

Serial measurement of urinary NGAL can predict worsening kidney function and recovery from AKI in ICU population

Maki Tsukamoto, Kent Doi, Daisuke Katagiri, Kousuke Negishi, Toshiro Fujita, Takehiro Matsubara, Naoki Yahagi, Eisei Noiri



Abstract

Serial measurement of urinary NGAL was evaluated with 274 adult critically ill patients in mixed ICU. 64 patients showed worsening kidney function after admission, and 69 of 159 AKI patients (43%) patients recovered renal function.

Based on the magnitude of urinary NGAL change for 24 hr (i.e. absolute delta), patients were divided into three groups as follows; the increasing group (the highest quartile, $\Delta > 46$ ng/ml), the decreasing group (the lowest quartile, $\Delta < -22$ ng/ml), and the stable/persistent group (Δ was within IQR).

Urinary NGAL could predict worsening in the stable/persistent and the increasing groups, but not in the decreasing group. In contrast, urinary NGAL could predict recovery from AKI only in the stable/persistent and the decreasing groups.

In conclusion, urinary NGAL can predict worsening renal function and recovery from AKI when its absolute change increased and decreased, respectively.

Objectives

This study evaluated whether serial measurement of urinary NGAL within 24 hr after ICU admission was able to predict worsening renal function and recovery of AKI.

Methods

Prospective observational study

Inclusion: Adult critically ill patients who were treated in mixed ICU of the University of Tokyo.

Exclusion: Patients who showed anuria or died within 24 hr. End-stage renal disease patients.

Measurement: Urinary NGAL was measured at ICU admission (day 1) and 24 hr after (day 2) by ELISA.

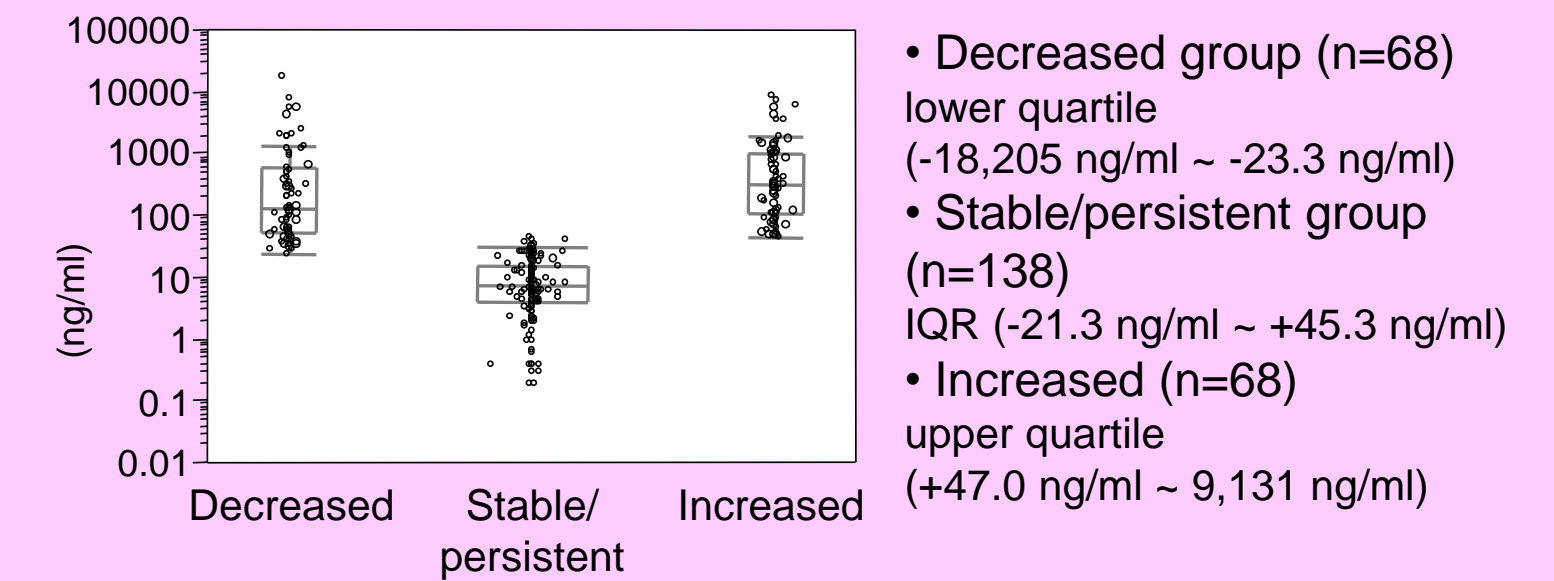
Outcomes: Diagnosis and severity of AKI was determined by the RIFLE Cre criteria with one exception; the patients who needed RRT were categorized as Failure (i.e. stage 3). Worsening of AKI was determined by increased severity of the RIFLE class. Recovery of AKI was determined by a reduction of serum Cre from the peak to less than 0.3 mg/dl above baseline.

Results

Patient characteristics and outcomes

	Non-AKI (n=115)	AKI (n=159)	P value
Age	60.2±1.6	62.3±1.3	0.372
Male, n (%)	66 (57.4)	98 (61.6)	0.480
DM, n (%)	18 (15.7)	30 (18.9)	0.488
HT, n (%)	44 (38.3)	69 (43.4)	0.394
Baseline Cre (mg/dl)	0.67±0.07	1.05±0.06	0.0002
Cre at ICU admission (mg/dl)	0.72±0.18	2.62±0.15	<0.0001
Sepsis	29 (25.2)	79 (49.7)	<0.0001
14-day mortality	0 (0)	14 (8.8)	0.00037
ICU stay (day)	4 (2-8)	6 (3-10)	0.0101

Changes of urinary NGAL between Day 1 and Day 2



Area under the curve of ROC analysis: Worsening renal function

	Day 1	Day 2	Ave	Max	Min	D2-D1	D2-D1 /D1
All (n=227)	0.78* [0.70-0.84]	0.83* [0.77-0.88]	0.82* [0.76-0.87]	0.82* [0.75-0.87]	0.81* [0.74-0.86]	0.64* [0.54-0.73]	0.56 [0.48-0.64]
Inc (n=48)	0.74* [0.57-0.86]	0.77* [0.60-0.88]	0.76* [0.59-0.88]	0.77* [0.60-0.88]	0.74* [0.57-0.86]	0.73* [0.56-0.85]	0.59 [0.42-0.74]
Stable (n=131)	0.81* [0.65-0.90]	0.84* [0.72-0.92]	0.84* [0.71-0.92]	0.85* [0.72-0.92]	0.82* [0.67-0.91]	0.53 [0.38-0.68]	0.53 [0.41-0.65]
Dec (n=48)	0.58 [0.40-0.75]	0.65 [0.47-0.79]	0.60 [0.42-0.76]	0.58 [0.40-0.75]	0.65 [0.47-0.79]	0.46 [0.29-0.63]	0.63 [0.46-0.78]

Area under the curve of ROC analysis: Recovery from AKI

	Day 1	Day 2	Ave	Max	Min	D2-D1	D2-D1 /D1
All (n=159)	0.69* [0.60-0.77]	0.75* [0.66-0.82]	0.72* [0.63-0.79]	0.71* [0.62-0.78]	0.73* [0.65-0.81]	0.61* [0.52-0.69]	0.45 [0.35-0.54]
Inc (n=60)	0.61 [0.42-0.76]	0.60 [0.41-0.77]	0.59 [0.40-0.76]	0.60 [0.41-0.77]	0.61 [0.42-0.76]	0.42 [0.25-0.61]	0.63 [0.45-0.77]
Stable (n=47)	0.87* [0.74-0.95]	0.81* [0.65-0.91]	0.84* [0.69-0.93]	0.82* [0.66-0.91]	0.87* [0.73-0.94]	0.57 [0.39-0.72]	0.65 [0.48-0.79]
Dec (n=52)	0.64 [0.47-0.77]	0.71* [0.55-0.83]	0.65 [0.49-0.78]	0.64 [0.47-0.77]	0.71* [0.55-0.83]	0.57 [0.41-0.72]	0.72* [0.56-0.84]

