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The Prognostic Value of the CHA2DS2-VASc Score for Predicting In-Hospital Mortality and Short-Term Outcomes in Patients with Acute Ischemic Stroke

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ABSTRACT

Introduction: Acute ischemic stroke (AIS) is a common fatal neurological disease worldwide. This study aimed to investigate the prognostic value of the CHA2DS2-VASc score in patients with AIS.

Methods: Two hundred and fifty patients admitted to the emergency department with a diagnosis of AIS without AF were prospectively enrolled in the study.

Results: The CHA2DS2-VASc score, NIHSS score, initial stroke severity (ISS), cerebral infarct volume (CIV), and modified Rankin Scale (mRS) were significantly higher, whereas left ventricular ejection fraction (LVEF) and Barthell index (BI) were significantly lower in the in-hospital mortality (+) group. There was a statistically significant positive correlation of the CHA2DS2-VASc score with NIHSS score (r=0.389; p<0.001), ISS (r=0.417; p<0.001), mRS (r=0.362; p<0.001) and SIV (r=0.214; p<0.001) whereas a significant negative correlation of the CHA2DS2-VASc score with BI (r= -0.371; p<0.001). In multivariable Cox-regression analysis, we found that the CHA2DS2-VASc score (HR: 1.816; 95% CI: 1.209-2.726; p<0.001), congestive heart failure, NIHSS score, and BI were independent predictors of in-hospital mortality. Finally, in the Kaplan-Meier survival analysis, in-hospital mortality was significantly higher in patients with the CHA2DS2-VASc score ≥6 (log-rank p<0.001).

Conclusion: The CHA2DS2-VASc score was established to be an independent predictor of in-hospital mortality and short-term outcomes in AIS patients without AF.

Keywords: Acute ischemic stroke, CHA2DS2-VASc score, in-hospital mortality, prognosis, short-term outcomes

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INTRODUCTION

Acute ischemic stroke (AIS) is the world's third leading cause of disability (4.5%) and mortality (11.8%) related to arterial occlusion (1). AIS has dramatically increased the absolute number of patients on healthcare burden, regardless of gender or economic status (developing or developed) (1,2). Hypertension (HT), diabetes mellitus (DM), atherosclerosis, heart failure, and atrial fibrillation (AF) are all important etiologic variables (3). CHA2DS2-VASc score (heart failure, hypertension, diabetes mellitus, vascular disease, age 65 to 74 years, and female gender confer 1 point; age ≥75 years and prior stroke/transient ischemic attack/thromboembolism confer 2 points) was first recommended for determining the risk of a thromboembolic event in patients with AF (4).

Apart from thromboembolic risk in AF, clinical researchers have already used this score as a predictor for adverse clinical events in various cardiovascular and cerebrovascular diseases. In their recent study, Yoshihisa et al. reported that the CHA2DS2-VASc score was an independent predictor of all-cause mortality in hospitalized heart failure patients with or without AF (5). In addition, several other studies have discovered a link between the CHA2DS2-VASc score and major adverse cardiovascular and cerebrovascular events (MACCE) and cardiovascular prognosis in a variety of patient populations, including end-stage renal disease (ESRD), heart failure (HF), acute and chronic coronary syndrome (5-8).

Highlights

- **Acute ischemic stroke is the world's leading cause of disability and mortality**
- **CHA2DS2-VASc is used to determine the risk of thromboembolic events.**
- **There is a positive correlation of CHA2DS2-VASc with NIHSS and modified Rankin.**
- **CHA2DS2-VASc and NIHSS were independent predictors of in-hospital mortality.**

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In AIS patients without AF, the CHA2DS2-VASc score's predictive and prognostic impact on the severity of an ischemic stroke and in-hospital mortality is not yet well-known. Consequently, the goal of our study was to determine whether the CHA2DS2-VASc score has any predictive or prognostic significance for in-hospital mortality in AIS patients without AF.

METHODS

Study population

This study prospectively included 250 consecutive non-AF patients, who presented to the Emergency Department within 24 hours after symptom onset and were hospitalized in the Department of Neurology with the diagnosis of AIS for the first time, between September 2017 and February 2018. Previous stroke/TIA, diagnosis of hemorrhagic cerebrovascular disease, neurological findings which fully resolved within 24 hours, using oral anticoagulants, history of any liver disease, chronic kidney disease, severe peripheral artery disease, the presence of any autoimmune or hematologic or malignant diseases, systemic infection or other inflammatory conditions, acute or chronic coronary syndrome, prior revascularization history, presence of any cardiomyopathy or valvular heart disease, and AF or paroxysmal atrial fibrillation (history of AF or detected AF on 12-lead ECG and/or 24–48 h Holter monitoring) were all exclusion criteria for this study.

A total of 209 patients were excluded from the study: 58 patients due to AF and/or cardiac disease, 51 patients due to TIA, 44 patients due to previous stroke, 21 patients due to intracranial hemorrhage, 18 patients due to infection, 10 patients due to liver and/or kidney disease, and 7 patients due to malignancy.

The study population's fundamental clinical and demographic characteristics were recorded. Hypertension (HT) was defined as a blood pressure reading of 140/90 millimeters of mercury (mmHg) or higher in at least two measurements. Diabetes mellitus (DM) was defined as a glucose level of more than 200 mg/dL at any measurement or a fasting plasma glucose level of more than 126 mg/dL. Patients' blood samples were collected within the first 24 hours of their AIS. The biochemical analysis was performed in dry tubes, while the hematological test was conducted in EDTA tubes.

Each patient's CHA2DS2-VASc score was calculated. Chronic heart failure was defined as a left ventricular ejection fraction (LVEF) of less than 40%. Patients receive one point for each criterion completed, except for being over 75 years old and having had a stroke or TIA. The last two criteria have been calculated as 2 points. A Vivid 7 device was used for echocardiography in the left decubitus position. The modified Simpson technique was calculated for LVEF. All AIS patients were constantly monitored with 12-lead ECG in the neurology intensive care unit.

The NIHSS (National Institutes of Health Stroke Scale) score, initial stroke severity (ISS) based on the NIHSS score, and cerebral infarct volume (CIV) based on MRI were used to measure the severity of the presenting neurologic condition throughout hospitalization. For the clinical prognostic evaluation of AIS patients, the final global disability outcome was measured at 90 days using the modified Rankin Scale (mRS) and the Barthell index (BI). In-hospital mortality was defined as death from any cause during hospitalization.

Cranial imaging

In the first 24 hours, all patients had cranial computed tomography (CT) and magnetic resonance imaging (MRI). The CT scans were acquired using 5mm thick collimation and angulating parallel sections to the orbitomeatal line. Diffusion-weighted MRI demonstrated acute ischemic stroke. A 1.5 T superconducting magnet (Philips Achieva) MRI system with a typical head dressing with 8-16 channels was used for cranial MRI. In cranial MRI, infarct volumes were determined by hand drawing from diffusion-weighted slices. Each section's circumference of the lesion region was drawn by hand. The PACS (Picture Archiving and Communication System software) installed on the computer automatically calculated the surface area of the drawn area in mm2. The regions were then collected and multiplied by the slice thickness (5 mm), and the infarct volume was obtained by dividing the result by 1000 to convert it to cm^3.

Statistical analysis

The SPSS-22 Statistical Package Program was used for the statistical analysis. Firstly, the Kolmogorov-Smirnov test determined the distribution pattern of parameters. Categorical variables were compared by the Chi-square test and they were demonstrated with percentage values and numbers. Continuous parameters with non-normal distribution were demonstrated as median, and parameters with normal distribution were demonstrated as mean ± standard deviation. Student's t-test compared parametric continuous variables and the Mann-Whitney U test compared nonparametric continuous variables. The Spearman rank test was used to indicate whether there was a correlation between the CHA2DS2-VASc score with NIHSS score, ISS, BI, mRS, and CIV.

The univariable and multivariable Cox regression analysis was performed to evaluate independent predictors of in-hospital mortality in patients with acute ischemic stroke. Possible confounding factors for which the unadjusted p-value was <0.10 in univariate regression analysis (the CHA2DS2-VASc score, age, NIHSS score, BI, mRS, CIV, LVEF, hemoglobin, mean platelet volume, creatinine, and HDL-cholesterol) were identified as potential risk markers and included in multivariable Cox-regression model (Backward Stepwise Likelihood Ratio). Multicollinearity (also collinearity) between the CHA2DS2-VASc score and stroke risk factors were checked by using tolerance and variance inflation factor (VIF). Variables with a tolerance of less than 0.10 and a variance inflation factor of 10 and above were withdrawn from multivariate Cox regression models. Kaplan-Meier method demonstrated the survival curves during hospitalization for the CHA2DS2-VASc groups (< 6 vs ≥ 6). The cut-off values of the CHA2DS2-VASc score for the prediction of in-hospital mortality were determined by using the ROC curve method.

RESULTS

A total of 250 acute ischemic stroke patients (mean age 69.6 years, 56% men) were separated into two subgroups based on in-hospital mortality [n=27 patients in the in-hospital mortality(+) group and n=223 patients in the in-hospital mortality(-) group]. Table 1 shows the fundamental demographic and clinical characteristics of the research groups. In-hospital mortality(+) patients were older and had a higher prevalence of HT, DM, congestive heart failure, and peripheral artery disease. Furthermore, in the in-hospital mortality(+) group, the CHA2DS2-VASc score, NIHSS score, ISS, mRS, and CIV were statistically substantially greater, whereas LVEF and BI were statistically significantly lower ($p<0.05$). Except for HDL-cholesterol, there were no significant variations in laboratory data between the two groups (Table 2).

The CHA2DS2-VASc score had a statistically significant positive correlation with the NIHSS score ($r=0.389$; $p<0.001$), the ISS ($r=0.417$; $p<0.001$), the mRS ($r=0.362$; $p<0.001$), and the CIV ($r=0.214$; $p=0.001$), but a statistically significant negative correlation with the BI ($r=-0.371$; $p<0.001$) (Table 3).

Age, the CHA2DS2-VASc score, the NIHSS score, the BI, mRS, CIV, LVEF, Hemoglobin, mean platelet volume, creatinine, and HDL-cholesterol were identified to be possible confounding factors for in-hospital mortality in patients with acute ischemic stroke in a Univariable Cox-

regression analysis (p<0.1). Congestive heart failure (hazard ratio [HR]: 1.942; 95% confidence interval [CI]: (1.380-2.903); p=0.006), the CHA2DS2-VASc score (HR: 1.816; 95% CI: 1.209-2.726; p<0.001), the NIHSS score (HR: 1.214; 95% CI: 1.097-1.445; p=0.035), and the BI (HR: 0.960; 95% CI: 0.928-0.994; p=0.022) were all found to be independent predictors of in-hospital mortality (Table 4). Finally, in a Kaplan-Meier survival analysis, individuals with a CHA2DS2-VASc score of ≥ 6 had significantly increased in-hospital mortality (log-rank p 0.001). (Figure 1). The discriminatory capability of the CHA2DS2-VASc score using the area under the ROC curve was 0.827 (95% CI: 0.757–0.897, p<0.001) for in-hospital mortality which was deemed good and using a cut-off level of 5.5 for the CHA2DS2-VASc score predicted in-hospital mortality with a sensitivity of 81.5% and specificity of 72.3% (Figure 2).

DISCUSSION

This was the first study to demonstrate a significant positive association of the CHA2DS2-VASc score with the NIHSS score, ISS, mRS, and CIV, but a significant negative correlation with the BI. The CHA2DS2-VASc score was also an independent predictor of in-hospital mortality as well as congestive heart failure, the NIHSS score, and the BI in AIS patients without AF.

Despite recent advances in revascularization methods and early invasive therapy, patients with AIS may still have a greater rate of morbidity and mortality (9). As a result, managing vascular risk factors such as HT, DM, quitting smoking, obesity, and hyperlipidemia is still the most effective approach for both primary and secondary AIS prevention (9,10).

Table 1. Comparison of Basic Demographic and Clinical Characteristics of the Study Groups.

Parameters	In-hospital mortality (-) (n = 223)	In-hospital mortality (+) (n = 27)	p-value
Age, years	68.8 ± 12.2	75.6 ± 11.3	**0.006**
Male sex, n (%)	127 (57%)	13 (48.1%)	0.384
Hypertension, n (%)	139 (62.3%)	23 (85.2%)	**0.019**
Diabetes mellitus, n (%)	64 (28.7%)	16 (59.3%)	**0.001**
Congestive heart failure, n (%)	18 (8.1%)	9 (33.3%)	**< 0.001**
Peripheral artery disease, n (%)	42 (18.8%)	12 (44.4%)	**0.002**
LVEF (%) [a]	55 (50 - 60)	50 (45 - 55)	**0.005**
CHA2DS2-VASc score [a]	5 (4 - 6)	7 (6 - 8)	**< 0.001**
NIHSS score a	4 (3 - 7)	21 (17 - 25)	**< 0.001**
Initial stroke severity based on NIHSS score [a]			**< 0.001**
Mild (1 - 4)	124 (55.6%)	0	
Moderate (5 - 15)	86 (38.6%)	6 (22.2%)	
Severe (> 15)	13 (5.8%)	21 (77.8%)	
Barthell index [a]	85 (70 - 90)	10 (5 - 15)	**< 0.001**
Modified Rankin scale [a]	2 (2 - 3)	6 (4 - 6)	**< 0.001**
Cerebral infarct volume (cm^3) [a]	0.182 (0.057 – 0.780)	0.868 (0.355 – 3.015)	**< 0.001**
Prior medical therapy, n (%):			
RAAS blocker	100 (44.8%)	12 (44.4%)	0.969
Diuretic	56 (25.1%)	7 (25.9%)	0.927
Calcium channel blocker	78 (35.0%)	10 (37.0%)	0.832
β-blocker	47 (21.1%)	8 (29.6%)	0.311
Statin	88 (39.5%)	10 (37.0%)	0.807
Antiaggregant	61 (27.4%)	6 (22.2%)	0.570
Oral antidiabetic drug	47 (21.1%)	7 (25.9%)	0.563
Insulin	34 (15.2%)	4 (14.8%)	0.953

Data are given as mean ± standard deviation or %.
Abbreviations: CHA2DS2-VASc, congestive heart failure, hypertension, age ≥ 75 years, diabetes mellitus, previous stroke or transient ischemic attack (TIA), vascular disease, age 65 to 74 years, female gender, LVEF: left ventricular ejection fraction, NIHSS: National Institutes of Health Stroke Scale, RAAS: renin-angiotensin-aldosterone system.
[a] Median (interquartile range).

Table 2. Comparison of Laboratory Parameters of the Study Groups.

Parameters	In-hospital mortality (-) (n = 223)	In-hospital mortality (+) (n = 27)	p-value
Hemoglobin, g/dL	13.1 ± 1.8	12.4 ± 2.1	0.087
Hematocrit, %	39.8 ± 4.8	38.2 ± 6.8	0.128
Platelet, $10^3/mm^3$	246 ± 70	261 ± 83	0.318
Mean platelet volume, fL	10.8 ± 1.0	11.2 ± 1.3	0.093
White blood cell, $10^3/mm^3$	9.0 ± 2.9	9.8 ± 3.3	0.174
Fasting plasma glucose, mg/dL [a]	119 (96 -164)	137 (93-170)	0.460
Creatinine, mg/dL	0.90 ± 0.17	1.02 ± 0.24	0.073
Total cholesterol, mg/dL [a]	187 (149 - 221)	167 (144 - 214)	0.225
HDL-cholesterol, mg/dL [a]	41 (34 - 51)	35 (28 - 45)	0.047
LDL-cholesterol, mg/dL [a]	113 (86 - 141)	108 (84 - 139)	0.615
Triglyceride, mg/dL [a]	130 (84 - 198)	125 (95 - 163)	0.861

Data are given as mean ± standard deviation or %.
HDL: high-density lipoprotein, LDL: low-density lipoprotein.
[a]Median (interquartile range).

Table 3. Correlation analysis of CHA2DS2-VASc score with potential continuous variables.

Variables	r	p
NIHSS score	0.389	< 0.001
Initial stroke severity	0.417	< 0.001
Barthell index	- 0.371	< 0.001
Modified Rankin scale	0.362	< 0.001
Cerebral infarct volume	0.214	0.001

CHA2DS2-VASc: congestive heart failure, hypertension, age ≥75 years, diabetes mellitus, previous stroke or transient ischemic attack (TIA), vascular disease, age 65 to 74 years, female gender, NIHSS: National Institutes of Health Stroke Scale, r: correlation coefficient.

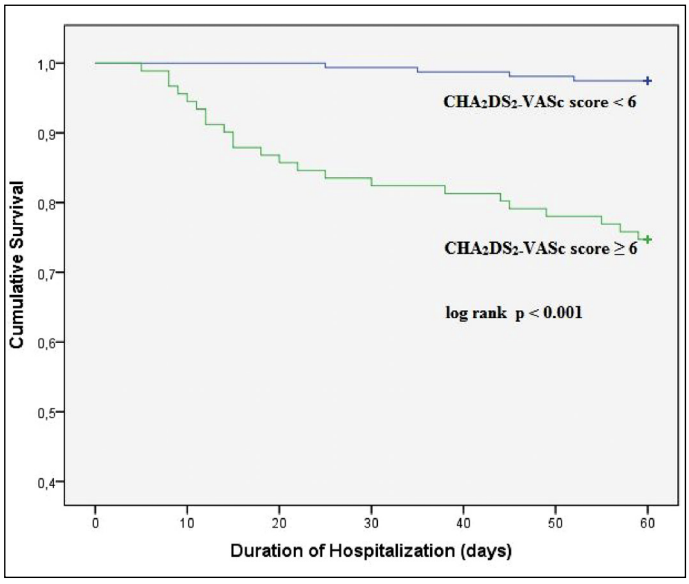

Figure 1. Kaplan-Meier survival curves are stratified by the CHA2DS2-VASc score (<6 vs ≥6) for in-hospital mortality.

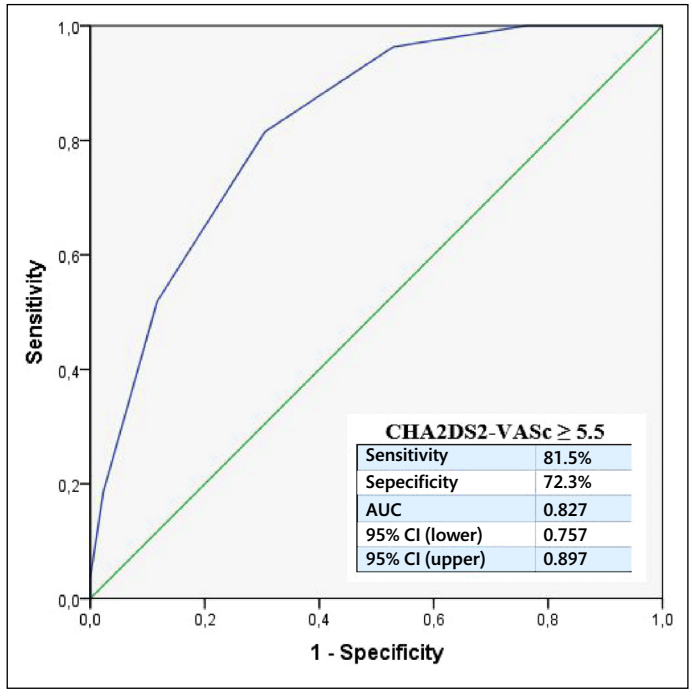

Figure 2. ROC curve analysis of the CHA2DS2-VASc score for the prediction of in-hospital mortality.

Table 4. Univariable and multivariable Cox-regression analysis for assessment of independent predictors of in-hospital mortality in patients with acute ischemic stroke.

	Univariable			Multivariable	
Variables	**HR (95% CI)**	**p-value**		**HR (95% CI)**	**p-value**
Age	1.051 (1.013 – 1.090)	0.008		0.979 (0.921 – 1.045)	0.083
Hypertension	1.274 (1.032 – 1.668)	0.029			
Diabetes mellitus	1.436 (1.148 – 2.030)	0.002			
Congestive heart failure	2.161 (1.316 – 3.501)	< 0.001		1.942 (1.380 – 2.903)	**0.006**
Peripheral artery disease	1.084 (1.043 – 1.189)	0.014			
LVEF	0.938 (0.894 – 0.984)	0.008		1.056 (0.997 – 1.118)	0.064
CHA2DS2-VASc score	2.815 (1.907 – 4.157)	< 0.001		1.816 (1.209 – 2.726)	**< 0.001**
NIHSS score	1.384 (1.259 – 1.521)	< 0.001		1.214 (1.097 – 1.445)	**0.035**
Barthell index	0.925 (0.902 – 0.949)	< 0.001		0.960 (0.928 – 0.994)	**0.022**
Modified Rankin scale	1.266 (1.063 – 2.335)	< 0.001			
Cerebral infarct volume	1.219 (1.063 – 1.398)	0.004			
Hemoglobin	0.832 (0.674 – 1.028)	0.088			
Mean platelet volume	1.368 (0.947 – 1.976)	0.095			
Creatinine	1.230 (0.886 – 2.781)	0.076			
HDL-cholesterol	0.970 (0.938 – 1.003)	0.077			

CHA2DS2-VASc: congestive heart failure, hypertension, age ≥75 years, diabetes mellitus, previous stroke or transient ischemic attack (TIA), vascular disease, age 65 to 74 years, female gender, CI: confidence interval, HDL: high-density lipoprotein, LVEF: left ventricular ejection fraction, HR: hazard ratio, NIHSS: National Institutes of Health Stroke Scale.

Recent research has focused on evaluating different clinical predictors to estimate the prognosis of the above-mentioned group. The CHA2DS2-VASc score is a clinical thromboembolic risk score for predicting the high-risk population for stroke in patients with non-valvular AF (11). It incorporates similar risk variables for the presentation or existence of MACCE (11,12). Each of the CHA2DS2-VASc score components has previously been demonstrated to have a substantial connection with AIS, particularly HT, DM, congestive heart failure, older age, previous stroke or TIA, and vascular disease (13,14). In a large cohort of non-AF patients with AIS, Ntaios, and colleagues demonstrated that the pre-stroke CHA2DS2-VASc score also predicted long-term prognosis (15). According to a recent study, a higher CHA2DS2-VASc score of 4 or higher was independently associated with a higher risk of in-hospital mortality in patients presenting with non-ST elevation myocardial infarction (16). Furthermore, Kurtul et al. discovered that the CHA2DS2-VASc score is related to an increased likelihood of larger coronary atherosclerotic burden determined by SYNTAX score and is also an independent predictor of all-cause mortality in acute coronary syndrome patients, even after adjusting for clinical factors (17). In a recent study, Hong et al. reported that a higher CHA2DS2-VASc score was a substantial predictor of all-cause death in patients who had an implantable cardioverter-defibrillator (ICD) device implanted (18). Yilmaz and colleagues demonstrated that in patients with stable CAD, the CHA2DS2-VASc score was an independent predictor of ISR (in-stent restenosis) (19).

In our study, we first investigated the link between the CHA2DS2-VASc score and the severity of the presenting neurologic deficit, including the NIHSS score, ISS, and CIV, as well as the final global disability outcome at 90 days, including mRS and BI, and in-hospital mortality in AIS patients. One of this study's main findings was that there was a statistically significant positive correlation between the CHA2DS2-VASc score and the NIHSS score, ISS, mRS, and CIV, but a statistically significant negative correlation between the CHA2DS2-VASc score and the BI.

It demonstrates that in AIS patients, a greater CHA2DS2-VASc score is a significant and reliable predictor of both the severity of early stroke deficits and the eventual global disability outcome at 90 days. The most important predictor of both short and long-term outcomes in AIS patients is the current stroke severity, which is most typically assessed using the NIHSS score, ISS, and CIV (20). As a result, in the analysis of treatment trials and quality of care registries, controlling for the severity of the presenting stroke disability as a baseline variation is essential (21). Another recent study reported that CHA2DS2-VASc scores greater than 2 were related to the increased risks of fatal reinfarction, low LVEF, cardiogenic shock long term prognosis, and mortality in STEMI patients (22).

Age is a well-known risk factor for AIS and also a component of the CHA2DS2-VASc score (23). We found that the patients in the in-hospital mortality (+) group were older, and that age was an independent predictor of in-hospital mortality. As a result, we can claim that older age is related to increased mortality and morbidity in cerebrovascular disease patients.

Another important finding from our study was that a higher CHA2DS2-VASc score was realted to in-hospital mortality in AIS patients. The components of the CHA2DS2-VASc scores are predictors of in-hospital and long-term cardiovascular / cerebrovascular outcomes in patients with AIS, and all of these findings were found to be related to our findings (24-26). Age, HT, DM, and heart failure are well-known CHA2DS2-VASc score components for AIS, and thus co-existence of both diseases may also indicate a higher risk for the severity of early stroke deficits and in-hospital mortality in AIS patients (26, 27).

In light of the findings of our study, we could say the following: Since AIS patients with high CHA2DS2-VASc score have higher in-hospital mortality rates, these patients should be monitored more closely throughout hospitalization. The treatment of these patients should

be organized in a multidisciplinary manner consisting of neurology, cardiology, and internal medicine departments. In AIS patients, risk factors such as high blood pressure (HT), high blood sugar (DM), and decompensated heart failure (CHF) that may increase mortality rates should be diagnosed immediately and treated appropriately by the relevant departments.

In conclusion, the CHA2DS2-VASc is a basic and exhaustive risk evaluation score that provides an additional risk stratification beyond that provided by conventional risk scores in predicting both the severity of early neurologic deficits at hospitalization and final global disability outcome at 90 days, as well as in-hospital mortality in AIS patients without AF. Because high CHA2DS2-VASc scores are linked to a higher risk of in-hospital mortality and short-term stroke outcomes, the components of CHA2DS2-VASc scores should be investigated further in AIS patients with a high CHA2DS2-VASc score at admission. When an abnormality in these components is discovered, it should be treated as soon as possible while in the hospital during hospitalization.

Limitations

Our research has several limitations. First of all, this was a single-center study. Second, the in-hospital mortality (+) group had a small study population (n = 27 patients). As a result, additional research is required before drawing firm conclusions. Third, the study patients were only followed up for 90 days. Fourth, we did not perform a power analysis to determine the sample size at the beginning of the study. Fifth, the exact causes of death of the patients have not been determined in detail. Finally, our study used a single time point to establish a baseline, which may not accurately reflect the patient's condition in time.

As a result, The CHA2DS2-VASc score is associated with the severity of presenting neurologic deficits and was assessed at hospitalization using the NIHSS score, ISS, and CIV, which is a significant and robust indicator of both the severity of early stroke deficits and in-hospital mortality, despite being independent of other factors. Similarly, when utilizing mRS and BI to predict short-term outcomes at 90 days, the CHA2DS2-VASc is an independent predictor of the final global disability outcome. This simple score could be very beneficial in identifying patients who are at high risk for MACCE and in-hospital mortality in AIS patients. For the score to be utilized in everyday clinical practice, further multicenter and large-scale investigations are needed.

Statement of Ethics: The study complies with the Declaration of Helsinki and has been approved by the Clinical Research Ethics Committee of the Faculty of Medicine (Decision number: 26379996/212). Written informed consent was taken from each patient before enrollment.

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REFERENCES

1. Feigin VL, Krishnamurthi R, Bhattacharjee R, Parmar P, Theadom A, Hussein T, et al. New strategy to reduce the global burden of stroke. Stroke. 2015;46(6):1740-1747. [Crossref]
2. Gürler G, Soylu KO, Yemisci M. Importance of Pericytes in the Pathophysiology of Cerebral Ischemia. Noro Psikiyatr Ars. 2022;59(Suppl 1):S29-35. [Crossref]
3. Mosconi MG, Paciaroni M. Treatments in Ischemic Stroke: Current and Future. Eur Neurol. 2022;85(5):349-366. [Crossref]
4. Hindricks G, Potpara T, Dagres N, Arbelo E, Bax JJ, Blomström-Lundqvist C, et al. 2020 ESC Guidelines for the diagnosis and management of atrial fibrillation developed in collaboration with the European Association for Cardio-Thoracic Surgery (EACTS): The Task Force for the diagnosis and management of atrial fibrillation of the European Society of Cardiology (ESC) Developed with the special contribution of the European Heart Rhythm Association (EHRA) of the ESC. Eur Heart J. 2021;42(5):373-498. [Crossref]
5. Yoshihisa A, Watanabe S, Kanno Y, Takiguchi M, Sato A, Yokokawa T, et al. The CHA2DS2-VASc score as a predictor of high mortality in hospitalized heart failure patients. ESC Heart Fail. 2016;3(4):261-269. [Crossref]
6. Rozenbaum Z, Elis A, Shuvy M, Vorobeichik D, Shlomo N, Shlezinger M, et al. CHA2DS2-VASc score and clinical outcomes of patients with acute coronary syndrome. Eur J Intern Med. 2016;36:57-61. [Crossref]
7. Schamroth Pravda M, Cohen Hagai K, Topaz G, Schamroth Pravda N, Makhoul N, Shuvy M, et al. Assessment of the CHA2DS2-VASc Score in Predicting Mortality and Adverse Cardiovascular Outcomes of Patients on Hemodialysis. Am J Nephrol. 2020;51(8):635-640. [Crossref]
8. January CT, Wann LS, Calkins H, Chen LY, Cigarroa JE, Cleveland JC Jr, et al. 2019 AHA/ACC/HRS Focused Update of the 2014 AHA/ACC/HRS Guideline for the Management of Patients With Atrial Fibrillation: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. J Am Coll Cardiol. 2019;74(1):104-132. [Crossref]
9. Kleindorfer DO, Towfighi A, Chaturvedi S, Cockroft KM, Gutierrez J, Lombardi-Hill D, et al. 2021 Guideline for the Prevention of Stroke in Patients With Stroke and Transient Ischemic Attack: A Guideline From the American Heart Association/American Stroke Association. Stroke. 2021;52(7):e364-e467. [Crossref]
10. Bilge S, Tezel O, Acar YA, Cüce F, Karadaş Ö, Taşar M. Investigation of the Value of T peak to T end and QTc Intervals as Electrocardiographic Arrhythmia Susceptibility Markers in Acute Ischemic Stroke. Noro Psikiyatr Ars. 2020;57(3):171-176. [Crossref]
11. Rivera-Caravaca JM, Ding WY, Marín F, Roldán V, Lip GYH. Prediction of ischemic stroke in different populations: a comparison of absolute stroke risk and CHA2DS2-VASc in real-world and clinical trial patients. Eur J Intern Med. 2022;98:122-124. [Crossref]
12. Brown DL, Levine DA, Albright K, Kapral MK, Leung LY, Reeves MJ, et al. Benefits and Risks of Dual Versus Single Antiplatelet Therapy for Secondary Stroke Prevention: A Systematic Review for the 2021 Guideline for the Prevention of Stroke in Patients With Stroke and Transient Ischemic Attack. Stroke. 2021;52(7):e468-e479. [Crossref]
13. Boncoraglio GB, Del Giovane C, Tramacere I. Antihypertensive Drugs for Secondary Prevention After Ischemic Stroke or Transient Ischemic Attack: A Systematic Review and Meta-Analysis. Stroke. 2021;52(6):1974-1982. [Crossref]
14. Vemmos K, Ntaios G, Savvari P, Vemmou AM, Koroboki E, Manios E, et al. Stroke aetiology and predictors of outcome in patients with heart failure and acute stroke: a 10-year follow-up study. Eur J Heart Fail 2012;14(2):211–218. [Crossref]
15. Ntaios G, Lip GY, Makaritsis K, Papavasileiou V, Vemmou A, Koroboki E, et al. $CHADS_2$, $CHA_2S_2DS_2$-VASc, and long-term stroke outcome in patients without atrial fibrillation. Neurology. 2013;80(11):1009-1017. [Crossref]
16. Akboğa MK, Yılmaz S, Yalçın R. Prognostic value of CHA2DS2-VASc score in predicting high SYNTAX score and in-hospital mortality for non-ST elevation myocardial infarction in patients without atrial fibrillation. Anatol J Cardiol. 2021;25(11):789-795. [Crossref]
17. Kurtul A, Acikgoz SK. Validation of the CHA2DS2-VASc Score in Predicting Coronary Atherosclerotic Burden and In-Hospital Mortality in Patients With Acute Coronary Syndrome. Am J Cardiol. 2017;120(1):8-14. [Crossref]
18. Hong C, Alluri K, Shariff N, Khattak F, Adelstein E, Jain S, et al. Usefulness of the CHA2DS2-VASC Score to Predict Mortality in Defibrillator Recipients. Am J Cardiol. 2017;120(1):83-86. [Crossref]
19. Yilmaz S, Akboga MK, Aras D, Topaloglu S. Evaluation of the Predictive Value of CHA2DS2-VASC Score for In-Stent Restenosis. Angiology. 2018;69(1):38-42. [Crossref]
20. Smith EE, Shobha N, Dai D, Olson DM, Reeves MJ, Saver JL, et al. Risk score for in-hospital ischemic stroke mortality derived and validated within the get with the guidelines-stroke program. Circulation. 2010;122(15):1496–1504. [Crossref]
21. Saver JL, Altman H. Relationship between neurologic deficit severity and final functional outcome shifts and strengthens during first hours after onset. Stroke. 2012;43(6):1537-1541. [Crossref]

22. Bozbay M, Uyarel H, Cicek G, Oz A, Keskin M, Murat A, et al. CHA2DS2-VASc score predicts in-hospital and long-term clinical outcomes in patients with ST-segment elevation myocardial infarction who were undergoing primary percutaneous coronary intervention. Clin Appl Thromb Hemost. 2017;23(2):132-138. [Crossref]
23. van der Maten G, Dijkstra S, Meijs MFL, von Birgelen C, van der Palen J, den Hertog HM. Cardiac imaging in ischemic stroke or transient ischemic attack of undetermined cause: Systematic review & meta-analysis. Int J Cardiol. 2021;339:211-218. [Crossref]
24. Fumagalli S, Di Serio C, Ricciardi G, Lip GYH, Marchionni N; PURE-Rhythm Trial Investigators. From the CHA2DS2-VASc score to inflammation: a path leading to frailty? An update of the PURE-Rhythm Trial. Eur J Intern Med. 2021;84:118-120. [Crossref]
25. Zhang P, Yan XL, Qu Y, Guo ZN, Yang Y. Association between abnormal body weight and stroke outcome: A meta-analysis and systematic review. Eur J Neurol. 2021;28(8):2552-2564. [Crossref]
26. González-Del-Hoyo M, Carrasquer A, Bonet G, Fort-Gallifa I, Bardají A. Comparative prediction of long-term mortality by the CHA2DS2-VASc score and cardiac troponin I levels in patients with atrial fibrillation at the emergency department. Eur J Intern Med. 2020;78:154-156. [Crossref]
27. Zhang D, Song X, Chen Y, Raposeiras-Roubín S, Abu-Assi E, Henriques JPS, et al. Outcome of Patients With Prior Stroke/Transient Ischemic Attack and Acute Coronary Syndromes. Angiology. 2020;71(4):324-332. [Crossref]