

## INTERDEPENDENCE BETWEEN ATRIAL FIBRILLATION AND HEART FAILURE

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### **Abstract**

*Introduction: Atrial fibrillation (AF) and heart failure (HF) are among the most common medical conditions. AF is the most frequent arrhythmia worldwide and its evolution is becoming epidemic. Aim: These two conditions share similar risk factors, often coexist and have additive adverse effects when they occur in combination. Material and method: A total of 478 patients admitted consecutively in our clinic were evaluated during hospitalization and after discharge. The patients included have heart failure and atrial fibrillation. Results: Although the causality relationship between the 2 conditions has not been fully determined, their coexistence can be explained to some degree by the presence of common risk factors. AF and HF often co-exist. The presence of one increases the likelihood of the other and are associated with significant morbidity. Conclusion: The simultaneous presence of the two pathologies will have a dramatic impact on health services, requiring reassessment of prevention and clinical guides.*

**Key words:** arrhythmia, atrial fibrillation, heart failure, risk factors.

### **INTRODUCTION**

Atrial fibrillation (AF) is the most common heart rhythm disorder encountered in current medical practice worldwide. In the United States, it affects more than 2.7-6.1 million subjects and do to the increase in life expectancy, these numbers are growing on all continents of the globe. [January CT et al., 2014;] It is estimate that the prevalence of atrial fibrillation in developed countries is about 1.5-2% in the general population. [Agency for Healthcare Research and Quality. Weighted national estimates. HCUP National Inpatient Sample, 2012]

Currently, the average age for patients is between 75 and 85 years old.

About one-third of paroxysmal AF episodes are completely asymptomatic which means that the real figures are much higher than they were estimated. [A. John Camm et al., 2013]

The Framingham study demonstrated that between the age of 40 and 90 approximately one in four patients will develop AF and that over 70% of patients are over 65 years of age. The incidence of AF is slightly higher in males. [Zoni-Berisso M et al., 2014]

Until recently considered a benign arrhythmia, AF is accompanied by some devastating symptoms and complications (impaired quality of life, thromboembolic stroke, congestive heart failure) which contributes substantially to cardiac morbidity and mortality. [Bordignon S, C. Corti M, C Bilato, 2012]. Heart failure (HF) is commonly found in cardiovascular pathology, either in acute or chronic form, representing the end stage of most cardiovascular diseases. It is a clinical syndrome characterized by the inability of the heart to provide a cardiac flow corresponding to the oxygen requirement at the tissue level under conditions of normal venous pressure. [Yancy C.W et al., 2017]

HF is a global public health problem affecting an estimated 26 million worldwide. [Andrew P. Ambrosy, et al., 2014] Heart failure has a prevalence of approximately 2% in the general population, reaching more than 10% in the cardiac patients over 65 years. [Cowie MR, et al., 2014]

More than 2% of all hospitalizations are due to decompensated HF. Rehospitalization at 6 months after discharge can reach up to 50% in HF patients. [Roger V.L., 2013] Survival after 5 years of diagnosis is 25% in men and 38% in women, and the risk of death is 5-10% per year. [Bui A.L., TB. Horwich, GC. Fonarow, 2017]

HF and AF are frequently associated and interdependence leads to a reciprocal potentiation of detrimental effects. The Framingham study demonstrated that once HF is installed, the annual risk of developing AF increases 5 times directly proportional to the NYHA class of HF and with the associated pathology that may play an important role. [Kalon K.L, et al, 1993] HF can increase the risk for the development of AF in several ways, including elevation of cardiac filling pressures, dysregulation of intracellular calcium, and autonomic and neuroendocrine dysfunction. [Howard J.E et al., 2014]

## **AIM**

AF and chronic HF are among the most common medical conditions and are associated with significant morbidity and mortality. These two conditions share similar risk factors, often coexist and have additive adverse effects when they occur in combination.

## **MATERIAL AND METHODS**

We conducted a retrospective study among adult patients, who had a clinical diagnosis of HF and AF. A total of 517 patients admitted consecutively in our clinic between July 2016 and March 2017 were evaluated during hospitalization and after discharge periodically. The follow-up period of 6 months performed, included surveillance.

Data were obtained from the patient's medical charts using a standardized data abstraction form with demographic information as well as clinical, laboratory assessments and comorbidities. Laboratory findings in conjunction with physician notes as well as medication from the patient's medical charts, were used to determine whether or not they had a specific comorbidity. Patients who met the inclusion criteria but died during the specified observation range were also included in the study. In addition, we defined comorbidity as the presence of one or more diseases, associated with HF or AF condition.

All analyses were conducted using STATA statistical analysis software, version 11.0. Continuous variables were analyzed for normalization and compared using the *t* Student test; they were expressed by mean value  $\pm$  standard and median deviation. For comparison of parameter averages in the two groups, the Mann-Whitney U method and the Wilcoxon method W are used. The degree of correlation (*r*) between the studied parameters was evaluated by calculating the correlation coefficient Pearson (*p* <0.05 was considered significant).

## RESULTS AND DISCUSSION

From the 478 patients included in our study, the age group most affected by the association of these two diseases was over 65 years old (62.97%). Men were more prone to complex cardiac damage, but without differentiation according to their place of origin, according to data from Table 1.

The multi-organ damage in HF and AF highlights the number of comorbidities (a significant group of patients had 3 or more comorbidities) in study group patients. During hospitalization and follow-up period, 108 patients died and 6.48% were lost to follow-up. The average length of hospitalization of these patients was 6.4 days, somewhat higher than in other published studies, where the average length hospitalization was 5 days. The rate of rehospitalisation at 6 months was 68.20%, slightly higher than in other countries.

Atrial fibrillation generates an increased cost to society and a burden on the public health system due to frequencies of extremely severe complications such as thromboembolism, stroke, and congestive global heart failure that leads to severe deterioration in quality of life.

There are a lot of studies that prove the evidence of the relationship between AF and HF. The HF with diastolic dysfunction of the left ventricle, which is more common today in practice, generates AF but with a risk from 12% to 21%, at 4 years, depending on the degree of dysfunction. [Wang TJ et al., 2003]

Table 1

Clinical parameters of patients included in our study (these are expressed in percent)

Association of HF and AF (total of 478 patients)			
Studied parameter		Patient proportion	p
Age	18 – 40 yo	3.97%	0.002
	41 – 50 yo	15.89%	0.002
	51 – 64 yo	17.15%	0.002
	>65 yo	62.97%	0.002
Urban		45.18%	0.31
Rural		54.81%	0.31
Man		61.92%	0.08
Female		38.07%	0.08
Functional AF type	paroxysmal	34.51%	0.03
	persistent	28.03%	<0.001
	permanent	37.44%	<0.001
Number of comorbidities	1	11.71%	0.005
	2	15.27%	0.03
	>3	73.01%	0.04
Deceased patients		22.59%	<0.001
Rehospitalisation rate at 6 months		68%	0.07
Lost to follow - up		6.48%	0.003

Atrial fibrillation is characterized by a chaotic atrial electrical activity, with the loss of mechanical atrial activity resulting in altered left ventricular systolic performance, atrial stasis with major embolic risk, the exhaustion of myocardial energy reserves with the increase of HF phenomena.

Recent clinical studies have demonstrated that AF is an independent predictor, extremely sensitive to the mortality of HF patients. However, there are studies that have attempted to suggest that in the presence of correct HF treatment, AF is no longer an independent predictor of mortality, but their study methodology is questionable and leaves room for subjective interpretations. [Priori SG et al., 2016]

AF can also be interpreted as an HF worsening factor or as a marker of unfavorable development of a pre-existing serious condition. [Kotecha D., 2015] It is extremely important for the time frame in which the AF occurs and the one in which HF develops, interdependence and succession in this morbid association. Because AF and HF often co-exist, the presence of one increases the likelihood of the other; thus identification of high risk patients is essential in cardiovascular management. [Cha YM et al., 2004]

Although the causative relationship between the 2 conditions has not been fully determined, their coexistence can be explained to some degree by the presence of common risk factors such as age, hypertension, diabetes, obesity, metabolic disturbance, cardiomyopathy, congenital heart malformations, as well as valvular, ischemic, and nonischemic structural heart disease, chronic lung disease, endocrine disease, but also lifestyle factors (alcohol, narcotics, smoking). [Narayan T.KM, SM Piccini, 2014]

These factors are associated with myocardial cellular and extracellular alterations, electrophysiological and neuro-hormonal changes that mixed

together to create an environment that predisposes the heart to both HF and AF. [Kareti KR et al., 2005]

The major goals of AF treatment in HF are prevention of thromboembolic complications, cardiac frequency control, conversion to sinus rhythm and its maintenance, if possible, improvement of symptomatology, and the quality of life score.

The pathophysiological mechanisms of AF in HF patients are complex and involve reentry, trigger activity, and cardiac automatism. Therefore, it is unlikely that a treatment strategy targeting any of these mechanisms alone will restore the sinus rhythm. [Kotecha D, J.P. Piccini; 2015] A strategy of controlling the rhythm with antiarrhythmic drugs and electrical conversion in patients with AF and HF does not add any benefit to a rate control strategy. New therapies aimed at restoring sinus rhythm, such as catheter ablation for AF, and ventricular rate control therapies (such as atrioventricular node ablation with biventricular stimulation).

All of these have emerged as alternatives to conventional rhythm and rate control strategies. Future studies will be needed to delineate the role of such techniques in the multitude of patients with these morbid conditions. [Lubitz SA, EJ Benjamin, PT Ellinor, 2010]

## **CONCLUSIONS**

Nowadays and in the nearest future, AF and HF represent two of the growing pathologies that will be the most important point in cardiovascular disease management as well as in public health services.

The simultaneous presence of the two pathologies will have a dramatic impact on patients' well-being requiring reassessment of prevention and clinical protocols.

HF is the only growing disease in developed countries due to population aging and prolonging the life of cardiac patients. AF was associated with an increase in HF mortality.

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