Neutrophil Gelatinase-Associated Lipocalin (NGAL) predict higher risk of serious renal dysfunction in patients with CI-AKI

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Introduction: The Neutrophil Gellatinase Associated-Lipocalin (NGAL) as a biomarker for kidney damage is less investigated in terms of risk prediction.

Purpose: The aim of our study was to evaluate the diagnostic power of NGAL in detection of contrast-induced acute kidney injury (CI-AKI) and it's role for evaluation of the risk for serious renal dysfunction (SRD).

Methods: The study included high risk patients with chronic kidney disease (CKD) stage 2 and 3 undergoing coronary angiography and/or angioplasty for stable angina. Blood samples for plasma NGAL and serum creatinine (sCr) were collected baseline at the day before, at 4th and 24th hours after contrast exposure. The original risk scale as validated from Brown was used to calculate SRDcreat based on sCr and modified score was established with calculate SRDngal according to baseline levels of NGAL.

Results: The study enrolled 93 patients divided in control group (n=18/19%), CI-AKI group (n=18/19%), subclinical CI-AKI (n=15/16%), CKD 3a stage (n=33/36%) and CKD 3b stage (n=9/10%). The baseline level of NGAL in control group was 76.40±14.70 ng/ml and didn't change significantly after angiography. In the CI-AKI group NGAL increased early after contrast investigation (at 4th hour 139.59±65.57 ng/ml versus baseline values 121.91±59.37 ng/ml; p=0.003) and maintained this tendency until 24th hour (202.88±225.29 ng/ml; $p<0.001$). In the subclinical CI-AKI pattern of NGAL was similar to CI-AKI with estimated levels at 4th hour 128.18±99 ng/ml (vs baseline values 76.69±29.32 ng/ml, p=0,002). Groups with CKD showed significantly higher baseline level of NGAL (3a stage – 114.98±29.98 ng/ml and 3b stage – 173.30±47.66 ng/ml, $p<0.05$). The ROC analysis demonstrated AUC 0.889 (95% CI: 0.768–1.000; $p<0.001$) for diagnostic power of NGAL at 4th hour to detect CI-AKI and AUC 0.731 (95% CI: 0.539–0.924; p=0.024) at 4th hour to detect subclinical CI-AKI. Estimated risk of SRDcreat was 0.41±0.39% in control group and respectively 0.91±1.53% in CI-AKI group (p=0.20); 0.63±0.54% in subclinical CI-AKI (p=0.18), 1.33±1.29% in CKD 3a stage ($p<0.001$) and 3.0±2.63% in CKD 3b stage ($p<0.001$). According to baseline values of NGAL calculated risk of SRDngal were 0.41±0.39% in control group and 2.34±4.05% in CI-AKI group (p=0.02 compared to levels in control patients). In the rest groups SRDngal respectively was 0.99±1.28% for subclinical CI-AKI (p=0.09), 2.01±2.53% for CKD 3a stage (p=0.002), and 4.83±4.12% in CKD 3b stage ($p<0.001$). Direct comparison of the two scales SRDcreat/SRDngal demonstrated significantly higher levels with measurement of NGAL in CI-AKI group (p=0.03) and CKD 3b stage group (p=0.02).

Conclusions: The NGAL is not only a good predictor for clinical/subclinical CI-AKI but can also predict better the level of risk for SRD in patients with CI-AKI than the risk estimated by measurement of sCr. NGAL incorporated in risk calculator may be applied as useful assessment tool in clinical practice.