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A relation between Serum Creatine Kinase Level and Cardiac Function in Duchenne Muscular Dystrophy

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Introduction

Duchenne muscular dystrophy (DMD) is a progressive disease which gradually affects all voluntary muscles, finally involving cardiac and respiratory muscles in the end stages. Eventually, cardiomyopathy induced heart failure develops which is a major cause of death in DMD patients. In a previous study, serum Creatine Kinase (CK) level was found to have a strong correlation with pulmonary functions. However, there are not enough studies to demonstrate the relationship between cardiac laboratory data and ejection fraction (EF) in patients diagnosed with DMD. This study aims to evaluate the relationship between serum CK level and cardiac EF in DMD patients.

Method

Data were retrospectively collected from medical records of patients diagnosed with DMD who were hospitalized in the Department of Rehabilitation Medicine, Gangnam Severance Hospital from January 1999 to March 2015. DMD patients who took laboratory exams or transthoracic echocardiogram (TTE) were included. Among 185 patients, 72 patients were excluded due to absence of TTE Results. 7 patients were excluded because of insufficient TTE data and 6 other patients were excluded because some of their cardiac laboratory data were missing. For patients with multiple admissions in the period, the only data from first hospitalization period were included in the analysis. As a Result, data from 100 patients were eligible and finally analyzed. Pearson correlation and regression analysis were used to determine the degree of correlation.

Results

EF and serum CK showed no significant correlation on Pearson correlation (correlation coefficient=0.113, p value= 0.139). Furthermore, EF and serum Creatine Kinase-muscle/brain (CK-MB) showed no significant correlation on Pearson correlation (correlation coefficient =0.121, p value= 0.121). However, a weak correlation was observed for Brain Natriuretic Peptide (BNP) and EF (correlation coefficient=-0.290, p value= 0.002). On simple and multiple linear regression study, other various factors (age, weight, height, body-mass-index, CK and CK-MB) showed no significant correlation. However, BNP showed statistically significant explanatory strength for EF in simple and

multiple linear regression analysis (R2=0.086, p value=0.003 and R2 = 0.146, p value=0.002, respectively). Therefore, although the correlation between BNP and EF is weak, BNP rather than CK or CK-MB, may have stronger correlation with EF.

Conclusion

There was no statistically significant relationship between serum CK and EF. However, BNP had weak correlation with cardiac EF. Therefore, to evaluate cardiac function in DMD patients, routine TTE should be emphasized and assessment of laboratory data including BNP could be helpful.

Table 1. Pearson correlation between EF and laboratory cardiac function parameters in DMD patients

Cardiac function	Cardiac marker	Correlation coefficient	P-value
EF	CK	0.122	0.227
	CK-MB	0.135	0.181
	BNP	-0.292	0.003*

EF: ejection fraction; CK: creatine kinase; CK-MB: creatine kinase-muscle/brain; BNP: brain natriuretic peptide
* means stastistically significant ($p < .05$)

Table 2. Association between EF and various factors (simple linear regression analysis)

		EF	
	Mean(±SD)	B(SE)	p-value
Age	20.480(±4.69)	-0.425(0.347)	0.223
Weight(kg)	41.76(±14.45)	-0.048(0.113)	0.671
Height(cm)	156.92(±9.95)	-0.165(0.164)	0.316
BMI(kg/m²)	16.83(±5.25)	0.028(0.313)	0.929
CK(U/L)	1054.200(±769.23)	0.003(0.002)	0.227
CK-MB(μg/L)	22.17(±15.92)	0.138(0.102)	0.181
BNP(pg/mL)	68.537(±216.54)	-0.022(0.007)	0.003*

EF: ejection fraction; BMI: body mass index; CK: creatine kinase; CK-MB: creatine kinase-muscle/brain; BNP: brain natriuretic peptide; B: β coefficient; SE: standard error; SD: standard deviation
* means stastistically significant ($p < .05$)

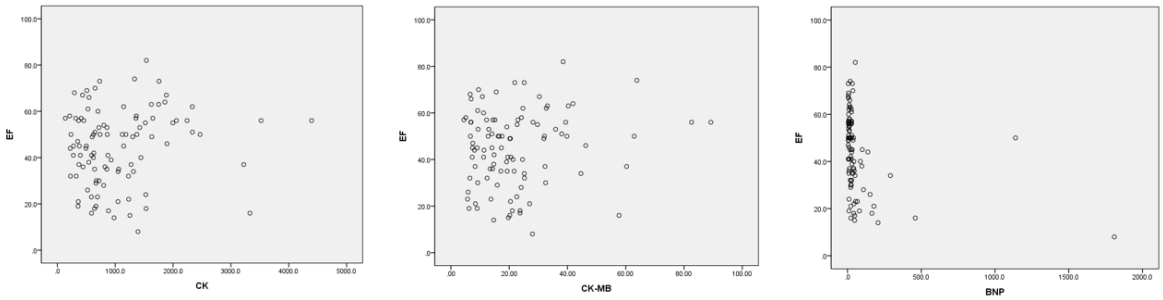

Figure 1. Correlations between EF and laboratory cardiac function parameters (CK, CK-MB and BNP)