Original Article

Assessing the Impact of CHA2DS2-VASc Score on Oral Anticoagulation Recommendations for Non-valvular Atrial Fibrillation Patients in the Indian Population

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Abstract

Background : Stroke is a major complication of Atrial Fibrillation (AF), often managed with oral anticoagulation to reduce associated morbidity and mortality. This study compares the CHADS2 and CHA2DS2-VASc scoring systems in guiding anticoagulation therapy in patients with Non-valvular Atrial Fibrillation (NVAF).

Materials and Methods : A total of 87 NVAF patients from a Tertiary Care Center in Pune were evaluated using ECG and Echocardiography. CHADS2 and CHA2DS2-VASc scores were calculated and oral anticoagulation was initiated based on the CHA2DS2-VASc score. Follow-up was conducted at 3 and 6 months to assess compliance and bleeding events.

Results : While CHADS2 recommended anticoagulation in 64% of patients, the CHA2DS2-VASc score increased this to 92%, reflecting a 28% higher identification rate. Eighty patients received oral anticoagulants. Discontinuation rates were 26% and 33% at 3 and 6 months, respectively. Minor bleeding was reported in 2.5% and 6% of patients at the same intervals.

Conclusion : The CHA2DS2-VASc score offers more precise recommendations for anticoagulation in NVAF, identifying a higher number of patients at risk of Stroke compared to CHADS2.

Key words : CHA2DS2-VASc, CHADS2, Atrial Fibrillation, Stroke Prevention, Anticoagulation.

Atrial Fibrillation (AFib or AF), is the most common type of treated heart arrhythmia. When the heart beats too slowly, too fast, or in an irregular way, the condition is called as arrhythmia[1]. An estimated, around 6-12 million people will suffer this condition in the US by 2050 and 17.9 million people in Europe by 2060[2]. However, epidemiological data reporting the actual incidence and prevalence of AF in India are scarce[3]. Overall prevalence of AF increases with age[4,5].

Editor's Comment :

- The CHA2DS2-VASc score identified more patients with Non-Valvular Atrial Fibrillation (NVAF) who needed oral anticoagulation compared to the CHADS2 score (92% *versus* 64%).
- This suggests that CHA2DS2-VASc provides clearer and more comprehensive guidance for initiating anticoagulant therapy to prevent stroke.

Stroke, as reported is one of the major complications of Atrial Fibrillation (AF) owing to significant morbidity and mortality[6,7]. Systematic reviews concluded that,the previous Stroke or transient ischemic attack, increasing age, hypertension, heart failure, diabetes mellitus, female sex and vascular disease are the major risk factors in the patients with AF associated Stroke[8,9]. Antiplatelets and anticoagulants are usually prescribed for the prevention of Stroke. Warfarin has a high risk of bleeding than aspirin, but is more effective at preventing Strokes[10,11].

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Risk stratification is crucial step in determining Stroke risk in patients which further can justify the bleeding risk associated with the use of oral anticoagulant. Since last several decades, many risk stratification schemes to predict Stroke in patients with AF have been proposed[9]. In search of user-friendly risk stratification scheme, Gage BF, *et al* (2001) have created the CHADS2 index by integrating risk factors independently predicting the Stroke risk. The name CHADS2 index indicates both, the factors, and scores upon which it is based.Each factor counting as 1 point except prior stroke, which as the strongest risk factors gets 2 points[12].

According to the 2006 American College of Cardiology/American Heart Association/ Heart Rhythm Society guidelines for the management of Atrial Fibrillation, the CHADS2 scheme has emerged as a gold standard for predicting risk for stroke[13].

Though CHADS2 score has been used commonly, several concerns have remained. Recent studies have failed to show that the CHADS2 score has good predictive value. Additionally, several known risk factors (Old age, Female gender and Vascular disease) for Stroke in AF, are not accounted in the CHADS2 score. For the CHADS2 score 1, the risk of bleeding and the risk of Stroke are comparable.

The CHA2DS2-VASc score has been proposed, as there was an increasing need to include common Stroke risk factors.The CHA2DS2-VASc score ranges from 0 to 9 and considers the weightage of age ≥75 years as a single risk factor for stroke. CHA2DS2-VASc also includes other risk factors like, vascular disease with myocardial infarction, aortic plaque and peripheral vascular disease and the female gender[14].

Here, in this study we aimed to report the additional proportion of Non-valvular Atrial Fibrillation patients, who required oral anticoagulation when the CHA2DS2-VASc score was used instead of $CHADS_2$ score and the number of bleeding episodes and compliance to oral anticoagulation in Indian population.

Materials and Methods

This study was conducted at the Outpatient/ In-patient Department of a Tertiary Care Centre in Western Maharashtra. Patients were screened based on the predefined inclusion/ exclusion criteria. Adults (either gender) with Non-valvular Atrial Fibrillation (NVAF) based on Electrocardiography (ECG) and Echocardiography (2DECHO) findings and willing to participate in the study were included. Patients with severe mitral stenosis and prosthetic valve implantation were excluded.

The study was approved by an Institutional Ethics Committee and included patients signed an informed written consent.

General and clinical history was recorded in a pretested proforma. Physical and Clinical examinations were performed by a clinician. Data regarding initial diagnosis of NVAF, types of symptoms, presence of comorbidities including Stroke, Diabetes Mellitus, Coronary Artery Disease, Peripheral Vascular Disease, Congestive Heart Failure, Hypertension and Bleeding events were collected.

Standardized protocols were followed to perform radiological investigations (ECG and ECHO) and results were recorded.

Vascular disease defined as Coronary Artery Disease or Peripheral Vascular Disease. The CHADS2 score and CHA2DS2-VASc score of all the patients were calculated.

The CHADS2 index takes its acronym from both the factors and scores upon which it is based (Table A) with each factor counting as 1 point except prior Stroke, which as the strongest risk factors gets 2 points[12].

Table A — *$CHADS_2$ Risk Factors*

$CHADS_2$ Risk factors	Score
Congestive heart failure	1
Hypertension (BP>140/90 mmHg or treated hypertension)	1
Age ≥75 years	1
Diabetes mellitus	1
Stroke / Trasientischaemic attack	2
Maximum Score	6

Table B — *CHA_2DS_2-VASc Score*

CHA_2 DS_2-VASc score	Score
Congestive heart failure	1
Hypertension	1
Age ≥75 years	2
Diabetes mellitus	1
Stroke / transient ischaemic attack	2
Vascular disease	1
Age 65-74 years	1
Sex category (female sex)	1
Maximum score	9

The CHA2DS2-VASc score has been calculated (Table B), with scores ranging from 0 to 9[14].

After enrollment a six month telephonic follow-up was done to see the compliance and bleeding events.

Statistical Analysis :

Data analysis was conducted using MS Excel (Microsoft 365) and IBM SPSS Statistics 27. Data was presented using descriptive statistic. Since most of the data was categorical, data is represented as frequency and percentages. Age is represented as Mean & Standard Deviation. Chi-square test of independency of attributes was applied for checking association between scoring systems and different scores. For all the tests p-value of <0.05 (two tailed) was considered as statistically significant.

Results

A total of 87 patients (43 females) of Non-valvular Atrial Fibrillation (NVAF) based on Electrocardiography (ECG) and Echocardiography (ECHO) were studied. Patients had an average age of 71.7 (±8.5) years with the range of 46-93 years. Maximum (n=39, 45%) patients were >74 years of age. Symptoms described by the patients included, Palpitation (41%), Shortness of breath (34%), Chest pain (2%) and syncope (1%). Good number (n=34, 39%) patient were asymptomatic, out of which some tolerated AF well, but majority were on treatment. The duration of Atrial Fibrillation was ≤1 week in one third and >1 week in two third numbers of patients (Table 1).

Table 1 — *Characteristics of the Population (at presentation) (n=87)*

Characteristics		Frequency
Age (years); mean ±SD		71.7 ± 8.5
Gender : Female (n%)		43 (49.4%)
Age groups :	< 65 years	17 (19.5%)
	65 - 74 years	31 (35.6%)
	≥74 years	39 (44.8%)
Presence of Symptoms of AF (n,%)	Palpitation	36 (41.4%)
	Shortness of breath	30 (34.5%)
	Chest pain	2 (2.3%)
	Syncope	1 (1.1%)
	Stroke/TIA	16 (18.4%)
Asymptomatic		34 (39.1%)
Duration of AF (weeks)	<1 week	29 (33.3%)
	>1 week	37 (42.5%)
	More than 12 months	21 (24.1%)
Treatment	Aspirin	42 (48.3%)
	Oral anticoagulants	27 (31%)
Comorbidities present (n%)	Thyroid disease	11 (12.6%)
	IHD	27 (31%)
Additions present (n%)	Smoking	18 (20.7%)
	Alcoholism	13 (14.9%)
ECG findings	AF	84 (96.6%)
	Sinus rhythm	3 (3.4%)
ECHO findings	Ejection fraction <40%	20 (23%)
	Ejection fraction >40%	67 (77%)

Values displayed are frequency (%), Age is summarised in mean ± SD.

At the time of presentation, 42 patients were on Aspirin and 27 were on oral anticoagulation. Some patients came to us directly but majority were referred to Cardiology Department by treating Physician for opinion regarding management of AF. Comorbidities were present in 38 patients (11 with Thyroid disease and 27 with Ischemic Heart Disease). Among patients with Thyroid disease, only one patient had Hyperthyroidism. History of substance abused revealed, 18 (21%) were smokers and 13 (15%) used to consume Alcohol (Table 1).

As per the ECG findings, at time of presentation 84 patients were in AF and 3 were in sinus rhythm. On Echocardiography 20 patients were having ejection <40% and 67 patients were having ejection fraction >40% (Table 1).

Frequency of variables of CHADS2 scoring system and CHA2DS2-Vasc scoring systems are shown in Table 2.

CHADS2 Score of the Patients :

Using CHADS2 scoring 8 patients had 0 score, 23 had 1 score and 56 patients were having score ≥2. Considering CHADS2 score 56 patients were needed oral anticoagulation (Table 3).

Table 2 — *Frequency of variables of CHADS2 scoring system and CHA2DS2-Vasc scoring systems*

Risk factors	Number of patients	Percentage (%)
CHADS2 Score :		
CCF	20	23
Hypertension	58	66.7
Age ≥75	39	44.8
Diabetes Mellitus	33	37.9
Stroke or TIA	16	18.4
CHA2DS2-Vasc Score :		
CCF	20	23
Hypertension	58	66.7
Age 65 - 74	31	36.8
Age ≥75	39	44.8
Diabetes Mellitus	33	37.9
Stroke or TIA	16	18.4
Vascular disease	30	34.5
Gender Female	44	50.6

Data presented as n(%)

CHA2DS2-Vasc Score of the Patients :

Using CHA2DS2-vasc scoring 1 patient had 0 score and remaining 86 had score ≥1.

At time of presentation, 27 patients were already on oral anticoagulants. Either Vitamin K antagonist or newer oral anticoagulants were started in 60 patients, depending on their CHA2DS2-Vasc score. At the time of 3 months follow up, 21 (26%) patients discontinued oral anticoagulation at 6 months follow up 27 (33%) patients discontinued oral anticoagulation (Table 3).

Among patients taking oral anticoagulation previously, 5 had history of bleeding. During follow up 2 patients had bleeding episode at the end of 3 months and 5 had bleeding episodes at end of 6 months. All were minor bleeding like gum bleeding and epistaxis, needing only local treatment without stopping oral anticoagulation (Table 4).

In the studied population, 80 patients needed oral anticoagulation depending on their CHA2DS2- Vasc score. Of the remaining 7 patients, 6 were female <65 years of age with lone AF and 1 patient had CHA2DS2- Vasc score of zero. Only 22 (27%) patients needing anticoagulation opted for newer oral anticoagulants over Vitamin K antagonists (Table 4). The main hurdle to start newer oral anticoagulants was the economic constraints of the patients. Among the newer anticoagulants, Apixaban was most preferred and started in 18 patients followed by Rivoroxaban in 3 patients and Dabigatran in one patient.

Table 3 — *Association between scores and different scoring systems*

Score	CHADS2	CHA2DS2	P-Value
0	8 (9.2%)	1 (1.1%)	< 0.001*
1	23 (26.4%)	7 (8%)	
≥2	56 (64.4%)	79 (90.8%)	

Variables are expressed as Frequency (%), Chi-square test. P<0.05; *Statistically Significant.

Table 4 — *characteristics at presentation and follow-up*

	Prescription and Compliance to Oral Anticoagulants (n)			Bleeding Episodes (n)	
	On OAC (VKA/NOAC)	Not On OAC (VKA/NOAC)	Not Needed OAC	Yes	No
At presentation	27	60	0	5	82
At 3 months	59	21	7	2	78
At 6 months	53	27	7	5	75

Data presented as numbers
OAC : Oral Anti Coagulants, VKA : Vitamin K Antagonist, NOAC : Newer Oral Anti Coagulants

Effect of CHA2DS2-Vasc Score on CHADS2 Score of the Patients :

The increment in the risk score when CHA2DS2 Vasc scoring applied to same patient population compared to their CHADS2 score is shown in Table 2[6]. Out of 87 patients, 8 patients were having CHADS2 score of 0, 23 patients were having score of 1 and 56 were having a score ≥2.

When CHA2DS2- Vasc scoring was applied to 8 patients with CHADS2 score of zero, only one stood with score of zero, 5 patient's score increased to 1, and 2 patients score increased to ≥2. Similarly with CHA2DS2- Vasc scoring out 23 patients with CHADS2 score of 1, only 2 patients were stood with a score of 1 and 21 patients score increased to ≥2. This increment in risk score kept very few patients in low and intermediate risk group.

The Bland Altman plot to find out difference between the scores of CHADS2 score and CHA2DS2-Vasc score, depicted positive agreement between the methods (Fig 1).

The below chart (Fig 1) for difference between the scores of CHADS2 score and CHA2DS2-Vasc score almost all the data points fall within the range of 95% confidence interval.

Discussion

In the context of Stroke risk in Atrial Fibrillation (AF), the CHADS2 scheme, widely adopted since the 2006 guidelines, has been a standard tool. However, recognizing the need to account for additional stroke

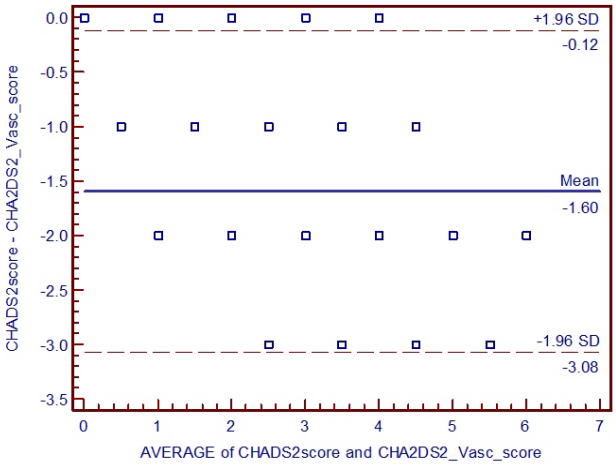

Fig 1 — Bland Altman plot to compare the CHADS2 score and CHA2DS2 score

risk factors, the CHA2DS2-VASc score was introduced. Our study focuses on its impact on anticoagulation recommendations for Indian AF patients. We enrolled 87 Non-valvular AF patients in a short-duration prospective observational study.

The mean age of the patients was 71 years, with the majority falling in the 71-80 age group. Fifty percent of the patients were female and 34% had Vascular Disease, Mainly Coronary Artery Disease. We observed a significant shift in risk categorization when factors like Age, Gender, Vascular Disease and Age $\geq$75 were considered. Symptomatically, patients presented with Palpitations (41%), Shortness of breath (34%), Chest pain (2%) and Syncope (1%). Notably, 39% were asymptomatic or symptom-free due to ongoing treatment. The duration since AF diagnosis varied, with most patients on rate control medication (96%).

In a similar vein, the PINNACLE registry reported a 45% rate of anticoagulation initiation among AF patients[17]. Eleven patients had Thyroid disease, primarily Hypothyroidism, deviating from the expected prevalence of Hyperthyroidism. At the time of presentation, 84 patients were in AF, while 3 were in sinus rhythm. Comorbidities included Congestive Cardiac Failure (23%), Hypertension (66%), Diabetes Mellitus (37%) and Stroke/Transient Ischemic Attacks (18%). Comparing CHADS2 and CHA2DS2-VASc scores showed that the latter increased risk scores for many patients, with 92% needing anticoagulation, compared to 64% using CHADS2. This shift was in line with previous studies[18]. Following anticoagulation initiation, telephonic follow-ups revealed discontinuation rates of 26% at 3 months and 33% at 6 months. This mirrored findings in the ATRIA study, where 50% of patients discontinued warfarin over 3 to 5 years due to various reasons. Among those on oral anticoagulation, 73% opted for Vitamin K antagonists, while 27% chose Newer Oral Anticoagulants (NOACs). A small percentage of patients experienced minor bleeding episodes during follow-up, with none necessitating anticoagulation cessation. In summary, our study highlights the significant impact of CHA2DS2-VASc scoring on anticoagulation recommendations for Indian AF patients, underscoring the need for more comprehensive risk assessment in Stroke prevention strategies.

Limitations :

Our study is a single centered study, though the sample size included is statistically significant, the number of AF patients included was small. Additionally, an emergence of new techniques (machine learning and artificial intelligence) for digital ECG analysis and new technologies (wearables) have provided significant opportunities for the detection and diagnosis of AF. These innovations may help to personalize therapy and risk stratification.

There is a gap in knowledge regarding optimal NOAC dosing in specific groups, including those with mild-to-moderate CKD, with very low/high Body Mass Index, and patients receiving medications with a high risk of metabolic interaction

Conclusions

Structured, clinical and risk-score"based assessment of individual thrombo-embolic risk, using the CHA_2DS_2-VASc score, should be performed as the first step in optimal thrombo-embolic risk management in AF patients

Close follow up is needed to improve compliance and to look for any bleeding or ischemic events. To improve compliance and decrease complication safer agents like newer oral anticoagulants should be used.

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Conflict of Interest : None

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