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Utility of Cystatin C as a Predictor for Postoperative Acute Kidney Injury in Non-Cardiac Surgeries

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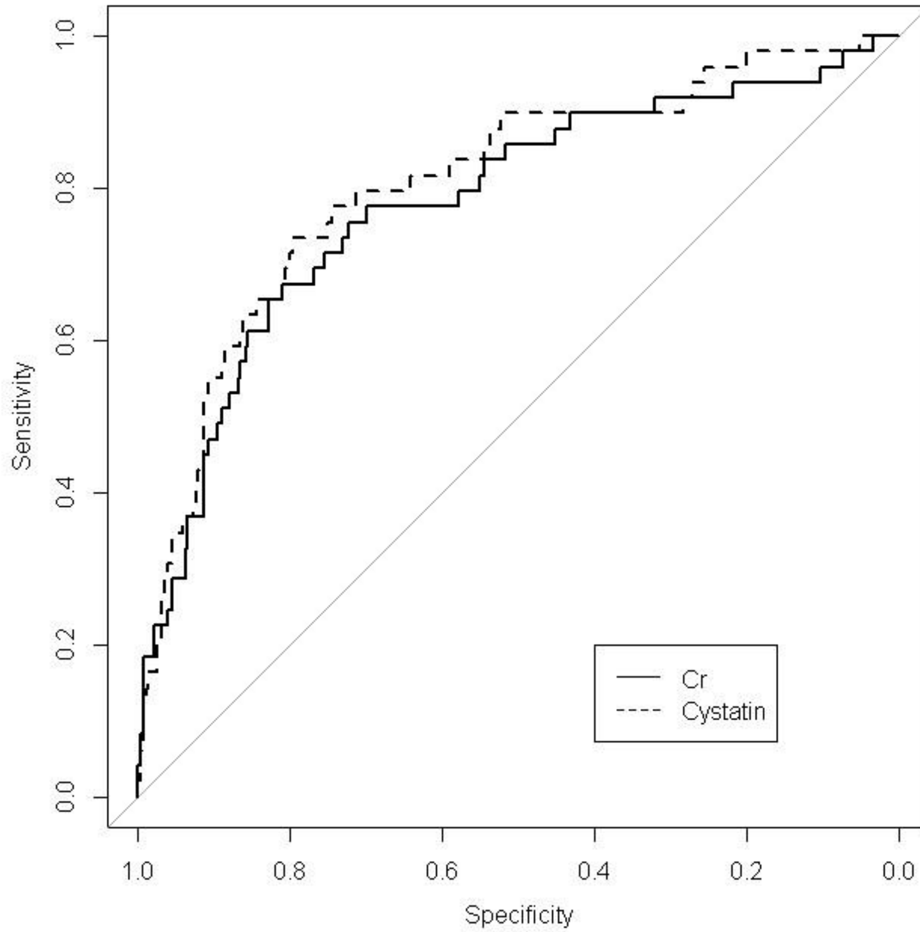
Objectives : Serum creatinine has been widely utilized to estimate glomerular filtration rate (eGFR), although various biomarkers have been developed to address its limitations. Among these biomarkers, the clinical use of Cystatin C is increasingly gaining recognition. However, there is a lack of evaluation regarding the utility of cystatin C in predicting the risk of postoperative acute kidney injury (PO-AKI) in non-cardiac surgeries.
Methods : A retrospective cohort study was conducted on patients who underwent non-cardiac surgeries lasting over 1 hour in five departments. PO-AKI was defined as per KDIGO-AKI criteria occurring within 7 days after surgery. Logistic regression was used to develop a prediction model, and C-statistics and the Delong test were used to compare the performance of each model. Baseline comorbidities, laboratory findings, medication usage within 90 days of surgery, and operation information were adjusted.
Results : 339 patients were enrolled, with 49 (14.5%) developed PO-AKI. Patients who developed AKI had a higher prevalence of diabetes and prescription of RAS blockers, longer operation duration, and lower eGFR of all types (Table 1). No statistical differences were observed in other laboratory findings between the two groups. The model with eGFR-Cystatin C demonstrated the highest area under the curve (AUC) among the three models (eGFR-Cr: AUC 0.78, 95% confidential interval [CI] 0.702–0.857; eGFR-Cystatin C: AUC 0.81, 95% CI 0.735–0.877; eGFR-Cr/Cystatin C: AUC 0.80, 95% CI 0.724–0.871). Only the eGFR-Cystatin C-based model showed significant improvement in prediction compared to the eGFR-Cr-based model in the Delong test (eGFR-Cystatin C vs eGFR-Cr: p-value 0.033; eGFR-Cr/Cystatin C vs eGFR-Cr: p-value 0.055, Figure 1).
Conclusions : Our findings suggest the potential usefulness of cystatin C in predicting the risk of PO-AKI in non-cardiac surgery. Further studies involving larger and external cohorts are essential for validation.

Table1.png

	No AKI (N=290)	AKI (N=49)	Total (N=339)
Age	72.0 [63.0;79.0]	73.0 [66.0;80.0]	73.0 [64.0;80.0]
Gender (male, %)	54.8	51.0	54.3
DM	82 (28.3%)	24 (49.0%)	106 (31.3%)
Hypertension	138 (47.6%)	31 (63.3%)	169 (49.9%)
Operation information			
Emergency operation	48 (16.6%)	6 (12.2%)	54 (15.9%)
Operation duration (min)	125.0 [80.0;185.0]	170.0 [110.0;255.0]	130.0 [85.0;185.0]
General anesthesia	268 (92.4%)	47 (95.9%)	315 (92.9%)
Department (n,%)			
General surgery	110 (37.9%)	20 (40.8%)	130 (38.3%)
Neurosurgery	77 (26.6%)	12 (24.5%)	89 (26.3%)
OBGY	7 (2.4%)	2 (4.1%)	9 (2.7%)
Orthopedics	61 (21.0%)	7 (14.3%)	68 (20.1%)
Urosurgery	35 (12.1%)	8 (16.3%)	43 (12.7%)
Medication usage (n,%)			
NSAIDs	92 (31.7%)	13 (26.5%)	105 (31.5%)
RAS blocker	100 (34.5%)	31 (63.3%)	131 (38.6%)
Laboratory findings (n,%)			
Hypoalbuminemia	101 (34.8%)	22 (44.9%)	123 (36.3%)
Anemia	185 (63.8%)	38 (77.6%)	223 (65.8%)
Hyponatremia	51 (17.6%)	9 (18.4%)	60 (17.7%)
eGFR (ml/min/1.73m2)			
Creatinine	88.0 [66.9;99.9]	69.8 [45.3;94.2]	86.4 [65.5;99.1]
Cystatin C	80.5 [57.6;103.6]	57.2 [43.9;78.2]	77.2 [54.5;100.5]
Creatinine-CystatinC	74.0 [49.0;95.1]	48.0 [31.4;74.7]	70.0 [45.2;92.7]

Table1.png


Sensitivity
0.0
0.2
0.4
0.6
0.8
1.0
Specificity
1.0
0.8
0.6
0.4
0.2
0.0
Cr
Cystatin