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Original Research

The Frequency and Clinical Associations of Interatrial Block among Patients with Heart Failure

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ABSTRACT

Objective: Heart failure is a rising global pandemic. Numerous structural and functional alterations occur within the heart in response to reduced ejection fraction and dilated chambers. The frequency and clinical associates of interatrial block (IAB) among heart failure patients with reduced systolic function were evaluated in this study.

Methods: Patients with heart failure and reduced systolic function (ejection fraction [EF] <50%) were consecutively enrolled in the study. Patients with atrial fibrillation were excluded. In total, 142 patients with sinus rhythm and systolic heart failure were included. Demographic variables and basic echocardiographic variables were recorded. The presence, absence, and degree of IAB were recorded using standard twelve-lead electrocardiography (ECG). A p wave duration of <120 ms was accepted as normal interatrial conduction. If the p-wave duration was ≥120 ms and p-wave morphology was normal in inferior derivations, it was accepted as partial IAB. A combination of a prolonged p-wave duration (≥120 ms) and biphasic p waves (positive and negative) was accepted as advanced IAB. The Kruskal–Wallis test was used to compare the variables and IAB.

Results: In total, 142 patients had heart failure (EF <50%) and sinus rhythm; 79 patients (59%) had normal interatrial conduction, 37 (27.6%) had partial IAB, and 18 (13.4%) had advanced IAB. The total frequency of IAB among patients with heart failure was 38.7%. The presence and degree of IAB were associated with advanced age (p=0.004) but not with the etiology of heart failure (ischemic and nonischemic) and gender of the patients. Also, the degree of systolic impairment, as assessed by EF, was not associated with the degree of IAB (p=0.19). The ECG P-wave duration had a significant correlation with age (p=0.002) and left atrial diameter (p=0.048).

Conclusion: Interatrial block is quite common and independent of the degree of systolic impairment among patients with heart failure. Since the clinical implication is high, frequent monitoring and a close follow-up is necessary in these patients.

Keywords: Heart failure, interatrial block, stroke

INTRODUCTION

The frequency of heart failure is increasing globally (1). An aging population and increased survival after myocardial infarction are the primary reasons for high heart failure rates. Also, transcatheter techniques developed to treat patients with advanced and inoperable valve disease increase survival and prolong life expectancy in patients with heart failure. Despite the ever-growing armamentarium of medical and device-based therapies, the mortality remains unacceptably high (2). Several structural alterations occur in the heart in response to the reduced ejection fraction (EF). Left atrial dilatation and consequent prolongation in interatrial impulse conduction frequently accompany systolic heart failure. An interatrial block (IAB) is defined as a prolonged p-wave duration (≥120 ms) and/or bimodal p waves in the inferior (II, III, and aVF) leads (3). Here, we evaluated the IAB frequency and its associates with clinical variables inheart failure patients with reduced ejection fraction.

METHODS

The ethics committee approved the study prior to patient enrollment (Gaziantep University School of Medicine, no: 348). Patients with systolic heart failure, as evidenced by reduced EF (<50%), were prospectively enrolled. Informed consent was obtained from each patient. Patients with atrial fibrillation were excluded. Standard echocardiographic examinations, including left atrial diameter, left ventricular end-diastolic diameter, and EF, were performed. The electrocardiographic (ECG) measurement was performed using SEMA Workstation 3.8.1 (Schiller AG). The ECG variables were p-wave duration and p-wave morphology in the inferior leads (II, III, and aVF). Based on these variables, patients were divided into three groups: normal interatrial conduction (p-wave<120 ms), partial IAB (p-wave≥120 ms but normal p-wave morphology in the inferior leads), and advanced IAB (p-wave≥120 ms and biphasic p waves in the inferior leads).

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Statistical Analysis

The consistency of the data for normal distribution was tested using the Shapiro–Wilk test. The Mann–Whitney U test was used to compare two groups of variables without normal distribution and Kruskal–Wallis for more than two groups of variables without normal distribution. Spearman rank correlation analysis was used to evaluate the association between numerical variables without normal distribution, and the chi-square test was used to evaluate the association between categorical variables. Numerical variables were represented as mean ± standard deviation and categorical variables as absolute number and percentages. Statistical analyses were performed using the Statistical Package for Social Sciences for Windows version 22.0 (SPSS IBM Corp.; Armonk, NY, USA). A two-sided p value of <0.05 was considered statistically significant.

RESULTS

In total, 106 male (74.6%) and 36 female (25.3%) patients with heart failure and sinus rhythm were included. The mean age of the patients was 64.74±14.28 years. The baseline characteristics of the patients are summarized in Table 1. The etiology of heart failure was ischemic in 100 patients (75.2%) and non-ischemic in 33 patients (24.8%). Based on the pwave analysis in ECG, 79 patients had normal interatrial conduction (59%), 37 had partial IAB (27.6%), and 18 had advanced IAB (13.4%). The total frequency of any degree of IAB was 41%. A sample ECG from one of the patients with advanced IAB is demonstrated in Figure 1. Also, Figure 2 is a magnified view of Figure 1, which clearly demonstrates biphasic P waves. The presence and degree of IAB were not associated with EF or left atrial diameter. However, there was a strong correlation between age and IAB. Compared to the patients with normal interatrial conduction, partial and advanced IAB were more frequent among older patients. The mean age of the patients with normal, partial, and advanced IAB was 61.22±14.26, 68.11±11.72, and 70.22±12.51 years, respectively (p=0.004). The results of the

Table 1. Baseline characteristics of the study population

Mean age (years)	64.74±14.28
Gender	Female: 24.8%
	Male: 75.2%
Mean EF (%)	34.89%
Mean p –wave duration (ms)	115.12
Frequency of IAB	Normal interatrial conduction: 59%
	Partial IAB: 27.6%
	Advanced IAB: 13.4%
	Total frequency of any degree of IAB: 41%
Etiology of heart failure	Ischemic: 75.2%
	Nonischemic: 24.8%

EF: ejection fraction; IAB: interatrial block

Figure 1. Standard 12-lead ECG showing sinus rhythm and advanced interatrial block

ECG: electrocardiography

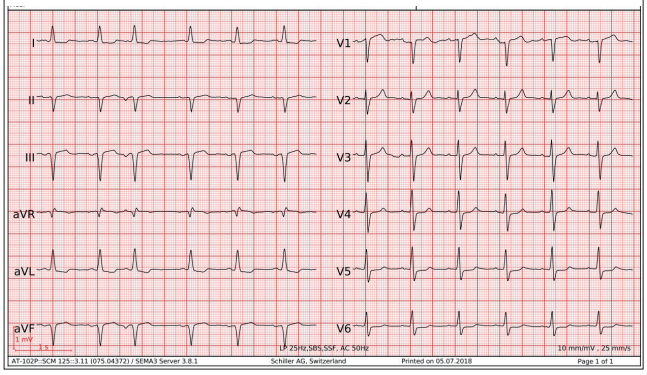

Figure 2. Zoomed view of Figure 1 shows prolonged and biphasic p waves in derivations II (top) and III (bottom)

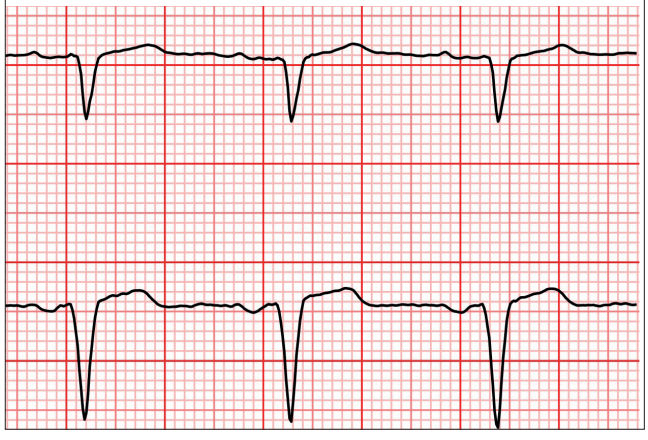

Table 2. Results of the correlation analysis

Variables	IAB Absent	Partial IAB (n=37)	Advanced IAB (n=18)	p
EF (%)	35.99±8.48	33.54±8.65	31.78±11.17	0.194
Age (years)	61.22±14.26	68.11±11.72	70.22±12.51	0.004
LA diameter (mm)	39.56±5.2	41.54±5.93	41±5.73	0.224
LVEDD (mm)	55.34±6.94	58.35±8.37	59.12±9.14	0.135
p–wave duration (ms)	103.87±12.46	130.35±9.77	133±13.14	0.001

EF: ejection fraction; LA: left atrium; LVEDD: left ventricle end–diastolic diameter; IAB: interatrial block

correlation analysis are summarized in Table 2. The etiology of heart failure (ischemic or nonischemic) was not associated with the presence and degree of IAB. Also, gender was not associated with interatrial conduction. The duration of atrial depolarization (electrocardiographic p-wave duration) was not associated with the severity of heart failure (EF) but showed a strong positive correlation with p-wave duration and age (p=0.002). Also, there was a positive correlation between left atrial diameter and p-wave duration (p=0.048). The p-wave duration was not correlated with the etiology of heart failure and gender.

DISCUSSION

Results of this study reveal a significant positive correlation between the presence and degree of IAB and age. Also, a positive correlation between the electrocardiographic p-wave duration and age and left atrial diameter was observed.

Heart failure is a complex clinical syndrome that affects all the systems of the body. In addition to the effects on the other organ systems, reduced systolic function results in a multitude of structural and functional changes to the heart. Increased left ventricular enddiastolic pressure results in increased left atrial pressure, leading to left atrial dilatation. Left atrial dilatation results in derangements in impulse conduction within the atria, there by increasing the p-wave duration seen in the ECG, and atrial fibrillation will develop in advanced cases. Escobar-Robledo et al. (4) demonstrated that in patients with heart failure, advanced IAB was associated with an increased risk of stroke. O'Neal et al. (5) revealed that the incidence rate of ischemic stroke was two-fold higher among patients with advanced IAB compared to those without advanced IAB. Cotter et al. (6) evaluated the incidence of atrial fibrillation among patients who received loop recorder implantation for evaluating unexplained stroke. The authors showed that the frequency of atrial fibrillation was 25.5%, and IAB was significantly more prevalent among patients with atrial fibrillation compared to those without atrial fibrillation. In another study, Cotter et al. (7) evaluated younger patients (<55 years of age) with cryptogenic stroke. They found that young patients with unexplained stroke had longer Pwave durations and a greater prevalence of IAB.

Abdellah and El-Nagary (8) evaluated the prevalence of IAB and its clinical correlations in patients with systolic heart failure (EF <50%) similar to this study. The prevalence of IAB was 57.3% in their study, which was close to the current findings. The authors also noted that patients with IAB had increased rate of hospitalizations and mortality.

The association of IAB with the development of atrial fibrillation after ablation for the atrial flutter was evaluated by Enriquez et al. (9). Patients were followed up after ablation for atrial flutter, and it was found that those with advanced IAB after the ablation had the highest risk of developing atrial fibrillation in the follow-up period.

The most robust association was between age and the presence and degree of IAB. Our results showed that as the population of heart failure ages, the frequency and degree of IAB also increase (p=0.004). Boccanelli et al. (10) evaluated the frequency and predictive value of IAB for atrial fibrillation among elderly patients. They found that the frequency of IAB was 25.5% among the elderly patients (aged 65–84 years). Also, the crude rate of atrial fibrillation incidence was significantly higher among patients with IAB compared to those without IAB (13.1 per 1000 person-years vs. 8.5 per 1000 person-years, p=0.0394). Bernal et al. (11) evaluated elderly patients (≥75 years of age) with acute myocardial infarction. Baseline ECG was evaluated, and after 1 year of follow-up, mortality and the incidence of atrial fibrillation were higher among patients with advanced IAB. Furthermore, the prevalence of frailty was higher among patients with advanced IAB.

As the most important predictor of survival among patients with heart failure, left ventricular EF (LVEF) did not correlate with the presence and degree of IAB. Escobar-Robledo et al. (4) also did not find any interaction between IAB and LVEF among patients with heart failure. These findings suggest that interatrial conduction is not associated with the degree of systolic dysfunction.

CONCLUSION

There is a high prevalence of IAB among patients with heart failure. Also, IAB was strongly associated with aging.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of Gaziantep University School of Medicine (no: 348).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Conflict of Interest: The author has no conflicts of interest to declare.

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REFERENCES

1. Ponikowski P, Voors AA, Anker SD, Bueno H, Cleland JGF, Coats AJS, et al. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: The task force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) developed with the special contribution of the Heart Failure Association (HFA) of the ESC. Eur Heart J 2016; 37: 2129-200. [CrossRef]
2. Maggioni AP, Dahlström U, Flippatos G, Chioncel O, Leiro MC, Drozdz J, et al. EURObservational Research Programme: regional differences and 1-year follow-up results of the Heart Failure Pilot Survey (ESC-HF Pilot). Eur J Heart Fail 2013; 15: 808-17. [CrossRef]
3. Bayes de Luna A, Fort de Ribot R, Trilla E, Julia J, Garcia J, Sadurni J, et al. Electrocardiographic and vectorcardiographic study of interatrial conduction disturbances with left atrial retrograde activation. J Electrocardiol 1985; 18: 1-13. [CrossRef]
4. Escobar-Robledo LA, Bayes-de-Luna A, Lupon J, Baranchuk A, Moliner P, Martinez-Selles M, et al. Advanced interatrial block predicts new-onset atrial fibrillation and ischemic stroke in patients with heart failure: The "Bayes' Syndrome-HF" study. Int J Cardiol 2018; 271: 174-80. [CrossRef]
5. O'Neal WT, Kamel H, Zhang ZM, Chen LY, Alonso A, Soliman EZ. Advanced interatrial block and ischemic stroke: the atherosclerosis risk in communities study. Neurology 2016 ;87: 352-6. [CrossRef]

6. Cotter PE, Martin PJ, Ring L, Warburton EA, Belham M, Pugh PJ. Incidence of atrial fibrillation detected by implantable loop recorders in unexplained stroke. Neurology 2013; 80: 1546-50. [CrossRef]
7. Cotter PE, Martin PJ, Pugh PJ, Warburton EA, Cheriyan J, Belham M. Increased incidence of interatrial block in younger adults with cryptogenic stroke and patent foramen ovale. Cerebrovasc Dis Extra 2011; 1: 36-43. [CrossRef]
8. Abdellah AT, El-Nagary M. Prevalence of P wave dispersion and interatrial block in patients with systolic heart failure and their relationship with functional status, hospitalization and one year mortality. Egypt Heart J 2018; 70: 181-7. [CrossRef]
9. Enriquez A, Sarrias A, Villuendas R, Ali FS, Conde D, Hopman WM, et al. New-onset atrial fibrillation after cavotricuspidisthmus ablation: identification of advanced interatrial block is key. Europace 2015; 17: 1289-93. [CrossRef]
10. Boccanelli A, Mureddu GF, Cesaroni G, Prati F, Rangoni F, Agabiti N, et al. Predictive value of interatrial block for atrial fibrillation in elderly subjects enrolled in the PREDICTOR study. J Electrocardiol 2019; 54: 22-7. [CrossRef]
11. Bernal E, Bayes-Genis A, Ariza-Sole A, Formiga F, Vidan MT, Escobar-Robledo LA, et al. Interatrial block, frailty and prognosis in elderly patients with myocardial infarction. J Electrocardiol 2018; 51: 1-7. [CrossRef]