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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

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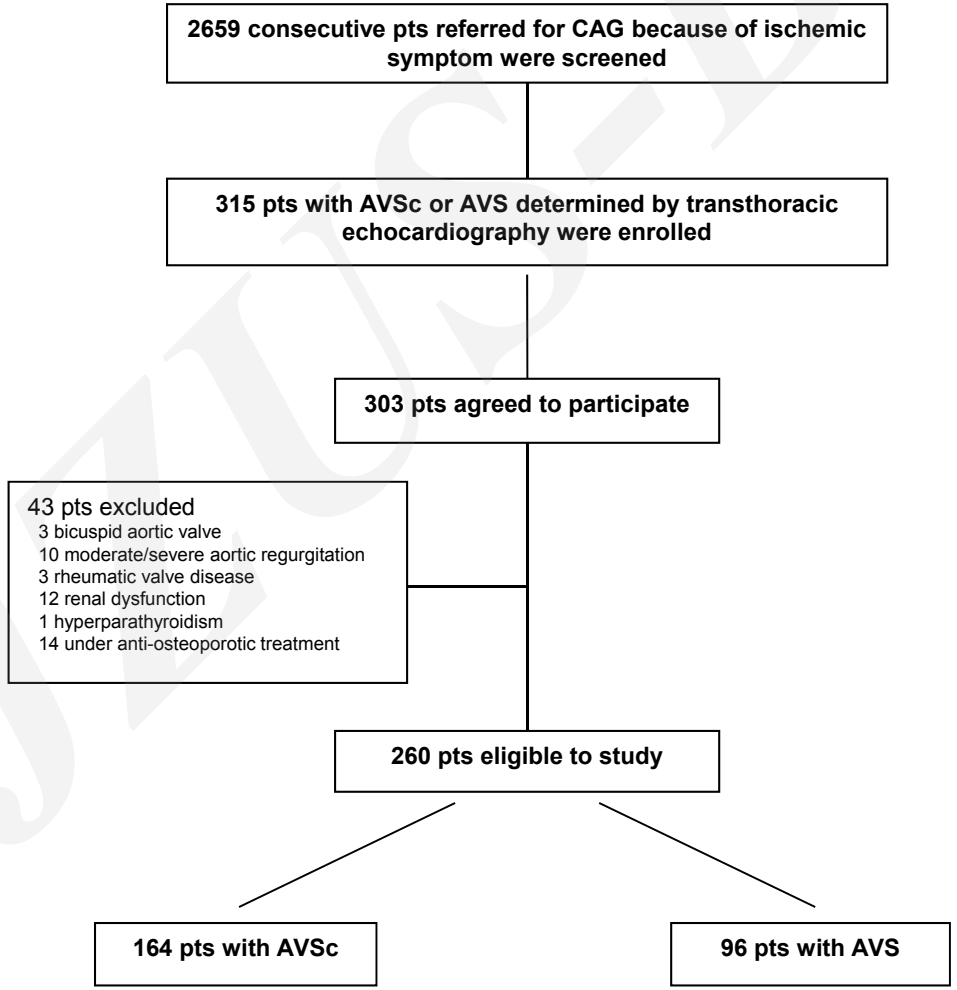
Research Summary

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.

Flowchart of patient enrollment



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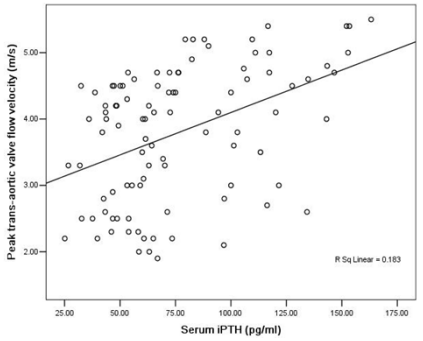
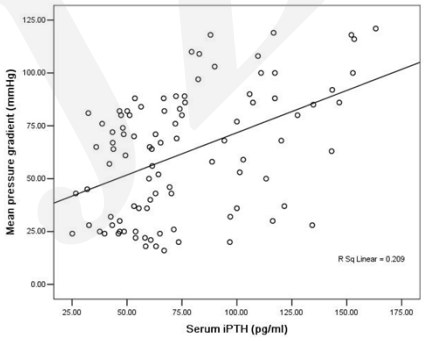
Results and Conclusion

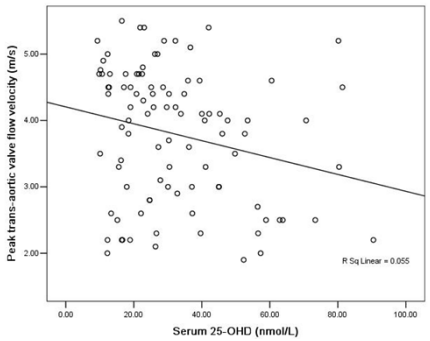
Mineral metabolism parameters and biomarkers of bone turnover

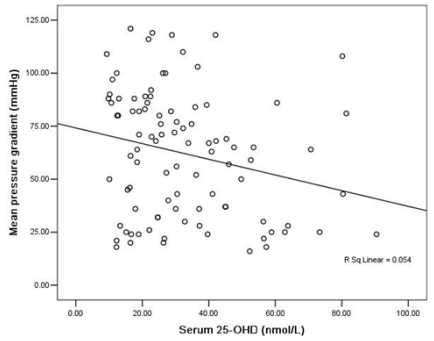
Variable	Controls (n=164)	Patients with AVSc (n=164)	Patients with AVS (n=96)	P_1 Value	P_2 Value
Mineral metabolism parameters					
Serum calcium (mg/dl)	8.39±0.44	8.79±0.33	9.11±0.57	<0.001	<0.001
Serum phosphate (mg/dl)	3.06±0.54	3.75±0.57	4.38±1.05	<0.001	<0.001
iPTH (pg/ml)	37.88±13.11	55.97±17.96	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.

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