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Research Article

Periprocedural Changes in Hematocrit and Serum Creatinine During Left Main Coronary Artery PCI: A Real-World Observational Study

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Abstract:

Background: Left main coronary artery (LMCA) percutaneous coronary intervention (PCI) is a complex procedure involving a large myocardial territory. Although clinical outcomes after LMCA PCI have been widely reported, early periprocedural changes in routine hematologic and renal laboratory parameters remain less well characterized.

Methods: This retrospective, single-center observational study screened 139 consecutive patients who underwent LMCA PCI between August 2021 and December 2025. Six patients were excluded because complete paired hematologic and renal laboratory measurements were unavailable, leaving 133 patients in the final analysis. Periprocedural laboratory changes were evaluated using pre- and post-procedural hematocrit values and baseline and 24-hour serum creatinine values. Major periprocedural adverse events included no-reflow, cardiac arrest, coronary perforation, and in-hospital death.

Results: Among 133 included patients, the composite procedural adverse event rate was 7.5%. Individual event components included no-reflow in 4 patients (3.0%), cardiac arrest in 6 (4.5%), coronary perforation in 1 (0.8%), and in-hospital death in **5** (3.8%); event components were not mutually exclusive. Median hematocrit decreased from **39.0% (IQR 36.0–44.0)** to **37.0% (IQR 33.0–40.0)** ($p<0.001$). Any hematocrit reduction occurred in **108 patients (81.2%)**, and **33 patients (24.8%)** experienced a decrease of at least 5 percentage points. Median serum creatinine remained unchanged at **0.90 (0.80–1.10) mg/dL** before and 24 hours after PCI ($p=0.766$). A creatinine increase of at least 0.30 mg/dL occurred in **5 patients (3.8%)**, whereas a ≥50% increase occurred in **2 patients (1.5%)**.

Conclusions: In this real-world LMCA PCI cohort, modest hematocrit reduction was common, whereas clinically meaningful creatinine elevation was uncommon. These findings likely reflect periprocedural physiological and hydration-related changes rather than a distinct hemato-renal stress syndrome. Larger prospective studies incorporating contrast volume, procedure duration, bleeding outcomes, renal function, and left ventricular function are needed to better define the clinical significance of these laboratory changes.

Keywords: Left main coronary artery; Percutaneous coronary intervention; Hematocrit; Serum creatinine; Hemodilution; Acute kidney injury.

Background

Left main coronary artery disease is considered high risk because the LMCA supplies a large proportion of the left ventricular myocardium, depending on coronary dominance. Historically, coronary artery bypass grafting (CABG) has been the standard strategy for myocardial revascularization in this setting. However, advances in drug-eluting stents, intracoronary imaging, antithrombotic therapy, and operator experience have made PCI an accepted alternative in selected patients with suitable anatomical characteristics and Heart Team-based decision-making.

Randomized trials and large observational studies have demonstrated high procedural success and acceptable long-term outcomes with LMCA PCI in selected patients. Nevertheless, LMCA interventions remain procedurally complex because of the large myocardial territory at risk, frequent distal bifurcation involvement, need for extended device manipulation, and potential for hemodynamic instability. These characteristics may be accompanied by early changes in routine laboratory parameters, including hematocrit and serum creatinine.

A reduction in hematocrit after PCI may reflect hydration-related hemodilution, repeated catheter exchanges, vascular access-related blood loss, occult bleeding, or a combination of these factors. Similarly, a post-procedural increase in serum creatinine may reflect contrast exposure, hypotension, cardiac arrest, hemodynamic compromise, or other procedural complications. Importantly, the temporal relationship between procedural events and post-procedural creatinine measurement limits causal interpretation.

Data specifically describing early hematologic and renal laboratory changes after LMCA PCI are limited. Therefore, this study aimed to characterize periprocedural changes in hematocrit and serum creatinine and to describe procedural safety outcomes in a real-world cohort of patients undergoing LMCA PCI.

Methods

Study Design and Reporting Guidelines

This retrospective, single-center observational study was reported in accordance with the STROBE guidelines. We analyzed anonymized clinical data from consecutive patients who underwent LMCA PCI at a tertiary care center between August 2021 and December 2025. The study was conducted in accordance with the principles of the Declaration of Helsinki and institutional policies for retrospective analyses using de-identified data.

Study Population

Between August 2021 and December 2025, 139 consecutive patients underwent LMCA PCI at our institution. Six patients were excluded because complete paired hematologic and renal laboratory measurements were unavailable, leaving 133 patients for the final analysis. No patients were excluded because of prior CABG involving the left main coronary artery or active bleeding at the time of the procedure.

Patients aged 18 years or older who underwent LMCA PCI during the study period were eligible. Baseline demographic, clinical, and laboratory data were collected from electronic medical records, including age, sex, comorbidities, hematocrit, and serum creatinine.

Procedural Details

All procedures were performed via transradial access using standard interventional techniques. Isolated LMCA PCI was performed when feasible; otherwise, stent implantation was extended into the left anterior descending artery or the circumflex artery as clinically indicated. A provisional single-stent strategy was the default approach for bifurcation lesions. Planned two-stent techniques, including culotte or crush, were used in selected cases with side-branch compromise or complex bifurcation anatomy. Intravascular ultrasound (IVUS) guidance was used at the operator's discretion for lesion assessment or stent optimization. Rotational atherectomy was performed in highly calcified lesions when required. Periprocedural hydration was administered according to institutional protocols to reduce the risk of contrast-associated acute kidney injury.

Endpoints and Definitions

The primary safety endpoint was a composite of major periprocedural adverse events, defined as no-reflow, cardiac arrest, coronary perforation, or in-hospital death occurring during the index hospitalization. Individual components were also reported separately. Because components could overlap within the same patient, individual event counts were not considered mutually exclusive.

Secondary endpoints included periprocedural changes in hematologic and renal laboratory parameters:

Hematocrit change: post-procedural hematocrit minus pre-procedural hematocrit.

Renal change: serum creatinine at 24 hours minus baseline serum creatinine.

A hematocrit decrease of at least 5 percentage points was considered a clinically relevant hematocrit reduction. A serum creatinine rise of at least 0.3 mg/dL at 24 hours was considered a clinically relevant early creatinine increase. Because hemoglobin measurements were not consistently available, baseline anemia was pragmatically defined using hematocrit values rather than sex-specific hemoglobin thresholds. Elevated creatinine was defined as >1.2 mg/dL for women and >1.3 mg/dL for men.

Statistical Analysis

Continuous variables were assessed for distribution using histograms and Q-Q plots. Continuous variables were assessed for normality using the Shapiro–Wilk test. As most continuous variables were not normally distributed, continuous variables are presented as median (interquartile range [IQR]). Paired comparisons between baseline and post-procedural laboratory measurements were performed using the Wilcoxon signed-rank test. Categorical variables are presented as counts and percentages and were compared using the chi-square test or Fisher's exact test, where appropriate. Because only 10 composite adverse events occurred, no multivariable logistic regression or formal predictor modeling was performed. All statistical analyses were considered descriptive.Statistical analyses were conducted using IBM SPSS Statistics (IBM Corp., Armonk, NY, USA).

Results

Study Population and Baseline Characteristics

Of the 139 patients initially screened, 133 (95.7%) met the eligibility criteria and were included in the final analysis. The median age was **69 years (IQR 59–76.5)**. Of the study population, **102 patients (76.7%) were male**, 107 (81.7%) had hypertension, and 39 (29.8%) had diabetes mellitus. Baseline hematocrit was **39.0% (IQR 36.0–44.0)** and baseline serum creatinine was **0.90**

mg/dL (IQR 0.80–1.10) (Table 1).

Most procedures were performed electively (n = 130), whereas 3 cases were performed in an emergency setting. Two patients were receiving chronic hemodialysis at the time of the procedure and continued renal replacement therapy after PCI.

Procedural Characteristics

All interventions were performed via transradial access. Isolated LMCA PCI was performed in 32 patients. In the remaining cases, stent implantation was extended from the left main into a downstream vessel, most commonly by crossing over to the left anterior descending artery. In 2 patients, the stent crossed over to the circumflex artery.

A provisional single-stent approach was the default technique for LMCA PCI. 13 patients required a planned two-stent approach using the culotte technique to treat bifurcation lesions, while one patient received a planned crush technique. IVUS guidance was used in 8 procedures (6.0%) for lesion assessment or stent optimization. Rotational atherectomy was used in 1 case (0.8%).

Procedural Safety Outcomes

Major periprocedural adverse events occurred in 10 patients, corresponding to a composite event rate of 7.5%. Individual components were not mutually exclusive and included no-reflow in 4 patients (3.0%), cardiac arrest in 6 patients (4.5%), coronary perforation in 1 patient (0.8%), and in-hospital death in 5 patients. One patient developed ventricular tachycardia on the first in-hospital day following LMCA PCI.

Periprocedural Hematologic Dynamics

A reduction in hematocrit following the procedure was observed in most patients. Baseline hematocrit was 39.0% (IQR 36.0–44.0), decreasing to 37.0% (IQR 33.0–40.0) after PCI (Wilcoxon signed-rank test, $p<0.001$). Median hematocrit change was −3.0 percentage points (IQR −4.5 to −1.0). Overall, 108 patients (81.2%) experienced any hematocrit decrease, and 33 (24.8%) had a reduction of at least 5 percentage points.

Periprocedural Renal Changes at 24 Hours

Baseline serum creatinine was 0.90 mg/dL (IQR 0.80–1.10), and the median 24-hour value remained unchanged at 0.90 mg/dL (IQR 0.80–1.10) (Wilcoxon signed-rank test, $p=0.766$). Median creatinine change was 0.00 mg/dL (IQR −0.10 to 0.10). Five patients (3.8%) experienced an increase of at least 0.30 mg/dL, while two patients (1.5%) had an increase of at least 50%.

Discussion

The principal finding of this single-center real-world study is that early laboratory changes following LMCA PCI were common but generally modest. Nearly 81.2% patients experienced a decrease in hematocrit after the procedure, whereas clinically meaningful creatinine elevation at 24 hours was uncommon. The overall composite adverse event rate was 7.5%. These observations provide a descriptive assessment of the immediate hematologic and renal laboratory response after contemporary LMCA PCI rather than evidence for a distinct hemato-renal stress syndrome.

The frequent hematocrit reduction observed in this cohort may reflect several mechanisms, including periprocedural hydration, hemodilution, repeated catheter exchanges, blood sampling, and unmeasured access-site or occult blood loss. Because standardized bleeding outcomes and hemoglobin measurements were not consistently available, the present study cannot distinguish dilutional hematocrit reduction from true blood loss. Therefore, hematocrit changes should be interpreted as descriptive laboratory dynamics rather than as a validated marker of bleeding or ischemic risk.

The average 24-hour creatinine change was minimal, and clinically relevant creatinine elevation was uncommon. Importantly, creatinine was measured after the index procedure, whereas several safety events occurred during PCI. Therefore, post-procedural creatinine elevation should not be interpreted as a predictor of procedural events. Rather, in patients who experienced procedural instability, any subsequent creatinine increase may plausibly reflect the physiological consequences of hypotension, cardiac arrest, contrast exposure, or hemodynamic compromise.

The IVUS use rate in this cohort was 6.0%, which is lower than that reported in many contemporary LMCA PCI registries. This likely reflects real-world practice patterns, operator preference, availability, and reimbursement-related constraints during the study period. Accordingly, these findings should be interpreted within the context of a predominantly angiography-guided LMCA PCI cohort.

The current analysis should not be interpreted as showing that baseline anemia or renal impairment independently predicts adverse events after LMCA PCI. The number of events was limited, and clinically important covariates such as contrast volume, procedure duration, left ventricular function, CKD status, and bleeding outcomes were unavailable. The value of the present study is therefore primarily descriptive: it characterizes the frequency and magnitude of early hematocrit and creatinine changes in a consecutive LMCA PCI cohort.

Limitations

This study has several limitations. First, it was conducted at a single center and used a retrospective observational design, which may limit generalizability and introduces the possibility of selection bias. Six of 139 screened patients were excluded because complete paired hematologic and renal laboratory measurements were unavailable; the retrospective dataset did not allow a detailed comparison of excluded and included patients.

Second, the number of adverse events was small (n = 10), limiting statistical power. Therefore, no multivariable logistic regression or formal predictor modeling was performed, and all associations should be interpreted descriptively.

Third, several clinically relevant procedural and patient-level variables were unavailable, including contrast volume, fluoroscopy time, procedure duration, guiding catheter size, left ventricular ejection fraction, chronic kidney disease status, and standardized bleeding outcomes. Consequently, the relative contribution of these factors to periprocedural hematologic and renal changes could not be assessed.

Fourth, baseline anemia was defined using hematocrit rather than sex-specific hemoglobin thresholds because complete hemoglobin measurements were unavailable. Some degree of misclassification cannot be excluded. Fifth, hematologic and renal changes were evaluated using early post-procedural measurements, and longer-term dynamic fluctuations were not systematically assessed in all patients. Finally, more sensitive biomarkers of renal injury or myocardial stress, such as cystatin C, neutrophil gelatinase-associated lipocalin, troponin, or natriuretic peptides, were not available. Therefore, our findings should be interpreted as descriptive rather than hypothesis-testing.

Conclusions

In this real-world cohort undergoing LMCA PCI, modest reductions in hematocrit were common, whereas clinically significant creatinine increases were uncommon. The observed laboratory changes likely reflect procedural and hydration-related physiological responses rather than a distinct hemato-renal stress syndrome. Larger prospective studies incorporating procedural variables, bleeding definitions, renal function metrics, and left ventricular function are needed to better characterize the determinants and clinical significance of these findings.

List of Abbreviations

CABG: Coronary artery bypass grafting
Cr: Creatinine
Hct: Hematocrit
IVUS: Intravascular ultrasound
LMCA: Left main coronary artery
PCI: Percutaneous coronary intervention
STROBE: Strengthening the Reporting of Observational Studies in Epidemiology

Declarations

Ethics approval and consent to participate:

This study was conducted as a retrospective analysis of anonymized clinical data. According to institutional policies, formal ethical approval was not required for retrospective studies using fully de-identified data. The study was conducted in accordance with the principles of the Declaration of Helsinki. Patient consent to participate was waived due to the retrospective nature of the study and the use of anonymized data.

Consent for publication:

Not applicable.

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Data Availability Statement:

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest:

The authors declare no conflict of interest.

Author Contributions:

Conceptualization, M.T.O. and A.K.; methodology, M.T.O.; formal analysis, M.T.O.; investigation, M.J., R.I., S.C., and U.S.; data curation, M.T.O.; writing-original draft preparation, M.T.O.; writing-review and editing, A.K.; supervision, A.K. All authors have read and agreed to the published version of the manuscript.

Table 1. Baseline Clinical Characteristics

Variable	Overall (n=133)
Age, years	**69 (59–76.5)**
Male sex	**102 (76.7%)**
Hypertension	**107 (81.7%)**
Diabetes mellitus	**39 (29.8%)**
Previous myocardial infarction	**15 (11.3%)**
LDL cholesterol, mg/dL	**87 (61–115)**
Baseline hematocrit, %	**39 (36–44)**
Baseline serum creatinine, mg/dL	**0.90 (0.80–1.10)**
Low baseline hematocrit (<36%)	**29 (21.8%)**
Elevated baseline creatinine (≥1.3 mg/dL)	**21 (15.8%)**

Footnote

Continuous variables are presented as **median (interquartile range [IQR])**. Categorical variables are presented as **number (percentage).**

Table 2. Procedural Characteristics

Variable	Overall (n=133)
In-stent restenosis (ISR)	**9 (6.8%)**
Chronic total occlusion (CTO)	**13 (9.8%)**
Distal LMCA bifurcation lesion	**2 (1.5%)**
LAD ostial involvement	**108 (81.2%)**
Circumflex ostial involvement	**37 (27.8%)**
Provisional one-stent strategy (LAD)	**66 (49.6%)**
Provisional one-stent strategy (Circumflex)	**24 (18.0%)**
Final kissing-balloon inflation	**52 (39.1%)**
Culotte technique	**13 (9.8%)**
Crush technique	**5 (3.8%)**
Intravascular ultrasound (IVUS) guidance	**8 (6.0%)**

Variable	Overall (n=133)
Rotational atherectomy	**3 (2.3%)**

Footnote
Values are presented as **number (percentage).**

Table 3. Periprocedural Hematologic and Renal Changes

Variable	Overall (n=133)	*p* value
Baseline hematocrit, %	**39.0 (36.0–44.0)**	
Post-procedural hematocrit, %	**37.0 (33.0–40.0)**	**<0.001**
Change in hematocrit, percentage points	**−3.0 (−4.5 to −1.0)**	
Any hematocrit decrease	**108 (81.2%)**	
Hematocrit decrease ≥5 percentage points	**33 (24.8%)**	
Baseline serum creatinine, mg/dL	**0.90 (0.80–1.10)**	
24-hour serum creatinine, mg/dL	**0.90 (0.80–1.10)**	**0.766**
Change in serum creatinine, mg/dL	**0.00 (−0.10 to 0.10)**	
Creatinine increase ≥0.30 mg/dL	**5 (3.8%)**	
Creatinine increase ≥50%	**2 (1.5%)**	

Footnote
Continuous variables are presented as **median (IQR)**. Paired comparisons were performed using the **Wilcoxon signed-rank test**.

Table 4. Procedural and In-Hospital Safety Outcomes

Outcome	Overall (n=133)
Coronary perforation	**1 (0.8%)**
Cardiac arrest	**6 (4.5%)**
No-reflow	**4 (3.0%)**
In-hospital death	**5 (3.8%)**
Composite procedural adverse event	**10 (7.5%)**

Footnote
Composite procedural adverse events include coronary perforation, cardiac arrest, no-reflow, and other predefined major procedural complications. Individual events are not mutually exclusive.

Figure Legends
Figure 1. Flowchart of patient selection and study design. A total of 139 consecutive patients undergoing left main coronary artery PCI between August 2021 and December 2025 were screened. Six patients were excluded because complete paired hematologic and renal laboratory measurements were unavailable. The final analysis included 133 patients.
Figure 2. Periprocedural hematologic, renal, and safety outcomes. Bar graph showing the proportion of patients with any hematocrit decrease, hematocrit decrease of at least 5 percentage points, clinically relevant creatinine rise of at least 0.3 mg/dL at 24 hours, and composite major periprocedural adverse events.

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