■ Sat-339 ■

The effect of protein provision on clinical outcomes in patient, receiving renal replacement therapy

[1]단국대학교 병원 내과학교실, [2]단국대학교 병원 신장내과학교실

*임성결[1], 김석원[2], 전지현[2], 조종태[2], 이은경[2], 김소미[2], 윤성철[2]

Background/Aims: The energy-protein deficit is known to be correlated with increased mortality in critically ill patients. Although the substantial protein loss during continuous renal replacement therapy (CRRT) procedure was expected. the proper nutrition was overlooked. Therefore, we try to investrigate the nutrition status and clinical outcomes according to protein provision in nutrition of critically ill patients, receiving CRRT **Methods:** A total of 46 intensive care unit (ICU) patient, receiving the CRRT was included. The nutritional requirement was analyzed by nutritional support team, using Harris-Benedict equation. Adequate protein provision was defined as; >90% of calculated protein target. The patients were divided into two groups based on protein provision. The ICU stay and mortality rate were evaluated. **Results:** The patients in adequate protein group were 14 and inadequate protein group were 32. The mean protein provision was higher in adequate groups than inadequate groups (59.2 vs 48.3g/day, *p*=0.04). Although the ICU stay showed the higher tendency in inadequate groups than adequate group, there was no significant difference (7.8 vs 4.6, *p*=0.12). And the mortality rate was significant lower in adequate group than inadequate group (10/32 vs 4/14). **Conclusions:** Our study showed the adequate protein provision is important factor of survival in ICU patient, receiving the CRRT.

value	adequate protein group (n=14)	inadequate protein group (n=32)	P value
Age, year	63.15±11.98	64.03±13.18	0.72
Male, n (%)	9 (64)	17 (53)	0.64
Cause of renal failure, n (%)			0.24
cardiovascular	5	7	
pulmonary	7	16	
gastrointestinal	1	5	
urology	1	3	
others	1	1	
Serum cholesterol	152±32	135±41	0.32
Serum albumin	3.0±1.2	2.8±1.3	0.18
Protein, g/day	59.2±5.29	48.3±4.32	0.04
Clinical outcomes	**adequate protein group (n=14)**	**inadequate protein group (n=32)**	**P value**
ICU stay, day	4.6	7.8	0.12
Mortality, %	4 (31)	7 (21)	0.04

■ Sat-340 ■

Secondary hyperparathyroidism is an independent predictor of LV diastolic dysfunction in CKD

양산부산대학교병원 내과

*장진욱, 김민정, 김일영, 이동원, 이수봉

Background/Aims: Cardiovascular disease (CVD) is the leading cause of death in patients with chronic kidney disease (CKD). Left ventricular (LV) diastolic dysfunction is known as the predictor of CVD in these patients. Secondary hyperparathyroidism (SHPT), a common complication of CKD, contribute to cardiac dysfunction. This study aimed to evaluate the association between SHPT and LV diastolic dysfunction in patients with CKD. **Methods:** This study included 332 pre-dialysis CKD patients (estimated glomerular filtration rate (eGFR)<60 ml/min/1.73m2). Two-dimensional echocardiography was performed to left ventricular ejection fraction (LVEF). Tissue Doppler imaging was used to measure the early mitral inflow velocity (E) and the peak early mitral annular velocity (E'). Diastolic function was estimated by the E' and the ratio of E to E' (E/E'). The associations of echocardiographic index with clinical and laboratory variables [age, sex, diabetes, hypertension, eGFR, albumin, uric acid, calcium, phosphate, total cholesterol, hemoglobin, C-reactive protein, and intact parathyroid hormone (PTH)] were investigated by univariate (Pearson's correlation, r) and multivariate analysis (multiple linear regression analysis, β). **Results:** Of the 332 patients, 198 were in CKD stage 3, 84 in CKD stage 4, and 50 in CKD stage 5. The degree of diastolic dysfunction was more severe (lower E' and higher E/E') with increasing CKD stage. There were no significant differences between the three CKD groups in LVEF (Table 1). In univariate analysis (Table 2, 3), the intact PTH levels correlated with E' (r=-0.321, P<0.001) and E/E' (r=0.297, P<0.001). However, they did not correlate with an index of systolic dysfunction (LVEF). In multivariate analysis (Table 2, 3), the intact PTH levels were significantly associated with E' (β=-0.349, P<0.001), and E/E' (β =0.322, P<0.001) after adjustment for other confounding factors. **Conclusions:** Increased intact PTH levels were independently associated with decreased E' and increased E/E' in patients with CKD, suggesting that SHPT are an independent predictor of LV diastolic dysfunction in these patients.

Table 1. Baseline characteristics of the study population (n = 332)

	CKD stage 3 (n = 198)	CKD stage 4 (n = 84)	CKD stage 5 (n = 50)	P
Age (years)	55.3 ± 10.5	59.5 ± 11.0	63.1 ± 12.3	<0.001
Sex, male	104 (52.8%)	45 (52.9%)	27 (54.0%)	0.988
Diabetes	108 (54.8%)	45 (52.9%)	27 (54.0%)	0.958
Hypertension	134 (68.0%)	64 (75.3%)	41 (82.0%)	0.106
eGFR (ml/min/1.73m^2)	42.7 ± 7.9	21.7 ± 4.1	10.0 ± 2.5	<0.001
Albumin (g/dl)	4.2 ± 0.4	4.0 ± 0.4	3.9 ± 0.5	<0.001
Uric acid (mg/dl)	6.3 ± 1.9	6.6 ± 1.9	7.3 ± 1.8	0.004
Calcium (mg/dl)	9.2 ± 0.3	9.0 ± 0.3	8.9 ± 0.3	<0.001
Phosphate (mg/dl)	3.4 ± 0.5	3.9 ± 0.7	4.6 ± 0.9	<0.001
Total cholesterol (mg/dl)	214.1 ± 44.8	209.6 ± 46.9	216.5 ± 45.8	0.638
Body mass index (kg/m^2)	23.9 ± 2.7	24.0 ± 2.7	23.7 ± 2.4	0.890
Hemoglobin (g/dl)	12.8 ± 1.9	11.0 ± 1.9	9.6 ± 1.2	<0.001
CRP (mg/dl)	1.3 ± 1.1	1.9 ± 1.3	2.7 ± 1.4	<0.001
iPTH (pg/ml)	50.2 ± 20.0	112.6 ± 76.6	212.7 ± 91.2	<0.001
E (cm/s)	62.9 ± 8.6	64.1 ± 8.3	61.0 ± 11.1	0.145
E' (cm/s)	8.0 ± 1.4	7.5 ± 1.0	7.4 ± 1.3	0.003
E/E'	8.1 ± 1.7	8.6 ± 0.7	8.6 ± 2.5	0.041
LVEF (%)	60.9 ± 10.4	59.5 ± 9.7	58.8 ± 8.7	0.300
Diastolic dysfunction	123 (62.4%)	54 (63.5%)	33 (66.0%)	0.895

Data are mean ± standard deviation or (n, %). CRP, C-reactive protein; E, early mitral inflow velocity; E', peak early mitral annular velocity, eGFR, estimated glomerular filtration rate; iPTH, intact parathyroid hormone; LVEF, left ventricular ejection fraction; LVH, left ventricular hypertrophy; LVMI, left ventricular mass index; NGAL, neutrophil gelatinase-associated lipocalin

Table 2. Univariate and multivariate analysis for variables associated with E' in study population (n = 332)

	Univariate		Multivariate	
	r^a	P	β^b	P
Age (years)	-0.066	0.232	-	-
Sex, male	0.021	0.701	-	-
Diabetes	-0.074	0.180	-	-
Hypertension	-0.243	<0.001	-0.186	<0.001
eGFR (ml/min/1.73m^2)	0.139	0.011	-0.113	0.116
Albumin (g/dl)	0.092	0.093	0.016	0.767
Uric acid (mg/dl)	-0.009	0.873	-	-
Calcium (mg/dl)	-0.024	0.667	-	-
Phosphate (mg/dl)	-0.071	0.198	-	-
Total cholesterol (mg/dl)	-0.020	0.720	-	-
Body mass index (kg/m^2)	0.033	0.555	-	-
Hemoglobin (g/dl)	0.144	0.009	0.023	0.709
CRP (mg/dl)	-0.043	0.430	-	-
iPTH (pg/ml)	-0.321	<0.001	-0.349	<0.001

[a]r means Pearson's correlation coefficients. [b]β means standardized regression coefficients. %). CRP, C-reactive protein; eGFR, estimated glomerular filtration rate; iPTH, intact parathyroid hormone; LVMI, left ventricular mass index;

Table 3. Univariate and multivariate analysis for variables associated with E/E' in study population (n = 332)

	Univariate		Multivariate	
	r^a	P	β^b	P
Age (years)	0.107	0.052	0.005	0.926
Sex, male	0.038	0.494	-	-
Diabetes	0.030	0.583	-	-
Hypertension	0.214	<0.001	0.164	0.002
eGFR (ml/min/1.73m^2)	-0.135	0.014	0.083	0.225
Albumin (g/dl)	-0.061	0.270	-	-
Uric acid (mg/dl)	-0.039	0.476	-	-
Calcium (mg/dl)	-0.053	0.335	-	-
Phosphate (mg/dl)	0.048	0.378	-	-
Total cholesterol (mg/dl)	-0.036	0.511	-	-
Body mass index (kg/m^2)	-0.061	0.265	-	-
Hemoglobin (g/dl)	-0.066	0.228	-	-
CRP (mg/dl)	0.005	0.932	-	-
iPTH (pg/ml)	0.297	<0.001	0.322	<0.001

[a]r means Pearson's correlation coefficients. [b]β means standardized regression coefficients. %). CRP, C-reactive protein; eGFR, estimated glomerular filtration rate; iPTH, intact parathyroid hormone; LVMI, left ventricular mass index;