Urinary Osmolar Gap and Long-term Outcomes in Chronic Kidney Disease

Naoto Matsumoto[1], Takuya Fujimaru[1], Sachiko Ohde[2], Yasuhiro Komatsu[1]

1:Department of internal medicine, Division of Nephrology St. Luke's International Hospital, Tokyo, Japan
2:Center for Clinical Epidemiology, Graduate School of Public Health, St. Luke´s International University, Epidemiology, Tokyo, JAPAN.

BACKGROUND

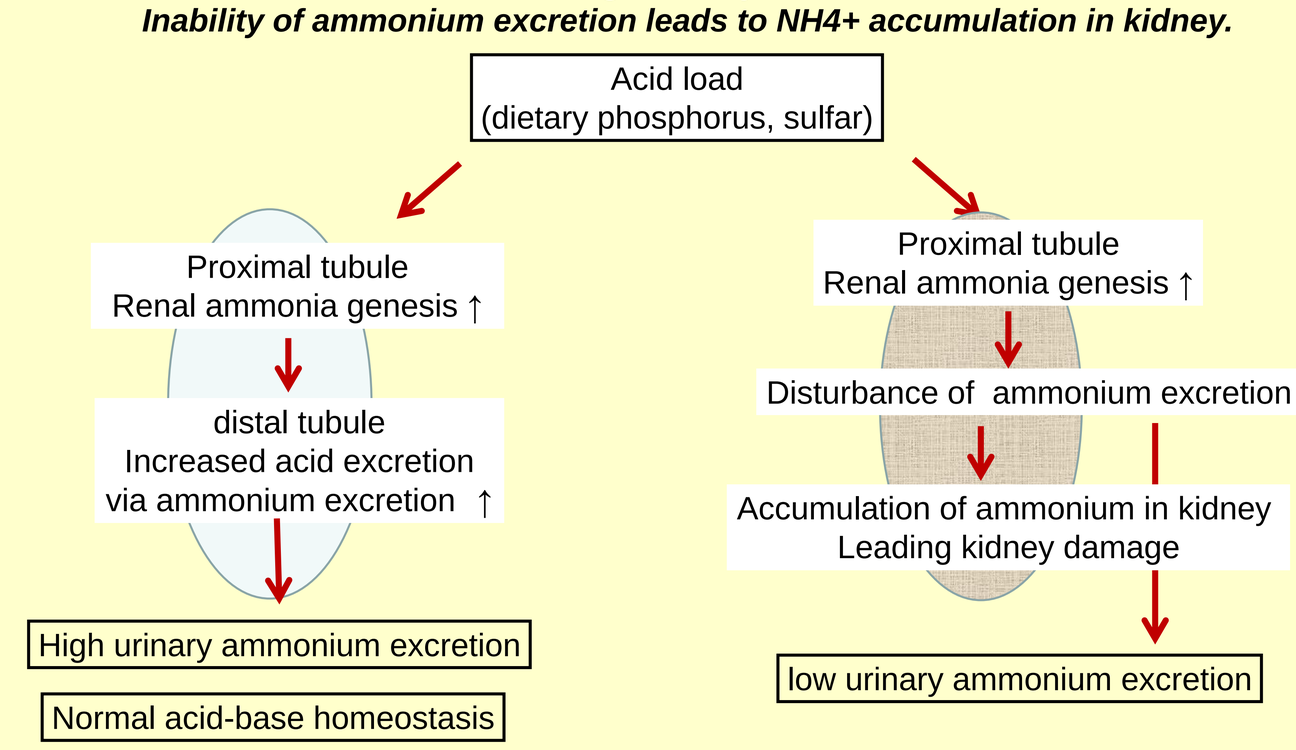
Metabolic acidosis is associated with a higher risk of progression of chronic kidney disease. Urinary ammonium excretion is a key determinant of renal acid-base regulation. Previous study showed that lower urinary ammonium excretion is associated with higher risk of progression of chronic kidney disease. Hospital laboratory does not routinely measure urine ammonium concentration; however, urine osmolar gap, which can be measured by routine hospital laboratories, is strongly correlated with urine ammonium concentration.

OBJECTIVES

The aim of the present study is to clarify the association between urine osmolar gap and progression of chronic kidney disease.

Acid-base homeostasis in the kidneys

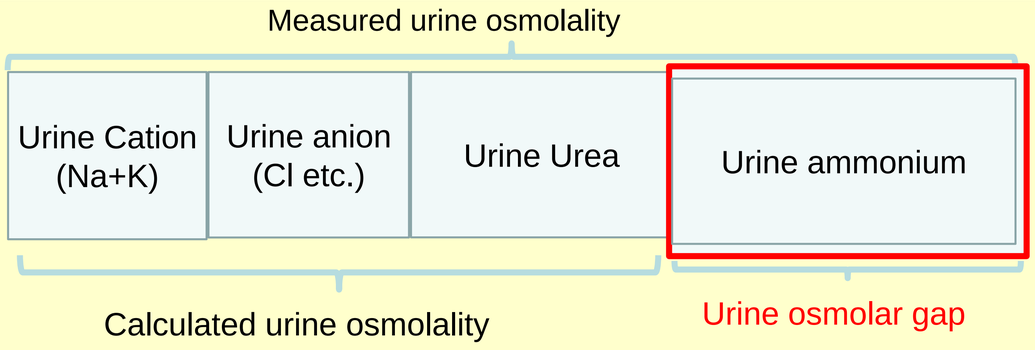
Renal ammonium excretion regulates systemic acid-base homeostasis. Inability of ammonium excretion leads to NH4+ accumulation in kidney.



METHODS

A retrospective cohort study was conducted on CKD(G3a-4) patients who are managed at our CKD clinic, from July 2003 to April 2016 at a general hospital in Tokyo, Japan. Urinary osmolar gap measured at the first patients' visit was used for the analysis. We followed the previously reported methodology to calculate Urine osmolar(Uosm)gap.We defined ESRD as start of renal replacement therapy including hemodialysis, peritoneal dialysis or kidney transplantation. To determine whether low urinary osmolar gap is higher risk of End Stage Renal Disease(ESRD), multivariate cox proportional hazard ratio was applied to calculate adjusted hazard ration of Uosm gap <25 to ESRD. Model was adjusted by age, gender, systolic blood pressure, history of diabetes, eGFR<30.

- $\frac{\text{Urine osmolar gap}}{2} \fallingdotseq \text{urine } NH_4^+$
- Urine osmolar (Uosm) gap =measured Uosm-calculated Uosm
- Calculated Usom = $(Na+K) \times 2 + \frac{\text{urea nitrogen}}{2.8}$



RESULTS

Two hundred and six patients were included with a mean age of 66.4±12.4 years old, 79.1% male, mean eGFR of 32.7±11.3 ml/min./1.73m², systolic and diastolic blood pressure 130±19.0/75±13mmHg, 22.8% have cardiovascular disease, 40.3% have history of smoking and 40.8% is diagnosis of diabetes. Thirty five patients started renal replacement therapy during study period.(Table1)
ESRD patient tend to have higher rates of eGFR under 30 (82.1% vs. 37.7%) and higher rate of osmolar gap under 25 (66.7% vs. 48.5%), higher systolic blood pressure (136±21.7 mmHg vs. 129±18.1 mmHg) and higher diastolic blood pressure (79.9±11.1 mmHg vs. 73.9±13.2 mmHg) compared with non-ESRD patient. Adjusted HR for Uosm<25 was 2.35 (95% CI 1.17-4.74 p=0.02) (Table2)

Table 1

Characteristics		All(N=206)	ESRD(+)	ESRD(-)	P value
Age		66.4±12.4	65.6±13.1	66.5±8.7	0.69
male		163(79.1)	132(79)	31(79.5)	0.95
DM(+)		84(40.8)	16(41)	68(40.7)	0.97
eGFR=>30		95(46)	32(82.1)	63(37.7)	<0.001
Osm<=25		107(51.9)	26(66.7)	81(48.5)	0.04
SBP		130.5±19.0	136±21.7	129±18.1	0.04
DBP		75±13.0	79.9±11.1	73.9±13.2	0.009
Smoking	Past	67(32.5)	12(34.3)	55(37.2)	0.81
	Current	16(7.8)	4(11.4)	12(34.3)	
	Never	123(59.7)	19(54.3)	81(54.7)	

Table 2

	HR	95% CI	P
Osmolargap<=25	2.35	1.17-4.74	0.02
Sex	1.67	0.74-3.79	0.22
Diabetes	0.92	0.47-1.78	0.79
Systolic BP	1.02	1.01-1.04	0.003
eGFR <30	10.16	4.23-24.4	0.00
Age	1.00	0.97-1.03	0.88

event =ESRD
Adjusted by Age,gender,sBP, history of Diabetus eGFR<30

CONCLUSIONS

Low urinay osmolar gap is associated with higher risk of developing ESRD.

REFERENCES:

Shah et al., Am J Kidney Dis, 2009
Vallet et al., Kidney International, 2015

54 ERA
314--MP
CKD - GFR and laboratory methods
Naoto Matsumoto
DOI: 10.3252/pso.eu.54ERA.2017
ePosters supported by F. Hoffmann- La Roche Ltd.