

Renal handling of zinc in chronic kidney disease patients and the role of circulating zinc levels in renal function decline

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Abstract

Background: Zinc deficiency is commonly encountered in chronic kidney disease (CKD). The aims of this study were to assess whether zinc deficiency was related to increased renal excretion of zinc and to the progression of CKD.

Methods: Plasma and 24-h urinary zinc levels, urinary electrolytes and uromodulin were measured in 108 CKD patients and 81 individuals without CKD. Serum creatinine values were collected for 3 years to calculate the yearly change in estimated glomerular filtration rate (eGFR). Multivariable regression analysis was performed to assess the association between baseline zinc levels and yearly change in eGFR.

Results: CKD patients had lower circulating zinc levels and higher 24-h urinary zinc excretion than non-CKD participants (612.4 ± 425.9 versus 479.2 ± 293.0 $\mu\text{g/day}$; $P = 0.02$). Fractional excretion (FE) of zinc was higher and it significantly increased at more advanced CKD stages. Zinc FE was correlated negatively with 24-h urinary uromodulin excretion ($r = -0.29$; $P < 0.01$). Lower baseline plasma zinc levels were associated with a faster yearly decline of renal function in age, gender, diabetes and hypertension adjusted models, but this relationship was no longer significant when baseline eGFR or proteinuria were included.

Conclusions: Zinc levels are lower in CKD, and not compensated by reduced renal zinc excretion. The inverse association between urinary zinc excretion and uromodulin possibly points to an impaired tubular activity, which could partly account for zinc imbalance in CKD. These data suggest that zinc status is associated with renal function decline, but further studies elucidating the underlying mechanisms and the potential role of zinc supplements in CKD are needed.