EFFECT OF LANTHANUM CARBONATE ON CARDIAC ABNORMALITIES IN PATIENTS NEW TO HEMODIALYSIS

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Background/Aims

Cardiac abnormalities such as left ventricular hypertrophy (LVH) and systolic and diastolic dysfunction are frequently observed in patients with chronic kidney disease (CKD) and these are associated with cardiovascular disease events and mortality.

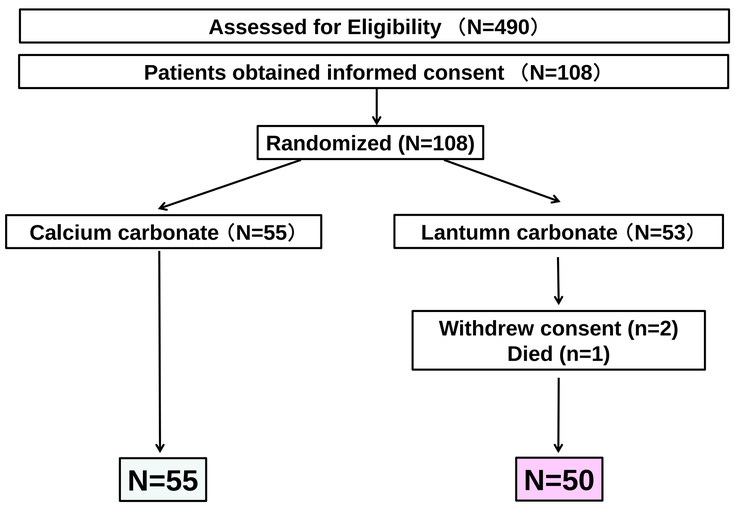
Lanthanum carbonate (LC) is one of the non-calcium-based phosphate binders that decreases serum phosphate levels in patients with CKD. The results of our previous study showed that LC has less effect on the progression of VC compared to calcium-based phosphate binder in CKD patients during the early period after initiation of hemodialysis (HD).

Although there are many studies to assess the effect of phosphate binders on the progression of vascular calcification, few studies investigated its effect on cardiac abnormalities.

Therefore, the present study investigated the effect of lanthanum carbonate (LC) on cardiac abnormalities compared to that of calcium carbonate (CC) in patients new to hemodialysis.

Methods

This was a randomized open-label study including 108 patients from five centres. These patients were registered with the present study just prior to or within 4 weeks after initiating HD therapy. They were divided into two groups based on the treatment of hyperphosphatemia; the calcium carbonate (CC group) and the LC (LC group). Serum calcium, phosphate, PTH and FGF23 levels and cardiovascular biomarkers were measured prior to initiating HD and 6, 12 and 18 months after initiating HD. We also evaluated the echocardiographic parameters prior to initiating HD and 12 and 18 months after initiating HD.



【Clinical characteristics at baseline】

	CC (n=55)	LC (n=50)	*p*
Male gender (%)	38 (69.1)	44 (88.0)	0.0191
Age (year)	63±13	65±14	0.3826
BMI	24.3±3.9	24.5±4.0	0.7259
SBP (mmHg)	149.2±22.8	146.7±19.9	0.5630
DBP (mmHg)	75.0±14.1	71.8±14.9	0.2687
Smoking (%)	26 (47.3)	19 (38.0)	0.3423
HT (%)	53 (96.4)	48 (96.0)	0.9235
DM (%)	23 (41.8)	26 (52.0)	0.3008
HLP (%)	18 (32.7)	18 (36.0)	0.7273
CVD (%)	16 (29.1)	10 (20.0)	0.2855
ACE-I/ARB (%)	34 (61.8)	30 (60.0)	0.8505
Statin (%)	24 (43.6)	14 (28.0)	0.0977
Vit. D (%)	22 (40.0)	17 (34.0)	0.5297
Warfarin (%)	0 (0)	4 (8.0)	0.5297
Hb (g/dl)	8.6±1.6	8.8±1.4	0.4462
Cr (mg/dl)	9.1±2.3	8.8±2.4	0.4855
eGFR (ml/min/1.73m^2)	5.2±1.3	5.8±2.3	0.0669
Alb（g/dl）	3.3±0.6	3.4±0.5	0.3724
LDL (mg/dl)	89.5±30.2	87.6±32.3	0.7602
cCa (mg/dl)	8.3±0.9	8.5±0.7	0.2129
P (mg/dl)	5.9±1.5	5.7±1.5	0.3484
i-PTH (pg/ml)	349.5±231.3	333.0±275.7	0.7413
i-FGF23 (pg/mL)	732.8 (438.1-1588.2)	700.5 (275.7-1824.2)	0.918
iPTH (pg/ml)	349.5±231.3	333.0±275.7	0.7413
LDL (mg/dl)	89.5±30.2	87.6±32.3	0.7602

Results

Change in CKD-MBD parameters and cardiac biomarkers during the study period

	CC (n=55)				LC (n=50)			
(months)	0	6	12	18	0	6	12	18
Ca (mg/dl)	8.5±0.7	8.8±0.4	8.8±0.5	9.1±0.6	8.3±0.9	8.5±0.4	8.5±0.5	8.9±0.6
P (mg/dl)	5.7±1.5	5.5±1.3	5.2±1.7	5.3±1.6	5.9±1.5	5.1±1.1	5.5±1.7	5.4±1.2
PTH (ng/ml)	251.0 (129.0-523.5)	153.2 (56.9-279.8)	125.0 (66.5-195.1)	136.4 (57.0-207.8)	292.5 (173.0-467.6)	187.0 (105.9-295.0)	151.2 (96.8-229.7)	161.5 (101.0-200.0)
FGF23 (pg/ml)	732.8 (438.1-1588.2)	2657.7 (604.5-4203.5)	2484.6 (726.5-8229.5)	3002.8 (911.7-9846.6)	700.5 (275.7-1824.2)	962.3* (401.1-3662.5)	1802.7 (663.3-5810.2)	2649.6 (1069.6-4551.0)
NT-proBNP (pg/ml)	4605.0 (1510.0-10900.0)	2020.0 (1535.0-4005.0)	2890.0 (1395.0-5640.0)	2900.0 (1290.0-5535.0)	1980.0 (1175.0-7355.0	1440.0 (875.5.0-4070.0)	1580.0 (845.0-2890.0)	1425.0* (943.0-2330.0)
Troponin-T (ng/ml)	0.054 (0.043-0.075)	0.054 (0.035-0.063)	0.047 (0.036-0.069)	0.052 (0.036-0.071)	0.057 (0.034-0.088)	0.044 (0.026-0.062)	0.051 (0.027-0.064)	0.043 (0.025-0.062)
ADMA (nmol/ml)	0.55±0.14	0.59±0.12	0.53±0.10	0.56±0.10	0.54±0.12	0.60±0.11	0.56±0.12	0.59±0.11

* ; CC v.s. LC, p<0.05

Change in CKD-MBD parameters and cardiac biomarkers during the study period

	CC (n=55)			LC (n=50)		
(months)	0 (n=55)	12 (n=52)	18 (n=50)	0 (n=50)	12 (n=43)	18 (n=41)
LA (mm)	43.1±6.5	44.1±6.8	42.4±7.5	42.3±6.6	39.5±5.6*	39.4±4.9*
LVDd (mm)	49.4±5.2	48.2±6.6	48.3±6.4	49.2±5.9	46.0±5.9	45.7±5.0*
LVDs (mm)	32.1±5.1	31.6±6.1	31.9±6.4	31.2±6.3	28.6±5.2*	28.5±5.4*
IVST (mm)	11.6±1.8	11.8±1.9	11.4±2.2	11.8±2.2	12.3±3.1	12.1±3.4
LVPWT (mm)	11.8±1.8	11.7±1.7	11.7±1.9	11.5±1.7	11.8±1.7	11.7±1.9
FS (%)	35.2±6.2	34.8±6.1	34.4±6.2	36.7±7.6	38.7±7.3*	37.9±7.1*
EF (%)	62.9±7.8	62.5±8.8	62.1±8.4	64.2±8.3	65.3±7.0	66.5±6.4*
LVMI (g/m2)	158.7±42.9	153.8±42.2	150.2±44.8	155.9±39.0	150.3±49.6	144.7±48.5
RWT	0.48±0.09	0.49±0.09	0.49±0.09	0.47±0.12	0.50±0.09	0.51±0.10
E/A	0.84±0.33	0.84±0.29	0.83±0.33	0.97±0.62	0.86±0.32	0.80±0.24
DcT (msec)	226.6±57.8	223.8±67.4	215.8±67.6	213.2±58.6	248.4±61.6	242.8±56.9*
TRPG (mmHg)	26.4±9.8	22.4±10.6	21.3±4.4	26.8±9.0	23.0±6.1	20.1±9.0
IVCD (mm)	14.4±6.2	13.8±5.1	12.9±4.4	14.1±4.6	12.6±3.9	12.4±4.5

* ; CC v.s. LC, p<0.05

Correlation between log serum FGF23 levels and echocardiographic parameters

	Univariate		Multivariate	
	r	*P*	β	*P*
LVMI	0.026	0.813	-	-
EF	-0.211	0.050	-0.160	0.139
E/A	0.340	0.002	0.283	0.015
DcT	-0.232	0.032	-0.055	0.635
IVCD	0.265	0.012	0.163	0.125

- ✓Though serum phosphate levels were comparable between the two groups at 18 months, serum calcium levels were significantly lower, serum PTH levels tended to be higher and serum FGF23 levels tended to be lower in the LC group compared to the CC group.
- ✓At 18 months, left atrial diameter (LAD), left ventricular diastolic diameter (LVDd), left ventricular systolic diameter (LVDs), fractional shortening (FS), and ejection fraction (EF) were significantly improved in the LC group compared to the CC.
- ✓At 18 months, log-serum FGF23 levels were significantly correlated with LVDd, LVDs, and EF, and tended to be correlated with LAD.
- ✓log-serum FGF23 levels had no significant relationship with left ventricular mass index (LVMI).
- ✓The results of multivariate regression analysis showed that log-serum FGF23 levels were significantly correlated with E/A.

Conclusion

Our study suggest that LC can ameliorate cardiac abnormalities in patients with CKD during the early period following the initiation of hemodialysis.

◎ COI: This study was partly supported by Bayer Yakuhin, Ltd.

DOI: 10.3252/pso.eu.54ERA.2017
ePosters supported by F. Hoffmann- La Roche Ltd.