Pak Heart J

CHA2DS2-VASC-HS SCORE AS A PREDICTOR OF SEVERITY OF CORONARY LESIONS, AND COMPLICATIONS OF PRIMARY PERCUTANEOUS CORONARY INTERVENTION FOR STEMI PATIENTS

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Date Received: April 18, 2019

Date Revised: Aug 09, 2019

Date Accepted: Sep 20, 2019

Contribution

AA, MA contributed in data collection, data analysis, article review and statistic analysis. TH did final review and manuscript writing. All authors contributed equally to be submitted manuscript.

All authors declare no conflict of interest.

This article may be cited as: Hassan T, Alarag A, Abouomar M. CHA2DS2-VASC-HS score as a predictor of severity of coronary lesions, and complications of primary percutaneous coronary intervention for STEMI patients. Pak Heart J 2019; 52 (04):288-93

ABSTRACT

Objective: To study if CHA2DS2-VASc-HS score can predict severity of coronary lesions, contrast induced nephropathy and new onset transient ischemic attack (TIA) or stroke during hospital admission in patients without atrial fibrillation (AFib) presented by STEMI and treated by primary PCI.

Methodology: We performed a cross-sectional study on STEMI patients treated by primary PCI in cardiology department Tanta University hospital, Egypt between January 2016 and January 2018. CHA2DS2-VASc-HS score, Mahran risk score and SYNTAX score were calculated for all patients excluding patients presented with Afib. Occurrence of CIN, new-onset TIA or stroke and death was noted for all patients.

Results: About 179 STEMI patients were included. We found that CHA2DS2-VASc-HS score > 4 is associated with higher incidence of CIN P value (0.001), new-onset stroke or TIA P value (0.003) and death (0,001). Also Score from (0-2) has less incidence of occurrence of theses complication and the score > 4 has higher incidence of complex coronary lesions P value (0.001).

Conclusion: CHA2DS2-VASc-HS score can be used as a good predictor of complexity of coronary anatomy, in hospital mortality (CIN, new-onset TIA or Stroke and death) in patients presented with STEMI.

Key Words: CHA2DS2-VASc-HS, ST elevation myocardial infarction, Complication

INTRODUCTION

Coronary artery disease (CAD) is the leading cause of death all over the world.[1] Prospective risk evaluation can help to estimate early hospital outcomes, patients' prognosis, clinical and treatment decisions. The newly developed CHA2DS2-VASc-HS score is used as a new predictor of (CAD) severity in stable CAD patients.[2]

Patients with ST segment elevation myocardial infarction (STEMI) are subjected to many complicationsand their mortality is affected by multiple risk factors, as older age, Killip class, time delay to treatment, presence of emergency medical system (EMS), history of previous myocardial infarction, diabetes mellitus, chronic kidney disease, severity of coronary lesions and left ventricular function.[3]

Primary PCI is now the standard treatment strategy of patients presented with STEMI, however Contrast-induced nephropathy (CIN) is a one of its complication which is linked to increased long and short-term mortality and longer duration of stay in hospital and long-term chronic kidney disease.[4]

Several risks for CIN have been identified.[5] Primary percutaneous coronary intervention (PCI) helps rapid revisualization by restoring coronary artery flow which saves myocardium,reduces deterioration of ventricular function and improves outcome in STEMI patients [6] However, patients treated with primary PCI have a higher risk for CIN compared to patients doing elective PCI for stable coronary artery disease, especially those presented with hemodynamic decompensationand lowleft ventricular fraction.

Also stroke is one of the worst complications of STEMI and randomized clinical trials have shown that, primary PCI was better compared to fibrinolysis in improvingmortality, reinfarction and stroke.[2]

Several risk stratification score have been developed. The thrombolysis in myocardial infarction (TIMI) risk score could accurately predict STEMI outcomes. The TIMI risk index is thought to be useful in the rapid triage of patients with STEMI during hospital transportation.[7]

Vital signs had a great importance forinter ventionalcardiologist to evaluatea patient presentedacute myocardial infarction, the TIMI risk index and the TIMI risk score depends on vital sings they are simple and can predict in- hospital mortality for patients with acute infarction. However, vital signs are fluctuating and can be affected by degree of stress, chest pain, and the occurrence of dysrhythmia. So, vital sings may be variable over time and multiple measureme nts can be obtained for the same patient in many situations.[8]

So we felt that we need to integrate a simple clinical data to risk stratify patients with STEMI.

The aim of this work is to study if CHA2DS2-VASc-HS score can predict severity of coronary lesions, contrast induced nephropathy and new onset transient ischemic attack (TIA) or stroke during hospital admission in patients without atrial fibrillation (AFib) presented by acute (STIMI) and treated by primary percutaneous intervention (PCI).

METHODOLOGY

It is a prospective cross-sectional study performed at Cardiology department, Tanta University Hospital, Egypt. The study protocol conformed to the principles of the Declaration of Helsinki and was approved by the Local Ethics Committee. Informed consent was obtained from all patients.

Our study included consecutive patients with acute STEMI admitted to our department between January 2016 and 2018. STEMI was defined as presenting with typical chest discomfort within the past 24 h along with characteristics: 1) ST elevation electrocardiogram, 2) positive cardiac enzymes, (We used cardiac troponin I as a positive biomarker). Patients underwent coronary angiography with view of revascularization of culprit lesion.

SYNTAX score had been validated for only native coronary arteries.[9] Lesions with in-stent restenosis were scored as de novo lesions.

Patients with previous coronary artery bypass graft (CABG)and with atrial fibrillation at time of presentation were excluded. There were no other specific exclusion criteria.

Demographic data (age, sex, diabetes mellitus, hypertension, current cigarette smoking, peripheral artery disease (PAD), previous ischemic stroke or transient ischemic attack (TIA), chronic heart failure, clinical history (previous coronary intervention and/or coronary bypass surgery), current symptoms, clinical examination, cardiac enzymes, electrocardiography and echocardiographic findings were recorded.

Diabetes was diagnosed as a fasting blood sugar ≥126 mg/dL or the current use of anti-diabetic treatment. Hypertension was diagnosed if systolic blood pressure were ≥140 mm Hg and or diastolic blood pressure≥90 mm Hg or if the patient was on anti-hypertensive medication. Low-density lipoprotein (LDL) cholesterol above 160 mg/dL was considered hyper-lipidaemic according to the National Cholesterol Education Program Adult Treatment Panel III recommendations or patients on anti-dyslipideamic treatment.[10] Cigarette smoking was defined as smoking a minimum of 10 cigarettes per day for at least 1 year in patients who had never stopped smoking before the day of evaluation.[2]

Chronic heart failure was defined as decreased left ventricular ejection fraction (<40%).[11] Coronary angiography was performed using the standard Judkins technique via the femoral access. The severity of coronary artery lesions was determined by the number of significantly diseased coronary arteries. Significant coronary artery disease was defined as the presence of more than 50% Luminal diameter narrowing in at least one major coronary artery. Syntax Score (SS) assisted with two experienced cardiologists evaluated all of the angiograms using the algorithm reported on the website. Patients was classified according to the score into 3 groups SS <23, SS 23–32 and SS >32.9

The CHA2DS2-VASc-HS score was calculated by giving one point each of the following(chronic heart failure, hypertension, diabetes, vascular disease, age 65– 74 years, male gender (as a sex category), hyper-lipidaemicand smoking (S), and by giving

two points for history of stroke or TIA and age ≥75 years (Table 1). The maximum CHA2DS2-VASc-HS score was 11.[12] Patients presented with atrial fibrillations were excluded.

The Mehran CIN-Risk score (MRS) was developed andinitially validated for prediction of CIN after non-urgent PCI in patients undergoing angioplasty. This score includes 8 clinical and procedural variables Table 1.[13]

Table 1: CHA2DS2-VASc-HS score and Mehran Risk Score Points

Variables		
	CHA2DS2 - VASc - HS score	
C	Congestive heart failure	1 point
H	Hypertension	1 point
A2	Age >75 years	2 point
D	Diabetes mellitus	1 point
S2	Previous Stroke or TIA	2 point
V	Vascular disease	1 point
A	Age 65 – 74 years	1 point
Sc	Sex category, male gender	1 point
H	Hyperlipideamia	1 point
S	Smoker	1 point

Mehran Risk Score	
Risk Factors	**Score**
Hypotension	5
IABP	5
CHF	5
Age ≥ 75 y	4
Anaemia	3
Diabetes	3
Contrast media volume	1 for each 100cc
eGFR _20 mL/min/1.73 m2	6
eGFR 20 – 40 mL/min/1.73 m2	4
eGFR 40 – 60 mL/min/1.73 m2	2
low risk ≤ 5 , Intermediate risk: 6-10,	
High risk: 11-16, Very high risk: ≥ 16	

RESULTS

Total of 170 patients were included. The results of our study showed a positive correlation between SYNTAX score and CHA2DS2- VASc-HS score (p= 0.001), as we found that when CHA2DS2- VASc-HS score more than 4 there is high probability of having more complex lesions. From 48 patients with SYNTAX score > 32,36 patients hadCHA2DS2- VASc-HS more than 4 which represents 75% of patients with SYNTAX score > 32and only 1patient hasCHA2DS2- VASc-HS score from (0-2).

Also with CHA2DS2- VASc-HS score from (3-4) there was high probability of having intermediate coronary lesions. From 76 patients with SYNTAX score (23 – 32), 46 patients had CHA2DS2-VASc-HS score which represents 68.6% of those patients.

Farther more when we had a CHA2DS2- VASc-HS score from (0-2) there was a high probability of having more simple coronary anatomy, in our data 46 patients had SYNTAX score of < 23, 45 patients had CHA2DS2-VASc-HS score of (0-2) which represents (97.8%) of patients and no patients had SYNTAX score more than

4.(table2)

Also we found that there is a positive correlation between CHA2DS2- VASc-HS score and MRS and incidence of CIN (p= 0.001) with all patients who developed CIN had a CHA2DS2-VASc-HS score more than 4 shown in table 2 and 3.

24 patients with low probability of CIN as shown by MRS of<6 , 22 patients has CHA2DS2-VASc-HS score from (0-2) and all patients with high incidence of CIN had a CHA2DS2-VASc-HS score> 4 as shown in table 2 and 3.

As regard to deaths and new- onset TIA or stroke all the patients who had death which represents 3.5 % of all patients had a CHA2DS2-VASc-HS score more than 4 (P value 0.001) and also the patients who developed new- onset TIA or stroke which represents 2.9% of all patients had CHA2DS2-VASc-HS score more than 4 (P value 0.003) as shown in table 3.

Table 2: Relation Between the CHA2DS2-VASc-HS Score and Severity of Coronary Lesions Represented by SYNTAX Score and MRS for CIN.

			CHA2DS2 - VASc - HS			Chi-square	
			0 – 2	3 – 4	> 4	X^2	P-value
Syntax	< 23	n %	45 76.3%	1 1.7%	0 .0%	151.169	0.001*
	23 – 32	n %	13 22.0%	46 79.3%	17 32.1%		
	> 32	n %	1 1.7%	11 19.0%	36 67.9%		
MRS	< 6	n %	22 37.3%	1 1.7%	0 .0%	66.674	0.001*
	6 – 10	n %	37 62.7%	57 98.3%	42 79.2%		
	11 – 16	n %	0 .0%	0 .0%	11 20.8%		

Table 3: Incidence of CIN , New Onst TIA or Stroke and Death and its Relation to CHA2DS2- VASc-HS Score

			CHA2DS2 - VASc - HS			Chi -square	
			0 – 2	3 – 4	> 4	X^2	P-value
CIN	Yes	n %	0 0%	0 0%	13 24.5%	31.074	0.001*
	No	n %	59 100.0%	58 100.0%	40 75.5%		
Death	Yes	n %	0 0%	0 0%	6 11.3%	13.730	0.001*
	No	n %	59 100.0%	58 100.0%	47 88.7%		
New onset TIA or Stroke	Yes	n %	0 0%	0 0%	5 9.4%	11.372	0.003*
	No	n %	59 100.0%	58 100.0%	48 90.6%		

DISCUSSION

Most patients with ischemic heart disease have at least one coronary risk factor. Assessment of risk of patients presented by ACS helps to provide them with adequate medical therapy and to assess their mortality and morbidity. Thus, a lot of risk scores were developed; these risk scores include most of major CAD risks.

Clinicians need rapid, simple, reproducible, reliable, and quantitative scores to evaluate patients' risks and recommend short-terms treatments and long standing preventive measures.[14]

The development of primary (PCI) had a great impact on reducing the in-hospital mortality in patients presented by STEMI. Nonetheless, the outcomes and mortality of STEMI patients is variable according to patient risk status so accurate risk stratification should be preferred.[7]

We thought that our result helps to provide convenient, rapid and simple risk stratification for each patient which helps to choose appropriate therapeutic measures and to avoid or reduce mortality and morbidity in patients with STEMI.

Our data are found that the CHA2DS2-VASc-HS score more than 4 are associated with higher incidence of complex coronary anatomy and more worse in-hospital outcomes which is consistent with the finding of Taşolar et al who found that the CHA2DS2-VASc-HS score of more than 4 are associated with more complex lesion and increased incidence of in-hospital major adverse cardiovascular events (MACE) in patients presented with non-STEMI.[2]

Also Ruey-Hsing Chou et al used CHADS2 as a predictor of CIN of stable coronary artery disease patients under-going PCI and found also a positive correlation between the incidence of CIN and CHADS2 more than 4.[15]

Our study declared that, CHA2DS2-VASc-HS score was shown to be comparable and have nearly similar predictive value to MRS in predicting the incidence of CIN in patients underwent for primary PCI. So, we can predict patients in need for close follow-up and to take prophylactic measures against CIN and this intensive care should be provided to patients medium to high-risk for developing CIN (those with CHA2DS2-VASc-HS score of more than 4 or MRS of more than 6.)

The British society of cardiovascular intervention studied the incidence of stroke in PCI in 426046 patients who underwent PCI in England and Wales between 2007 and 2012.Statistical analysis were performed evaluating the rates of stroke complications according to the year of PCI and multiple logistic regressions were used to evaluate the odds of 30-day mortality and in-hospital major adverse cardiovascular events (MACE; a composite of in-hospital mortality, myocardial infarction or re-infarction, and revascularization) with stroke complications and found that both ischaemic and haemorrhagic strokes are rare but overwhelming complications and are associated with high 30-day mortality and in-hospital MACE.[16]

Our results showed also that the incidence of stroke or new onset TIA were increased with CHA2DS2-VASc-HS score more than 4 and it is of low incidence in score of (0-2) so it can predict the occurrence of this rare but serious complication associated with high morbidity and mortality.

CONCLUSION

We can conclude from our data that the CHA2DS2- VASc-HS can be used to risk stratify patients presented with STEMI and do not have atrial fibrillation at time of presentation with score of more than 4 in patients have higher incidence of complex coronary lesions as presented by SYNTAX score 32 or more, higher incidence of CIN, deaths , new-onset TIA and stroke and those who had score from (0-2) had a low incidence of occurrence of these complications and have more simple coronary anatomy.

REFERENCES

1. Perk J, De Backer G, Gohlke H, Graham I, Reiner Z, Verschuren M, et al.European Guidelines on cardiovascular disease prevention in clinical practice (version 2012). The Fifth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of nine societies and by invited experts). Eur Heart J 2012;33(13):1635-701.

2- Taşolar H, Çetin M, Ball M, Bayramoğlu A, Otlu YÖ, Türkmen S, Aktürk E. CHA2DS2-VASc-HS score in non-ST elevation acute coronary syndrome patients: assessment of coronary artery disease severity and complexity and comparison to other scoring systems in the prediction of in-hospital major adverse cardiovascular events. Anatol J Cardiol2016;16(10):742-8.

3- Townsend N, Wilson L, Bhatnagar P, Wickramasinghe K, Rayner M, Nichols M.Cardiovascular disease in Europe: epidemiological update 2016. Eur Heart J2016;37(42):3232-45.

4- McCullough PA. Contrast-induced acute kidney injury. J Am CollCardiol2008;51(15):1419-28.

5- Nikolsky E, Mehran R, Lasic Z, Mintz GS, Lansky AJ, Pocock S,et al.Lowhematocrit predicts contrast-induced nephropathy after percutaneouscoronary interventions. Kidney Int2005;67(2):706-13.

6- Keeley EC, Boura JA, Grines CL. Primary angioplasty versus intravenousthrombolytic therapy for acute myocardial infarction: a quantitative review of 23 randomised trials. Lancet 2003;361(9351):13-20.

7- Morrow DA, Antman EM, Charlesworth A, Cairns R, Murphy SA, de Lemos JA, et al. TIMI risk score for ST-elevation myocardial infarction: a convenient, bedside, clinical score for risk assessment at presentation:an intravenous nPA for treatment of infarcting myocardium early II trial substudy. Circulation2000;102(17):2031-7.

8- Yanishi K, Nakamura T, Nakanishi N, Yokota I, Zen K, et al. A simple risk stratification model for ST-Elevation Myocardial Infarction (STEMI) from the combination of blood examination variables: acute myocardial infarction-Kyoto multi-center risk study group. PLoS One 2016;11(11):e016639.

9- Sianos G, Morel MA, Kappetein AP, Morice MC, Colombo A,

Dawkins K, et al.The SYNTAX score: an angiographic tool grading the complexity ofcoronary artery disease. Eurointervention2005;1(2):219-27.

10- Grundy SM, Cleeman JI, Merz CN, Brewer HB Jr, Clark LT, Hunninghake DB, et al.Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III guidelines.Circulation 2004;110(2):227-39.

11- Duncan RF, Dundon BK, Nelson AJ, Pemberton J, Williams K, Worthley MI, et al. A study of the 16-Segment Regional Wall MotionScoring Index and biplane Simpson's rule for the calculation of leftventricular ejection fraction: a comparison with cardiac magneticresonance imaging. Echocardiography2011;28(6):597-604.

12- Cetin M, Cakici M, Zencir C, Tasolar H, Baysal E, Balli M, et al. Prediction of coronary artery disease severity using CHADS2 andCHA2DS2-VASc scores and a newly defined CHA2DS2-VASc-HSscore. Am J Cardiol 2014;113(6):950-6.

13- Mehran R, Aymong ED, Nikolsky E, Lasic Z, Iakovou I, Fahy M,et al.A simplerisk score for prediction of contrast-induced nephropathy after percutaneouscoronary intervention: development and initial validation. J Am CollCardiol2004;44(7):1393-9.

14- Eberly LE, Neaton JD, Thomas AJ, Yu D.Multiple risk factor intervention trial research group. multiple-stage screening and mortality in the multiple risk factor intervention trial. Clin Trials 2004;1(2):148-61.

15- Chou RH, Huang PH, Hsu CY, Leu HB, Huang SS, Huang CC, et al.CHADS2 score predicts risk of contrastinduced nephropathy in stable coronary artery disease patients undergoing percutaneous coronary interventions. J Formosan Med Assoc2016;115(7):501-9.

16- Kwok CS, Kontopantelis E, Myint PK, Zaman A, Berry C, Keavney B,et al. Stroke following percutaneous coronary intervention: type-specific incidence, outcomes and determinants seen by the British Cardiovascular Intervention Society 2007–12.EurHeart J2015;36(25):1618-28.