

Atrial Fibrillation: An Adverse Prognostic Indicator for Individuals with Dilated Cardiomyopathy

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ABSTRACT

Dilated cardiomyopathy (DCM) is a myocardial condition characterized by the enlargement of the left ventricle (LV) and impaired systolic function. The primary causes are ischemic heart disease and severe valvulopathies, leading to LV enlargement due to pressure or volume overload. However, in nearly half of DCM cases, the exact cause remains unknown. Despite advances in medical treatment and heart-assisting devices, DCM results in progressive and irreversible heart failure. Atrial fibrillation (AF) is a common arrhythmia in DCM patients, arising from structural changes in the left atrial myocytes.

This study aims to investigate how the combination of dilated cardiomyopathy and atrial fibrillation impacts the severity of heart failure. We observed 139 patients admitted for heart failure, tracking their progress for a year. At the beginning, 46.04% (64 patients) had permanent atrial fibrillation, while 53.96% (75 patients) were in normal sinus rhythm. Among these patients, 70.5% (98) were men, with DCM being more prevalent in men than women. Patients with AF were older, required extended hospital stays, had a lower Left Ventricle Ejection Fraction (LVEF), higher New York Heart Association (NYHA) class, and more frequent right ventricle dysfunction (RV) associations.

Keywords: Atrial Fibrillation; Adverse Prognostic Indicator; Dilated Cardiomyopathy; Heart Failure; Left Ventricle Enlargement; Systolic Dysfunction; Arrhythmia; Cardiovascular Complications; Disease Progression.

INTRODUCTION

Dilated cardiomyopathy (DCM) stands as a prevalent cause of heart failure in adults, often necessitating heart transplants in both adults and children [1]. The condition is broadly categorized into two types: primary, linked to various genetic mutations in myocardial cells, and secondary, resulting from systemic diseases, cardiotoxic medications, or heart-related issues like ischemic heart diseases [2]. Notably, 60% of DCM cases stem from ischemic heart disease in its different forms [3]. Secondary DCMs arise due to cardiac muscle remodeling caused by factors such as hypoxia or pressure overload, leading to impaired systolic function and enlarged left ventricles [4].

The intricate relationship between septic shock and left ventricle impairment remains a topic of ongoing research [5]. Left ventricle remodeling damages the ultrastructure of left atrial myocytes, progressively enlarging the left atrium. This enlargement creates multiple re-entry circuits, eventually leading to atrial fibrillation [6]. Given DCM's impact on patients' quality of life and its association with chronic heart failure, several negative predictive factors for mortality have been identified, including older age, pulmonary arterial hypertension, advanced NYHA classes, prolonged QT interval, unsustainable ventricular tachycardia, and the onset of atrial fibrillation [7].

Atrial fibrillation, the most common arrhythmia, becomes more prevalent with age. Permanent atrial fibrillation significantly raises mortality risk, mainly due to cardio-embolic complications [8]. Chronic heart failure poses a significant public health challenge, with a challenging prognosis despite advancements in treatments. Permanent atrial fibrillation exacerbates heart failure symptoms due to inefficient ventricular filling, leading to rest dyspnea and pulmonary edema. Studies have indicated reduced myocardial perfusion reserve and increased coronary resistance in nonischemic DCM patients with permanent atrial fibrillation [9]. Beta-blockers have shown efficacy in atrial fibrillation prevention in heart failure patients [10]. A meta-analysis examining Angiotensin Converting Enzyme Inhibitors (ACEI) and Angiotensin Receptor Blockers (ARB) suggested a reduced atrial fibrillation prevalence, especially in patients with systolic left ventricular dysfunction or LV hypertrophy [11].

This study aimed to evaluate the hemodynamic impact of atrial fibrillation in DCM patients and assess its influence on symptoms. The objective was to establish a negative correlation between DCM and AF, identifying atrial fibrillation as a significant risk factor for DCM patients.

MATERIALS AND METHODS

The study included 139 DCM patients at various heart failure stages, categorized based on the presence or absence of AF. 64 patients (46.04%) had permanent atrial fibrillation. Atrial fibrillation diagnosis was made through 12-lead electrocardiogram. Patient symptoms were quantified using the New York Heart Association (NYHA) classification. Patients with other arrhythmias were excluded. All patients received standard heart failure treatment (beta-blockers, ACEI or ARB, diuretics). The study observed a decline in left ventricular ejection fraction and increased NYHA functional class due to atrial fibrillation in DCM patients.

STATISTICAL ANALYSIS

Numerical values were expressed as mean \pm standard deviation. Various statistical tests including Chi-square, Fisher, Student, Mann-Whitney, and ANOVA were used. Univariate and multiple logistic regression analyses were performed using STATISTICA 8.0. Results were considered significant if $p < 0.05$.

RESULTS

The study revealed that permanent atrial fibrillation patients had larger left atria and right ventricles, and they displayed more severe symptoms, particularly dyspnea at rest (NYHA class IV). Significant differences in NYHA class distribution were observed between groups ($p=0.02$) (Figure 1).

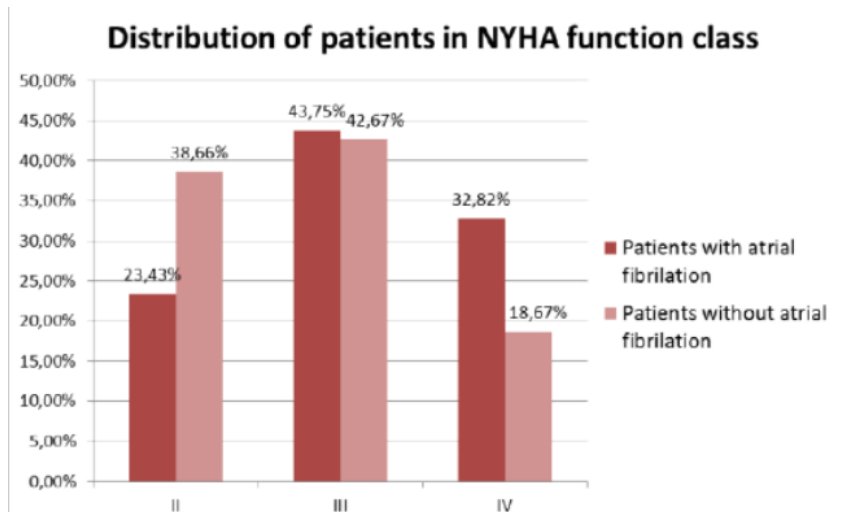


Figure 1. Distribution of patients in NYHA function class.

The left ventricular ejection fraction was assessed using echocardiography in M mode and 2D mode, employing the Teicholtz and Simpson methods respectively. Notably, there was a significant rise in patients displaying severe left ventricle dysfunction among those with permanent atrial fibrillation (21.88%). Conversely, patients not afflicted with this rhythm disorder saw an increase in mild left ventricular dysfunction (37.34%) ($p=0.04$) (Figure 2). Additionally, patients with atrial fibrillation linked to dilated cardiomyopathy experienced prolonged hospital stays due to acute decompensation and were more prone to moderate/severe pulmonary hypertension.

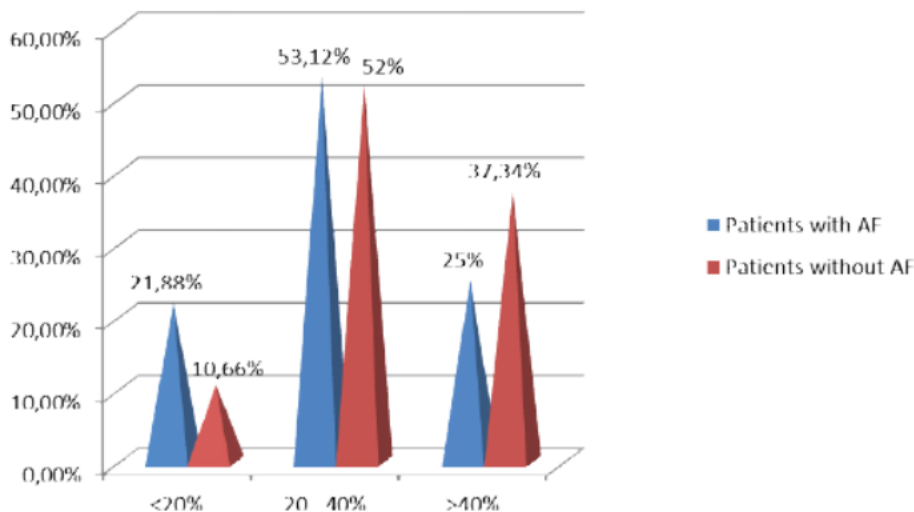


Figure 2. Distribution of patients considering left ventricular ejection fraction.

Various adverse prognostic indicators for dilated cardiomyopathy were identified: advanced age, NYHA class III or IV, pulmonary stasis, pulmonary hypertension, elevated uric acid and NT-proBNP levels, substantial left ventricle dilation, and a low ejection fraction. These factors were more prevalent in patients with atrial fibrillation.

DISCUSSION

Idiopathic dilated cardiomyopathy, a rare myocardial condition, is primarily diagnosed between ages 20 and

50. Secondary DCM emerges in older patients due to the prolonged evolution of other heart conditions. While idiopathic DCM manifests as heart failure, secondary etiology patients experience symptoms of underlying heart disease, culminating in heart failure.

Atrial fibrillation, the most common sustained arrhythmia, is expected to rise due to increased heart disease survival and advanced medical therapies. Studies suggest atrial fibrillation's prevalence doubles with each decade after age 70. This condition, linked to thromboembolic complications, poses significant economic and social burdens, emphasizing the need for preventive strategies.

New-onset atrial fibrillation during heart failure exacerbation heightens risks, especially for stroke. Risk factors include old age, male gender, high BMI, hypertension, and prior cardiovascular diseases.

In dilated cardiomyopathy, autonomic nervous system dysfunction and impaired myocardial response exacerbate complications. In our patient group, almost half (46.04%) had permanent atrial fibrillation, consistent with prior studies. Lower LVEF and lack of beta-blocker treatment correlated with higher atrial fibrillation incidence.

Atrial fibrillation in dilated hearts is linked to low 5-year survival rates. Patients with atrial fibrillation experienced worse heart failure stages, more hospitalizations, and longer stays. The CHARM trial emphasized atrial fibrillation's impact on morbidity and mortality, regardless of ejection fraction.

CONCLUSION

In our study, 46.04% of patients had atrial fibrillation despite standard heart failure treatment. Permanent atrial fibrillation exacerbated systolic left ventricle dysfunction and worsened NYHA class. Converting to sinus rhythm improved heart failure symptoms, underscoring its importance. Atrial fibrillation stands as a critical prognostic factor in dilated cardiomyopathy.

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