Original Article

The predictive value of CHA2DS2-VASc score on the prognosis of patients with atrial fibrillation based on a prospective cohort study

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Background: Atrial fibrillation (AF) is the most prevalent cardiac arrhythmia encountered in clinical practice, and it is associated with an increased risk of mortality, stroke, and peripheral embolism. The risk of stroke in AF is heterogeneous and dependent on underlying clinical conditions included in current risk stratification schemes. Recently, the CHA2DS2-VASc score has been incorporated into guidelines to encompass common stroke risk factors observed in routine clinical practice. The aim of this study was to study the predictive value of CHA2DS2-VASc score on the prognosis of patients with AF to determine the correlation of major complications including cerebral infarction and intracranial hemorrhage in patients with AF with oral anticoagulant and antiplatelet aggregation drugs and to identify the risk factors for all-cause mortality.

Methods: A prospective study was conducted on 181 patients with AF who underwent physical examinations at Hai'an Qutang Central Hospital from January 2020 to December 2020. The patient's general condition, chronic disease history, CHA2DS2-VASc [congestive heart failure, hypertension, age ≥75 years (doubled), diabetes, stroke (doubled), vascular disease, age 65 to 74 years, and sex category (female)] score, left ventricular ejection fraction (LVEF), lipid metabolism, and oral anticoagulant and antiplatelet aggregation medication during physical examination were recorded. By using telephone meetings to complete the follow-up, we tracked the patient's cerebral infarction, intracranial hemorrhage, and survival status within 2 years of follow-up, statistically analyzed the relationship between AF complications and medication, and grouped patients with AF based on the CHA2DS2-VASc score to evaluate its predictive ability for mortality outcomes in these patients.

Results: The patients were divided into four groups according to the medication situation, and the incidence of cerebral infarction in the combination group was significantly lower than that in the non-medication group (0.0% *vs.* 19.2%; P<0.01). The incidence of intracranial hemorrhage in the combination group was significantly higher than that in the non-drug group (13.8% *vs.* 0.0%; P<0.01). The logistic regression model indicated that patients with a history of cerebral infarction had an increased risk of death compared to those without a history of cerebral infarction [odds ratio (OR) =7.404; 95% confidence interval (CI): 2.255–24.309]. After grouping according to the CHA2DS2-VASc score, we found that there was a significant difference in the 2-year survival rate between patients with CHA2DS2-VASc score <5 and those with a score ≥5 (P<0.01). The characteristic curve analysis of the participants showed that the CHA2DS2-

VASc score had good predictive ability for all-cause mortality in patients with AF (area under the curve =0.754), with a cutoff value of 4, a sensitivity of 62.50%, a specificity of 86.06%, and a 95% CI of 0.684–0.815.

Conclusions: The CHA2DS2-VASc score demonstrated high predictive value for all-cause mortality in patients with AF.

Keywords: Atrial fibrillation (AF); complications; CHA2DS2-VASc score

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Introduction

Atrial fibrillation (AF) is the most common persistent arrhythmia and is characterized by rapid and disordered excitation of the atrium and irregular activation of the ventricles. AF causes irregular blood flow velocity, and the resulting turbulence leads to the formation of thromboemboli. The clinical consequences of AF include embolism, heart failure, and early death (1), as well as an up-to-fivefold increase in the risk of cerebral infarction.

Highlight box

Key findings

- In this study, we have discovered that the CHA2DS2-VASc score not only serves as a guide for determining oral anticoagulation treatment strategies in patients with atrial fibrillation (AF) but also effectively predicts the overall mortality rate associated with permanent AF.

What is known and what is new?

- Previous studies have already established the successful predictive ability of the CHA2DS2-VASc score in terms of cardiovascular events and death risk among high-risk AF patients receiving oral anticoagulation therapy.
- Our study expands upon these findings by including groups receiving antiplatelet therapy alone and receiving both antiplatelet and anticoagulant therapy, thereby evaluating the relationship between the CHA2DS2-VASc score and treatment plans while elucidating its capacity to predict overall mortality rates in patients with AF.

What is the implication, and what should change now?

- These results provide valuable guidance for clinical practice regarding anticoagulation treatment, ultimately reducing complications such as stroke and intracranial hemorrhage in individuals with AF. The CHA2DS2-VASc score demonstrated high predictive value for all-cause mortality in patients with AF, which could be used in the clinical diagnosis, treatment, and prognosis evaluation of patients with AF.

Cerebral infarction associated with AF leads to more severe disability and mortality, in addition to an increased risk of cardiovascular complications and all-cause mortality (2,3). Cerebral embolism, which contributes to ischemic stroke and cognitive decline, accounts for 25% to 30% of all acute ischemic stroke cases (4). Cerebral infarction is the fifth leading cause of death in the United States and a major cause of chronic severe disability (5). The Framingham Heart Study (6) showed that compared to participants without AF, those with AF had a 50–90% higher mortality rate. Subsequently, many studies have further confirmed the differences in patient mortality between those with AF and those without AF (7,8). Over the past two decades, significant breakthroughs have been made in the treatment of patients with AF, ranging from oral anticoagulants for preventing cerebral infarction and reducing mortality (9) to the successful use of inferior vena cava filter technology (10). However, it is still worth exploring whether these advances have improved the survival rate of patients with AF during this period. Indeed, examining the complications and mortality-related risk factors in patients with AF may be highly valuable for relieving patient stress, minimizing the incidence of AF-related symptoms, improving the general situation of patients with AF, enhancing quality of life, and prolonging survival time. This study thus examined the risk factors associated with the prognosis of patients with AF through follow-up on the management of chronic diseases in these patients. We present this article in accordance with the TRIPOD reporting checklist (available at https://jtd.amegroups.com/article/view/10.21037/jtd-24-737/rc).

Methods

Research participants

This study ultimately included 181 patients with AF who underwent physical examinations at Hai'an Qutang Central

Hospital from January 2020 to December 2020. The inclusion criteria for patients were as follows: age >18 years old, an AF rhythm as confirmed via electrocardiography, no intent from the patient to undergo rhythm control treatment, self-care ability, and willingness to receive telephone follow-up. Meanwhile, the exclusion criteria were the following: age <18 years old, pregnancy, refusal to participate in telephone follow-up, intent to undergo cardiac rhythm control treatment, and acute heart failure during physical examination. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013), and approved by the Ethics Committee of Hai'an Qutang Central Hospital (approval number HA20190012). Informed consent was taken from all the patients.

General data collection

During the patients' physical examination, their general condition, history of chronic illness, smoking and drinking history, oral medication, electrocardiogram and echocardiography results, lipid metabolism indicators, and CHA2DS2-VASc [congestive heart failure, hypertension, age ≥75 years (doubled), diabetes, stroke (doubled), vascular disease, age 65 to 74 years, and sex category (female)] score, among other data, were collected.

Collection of telephone follow-up data

After the physical examination, the patients' health status was followed up via telephone every month, with data on medication adjustments (without intervention), the presence of neurological symptoms, electrophysiological treatment, and survival status being recorded.

Statistical analysis

SPSS 27.0.1 (IBM Corp.), GraphPad Prism (GraphPad Software), and MedCalc (MedCalc Software) were used for statistical analyses of the data. Econometric data in a normal distribution are expressed as the mean ± standard deviation, data with a skewed distribution are expressed as the median with the minimum and maximum, and count data are expressed in percentages. Intergroup comparisons were conducted using *t*-tests, and the comparison of rates between the two groups was completed using the χ^2 test. The predictive value of relevant indicators on patient prognosis was evaluated by drawing receiver operating characteristic (ROC) curves. Meanwhile, logistic regression analysis was used to evaluate the risk factors for mortality in patients with AF. P<0.05 was considered to indicate a statistically significant difference.

Results

Baseline data of patients with AF

Data on the lifestyle and related indicators were collected during the physical examinations of the 181 patients with AF and have been summarized in *Table 1*. The baseline data showed that in the AF sample enrolled (181 cases in total), the majority of patients were older adults, with an average age of 74.74 years. Moreover, male patients (65.2%) were more common than female patients, 63.0% of patients had a history of hypertension, 42.0% of patients had a history of diabetes, 29.8% of patients had enlarged hearts, and the average ejection fraction was 0.44, which is lower than the lower limit of normal values. All patients had normal lipid metabolism, and four patients had chronic kidney failure.

Correlation analysis of patient's general situation and physical examination results

In order to clarify the relationship between the general condition of patients and the results of cardiac ultrasonography, electrocardiography, and blood tests, Spearman correlation analysis was used and yielded the following results (*Figure 1*): the gender of patients with AF was correlated with the level of triglycerides (r=0.25; P<0.01), cholesterol (r=0.28; P<0.01), urinary creatinine (r=−0.16; P=0.03), and microalbumin (r=−0.15; P=0.04); age was correlated with cholesterol level (r=−0.19; P=0.01); smoking was correlated with triglyceride level (r=−0.18; P=0.01); alcohol consumption was correlated with the level of triglycerides (r=−0.16; P=0.03), high-density lipoprotein (r=0.16; P=0.03), and low-density lipoprotein (r=0.18; P=0.02); diabetes was associated with triglyceride level (r=0.19; P<0.02); and a history of cerebral infarction was correlated with the average ventricular rate (r=0.24, P<0.01).

Correlation analysis of physical examination results

This study included corrected Q-T interval, left ventricular ejection fraction (LVEF) value, and other data from different examinations, which could reflect the patient's cardiac function and lipid metabolism. Analyzing the correlation of these data can help us understand the relationship between

Table 1 Baseline data of patients with atrial fibrillation

Clinical information	Values
Male	118 (65.2)
Age (years)	74.74±8.041
Smoking	29 (16.0)
Drinking	
Never	156 (86.2)
Often	2 (1.1)
Every day	23 (12.7)
Hypertension	114 (63.0)
Diabetes	76 (42.0)
History of cerebral infarction	18 (9.9)
Cardiac enlargement	54 (29.8)
Average ventricular rate	81.54±13.3
Left ventricular ejection fraction	0.44±0.11
Corrected Q-T interval (ms)	431.94±41.58
Score of CHA2DS-VASc	3 [0, 7]†
Triglyceride (mmol/L)	1.50±0.90
Cholesterol (mmol/L)	4.62±0.96
Low density lipoprotein (mmol/L)	2.66±0.86
Chronic renal failure	4 (2.2)
Oral medication	
Anticoagulant	43 (23.8)
Antiplatelet	89 (49.2)
Both anticoagulant and antiplatelet	29 (16.0)
B-blocker therapy	22 (12.2)
Cardiac glycoside	19 (10.5)
History of atrial fibrillation	
1–3 years	11 (6.1)
4–5 years	29 (16.0)
6–10 years	66 (36.5)
>10 years	75 (41.4)

Data are presented as n (%) or mean ± standard deviation. †, data with a skewed distribution are represented as the median [minimum, maximum].

heart, kidney, and liver function. Spearman correlation analysis showed that cardiac enlargement was related to heart-rate corrected QT interval (QTc) (r=–0.18; P<0.02), cholesterol was correlated with high-density lipoprotein level (r=0.21; P=0.02) and low-density lipoprotein level (r=0.62; P<0.01), and microalbumin level was correlated with mean ventricular rate (r=–0.16; P=0.04) and urinary creatinine level (r=0.32, P<0.01). The relevant results are shown in *Figure 2*.

Correlation of CHA2DS2-VASc score with oral antiplatelet and anticoagulant medication status

In order to investigate the effects of oral anticoagulants and antiplatelet drugs on cerebrovascular complications in patients with AF, we first characterized the medication status and the compliance of the study population. In this study, the median CHA2DS2-VASc score of the 181 patients with AF was 3, with a minimum value of 0 and a maximum value of 7. In terms of oral medication use, the usage rates were as follows: anticoagulants, 23.8%; antiplatelet drugs, 49.2%; β-blockers, 12.2%; and cardiac glycosides, 10.5%. The rate of anticoagulants and antiplatelet drug use in patients was divided according to the CHA2DS2-VASc score. For those with a CHA2DS2-VASc score of 0–7, the use rates of anticoagulants were 0/1, 3/16, 8/36, 9/51, 10/44, 8/22, 4/7, and 1/4 , respectively; meanwhile, the use rates of antiplatelet drugs were 0/1, 5/16, 17/36, 27/51, 20/44, 14/22, 3/7, and 3/4, respectively. The relevant results are shown in *Figure 3*.

Relationship between anticoagulants, antiplatelet drugs, cerebral infarction, and intracranial hemorrhage

Patients with AF are prone to cerebral infarction due to atrial wall thrombus formation. Taking antiplatelet aggregation drugs (most commonly aspirin or clopidogrel) and anticoagulants (most commonly warfarin or rivaroxaban) can effectively reduce the risk of cerebral infarction, but it can increase the risk of cerebral hemorrhage. Therefore, the timing of anticoagulation and antiplatelet treatment for patients with AF is critical in clinical practice. In our study, patients were divided into the following treatment groups: non-anticoagulant and antiplatelet treatment, anticoagulant-only treatment, antiplatelet-only treatment, and anticoagulant antiplatelet treatment. The incidence of cerebral infarction in these four treatment conditions was analyzed, and it was found that the incidence of cerebral infarction in the anticoagulant antiplatelet group (0%) was significantly lower than that in the non-anticoagulant and antiplatelet group (19.2%) (Fisher exact test P<0.01). There

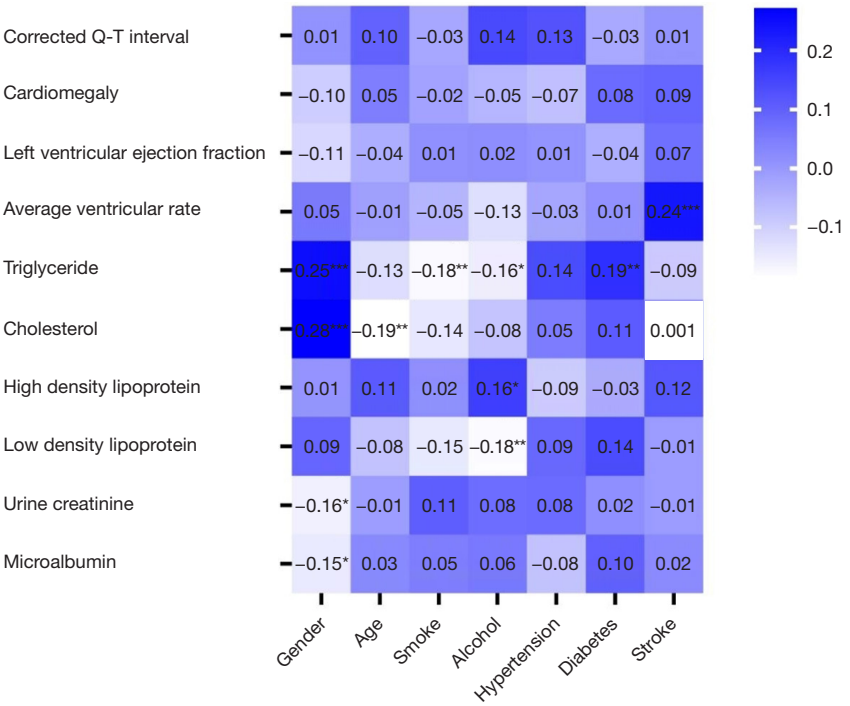

Figure 1 Correlation analysis between patient's general situation and physical examination results. *, P<0.05; **, P<0.02; ***, P<0.01.

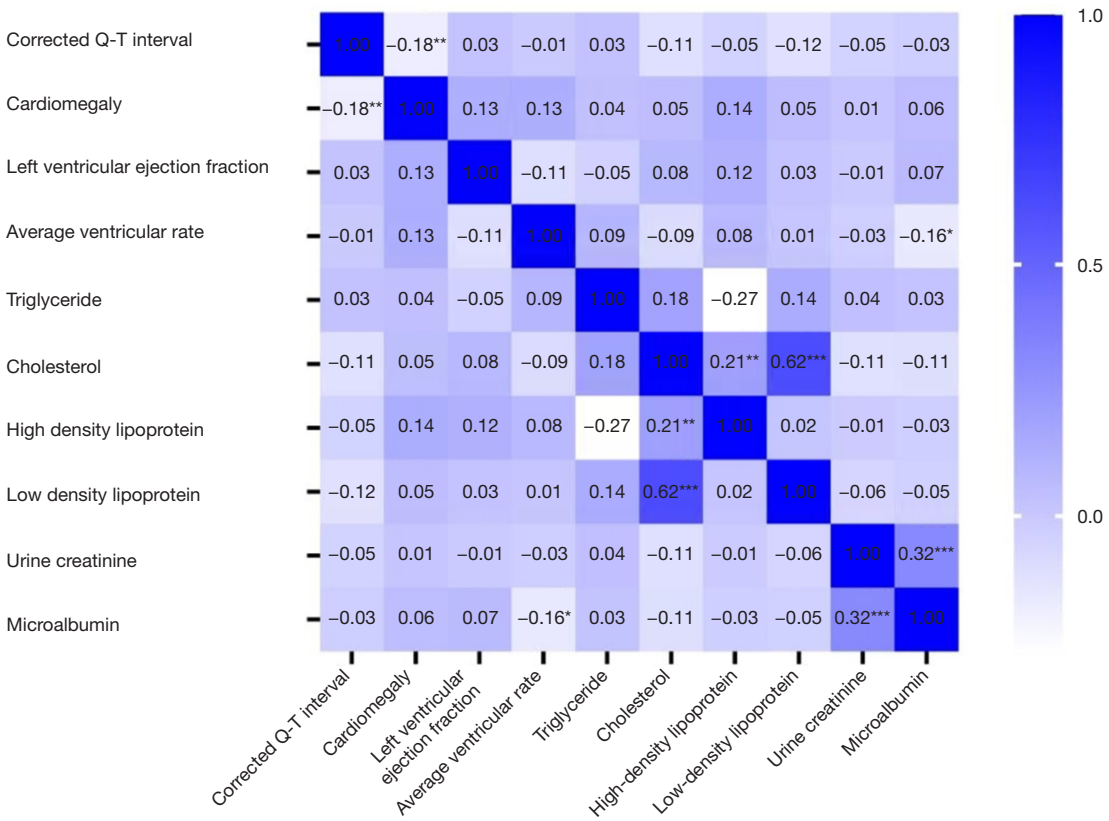

Figure 2 Correlation analysis of physical examination results. *, P<0.05; **, P<0.02; ***, P<0.01.

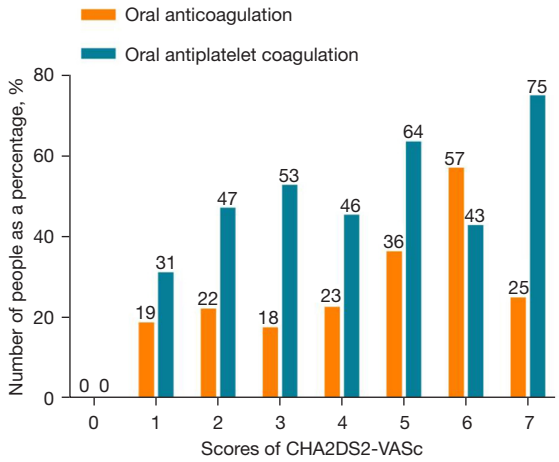

Figure 3 Oral medication usage rates in patients with different CHA2DS2-VASc scores.

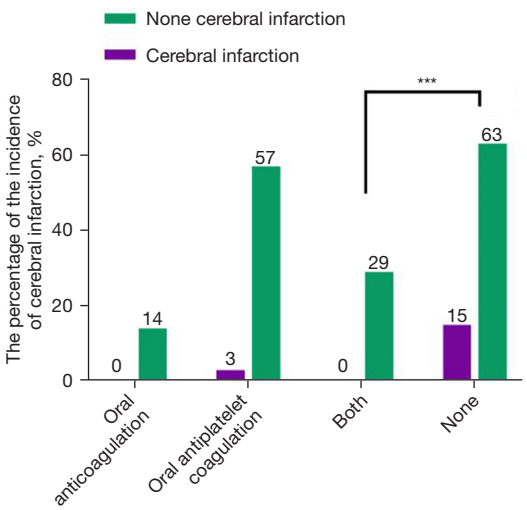

Figure 4 Comparison of the incidence of cerebral infarction among different anticoagulation and antiplatelet therapy conditions. ***, P<0.01.

was no significant difference in the incidence of infarction between the other treatment schemes. The relevant results are shown in *Figure 4*.

The incidence of intracranial hemorrhage in the anticoagulant and antiplatelet groups (13.8%) was significantly higher than that in the non-anticoagulant and antiplatelet groups (0%) (Fisher exact test P<0.01). There was no significant difference in the incidence rate of intracranial hemorrhage between the other treatment schemes (*Figure 5*).

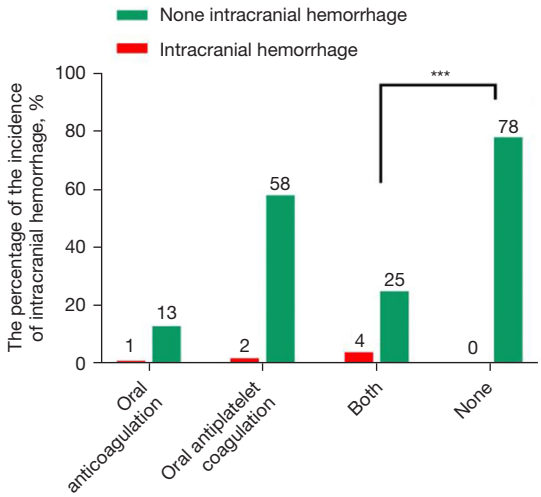

Figure 5 Comparison of intracranial hemorrhage incidence among different anticoagulation and antiplatelet therapy conditions. ***, P<0.01.

Risk factors related to all-cause mortality in patients with AF

During the 2-year follow-up period, a total of 16 deaths occurred among the 181 patients, representing an overall mortality rate of 8.84%. Patients were divided into a death group and survival group. As can be seen from the data comparison of the two groups in *Table 2*, there were significant differences in average ventricular rate and history of cerebral infarction between the survival group and the death group, and thus these may be the potential risk factors for mortality in patients with AF.

Further logistic analysis revealed that the mean ventricular rate and history of cerebral infarction were risk factors for mortality in patients with AF. After adjusting for mean ventricular rate, the logistic regression model showed that patients with a history of cerebral infarction had an increased risk of mortality compared to those without a history of cerebral infarction [odds ratio (OR) =7.404; 95% confidence interval (CI): 2.255–24.309]. The results of the multiscale analysis are shown in *Table 3*.

The relationship between CHA2DS2-VASc score and patient mortality rate

We initially evaluated the CHA2DS2-VASc score for all patients with AF and followed them up to determine the 2-year all-cause mortality rate. According to the CHA2DS2-VASc score at the physical examination, we found that among the two patients with a score of 0, the mortality rate

Table 2 Comparison of basic information between surviving and deceased patients

Clinical information	Survival	Death	t/χ^2	P
Age (years)	74.41±8.08	77.31±7.98	−1.375	0.17
Male	107 (64.8%)	11 (68.8%)	0.098	0.79
Smoke	27 (16.4%)	2 (12.5%)	–	>0.99
Drink	21 (12.7%)	2 (12.5%)	–	>0.99
Cardiac enlargement	47 (28.5%)	7 (43.8%)	1.624	0.20
Corrected Q-T interval	431.39±41.87	437.06±37.92	−0.522	0.60
Left ventricular ejection fraction	0.43±0.11	0.44±0.12	−0.217	0.83
Average ventricular rate	80.49±12.74	92.38±14.51	−3.519	<0.01*
Triglyceride	1.52±0.93	1.31±0.48	0.861	0.39
Cholesterol	4.65±0.97	4.25±0.78	1.638	0.10
High-density lipoprotein	1.37±0.50	1.31±0.48	0.441	0.66
Low-density lipoprotein	2.67±0.88	2.50±0.73	0.761	0.45
Urinary creatinine	0.27±0.46	0.31±0.48	−0.329	0.74
Microalbumin	1.22±0.58	1.31±0.70	−0.572	0.57
Hypertension	104 (63.0%)	13 (81.3%)	2.118	0.12
Diabetes	68 (41.2%)	8 (50%)	0.462	0.60
History of cerebral infarction	12 (7.3%)	7 (43.8%)	20.657	<0.01*

Econometric data in a normal distribution are expressed as the mean ± standard deviation or n (%). *, a statistically significant difference.

Table 3 Logistic regression analysis of mortality-related factors in patients with atrial fibrillation

Clinical information	Beta	S.E.	P	Exp(B)	95% CI
Average ventricular rate	0.058	0.021	<0.01	1.059	1.016–1.104
History of cerebral infarction	2.002	0.607	<0.01	7.404	2.255–24.309
Constant	−7.756	1.949	<0.01	0	–

S.E., standard error; Exp(B), the exponential function of the independent variable; 95% CI, 95% confidence interval.

was 0%. The mortality rate of those with a score of 1 was 0%, the mortality rate of those with a score of 2 was 5.6% (2/36), the mortality rate of those with a score of 3 was 3.9% (2/51), the mortality rate of those with a score of 4 was 4.5% (2/44), the mortality rate of those with a score of 5 was 31.8% (7/22), the mortality rate of those with a score of 6 was 28.6% (2/7), and the mortality rate of those with a score of 7 was 25% (1/4). Chi-squared analysis showed that there was a statistically significant difference in mortality rates between those with a score of 5 and those with a score of 1 (Fisher exact test P=0.03), 2 (Fisher exact test P=0.02), 3 (Fisher exact test P<0.01), or 4 (Fisher exact test P<0.01); moreover, and patients with a score of 5 had significantly higher mortality rates than those with other scores. There was no statistically significant difference in mortality rates among other groups, as shown in *Figure 6*.

At present, the CHA2DS2-VASc score is mainly used in clinical practice to assess the risk of thrombosis in patients and guide the use of anticoagulants. Patients with a score ≥2 are considered to have a high risk of thrombosis and require antiplatelet and anticoagulant treatment. To investigate whether thrombosis risk is related to all-cause mortality, we conducted chi-squared analysis on the mortality rate of patients with a score of 1 and a score ≥2 and found no

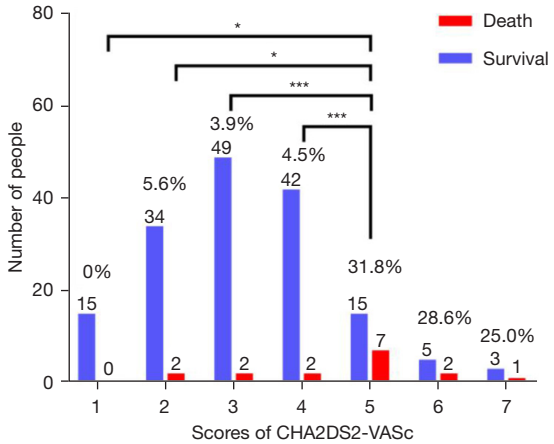

Figure 6 Mortality rate of patients in different CHA2DS2-VASc scores. *, P<0.05; ***, P<0.01.

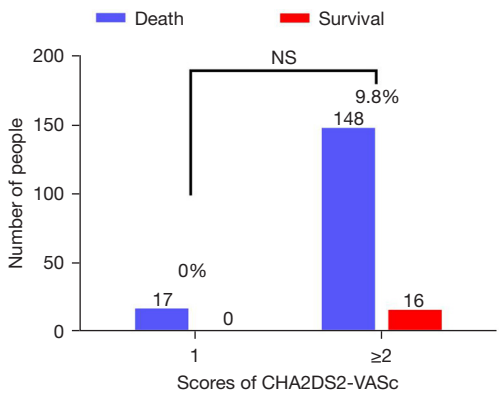

Figure 7 Mortality rate of patients with different CHA2DS2-VASc scores. NS, no significance.

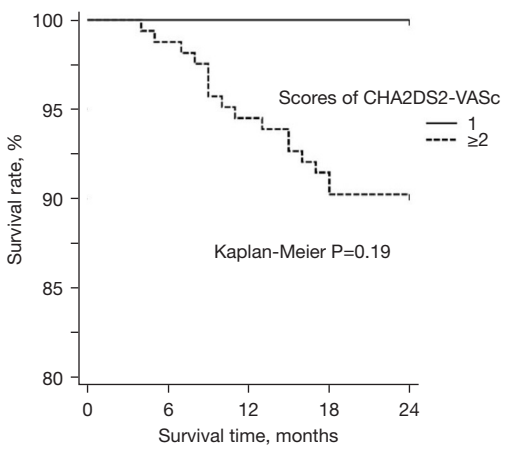

Figure 8 Survival analysis of patients with atrial fibrillation (CHA2DS2-VASc =1 and CHA2DS2-VASc ≥2).

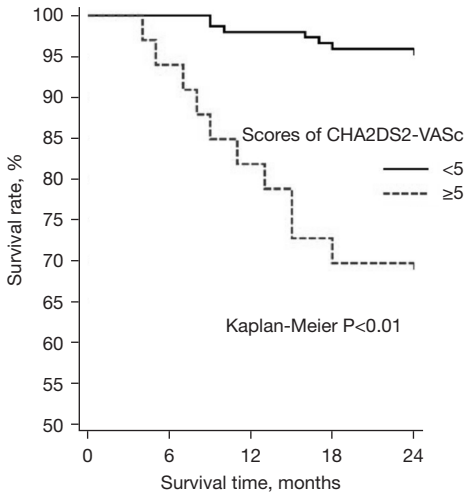

Figure 9 Survival analysis of patients with atrial fibrillation (CHA2DS2-VASc <5 and CHA2DS2-VASc ≥5).

statistically significant difference in mortality rate between a score of 1 and a score ≥2 (Fisher exact test P=0.37), as shown in *Figure* 7.

Further Kaplan-Meier survival analysis revealed that there was no statistically significant difference in the survival rates between patients with scores ≥2 and those with scores =1 (Kaplan-Meier P=0.19), as shown in *Figure 8*.

From *Figure 9*, it can be observed that the all-cause mortality rate significantly increased in patients with AF and CHA2DS2-VASc score ≥5. Survival analysis showed a significant difference in the 2-year survival rate between patients with CHA2DS2-VASc score <5 and those with score ≥5 (Kaplan-Meier P<0.01), with the survival rates being lower in the ≥5 group than in the <5 group.

Using subject characteristic curve analysis, it was found that the CHA2DS2-VASc score demonstrated a high predictive ability for all-cause mortality in patients with AF (area under the curve =0.754), with a cutoff value of 4, a sensitivity of 62.50%, a specificity of 86.06%, and a 95% CI of 0.684–0.815, as shown in *Figure 10*.

The relationship between anticoagulant and antiplatelet drugs and all-cause mortality in patients with AF

A chi-squared analysis was conducted on the mortality rates of the non-anticoagulant and antiplatelet, anticoagulant-only, antiplatelet-only, and both anticoagulant and antiplatelet treatment conditions. It was found that there was no statistical difference between the groups, as shown

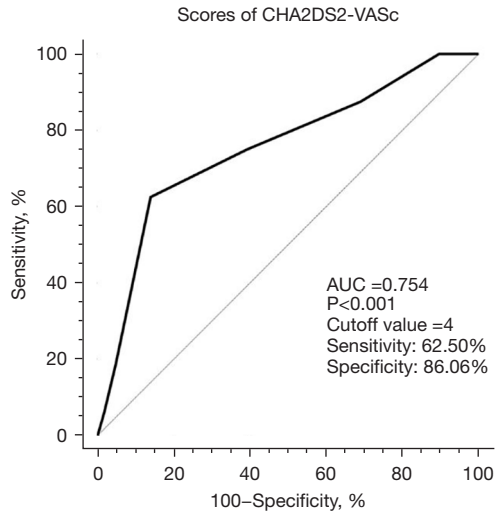

Figure 10 Analysis of the predictive value of CHA2DS2-VASc scores for all-cause mortality in patients with atrial fibrillation. AUC, area under the curve.

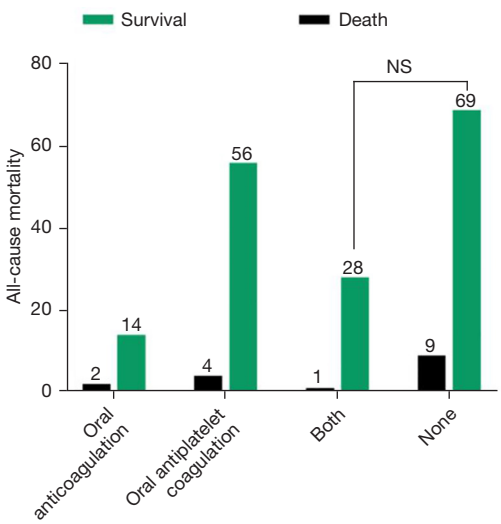

Figure 11 The relationship between anticoagulant and antiplatelet drugs and all-cause mortality in patients with atrial fibrillation. NS, no significance.

in *Figure 11*.

Discussion

AF is the most commonly treated arrhythmia and is typically characterized by absolute arrhythmia and lack of clear P-waves. Its complications include the risk of thromboembolism (including cerebral infarction) and heart failure (11). Adjusted associations between essential amino acid measures and the incidence of AF have been identified (12), suggesting that biological aging plays an important role independent of chronological age, which may be modifiable and not constrained by the immutable factor of time. Patients with new-onset AF display high-risk features for heart failure with preserved ejection fraction (HFpEF) at diagnosis, emphasizing the importance of diagnosis among symptomatic patients with AF. Patients with new-onset AF have accelerated progression in diastolic dysfunction over time, which may help identify patients with preclinical HFpEF, for whom preventive therapies may be attempted (13).

The general effective treatment for AF is the AF better care (ABC) pathway (14), with "A" further representing anticoagulation, "B" representing better symptom management, and "C" representing assessment and management of cardiovascular risk factors and comorbidities. Reducing the risk of cerebral infarction is one of the most important treatment considerations for patients with AF, and long-term use of oral anticoagulants is the most effective means for accomplishing this. However, it is necessary to balance the risk of cerebral infarction with the risk of bleeding caused by these anticoagulants using scores such as CHA2DS2-VASc and HAS BLED (hypertension, abnormal renal/liver function, stroke, bleeding history or predisposition, labile INR, elderly, drugs/alcohol concomitantly).

In our study, the average age of 181 patients with AF was 74.74±8 years old. During follow-up, 18 patients experienced cerebral infarction, with an anticoagulant drug usage rate of 23.8% and an antiplatelet drug usage rate of 49.2%. The usage rate of β-blockers was 12.2%, and the usage rate of cardiac glycosides was 10.5%. After grouping patients based on the CHA2DS2-VASc score, the anticoagulant drug usage rates were 0% (0/1), 18.75% (3/16), 22.22% (8/36), 17.65% (9/51), 22.73% (10/44), 36.36% (8/22), 57.14% (4/7), and 25%(1/4), respectively, for scores 0–7; meanwhile, the antiplatelet drug usage rates were 0% (0/1), 31.25% (5/16), 47.22% (17/36), 52.94% (27/51), 45.45% (20/44), 63.63% (14/22), 42.86% (3/7), and 75% (3/4), respectively. The usage rate of anticoagulants in patients with AF increased continuously with the increase of CHA2DS2-VASc score. Among patients with a score of 7, the usage rate of anticoagulants decreased from 57% to 25% compared to those with a score of 6. In patients with a CHA2DS2-VASc score of 1–3 groups, the usage rate of antiplatelet aggregation drugs gradually increased from

31% to 53%. However, in the patients with a score of 4–7 groups, the usage rate of antiplatelet drugs fluctuated significantly, and the usage rate in those with a score of 6 was even lower than that with a score of 2 (43% *vs.* 47%). This phenomenon indicates that patient compliance is generally poor, indicating that long-term oral drug treatment plans for AF patients require continuous follow-up and encouragement.

Our study found that the incidence rate of cerebral infarction was only statistically different between the combined medication group and the non-medication group, indicating that the combined medication scheme could significantly reduce the incidence rate of cerebral infarction in patients with AF. We further found that the incidence of intracranial hemorrhage in patients receiving the combined treatment scheme was as high as 13.79% (4/29), significantly higher than that in the non-medication group (0/78), However, there was no statistical difference in the incidence rate of intracranial hemorrhage between the anticoagulant-only and the antiplatelet-only drug groups, indicating that although anticoagulant combined plate therapy could significantly reduce the incidence rate of cerebral infarction in patients with AF, it may be significantly associated with an increased probability of inducing intracranial hemorrhage. In addition, we found that the incidence of intracranial hemorrhage in patients with AF who received anticoagulant-only therapy was 7.6% (1/13). As only 14 patients received anticoagulant-only therapy, this sample size is likely not representative. Therefore, the statistical results between the anticoagulant-only group and the non-medication group do not conform to our conventional clinical understanding. In a study that included over 16,000 patients diagnosed with AF between 2005 and 2010, the risk of bleeding in clinical practice was evaluated and the bleeding incidence results indicated a potentially increased risk for patients with AF that recently stopped treatment of vitamin K antagonists compared to periods of past exposure and non-use (15).

In this study and another study, the annual intracerebral hemorrhage risk for patients with uncomplicated AF is around 0.2%, but the annual risk of intracranial hemorrhage with warfarin anticoagulant therapy has increased by approximately twice that of untreated patients (16). In summary, in the study of anticoagulation, antiplatelet regimens, and complications, we found that the combination of anticoagulation and antiplatelet therapy can significantly reduce the incidence of AF and cerebral infarction, but the accompanying risk of intracranial hemorrhage is significantly increased. This finding should encourage clinical physicians to be more cautious when implementing anticoagulation and antiplatelet therapy for patients with AF.

In the study of risk factors related to all-cause mortality in patients with AF, we found significant differences in the average ventricular rate and history of cerebral infarction between the survival and death groups. Logistic regression analysis found that a faster average ventricular rate was associated with an increase in mortality in patients with AF (OR =1.059; 95% CI: 1.016–1.104), while a history of cerebral infarction was associated with an approximately sevenfold increase in mortality in patients with AF (OR =7.404; 95% CI: 2.255–24.309). After grouping patients based on the CHA2DS2-VASc score, we found that the mortality rate of patients with AF increased drastically at a score 5, from 4.5% at 4 to 31.8%, which is higher than the 11.1% annual mortality rate of patients with AF and a score of 5 in the European Society of Cardiology's AF management guidelines (6), considering that we examined the 2-year mortality rate and that most of the included study patients had AF lasting for more than 1 year, and the increase in mortality rate is in line with general patterns. In the subsequent analysis of ROC curve, we determined that the CHA2DS2-VASc score had a predictive ability for all-cause mortality in patients with AF, with an area under the curve of 0.754 and a cutoff value of 4. When a score of 4 was taken, its sensitivity was 62.50% and its specificity was 86.06%.

Conclusions

In summary, our study found that patients with permanent AF generally lack compliance with long-term oral medication use, which may require active intervention from the medical system. The treatment scheme of oral anticoagulant combined with antiplatelet aggregation drugs for patients with AF can significantly reduce the incidence rate of cerebral infarction, but at the same time, it significantly increases the risk of intracranial hemorrhage. Our findings indicated no statistical difference in the related risks between anticoagulants used alone and antiplatelet drugs used alone. Therefore, clinicians should be more cautious in choosing the oral scheme of anticoagulant and antiplatelet drugs and account for the patient's level of medication compliance. The average ventricular rate and history of cerebral infarction are risk factors for all-cause mortality in patients with AF, and a history of cerebral

infarction may increase the all-cause mortality rate of patients with AF by about 7 times. The CHA2DS2-VASc score can not only guide oral treatment plans for patients with AF but also may have predictive value for all-cause mortality in patients with permanent AF.

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Footnote

Reporting Checklist: The authors have completed the TRIPOD reporting checklist. Available at https://jtd.amegroups.com/article/view/10.21037/jtd-24-737/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-24-737/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), and approved by the Ethics Committee of Hai'an Qutang Central Hospital (approval number HA20190012). Informed consent was taken from all the patients.

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