심폐재활

발표일시 및 장소: 10 월 18 일(금) 13:55-14:05 Room C(5F)

OP3-1-5

Correlation between Echocardiographic Parameters and Exercise Capacity in Patients with AMI

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Objective

Echocardiography provides the diagnostic and prognostic information by showing the location and extent of myocardial infarction. A few researches have been conducted on the relationship between echocardiographic parameters and functional exercise capacity, but there is a lack of research on the factors that predict improvement of exercise capacity. Therefore, we aimed to 1) investigate the relationship between echocardiographic parameters and the exercise capacity in patients who participated in cardiac rehabilitation (CR) after acute myocardial infarction (AMI) and 2) determine the echocardiographic parameters that are associated with the change of exercise capacity during 1 year follow-up.

Methods

We retrospectively analyzed 8,735 medical records of Korean Registry of Regional Cardiocerebrovascular Center for Acute Myocardial Infarction (KRAMI) database from July 2016 to September 2018. In this study, 4,476 patients who had undergone a percutaneous coronary intervention (PCI) and had been referred to 11 rehabilitation centers were included. Echocardiography was checked at the time between post-PCI and discharge. Ejection fraction (EF), left ventricular internal dimension in diastole (LVIDd), annular diastolic velocities in septal area (E/e' septal) and annular diastolic velocities in lateral area (E/e' lateral) were recorded by cardiac sonographers. Exercise tolerance test was conducted and functional performance scale by Korean Activity Scale/Index (KASI) was checked at 3 assessment points; 1 month (T0), 4 months (T1), 12 months (T2) after AMI attack. ΔValue is used to calculate the change of each exercise capacity and performance scale from values obtained at T0, T1 and T2; $\Delta Value = (Value_{final} - Value_{initial}) / Value_{initial}$.

Results

ETT was performed in 1,742, 666 and 240 AMI patients at T0, T1 and T2, respectively. KASI was checked in 2,449, 2,136 and 1,372 AMI patients by telesurvey or interview at T0, T1

and T2 (Table 1). Each E/e' septal and E/e' lateral showed a negative correlation with METsmax at T0 (r=-0.235, p= 0.000; r =-0.165, p=0.000). E/e' lateral indicated a moderate negative correlation with KASI at T0 (r=-0.461, p=0.000) (Table 2). When it comes to the relationship between echocardiographic parameters and the change of exercise capacity during 1 year follow-up, E/e' septal displayed a negative correlation with ΔMETsmax in T2-T0 (r=-0.258, p=0.000). E/e' lateral was negatively correlated with ΔMETsmax in T2-T0 (r=-0.394, p=0.002) and each ΔKASI in T1-T0 and ΔKASI inT2-T0 (r=-426, p=0.000; r=-0.445, p=0.000) (Table 3).

Conclusion

E/e' lateral and E/e' septal might be used as one of the indicators of functional exercise capacity and its change. However, further study would be required to find more predictive echocardiologic parameters correlated with exercise capacity.

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Table 1. Biomedical Characteristics of the Patients Classified by the Functional Evaluation Time

	ETT at T0 (n=1,742)	ETT at T1 (n=666)	ETT at T2 (n=232)	KASI at T0 (n=2,449)	KASI at T1 (n=2,136)	KASI at T2 (n=1,372)
Age (years)	63.74±12.91	62.97±12.80	63.18±13.27	64.82±12.94	64.94±12.91	65.06±12.95
Sex (n, %)	1,366 (78.4%)	537 (80.6%)	176 (75.9%)	1,891 (77.2%)	1,648 (77.2%)	1,050 (76.5%)
BMI (kg/m^2)	24.30±3.48	24.44±3.42	24.02±6.23	24.12±3.29	24.16±3.34	24.10±3.37
Hypertension (n, %)	677 (38.1%)	232 (34.8%)	76 (32.8%)	1,076 (43.9%)	935 (43.8%)	568 (41.3%)
Dyslipidemia (n, %)	226 (12.9%)	90 (13.5%)	33 (14.2%)	292 (11.9%)	258 (12.1%)	156 (11.4%)
Diabetes mellitus (n, %)	313 (18.0%)	104 (15.6%)	29 (12.5%)	570 (23.2%)	492 (23.0%)	111 (21.1%)
Subtype of MI						
STEMI (n, %)	909 (52.2%)	362 (54.4%)	114 (49.1%)	1,184 (48.3%)	1,039 (48.6%)	686 (50.0%)
NSTEMI (n, %)	833 (47.8%)	303 (45.6%)	118 (50.9%)	1,265 (51.6%)	1,097 (51.4%)	686 (50.0%)
Medication						
B-blocker (n, %)	1,510 (86.7%)	578 (86.8%)	197 (84.9%)	2,097 (85.6%)	1,847 (86.5%)	1,193 (87.0%)
ARB (n, %)	715 (41.0%)	175 (26.3%)	54 (23.2%)	1,186 (48.4%)	1,037 (48.5%)	657 (47.9%)
Statin (n, %)	1,719 (96.8%)	646 (97.0%)	224 (96.6%)	2,322 (94.8%)	2,020 (94.6%)	1,295 (93.6%)
$METs_{max}$	7.84±2.49	8.85±2.58	9.79±2.51			
KASI				40.67±21.42	47.47±21.21	51.36±21.34

Values are mean±standard deviation or number (%).

T0, 1 month after AMI; T1, 4 months after AMI; T2, 12 months after AMI.

BMI, body mass index; STEMI, ST elevation myocardial infarction; STEMI, Non-ST elevation myocardial infarction; ARB, Angiotensin II receptor antagonist; $METs_{max}$, maximal metabolic equivalents; KASI, Korean Activity Scale/Index.

Table 2. Relationship between Echocardiographic Parameters and Exercise Capacity in T0

	$METs_{max}$ at T0			KASI at T0		
Variables	**†Mean±SD**	**r**	**p-value**	**†Mean±SD**	**r**	**p-value**
EF	54.79±9.87	0.102	0.000*	53.68±9.77	0.116	0.000*
LVIDd	48.66±7.43	0.036	0.129	50.34±5.57	-0.044	0.034
E/e' septal	10.85±5.74	-0.235	0.000*	12.08 ±5.10	-0.012	0.572
E/e' lateral	9.62±4.93	-0.165	0.000*	9.64 ± 4.35	-0.461	0.000*

$METs_{max}$, maximal metabolic equivalents; KASI, Korean Activity Scale/Index; T0, 1 month after AMI.

SD, standard deviation; EF, ejection fraction; LVIDd, left ventricular internal dimension in diastole; E/e' septal, annular diastolic velocities in septal area; E/e' lateral, annular diastolic velocities in lateral area.

†Mean±SD: mean value of echocardiographic variables in the patients underwent each evaluation at T0.

*p < 0.05

Table 3. Correlation between Echocardiographic Parameters and Interphase Changes of Exercise Capacity.

		$\Delta METs_{max}$				ΔKASI				
		T1 - T0		T2 - T0		T1 - T0			T2 - T0	
Variables	**†Mean±SD**	**r**	**p-value**	**r**	**p-value**	**‡Mean±SD**	**r**	**p-value**	**r**	**p-value**
EF	55.88±7.95	0.199	0.000*	0.142	0.030*	54.39±9.34	0.137	0.000*	0.100	0.000*
LVIDd	49.51±4.73	0.038	0.565	-0.10	0.883	50.19±5.67	-0.044	0.108	-0.044	0.109
E/e' septal	10.68±2.94	-0.167	0.012*	-0.258	0.000*	11.39±4.50	-0.019	0.496	-0.025	0.374
E/e' lateral	8.67±2.99	-0.069	0.599	-0.394	0.002*	9.12±3.82	-0.426	0.000*	-0.445	0.000*

T0, 1 month after AMI attack; T1, 4 months after AMI; T2, 12 months after AMI.

EF, ejection fraction; LVIDd, left ventricular internal dimension in diastole; E/E' septal, annular diastolic velocities in septal area; E/E' lateral, annular diastolic velocities in lateral area; $METs_{max}$, maximal metabolic equivalents; KASI, Korean Activity Scale/Index.

†Mean±SD: mean value of echocardiographic variables in the patients who underwent all three ETT.

‡Mean±SD: mean value of echocardiographic variables in the patients who completed KASI all three times.

$\Delta Value = (Value_{final} - Value_{initial}) / Value_{initial}$.

*p < 0.05