

Relationship Between CHA2DS2-VASC Score With CIN For AMI Patients After PCI

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Abstract. The CHA2DS2-VASC score has been reported recently to predict adverse clinical outcomes so is CIN in patients with AMI regardless of having AF. We investigated relationship between CHA2DS2-VASC score with CIN in patients who underwent PCI strategies. This is a study of 40 patients with and underwent PCI. The CHA2DS2-VASC score was calculated for each patient. From this study 16 cases (18.82%) of CIN were diagnosed. CIN was defined as rise in serum creatinine $>0,5\text{mg/dL}$ or $>25\%$ increase in baseline within 24h after PCI. In the ROC curve analysis, the cut-off value of CHA2DS2-VASC score in the prediction of CIN was >4 (sensitivity: 56.25%, Specificity: 87.5%) (AUC 0.698, 95%: CI 1.460-6.163, $p=0.003$) and has a significant association with CIN (RR 20.485). We also identified Hb level $<12\text{mg/dL}$ as an independent predictor of CIN with (RR 3.44, 95%: CI 1.816-6.532, $p<0.001$). The CHA2DS2-VASC score was positively associated with CIN. Therefore, it can be used as a simple and reliable tools to predict CIN in AMI patients who underwent PCI.

Keyword: CHA2DS2-VASC, CIN, PCI, AMI

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1 Introduction

Cardiovascular disease (CVD) is a leading cause of death worldwide (WHO, 2014). Renal injury as one of its adverse outcome is increasingly being seen in patients with acute myocardial infarction (AMI). As well as renal impairment can also be found due to the use of contrast agent in the setting of AMI patients who underwent percutaneous coronary intervention (PCI) known as Contrast Induced Nephropathy (CIN) (Gleeson, 2004).

Some study recently described the components of CHA2DS2-VASC score such as older age, hypertension, diabetes mellitus, heart failure, and female as a novel predictor of severity and also adverse outcomes in cardiovascular disease including CIN, despite of having atrial fibrillation (Kurtul, 2017; Marenzi, 2004). Thus, we aimed to investigate the predictive value of CHA2DS2-VASC score as a simple tool for CIN in patients with ACS who underwent PCI.

2. Methodology

This was a single center study in which a total of 40 consecutive acute coronary syndrome (ACS) patients from total 84 patients ACS who underwent PCI at our hospital. The exclusion criteria was patients with hypotension state during PCI or using any inotropic for stabilizing haemodynamic, shock cardiogenic, atrial fibrillation, and patients with post cardiac resuscitation.

Clinical and demographic characteristics were obtained by medical history, physical examination, electrocardiographic findings, echocardiographic examination, and laboratory data. The CHA2DS2-VASC score was calculated for each patient with the lowest score was 1 and the highest score was 9, because all of the patients consider have vascular disease due to AMI. The study was approved by the local ethics committee, and all patients provided their written informed consent (Kurtul, 2017).

Baseline serum creatinine was determined at admission, and serum creatinine measurement was repeated 24 after PCI. The eGFR was calculated using the Cockcroft-Gault formula and using the serum creatinine measured at admission. Routine hemogram parameters, fasting lipid profiles, fasting glucose, 2 hours post prandial glucose, HbA1C, and serum electrolytes were also measured. CIN was defined as the elevation of serum creatinine 0.5 mg/dl or 25% in baseline serum creatinine within 24 hours after PCI (McCullough, 2008).

All statistical analyses were performed using statistical software, and a p value < 0.05 was considered significant. Receiver operating characteristic curve analysis was used to determine the optimum cut-off values of CHA2DS2-VASC score to predict the development of CIN. Data were compared with the use of Student t or Mann-Whitney U test for continuous variables (expressed as mean standard deviation for parametric variables and median and interquartile ranges [25 to 75 percentile levels] for nonparametric variables) and the chi-square or Fisher's exact test for categorical variables (expressed as counts and percentages). Continuous variables were analyzed for normal distribution using the Kolmogorov-Smirnov test. To address concern over confounding

variables affecting CIN development, we also performed a multivariate logistic regression analysis. Variables significantly associated with CIN, but not included in the calculation of the CHA2DS2-VASC score, were entered into the multivariate model.

3. Results

From total of 85 ACS patients who were admitted to our cardiac care unit, 40 patient were enrolled to our study, and 16 patients were diagnosed with CIN (18.82%). The mean age of our study population was 54.28 ± 8.121 years, and the mean CHA2DS2-VASC score was 1.82 ± 1.152 .

On bivariate analysis, CHA2DS2-VASC score ≥ 4 (relative risk [RR] 3, 95%CI 1.460-6.163; $p=0.003$), Hb level < 12 mg/dL (relative risk [RR] 3.44, 95%CI 1.816-6.532; $p<0.001$), eritrosit level (relative risk [RR] 2.778, 95%CI 1.268-6.084; $p=0.008$), hematokrit level (relative risk [RR] 4.09, 95%CI 1.582-10.412; $p<0.001$), HDL level (relative risk [RR] 1.8, 95%CI 0.766-4.229; $p=0.154$), and Mehran score (relative risk [RR] 0.491, 95%CI 0.221-1.090; $p=0.069$) (Table 2)

From multivariate analysis CHA2DS2-VASC score ≥ 4 and Hb level < 12 mg/dL were independent predictors for CIN after urgent PCI in patients with ACS (R^2 0.485) (Table 4).

4. Discussion

The present study demonstrated that the CHA2DS2-VASC score ≥ 4 was independently associated with CIN development in patients with ACS who were treated by urgent PCI. CIN, an important complication after PCI, especially in the setting of ACS, is associated with extended length of hospital stays, increased costs, and increased short- and long-term morbidity and mortality. Although pathophysiological mechanisms of CIN is not fully understood, researchers concluded that CIN is caused by renal vasoconstriction, endothelial dysfunction, endothelium cell damage, followed by renal tubular injury and medullary hypoxia (Mehran, 2006). From previous study advanced age, female gender, diabetes mellitus, CHF, and renal dysfunction are already well known risk factors for CIN. The components of the CHA2DS2-VASC score include similar risk factors for CIN so there are opinion arise that CHA2DS2-VASC score can also predict the CIN event. From multivariate analysis in this study we conclude that CHA2DS2-VASC score was an independent risk factor for CIN regardless having AF.

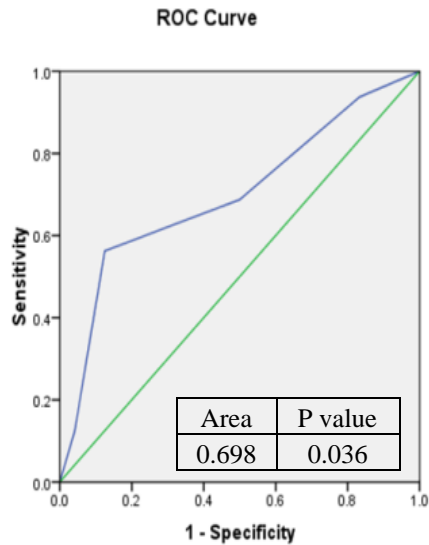


Figure 1. ROC Curve Analysis for The Presence and Number of CHA2DS2-VASC Scores for Predicting Contrast-Induced Nephropathy.

Table 1. Significance Value of CHA2DS2-VASC Score

Positive if Greater Than or Equal To	Sensitivity	1-Specificity
.00	1.000	1.000
1.50	.938	.833
2.50	.688	.500
3.50	.562	.083
4.50	.125	.042
6.00	.000	.000

Table 2. Bivariate Analysis of Independent Predictors Of CIN

Variable	95% CI	RR	CIN		p-value
			Yes	No	
HR < 74	1.13-17.07	2.42	11	8	0.051
HR ≥ 74			5	16	
Hb < 12	1.816-6.532	3.44	8	1	<0.001
Hb ≥ 12			8	23	
Erit. < 4.5	1.268-6.084	2.778	10	5	0.008
Erit. ≥ 4.5			6	19	
Ht < 39	1.582-10.412	4.09	12	5	0.001
Ht ≥ 39			4	19	
Mehran < 9	0.221-1.090	0.491	6	10	0.069
Mehran ≥ 9			16	8	
CHA2DS2-VASc < 4	1.460-6.163	3	9	3	0.003
CHA2DS2-VASc ≥ 4			7	21	
HDL > 40	0.766-4.229	1.80	5	13	0.154
HDL < 40			11	11	

Recently, Kurtul et al have concluded a CHA2DS2-VASC score of ≥ 4 is an independent predictor for incidence. There is no difference of cut off point despite small sample size in our study and differences of patients characteristic in our study. Also, we compare the association in predicting CIN with Mehran score. In bivariate and multivariate analysis, the CHA2DS2-VASC score has more association in predicting CIN than Mehran score, but this finding must be tested in larger sample.

Tabel 3. Multivariate Model Analysis of Independent Factors of CIN

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	30.592 _a	.441	.596
2	32.898 _b	.408	.551
3	34.104 _b	.389	.527
4	36.086 _b	.358	.485

From this study we found that dyslipidemia, smoker, and family history as risk factor of CAD has significant value in CIN (+) group. The combined oxidative stress, inflammation and dyslipidemia can accelerate atherosclerosis, the basic pathophysiology of all kinds of vascular disease (Park, 2016).

The present study had some limitations. First, the present study was a single-center study and has small sample. Second, we don't fully assessed the kind of contrast media as confounders of CIN. Finally, we also don't predict others adverse outcome such MACE in our study.

5. Conclusion

From this study we can conclude CHA2DS2-VASC score can be used as a simple, more reliable tool to predict CIN in patients who underwent PCI.

Characteristic	CIN Event		P value
	CIN (+) (n=16)	CIN (-) (n=24)	
Age (years)	53.12 \pm 9.062	55.04 \pm 7.532	0.472
Sex Category (n,%)			
Male	12 (30%)	19 (47.5%)	0.757
Female	4 (10%)	5 (12.5%)	
Diabetes Mellitus (n,%)	8 (20%)	8 (20%)	0.292
Hipertension (n,%)	11 (27.5%)	14 (35%)	0.505
Dislipidemia (n,%)	12 (30%)	8 (20%)	0.010
Smoker (n,%)	11 (27.5%)	8 (20%)	0.028
Family History (n,%)	12 (30%)	6 (15%)	0.002
CHF (n,%)	10 (25%)	8 (20%)	0.069
Stroke (n,%)	1 (2.5%)	0 (0%)	0.215
Vascular Disease (n,%)	1 (2.5%)	0 (0%)	0.215
Laboratorium			
Hb	12.1562 \pm 1.95345	14.3500 \pm 1.29581	<0.001
Hematokrit	35.75 \pm 5.615	43.29 \pm 4.486	<0.001
Ureum pre PCI	46.38 \pm 49.679	35.29 \pm 17.652	0.320
Creatinin pre PCI	1.3706 \pm 1.16101	.9958 \pm .38528	0.149
CrCl	84.0000 \pm 44.88058	88.1667 \pm 30.02414	0.726

Ureum post PCI	64.50 ± 51.024	35.21 ± 16.59	0.012
Creatinin post PCI	2.8131 ± 3.67862	.9287 ± .24503	0.016
HDL	33.00 ± 10.614	41.54 ± 11.595	0.024

Table 3. Baseline Characteristic**REFERENCES**

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