KSN 2020
FULLY VIRTUAL MEETING

Abstract Type : Oral
Abstract Submission No. : OR-1584

The impact of chronic kidney disease on renal circadian clock system

Yina Fang, Myung-Gyu Kim, Jihyun Yang, Yoon Sook Ko, Hee Young Lee, Se Won Oh, Sang-Kyung Jo, Won Yong Cho
Department of Internal Medicine-Nephrology, Korea University Anam Hospital, Korea, Republic of

Objectives: Most physiological functions exhibit circadian rhythmicity, which are regulated in part by endogenous molecular machinery of circadian clock. However, little is known how renal circadian rhythm is affected in CKD. Here, we examined the effect of CKD on the circadian clock system of renal functions in mice.

Methods: To induce CKD, C57BL/6 mice was administered with adenine for 2 weeks and housed for 4weeks under 12:12 light/dark conditions. In CKD and control mice, renal function was assessed day and night by measuring glomerular filtration rate (GFR) through transcutaneous measurement of FITC-sinistrin, and by measuring urine osmolarity and electrolyte excretion. The circadian expression of renal clock genes and tubular transporters was also examined.

Results: In control mice, GFR increased at night period (Zeitgeber time, ZT14) and decreased at day period (ZT2), but this circadian pattern was attenuated in adenine-induced CKD mice. Similarly, urine osmolarity and excretion of sodium and potassium displayed high level at dark period and low level at light period, which were also disrupted in CKD mice. The renal functional circadian rhythms in control mice were associated with circadian expression of Per1 and BMAL, and CKD mice had blunted circadian oscillating of clock genes, which suggests that kidney specific clock genes are coupled with the disrupted circadian rhythm of renal functions. However, the mRNA expressions of tubular transporters such as ENaC, Na^+-K^+ ATPase, and SGLT2 did not show significant difference between control and CKD mice. And both control and CKD mice displayed similar pattern of urine volume.

Conclusions: CKD interferes with the circadian rhythm of GFR, electrolyte excretion and renal clock gene expression. These results suggest that disruption of the circadian clock system at molecular level may impair circadian regulation of renal function.