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Research Article

PREDICTIVE VALUE OF CHA2DS2-VASC AND CHA2DS2-VASC-HSF SCORES FOR SEVERITY OF CAD IN ST SEGMENT ELEVATION MYOCARDIAL INFARCTION

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A R T I C L E I N F O

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A B S T R A C T

Background: Timely prevention is need of the hour in patients with STEMI. The CHADS2 and CHA2DS2-VASc are clinical scores used to guide antithrombotic therapy in patients with non-valvular AF and include similar risk factors for the development of coronary artery disease (CAD) as well. Factors comprising CHA2DS2-VASc-HSF score can predict severity of CAD in patients with STEMI.

Aim: To investigate the association of higher CHA2DS2-VASc and CHA2DS2-VASc-HSF scores with CAD severity on angiography as assessed by SYNTAX score in patients with STEMI.

Material and Methods: Total of 462 patients of STEMI were included in the study meeting inclusion criteria. Study population included of 240 males and 222 females. All the study patients were divided into three SxS tertiles.

Results: Mean CHA2DS2-VASc and CHA2DS2-VASc-HSF scores according to Syntax score tertiles and number of vessels involved and correlation were evaluated. Both CHA2DS2-VASc and CHA2DS2-VASc-HSF scores were positively correlated with SYNTAX score and number of diseased vessels; but CHA2DS2-VASc-HSF score had a stronger correlation out of two scores.

Conclusion: CHA2DS2-VASc and CHA2DS2-VASc-HSF scores are positively correlated with anatomic severity of CAD.

INTRODUCTION

To effectively recommend prevention strategies, and to assist in clinical and treatment decisions, clinicians need reliable, simple, non-invasive, objective, and quantitative tools for risk stratification. Several multivariable risk prediction algorithms incorporating major risk factors have been developed to assess the individual risk of developing atherosclerotic CVD. The CHADS2 and CHA2DS2-VASc scores are clinical predictors used to to guide antithrombotic therapy in patients with non-valvular AF.[1,2] These scores are widely used in clinical practice and include similar risk factors for the development of coronary artery disease (CAD) as well.

Cetin *et al* reported that the CHADS2, CHA2DS2-VASc, and newly defined CHA2DS2-VASc-HS scores could predict CAD severity using the Gensini score in patients who underwent diagnostic CAG.[3] Uysal *et al* studied the association of the CHA2DS2-VASc-HSF score with the severity of CAD as assessed by the SYNTAX score (SxS) in patients with ST segment elevation MI (STEMI) and observed that a higher CHA2DS2-VASc-HSF score was associated with severity of CAD as assessed by SYNTAX score, which is an established angiographic tool for grading the anatomic severity of coronary artery disease. Compared to the CHA2DS2-VASc score, male gender instead of female as sex category, hyperlipidemia, smoking, and family history of CAD were added in this score. This score predicted severity of CAD better than CHADS2 and CHA2DS2-VASc scores.[4] The study by Modi *et al* also showed similar utility of CHA2DS2-VASc-HSF score in assessment of CAD severity.[5] The primary aim of the present study was to investigate the association of higher CHA2DS2-VASc and CHA2DS2-VASc-HSF scores with CAD severity on angiography as assessed by SYNTAX score in patients with STEMI.

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MATERIAL AND METHODS

This was a hospital-based, cross-sectional, observational study done at LPSIC, Kanpur from August 2016 to January 2018. Consecutive 462 patients undergoing coronary angiography for acute STEMI were included in the present study.

STEMI was defined by the criteria formulated by the European Society of Cardiology: cardiac chest pain lasting at least 30 minutes with a new ST elevation at the J point in leads V2–V3 ≥ 0.2 mV in men ≥ 40 years, ≥ 0.25 mV in men < 40 years, ≥ 0.15 mV in women, ≥ 0.1 mV in the other contiguous leads and also new onset/presumed new onset left bundle branch

block with an increase of cardiac biomarker values.[6] Cardiac troponin I was measured using enzyme linked fluorescent assay on admission. Patients with history of CABG in past were excluded from this study. Patients with severe renal and hepatic diseases could not undergo coronary angiography were also excluded.

All study patients were subjected to routine physical examination. All patients had baseline echocardiographic examination, ECG, X-Ray chest PA view, routine blood investigations and evaluation of cardiac biomarker Troponin I and viral markers.

Following components of the CHA2DS2-VASc and CHA2DS2-VASc-HSF score were obtained for each patient: Chronic heart failure (CHF) (defined as signs/symptoms of heart failure confirmed with objective evidence of cardiac dysfunction, LVEF<45%), Hypertension (defined as measurements of systolic and diastolic blood pressure ≥ 140/90 mm Hg or taking antihypertensive medications), Age, Diabetes Mellitus (defined as a fasting blood glucose level >126 mg/dL or blood glucose ≥ 200 mg/dL with symptoms or HbA1c level >6.5g% or using anti-diabetic drugs), Previous ischemic stroke or transient ischemic attack (TIA), Vascular disease (defined as MI and peripheral artery disease including prior revascularization, amputation or angiographic evidence or aortic plaque), Gender, Hyperlipidemia (defined as increased level of LDL-C>130mg/dL according to the National Cholesterol Education Program-3 recommendations or history of using lipid lowering medications). Lipid profile was obtained by autoanalyser. LDL levels were calculated using Friedwald equation.65 Smoking status (defined as smoking > 10 cigarettes a day for at least one year without a quite attempt), Family history of CAD (defined as MI before 55 years of age for men or 65 years of age for women in first-degree relatives)

Total CHA2DS2-VASc-HSF score out of maximum 12 was calculated for each patient using point system[4] as shown in Table 1.

All the studied patients underwent Coronary Artery Angiography using standard Judkin's technique. From the baseline diagnostic angiogram, each coronary lesion producing at least 50% diameter stenosis in vessels of at least 1.5 mm was evaluated separately and added together to provide the total SYNTAX score. This is available on the SxS website (http://www.syntaxscore.com). The patients were divided into three groups according to the SxStertiles: low SxS group (SxS< 22), intermediate SxS group (SxS 23–32), and high SxS group (SxS ≥ 33). Data entry and analysis was done in Excel. For this study p value < 0.05 was considered as statistically significant.

RESULTS

Total of 462 patients of STEMI were included in the study meeting inclusion and exclusion criteria. Study population included of 240 males and 222 females.

All the study patients were divided into three SxS tertiles. Then all the baseline features were compared (Table 2). Difference in the three groups was statistically highly significant with p value <0.001 except history of stroke (p value <0.05 significant).

Mean CHA2DS2-VASc and CHA2DS2-VASc-HSF scores according to Syntax score tertiles and number of vessels involved and correlation were evaluated (Table 3 & 4). Both CHA2DS2-VASc and CHA2DS2-VASc-HSF scores were positively correlated with SYNTAX score and number of diseased vessels; but CHA2DS2-VASc-HSF score had a stronger correlation out of two scores (Figure 1).

Table 1 Componenets of CHA2DS2-VASc-HSF 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	Hyperlipidemia	1 point
S	Smoking	1 point
F	Family history of CAD	1 point

Table 2 Baseline characteristics of the patients classified according to Syntax score tertiles

Characteristics	SYNTAX score low tertile (upto 22)(n=253)	SYNTAX score intermediate tertile (23-32) (n=172)	SYNTAX score high tertile (>32) (n=37)	p value
Age	55.6±10.57	60.87±13.03	60.94±15.50	<0.001
Male gender	113	92	35	<0.001
Hypertension	79	67	16	<0.001
Smoker	121	114	21	<0.001
PVD	2	32	7	<0.001
Diabetes mellitus	35	100	27	<0.001
CCF	22	66	18	<0.001
Stroke/TIA	7	4	1	<0.05
Family history	51	37	15	<0.001
Number of vessels involved (mean)	1.04±0.18	2.0±0.41	2.91±0.27	<0.001
Hyperlipidemia	74	89	28	<0.001

Table 3 CHA2DS2-VASc and CHA2DS2-VASc-HSF score according to SxS tertiles

	SYNTAX score low tertile(upto 22) N=253 I	SYNTAX score intermediate tertile (23-32) N=172 II	SYNTAX score high tertile (>32) N=37 III	p value	r value
CHA2DS2-VASc score	1.52±0.86	2.76±1.20	3.38±0.86	I & II (<0.001) I & III (<0.001) II & III (<0.05)	I & II (0.51) I & III (0.58) II & III (0.20)
CHA2DS2-VASc-HSF	2.38±0.86	4.27±0.83	5.86±0.88	I & II (<0.001) I & III (<0.001) II & III (<0.001)	I & II (0.73) I & III (0.80) II & III (0.58)

Table 4 CHA2DS2-VASc score according to number of vessels involved and correlation

	1 vessel disease (n = 261) I	2 vessel disease (n = 155) I	3 vessel disease (n = 46) III	p value	r value
CHA2DS2-VASc-HSF score (mean)	2.43 ± 0.87	4.21 ± 0.88	4.54 ± 1.10	I & II (<0.001) I & III (<0.05) II & III (<0.001)	I & II (0.70) I & III (0.18) II & III (0.46)
CHA2DS2-VASc score (mean)	1.52 ± 0.88	2.64 ± 1.03	2.90 ± 1.13	I & II (<0.001) I & III (<0.001) II & III (>0.05)	I & II (0.50) I & III (0.47) II & III (0.10)

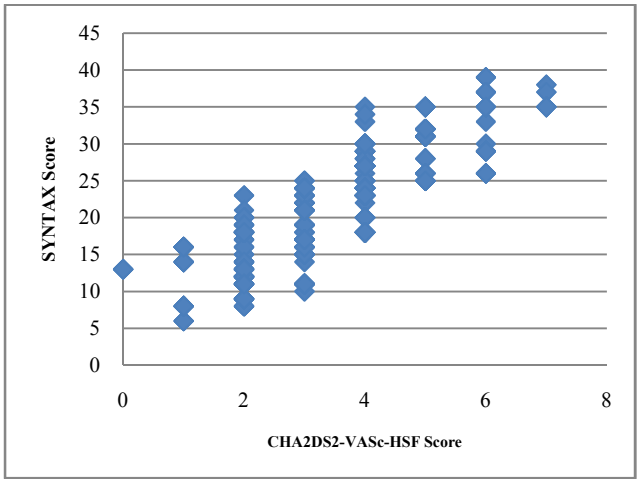

Figure 1 Correlation of CHA2DS2-VASc-HSF score with Syntax score

DISCUSSION

Early detection of the risk population and commencing prevention strategies is an important aspect in the treatment of CVD. Clinicians need reliable, simple, objective, and quantitative tools to identify the risk. Several multivariable risk prediction algorithms incorporating major risk factors have been developed to assess the risk of atherosclerotic CVD, such as the Framingham risk score (FRS), systematic coronary risk evaluation (SCORE), Reynolds, QRESEARCH cardiovascular risk (QRISK), and the assessing cardiovascular risk to Scottish Intercollegiate Guidelines Network to assign preventative treatment (ASSIGN) score.[7-14]

CHA2DS2-VASc and CHA2DS2-VASc-HSF are scores proposed to have correlation with severity of CAD recently, as these scores are based on risk factors for CAD only. There are a number of scoring systems available for assessing severity of coronary artery stenosis. These include but are not limited to Gensini scoring, CASS scoring, Duke Jeopardy scoring, SYNTAX score, BARI Jeopardy score and APPROACH score, among others.[15-20] We used SYNTAX score for assessment of CAD severity in our study.

Our study was done over a period of 18 months in the Cardiology department of LPSIC Kanpur. A total of 462 patients were enrolled in the present study, unless they fulfilled the exclusion criteria.

The mean CHA2DS2-VASc (3.38±0.86 Vs 1.52±0.86) and CHA2DS2-VASc-HSF (5.86±0.88 Vs 2.38±0.86) scores were higher in patients with high SYNTAX score tertile (SxS>32). The mean CHA2DS2-VASc, CHA2DS2-VASc-HSF scores were correlated significantly with SYNTAX score and also with the number of diseased vessels. The CHA2DS2-VASc-HSF score was found to be the best score scheme to predict CAD severity.

Results of our study match with observation of Uysal *et al*. In their study, the severity of CAD was evaluated by SxS in patients presenting with STEMI. They also observed that a higher mean CHA2DS2-VASc score is found in high SxStertile (2.35 ± 1.0 Vs 3.1 ± 1.6). Also a higher CHA2DS2-VASc-HSF score was found in patients in high SxS tertile (3.90 ± 1.0 Vs 4.72 ± 1.2). They had concluded that CHA2DS2-VASc-HSF score is the best score scheme to predict CAD severity and results of our study are in accordance to their results.[4]

Results of another study of 407 patients of CAD by Cetin *et al*, are also comparable to our observation. They found that CHADS2, CHA2DS2-VASc, and CHA2DS2-VASc-HS scores correlated significantly with the number of diseased vessels and the Gensini score as well. The CHA2DS2-VASc-HS score was found to be the best scoring scheme to predict CAD severity.[3]

Tasolar*et al* who analyzed the clinical and angiographic data of 252 consecutive NSTEMI patients. They also had similar findings as our study. The number of diseased vessels was correlated with the CHA2DS2-VASc and CHA2DS2-VASc-HS scores in their study as well.[22]

In an Indian study by Modi *et al*, CHA2DS2-VASc-HSF score predicted CAD severity in a total of 2976 consecutive patients of suspected CAD who underwent coronary angiography. They concluded that patients with CHADS2 and CHA2DS2-VASc score >2, and CHA2DS2-VASc-HS and CHA2DS2-VASc-HSF scores >3 had higher Gensini score. CHA2DS2-VASc-HSF scoring scheme was best correlated with severity of CAD similar to our observation.[5]

Our study had few limitations as well. This study represents a single-centre, non-randomized experience with limited number of patients, a larger population is required to truly derive significant results. It was not a longitudinal study and information regarding in-hospital mortality, intervention done for the angiographic findings and future morbidity was not included in the study. In SYNTAX scoring system there is inter-operator variability even when specific watershed points exist (e.g<22, >32) to differentiate severity of disease. Whether this angiographic severity will result into worse clinical events is also not clear. CHA2DS2-VASc-HSF is a new score, and it should be validated in other MI populations before its routine bedside use.

CONCLUSION

CHA2DS2-VASc and CHA2DS2-VASc-HSF risk scoring systems may play an important role as bedside predictive models of anatomic severity of CAD because they are simple and can be easily applied by physicians without any additional costs in routine practice.

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