ISCHEMIA MODIFIED ALBUMIN AND ACUTE KIDNEY INJURY IN PUMP-ON CARDIAC SURGERY

Abduzhappar Gaipov[1,2], Kultigin Turkmen[1], Aysun Toker[1], Yalcin Solak1, Humeyra Cicekler[1], Ramazan Ucar[1], Alper Kilicaslan[1], Niyazi Gormus[1], Halil Zeki Tonbul[1], Mehdi Yeksan[1] and Suleyman Turk[1].

[1]Necmettin Erbakan University Meram School of Medicine, Konya, Turkey and [2]National Scientific Medical Center, Astana, Kazakhstan.

OBJECTIVES

The neutrophil gelatinase - associated lipocalin (NGAL) is a novel biomarker of acute kidney injury (AKI). Ischemia Modified Albumin (IMA) is used to detect acute ischemic events. The aim of our study was to determine the predictive role of IMA in the development of AKI in patients undergoing pump-on cardiac surgery.

KDIGO 2012   AKI guideline

AKI is defined as any of the following (*Not Graded*):
- Increase in SCr by ≥ 0.3 mg/dl (≥ 26.5 µmol/l) within 48 hours; or
- Increase in SCr to ≥ 1.5 times baseline, which is known or presumed to have occurred within the prior 7 days; or
- Urine volume < 0.5 ml/kg/h for 6 hours.

Table 2 | Staging of AKI

Stage	Serum creatinine	Urine output
1	1.5–1.9 times baseline OR ≥ 0.3 mg/dl (≥ 26.5 µmol/l) increase	< 0.5 ml/kg/h for 6–12 hours
2	2.0–2.9 times baseline	< 0.5 ml/kg/h for ≥ 12 hours
3	3.0 times baseline OR Increase in serum creatinine to ≥ 4.0 mg/dl (≥ 353.6 µmol/l) OR Initiation of renal replacement therapy OR, In patients <18 years, decrease in eGFR to < 35 ml/min per 1.73 m^2	< 0.3 ml/kg/h for ≥ 24 hours OR Anuria for ≥ 12 hours

ROC analysis of 2nd hour's markers showed that NGAL and creatinine had significantly large area under the curve (AUC) than IMA and NLR to predict AKI developed at 24 hours (table 2).

Table-2. ROC curve analysis

2nd h markers	AUC	P value
NGAL	0,731	0,008
Creatinine	0,715	0,014
IMA	0,480	0,820
NLR	0,685	0,034

METHODS

This is a prospective study of patients who were underwent pump-on cardiac surgery due to coronary artery bypass grafting and/or cardiac valve surgery. AKI defined according to KDIGO AKI guideline. Blood samples for measurement of IMA, NGAL and creatinine levels were collected prior to cardiac surgery (0th h) and in the time course on 2nd, 12th and 24th hours after conducted surgery (2h, 12h, and 24h respectively), and neutrophil-to-lymphocyte ratio (NLR) was calculated from hemogram as well. Patients who developed AKI were divided into two subgroups as progressing and progressing AKI. Criteria for progression of AKI included the transition from the stage I to the II or III, from the II stage to the III stage and the need of CRRT.
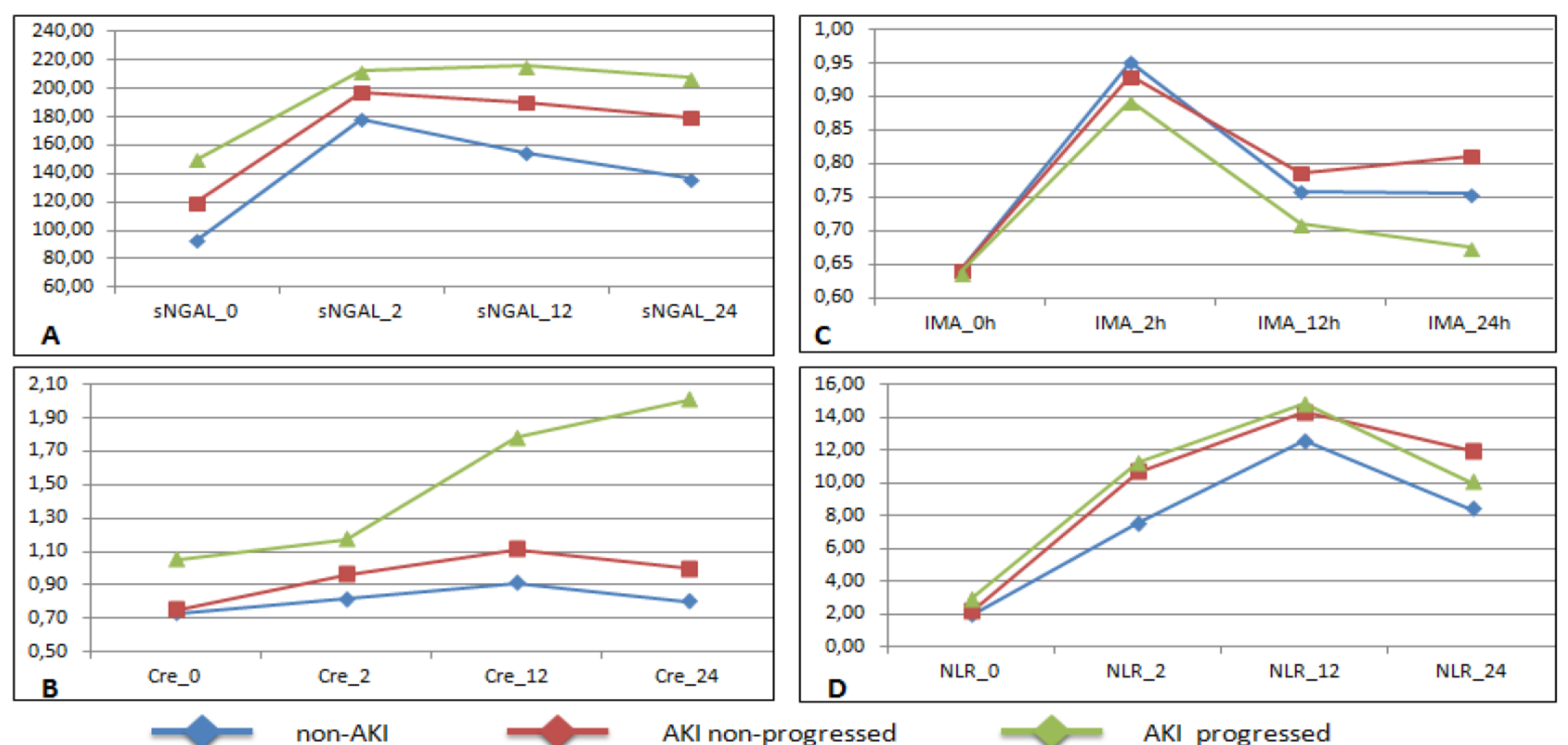
RESULTS

Fourty eight patients (31 males, 17 females) were included in the study. After CABG, 33 patients developed any stage of AKI, 22 of them non-progressing AKI, 11 – progressing AKI. The basal characteristics of patients are showed in table 1.

Table 1. The basal characteristics of patients according to group of AKI

	Non AKI (n=15)	AKI nonprogressors (n=22)	AKI progressors (n=11)	P value
Age, years	47,9 ± 16,6	54,9 ± 13,3	61,1 ± 10,8	0,066
LVEF, %	54,5 ± 9,0	54,9 ± 10,2	54,4 ± 9,2	0,912
GFR, ml/min	118,3 ± 23,5	115,2 ± 39,1	76,0 ± 28,8	0,003
Creatinine, mg/dL	0,73 ± 0,15	0,75 ± 0,22	1,05 ± 0,39	0,003
NGAL, ng/ml	93,0 ± 33,2	119,9 ± 49,8	149,9 ± 53,0	0,012
IMA, ABSU	0,64 ± 0,1	0,64 ± 0,06	0,64 ± 0,07	0,994
NLR	1,94 ± 0,48	2,17 ± 0,82	2,9 ± 1,99	0,097
Pump Time, min	107,6 ± 36,2	120,6 ± 38,5	115,5 ± 34,8	0,582
ICU stay, days	2,6 ± 0,99	3,41 ± 1,84	9,18 ± 9,93	0,003

All of the markers significantly increased after cardiac surgery, but IMA and NLR levels were not different between the groups (figure 1).

CONCLUSIONS

IMA levels as well as NLR increased after cardiac surgery, but could not predicted development of AKI.

Acknowledgments