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Mineral metabolism disturbances are associated with the presence and severity of calcific aortic valve disease

Key words: Valve heart disease, Aortic stenosis, Mineral metabolism, Calcium, Phosphate

Research Summary

This study investigated whether disturbance of calcium and phosphate metabolism is associated with the presence and severity of calcific aortic valve disease (CAVD) in patients with normal or mildly impaired renal function.



Results and Conclusion

Mineral metabolism parameters and biomarkers of bone turnover

Variable	Controls (n=164)	Patients with AVSc (n=164)	Patients with AVS (n=96)	P ₁ Value	P ₂ Value				
Mineral metabolism parameters									
Serum calcium (mg/dl)	8.39±0.44	8.79±0.33	9.11±0.57	<0.001	<0.001				
Serum phosphate (mg/dl)	3.06±0.54	3.75±0.57	4.38±1.05	<0.001	<0.001				
iPTH (pg/ml)	37.88±13.11	55.97±17.96	76.12±33.72	<0.001	<0.001				
25-OHD (nmol/L)	58.48±20.80	39.27±16.31	32.32±18.58	<0.001	<0.001				
AKP (U/L)	52.58±15.69	70.48±24.63	82.40±26.51	<0.001	<0.001				
Biomarkers of bone turnover									
Serum osteocalcin (ng/ml)	11.80±4.33	18.45±8.19	21.76±9.53	<0.001	<0.001				
Serum PINP (ng/ml)	30.94±13.67	45.24±17.01	59.33±32.98	<0.001	<0.001				
Serum β-CTx (ng/ml)	0.32±0.16	0.50±0.19	0.67±0.35	<0.001	<0.001				

Correlation between mineral metabolism parameters and hemodynamic severity of CAVD









Results and Conclusion

Association between mineral metabolism measurements and the presence and severity of CAVD

Variable	Univariate		Multivariate		
	OR (95%CI)	P Value	OR (95%CI)	P Value	
Presence of CAVD					
Total cholesterol (mmol/l)	1.355 (1.083-1.695)	0.008	0.873 (0.318-2.396)	0.793	
LDL-cholesterol (mmol)	1.320 (1.011-1.724)	0.041	1.014 (0.297-3.459)	0.982	
Serum calcium (mg/dl)	14.845 (7.298-30.197)	<0.001	10.018 (3.364-29.835)	<0.001	
Serum phosphate (mg/dl)	9.840 (5.721-16.922)	<0.001	3.945 (1.955-7.959)	<0.001	
AKP (U/L)	1.058 (1.041-1.076)	<0.001	1.037 (1.013-1.062)	0.003	
25-OHD (nmol/L)	0.943 (0.930-0.957)	<0.001	0.950 (0.932-0.969)	<0.001	
iPTH (pg/ml)	1.077 (1.058-1.097)	<0.001	1.068 (1.041-1.097)	<0.001	
Severity of CAVD					
Serum calcium (mg/dl)	5.662 (2.829-11.331)	<0.001	6.984 (2.736-17.825)	<0.001	
Serum phosphate (mg/dl)	3.275 (2.097-5.116)	<0.001	3.665 (1.985-6.765)	<0.001	
AKP (U/L)	1.018 (1.008-1.029)	0.001	1.016 (1.003-1.029)	0.019	
25-OHD (nmol/L)	0.975 (0.959-0.991)	0.002	0.971 (0.951-0.992)	0.006	
iPTH (pg/ml)	1.032 (1.020-1.044)	<0.001	1.037 (1.021-1.053)	<0.001	

This study suggests an association between mineral metabolism disturbance and the presence and severity of CAVD in patients with normal or mildly impaired renal function. Abnormal bone turnover may be a potential mechanism.

Innovation points

• The patient population differs from previous studies

• In addition, serum levels of bone turnover biomarkers, including osteocalcin, procollagen I N-terminal peptide (PINP), and β -isomerized type I collagen C-telopeptide breakdown products (β -CTx), were measured to elucidate the possible mechanisms.