IMPAIRED FUNCTION OF THE CORTISOL-CORTISONE-CONVERSION IN PATIENTS WITH CHRONIC KIDNEY DISEASE

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Introduction

The activity of 11-β-Hydroxysteroid dehydrogenase (11-β-HSD) plays a crucial role in regulating blood pressure (BP) by metabolizing cortisol, a potential mineralocorticoid, to cortisone, an inactive steroid. The major sites of action of 11-β-HSD are thought to be renal tubules. However, it is unknown how the activity of this enzyme changes in line with the degree of chronic kidney disease (CKD). We evaluated the 11-β-HSD activities and compared them between moderate stage CKD patients and advanced stage CKD patients..

Materials and Methods

Twenty-two patients with CKD grade 4 and above (the advanced group, men/women, 13/9; mean age, 57±11 years; estimated glomerular filtration rate<30 mL/min) and age- and sex-matched fourteen patients with CKD grades 2 and less (the moderate group, men/women, 8/6; mean age, 55±13 years; estimated glomerular filtration rate>60 mL/min) were examined (Table). In all subjects, after the measurement of BP, blood samples were obtained from renal veins, inferior vena cava (IVC), and femoral arteries. Conversion ratios from cortisol to cortisone as an index of the metabolic rates were calculated by the ratio of absolute differences in concentrations between cortisol and cortisone in the venous bloods to the cortisol concentrations in arterial bloods, and concentration ratios between cortisol and cortisone in the renal veins to evaluate the cortisol-cortisone-conversion. Informed consent was obtained from each subject.

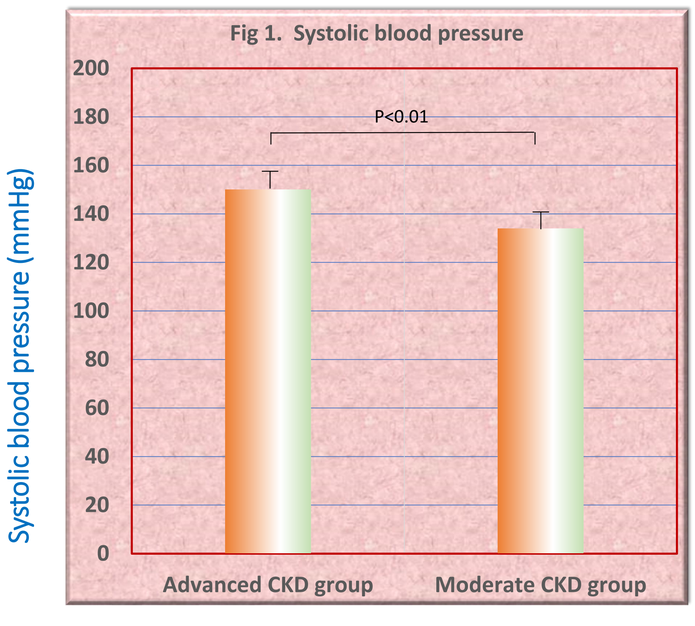
Conclusions

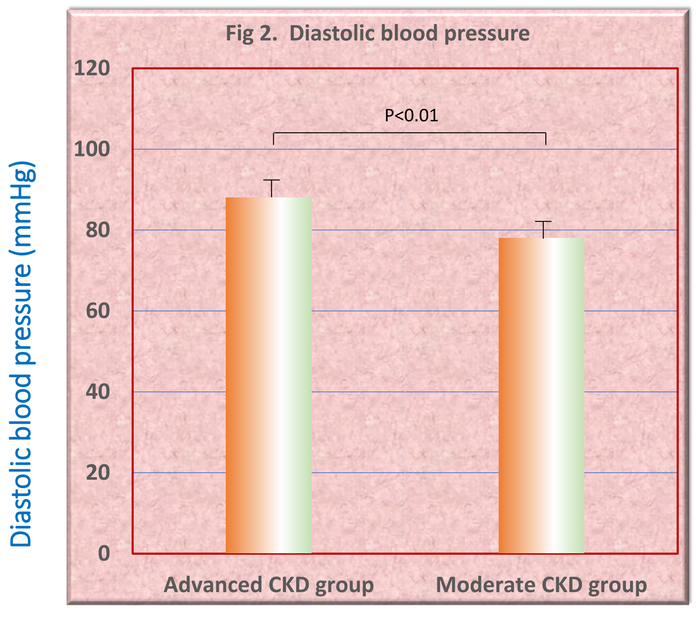
Our study suggests that the impaired cortisol-cortisone-conversion contributes to the increase in BP through decreasing the conversion from cortisol to cortisone in patients with advanced CKD.

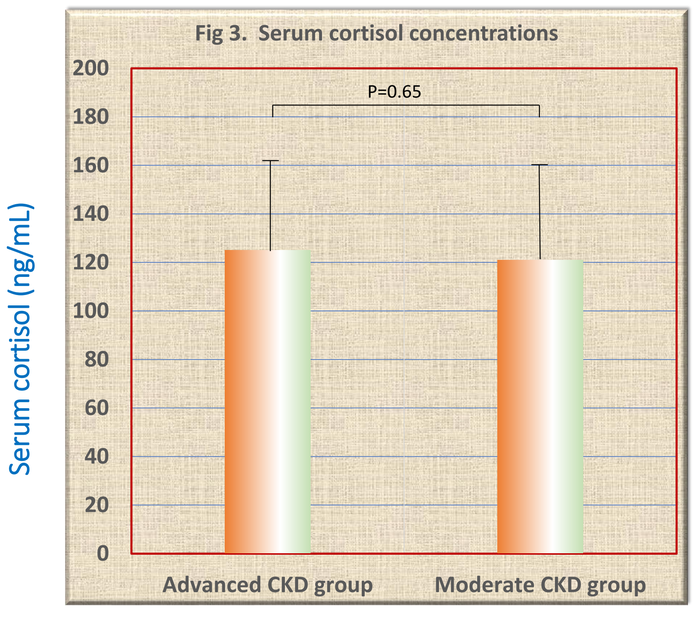
Results

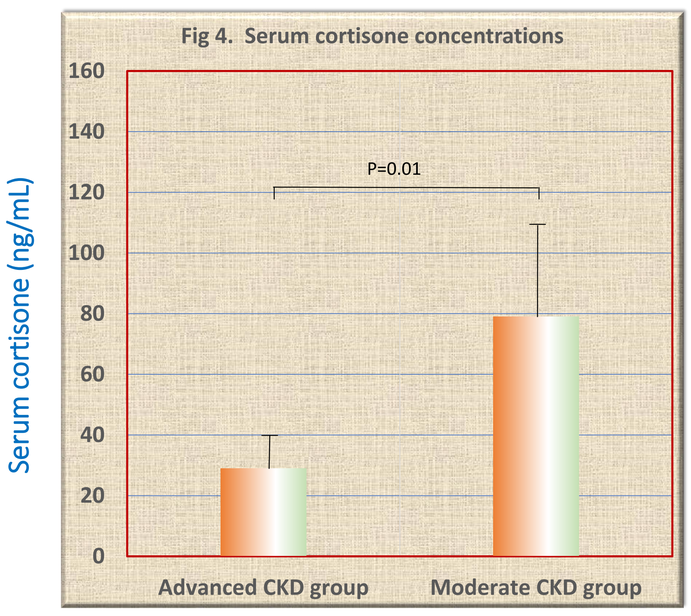
The advanced group showed higher (P<0.01) systolic BP (150±14 mmHg) and diastolic BP (88±10 mmHg) than those (134±12 mmHg and 78±9 mmHg) in the moderate group (Figures 1, 2). Serum cortisol concentrations obtained from the renal veins in the advanced group were 125±49 ng/mL, which was as high as 121±46 ng/mL in the moderate group (Figure 3). Serum cortisone concentrations obtained from the renal veins in the advanced group were 29±16 ng/mL, which was lower (P=0.01) than 79±32 ng/mL in the moderate group (Figure 4). The cortisol/cortisone concentration ratios in renal veins were 4.2±0.6 in the advanced group, which was significantly higher (P<0.01) than 1.5±0.5 in the moderate group (Figure 5). The conversion ratios of differences in the venous blood concentrations between cortisol and cortisone to cortisol concentrations in the arterial blood were 0.19±0.14 in the moderate group, which was significantly lower (P<0.01) than 0.32±0.07 in the advanced group (Figure 6).

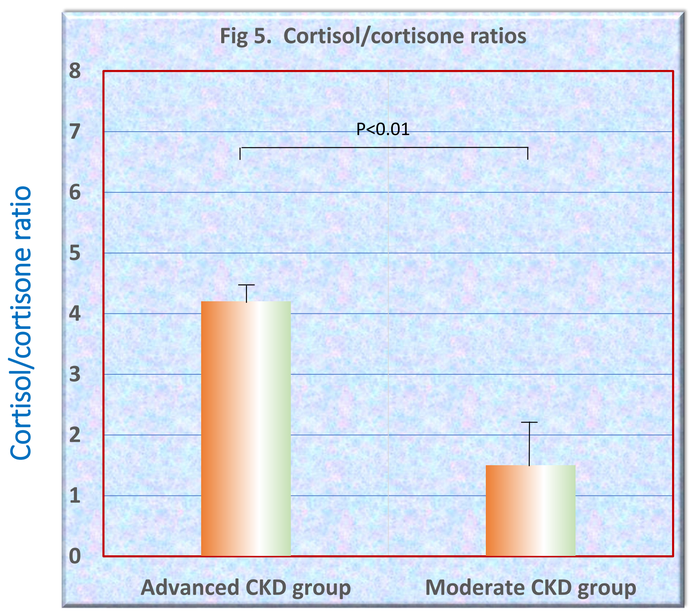
Table	Advanced CKD group	Moderate CKD group
• Number	21	14
• Age(years old)	57±11	55±13
• Men/women	13/9	8/6
• Serum creatinine concentrations (mg/dL)	5.1±1.7	1.5±0.6
• Serum potassium concentrations (mEq/L)	4.5±1.6	4.4±1.3
• Estimated glomerular filtration rate (ml/min/1.73m^3)	22±6	76±9

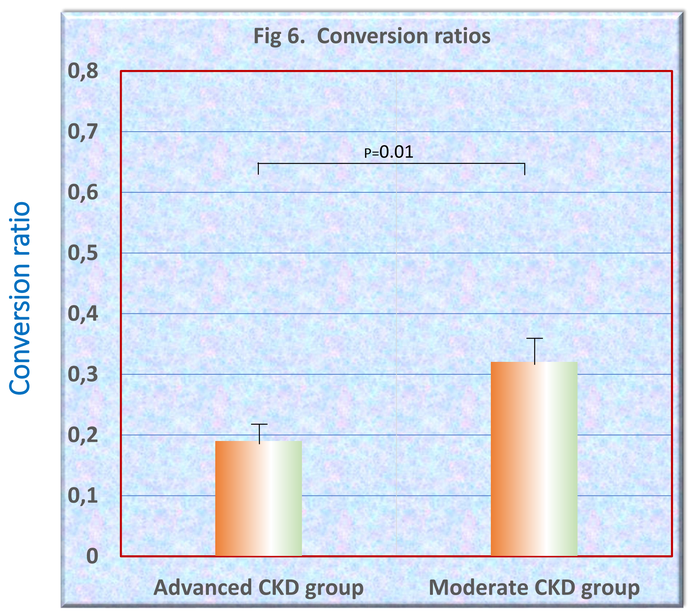












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