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High cortisol levels are associated with oxidative stress and mortality in maintenance hemodialysis patients

Seyeon Park[1], Yo Seop Cha[1], AJin Cho[1], Do Hyoung Kim[1], Young-Ki Lee[1], Myung-Jin Choi[2], Seok-hyung Kim[3], Hyunsuk Kim[3], Jong-Woo Yoon[3], Hayne Cho Park[1]
[1]Department of Internal Medicine-Nephrology, Kangnam Sacred Heart Hospital, Korea, Republic of
[2]Department of Internal Medicine-Nephrology, Korean Armed Forces Capital Hospital, Korea, Republic of
[3]Department of Internal Medicine-Nephrology, Chuncheon Sacred Heart Hospital, Korea, Republic of

Objectives: Chronic stimulation of the mineralocorticoid receptor has been suggested as one of the potential causes of cardiovascular events and death in patients with end-stage renal disease. This observational cohort study was performed to demonstrate that serum cortisol might be a predictive marker for patient mortality and to evaluate its association with oxidized low-density lipoprotein (oxLDL) in hemodialysis (HD) patients.

Methods: Patients receiving HD three times a week were screened for enrollment at two institutions. Baseline cortisol levels were measured before each HD session, and the patients were divided into two groups according to the median value of serum cortisol before analysis. The baseline characteristics and laboratory values of the high and low cortisol groups were compared. Serum cortisol, adrenocorticotropic hormone, renin, aldosterone, and oxLDL were measured in 52 patients to evaluate the effect of oxidative stress on serum cortisol levels.

Results: A total of 133 HD patients were enrolled in this cohort study. Compared to the patients with low serum cortisol levels, the patients with high serum cortisol levels (baseline cortisol ≥ 10 μg/dL) showed higher rates of cardiovascular disease (59.7% vs. 39.4%, P=0.019) and left ventricular systolic dysfunction (LVSD) (25.9% vs. 8.0%, P=0.016). The patients in the high cortisol group demonstrated higher all-cause mortality than those in the low cortisol group. The serum cortisol level was an independent risk factor for patient mortality (hazard ratio 1.234, 95% confidence interval 1.022-1.49, P=0.029). Among the 52 patients with oxLDL measurements, oxLDL was an independent risk factor for elevated serum cortisol levels (Exp(B) 1.114, P=0.013) and LVSD (Exp(B) 12.308, P=0.045). However, plasma aldosterone levels did not affect serum cortisol levels.

Conclusions: Serum cortisol is a useful predictive marker for all-cause death among patients receiving HD. OxLDL is an independent marker for elevated serum cortisol among HD patients.