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Nonsustained Atrial Fibrillation in Ambulatory ECG Recording and Thromboembolic Events in Longterm Follow-Up

ABSTRACT

Background: Nonsustained atrial fibrillation (NS-AF) lasting longer than 30 seconds on ambulatory electrocardiogram(ECG) monitoring is considered a potential risk factor for future persistent or permanent AF and stroke. However, the clinical significance of NS-AF episodes shorter than 30 seconds, as detected on 24-hour Holter monitoring, remains unclear, as does their potential impact on stroke risk.

Methods: A total of 6117 Holter recordings were analyzed after excluding patients with AF, valvular heart disease, and a history of thromboembolic events. A total of 133 patients with NS-AF lasting less than 30 seconds and 113 controls with no detected arrhythmias were included. Both groups were followed for a mean of 65.84 ± 6.38 months.

Results: In 133 patients (2.17%), NS-AF episodes were detected. During follow-up, the stroke rate was significantly higher in the NS-AF group [21 (15.78%) vs. 5 (4.42%), $P = .004$]. After excluding 20 patients through propensity matching and adjusting for other risk factors, both NS-AF (OR = 3.930, 95% CI: 1.235-12.510, $P = .021$) and CHA_2DS_2-VA score (OR = 1.819, 95% CI: 1.204-2.748, $P = .004$) were identified as independent predictors of ischemic stroke. In the NS-AF group, the prevalence of stroke increased with advancing CHA_2DS_2-VA score. Furthermore, in the NS-AF group, a CHA_2DS_2-VA score ≥2 demonstrated a sensitivity of 85.7%, a specificity of 56.6%, a positive predictive value of 26.8%, and a negative predictive value of 95.5% for predicting stroke (area under the curve [AUC]: 0.76; 95% CI: 0.65-0.86.6; $P < .001$).

Conclusion: Stroke risk is increased in patients with NS-AF of less than 30 seconds detected on 24-hour ambulatory ECG monitoring with a CHA_2DS_2-VA score ≥2. Close follow-up should be considered for these patients to evaluate the need for anticoagulation.

Keywords: Ambulatory ECG monitoring, atrial fibrillation, CHA_2DS_2-VA score, ischemic stroke

INTRODUCTION

Atrial fibrillation (AF) is the most common arrhythmia, with its incidence increasing with age. Atrial fibrillation promotes thrombus formation through mechanisms such as blood stasis, atrial remodeling, and endothelial dysfunction, leading to an elevated risk of ischemic cerebrovascular events.[1,2] The current guidelines recommend anticoagulant therapy based on stroke risk factors, regardless of whether the AF is persistent, permanent, or paroxysmal.[3]

The previous European Society of Cardiology (ESC) guidelines defined clinical AF as absent P waves and irregular R-R intervals on an ECG recording lasting more than 30 seconds. However, the most recent ESC guideline has redefined the diagnosis of clinical AF by removing this 30-second duration requirement. As a result, the new definition no longer imposes a specific time limit for the diagnosis.[4,5] While this expanded definition broadens the indication for initiating anticoagulant therapy, it may also lead to confusion in clinical practice. Subclinical AF, often detected through insertable or wearable monitoring devices, further complicates decision-making. While anticoagulant therapy in clinical AF is guided by the CHA_2DS_2-VA score, the optimal AF duration requiring anticoagulation in subclinical AF remains debated. Several studies have linked subclinical AF to increased stroke risk,[6,7] with

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most analyses based on data from implantable devices suggesting that varying durations of AF episodes contribute to stroke risk.[8,9] Moreover, trials investigating the relationship between subclinical AF and stroke in patients using prolonged ECG monitoring have reported conflicting findings on the temporal relationship between subclinical AF episodes and stroke.[10,11]

Recently, there has been growing interest in anticoagulating ischemic stroke patients with brief atrial tachyarrhythmias for secondary stroke prevention, though the role of anticoagulation in primary prevention for such patients is still unclear.[12] In clinical practice, uncertainty remains about whether anticoagulant therapy should be considered when AF episodes lasting less than 30 seconds are detected on Holter monitoring. In this study, the aim was to assess the relationship between brief AF episodes (<30 seconds) and stroke risk in patients with no prior history of stroke.

METHODS

The study was approved by the local ethics committee and was conducted in accordance with the Declaration of Helsinki. The 24-hour Holter monitoring records of patients admitted to 2 tertiary university hospitals between 2010 and 2014 were retrospectively analyzed. The Cardioline S.P.A. Walks 400H ECG Holter system was used for these recordings. A total of 6117 Holter monitoring records from patients who underwent Holter ECG recording solely for palpitations were reviewed. Holter ECGs were not reviewed if the indication was arrhythmia detection in patients with known cardiac, cardiovascular, or cerebrovascular disease or if the patient was under the age of 18. Patients with AF episodes lasting less than 30 seconds were included in the study. Atrial fibrillation was defined as more than 3 consecutive irregular atrial contractions without visible P waves. Patients with short tachyarrhythmia episodes on Holter ECG recording with identifiable P waves or regular R-R intervals, which were the distinguishing criteria for atrial tachycardias or other supraventricular arrhythmias, were not included in the study. Patients with Holter recordings lasting less than 22 hours, known paroxysmal, persistent, or permanent AF, severe valvular disease, a history of ischemic stroke, or cerebrovascular disease, or those on anticoagulant therapy were excluded. Additionally, patients who had not undergone echocardiography within 3 months of their Holter monitoring were excluded. After enrollment, patients were followed-up for 65.84 ± 6.38 months. During follow-up, patients who developed paroxysmal or persistent AF, or those who had initiated anticoagulant therapy before a stroke event, as determined from hospital records, national databases, or phone interviews, were also excluded (Figure 1). For both NS-AF patients and controls, treatment for stroke risk factors was managed by a cardiologist independent of the study throughout the follow-up period.

A control group was formed from 113 consecutive patients who were randomly selected and had no arrhythmias or exclusion criteria. To prevent selection bias, consecutive patients were included unless they met exclusion criteria or had any arrhythmia, including those other than short AF. If either was detected, the next consecutive patient was screened.

For all included patients, demographic data such as age and sex, along with comorbid conditions including hypertension, coronary artery disease (CAD), heart failure (HF), and diabetes mellitus (DM) were recorded. Hypertension was defined either by a prior diagnosis or blood pressure readings above 140/90 mmHg on 2 separate occasions. Coronary artery disease was defined by a history of acute coronary syndrome, more than 50% stenosis in epicardial coronary arteries (identified through angiography or computed tomography), myocardial ischemia on stress testing, or previous coronary revascularization. Heart failure was defined as a prior clinical diagnosis based on symptoms like dyspnea, fatigue, or fluid retention, along with objective evidence of cardiac dysfunction, such as reduced left ventricular ejection fraction or elevated natriuretic peptides. Both HF with reduced and preserved ejection fraction were included, based on international guidelines. Diabetes was defined by a prior diagnosis, fasting blood glucose levels over 126 mg/dL, or HbA1c levels above 6.5%. The estimated glomerular filtration rate (eGFR) was calculated using the Modification of Diet in Renal Disease formula.

Additional data recorded included CHA_2DS_2-VA scores and echocardiographic parameters, such as left ventricular ejection fraction, pulmonary artery systolic pressure, left ventricular wall thickness, and left atrial diameter. Left ventricular hypertrophy was defined as a left ventricular mass index (LVMi) greater than 115 g/m^2 for males and 95 g/m^2 for females. Left atrial dilatation was defined as a left atrial transverse dimension exceeding 4.0 cm. The CHA_2DS_2-VA score was calculated as 1 point for HF, hypertension, age 65-74, diabetes, and vascular disease, and 2 points for age >74 and prior stroke or transient ischemic attack. Both groups were followed for a mean of 65.84 ± 6.38 months. New-onset ischemic strokes caused by thromboembolic events were recorded using hospital records, national databases, or phone interviews. Ischemic stroke was defined as a sudden neurological deficit caused by the blockage of a cerebral artery, leading to brain ischemia and tissue infarction.

HIGHLIGHTS

- Nonsustained atrial fibrillation (NS-AF) lasting less than 30 seconds on ambulatory ECG monitoring is a common condition that poses challenges in clinical decision-making.
- This study showed that NS-AF lasting less than 30 seconds is associated with an increased risk of stroke.
- The stroke risk is particularly higher in patients with a CHA_2DS_2-VA score of 2 or more.
- Close follow-up and assessment for anticoagulant therapy may be considered for patients with NS-AF lasting less than 30 seconds who have a CHA_2DS_2-VA score of 2 or higher.

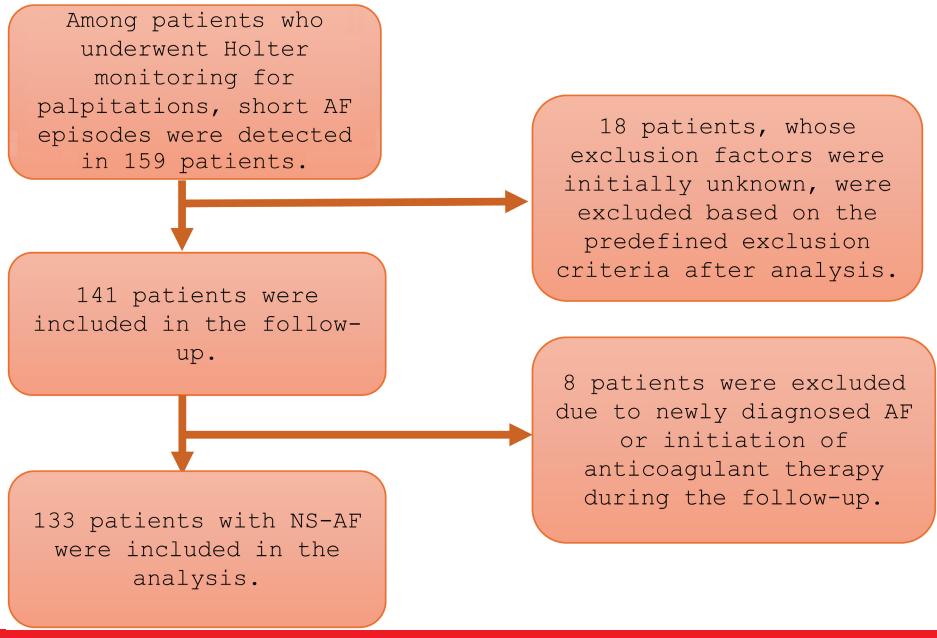


Figure 1. Flowchart of the inclusion of the study population.

Statistical Analysis

All statistical analyses were performed using SPSS version 26 (IBM Corp.). The Kolmogorov-Smirnov test was used to assess the normality of data distribution. Continuous variables were expressed as mean ± SD, while categorical variables were expressed as percentages. Normally distributed variables were compared using Student's *t*-test, and the Mann-Whitney U test was used for non-normally distributed variables. Categorical variables were compared using the chi-square test. To reduce heterogeneity between the control and NS-AF groups, propensity score matching (PSM) was applied. Propensity scores were generated using logistic regression, and matching was performed using a pre-defined macro. Cases that did not meet the matching criteria were excluded from further analyses related to these 2 groups. Binary logistic regression analysis was performed to identify independent parameters associated with the new onset of ischemic stroke. Variables that were significantly different between groups in the univariate analysis were adjusted in the multivariate analysis to prevent overestimation of the risk increase associated with NS-AF presence. Receiver operating characteristic (ROC) analysis was conducted to test the sensitivity and specificity of having a CHA_2DS_2-VA score of 2 or higher in predicting future ischemic stroke in NS-AF patients. A *P*-value of <.05 was considered statistically significant.

Artificial intelligence (AI)-powered tools (including large language models [LLMs], chatbots, and image generators) were not utilized in the preparation of this study.

RESULTS

A total of 246 patients were included in the study: 133 in the nonsustained AF (NS-AF) group, with AF episodes shorter than 30 seconds, and 113 in the control group. The mean follow-up was 65.84 ± 6.38 months. The baseline characteristics of the NS-AF and control groups are shown in Table 1. Patients in the NS-AF group were older (62.35 ± 11.18 vs 57.64 ± 9.38, $P < .001$) and had a higher prevalence of hypertension compared to the control group (64.2% vs 50.9%, $P = .039$). Additionally, the left atrial diameter (40.54 ± 4.38 vs 38.49 ± 3.82, $P < .001$) and pulmonary artery systolic pressure (20.67 ± 13.09 vs 17.54 ± 9.64, $P = .036$) were higher, while the ejection fraction was lower (59.96 ± 14.43 vs 64.59 ± 12.05, $P = .007$) in the NS-AF group. The mean CHA_2DS_2-VA score was not significantly different between the groups, [1 (interquartile range [IQR] 0-2) in the NS-AF group vs 2 (IQR 0.5-3) in the control group ($P = .069$)] (Figure 2A). However, the stroke incidence was significantly higher in the NS-AF group (15.7% vs 4.4%, $P = .004$).

The baseline characteristics of the entire study group, stratified by stroke development, are presented in Supplementary Table 1. Patients who developed stroke were older ($P < .001$) and had higher rates of diabetes ($P = .001$), hypertension ($P < .001$), and HF ($P = .041$). They also had lower eGFR ($P = .018$), larger left atrial diameter ($P = .024$), and higher pulmonary artery systolic pressure ($P = .017$). Nonsustained AF was more prevalent ($P = .004$), CHA_2DS_2-VA scores were higher ($P < .001$), and 5-year mortality was also greater in the stroke group ($P = .013$).

Propensity score matching (PSM) was performed to reduce heterogeneity in the baseline characteristics of the NS-AF and control groups. Table 2 The propensity-matched variables that were statistically significant in the baseline comparison between the 2 groups are presented. During the matching process, twenty cases that contributed to heterogeneity were excluded. As a result, differences between the groups were eliminated, except for age, which remained significantly different between the 2 groups even after matching.

Table 1. Characteristics of Control and Nonsustained Atrial Fibrillation Groups

Variables	Control n = 113	NS-AF n = 133	*P*
Age (mean ± SD)	57.64 ± 9.38	62.35 ± 11.18	<.001
Sex (women) % (n)	56.63 (64)	57.89 (77)	.898
Diabetes % (n)	36.28 (41)	28.57 (38)	.220
Hypertension % (n)	51.32 (58)	64.66 (86)	.039
Coronary artery disease % (n)	19.46 (22)	20.30 (27)	1
Heart failure % (n)	7.96 (9)	13.53 (18)	.220
Chronic obstructive pulmonary disease % (n)	12.38 (14)	15.78 (21)	.470
eGFR (mean ± SD)	83.19 ± 23.28	82.97 ± 21.01	.443
Antiaggregant use % (n)	32.74 (37)	43.6 (58)	.066
Echocardiography Parameters			
LV interventricular septum (mean ± SD)	11.11 ± 1.74	11.27 ± 1.51	.452
LV posterior wall (mean ± SD)	10.70 ± 1.18	10.79 ± 1.02	.558
LV end diastolic diameter (mean ± SD)	46.47 ± 5.15	46.63 ± 5.42	.813
Ejection fraction % (mean ± SD)	64.59 ± 12.05	59.96 ± 14.43	.007
Left atrium diameter (mean ± SD)	38.49 ± 3.82	40.54 ± 4.38	<.001
Pulmonary artery systolic pressure (mean ± SD)	17.54 ± 9.64	20.67 ± 13.09	.036
Mitral regurgitation more than mild % (n)	6.19 (7)	10.52 (14)	.255
Tricuspid regurgitation more than mild % (n)	6.19 (7)	8.27(11)	.626
CHA_2DS_2-VA score, median (IQR)*	1 (0-2)	2 (0.5-3)	.069
Ischemic stroke in 5 years % (n)	4.42 (5)	15.78 (21)	.004
Exitus in 5 years % (n)	1.76 (2)	6.76 (9)	.069

eGFR, estimated glomerular filtration rate; IQR, interquartile range; LV, left ventricle.
*Nonparametric test was used for statistical analysis.

After propensity matching, all subsequent analyses related to the NS-AF and control groups were conducted with 113 NS-AF cases and 113 controls.

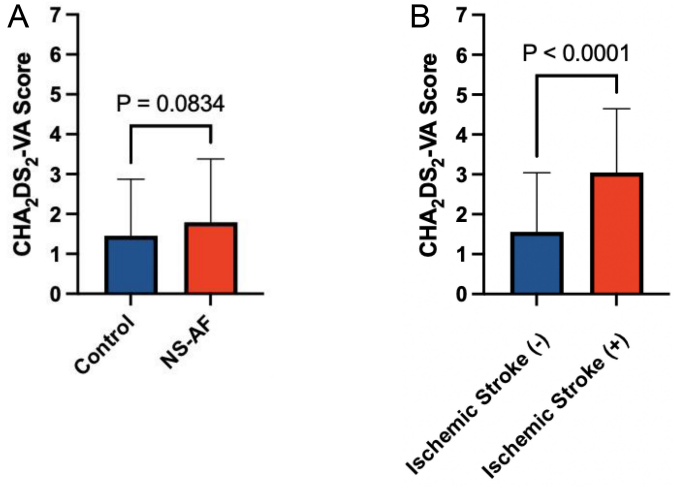


Figure 2. Comparison of mean CHA_2DS_2-VA scores across groups: A. Comparison of mean CHA_2DS_2-VA scores between the control and NS-AF groups shows no significant difference. B. Comparison of mean CHA_2DS_2-VA scores within the NS-AF group between patients who experienced an ischemic stroke and those who did not during follow-up shows a significantly higher score in patients who experienced ischemic stroke.

When the predictors of ischemic stroke were analyzed in the cohort that was not excluded after propensity matching (n = 226), univariate analysis identified age, NS-AF, DM, hypertension, estimated glomerular filtration rate (eGFR), left atrial enlargement, pulmonary arterial systolic pressure, left ventricular hypertrophy, and CHA_2DS_2-VA score as significant predictors. However, in a multivariate binary logistic regression model that included all these parameters except those already incorporated into the CHA_2DS_2-VA score, only NS-AF episodes (OR: 3.930, 95% CI: 1.235-12.510, *P* = .021) and CHA_2DS_2-VA score (OR: 1.819, 95% CI: 1.204-2.748, *P* = .004) remained as independent predictors of ischemic stroke (Table 3). In the NS-AF group, the CHA_2DS_2-VA score was significantly higher in patients who experienced ischemic stroke compared to those who did not (3.04 ± 1.59 vs 1.55 ± 1.48, *P* < .001) (Figure 2B). In the NS-AF group, the prevalence of ischemic stroke increases with higher CHA_2DS_2-VA scores. The prevalence was 2.9% (1 in 34) in patients with a CHA_2DS_2-VA score of 0, 6.1% (2 in 33) in patients with a score of 1, 18.5% (5 in 27) in patients with a score of 2, 26.3% (5 in 19) in patients with a score of 3, 38.5% (5 in 13) in patients with a score of 4, and 40% (2 in 5) in patients with a score of 5 (Table 4). Due to the very low number of patients with a CHA_2DS_2-VA score of 6 (n = 3) and 7 (n = 1), no stroke events were observed in the score 6 group, and only 1 stroke event occurred in the score 7 group. As a result, a meaningful prevalence analysis could not be performed for these score groups. ROC analysis showed that having a CHA_2DS_2-VA score of 2 or higher was

Table 2. Propensity Matching for Baseline Characteristics

	Before Propensity Matching			After Propensity Matching		
Variables	**Control**	**NS-AF**	***P***	**Control**	**NS-AF**	***P***
Age (mean ± SD)	57.48 ± 9.26	62.35 ± 11.22	<.001	57.48 ± 9.26	60.11 ± 10.30	.045
Hypertension n (%)	57(50.4%)	86 (64.7%)	.024	57 (50.47%)	68 (60.2%)	.090
Pulmonary artery systolic pressure (mean ± SD)	17.48 ± 9.66	20.49 ± 12.96	.043	17.48 ± 9.66	18.19 ± 11.36	.614
Left atrium enlargement	40 (35.4%)	73 (54.9%)	.003	40 (35.4%)	53 (46.9%)	.080
CHA_2DS_2-Va score, median (IQR)*	1 (0-2)	2 (0.5-3)	.069	1 (0-2)	1 (0-2)	.210

IQR, interquartile range, NS-AF, nonsustained atrial fibrillation.
*Nonparametric test was used for statistical analysis.

associated with 85.7% sensitivity and 56.6% specificity (area under the curve [AUC]: 0.76; 95% CI: 0.65-0.86.6; $P < .001$) with a 26.8% positive predictive value and 95.5% negative predictive value for predicting ischemic stroke within 5 years in patients with NS-AF (Figure 3).

DISCUSSION

In this study, ischemic stroke occurred more than 3 times as frequently in patients with AF episodes shorter than 30 seconds detected by 24-hour Holter monitoring. Atrial fibrillation episodes of less than 30 seconds and the CHA_2DS_2-VA score were found to be independent risk factors for ischemic stroke. Additionally, this study confirmed that in patients with brief AF episodes, a CHA_2DS_2-VA score of 2 or higher was associated with an increased risk of ischemic stroke, while a CHA_2DS_2-VA score of less than 2 had a high negative predictive value of 95.5% for ischemic stroke.

AF is a well-known risk factor for ischemic stroke, and the effectiveness of anticoagulation in preventing stroke is firmly established. However, whether anticoagulant therapy is necessary for short-lasting AF episodes is still debated. While the recent ESC Guideline removed the 30-second minimum duration for AF diagnosis, the association between brief AF episodes and stroke risk remains uncertain, and many studies in the literature aim to clarify this question.

To clarify the relationship between stroke and short episodes of AF, studies in stroke patients have been conducted. Arsava et al[13] examined stroke patients and concluded that the clinical and ischemic imaging features differ between those with NS-AF lasting less than 30 seconds and those with longer AF episodes. Yetim et al[14] suggested that NS-AF episodes lasting less than 30 seconds do not have a direct causal

Table 3. Independent Predictors of Ischemic Stroke

Variables	**OR**	**95% CI**	***P***
eGFR	0.997	0.974-1.021	.804
Pulmonary artery systolic pressure	1.029	0.987-1.072	.186
Left atrium enlargement	1.261	0.441-3.609	.665
Left ventricle hypertrophy	1.934	0.607-6.161	.264
NS-AF	3.930	1.235-12.510	**.021**
CHA_2DS_2-VA score	1.819	1.204-2.748	**.004**

eGFR, estimated glomerular filtration rate; NS-AF, nonsustained atrial fibrillation; OR, odds ratio. Statistically significant *P*-values were indicated in bold.

Table 4. CHA_2DS_2-VA Score and Stroke Prevalence

CHA_2DS_2-VA Score	**NS-AF (n)**	**Stroke Prevelance n (%)**
0	34	1 (2.9)
1	33	2 (6.1)
2	27	5 (18.5)
3	19	5 (26.3)
4	13	5 (38.5)
5	5	2 (40)
6	3	0
7	1	1(100)

NS-AF, non-sustained atrial fibrillation.

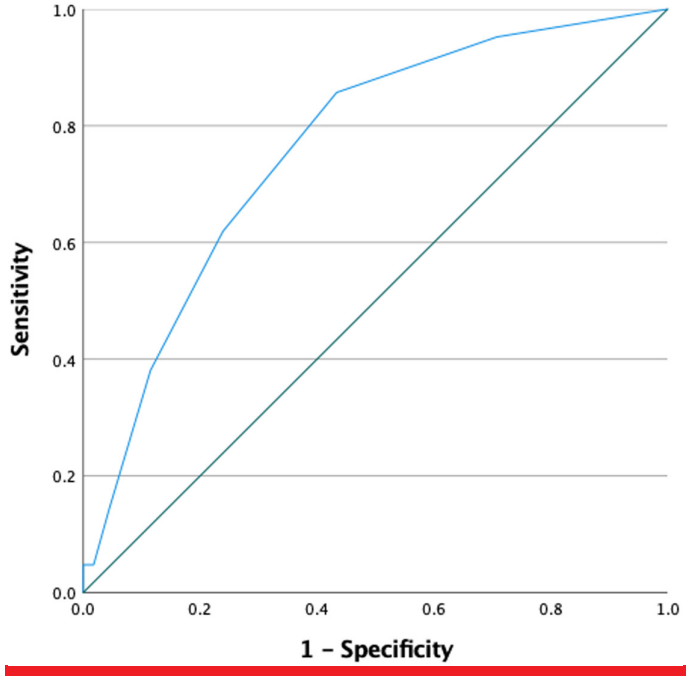


Figure 3. ROC analysis of the CHA_2DS_2-VA score for predicting ischemic stroke in the NS-AF group. The area under the curve (AUC) is 0.76, with a 95% CI of 0.65-0.86, $P < .001$

relationship with stroke; however, they reported a higher prevalence of NS-AF in stroke patients compared to controls and found that stroke patients had more cardiovascular risk factors. Similar to Yetim et al,[14] a higher prevalence of stroke in patients with NS-AF was observed. Moreover, consistent with their findings, patients who developed stroke in this study also had more cardiovascular risk factors.

Numerous studies have been conducted to determine the duration of AF episodes that increase the risk of stroke. Some studies reported that AF episodes lasting 5-6 minutes might increase ischemic stroke risk.[6,8] In the ASSERT trial, AF episodes lasting longer than 24 hours were linked to a higher risk of stroke.[9] Although an analysis of the Registry of Atrial Tachycardia and Atrial Fibrillation Episodes (RATE) Registry found that short AF episodes (10-20 seconds) were not to be associated with an increased stroke risk, another study has shown that even brief episodes of atrial activity, like short atrial runs, may raise the stroke risk.[15,16] Additionally, several studies have linked shorter episodes of AF-like activity—such as supraventricular ectopic beats and supraventricular tachycardias (SVTs)—to a higher stroke risk over time.[16,17] A recent review analyzing large studies has suggested that differences in research methods make the timing relationship between ischemic stroke and AF uncertain.[18]

Most studies investigating the timing of ischemic stroke risk in relation to AF have been conducted using implantable devices. While these devices allow for convenient long-term rhythm monitoring, short AF episodes and atrial high-rate episodes can interfere with oversensing. As a result, a 5-minute threshold has been identified as a safe cut-off for detecting AF with implantable devices.[19] However, rhythm Holter monitoring enables arrhythmias to be analyzed with 3 channels, allowing for more accurate identification of short arrhythmias. In this study, rhythm Holter monitoring was used to detect AF by visualizing 3-channel ECG recordings, and 2 independent observers analyzed these recordings, ensuring that AF episodes shorter than 30 seconds were accurately identified.

The Atrial Fibrillation Follow-up Investigation of Rhythm Management (AFFIRM) trial demonstrated that patients with asymptomatic AF experience higher rates of ischemic stroke. However, other studies suggest that the absolute stroke risk may be lower in patients with subclinical AF compared to those with symptomatic AF.[20,21] Most studies examining the link between short-lasting AF and stroke have focused on asymptomatic AF patients. The study, however, differs in that patients who underwent Holter monitoring due to palpitations were included. This design enables to specifically analyze short-lasting clinical AF episodes, rather than focusing on subclinical AF.

The $CHADS_2$ and CHA_2DS_2-VASc scores are widely recognized as the most effective scoring systems for predicting stroke risk.[22] Previous ESC guidelines recommended using the CHA_2DS_2-VASc score, which included female sex (S) as an additional point, to assess stroke risk in patients with AF. However, these guidelines provided different thresholds for oral anticoagulant therapy based on sex: anticoagulation was strongly recommended for males with a score of 2 and females with a score of 3, leading to some confusion.[4] The recent ESC guideline has removed sex from the scoring system and recommended anticoagulant therapy with a Class I indication for patients with a CHA_2DS_2-VA score ≥ 2, noting that female sex is a risk modifier rather than a risk factor, which has helped clarify the recommendations.[5] In this study, the CHA_2DS_2-VA score was analyzed and confirmed as an important independent predictor of stroke also in patients with brief episodes of AF. It was also demonstrated that as the CHA_2DS_2-VA score increases, the prevalence of stroke rises, and this finding, along with the observed prevalence rates, is consistent with the stroke rates estimated in previous guidelines based on the CHA_2DS_2-VASc score.[23]

In various studies, different parameters have been investigated as stroke predictors in addition to classical clinical risk factors. Left atrial enlargement has been identified in previous studies as a factor associated with ischemic stroke in patients with or without AF.[24] In this study, although it was a significant predictor of ischemic stroke in the univariate analysis, it lost its significance in the multivariate analysis, likely due to the predictive power of NS-AF and the CHA_2DS_2-VA score.

The study has some limitations. The control group was selected based on consecutive patient inclusion rather than age- or risk factor-matching. However, selecting controls based on specific characteristics could introduce additional bias. To address potential differences between groups, propensity matching and excluded cases contributing to heterogeneity were performed. In the multivariate analysis, adjustments were made for statistically significant parameters to minimize confounding effects. Furthermore, in the multivariate analysis, adjustments were made for statistically significant parameters to help mitigate differences between groups. Atrial cardiomyopathy, a newly introduced concept reported to be associated with an increased stroke risk, could not be evaluated due to limited data.[25] A 24-hour monitoring period may be insufficient to detect AF episodes that occur at longer intervals. Additionally, AF duration can vary daily, meaning that while a patient may have a short AF episode on a 24-hour Holter monitor, they could experience longer episodes on another day, which the monitoring may not have captured. Although patients who developed paroxysmal or persistent AF during follow-up based on hospital records and telephone interviews were excluded, there was no sufficient evidence to confirm that these patients did not experience subclinical paroxysmal AF during the follow-up period. Another limitation is that AF burden could not be analyzed in this study.

However, this study differs from the subclinical AF studies in the literature as it focuses on screening patients with palpitations. It addresses a common clinical scenario where clinicians face uncertainty about the clinical significance of these episodes and the consideration of anticoagulant therapy, particularly given that recent guidelines have removed

the time threshold for diagnosing AF, adding further complexity. The strength of this study lies in its evaluation of an issue encountered daily in clinical practice and its emphasis on the need for clinicians to recognize the potential stroke risk in these patients and ensure close follow-up to assess the necessity of anticoagulant therapy.

This study demonstrated that patients with AF episodes shorter than 30 seconds may have an increased stroke risk, especially if their CHA_2DS_2-VA score is equal to 2 or higher. This finding suggests that such patients should be closely monitored and undergo more detailed evaluation, such as extended Holter monitoring, and be reassessed for the need for anticoagulant therapy. However, before reaching a conclusion, the findings need to be supported by larger, long-term studies.

Ethics Committee Approval: The study was approved by the Local Ethics Committee of Kocaeli University School of Medicine (Approval Number: 202) on 22 June 2016.

Informed Consent: Written informed consent was obtained from the patients who agreed to take part in the study.

Peer-review: Externally peer-reviewed.

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Supplementry Table 1. Basic Variables According to Stroke.

Variables	Patients without Stroke n = 220	Patients with Stroke n = 26	*P* value
Age (mean ± SD)	59.15 ± 10.38	68.23 ± 9.25	**<0.001**
Sex (women) % (n)	58.6 (129)	46.2 (12)	0.295
Diabetes % (n)	28.2 (62)	61.5 (16)	**0.001**
Hypertension % (n)	54.5 (120)	88.5 (23)	**<0.001**
Coronary Artery Disease % (n)	18.6 (41)	7 (26.9)	0.303
Heart Failure % (n)	9.1 (20)	23.1 (6)	**0.041**
Chronic Obstructive Pulmonary Disease % (n)	13.2 (29)	23.1 (6)	0.229
eGFR (mean ± SD)	84.48 ± 21.48	73.80 ± 23.09	**0.018**
Antiaggregant Use % (n)	80 (36.4)	14 (53.8)	0.091
Echocardiography parameters			
LV Interventricular Septum (mean ± SD)	11.12 ± 1.58	11.91 ± 1.79	**0.017**
LV Posterior Wall (mean ± SD)	10.70 ± 1.03	11.15 ± 1.47	**0.047**
LV End Diastolic Diameter (mean ± SD)	46.40 ± 5.26	47.70 ± 5.57	0.238
Ejection Fraction % (mean ± SD)	62.54 ± 12.84	59.69 ± 17.59	0.307
Left Atrium Diameter (mean ± SD)	39.36 ± 4.26	41.35 ± 3.82	0.024
Pulmonary Artery Systolic Pressure (mean ± SD)	18.50 ± 11.54	24.23 ± 11.37	0.017
Mitral Regurgitation more than mild % (n)	9.1 (20)	3.8 (1)	0.708
Tricuspid Regurgitation more than mild % (n)	7.7 (17)	7.7 (2)	1
NS-AF	50.9 (112)	80.8 (21)	**0.004**
CHA_2DS_2-VA Score, median (IQR)*	1 (0-2)	2.5 (2-4)	**<0.001**
Exitus in 5 years % (n)	2.7(6)	15.4 (4)	**0.013**

eGFR, estimated glomerular filtration rate; IQR, interquartile range; LV, left ventricle
**Nonparametric test was used for statistical analysis*