Acute kidney injury in critically ill patients with sepsis: a step toward an earlier prediction

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Argomento: Funzione renale e metabolica in terapia intensiva

Background: In critically ill patients, early recognition of acute kidney injury (AKI) is of pivotal importance. However, creatinine-based methods are untimely and have several limitations. Recently, biomarkers have been proposed as early predictors of AKI in the ICU. The aim of our study was to investigate the role of urinary plasma neutrophil gelatinase associated lipocalin (uNGAL) measured at sepsis onset as an early predictor of AKI in critically ill patients with sepsis.

Methods: Critically ill adult patients with sepsis, diagnosed according to Sepsis-3 criteria, were enrolled. Exclusion criteria were pregnancy, renal dysfunction at sepsis onset, immunosuppression and hematologic diseases. At sepsis onset, age, Charlson Comorbidity Index, Apache II score on admission, site and etiology of infection, administered antibiotic therapy, uNGAL, serum creatinine levels, eGFR, WBC count, procalcitonin, presepsin, SOFA score and serum lactate were measured. AKI was defined according to KDIGO criteria.

Results: Out of 55 enrolled patients, 16 patients developed AKI. Demographic and clinical characteristics of AKI and no AKI patients are presented in *Table 1*. The median time of AKI development was 5 days (IQR 4-8). AKI patients showed higher uNGAL, creatinine, eGFR and PCT levels at sepsis onset, as compared to no AKI patients (*Table 2*). In the backward stepwise analysis, the only predictors of AKI development at sepsis onset were uNGAL (T-value 1.99, p-value 0.02) and septic shock (T-value 2.21, p-value 0.03).

Conclusions: In ICU, uNGAL at sepsis onset is a strong predictor of AKI development. This biomarker could increase awareness of clinicians and encourage them to optimize their interventions, in order to prevent further evolution to kidney injury.

	Whole sample	AKI patients	Non AKI patients
n. (%)	*55*	**16**	**39**
Age, y	*59 (39-74)*	**67 (49-79)**	**54 (35-71)***
Male, n. (%)	*33 (60)*	**11 (69)**	**22 (56)**
CCI	*2 (0-4)*	**3 (1-5)**	**1 (0-4)***
Apache II	*14 (9-19)*	**14 (9-19)**	**13 (8-18)**
Type of admission: surgical or trauma, n. (%)	*31 (56)*	**9 (56)**	**21 (54)**
Shock, n. (%)	*42 (76)*	**16 (100)**	**26 (67)***
Site of infection, n. (%)			
CAP/HAP	*34 (62)*	**10 (63)**	**24 (62)**
BSI	*12 (22)*	**5 (31)**	**7 (18)**
IAI	*5 (9)*	**2 (13)**	**3 (8)**
UTI	*1 (2)*	**0 (0)**	**1 (3)**
Others	*3 (5)*	**0 (0)**	**3 (8)**
Etiology, n. (%)			
G+	*18 (33)*	**3 (19)**	**15 (38)**
G-	*29 (53)*	**11 (69)**	**18 (46)**
Virus	*5 (9)*	**1 (6)**	**4 (10)**
Fungi	*1 (2)*	**1 (6)**	**0 (0)**
Polimicrobic	*12 (22)*	**2 (13)**	**10 (26)**
MDR	*20 (36)*	**8 (50)**	**12 (31)**
Comorbidities, n. (%)			
CKD	*1 (2)*	**0 (0)**	**1 (3)**
CHF	*5 (9)*	**4 (25)**	**1 (3)***
Hypertension	*19 (35)*	**7 (44)**	**12 (31)**
Diabetes mellitus	*6 (11)*	**2 (13)**	**4 (10)**
Obesity	*9 (16)*	**3 (19)**	**6 (15)**
Vascular disease	*2 (4)*	**1 (6)**	**1 (3)**
RRT, n. (%)	*2 (4)*	**2 (13)**	
Recovery of renal function, n. (%)	*5 (9)*	**4 (25)**	
Infection resolution, n. (%)	*30 (55)*	**4 (25)**	**26 (67)**
ICU LOS	*21 (15-27)*	**22 (13-26)**	**18 (15-31)**
Mortality	*12 (22)*	**9 (56)**	**3 (8)**
Nephrotoxic antibiotics, n. (%)	*37 (67)*	**14 (88)**	**24 (62)**
Colistin	*10 (18)*	**5 (31)**	**5 (13)**
Glicopeptides	*11 (20)*	**5 (31)**	**6 (15)**

Aminoglicosides	*8 (15)*	**3 (19)**	**5 (13)**
Radiocontrast, n. (%)	*15 (27)*	**5 (31)**	**10 (26)**
NSAIDs, n. (%)	*11 (20)*	**3 (19)**	**8 (21)**

Table 1. Clinical and demographic characteristics of patients. Continuous data are presented as median (25th and 75th percentiles) and the Mann-Whitney U test was used for comparisons between groups. Cathegorical data are expressed as absolute value (percentage) and χ 2-test or Fisher test were employed for comparisons between groups. *p<0.05

	AKI patients	Non AKI patients
Sepsis onset		
uNGAL	207 (16-477)	38 (16-92)*
Creat	0,93 (0,70-1,16)	0,67 (0,51-0,92)*
eGFR	70 (59-101)	109 (87-126)*
PCT	4,42 (0,4-14)	0,46 (0,15-2,91)*
PSEP	746 (592-1052)	575 (308-1068)
SOFA TOT	9 (6-12)	7 (4-9)

Table 2. Data are presented as median (25^{th} and 75^{th} percentiles). Mann-Whitney U test was used for comparison between groups. *p<0.05

References

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