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Vitamin D deficiency accentuate anti-proteinuria effect of calcitriol in Patients with Chronic Kidney Disease: A Randomized Controlled Trial

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Objectives: Vitamin D had shown efficacy in the reduction of proteinuria in patients with chronic kidney disease. This study aimed to determine the effect of low dose oral calcitriol (0.25μg, 3 times per week) on urinary protein excretion in patients with chronic kidney disease and vitamin D deficiency.

Methods: Sixty patients with chronic kidney disease (CKD) with an estimated GFR > 15 ml/min, and were on a stable dose of an angiotensin converting enzyme inhibitor (ACEi) or angiotensin receptor blocker (ARB) were studied for 24 weeks. Patients were randomly allocated to 2 groups. Group I received oral vitamin D (calcitriol) 0.25 mcg three times per week. Patients were followed up every 8 weeks. Urine protein/creatinine ratio (uPCR) was measured and blood was drawn for biochemistry tests before the study and during each follow-up visit

Results: There was no significant difference in baseline uPCR between control and vitamin D treatment groups. UPCR decreased significantly at 8 weeks, 16 weeks and 24 weeks ($p < 0.05$ vs. baseline) in vitamin D treatment group. In addition, uPCR were significantly lower in vitamin D treatment group than in control group at week 8, 16 and 24 ($p <0.05$). There was positive correlation between reduction of uPCRs at 24 weeks and the baseline serum level of 25-(OH) D in the vitamin D treatment group ($r = 0.738$, $p < 0.001$). There was no significant difference in blood pressure, serum creatinine, eGFR, glucose, ionized calcium and phosphorus between control and vitamin D treatment groups during follow-up.

Conclusions: Low dose Calcitriol administration in addition to stable RAAS inhibitiors led to a significant reduction in proteinuria in patients with CKD and vitamin D deficiency. Patients with lower baseline serum 25-(OH) D have a higher reduction of uPCR in the vitamin-D treatment group which is independent of BP and renal function change.

Table 1. Efficacy analysis.

TABLE 2.

	Baseline		Week 8		Week 16		Week 24	
	Control	Vitamin D	Control	Vitamin D	Control	Vitamin D	Control	Vitamin D
uPCR (g/g)	1.84 ± 0.83	2.02 ± 0.97	1.92 ± 0.92	1.64 ± 0.77 [a,b]	1.78 ± 0.90	1.57 ± 0.74 [a,b]	1.84 ± 0.81	1.35 ± 0.64 [a,b]
Serum Cr (mg/dl)	2.23 ± 0.43	2.35 ± 0.34	2.28 ± 0.48	2.41 ± 0.28	2.25 ± 0.45	2.36 ± 0.32	2.31 ± 0.43	2.42 ± 0.24
eGFR (ml/min)	30.8 ± 6.7	27.1 ± 5.6	30.1 ± 7.0	26.2 ± 4.3	30.6 ± 7.1	27.0 ± 5.0	29.6 ± 6.3	25.5 ± 3.8
Blood pressure (mmHg)								
Systolic	134 ± 8	136 ± 8	134 ± 8	136 ± 7	134 ± 8	136 ± 8	134 ± 8	135 ± 8
Diastolic	70 ± 7	70 ± 7	70 ± 7	70 ± 6	70 ± 7	71 ± 7	69 ± 7	70 ± 7
Serum albumin (g/dl)	4.17 ± 0.21	4.09 ± 0.22	4.11 ± 0.20	4.04 ± 0.19	4.23 ± 0.18	4.13 ± 0.15	4.13 ± 0.19	4.10 ± 0.18
Serum iPTH (pg/ml)	117 ± 33	125 ± 27	118 ± 36	75 ± 17 [a,b]	121 ± 32	73 ± 13 [a,b]	119 ± 32	65 ± 14 [a,b]
Serum phosphorus (mg/dl)	3.50 ± 0.27	3.55 ± 0.21	3.52 ± 0.27	3.46 ± 0.25	3.59 ± 0.23	3.44 ± 0.22	3.48 ± 0.33	3.51 ± 0.24
Serum ionized Ca (mg/dl)	4.61 ± 0.28	4.59 ± 0.24	4.59 ± 0.24	4.68 ± 0.25	4.64 ± 0.26	4.60 ± 0.25	4.59 ± 0.29	4.64 ± 0.25
25(OH)D (nmol/L)	26.1 ± 2.0	25.3 ± 2.1	25.6 ± 1.9	24.6 ± 2.0	25.9 ± 2.0	24.8 ± 2.0	25.2 ± 2.0	25.4 ± 2.1

Abbreviations: [a]: $p < 0.05$ vs. baseline; [b]: $p < 0.05$ vs. control; uPCR: urine protein to creatinine ratio; iPTH: intact parathyroid hormone; Ca: calcium; eGFR: estimated glomerular filtration rate; Cr: creatinine; 25(OH)D: 25-hydroxyvitamin D.

Figure 1. Correlation between change of uPCR at 24 weeks and baseline 25-hydroxy vitamin D levels in vitamin D treatment group.