CORRELATION OF CALCIUM-PHOSPHORUS METABOLISM & CARDIAC STRUCTURE IN MAINTENANCE HEMODIALYSIS PATIENTS

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Abstract

Background: The determine the correlations between calcium-phosphorus metabolism, use of calcium supplements, blood pressure and use of hypotensors, dialysis duration and cardiac structure in maintenance hemodialysis (MHD) patients.
Methods:A total of 102 patients on MHD for more than 1 year were recruited and allocated.
Results:Structural changes in the hearts of MHD patients were significantly correlated with calcium and phosphorus metabolism and dialysis duration. LVEDd, LVEDs and LVMI were significantly higher in the hyperphosphate and high Ca×P groups.Patients receiving calcium acetate had decreased LVEDd and LVEDs compared with those having calcium carbonate. hs-CRP, pro-BNP, P, Ca×P, LVMI, and LVHincidence were significantly higher in patients with diabetic nephropathy. ACEI/ARB was more commonly used in patients with diabetic nephropathy.
Conclusions:MHD patients exhibited changes in cardiac structure, with increased incidence of LVH in patients with longer MHD duration. Calcium acetate was more beneficial to cardiac structure and ACEI/ARB should be recommended to treat the hypertension patients with diabetic nephropathy

Materials and methods

Patients
A total of 151 patients receiving MHD for more than 1 year were recruited between January 2011 and January 2017 at the Hemodialysis Center, Sixth People's Hospital of Shanghai(China).The Ethics Committee of the hospital approved the study, and prior written informed consent was obtained from all participants.
Study protocol
The age, gender, dialysis duration, present and past illnesses, family history and medical history, height and dry weight of the patients were recorded. Routine biochemical tests were performed before dialysis,serum calcium Ca, and P were assayed, and Ca×Pwas calculated. Patients were stratified according to serum P level, Ca×P, and dialysis durationfollowing the 2007 Kidney Disease Outcomes Quality Initiative (KDOQI) clinical practice guidelines for bone metabolism and disease
Serum biochemistry
Fibroblast growth factor 23 (FGF23)was measured by ELISA according to the kit manufacturer's instructions
Statistical analyses
SPSS 19.0 software (IBM Corp., USA)was used for statistical analysis.

Result

Table 1.Clinical characteristics of MHD patients with or without diabetic nephropathy

	All patients (n=127)	Diabetic nephropathy (n=46)	Without diabetic nephropathy (n=81)	P
Dialysis duration (months)	46.13±35.62	36.52±30.05	51.46±37.66	0.008*
ACEI/ARB [n (%)]	45 (35.4)	22 (47.8)	23 (28.4)	0.028*
Hs-CRP (mg/L)	4.62±7.34	7.33±11	3.08±3.17	0.001*
Pro-BNP (ng/L)	9394.26±1134 1	12817.48±12926.4 6	7450.21±9885.89	0.002*
P (mmol/L)	1.94±0.53	2.04±0.62	1.87±0.46	0.010*
Ca×P (mmol2/L2)	2.93±1.00	3.05±1.00	2.72±0.90	0.030*
LVMI (g/m2)	138.64±39.07	150.23±48.54	127.04±29.59	0.001*
LVH [n (%)]	65 (51.2)	29 (63.0)	36 (44.4)	0.045*
FGF23(ng/L)	157.6±189.5	185.3±204.2	143.0±283.4	0.191
LogFGF23	2.198±0.41	2.27±0.43	2.16±0.44	0.048*

*Statistically significant P <0.05

Table 2. Correlation analysis of calcium-phosphorus product, dialysis duration and indicators of cardiac structure inMHD patients

	P	Ca×P	Dialysis duration
LVDd	r=0.377, P=0.001	r=0.478, P<0.001	r=0.229, P=0.021
LVDs	r=0.219, P=0.027	r=0.490, P <0.001	r=0.239, P=0.016
LAD	r=0.233, P=0.019	r=0.252, P=0.010	r=0.209, P=0.035
IVST	NS	NS	NS
LVPWT	NS	NS	NS
LVMI	r=0.295, P=0.003	r=0.346, P=0.001	r=0.199, P=0.045
FS	NS	r=−0.310, P=0.002	NS

NS: not statistically significant

Fig.1. Correlation analysis of serum P level with indicators of cardiac structure in MHD patients.
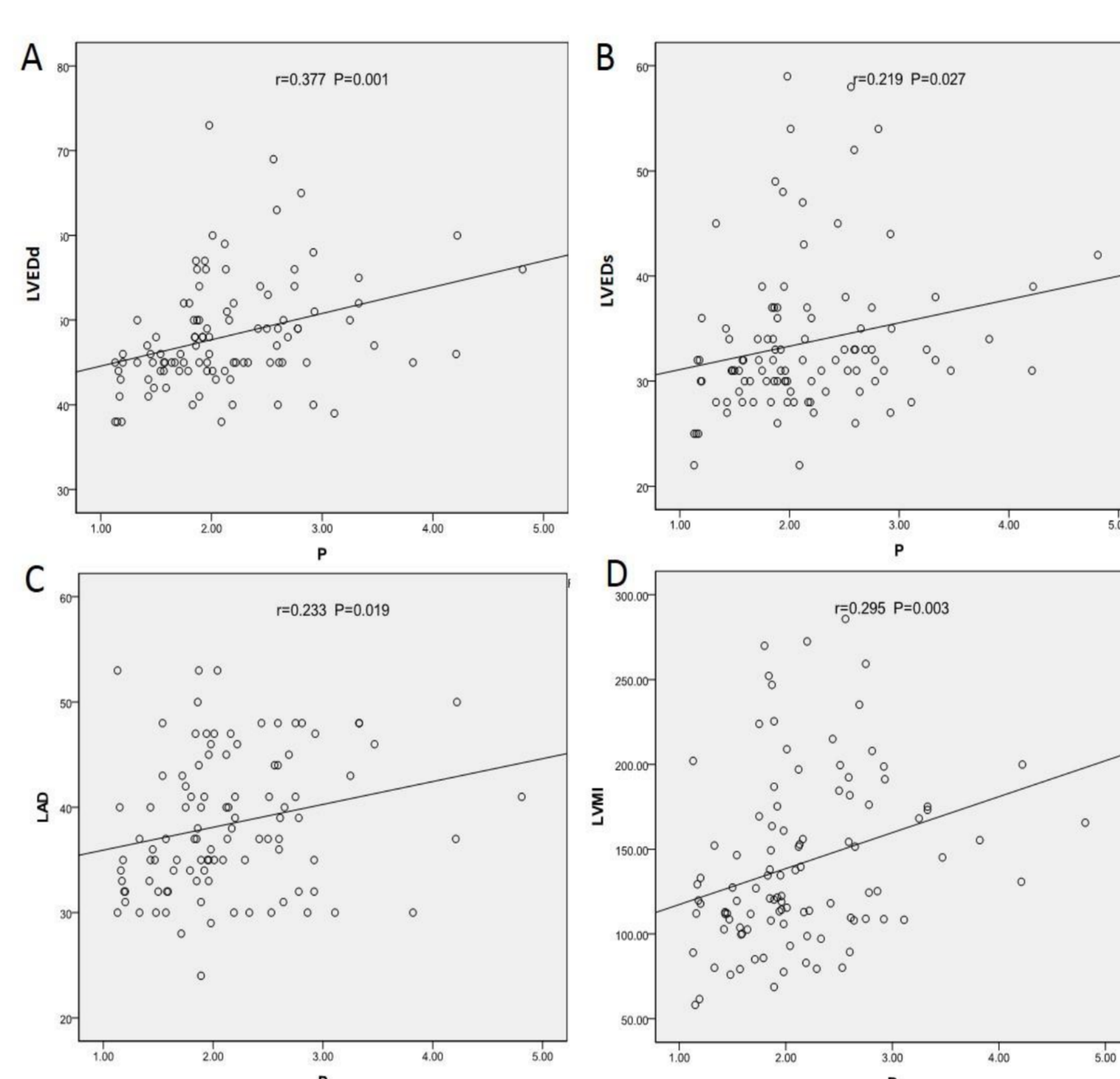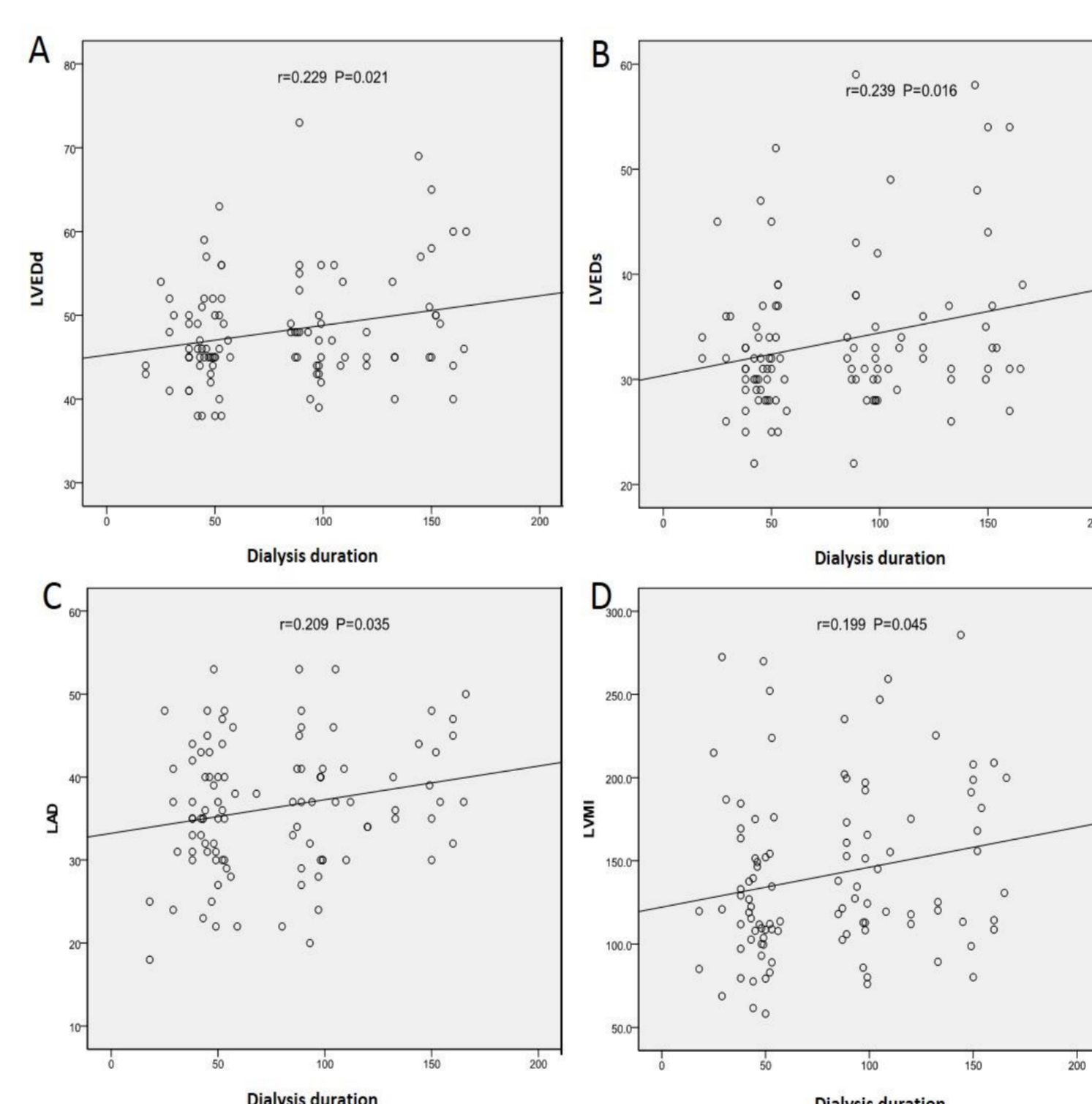

Fig.2. Correlation analysis of serum level of Ca×P with indicators of cardiac structure in MHD patients.

Fig.3. Correlation analysis of dialysis duration with indicators of cardiac structure in MHD patients.
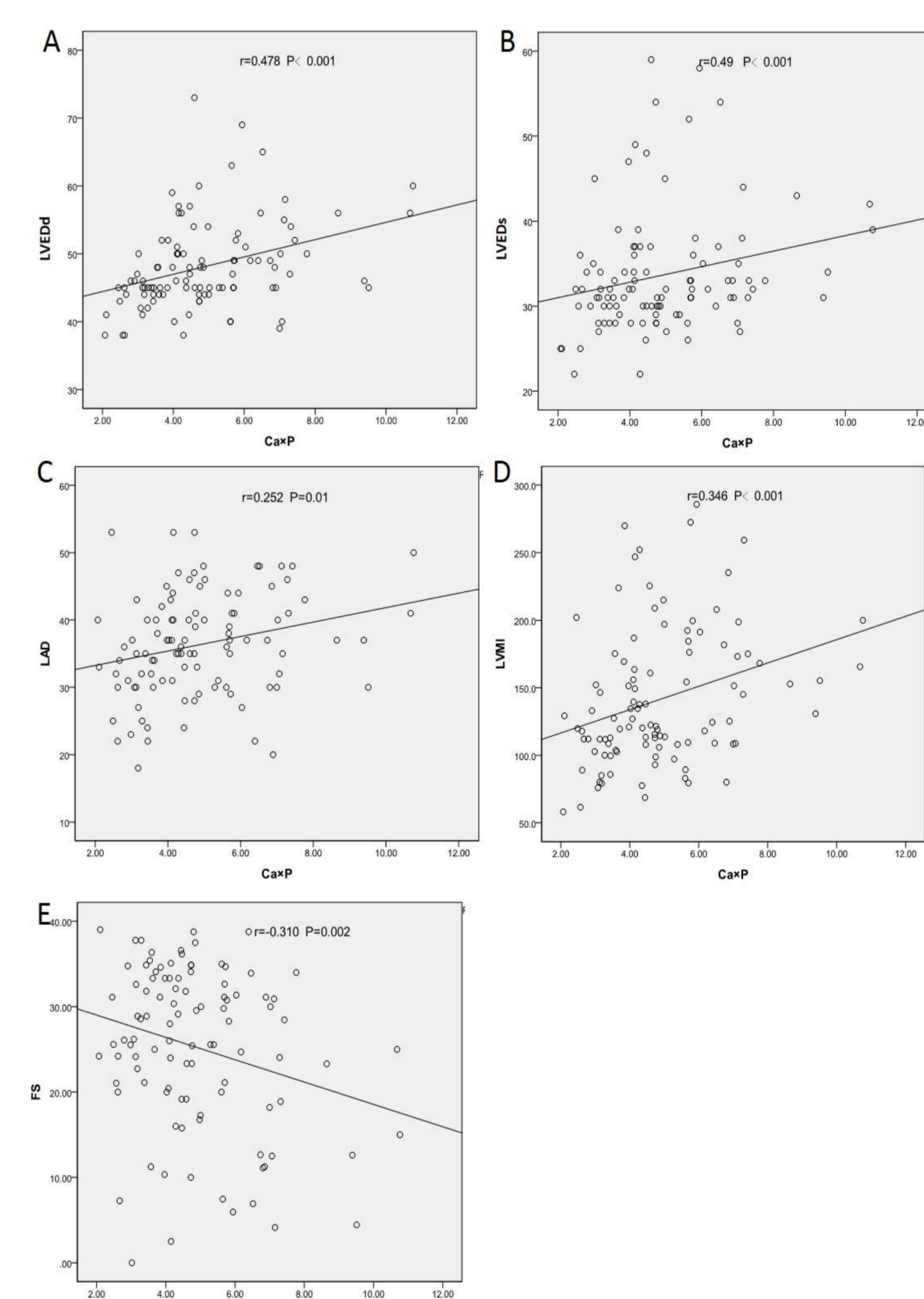
Table 3. Effects of serum P level on cardiac structure in MHD patients

	Control (n=32)	Hyperphosphate (n=70)	t	P
LVEDd (mm)	44.27±3.13	49.71±6.87*	4.155	0.001
LVEDs (mm)	35.73±5.75	38.82±7.74*	2.684	0.011
LAD(mm)	36.78±5.81	39.51±6.62	2.726	0.137
IVST(mm)	10.83±1.68	11.23±1.84	1.016	0.199
LVPWT(mm)	10.07±1.48	10.46±1.85	1.027	0.072
LVMI (g/m²)	115.87±36.32	152.13±52.06*	3.474	0.008
FS(%)	30.61±7.39	30.51±6.74	−0.066	0.609

*P<0.05 compared with control

Summary

MHD patients exhibited changes in cardiac structure, with increased incidence of LVH in patients with longer MHD duration. Calcium acetate was more beneficial to cardiac structure and ACEI/ARB should be recommended to treat the hypertension patients with diabetic nephropathy. We study found that there was significant risen in DN patients when been compared with FGF23.It demonstrated that patients with diabetes are more likely to develop the abnormal calcium and phosphorus metabolism and CVD than non diabetes.

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