Predisposing factors of short paroxysmal atrial runs in the geriatric patients

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Abstract

Objective: Atrial fibrillation (AF) is the most common arrhythmia in the elderly population, and it has various major complications. This study aimed to investigate the factors that may cause short paroxysmal atrial runs (SPARs) in the geriatric patients.

Methods: The study included patients aged over 65 years who visited the cardiology outpatient clinic and were diagnosed with SPAR by a 24-hour electrocardiogram holter (24-h ECG). All patients underwent echocardiography, and their plasma C-reactive protein (CRP) levels were measured. Their demographic data, chronic disease status, echocardiographic findings and CRP values were evaluated.

Results: The mean age of the 144 patients was 73 (65-90). Of the patients, 70.8% were female and 29.2% were male. There was no significant difference between the groups with and without SPAR in terms of age (p=0.362), sex (p=0.549), hypertension (p=0.345), congestive heart failure (0.668), diabetes mellitus (p=0.150), coronary artery disease (p=0.518), ejection fraction (p=0.577), or left atrial area (p=0.696). In the univariate regression analysis, diabetes mellitus and plasma CRP levels were associated with the risk of SPAR. In the multivariate logistic regression analysis model including diabetes mellitus (OR: 1.996; 95% CI: (0.616–6.472); p=0.249) and plasma CRP levels (OR: 0.325; 95% CI: (0.049–2.143); p=0.243), neither factor was found to be independently associated with the risk of SPAR.

Conclusion: Clinical conditions that are known to increase the risk of developing atrial fibrillation, such as hypertension and congestive heart failure, were not associated with the development of SPAR.

Keywords: Atrial ectopic tachycardia, atrial flutter, geriatrics.
INTRODUCTION

Atrial fibrillation (AF) is the most common arrhythmia in the elderly population, and the prevalence of AF increases in direct proportion to age (1). AF has major complications, including stroke, cardiomyopathy, and congestive heart failure (2).

Inflammation and oxidative stress play an important role in the etiology of AF. Lymphocyte infiltrations, myocyte necrosis, cell damage findings due to oxidative stress, and fibrosis were frequently observed in atrial biopsy specimens of patients with atrial fibrillation (3). Numerous clinical studies have shown that inflammatory markers such as C-reactive protein (CRP), IL-6, and transforming growth factor-B can cause AF. Elevated basal plasma CRP and IL-6 levels increase the likelihood of recurrence after atrial fibrillation catheter ablation (4).

AF and atrial remodeling are associated with inflammation and oxidative stress. Atrial fibrosis increases with aging and causes premature atrial complexes and short atrial run attacks (SPAR). Brief episodes of atrial run attacks are a risk marker for atrial fibrillation. Frequent premature atrial complexes or SPARs on 24–48-hour Holter electrocardiogram are significantly associated with first stroke and mortality in elderly patients with sinus rhythm (5,6).

In this study, we aimed to determine the predisposing factors of SPARs in geriatric population.

MATERIALS AND METHODS

The study was conducted prospectively. Ethical approval was obtained from the ethics committee of Zonguldak Bülent Ecevit University (ethical approval no: 2015-56-07/07). Informed consent was obtained from the patients.

The study included patients with sinus rhythm aged 65 and over who were admitted to the cardiology outpatient clinic of Zonguldak Atatürk State Hospital between 2015 and 2016. The patients were diagnosed with SPARs using a 24-hour ECG holter.

Echocardiography was performed on all patients. The VIVID 7 Cardiovascular Ultrasound System (Vingmed-General Electric, Horten, Norway) with a 3.5 MHz probe was used for echocardiographic evaluation. Echocardiographic measurements were made in the left supine position. Parasternal long and short axes and apical angle standard viewing windows were used. The ejection fraction was calculated by the modified Simpson’s method. All echocardiographic images were evaluated by an experienced cardiologist. Plasma CRP values were measured using a Roche Diagnostics Cobas 8000 analyzer. Patients with AF in the basal ECG or with hyperthyroidism, using beta-blockers or calcium channel blockers, digoxin and any anti-arrhythmic drugs were excluded from the study.

Demographic data such as age, sex, chronic disease status (hypertension, diabetes mellitus, coronary artery disease, congestive heart failure), echocardiographic findings such as left ventricular ejection fraction, left atrial area, and CRP values were recorded from hospital records or patient anamnesis.

Statistical analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 20.0 for Windows (IBM Corp., Armonk, NY, USA). The conformity of the variables to the normal distribution was examined using visual (histogram and probability graphs) and analytical (Kolmogorov–Smirnov/Shapiro–Wilk tests) tests. Descriptive analyses were given using the median (min-max) for non-normally distributed variables. Categorical data were given using frequency (n) and percentage (%). The Mann–Whitney U test was used for non-normally distributed variables. Categorical variables between the groups were compared using the chi-square test and Fisher’s exact test as appropriate. Univariate logistic regression analyses were performed to estimate the proportion of possible risk factors for the development of AF. Clinical parameters that were analyzed at p<0.20 in a univariate model were included in multivariate logistic regression analyses to identify independent risk factors related to AF. In our study, diabetes mellitus and CRP showed P<0.20 in a univariate model. Multivariate logistic regression analyses were performed for diabetes mellitus and CRP. The backward stepwise method was used to determine the most appropriate model. Odds ratios with 95% confidence intervals were calculated for each variable, and p<0.05 was considered significant for all comparisons.
RESULTS

The study employed a total of 144 patients who met the criteria. Of the patients, 70.8% (n=102) were female and 29.2% (n=42) were male. The mean age was 73 (65-90). Of the patients, 86.1% (n=124) had hypertension, 28.5% (n=41) had diabetes mellitus, 26.4% (n=38) had heart failure, 30.6% (n=44) coronary artery disease, and 70.8% (n=102) dyslipidemia. The median left atrial area measurement level of the patients was 23.65 (16.5-34), and the median left ventricular ejection fraction was 57 (23-71). When the patients were classified as those with and without SPAR, there was no significant difference in terms of age (p=0.362), sex (p=0.549), hypertension (p=0.345), congestive heart failure (p=0.668), diabetes mellitus (p=0.150), coronary artery disease (p=0.518), ejection fraction (p=0.577), or left atrial area (p=0.696) (Table 1).

Univariate logistic regression analyses were conducted to assess the proportion of possible risk factors for SPAR. In the univariate regression analysis including possible risk factors, diabetes mellitus and plasma CRP levels were found to be associated with the risk of SPAR (p<0.200). In the multivariate logistic regression analysis model, diabetes mellitus (OR: 1.996; 95% CI: (0.616–6.472); p=0.249) and plasma CRP levels (OR: 0.325; 95% CI: (0.049–2.143); p=0.243) were not independently associated with the risk of SPAR (Table 2).

Table 1. Baseline characteristics of patients according to the short atrial runs in 24-hour ECG monitoring

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Short Paroxysmal Atrial Run (+) (n=25)</th>
<th>Short Paroxysmal Atrial Run (-) (n=119)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>72 (65-87)</td>
<td>73 (65-90)</td>
<td>0.362</td>
</tr>
<tr>
<td>Female</td>
<td>18 (12.5%)</td>
<td>84 (58.3%)</td>
<td>0.549</td>
</tr>
<tr>
<td>Hypertension</td>
<td>20 (13.9%)</td>
<td>104 (72.2%)</td>
<td>0.345</td>
</tr>
<tr>
<td>Congestive heart failure (%)</td>
<td>5 (3.5%)</td>
<td>33 (22.9%)</td>
<td>0.618</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>4 (2.8%)</td>
<td>37 (25.7%)</td>
<td>0.150</td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td>8 (5.6%)</td>
<td>36 (25.0%)</td>
<td>0.518</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>17 (11.8%)</td>
<td>85 (59%)</td>
<td>0.810</td>
</tr>
<tr>
<td>Left ventricular ejection fraction (%)</td>
<td>57 (35-65)</td>
<td>57 (23-71)</td>
<td>0.577</td>
</tr>
<tr>
<td>Left atrial area (mm²)</td>
<td>21.2 (16.5-34.0)</td>
<td>24.0 (17.0-33.0)</td>
<td>0.696</td>
</tr>
<tr>
<td>C-reactive protein (mg/dl)</td>
<td>0.4 (0.0-3.3)</td>
<td>0.1 (0.0-1.3)</td>
<td>0.020</td>
</tr>
</tbody>
</table>

Numerical variables were presented as median and categorical variables were defined as number (percentage).

Table 2. Univariate and multivariate logistic regression analyses indicating independent predictors of short atrial runs in 24-hour ECG

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Univariate Analyses</th>
<th>Multivariate Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR (95% CI)</td>
<td>p</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>2.369 (0.759–7.389)</td>
<td>0.137</td>
</tr>
<tr>
<td>CRP</td>
<td>0.228 (0.035–1.479)</td>
<td>0.121</td>
</tr>
</tbody>
</table>

**Abbreviations:** CRP: C-Reactive Protein, CI: Confidence Interval, OR: Odds Ratio.
DISCUSSION

Our study investigated the presence of clinical and laboratory parameters that can predict short atrial run attacks in 24-hour Holter ECG to anticipate possible atrial fibrillation risk in the geriatric patients within ECG in sinus rhythm at hospital admission. However, clinical conditions that are generally known to increase the risk of atrial fibrillation, such as hypertension and congestive heart failure, were not associated with the development of SPAR (7). Diabetes mellitus was associated with the development of SPAR in univariate analyses, but in multivariate regression analyses, it was not an independent risk factor for increasing short atrial run attacks. Additionally, left atrial dilatation, which increased the risk of atrial fibrillation in previous clinical studies, did not predict the development of SPAR in our study. Diabetes mellitus is known as an independent risk factor for AF. The underlying pathophysiology is related to structural and electrical remodeling. Glucose-lowering therapies may affect the development of AF. Patients with diabetes require optimal long-term rhythm control strategies (8). In geriatric population with comorbidities, AF often cannot be diagnosed until the first stroke occurs especially (9-12) Early detection of AF followed by initiation of oral anticoagulation has the potential to reduce these arrhythmia-associated strokes (13). Atrial high-rate episodes (AHRE) are atrial tachyarrhythmias detected by continuous rhythm monitoring by pacemakers, defibrillators, or implantable heart monitors, and there is increasing evidence in the literature that they increase the risk of atrial fibrillation, similar to SPAR episodes (14). Mizayawa et al. stated that advanced age and hypertension are risk factors for the long-term occurrence of AHRE (15). It was predicted that both arrhythmia attacks were related to atrial fibrosis. (5, 16) In addition to the data that can be obtained from cardiac implantable devices, many studies have been planned or carried out in recent years for the early diagnosis of atrial fibrillation due to the increasing availability of consumer electronics and wearable devices that can record and analyze heart rhythm (17,18). The Smart study included 882 people aged 65 and older who had no known AF, all patients were given a bracelet with a photoplethysmography sensor that connected to their smartphones. Atrial arrhythmias were detected in five percent of patients during the first four weeks of monitoring (19). Inflammation and fibrosis play an important role in the development of atrial cardiomyopathy (20). Atrial cardiomyopathy may cause atrial arrhythmias and SPAR attacks (21). There is increasing evidence that short supraventricular tachycardias seen on 24-hour ECG monitoring are associated with an increased risk of future atrial fibrillation and stroke (22-24). In a study by Johnson et al., which included 370 subjects with sinus rhythm attending an average of 13 years of follow-up, short SVT episodes detected during 24-hour ECG screening were associated with incident AF and ischemic stroke (25). The risk of high plasma CRP levels causing atrial fibrillation is confusing in the literature. In a meta-analysis including seven prospective studies, increased CRP levels were associated with a greater risk of AF recurrence after electrical cardioversion (26). In a clinical study by Lin, Yenn-Jiang et al., basal CRP levels before the atrial fibrillation catheter ablation procedure had an independent prognostic value indicating long-term recurrence (27). In contrast, in a clinical study conducted by Nicolas Lellouche et al., the basal CRP levels measured before atrial fibrillation catheter ablation were not associated with atrial fibrillation recurrence (28). Our study found no relationship between SPAR and diabetes mellitus, congestive heart failure or hypertension.

Limitations:

Our study has some limitations. It was conducted with a small number of subjects, and it was a single-center study.

CONCLUSION

Early detection of AF followed by initiation of oral anticoagulation has the potential to reduce these arrhythmia-associated strokes. There are limited studies in the literature on short atrial run attacks. We found no relationship between SPAR and clinical conditions that are known to increase the risk of developing atrial fibrillation, such as hypertension and congestive heart failure. Plasma CRP values were not associated with the development of SPAR. As an atrial fibrillation precursor, future extensive and multicenter studies are needed on detection of SPAR.
Conflicts of interest: The author declares that no conflicts of interest.

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Peer review: Externally peer reviewed.

Ethical approval: The study was conducted as per the principles recommended by the Helsinki Declaration. The study was approved by the Clinical Research Ethics Committee of the Zonguldak Bülent Ecevit University Faculty of Medicine (ethical approval no: 2015-56-07/07)

Author contributions: The authors declare that they all participated in the study, supervision, data collection/or processing, performed data analysis, literature search, writing, and critical review: M.OÇ.

References


