UTILITY OF NOVEL OXIDATIVE STRESS BIOMARKERS IN DIAGNOSIS AND PROGNOSIS OD SEPSIS-ASSOCIATED ACUTE KIDNEY INJURY

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Background

- Oxidative stress has a pivotal role in the pathophysiology of sepsis-associated acute kidney injury (SA-AKI) (1).
- Established biomarkers of oxidative stress are unstable and difficult to measure in real clinical settings.
- Total oxidant status (TOS), total antioxidant status (TAS) and oxidative stress index (OSI) are emerging biomarkers of oxidative stress.
- These biomarkers were not yet explored in SA-AKI .

Goals

- To investigate the utility of TOS, TAS and OSI as diagnostic and prognostic biomarkers od SA-AKI in major abdominal surgical patients with sepsis.

Results

Table 1. Baseline characteristics of the patients with sepsis and the control group

	Control group (n = 50)	Sepsis without SA-AKI (n = 16)	Sepsis with SA-AKI (n = 37)
Age (years)	65.0 [57.75 - 74.0]	70.00 [57.5 - 77.25]	70.00 [61.5 - 75.0]
Gender (m / f)	22 / 28	9 / 7	19 / 18
ASA 1/2/3/4/5	0 / 50 / 0 / 0 / 0	2 / 12 / 2 / 0 / 0	0 / 35 / 2 / 0 / 0
Upper gastrointestinal / colorectal surgery	9 / 41	7 / 9	13 / 24
APACHE II	7 [5 - 7.5]	16 [13.5 - 18] ^a	25 [18 - 30.75] ^{b,c}
SOFA	0 [0 - 0]	4 [1 - 5.75] ^a	7 [5.5 - 11.0] ^{b,c}
Urea (mmol/L)	4.9 [3.6 - 6.7]	7.2 [5.4 - 11.0] ^a	17.6 [10.5 - 22.5] ^{b,c}
Creatinine (μmol/L)	74.0 [56.7 - 92.0]	74.4 [56.0 - 90.1]	168.1 [124.7 - 233.9] ^{b,c}
Serum NGAL (ng/ml)	100.3 [91.2 - 111.9]	109.5 [85.4 - 173.4]	184.3 [112.7 - 209.6] ^{b,c}
Urine NGAL (ng/ml)	42.9 [27.2 - 57.6]	54.0 [27.7 - 169.6]	150.7 [86.7 - 207.3] ^{b,c}

Data are presented as frequencies or median and 25th - 75th percentile values. ^a sepsis without SA-AKI vs. controls (p < 0.05), ^b sepsis with SA-AKI vs. controls (p < 0.05), ^c sepsis with SA-AKI vs. sepsis without SA-AKI (p < 0.05); Mann-Whitney U.

Figure 1. Dynamics of (A) TOS, (B) TAS and (C) OSI in patients with sepsis with comparison to control group

Data are expressed as minimum, maximum, median, and interquartile range. Mann-Whitney U test.

- Septic patients with SA-AKI had lower TOS and OSI but similar TAS compared to septic patients without SA-AKI during 96 h following admission to ICU (linear mixed models: PTOS = 0.006, POSI = 0.001, PTAS = 0.070).
- TAS, TOS and OSI were indirectly correlated to urea, creatinine, NGAL, SOFA and APACHE II score.

Materials and Methods

- Prospective, observational study.
- 53 major abdominal surgical patients with sepsis divided into SA-AKI (n = 37) and non-SA-AKI (n =16) group were compared to 50 controls without sepsis matched by age, gender, comorbidities and type of surgery.
- Blood and urine samples from the septic patients were collected on admission to Intensive Care Unit (ICU) and 24, 48, 72 and 96 h later and once from the controls.
- Levels of TOS and TAS were measured using novel automated colorimetric method developed by Erel (2,3).
- OSI was calculated as TOS to TAS percent ratio (4).
- Urea, creatinine and neutrophil gelatinase-associated lipocalin (NGAL) were also measured.
- American Society of Anaesthesiology (ASA), Sequential Organ Failure Assessment (SOFA) and Acute Physiology and Chronic Health Evaluation II (APACHE II) scores were calculated.

Table 2. TOS, TAS and OSI as diagnostic biomarkers of SA-AKI

	AUC-ROC (95% C. I.)
TOS	0.732 (0.564 – 0.901) *
TAS	0.666 (0.495 – 0.837)
OSI	0.720 (0.547 – 0.893) *

* p < 0.05

Figure 2.TOS, TAS and OSI as prognostic biomarkers of sepsis

Patients are stratified in quartiles. Kaplan-Meier estimates of 28 day survival. Log rank: (A) P_{TOS} < 0.001, (B) P_{TAS}=0.918 and (C) P_{OSI} = 0.045.

Conclusions

- SA-AKI was associated with lower TOS and OSI.
- TOS and OSI were, unlike TAS, good diagnostic and excellent prognostic biomarkers of SA-AKI in major abdominal surgical patients with sepsis.

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