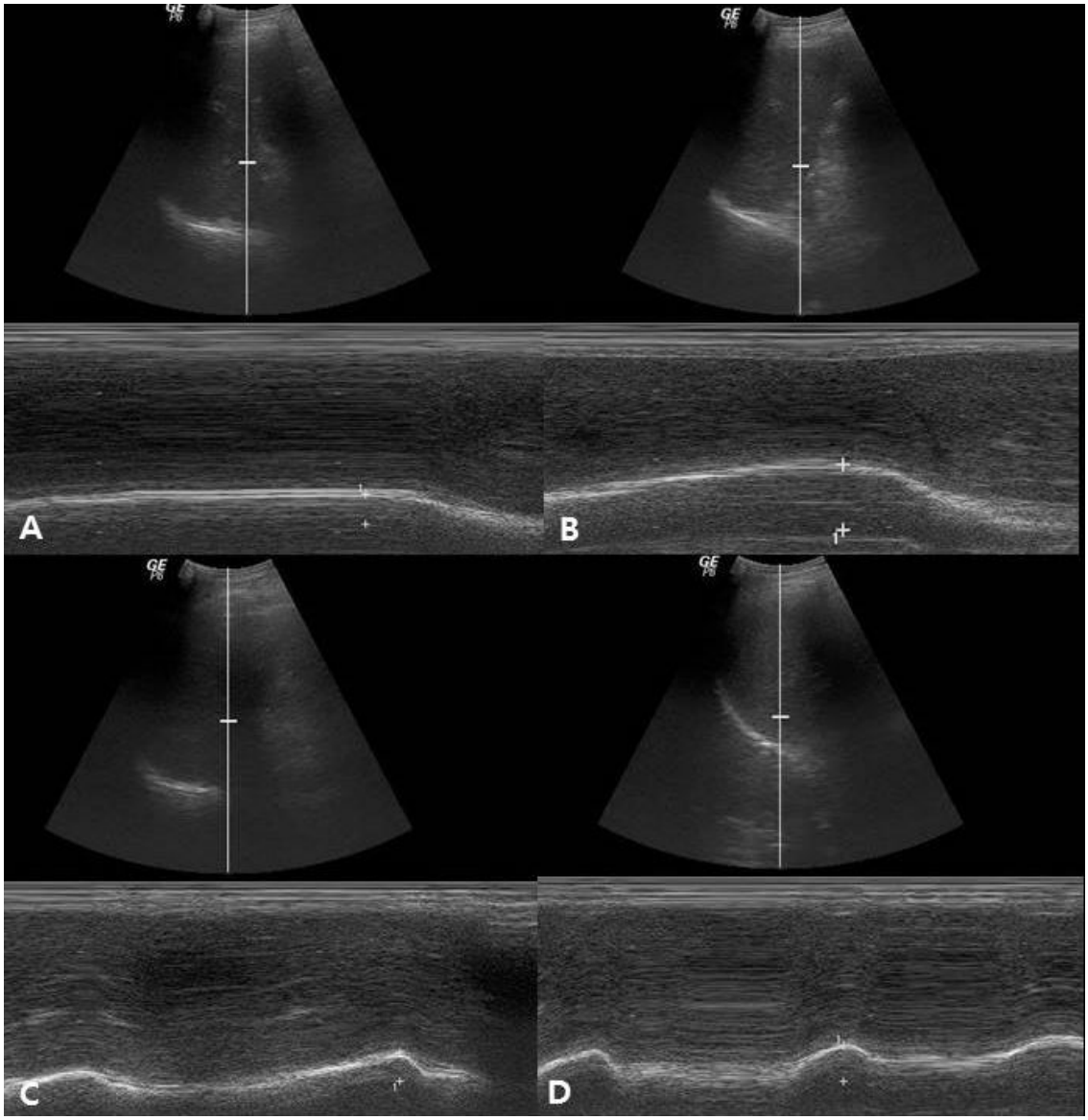

Fig 1. Diaphragmatic excursion measurement. Transducer positioned just below the ribs between the midaxillary and mammillary line with a 45 angle tilt between the surfaces of the abdominal wall. Measurements were performed with one caliper placed at the baseline of the diaphragm echoic line and a second caliper placed at the maximum height of the line. A: Quite Breathing (QB). B: Deep Breathing (DB) with maximal inspiration. C: Voluntary Sniffing (VS) as a quick nasal inspiration. D: Voluntary Coughing (VC).

Table 1. Patient's baseline characteristics, functional status, nutritional status and pulmonary functions.

		cooperation good (n=11)	cooperation poor (n=11)	p value
Age		70.1 ± 10.4	70.5 ± 17.1	0.95
Sex	M	9	6	0.17
	F	2	5	
Presense of dysphagia	No	7	6	0.66
	Yes	4	5	
Brain lesion (location)	Cortical	8	9	0.61
	Subcortica	3	2	
Brain lesion (side)	Left	4	5	0.66
	Right	7	6	
History of alcohol	No	6	5	0.67
	Yes	5	6	
History of smoking	No	6	9	0.17
	Yes	5	2	
Comorbidities				
HTN	No	2	2	1
	Yes	9	9	
DM	No	5	8	0.19
	Yes	6	3	
Pulmonary disease	No	11	10	0.23
	Yes	0	1	
Functional status				
MBI		56.1 ± 19.2	19.0 ± 12.2	<0.001*
MMSE		24.5 ± 3.9	15.3 ± 5.7	<0.001*
BBT		31.2 ± 19.9	8.5 ± 11.0	0.003*
NIHSS		2.9 ± 2.8	11.8± 3.3	<0.001*
Nutritional status				
MNA-SF		13.6 ± 2.7	9.5 ± 2.9	0.003*
SNAQ score		15.3 ± 1.1	12.3 ± 2.7	0.004*
Pulmonary functions				
MIP		59.0 ± 17.6 (n=9)	65.8 ± 29.4 (n=5)	0.59
MEP		46.7 ± 11.6 (n=19)	43.2 ± 18.6 (n=5)	0.67
PcF		337.3 ± 118.3 (n=11)	260.0 ± 145.8 (n=8)	0.22
FVC		86.6 ± 16.2 (n=9)	98.0± 19.8 (n=2)	0.40
FEV1		97.3 ± 20.9 (n=9)	111.5± 33.2 (n=2)	0.44

Table 2. Hemiplegic side and Non-hemiplegic side diaphragmatic excursion and thickness by ultrasonography.

	Hemiplegic side diaphragm			Non-hemiplegic side diaphragm		
	cooperation good (n=11)	cooperation poor (n=11)	p value	cooperation good (n=11)	cooperation poor (n=11)	p value
Diaphragmatic Excursion						
Quite Breathing (QB)	1.82± 0.29	1.46 ±0.44	0.04*	1.74 ±0.40	1.60 ±0.37	0.42
Voluntary Sniffing (VS)	2.58 ±0.57	2.03 ±0.52 (n=10)	0.03*	2.51± 0.36	2.48 ±0.59 (n=10)	0.88
Voluntary Coughing (VC)	2.63± 0.61	2.02 ±0.67	0.04*	2.63± 0.41	2.54 ±0.70	0.74
Deep Breathing (DB)	3.78 ±0.85	2.99 ±0.85	0.04*	4.32 ±0.83	3.54 ±0.78	0.04*
Diaphragm thickness						
Thickness in maximal inspiration	0.36 ±0.05	0.31 ±0.08	0.10	0.39 ±0.09	0.36 ±0.08	0.37
Thickness in end expiration	0.22 ±0.02	0.20 ±0.05	0.41	0.21 ±0.02	0.20 ±0.04	0.27
Diaphragm Thickness fraction (DTF)	67.5± 27.5	57.2 ±23.1	0.35	82.9 ±33.8	91.7 ±42.4	0.60