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CLINICAL AND IMAGING FACTORS PREDICTING THE SEVERITY OF ATRIAL FIBRILLATION IN THE CARDIAC INTENSIVE CARE UNIT AND THE RISK OF RECURRENCE AFTER RADIOFREQUENCY ABLATION

PhD Thesis

Summary

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Introduction. Atrial fibrillation (AF) is the most common chronic supraventricular tachyarrhythmia, which due to thromboembolic complications and associated heart failure presents high mortality and morbidity rates. During the last decade, due to the increase of life expectancy rate and predisposing factors to atrial fibrillation, as well as the modernization of diagnostic techniques, AF shows an increasing prevalence in the adult population. In 2010 the estimated number of people with atrial fibrillation was 33.5 million worldwide, developed countries having higher incidence and prevalence rates. In most cases, AF is caused by the myocardial tissue located in the pulmonary veins. So far, the pathophysiology of AF is not entirely understood. Several studies suggest that profibrotic and inflammatory processes play a crucial role in the development of AF. Up to now the success rate of ablation is not satisfactory, which is 70% in case of paroxysmal atrial fibrillation and 50% in subjects with persistent atrial fibrillation. Consequently, there is a sustained clinical interest in identifying predictive factors to enhance the success of radiofrequency ablation, and therefore it is necessary to create individualized therapeutic management for each patient.

Aim. This doctoral study aimed at evaluating and investigating the association between left ventricular remodeling, atrial fibrillation, and the severity of ventricular tachycardia in patients with ventricular rhythm disorders admitted to a level three acute cardiac care unit, as well as investigating the correlation between the level of atrial remodeling assisted by computerized tomography and the risk of recurrence of atrial fibrillation subsequent to radiofrequency ablation. During the study, the relationship among structural remodeling, epicardial adipose tissue volume, and associated comorbidities were also investigated in patients diagnosed with atrial fibrillation, who underwent the procedure of ablation, as well as the impact of these characteristics on long-term outcomes to establish and validate markers predicting atrial fibrillation recurrence.

Material and method. This research is based on two distinct studies. A total number of 174 patients with ventricular tachycardia and atrial fibrillation were investigated by taking into consideration the following: demographic data, clinical characteristics, cardiovascular risk factors, medical history, associated comorbidities, laboratory analyzes (biochemical tests, hemogram, ionogram), imaging characteristics (echocardiographic evaluation of the left ventricle function and diameter, coronary angiography for the evaluation of coronary arteries), therapeutic management (interventional and pharmacological treatment), and electrocardiographic characteristics (type of ventricular tachycardia, other ventricular rhythm disorders, supraventricular arrhythmia, interventricular and atrioventricular conduction abnormalities). **Study I** comprised the investigation of 150 patients suffering from ventricular tachycardia of various types. The association between left ventricular remodeling and atrial fibrillation in patients with ventricular rhythm disorders admitted to a tertiary acute heart care unit was studied to establish the predictive factors of the severity of ventricular tachycardia. **Study II** included 24 patients with atrial fibrillation who underwent radiofrequency catheter ablation. The main objective of this research was to investigate the correlation between left and right atrial remodeling, epicardial adipose tissue volume, and comorbidities associated with AF patients who had undergone radiofrequency catheter ablation and the impact on long-term outcomes to validate the predictive factors of atrial fibrillation recurrence.

Results. The vast majority of subjects (89.33%) comprised in **Study I** presented ischemic coronary artery disease on invasive coronary angiography, and a significant number of these patients were hospitalized with various forms of acute coronary syndrome. The investigation of the main study group revealed no differences between patients with or without dilated cardiomyopathy (DCM) in relation to demographic characteristics or cardiovascular risk factors. As expected, patients with DCM presented significantly lower left ventricular ejection fraction (%), higher NYHA class, and higher rates of renal function impairment, but compared to non-DCM patients they were less susceptible to present myocardial infarction (MI), despite the absence of any significant difference pertaining to the presence of coronary artery disease. Regarding the type of ventricular arrhythmia ($p = 0.7$) there were no significant differences identified between the DCM and non-DCM group; however, DCM patients presented higher rates of atrial fibrillation ($p = 0.01$) and left bundle branch block ($p = 0.0007$), whereas both of which could have occurred either as a cause or as a consequence of dilated cardiomyopathy. Patients who suffered from supraventricular arrhythmia were older, with a more severely altered clinical status and reduced ejection fraction.

Study II shows that one year after radiofrequency ablation one third (n=8, 33.33%) of the evaluated patients presented recurrent AF, while n=16 (66.66%) kept the sinus rhythm. Study II demonstrated that heart failure, the dimensions of the left atrium, right atrial volume index (RAVI) and left atrial volume index (LAVI), and the epicardial adipose tissue volume are essential predictive markers for a successful ablation in case of atrial fibrillation.

Conclusions. The clinical research performed during this doctoral study, identified and proved that the left atrium diameter, the presence of ventricular dysfunction, the atrial volume indexes and the epicardial fat volume are significant predictors of the recurrence risk one year after radiofrequency ablation of the pulmonary veins. In this investigation subjects diagnosed with heart failure presented a higher degree of predisposition to recurrent atrial fibrillation, compared with patients who did not have this medical condition, while neither of the following comorbidities: diabetes, dyslipidemia, and obesity had predictive value for maintaining the sinus rhythm. The present paper shows that pre-ablation LAVI and RAVI, respectively, reduced epicardial adipose tissue volume represent important predictive factors for the success of the intervention and for maintaining the sinus rhythm one-year post-ablation. Furthermore, this doctoral study proves and emphasizes that the presence of ventricular remodeling is associated with a higher incidence of atrial fibrillation in patients admitted to a cardiac intensive care unit with the diagnoses of ventricular tachycardia.