REVIEW

Heart failure: a diagnostic and therapeutic dilemma in elderly patients

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Introduction

Congestive heart failure (CHF) affects 3–5% of the population over the age of 65 years [1]. A 34-year follow-up of the Framingham study data has shown that the incidence and prevalence of CHF increases with advancing age, approximately doubling with each decade [2]. CHF greatly impairs the quality of life, leads to frequent hospital admissions and accounts for up to 5% of all geriatric admissions [3]. The annual admission rate in patients with established heart failure may be as high as 45% [3]. Each admission lasts an average of 8 days. The probability of dying within 5 years of the onset of CHF is about 50%; in patients with severe heart failure, the annual mortality is as high as 60% [4]. CHF is a public health concern and in the UK it is estimated to cost the National Health Service £360 million per year [5].

Diagnosis of CHF

In elderly patients, the clinical expression of CHF may be distorted by concurrent symptoms, and physical signs may also be misleading [6]. Recent studies have shown a poor correlation between echocardiographic assessments of left ventricular systolic dysfunction and clinical examination [7, 8]. A chest X-ray is most often used in the diagnosis and preliminary assessment of left ventricular failure in elderly patients [9]: it is fairly specific for heart failure but lacks sensitivity, especially in milder or compensated failure. Chest X-rays may also be more difficult to interpret in elderly subjects due to limited views and the presence of concomitant pulmonary parenchymal disease and kyphoscolisois.

Recent attention has been redirected towards the 12-lead electrocardiogram (ECG) as a marker for suspected left ventricular systolic dysfunction [10, 11]. A diagnosis of left ventricular systolic dysfunction is unlikely in the presence of a normal 12-lead ECG. An abnormal 12-lead ECG has good sensitivity but poor specificity in detecting left ventricular systolic dysfunction [12, 13]. Radionuclide ventriculography provides accurate assessments of left ventricular ejection fractions [14]. However, this method requires a dose of radiation and does not provide information about valvular structure. Consequently, it is not as clinically helpful as echocardiography, which can provide information not only on systolic and diastolic function, but also on the presence of valvular disease and left ventricular hypertrophy, important aetiological factors in heart failure in old age.

Echocardiography

This assesses left ventricular function, providing both qualitative and quantitative information [15, 16] and is easily applicable and reliable in assessing heart failure in elderly patients [16]. Moreover, it is a relatively inexpensive and quick method of assessment that may be performed at the bedside. Although it is the preferred method of many physicians in assessing heart failure [9], the lack of availability of echocardiography has left many elderly patients with CHF under-investigated [17]. Furthermore in old age, the incidence of CHF with normal left ventricular systolic function is greater, with a high incidence of diastolic dysfunction and left ventricular hypertrophy, often associated with hypertension [18]. This emphasizes why echocardiography is so important in elderly patients in whom the aetiology of heart failure is often multi-factorial. It is difficult to target accurately appropriate therapy without the simple baseline information available from echocardiography. Although diastolic dysfunction can give rise to symptoms identical to those caused by systolic dysfunction, the benefits of drugs such as angiotensin-converting enzyme (ACE) inhibitors in this subgroup of patients remains unproven and as yet cannot be routinely recommended. This is important, as the inappropriate use of powerful vasodilators may potentially be deleterious in patients with predominantly diastolic dysfunction.

Despite its important role in the assessment of left ventricular function, up to two-thirds of British patients with CHF do not have echocardiography [19]. The main problem is a lack of suitably trained staff who can perform the investigation, coupled with limited facilities (particularly in district general hospitals). How can we increase the numbers of patients receiving objective assessments of left ventricular function? Open-access echocardiography is effective in assessing patients with suspected heart failure and can increase the numbers of patients treated with ACE inhibitors [20]. The provision of the service may be further increased by the more widespread use of portable echocardiography [21]. Portable devices are cheaper than the larger imaging systems and are ideal for use at the bedside, in the outpatient department or in the community. However, concerns remain about the suitability of some of these devices (particularly those without Doppler facilities) for the detection of valvular disease.

Natriuretic peptides

The plasma natriuretic peptides—and in particular B-type natriuretic peptide—are potentially promising markers of left ventricular dysfunction [22]. B-type natriuretic peptide is released from the cardiac ventricles and plasma concentrations reflect ventricular systolic function. N-terminal pro-atrial natriuretic factor is released from a prohormone in the cardiac atria. The cardiac levels of N-terminal pro-atrial natriuretic factor reflect chronic levels of intracardiac volume and pressure [23]. Recent work has compared the diagnostic utility of each of these peptides in patients with chronic heart failure and has confirmed that B-type natriuretic peptide has good sensitivity and specificity in detecting a left ventricular ejection fraction of less than 35% [24]. Natriuretic peptides may be of prognostic significance: atrial natriuretic peptide predicts survival at 13-25-month follow-up in patients with chronic heart failure [25]. Furthermore, B-type natriuretic peptide is of prognostic significance in patients following myocardial infarction [26] and also in elderly patients with or even without overt chronic heart failure [27].

Use of ACE inhibitors in CHF

The Co-operative New Scandinavian Enalapril Survival Study first showed that the morbidity and mortality associated with severe CHF were markedly reduced by treatment with enalapril [4]. Subsequently, the Studies of Left Ventricular Dysfunction have shown that ACE inhibitors also improve survival and decrease the number of hospital admissions in patients with symptomatic mild to moderate CHF [28, 29]. More recently, ACE inhibitors have been shown to be of benefit in patients with heart failure following myocardial infarction [30, 31], although the selection

criteria for treatment varied from clinical grounds to a radionuclide-derived ejection fraction.

However, there has been concern about ACE inhibitors, largely based on reports of severe hypotension and renal dysfunction in early studies with large doses of these drugs and also when administered to elderly patients [32, 33]. This experience has left a reluctance amongst some physicians to use ACE inhibitors, particularly in elderly patients with CHF [34]. However, a recent survey of members of the British Geriatrics Society suggested that ACE inhibitors are used frequently and without serious side effects in the treatment of heart failure in old age [9]. Many of the problems with ACE inhibitors in elderly patients can be avoided if treatment is commenced when patients are hydrated and electrolytic abnormalities are avoided.

Despite the benefits of ACE inhibitors for the treatment of CHF, most of the multi-centre heart failure trials were performed in patients under 65 and it is still not clear what the benefits are in older patients, although a subset analysis of patients over 65 years of age in one post-infarction study did suggest that the benefits are as great as in their younger counterparts [30]. Moreover, with one study demonstrating a 50% mortality in elderly men admitted to hospital with heart failure [35], morbidity may be a more clinically relevant measure in elderly patients with established CHF. Few clinical trials have evaluated the benefits of ACE inhibitors in elderly patients with CHF using end-points such as 25 m walking time or activities of daily living [36], indices which may be more relevant to an elderly patient. A recent study evaluating the treatment of CHF in patients aged 60 years and over, using generic health status measures, revealed that ACE inhibitor treatment had little impact on quality of life [37]. This was a small study and the diagnosis of heart failure was based on Framingham criteria. This highlights the need for studies which assess quality of life and measure activities of daily living in patients treated for heart failure with ACE inhibitors. Potentially helpful outcome scales include the Nottingham [38], Rivermead [39] and Katz activities of daily living scales [40].

Other treatments for CHF in elderly patients

Conventional treatment for CHF includes treatment with diuretic therapy, which alleviates symptoms but has little impact on mortality [41]. Diuretics effectively correct salt and water overload, improving dyspnoea and oedema. However, they do not improve left ventricular function and are best used in combination with an ACE inhibitor. Diuretic treatment is not without inconvenience and can hinder everyday activities, particularly in patients with mobility problems. Caution is required in elderly patients with predominantly diastolic dysfunction, as large reductions in intravascular volume with loop diuretics can reduce

cardiac output to such an extent that marked hypotension and dizziness occur [42].

Digoxin is often used in elderly patients with heart failure. However, its role in patients with chronic heart failure and normal sinus rhythm remains controversial. In the most recent study of digoxin in over 7000 patients with left ventricular ejection fractions less than 45%, it did not reduce mortality at 37-month follow-up. It did, however, reduce the rate of hospitalization both overall and for worsening heart failure [43].

Hydralazine in combination with isosorbide dinitrate can be useful in improving symptoms and survival in patients with systolic heart failure [44]. This combination may be useful in patients in whom ACE inhibitors are not tolerated.

Traditionally, β-blockers have been contra-indicated for patients with heart failure. Recently, there has been a re-assessment of their use. Carvedilol [45] is a non-selective β-blocker with additional properties (which include α-blockade, vasodilator activity, antioxidant and antiproliferative activities) which may be effective in CHF. Several recent US trials recruited over 1000 patients and in a combined analysis [46] there was a 67% reduction in mortality in the carvedilol group *versus* controls.

Another area of promise is in the use of the new angiotensin receptor antagonists. These agents inhibit angiotensin II without increasing bradykinin concentrations, which are thought to be associated with many of the side effects of ACE inhibitors. In the recent ELITE study [47], in which two-thirds of the participants were over 70, the safety and efficacy of captopril and losartan (an angiotensin II antagonist) were compared. Losartan was well tolerated and there was a 46% reduction in mortality at 15 months. Indeed, losartan was better than captopril in reducing mortality in the elderly patients with CHF.

Calcium antagonists produce improvements in diastolic filling on echocardiography but their effect on symptoms is less clear and concerns remain over the negatively inotropic effects of agents such as nifedipine [48]. Some newer calcium antagonists may be less of a problem in patients with impaired systolic function. In the PRAISE [49] study, amlodipine did not increase cardiovascular morbidity or mortality in patients with severe heart failure. Indeed, it may prolong survival in patients with non-ischaemic dilated cardiomyopathy. Dihydropyridines may not be harmful in patients with a reduced left ventricular ejection fraction of between 25 and 50%, but without overt heart failure. Nisoldipine [50] was tolerated in post-infarction patients and improved diastolic left ventricular function. While these agents have unproven benefit in systolic dysfunction, they may be useful for elderly patients with impaired left ventricular diastolic function, in whom the benefits of ACE inhibitors are unproven.

In conclusion, the diagnosis of left ventricular systolic dysfunction can be difficult to make in elderly subjects. As echocardiography plays a pivotal role in the assessment of left ventricular systolic function in elderly patients with CHF, this investigation should be used more widely.

Key points

- The diagnosis of left ventricular systolic dysfunction is difficult to make on clinical grounds alone.
- An abnormal electrocardiogram has good sensitivity but poor specificity in aiding the diagnosis of left ventricular systolic dysfunction.
- Echocardiography is essential to make a diagnosis of left ventricular systolic dysfunction in elderly subjects.
- Diuretic therapy followed by treatment with an angiotensin-converting enzyme inhibitor is the cornerstone of therapy.
- Newer therapies such as angiotensin receptor antagonists offer potential benefits.
- Studies are required which assess the impact of treatments on activities of daily living and quality of life in elderly patients.

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