International Journal of Research in Health and Allied Sciences

Journal home page: www.ijrhas.com

Official Publication of "Society for Scientific Research and Studies" [Regd.]

ISSN: 2455-7803

Original Research

Evaluation of the risk of contrast-induced nephropathy in acute coronary syndrome patients who were treated with percutaneous coronary intervention

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ABSTRACT:

Background: Contrast-induced nephropathy (CIN) is a common and potentially severe complication in patients with acute coronary syndrome. The present study was conducted to assess blood urea nitrogen-to-left ventricular ejection fraction ratio as a predictor for contrast induced nephropathy in acute coronary syndrome patients who were treated with percutaneous coronary intervention (PCI). **Materials & Methods:** 140 ACS patients undergoing PCI of both genders were included. The patients were divided into a CIN group (Group I) and a no-CIN group (Group II). Parameters such as type of ACS, history of diabetes, hypertension, hyperlipidaemia, left ventricular ejection fraction (LVEF), serum creatinine (SCr) at admission, estimated glomerular filtration rate (eGFR), blood urea nitrogen-to-left ventricular ejection fraction ratio (BUNEFr) was recorded. **Results:** SCr adm (mg/dl) level was 0.98 and 0.85, BUN (mg/dl) was 23.5 and 16.2, Cr>1.5 mg/dl was seen in 7 and eGFR (mL/minute/1.73 m2) was 67.2 and 85.1, eGFR < 60 mL/minute/1.73 m2 was seen in 24 and 12, LVEF (%) was seen in 42% and 51% and BUNEFr was 0.59 and 0.35 I group I and II respectively. The difference was significant (P< 0.05). **Conclusion:** BUN/EFr can be used to predict acute kidney injury in patients with ACS undergoing PCI.

Key words: acute kidney injury, Contrast-induced nephropathy, left ventricular ejection fraction

Received: 16 June, 2021 Accepted: 22 July, 2021

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This article may be cited as: Reddy SR, Das A, Suthar HJ, Boopalraj V, Babker AEA. Evaluation of the risk of contrast-induced nephropathy in acute coronary syndrome patients who were treated with percutaneous coronary intervention. Int J Res Health Allied Sci 2021; 7(4): 188-191.

INTRODUCTION

Acute coronary syndrome refers to a spectrum of clinical presentations ranging from those for ST-segment elevation myocardial infarction to presentations found in non–ST-segment elevation myocardial infarction or in unstable angina. It is almost always associated with rupture of an atherosclerotic plaque and partial or complete thrombosis of the infarct-related artery.[1]

Contrast-induced nephropathy (CIN) is a common and potentially severe complication in patients with acute coronary syndrome (ACS) who were undergoing percutaneous coronary intervention (PCI).[2] The presence of CIN is also associated with increased morbidity and mortality. The incidence of CIN ranges from 2 to 30% due to variations in study populations, clinical settings, and CIN definitions.[3] Patients with acute coronary syndrome (ACS) have a 3-fold higher risk of developing CIN. Because CIN occurs more frequently after urgent PCI in patients with ST-segment elevation myocardial infarction (STEMI) and non-STEMI, objective, rapidly available and reliable markers may be useful for the identification of patients at risk of developing CIN.[4]

Blood urea nitrogen (BUN) is one of the markers of kidney function. Blood urea nitrogen may also serve as a comprehensive marker reflecting impaired cardiology function and neurohormonal activation.

There is a complicated relationship between CIN, comorbidity, and mortality. Most patients who develop CIN do not die from renal failure. Death, if it does occur, is more commonly from either a pre-existing non renal complication or a procedural complication. The incidence of CIN ranges from 2 to 30% due to variations in study populations, clinical settings, and CIN definitions.[5] The present study was conducted to assess blood urea nitrogen-to-left ventricular ejection fraction ratio as a predictor for contrast induced nephropathy in acute coronary syndrome patients who were treated with percutaneous coronary intervention (PCI).

MATERIALS & METHODS

The present study consisted of 140 ACS patients undergoing PCI of both genders. All were informed regarding the study and their written consent was obtained.

Demographic data was recorded. In all patients, the serum creatinine level was measured before and within 48–72 hours of contrast medium administration. The patients were divided into a CIN group (Group I) and a no-CIN group (Group II). Contrast-induced nephropathy was defined as an absolute increase of 0.3 mg/dL or a relative increase of 25% from baseline serum creatinine within 48–72 hours of contrast medium exposure. Parameters such as type of ACS, history of diabetes, hypertension, hyperlipidaemia, left ventricular ejection fraction (LVEF), serum creatinine (SCr) at admission, estimated glomerular filtration rate (eGFR), blood urea nitrogen-to-left ventricular ejection fraction ratio (BUNEFr) was recorded. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Baseline characteristics

Parameters	Group I (50)	Group II (90)	P value
History of heart failure	12%	2%	0.01
Hypertension	62%	45%	0.02
Diabetes mellitus	30%	24%	0.05
Hyperlipidaemia	17%	25%	0.09
Previous CAD	34%	21%	0.04
Current smoking	25%	42%	0.02
STEMI	65%	52%	0.01
NSTEMI	24%	28%	
USAP	11%	20%	

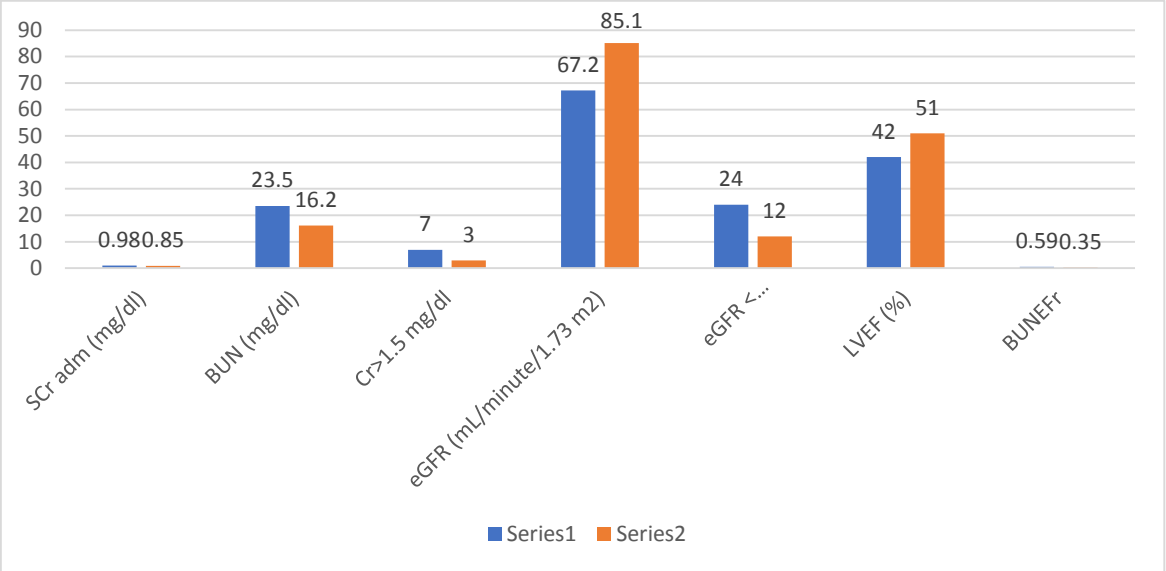
Table I shows that history of heart failure was seen in 12% in group I and 2% in group II. Hypertension in 62% and 45%, diabetes mellitus in 30% and 24%, hyperlipidaemia in 17% and 25%, previous CAD in 34% and 21%, current smoking in 25% and 42%, STEMI in 65% and 52%, NSTEMI in 24% and 28% and USAP in 11% and 20% in group I and group II. The difference was significant (P< 0.05).

Table II The laboratory findings

Parameters	Group I (50)	Group II (90)	P value
SCr adm (mg/dl)	0.98	0.85	0.04
BUN (mg/dl)	23.5	16.2	0.01
Cr>1.5 mg/dl	7	3	0.05
eGFR (mL/minute/1.73 m2)	67.2	85.1	0.03
eGFR < 60 mL/minute/1.73 m2	24	12	0.04
LVEF (%)	42	51	0.05
BUNEFr	0.59	0.35	0.01

Table II, graph I shows that SCr adm (mg/dl) level was 0.98 and 0.85, BUN (mg/dl) was 23.5 and 16.2, Cr>1.5 mg/dl was seen in 7 and eGFR (mL/minute/1.73 m2) was 67.2 and 85.1, eGFR < 60 mL/minute/1.73 m2 was seen in 24 and 12, LVEF (%) was seen in 42% and 51% and BUNEFr was 0.59 and 0.35 I group I and II respectively. The difference was significant (P< 0.05).

Graph I The laboratory findings



DISCUSSION

Contrast-induced nephropathy (CIN) is a serious complication of invasive cardiovascular procedures. The incidence of CIN is 2% for the general population. However, patients undergoing percutaneous coronary intervention (PCI) are at greater risk, and patients with diabetes or previous renal impairment have a risk of almost 50%.[6]

The development of CIN after PCI is associated with poor clinical outcomes including prolonged hospitalization, increased costs, increased rates of end-stage renal failure, myocardial infarction, repeat revascularization, and short- and long-term mortality.[7] Furthermore, patients with acute coronary syndrome (ACS) have a 3-fold higher risk of developing CIN.[8] Because CIN occurs more frequently after urgent PCI in patients with ST-segment elevation myocardial infarction (STEMI) and non-STEMI, objective, rapidly available and reliable markers may be useful for the identification of patients at risk of developing CIN.[9] The present study was conducted to assess blood urea nitrogen-to-left ventricular ejection fraction ratio as a predictor for contrast induced nephropathy in acute coronary syndrome patients who were treated with percutaneous coronary intervention (PCI).

In present study, history of heart failure was seen in 12% in group I and 2% in group II. Hypertension in 62% and 45%, diabetes mellitus in 30% and 24%, hyperlipidaemia in 17% and 25%, previous CAD in 34% and 21%, current smoking in 25% and 42%, STEMI in 65% and 52%, NSTEMI in 24% and 28% and USAP in 11% and 20% in group I and group II. Kiris et al[10] in their study 1010 ACS patients undergoing PCI were included. The serum creatinine level was measured before and within 48–72 h of contrast medium administration. Contrast-induced nephropathy was defined as an absolute increase of 0.3 mg/dL or a relative increase of 25% from baseline serum creatinine within 48–72 h of contrast medium exposure. A total of 74 patients developed CIN (7.3%). Patients with CIN were older and had a higher BUNEFr than those without. Multivariate analysis showed that age, hypotension or positive inotrope support, history of stroke, contrast volume, and BUNEFr were independent predictors of CIN. For the development of CIN, the AUC of a multivariable model that included hypotension or positive inotrope support, history of stroke, and contrast volume was 0.813.

We found that SCr adm (mg/dl) level was 0.98 and 0.85, BUN (mg/dl) was 23.5 and 16.2, Cr>1.5 mg/dl was seen in 7 and eGFR (mL/minute/1.73 m2) was 67.2 and 85.1, eGFR < 60 mL/minute/1.73 m2 was seen in 24 and 12, LVEF (%) was seen in 42% and 51% and BUNEFr was 0.59 and 0.35 I group I and II respectively. Ghazal et al[11] included 300 patients (68% male and 32% female). Patients were classified into two groups: CIN group vs non CIN group and we found that, hypotension positive inotrope, history of HF and history of TIA or stroke, were statistically high significant predictors for CIN, showed a statistical significant positive correlation between BUN\EFr level and BUN, creatinin level before and after PCI, TIMI risk index, contrast volume and mehran score and showed that sensitivity of BUN\EFr level as a predictor of CIN was 88.9% with ability to exclude 94.5% of truly negative cases, while sensitivity of mehran score in prediction of positive cases was 100% and 90% exclusion of negative cases, both tools had high accuracy above 90% and a high statistically significant tool used in prediction of CIN.

Demircelik et al[12] in their study a total of 426 patients with ACS undergoing PCI were enrolled. Admission PLR levels were measured before PCI. CIN developed in 53 patients (15.9%). Baseline PLR was significantly higher in patients who developed CIN compared to those who did not (160.8 ± 29.7 and 135.1 ± 26.1, respectively; $p < 0.001$). Multivariate analyses found that PLR [odds ratio (OR) 3.453, 95%

confidence interval (CI) 1.453–8.543; p = 0.004] and admission creatinine (OR 6.511, 95% CI 1.759–11.095; p = 0.002) were independent predictors of CIN.

CONCLUSION

Authors found that BUN/EFr can be used to predict acute kidney injury in patients with ACS undergoing PCI.

REFERENCES

1. McCullough PA, Wolyn R, Rocher LL, et al: Acute renal failure after coronary intervention: incidence, risk factors, and relationship to mortality. Am J Med 1997;103:368–375.
2. Wi J, Ko YG, Shin DH, et al: Prediction of contrast-induced nephropathy with persistent renal dysfunction and adverse long term outcomes in patients with acute myocardial infarction using the Mehran risk score. Clin Cardiol 2013;36:46–53.
3. Goldenberg I, Matetzky S: Nephropathy induced by contrast media: pathogenesis, risk factors and preventive strategies. CMAJ 2005;172:1461–1471.
4. Ronco C, McCullough P, Anker SD, et al; Acute Dialysis Quality Initiative (ADQI) consensus group: Cardio-renal syndromes: report from the consensus conference of the acute dialysis quality initiative. Eur Heart J 2010;31: 703–711.
5. Ronco C, Haapio M, House AA, et al: Cardiorenal syndrome. J Am Coll Cardiol 2008;52:1527–1539.
6. Heyman SN, Reichman J, Brezis M: Pathophysiology of radiocontrast nephropathy: a role for medullary hypoxia. Invest Radiol 1999;34:685–691.
7. McCullough PA: Acute kidney injury with iodinated contrast. Crit Care Med 2008;36(suppl 4):S204–S211.
8. Gary T, Pichler M, Belaj K, et al: Platelet-to-lymphocyte ratio: a novel marker for critical limb ischemia in peripheral arterial occlusive disease patients. PLoS One 2013;8:676–688.
9. Kaya A, Kaya Y, Topçu S, Günaydin ZY, Kurt M, Tanboğa IH, Kalkan K, Aksakal E: Neutrophil-to-lymphocyte ratio predicts contrast-induced nephropathy in patients undergoing primary percutaneous coronary intervention. Angiology 2014;65:51–56.
10. Kiris T, Avci E, Celik A. Association of the blood urea nitrogen-to-left ventricular ejection fraction ratio with contrast-induced nephropathy in patients with acute coronary syndrome who underwent percutaneous coronary intervention. International urology and nephrology. 2019 Mar;51(3):475-81.
11. Ghazal KH, Abdelghany TM, Hamed KM, Eldamahoury AS. Blood urea nitrogen to left ventricular ejection fraction ratio and TIMI risk index as predictors for contrast-induced nephropathy in patients with acute coronary syndrome. European Journal of Molecular & Clinical Medicine. 2021 Mar 7;8(2):2615-26.
12. Demircelik MB, Kurtul A, Ocek H, Cakmak M, Ureyen C, Eryonucu B. Association between platelet-to-lymphocyte ratio and contrast-induced nephropathy in patients undergoing percutaneous coronary intervention for acute coronary syndrome. Cardiorenal medicine. 2015;5(2):96-104.