Correlation Between the Severity of Coronary Artery Disease and CHA2DS2VASc Score in Patients with Non-valvular Atrial Fibrillation

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Abstract

Background: Nonvalvular atrial fibrillation (NVAF) frequently coexists with coronary artery disease (CAD) as they share similar risk factors and pathophysiology. However, the relation between the CHA2DS2VASc score and CAD in patients with NVAF is not studied well. The objective of this study is to evaluate the correlation between the CHA2DS2VASc score and the coronary angiographic findings in NVAF patients. **Methods:** This is a prospective, randomized, single-center study that included all patients with NVAF that attended Sohag University Hospital Cath. Lab. for coronary angiography from the first of January 2018 till the end of December 2021. Demographic data, risk factors of coronary artery disease, different presentations, echocardiographic and coronary angiographic findings were analyzed and assessed. **Results:** More than half (56.2%) of patients with NVAF had CAD. The majority of NVAF patients with normal coronary angiography were in score 2. All 26 patients had single CAD >50%: stenosis with 4 in score 0, 8 in score 1, 7 in score 2, 5 in score 3 and 2 in score 4. One patient had 2VD and was in score 2. 10 patients had 3VD: 2 in score 0, 5 in score 1, 2 in score 2, and 1 in score 3**. Conclusion:** More than half (56.2%) of the patients with NVAF had CAD based on coronary angiography. Single vessel CAD >50% was the most frequent lesion observed, meanwhile there was no correlation between the severity of the disease and CHA2DS2VASC score in NVAF patients.

Keywords: coronary- CHA2DS2VASc -Score- non-valvular- atrial- fibrillation

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Introduction

Atrial fibrillation (AF) is recognized as the most common serious cardiac arrhythmia. In the USA, it affects 2.3 million people (approximately 2% of individuals younger than 65 years of age, approximately 9% of people

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age 65 years or older.) In the EU, 4.5 million people (approximately 0.12%–0.16% of those younger than 49 years of age, 3.7%–4.2% of those aged 60–70 years, and 10%–17% of those aged 80 years or older) [1, 2, 3].

AF is associated with increased mortality and morbidity and bad quality of life [4, 5]. . The AF patients' mortality rate is almost twice that of patients with normal sinus rhythm and this observation is attributed to the associated cardiac disease [6 -9] rather than to thromboembolism [10]. .

Coronary artery disease (CAD) is highly prevalent in patients with AF and may be one of its underlying causes [11].. Furthermore, the sole manifestation of CAD may be AF [12]. Notably, epidemiological data confirms that one of the most common underlying causes of death among patients with AF is CAD [13]. Moreover, development of AF after acute myocardial infarction (MI) is associated with a higher mortality [14]. The absent atrial contractions predispose to thrombus formation; annual risk of cerebrovascular embolic events is about 7%. Loss of atrial contraction can lower cardiac output at normal heart rate by about 10%. Such a decrease is usually more or less tolerated except when the ventricular rate becomes too fast or when patients have low cardiac output from the start [15].

AF is associated with a 1.5- to 1.9-fold higher risk of death, which is in part due to the strong association between AF and thromboembolic events, according to data from the Framingham heart study [16]. [17] .

Several risk-factor assessment algorithms have been developed to aid the clinician on decisions on anticoagulation for patients with AF. The CHADS2 index (Cardiac failure, Hypertension, Age ≥75 years, Diabetes, Stroke or TIA) was widely used previously [18] ; however, multiple more recent studies have proven the superiority of the CHA2DS2-Vasc score over the CHADS2 score in predicting the risk of thromboembolism in patients with AF, particularly for participants with low to intermediate CHADS2 scores (0-1) [19, 20]

The CHA2DS2-Vasc score uses a point system to determine yearly thromboembolic risk. Two points are assigned for a history of stroke or TIA, thromboembolism, or age of 75 years or older, and one point is given for age 65-74 years or a history of hypertension, diabetes, heart

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failure, arterial disease (coronary artery disease, peripheral arterial disease, or aortic plaque), or female sex. The predictive value of this scoring system was evaluated in 90,490 elderly patients with nonvalvular AF who were taking warfarin therapy [21] . An increase in CHA2 DS2-VASc score was associated with serial increase in the risk of stroke (see **Table 1** below).

The aim of the study

The aim of this study is to evaluate the relation between the severity of coronary artery disease and the CHA2DS2VASc score in patients referred to Sohag University Cath. Lab with nonvalvular atrial fibrillation (NVAF).

Methods

This study is a prospective, randomized, single-center study that included all patients with NVAF that attended Sohag University Hospital Cath. Lab. for Coronary angiography from first of January 2018 till end of December 2021.

Demographic data, risk factors of coronary artery disease, different presentations, echocardiographic and coronary angiographic findings were analyzed and assessed.

Study population

112 patients with NVAF presented to Sohag University Hospital Cath. Lab. from the first of January 2018 till the end of December 2021. NVAF is defined as: AF without moderate-to-severe mitral stenosis or a mechanical heart valve as mentioned in the focused update of the 2019, AHA/ACC/HRS Guideline for the management of patients with AF (January et. al 2019).

Exclusion criteria

Patients with valvular AF, defined as: AF with moderate-to-severe mitral stenosis or a mechanical heart valve as mentioned in the focused update

of the 2019, AHA/ACC/HRS Guideline for the management of patients with AF (January et. al 2019).

Data collection:

Data were collected by direct contact with patients and with the Cath. Lab. files.

All patients were subjected to:

a. **History taking**: including history of age, smoking, hypertension, diabetes, previous cerebrovascular accident, the presenting symptom, previous myocardial infarction, acute coronary syndrome or previous coronary angiography.

b. **Clinical examination**: pulse rate and rhythm, blood pressure measurement taken twice (2-5 days before coronary angiography and on the day of angiography) and categorized according to ESC 2018 management of arterial hypertension guidelines (2018 ESC/ESH), presence of signs of heart failure (raised jugular venous pressure, lower limbs edema, basal chest crepitations), and body mass index (BMI) calculation.

c. **CHA2DS2VASc score calculation** for patients with AF.

d. **Laboratory tests:** done in Sohag University Hospital, including: complete blood count (CBC), random blood sugar test and glycosylated hemoglobin (HGBA1c) (categorized according to the 2019 Guidelines on Diabetes), lipid profile, serum creatinine level, INR, and TSH Level.

e. **12 lead Electrocardiogram** and recording of HR, rhythm and suggestive ischemic and old MI findings.

f. Transthoracic Echocardiographic examination was done in our echocardiography clinic with Philips Envisor machine to assess cardiac chambers size, cardiac valves structure and function, presence of left ventricular hypertrophy (LVH), systolic wall motion abnormalities (SWMA) at rest and diastolic dysfunction

(DD), ejection fraction (EF%), estimated pulmonary artery systolic pressure, type of heart disease (if present), and presence of spontaneous echo contrast or thrombus.

g. **Coronary angiography** was done in Sohag University Cath.Lab. with Toshiba Infinix-CBI using sterilization and local infiltration anesthesia of the right groin, right femoral artery puncture using Seldinger's technique, selective left and right coronary angiography in multiple views using JL4 and JR4 catheters respectively, assessment of left and right coronary arteries for the presence of atherosclerosis or stenosis, its site and percentage, and the final interpretation.

Ethical considerations

This research has been revised and approved by the Scientific Ethical Committee of Sohag Faculty of Medicine with informed written consents taken from all patients included in this study.

Statistical analyses:

Statistical analyses were performed using PASW Statistics 18 software (SPSS)

Results

The results of CHA2DS2VASc score calculation of the patients in the NVAF group was as shown in **Figure 1** and **Table 2** below.

CHA2DS2VASc score was between 0 and 4. **Score 2** presenting (38.7%) of patients was the most common, followed by **score 1** (30.6%), **score 3** (19%), **score 0** (9.9%) while **score 4** (1.8%) was the least common presentation.

The end diagnostic results of the coronary angiography were normal in 44.1%. Coronary artery disease <50% stenosis presented in 22.5% of patients while one vessel and CAD more than 50% was the finding in 23.4%, 2 vessel disease was found in only 0.9%, and 3 vessel disease was found in 9% of NVAF patients as shown in F**igure 2** and **Table 3**.

Regarding the relation between the CHA2DS2VASc score and the coronary angiographic results, the following was found as shown in F**igure 3** and **Table 4** below.

Regarding the CHA2DS2VASc score:

Score 0: 27.3% had normal coronary angiography, 36.4% had CAD >50%, 18.2% had 2 vessel disease and 27.3% had 3 vessel disease.

Score 1: 42.9% had normal coronary angiography, 22.9% had 1V CAD >50%, 14.3% had 2 vessel disease, and 42.9% had 3 vessel disease.

Score 2: 53.7% had normal coronary angiography, 22% had CAD < 50%, 17.1% had CAD >50%, 4.9% had 2 vessel disease, and 53.7% had 3 vessel disease.

Score 3: 38.1% had normal coronary angiography, 23.8% had CAD >50%, 4.8% had 2 vessel disease, and 38.1% had 3 vessel disease.

Score 4: 33.3% had normal coronary angiography, 66.7% had CAD >50%, and 33.3% had 3 vessel disease.

The majority of NVAF patients with normal coronary angiography were within score 2. A total of 25 patients had CAD <50%: 2 in score 0, 7 in score 1, 9 in score 2, and 7 in score 3. A total of 26 patients had CAD >50%: 4 in score 0, 8 in score 1, 7 in score 2, 5 in score 3 and 2 in score 4. One patient had 2VD and was in score 2. And 10 patients had 3VD: 2 in score 0, 5 in score 1, 2 in score 2, and 1 in score 3.

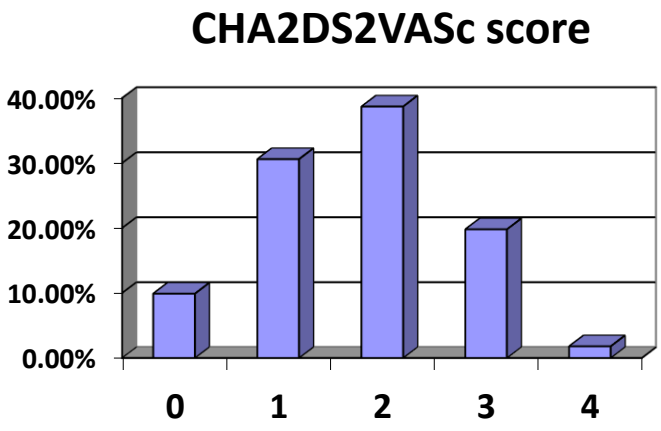

Figure 1: CHA2DS2VASc score results

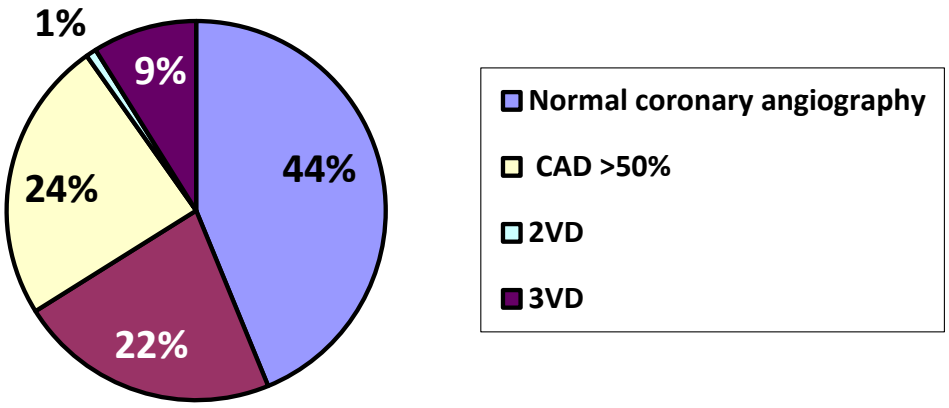

Figure 2: The coronary angiography results

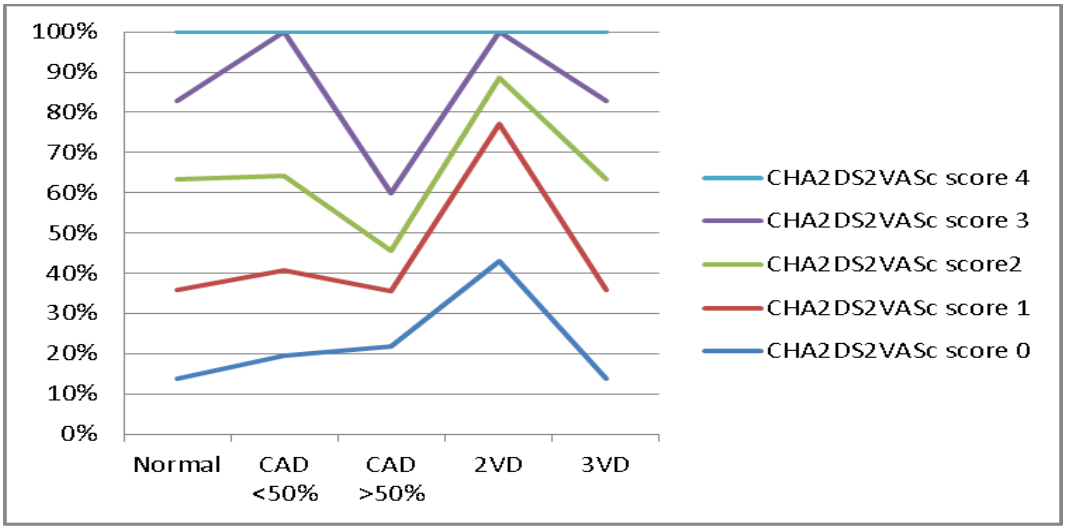

Figure 3: The relation between the CHA2DS2VASc score and the coronary angiographic results

Table 1: Stroke Rate in Patients with Nonvalvular Atrial Fibrillation Not Treated with Anticoagulation (Friberg et. al 2012)

CHA_2 DS_2-VASc Score	Unadjusted Stroke Rate (%/y)
0	0.2
1	0.6
2	2.2
3	3.2
4	4.8
5	7.2
6	9.7
7	11.2
8	10.8
9	12.2

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Table 2: CHA2DS2VASc Score Results

CHA2DS2VASc score	Number of patients	%
0	11	9.9%
1	34	30.6%
2	43	38.7%
3	22	19%
4	2	1.8%

Table 3: Interpretation of Coronary Angiography Results

	NO.	*%*
Normal coronary angiography	49	43.8%
CAD < 50%	25	22.3%
1 V CAD >50%	26	24.1%
2VD	1	0.9%
3VD	10	8.9%

Table 4: The Relation Between CHA2DS2VASc Score and Coronary Angiographic Results

Angiography Results	**CHA_2DS_2VASc Score 0**	**CHA_2DS_2VASc Score 1**	**CHA_2DS_2VASc Score 2**	**CHA_2DS_2VASc Score 3**	**CHA_2DS_2VASc Score 4**	**P Value**
Normal	3	15	22	8	1	
	27.3%	42.9%	53.7%	38.1%	33.3%	
CAD <50%	2	7	9	7	0	
	18.2%	20.0%	22.0%	33.3%	0.0%	
1 VD	4	8	7	5	2	0.6
	36.4%	22.9%	17.1%	23.8%	66.7%	
2 VD	2	5	2	1	0	
	18.2%	14.3%	4.9%	4.8%	0.0%	
3 VD	3	15	22	8	1	
	27.3%	42.9%	53.7%	38.1%	33.3%	

Discussion

All patients had a CHA2DS2VASc score between 0 and 4, with score 2 representing the most frequent score. This is consistent with Omer Uz et, al., in a study that observed that most of the patients with NVAF had score 2–4 [24].

More than half of the patients had CAD (56.2%) in the current study. In contrast, the RAMSES study that included 1828 patient with NVAF, CAD represented only in 29.2% of patients [25] while Keitaro Senoo et al. in their national study of coronary artery diseases in Japanese patients with NVAF that included 1835 patients with NVAF, CAD was found in only 6.4% of patients [26] .

Single vessel CAD >50% stenosis was the most frequent finding, followed by CAD <50%, then 3VD. 2VD as the least frequent lesion encountered, which gives the idea about the pattern of CAD anatomy in patients with NVAF. Similar results were presented by Stefan Kralev et al. in their study of Incidence and Severity of Coronary Artery Disease in Patients with Atrial Fibrillation Undergoing First-Time Coronary Angiography that included 261 patients in which the overall incidence of CAD in patients presenting with AF was 34% and the incidence of CAD >50% was 21% [27].

In the current study, we couldn't confirm any direct correlation between the severity of CAD depending on the coronary angiographic findings and CHA2DS2VASc score reducing the possibility of using the CHA2DS2VASc score as a predictor for CAD in patients with NVAF. This is not consistent with Parfrey et, al., Ranjan Modi and Mustafa Cetin, et, al. in their studies [28, 29, 30] .

Parfrey et, al. studied the role of the CHA2DS2-VASc score in evaluating patients with atrial fibrillation undergoing percutaneous coronary intervention that included 564 patients with AF who had worse outcomes with higher scores [28], Ranjan Modi in his study of CHA2DS2-VASc-HSF score, new predictor of severity of coronary artery disease in 2976 patients, found that CHADS2, CHA2DS2-VASc, and especially CHA2DS2-VASc-HS and CHA2DS2-VASc-HSF scores could be considered predictive of the risk of severe CAD with CHA2DS2-VASc-

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HSF the best scoring scheme to predict the severity of CAD (Ranjan et. al 2017). Mustafa Cetin, et, al. in their study about prediction of coronary artery disease severity using $CHADS_2$ and CHA_2DS_2-VASc scores and a newly defined CHA_2DS_2-VASc-HS score which concluded that $CHADS_2$, CHA_2DS_2-VASc, and especially CHA_2DS_2-VASc-HS scores could be considered predictive of the risk of severe CAD.

One of our limitations is the number of the study population and the large scale of patients with NVAF who need to be studied regarding this point, taking in consideration that those studies were on AF patients and not restricted to patients with NVAF [30]

Conclusion

More than half (56.2%) of the patients with NVAF had CAD. Single vessel CAD >50% was the most frequent lesion observed. CHA2DS2VASc score is not a suitable indicator for CAD severity in patients with NVAF.

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