Original Article

Study on the predictive ability of emergency $CHADS_2$ score and CHA_2DS_2-VASc score for coronary artery disease and prognosis in patients with acute ST-segment elevation myocardial infarction

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Background: Acute ST-segment elevation myocardial infarction (STEMI) has a high morbidity and mortality rate. The congestive heart failure, hypertension, age, diabetes, previous stroke/transient ischemic attack (2 points) ($CHADS_2$) and $CHADS_2$ score with 2 points assigned for age >75 years-vascular disease (CHA_2DS_2-VASc) scores are widely used for risk stratification management of non-valvular atrial fibrillation stroke and have high prognostic value in cardiovascular disease. This study aims to investigate the predictive value of the emergency $CHADS_2$ and CHA_2DS_2-VASc score on coronary artery lesions and prognosis in patients with acute STEMI.

Methods: A total of 524 patients with STEMI from May 2018 to October 2021 were selected for emergency $CHADS_2$ and CHA_2DS_2-VASc. Clinical data and laboratory indicators were collected. Patients were evaluated for coronary artery disease (CAD) and prognosis. Logistic regression and the receiver operating characteristic (ROC) curve were used to analyze the data.

Results: In severe group, CysC levels, $CHADS_2$, CHA_2DS_2-VASc score and the proportion of diabetes, stroke or transient ischemic attack (TIA), congestive heart failure, smoking history, Killip class ≥2 was higher than that in mild and moderate group. In poor prognosis group, levels of serum creatinine (Crea), CysC, hemoglobin (Hb), $CHADS_2$, CHA_2DS_2-VASc score and the proportion of hypertension, diabetes, stroke or TIA, congestive heart failure, smoking history, and Killip class ≥2 was higher than that in good prognosis group. Diabetes (OR, 3.678; 95% CI: 2.876–5.872, 0.008), $CHADS_2$ (OR, 3.829; 95% CI: 2.310–5.832, 0.003) and CHA_2DS_2-VASc score (OR, 4.671; 95% CI: 3.125–6.187, 0.000) were independent risk factors for the severity of CAD ($P<0.05$). Diabetes (OR, 3.287; 95% CI: 2.231–5.123, 0.012), Killip class ≥2 (OR, 2.212; 95% CI: 1.023–2.987, 0.045), LVEF (OR, 3.110; 95% CI: 2.124–5.031, 0.023), $CHADS_2$ (OR, 3.228; 95% CI: 2.133–5.886, 0.005) and CHA_2DS_2-VASc score (OR, 3.988; 95% CI: 2.987–5.873, 0.001) were independent risk factors for prognosis of acute STEMI patients. Area under curve (AUC) value of CHA_2DS_2-VASc score in evaluating CAD and prognosis was 0.947, 0.931, higher than that of the $CHADS_2$ score (0.836, 0.812) ($P<0.05$).

Conclusions: Multiple factors jointly affect the severity and prognosis of CAD in patients with acute STEMI. The CHA_2DS_2-VASc score is better than the $CHADS_2$ score in predicting the severity of coronary artery lesions and prognosis of patients, providing theoretical support for clinical practice.

Keywords: Congestive heart failure, hypertension, age, diabetes, previous stroke/transient ischemic attack (2 points) score ($CHADS_2$ score); $CHADS_2$ score with 2 points assigned for age >75 years-vascular disease score (CHA_2DS_2-VASc score); acute ST-segment elevation myocardial infarction (acute STEMI); coronary artery lesions

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Introduction

Acute ST-segment elevation myocardial infarction (STEMI) occurs with significantly higher than normal levels of serum myocardial injury markers in patients with ischemic chest pain, and most of these patients have a poor prognosis (1). Acute STEMI mostly manifests as myocardial ischemic necrosis, associated with coronary atherosclerotic plaque rupture leading to angiogenesis and coronary occlusion; a study (2) has found that the morbidity and mortality of acute STEMI are high, and most patients have a poor prognosis, which seriously affects the life safety of these patients. Acute STEMI has now become one of the most important causes of death worldwide, so it is particularly important to perform an assessment of emergency coronary lesion extent and prognosis prediction after admission to reduce clinical mortality in patients with acute STEMI. The congestive heart failure, hypertension, age, diabetes, previous stroke/transient ischemic attack (TIA) (2 points)($CHADS_2$) score (3) and $CHADS_2$ score with 2 points assigned for age >75 years-vascular disease (CHA_2DS_2-VASc) score (4) are risk stratification management scores that are widely used in non-valvular atrial fibrillation stroke, and with the continuous application of the above scoring systems in clinical practice, have been found to be of high value in predicting patient prognosis in cardiovascular disease. Most of the components of the $CHADS_2$ and CHA_2DS_2-VASc scores are also risk factors for coronary atherosclerosis and can therefore be used to predict the severity of CAD. There are many methods to predict the severity of CAD and the prognosis of STEMI, such as monitoring by ECG, monitoring by laboratory tests, angiographic intervention, etc. However, these methods are time-consuming, lagging, and complicated to perform. $CHADS_2$ and CHA_2DS_2-VASc scores are simple to administer and provide a basic understanding of the patient's condition in a short period of time. However, by searching the relevant literature, we were unable to locate any study that used both scoring systems to predict coronary lesions and prognosis in patients with acute STEMI. Therefore, we hypothesized that both scores could predict the severity of coronary lesions and prognosis in patients, and to verify this hypothesis, this study was designed and is reported below. We present the following article in accordance with the STARD reporting checklist (available at https://jtd.amegroups.com/article/view/10.21037/jtd-22-763/rc).

Methods

Objective

A total of 524 consecutive acute STEMI patients admitted to the Emergency Department of the Chinese PLA General Hospital from May 2018 to October 2021 were enrolled in the present retrospective, cohort study. All patients had undergone emergency $CHADS_2$ and CHA_2DS_2-VASc scoring. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the Ethics Committee of Chinese PLA General Hospital (No. 20220079). Individual consent for this retrospective analysis was waived.

Inclusion and exclusion criteria

In line with the clinical diagnosis of the disease, all cases had manifestations of chest pain in the precordial region, duration of chest pain ≥0.5 hours, ST-segment elevation in electrocardiogram (ECG) leads, and markedly elevated markers of myocardial injury such as troponin and creatine kinase isoenzymes.

The exclusion criteria were as follows: previous history of coronary artery bypass grafting or percutaneous coronary intervention; congenital heart disease; combined pulmonary and urinary tract infection; combined lung and liver cancer; organ insufficiency; incomplete clinical data; and communication and mental abnormalities.

Research methods

Clinical data collection

Clinical data were collected from all patients, including

gender, age, body mass index (BMI), comorbidities (hypertension, diabetes, stroke, TIA, congestive heart failure, hyperlipidemia), family history of myocardial infarction, history of smoking, history of alcohol consumption, Killip class ≥2, and laboratory indices [triglycerides (TG), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), creatinine (Crea), cystatin C (CysC), hemoglobin (Hb), white blood cell count (WBC), and left ventricular ejection fraction (LVEF)].

Evaluation of the degree of coronary artery lesion

After hospital admission, cases underwent coronary angiography [a common and effective method for diagnosing coronary artery disease (CAD) which is a safe and reliable invasive diagnostic technique that is now widely used in clinical practice and is considered the "gold standard" for the diagnosis of CAD] using the standard Jundkin's technique (5). The SYNTAX score (https://syntaxscore.org/) calculation was performed by two experienced physicians without knowledge of the baseline clinical features and clinical findings. The degree of coronary artery lesions was evaluated according to the SYNTAX score, with higher scores indicating more severe coronary artery lesions in patients with severe lesions, as follows: ≥33 points, moderate lesions: 23–32 points, and mild lesions: ≤22 points. Cases were divided into mild to moderate and severe groups according to their SYNTAX score.

Prognostic evaluation

Whether major adverse cardiovascular events (MACE) occurred during hospitalization was used as the endpoint event, and MACE events mainly included all-cause death of disease and recurrent myocardial infarction, which were divided into good and poor groups according to whether MACEs had occurred.

Scoring method

(I) The $CHADS_2$ score scoring method is as follows: 1 point for congestive heart failure, hypertension, age ≥75 years, and diabetes mellitus, and 2 points for stroke or TIA, respectively. (II) The CHA_2DS_2-VASc score scoring method is as follows: 1 point for congestive heart failure, hypertension, diabetes mellitus, vascular disease, age 65–75 years, and gender (female), and 2 for stroke or TIA, and age ≥75 years, respectively. The scorers were blinded to the baseline clinical characteristics and clinical outcomes of cases in each group.

Indicator observation

(I) To count the general data of patients in different coronary lesion subgroups and different prognosis subgroups, and to compare the $CHADS_2$ score and CHA_2DS_2-VASc score between different subgroups. (II) To analyze the factors affecting the coronary artery lesions and prognosis of acute STEMI patients. (III) To analyze the predictive value of the two scores on the coronary artery lesions and prognosis of acute STEMI patients.

Statistical analysis

The measures were first analyzed using the Kolmogorov-Smirnov test, and if the results showed conformity to a normal distribution, they were described using ($\bar{x}$±s), and independent samples *t*-test was used for comparison between groups. If they did not conform to a normal distribution, they were described using the median and quartiles [M(P25, P75)], and the Mann-Whitney test was used for comparisons between groups. The statistical data were expressed as ratios, and the chi-square test was used for comparison. Logistic regression analysis was applied to the risk factors affecting coronary artery lesions, prognosis in patients with acute STEMI. The receiver operating characteristic (ROC) curve was applied to analyze the predictive value of $CHADS_2$ score and CHA_2DS_2-VASc score on coronary artery lesions and the prognosis of patients. All statistics were tested using a two-sided test at α=0.05. A statistically significant difference was indicated when $P<0.05$, with a 95% confidence interval (CI). All data were analyzed using the software SPSS 22.0 (IBM Corp., Armonk, NY, USA).

Results

Comparison of various indexes in different coronary lesion subgroups

A total of 524 patients with acute STEMI, 238 men and 286 women, aged 48–80 years, were included in the study. The patients were grouped according to the degree of coronary artery lesions, including 385 cases in the mild to moderate group and 139 cases in the severe group. As shown in *Table 1*, the differences between the two groups were statistically significant when comparing diabetes mellitus, stroke or TIA, congestive heart failure, smoking history, percentage of Killip class ≥2, CysC, LVEF, $CHADS_2$ score, and CHA_2DS_2-VASc score. The percentage

Table 1 Comparison of various indexes in different coronary lesion subgroups [$\bar{x}$±s, n (%)]

Clinical indicators	Mild to moderate group (n=385)	Severe group (n=139)	χ^2/t	P value
Gender (male/female)	173/212	65/74	0.138	0.711
Average age (years)	62.43±5.43	62.87±5.13	0.831	0.406
Average BMI (kg/m^2)	23.45±2.93	23.76±3.00	1.041	0.289
Hypertension	102 (26.49)	34 (24.46)	0.261	0.610
Diabetes mellitus	54 (14.03)	65 (46.76)	62.355	<0.001
Stroke or TIA	62 (16.10)	53 (38.13)	28.923	<0.001
Congestive heart failure	71 (18.44)	56 (40.29)	26.544	<0.001
Hyperlipidemia	67 (17.40)	23 (16.55)	0.053	0.819
Family history of heart attack	85 (22.08)	24 (17.27)	1.435	0.231
Smoking history	71 (18.44)	48 (34.53)	26.209	<0.001
Drinking history	87 (22.60)	39 (28.06)	1.667	0.197
Killip class ≥2	89 (23.12)	51 (36.69)	9.611	0.002
TG (mmol/L)	1.50±0.28	1.53±0.32	1.041	0.298
TC (mmol/L)	4.27±0.65	4.32±0.76	0.742	0.458
HDL-C (mmol/L)	1.13±0.17	1.15±0.19	1.152	0.250
LDL-C (mmol/L)	2.93±0.43	2.98±0.32	1.251	0.211
Crea (μmol/L)	70.98±5.17	71.23±5.10	0.490	0.624
CysC (μmol/L)	1.00±0.11	1.29±0.17	22.790	<0.001
Hb (g/L)	138.11±14.62	137.96±14.54	0.104	0.917
WBC (×10^9/L)	7.23±0.84	7.17±0.82	0.726	0.468
LVEF (%)	60.98±7.65	52.18±5.13	12.580	<0.001
$CHADS_2$ score (points)	1.10±0.21	2.34±0.56	39.570	<0.001
CHA_2DS_2-VASc score (points)	2.17±0.34	5.62±0.87	65.290	<0.001

BMI, body mass index; TIA, transient ischemic attack; TG, triglycerides; TC, total cholesterol; HDL-C, high density lipoprotein cholesterol; LDL-C, low density lipoprotein cholesterol; Crea, creatinine; CysC, cystatin C; Hb, hemoglobin; WBC, white blood cells; LVEF, left ventricular ejection fraction; $CHADS_2$, congestive heart failure, hypertension, age, diabetes, previous stroke/transient ischemic attack (2 points); CHA_2DS_2-VASc, $CHADS_2$ score with 2 points assigned for age >75 years-vascular disease.

of diabetes mellitus, stroke or TIA, congestive heart failure, smoking history, and Killip class ≥2 was higher in the severe group than in the mild to moderate group, and the CysC, $CHADS_2$ score, and CHA_2DS_2-VASc score were higher than in the mild to moderate group, and LVEF was lower than in the mild to moderate group (P<0.05).

Analysis of factors affecting coronary artery lesions in patients with acute STEMI

As shown in *Table 2*, the severity of coronary artery lesions in patients with acute STEMI was used as the dependent variable (mild to moderate =0, severe =1), and the indicators with differences in the above table were used as independent variables to establish a logistic regression model, and the results showed that diabetes, $CHADS_2$ score, and CHA_2DS_2-VASc score were independent risk factors (P<0.05).

Analysis of the predictive value of $CHADS_2$ score and CHA_2DS_2-VASc score on the severity of coronary artery lesions in patients with acute STEMI

As shown in *Table 3* and *Figure 1*, AUC value of CHA_2DS_2-

Table 2 Analysis of factors affecting coronary artery lesions in patients with acute STEMI

Clinical indicators	β	SE	Wald χ^2	OR	95% CI	P value
Diabetes mellitus	0.765	0.238	10.922	3.678	2.876–5.872	0.008
Stroke or TIA	0.778	0.226	1.112	1.029	0.754–2.387	0.339
Congestive heart failure	0.654	0.279	1.087	1.276	0.812–2.549	0.487
Smoking history	0.526	0.228	1.022	1.236	0.765–2.834	0.256
Killip ≥ grade 2	0.487	0.217	1.991	1.037	0.827–2.765	0.098
CysC	0.678	0.321	1.768	1.002	0.910–2.338	0.273
LVEF	0.662	0.227	1.636	1.132	0.876–2.239	0.128
$CHADS_2$ score	0.519	0.256	15.223	3.829	2.310–5.832	0.003
CHA_2DS_2-VASc score	0.556	0.231	16.198	4.671	3.125–6.187	0.000

STEMI, ST-segment elevation myocardial infarction; SE, standard error; OR, odds ratio; CI, confidence interval; TIA, transient ischemic attack; CysC, cystatin C; LVEF, left ventricular ejection fraction; $CHADS_2$, congestive heart failure, hypertension, age, diabetes, previous stroke/transient ischemic attack (2 points); CHA_2DS_2-VASc, $CHADS_2$ score with 2 points assigned for age >75 years-vascular disease.

Table 3 Analysis of the predictive efficacy of $CHADS_2$ and CHA_2DS_2-VASc scores on the severity of coronary artery lesions in patients with acute STEMI

Clinical indicators	Area under curve	95% CI	Cut off value	Sensitivity	Specificity	P value
$CHADS_2$ score	0.836	0.693–0.978	2.00	85.14%	77.86%	0.002
CHA_2DS_2-VASc score	0.947	0.873–1.000	4.50	89.90%	75.17%	<0.001

$CHADS_2$, congestive heart failure, hypertension, age, diabetes, previous stroke/transient ischemic attack (2 points); CHA_2DS_2-VASc, $CHADS_2$ score with 2 points assigned for age >75 years-vascular disease; STEMI, ST-segment elevation myocardial infarction; CI, confidence interval.

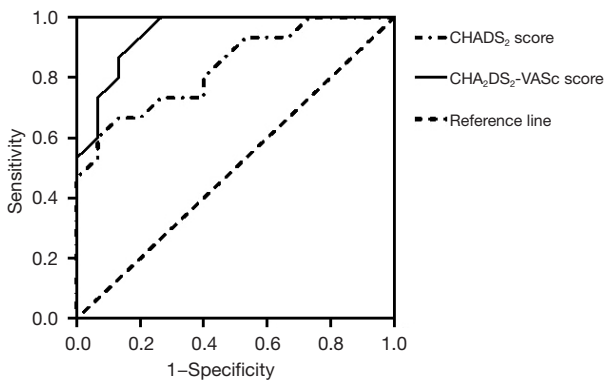

Figure 1 ROC curves of $CHADS_2$ and CHA_2DS_2-VASc scores for predicting the severity of coronary artery lesions in patients with acute STEMI. $CHADS_2$, congestive heart failure, hypertension, age, diabetes, previous stroke/transient ischemic attack (2 points); CHA_2DS_2-VASc, $CHADS_2$ score with 2 points assigned for age >75 years-vascular disease; ROC, receiver operating characteristic; STEMI, ST-segment elevation myocardial infarction.

VASc score in evaluating the severity of coronary artery lesions was 0.947, significantly higher than that of $CHADS_2$ (0.836) (Z=3.424, P<0.05), suggesting that CHA_2DS_2-VASc score was more suitable for predicting the severity of coronary artery lesions in patients with acute STEMI than the $CHADS_2$ score.

Comparison of various indicators in different prognostic subgroups

As shown in *Table 4*, the differences between the two groups were statistically significant in hypertension, diabetes, stroke or TIA, congestive heart failure, smoking history, Killip class ≥2, Crea, CysC, Hb, LVEF, $CHADS_2$ score, and CHA_2DS_2-VASc score. The percentage of hypertension, diabetes mellitus, stroke or TIA, congestive heart failure, smoking history, and Killip class ≥2 was higher in the poor prognosis group than in the good prognosis group; Crea,

Table 4 Comparison of various indicators in different prognostic subgroups [$\bar{x}$±s, n (%)]

Clinical indicators	Good group (n=368)	Poor group (n=156)	χ^2/t	P value
Gender (male/female)	157/211	81/75	3.790	0.052
Average age (years)	62.86±5.33	63.02±5.28	0.295	0.768
Average BMI (kg/m^2)	23.76±3.24	23.88±3.12	0.392	0.695
Hypertension	79 (21.47)	57 (36.54)	7.074	0.008
Diabetes mellitus	65 (17.66)	54 (34.62)	17.937	< 0.001
Stroke or TIA	69 (18.75)	46 (29.49)	7.373	0.007
Congestive heart failure	64 (17.39)	63 (40.38)	41.544	< 0.001
Hyperlipidemia	66 (17.93)	24 (15.38)	0.501	0.479
Family history of heart attack	54 (14.67)	25 (16.03)	0.156	0.693
Smoking history	68 (18.48)	51 (32.69)	12.611	< 0.001
Drinking History	79 (21.47)	27 (17.31)	1.175	0.278
Killip class ≥2	85 (23.10)	55 (35.26)	8.272	0.004
TG (mmol/L)	1.52±0.41	1.56±0.35	1.065	0.287
TC (mmol/L)	4.18±0.33	4.25±0.46	1.962	0.052
HDL-C (mmol/L)	1.11±0.23	1.08±0.32	1.208	0.228
LDL-C (mmol/L)	2.79±0.37	2.87±0.54	1.958	0.051
Crea (μmol/L)	76.81±6.12	88.65±10.33	16.270	< 0.001
CysC (μmol/L)	1.00±0.14	1.34±0.21	21.710	< 0.001
Hb (g/L)	130.23±13.65	139.98±12.34	7.688	< 0.001
WBC (×10^9/L)	7.18±0.25	7.22±0.31	1.555	0.121
LVEF (%)	61.29±7.85	50.53±4.87	15.870	< 0.001
$CHADS_2$ score (points)	1.04±0.12	3.27±0.43	91.530	< 0.001
CHA_2DS_2-VASc score (points)	2.45±0.55	5.12±0.86	42.510	< 0.001

BMI, body mass index; TIA, transient ischemic attack; TG, triglycerides; TC, total cholesterol; HDL-C, high density lipoprotein cholesterol; LDL-C, low density lipoprotein cholesterol; Crea, creatinine; CysC, cystatin C; Hb, hemoglobin; WBC, white blood cells; LVEF, left ventricular ejection fraction; $CHADS_2$, congestive heart failure, hypertension, age, diabetes, previous stroke/transient ischemic attack (2 points); CHA_2DS_2-VASc, $CHADS_2$ score with 2 points assigned for age >75 years-vascular disease.

CysC, Hb, $CHADS_2$ score, and CHA_2DS_2-VASc score were higher than in the good prognosis group; and LVEF was lower than in the good prognosis group (P<0.05).

Multivariate analysis of affecting the prognosis of patients with acute STEMI

As shown in *Table 5*, a logistic regression model was developed using the severity of coronary artery lesions in patients with acute STEMI as the dependent variable (good =0, poor =1) and the indicators that differed in the above table as independent variables, and the results showed that diabetes, Killip class ≥2, LVEF, $CHADS_2$ score, and CHA_2DS_2-VASc score were all independent risk factors (P<0.05).

Analysis of the predictive value of $CHADS_2$ score and CHA_2DS_2-VASc score on the prognosis of patients with acute STEMI

As shown in *Table 6* and *Figure 2*, AUC value of CHA_2DS_2-VASc score in evaluating the prognosis of patients with

Table 5 Multivariate analysis of affecting the prognosis of patients with acute STEMI

Clinical indicators	β	SE	Wald χ^2	OR	95% CI	P value
Diabetes mellitus	0.657	0.186	10.987	3.287	2.231–5.123	0.012
Stroke or TIA	0.764	0.241	1.078	1.182	0.542–1.578	0.346
Congestive heart failure	0.662	0.189	1.004	1.876	0.675–1.965	0.417
Smoking history	0.546	0.228	1.289	1.227	0.778–1.398	0.552
Killip ≥ grade 2	0.625	0.254	5.224	2.212	1.023–2.987	0.045
CysC	0.629	0.286	1.072	1.231	0.765–1.876	0.281
LVEF	0.576	0.267	7.054	3.110	2.124–5.031	0.023
$CHADS_2$ score	0.633	0.334	15.387	3.228	2.133–5.886	0.005
CHA_2DS_2-VASc score	0.572	0.231	18.970	3.988	2.987–5.873	0.001

STEMI, ST-segment elevation myocardial infarction; SE, standard error; OR, odds ratio; CI, confidence interval; TIA, transient ischemic attack; CysC, cystatin C; LVEF, left ventricular ejection fraction; $CHADS_2$, congestive heart failure, hypertension, age, diabetes, previous stroke/transient ischemic attack (2 points); CHA_2DS_2-VASc, $CHADS_2$ score with 2 points assigned for age >75 years-vascular disease.

Table 6 Analysis of the predictive efficacy of $CHADS_2$ and CHA_2DS_2-VASc scores on the prognosis of patients with acute STEMI

Clinical indicators	Area under curve	95% CI	Cut off value	Sensitivity	Specificity	P value
$CHADS_2$ score	0.812	0.608–0.952	2.19	82.14%	77.98%	0.009
CHA_2DS_2-VASc score	0.931	0.846–1.016	4.80	87.98%	75.34%	<0.001

$CHADS_2$, congestive heart failure, hypertension, age, diabetes, previous stroke/transient ischemic attack (2 points); CHA_2DS_2-VASc, $CHADS_2$ score with 2 points assigned for age >75 years-vascular disease; STEMI, ST-segment elevation myocardial infarction; CI, confidence interval.

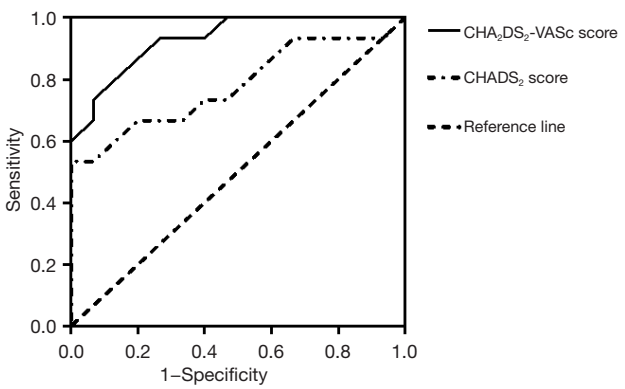

Figure 2 ROC curves of $CHADS_2$ and CHA_2DS_2-VASc scores for prognosis prediction of acute STEMI patients. $CHADS_2$, congestive heart failure, hypertension, age, diabetes, previous stroke/transient ischemic attack (2 points); CHA_2DS_2-VASc, $CHADS_2$ score with 2 points assigned for age >75 years-vascular disease; ROC, receiver operating characteristic; STEMI, ST-segment elevation myocardial infarction.

acute STEMI was 0.931, significantly higher than that of $CHADS_2$ (0.812) (Z=3.633, P<0.05), suggesting that the CHA_2DS_2-VASc score was more suitable for predicting the prognosis of patients with acute STEMI than the $CHADS_2$ score.

Discussion

The application of quantitative assessment systems of multiple risk factors is important for the identification and prognosis of patients with high-risk cardiovascular disease. Among them, the $CHADS_2$ and CHA_2DS_2-VASc scoring systems are two of the more widely used scoring systems, and both were first used clinically in patients with atrial fibrillation (6,7). In recent years, the relationship between these two scoring systems and cardiovascular disease has become a hot topic of research, and Zorlu *et al.* (8) and Kilic *et al.* (9) both concluded in their studies that the two

systems could predict the absence of reflow phenomenon and reperfusion failure after thrombolytic therapy in patients with acute STEMI, respectively. A study by Chen *et al.* (10) showed that both scores predicted prognostic death in patients with heart failure with or without an atrial fibrillation phase. This suggests that both may have the ability to predict the degree of CAD and prognosis in patients with acute STEMI and may play an important role in the assessment of the degree of CAD and prognosis.

The results of this paper showed that the $CHADS_2$ score and CHA_2DS_2-VASc score were higher in patients with more severe coronary artery lesions and poorer prognosis. Further multifactorial analysis was used to determine whether they were risk factors affecting coronary artery lesions and prognosis in patients with acute STEMI, and the results showed that both were independent risk factors, which suggests that the two scoring systems may have the potential to predict patients' coronary artery lesions and prognosis. In addition, although this paper concluded that both $CHADS_2$ score and CHA_2DS_2-VASc score are related to the degree and prognosis of coronary artery lesions in patients with acute STEMI, it did not analyze their specific pathophysiological mechanisms in depth and concluded that their correlation may be related to the following points: (I) both the $CHADS_2$ score and CHA_2DS_2-VASc scoring systems contain STEMI occurrence risk factors, such as hypertension, diabetes mellitus, stroke or TIA, and age ≥75 years, and both scoring systems are a combination of these factors (11-13). (II) Local inflammation in the body can mediate the development of STEMI, and a study has found that the two-scoring system is immune-related (14).

Several clinical studies have now found (15-17) that diabetes mellitus, hypertension, age, heart failure, and stroke are all risk factors that influence the development and prognosis of acute STEMI disease. Among them, stroke and peripheral vascular disease are not only manifested as peripheral and cerebral circulatory ischemia, but also associated with atherosclerosis including coronary artery-related atherosclerosis, and therefore stroke is considered an independent risk factor for CAD and prognosis in STEMI patients (18,19). The effect of gender on the development of acute STEMI disease and prognosis is still somewhat controversial, but studies have shown (20,21) that the risk of MACE is significantly higher in female than in male patients. Based on the above evidence, the ability of the two scores to predict CAD and prognosis in patients with acute STEMI is associated with a combination of the above factors. The content of the $CHADS_2$ score includes only the above-mentioned factors, yet the CHA_2DS_2-VASc score has three new factors added on this basis, namely gender, vascular disease, and age 65–75 years, which may have a better predictive value for disease than the $CHADS_2$ score (22-24). In this paper, we further analyzed the value of the two scoring systems in predicting coronary artery lesions and prognosis in patients with acute STEMI, and the results showed that the area under the curve (AUC) of $CHADS_2$ score in predicting coronary artery lesions and prognosis in patients with acute STEMI was 0.836 and 0.812, respectively, and the AUC of CHA_2DS_2-VASc score in predicting coronary artery lesions and prognosis in patients with acute STEMI was 0.947 and 0.931, respectively. This indicates that the AUC of both was >0.7, suggesting that both can be predicted, but the CHA_2DS_2-VASc has a higher predictive value compared with that of the $CHADS_2$; a better predictive value can be chosen in clinical practice to assess the coronary artery lesions of patients to the maximum extent, select the appropriate medication regimen, and improve the prognosis.

This paper is innovative in that it used SYNTAX, which is widely used in clinical practice, to evaluate the degree of coronary artery lesions in patients, and this scoring system can more accurately reflect the degree of coronary artery lesions in patients. In addition, the CHA_2DS_2-VASc score is more suitable for evaluating the degree of coronary artery lesions and prognosis of patients than $CHADS_2$ score, which has certain guiding significance for the study of acute STEMI.

The sample size included in this study was small, and the analysis of patient prognosis was limited to the prognosis during hospitalization. Changes in patients' in-hospital medication regimens also affect prognosis and may influence the results, and the specific mechanisms were not analyzed in depth, so the results of this paper need to be verified through a large scale study with long-term follow-up.

Conclusions

In conclusion, the coronary artery lesions and prognosis of patients with acute STEMI are influenced by a combination of factors, including diabetes, Killip class ≥2, LVEF, $CHADS_2$ score, and CHA_2DS_2-VASc score. The CHA_2DS_2-VASc score is more valuable than $CHADS_2$ score in evaluating patients' coronary artery lesions and prognosis,

and has a better clinical application prospect.

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Footnote

Reporting Checklist: The authors have completed the STARD reporting checklist. Available at https://jtd.amegroups.com/article/view/10.21037/jtd-22-763/rc

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Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://jtd.amegroups.com/article/view/10.21037/jtd-22-763/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the Ethics Committee of Chinese PLA General Hospital (No. 20220079). Individual consent for this retrospective analysis was waived.

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