Urinary biomarkers in different diuretic response groups with heart failure

Purpose: Predicting diuretic response in different hemodynamic profiles is challenging in heart failure patients. Worsening renal function with diuretic therapy leads to decision making more difficult. Spot urinary sodium is an important milestone to determine decongestion therapy intensity. Serum biomarkers are widely used for diagnosis and follow up but more urinary biomarkers can be identified for risk stratification.

Methods: We enrolled 61 patients with decompansated heart failure on the first day of admission. Baseline characteristics and urinary biomarkers were recorded. Diuretic response was classified as good or poor response groups according to spot urine sodium within second hour after first intravenous diuretic administration. Quantitative variables were specified as mean ± standard deviation, categorical variables were specified as frequency and percentage. Mean differences were assessed with Student-T test and Welch test. Statistically significant parameters were also assessed with logistic regression analysis.

Results: Only U/P creatinine ratio and urine creatinine were statistically lower in good diuretic response group ($p<0.0001$). Fractional excretion of urea and potassium were higher in good response group ($p<0.0001$ and $p<0.005$). Urinary sodium to potassium ratio, UNa/UCr and UK/UCr are also statistically higher in the good response group ($p<0.0001$). Sodium associated parameters (UNa/UK, UNa/UCr) and urinary creatinine were also significant in logistic regression.

Discussion: Urinary biomarkers are not well defined parameters in heart failure patients but these parameters may be more dynamic than serum parameters as spot urine sodium. Our data indicates that poor response group has a more prerenal phenotype than good response group.

Parameter	Definition
FeUrea	Fractional excretion of urea, not affected by diuretics (<35 indicates prerenal state)
UNa/UK	Urinary sodium to potassium ratio, diuretic response measure (<1 indicates poor diuretic response)
UNa/UCr	Urinary sodium to creatinine ratio, FeNa for HF (measure of natriuresis)
FeK	Fractional excretion of potassium, stressed kidney measure (>10%)
UCr	Urinary creatinine
UK/UCr	Urinary potassium to creatinine ratio (>0.5 indicates non adapted oliguria)
UCr/PCr	Urinary creatinine to plasma creatinine ratio, prerenal determinant (>40 indicates prerenal state)

Table 1. Urine biomarker definitions

	Poor response group	Good response group	P value
UNa (urinary sodium-mg/dl)	28±11	95±24	p<0.0001
UNa/UK	0.8±0.4	5.8±3.7	p<0.0001
UNa/Ucr	0.5±0.4	8±8.5	p<0.0001
UK/Ucr	0.6±0.2	1.1±0.6	p<0.0001
UCr/PCr	48.5±22.1	19.2±21.5	p<0.0001
UCr	65.3±26.2	23.5±19.5	p<0.0001
FeUrea	63.9±23.3	97.2±31.4	p<0.0001
FeK	22.4±14.4	33.5±15.3	p<0.005
GFR (ml/min)	54±22	57±24	p=0.56
Ejection Fraction (%)	28±13	30±12	p=0.52
TAPSE (mm)	12.1±3.9	13.6±3.4	p=0.105
NTproBNP (pg/ml)	10267±10741	8419±8401	p=0.402
Length of hospital stay (day)	15.6±10.8	8.5±6.1	p>0.0001
Daily furosemide dose (mg)	237.9±204.7	129.3±83.5	p=0.001

Table 2. Results