Summary

Pathological left ventricular hypertrophy is, regardless of its cause, associated with increased cardiovascular morbidity and mortality. The arrhythmogenic potential is most likely based on several factors, including significant electrophysiological alterations, anatomic alterations (fibrosis) and increased propensity for ischemic events. There is no single responsible arrhythmogenic mechanism. Hence, anti-arrhythmic therapy will be hard to manage successfully. The identification of patients at risk is of critical importance to direct specific therapy, which may include implantation of automatic defibrillators, to those individuals who really need it.

Introduction

Left ventricular hypertrophy is a frequently encountered cardiac abnormality. It is usually associated with hypertensive heart disease, but may also result from congenital malformation(s) or valve disease. In these conditions it can be regarded as an adaptive process by which the heart accommodates to volume overload or increased afterload. In addition, genetic defects in sarcomere function result in ventricular hypertrophy. There is little doubt that cardiac hypertrophy imposes an increased risk for cardiac morbidity and mortality due to an enhanced incidence of (supra-)ventricular arrhythmias, sudden cardiac death, heart failure and myocardial ischemia. This chapter reviews the existing knowledge of arrhythmogeneity of pathological hypertrophy be it either in the setting of hypertensive heart disease or caused by aberrancies in genes encoding sarcomeric proteins.

Clinical data

There is ample clinical evidence that hypertensive left ventricular hypertrophy is associated with an increased incidence of ventricular arrhythmias. The incidence of complex ventricular arrhythmias, generally defined as ventricular couplets and ventricular tachycardia (= 3 complexes at a rate of 120 beats per minute), has been compared between patients with and without electrocardiographic evidence of hypertensive left ventricular hypertrophy.\(^1\,^2\) In the second and largest study by McLenachan et al.\(^2\), 48-hour ambulatory electrocardiographic monitoring in 100 treated hypertensive patients revealed a 28% incidence of ventricular tachycardias in 50 patients with left ventricular hypertrophy compared to 8% in the other 50 without left ventricular hypertrophy (p < 0.05; both groups on comparable treatment and matched for blood pressure level). The presence of ventricular tachycardias or ventricular couplets also differed significantly from 50 age and sex matched controls. Ventricular arrhythmias were more common in patients with hypertrophy accompanied by ST-T-wave changes.\(^2\)

In an attempt to study the prognostic significance of these findings, patients included in the Framingham heart study and Framingham offspring study, with echocardiographic evidence of left ventricular hypertrophy and no clinical evidence of ischemic heart disease had one hour ambulatory ECG monitoring.\(^3\) In a 6-years follow-up period all-cause mortality, cardiac mortality and myocardial infarction was monitored. After adjustment for age and sex, the presence of complex arrhythmias was associated with reduced survival (hazard ratio 1.80, 95% CI: 1.13-2.87, p = 0.013).

In patients with genetically determined hypertrophy data pertinent to prognosis have also been obtained. Hypertrophic cardiomyopathy is a genetically heterogeneous disease with involvement of at least 7 genes, presumably all encoding sarcomeric proteins. Without doubt the presence of sustained ventricular tachycardia or ventricular fibrillation identifies a patient at high risk for sudden cardiac death (for overview see Spirito et al.\(^4\)) The relevance of non-sustained ventricular tachycardias, in particular when they occur infrequently, has heavily been debated over the years. Whereas in the early eighties the presence of single non-sustained ventricular tachycardias warranted amiodarone or other antiarrhythmic drug treatment\(^5\), later studies provided strong evidence that not all of these patients are at high risk.\(^6\) Based on many years of experience of experts in the field, prophylactic antiarrhythmic