

The Recent Concept of Heart Function in Elderly Patients

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Abstract: An epidemic increase in heart failure (HF) mortality, hospitalization, and prevalence rates has been observed among older persons associated with increased incidence and improved survival in recent years, in spite of a decrease in coronary artery and cerebrovascular disease mortality. Importantly, increases in HF mortality and morbidity rates were confined to the population over 65 years of age in the Framingham study. In contrast to middle-aged patients with HF, factors other than left ventricular (LV) systolic dysfunction contribute to HF in older patients. Epidemiological studies have established that 40 to 80 percent of older patients with heart failure, despite preserved ejection fraction without valve disease, are attributed to LV diastolic dysfunction.

Keyword: geriatrics, elderly person, diastolic heart function, heart failure

Introduction

An epidemic increase in heart failure (HF) mortality, hospitalization, and prevalence rates has been observed among older persons associated with an increased incidence and improved survival in recent years, in spite of a decrease in coronary artery and cerebrovascular disease mortality.¹ Importantly, increases in HF mortality and morbidity rates were confined to the population over 65 years of age in the Framingham study.² In contrast to middle-aged patients with HF, factors other than left ventricular (LV) systolic dysfunction contribute to HF in older patients. Epidemiological studies have established that 40 to 80 percent of older patients with heart failure, despite preserved ejection fraction without valve disease, are attributed to LV diastolic dysfunction. That is defined as diastolic heart failure (DHF).³ Studies examining prevalence of diastolic heart failure in hospitalized patients or in patients undergoing outpatient diagnostic screening and prospective community based studies have shown that in patients greater than 70 years old, the prevalence of diastolic heart failure approaches 50%.⁴⁻⁶ Although HF patients with preserved systolic function have a slightly better prognosis than HF patients with abnormal systolic function, there is a fourfold higher mortality risk compared with subjects free of HF.⁷

The Mechanism of DHF in the Elderly Patients

Heart failure is a clinical syndrome characterized by symptoms and signs of increased tissue water and decreased tissue perfusion. Definition of the mechanisms that cause this clinical syndrome requires measurement of both systolic and diastolic function.

When heart failure is accompanied by a predominant or isolated abnormality in diastolic function, this clinical syndrome is called diastolic heart failure. The pathophysiology is attributed to LV diastolic dysfunction, in which LV diastolic chamber size is normal or reduced despite elevated filling pressures resulting in decreased cardiac output. DHF occurs when the ventricular chamber is unable to accept an adequate volume of blood during diastole, because of a decrease in ventricular relaxation and/or an increase in ventricular stiffness,³ and increased circulating blood volume is present.

Hypertension, ischemia, aging and diabetes mellitus are the major risk factor of a decrease in ventricular relaxation and/or an increase in ventricular stiffness. Endocardial biopsies from HF patients without coronary artery disease (CAD) showed structural and functional differences in cardiomyocytes from patients with diastolic HF compared to cardiomyocytes from patients with abnormal systolic

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ejection fraction.⁸ Myocytes from patients with diastolic HF had increased diameter and higher myofibrillar density and developed greater passive force and had greater calcium sensitivity. Myocardial collagen volume fraction was equally elevated.

Characteristics of Medical Examination in the Older DHF Patients

Potential examinations for unrecognized HF in the older patient include the nonspecificity of complaints of fatigue, ascribing symptoms to aging or co-morbid conditions, reduction in activities to avoid symptoms, and memory impairment leading to poor historical information. In addition, physical examination may not be as definitive as in younger individuals. Peripheral edema can occur because of age-related changes in venous tone, decreased skin turgor, or prolonged sedentary states. Rales and a third heart sound may only be present during episodes of acute decompensation, and differentiation of HF from pneumonia may be difficult in older patients less likely to present with temperature elevations. With diastolic HF, fourth heart sounds may be present but third heart sounds are seldom present. Chest radiography will show pulmonary congestion during acute exacerbations and for some time following an episode. Cardiomegaly will be present in systolic HF but may or may not be present in HF with preserved ejection fraction. Because of the difficulties with diagnosing HF in the older patient by physician examination or by conventional radiography, it is important to use echocardiography^{9,10} and serum marker of HF for the diagnosis of DHF in the older patients.

Aging is a major risk factor of many diseases including heart failure. It is more difficult to treat in older patients with DHF, when they have other diseases, such as atrial fibrillation¹¹ and chronic kidney disease¹² and so on.

The Diagnosis of DHF

The decrease of exercise capacity is the primary symptom in chronic heart failure of systolic and/or diastolic cause. Dyspnea and fatigue are prominent symptoms in patients with HF, but fatigue is also present with many chronic illnesses, such as pulmonary disease, thyroid abnormality, anemia, or depression. Complaints of shortness of breath, orthopnea or development of a nocturnal cough,

or paroxysmal nocturnal dyspnea suggest the presence of HF. Despite the prevalence of HF documented in the older patients, less than half of patients with moderate or severe diastolic or systolic dysfunction as measured by Doppler echocardiography had recognized HF in a recent community-based study.¹³ Measurement of B-type natriuretic peptides (BNP) can improve diagnostic accuracy in patients with dyspnea presenting, and may be helpful in evaluating older patients with dyspnea and nonspecific symptoms.

Levels of BNP increase with age and renal dysfunction, and are higher in women, so interpretation in older patients requires consideration of these factors.¹⁴

The Treatment of DHF

Almost all randomized, double-blind studies of therapy for HF are studies of systolic dysfunction. Guidelines for the management of patients with chronic HF have been published by several organizations. The older HF population differs markedly from patients who have been enrolled in large trials of systolic HF treatment, and limited trial data is available to guide treatment of the older patient with HF and preserved or normal ejection fraction. The treatment of diastolic heart failure can be demonstrated by the following 3 strategies. First, treatment should target symptom reduction by decreasing pulmonary venous pressure at rest and during exertion. Second, treatment should target the pathological disease that caused the diastolic heart failure. For example, coronary artery disease and hypertensive heart disease provide relatively specific therapeutic targets, such as lowering of blood pressure, induction of hypertrophy regression and treatment of ischemia by increasing myocardial blood flow and reducing myocardial oxygen demand. Third, treatment should target the underlying mechanisms that are altered by the disease processes.

Diuretics are advised for therapy of diastolic HF in the ACC/AHA Guidelines for Evaluation and Management of Heart Failure. The use of diuretics may improve breathlessness in patients with diastolic HF, because circulating blood volume is a major determinant of ventricular filling pressure. In spite of a lack of data relating to the use of nitrates, they are effectively used for diastolic HF in the acute phase, because of decreasing central blood volume by vasodilation. Data is also lacking on the

use of human atrial natriuretic peptides, however they are effective for treating diastolic HF in the acute phase, because of decreasing the central blood volume by natriuretic and vasodilating effect.

Digoxin was reported to yield symptomatic improvement and decreased hospitalizations without mortality benefits in the DIG study in patients with DHF.¹⁵

We treat with ACE inhibitors, ARBs and Aldosterone antagonists in the chronic systolic heart failure patients, because the rennin-angiotensin-aldosterone system (RAAS) plays a pivotal role on left ventricular remodeling in HF patients.¹⁶

Recent studies of HF in the elderly with preserved LV function suggest that ACE inhibitors or ARBs may improve functional class, exercise duration, ejection fraction, diastolic filling and LV hypertrophy. In the large randomized trial of perindopril (an ACE inhibitor) for patients older than 70 years with chronic HF and normal or near-normal EF, event rates were lower than anticipated. Some trends towards the benefits of using this type of medication were primarily driven by reduction in HF-related hospitalizations, and were observed at 1 year.¹⁷ In the only large trial of ARBs for diastolic HF in the elderly patients, morbidity was reduced but mortality reduction were not achieved.¹⁸ Aldosterone antagonists have not been studied in patients with DHF. Beta blocker have been shown to improve morbidity in older patients with diastolic and systolic HF.^{19,20}

Although calcium channel antagonists can improve measures of diastolic function during short-term use, definitive data with chronic administration for diastolic HF is not available.

Disclosure

The authors report no conflicts of interest.

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