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Review Article

Arterial hypertension and chronic heart failure


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ABSTRACT

Arterial hypertension, alone or in combination with ischemic heart disease, precedes the development of heart failure. The Framingham study demonstrated that hypertension was the major risk factor in the development of heart failure. Arterial hypertension is not a sole factor contributing to the development of heart failure. The syndrome of heart failure is a consequence of multiple systemic responses and the development of heart failure is a complex and progressive process associated with cardiovascular disease resulting from risk factors: hypertension, obesity, smoking and dyslipidaemia. Arterial hypertension is the main precursor of left ventricular hypertrophy. Initially, this process causes diastolic dysfunction in the early stages of primary hypertension. Systolic dysfunction is rarely observed in those subjects. Left ventricular hypertrophy is also an important risk factor for myocardial infarction and ventricular arrhythmias. Asymptomatic systolic and diastolic left ventricular dysfunction may both progress to overt HF

The primary prevention of heart failure patients should be based upon strategies providing tight and sustained blood pressure control. This therapy should include an agent that inhibits the renin–angiotensin–aldosterone system. Treatment of arterial hypertension in patients with HF must take into account the prevalent type of cardiac dysfunction—diastolic or systolic.

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1. Introduction

Arterial hypertension is a risk factor for the development of chronic heart failure (CHF) and leads to the development of left ventricular hypertrophy. Arterial hypertension is a risk factor for the development of coronary heart disease (CHD). The relative risk of CHF among patients with arterial hypertension, compared to general population, was estimated to be 1.4 in an analysis from the First National Health and Nutrition Examination Survey [1]. In addition, patients with CHF may present with hypertension. In the general population, prognosis is poorer for hypertensive than for normotensive individuals. In contrast to the pattern seen in the general population, higher blood pressure prior to treatment is a predictor of better survival in patients with CHF.

Arterial hypertension and CHF are both major public health problems in the developed countries. Arterial hypertension is the most important modifiable risk factor for CHF [2]. The incidence, prevalence of and overall mortality from CHF has been increasing in recent decades, while the incidence of and mortality from CHD and stroke have been continuously declining.

Arterial hypertension is a disease of the cardiovascular system that primarily manifests as the chronic presence of a resting arterial pressure greater than 140/90 mm Hg and may be associated with the development of myocardial disease, i.e. cardiomyopathy. CHF is a clinical syndrome that manifests late in the course of cardiomyopathy. Hypertensive heart disease and hypertensive cardiomyopathy as the ultimate cause of heart failure associated with arterial hypertension, is due to the increased workload of the heart. Arterial hypertension seldom exists without other risk factors and comorbid conditions. In addition to gender, those factors include genotype, body size, coronary artery disease, diabetes mellitus, obesity and alcohol intake. Arterial hypertension is an important factor in the production of a pluricausal cardiomyopathy.

2. Epidemiology

The Framingham heart study showed that arterial hypertension, alone or in combination with CHD, preceded the development of CHF in 70% of both men and women [3,4]. Arterial hypertension was the most frequent cause of CHF in the 30 to 62-year age group. CHF occurred six times more frequently among hypertensive than among normotensive subjects. The progression from arterial hypertension alone to hypertension with CHF was reported for participants in the original Framingham Heart Study and the Framingham Offspring Study initiated in 1970. The risk of CHF in hypertensive was twice as high in men and free times as high in women, compared with normotensive subjects, when adjusted for age and risk factors for CHF [5]. The five year survival rate for hypertensive CHF was 24% for men and 31% for women. The risk for CHF in hypertensive subjects depends on hypertension grade, i.e. the blood pressure value. CHF is often preceded by isolated systolic hypertension.

Arterial hypertension has a high prevalence in the group of older patients with CHF, in whom CHF secondary to arterial

hypertension is often associated with preserved left ventricular systolic function [6]. CHF with preserved left ventricular systolic function accounts for up to 50% of all cases of HF in adults older than 65 years. In the Helsinki Ageing Study 72% subjects with CHF had normal systolic function. Diastolic HF was found in 51% of patients and arterial hypertension was the cause of CHF in 54% subjects [7].

Some comorbid conditions contribute to the development of pluricausal cardiomyopathy: CHD, diabetes mellitus and alcohol consumption. In the Framingham study, myocardial infarction, diabetes mellitus, left ventricular hypertrophy and valvular heart disease were predictive for CHF in both sexes with arterial hypertension. Mainly association of diabetes mellitus and arterial hypertension with CHF exceeds that would be expected from either one alone [8,9].

3. The cardiovascular continuum—from arterial hypertension to chronic heart failure

The CHF syndrome is a consequence of several systemic responses. In the early stages of arterial hypertension, the left ventricular structure and function is normal. With time the pathologic effects of one or more risk factors will reset in the development of functional and structural changes with left ventricular hypertrophy (LVH) and myocardial infarction (MI). This results in the development of diastolic and systolic dysfunction which leads to heart failure [10].

Arterial hypertension has been identified as the main precursor of left ventricular hypertrophy. Subjects with mild hypertension have two to three-fold higher risk for developing hypertrophy compared with normotensive subjects. The development of cardiac hypertrophy is associated with degenerative changes in cardiac myocytes and an abnormal accumulation of collagen in the interstitial spaces. These events cause diastolic dysfunction initially. The presence of LVH is also an important risk factor for MI. Several observational studies showed a significant, graded and strong relationship between blood pressure and the incidence of coronary events [11]. The pathological changes following an MI are characterized by left ventricular remodeling which is enhanced in the presence of arterial hypertension.

Asymptomatic systolic and diastolic cardiac dysfunction may progress to overt heart failure through the compensatory activation of sympathetic nervous system and the renin-angiotensin-aldosterone system (RAAS).

4. Prevention of heart failure in arterial hypertension

It has been suggested that the treatment of arterial hypertension may reduce the relative risk of CHF by approximately 50%. The effect of the treatment of arterial hypertension on the development of CHF was shown in isolated systolic hypertension, the relative risk was reduced by 51% in the STOP study and by 55% in the SHEP trial [12]. A meta-analysis of the efficacy of various antihypertensive therapies, particularly high-doses of diuretics, demonstrated the effect of reducing the risk of CHF by treating arterial hypertension [13].

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