Medicine in the elderly

Diagnosis and management of heart failure in the elderly

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Summary
Heart failure is common in the elderly and is associated with a significant morbidity and mortality. It accounts for about 5% of adult medical admissions and the expenditure of 1% of the total National Health Service budget. Clinical presentation in old age may be with the classical symptoms of heart failure but often, due to multiple pathology and low functional ability, presentation is atypical. Both nonspecific symptoms and signs of heart failure, and often a delayed presentation in this population, make diagnosis difficult. Treatment of the failing heart in an older person is similar to the young however, diligence is required when prescribing due to age-related pharmacokinetic changes and co-existent morbidity. This may result in polypharmacy and an increase in drug interactions which themselves may have deleterious consequences. However, knowledge of the aetiology of heart failure in old age and the possible atypical presentation, as well as available treatments, will result in better management and improved quality of life and reduced mortality in the elderly heart failure population.

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Cardiovascular disease is the most common cause of morbidity and mortality in old age and accounts for about half the deaths over 65 years. Heart failure in the elderly is all too common, may present atypically and has a poorer prognosis than many cancers.[1]

The population is ageing and by the end of this millennium the world population over 60 years of age will be 580 million, which represents a 50% increase over 20 years.[2] In England and Wales over the next decade there will be an increase of 12.6% in the current over-75 population of 3.525 million to give 3.95 million by the year 2000.[3] It is hoped that preventative measures will reduce the incidence of heart failure in the elderly in the future but, not withstanding this, early diagnosis, investigation and treatment of this lethal condition is imperative to reduce its deleterious effects.

The size of the problem

The overall prevalence of heart failure in the UK, Scandinavia, and the US is about 0.4–2%, increasing to 10% in elderly subjects.[4] Studies have been hampered by the lack of uniform diagnostic criteria. The Framingham study[1] used a set of major and minor criteria to define heart failure. These were such that patients with minor degrees of heart failure were probably excluded and the figures reported are therefore underestimates. However, the 34-year follow-up of the Framingham data[5] produced a prevalence of congestive heart failure increasing from 1% in the 50–59-year-old age group to 10% in those aged 80–89 years. The incidence also increased with age. In men, the annual incidence was four per 1000 in those aged 55–64 years and 54 per 1000 in those aged 85–94 years. In women the rates were three and 85 per 1000, respectively. A study looking at patients taking diuretics showed lower prevalence rates; 2.8% in patients over 65 years compared with 0.06% in those under 65,[6] whilst others have shown higher rates (13% in patients over 65 years).[7]

This high prevalence is reflected in hospital admissions for heart failure. Parameshwar et al[8] found that, over a six-month period, 5% of adult medical admissions were due to heart failure and the majority (80%) were patients over 65 years of age. The average length of stay was 16.7 days and over 60% had been admitted on more than one occasion during the previous six-month period. The burden of cost to the National Health Service (NHS) is not unsubstantial, £360 million being the expenditure on diagnosis and management in one year.[9] Hospital admission accounts for 60% of this cost. The total costs account for 1% of the total NHS budget and 10% of NHS expenditure on diseases of the circulatory system. The financial burden is similar to that of stroke and asthma.

Aetiology

As in other age groups, hypertension and coronary heart disease are the commonest aetiologies of congestive heart failure in the elderly (box 1).[1,8,10] In the Framingham study hypertension was found in 76% of men and 79% of women with heart failure.[1] Coronary heart disease was prevalent in 46% of men and 27% of women with congestive heart failure. Valvular heart disease is a relatively uncommon cause of congestive heart failure. Calcific aortic stenosis, however, is the commonest valvular disease causing heart failure in the elderly, followed by mitral regurgitation secondary to mitral valve prolapse or mitral valve calcification. Rheumatic heart disease is now an uncommon cause of heart failure and accounts for 2% of cases in men and 3% in women.[1] Causes of heart failure in the elderly may be multiple, as hypertension, coronary heart disease and atrial fibrillation are more common in this age group.[11]

The multiple aetiology and presence of precipitating causes of heart failure in the elderly is further complicated by age-related changes in the cardiovascular

Aetiology of heart failure in the elderly
Most common
● hypertension
● coronary heart disease
● cor pulmonale
● valvular heart disease
Less common
● myocarditis
● cardiomyopathy
Precipitating causes
● thyrotoxicosis
● anaemia
● atrial fibrillation
● renal failure
● excess iv fluids
● steroids

Box 1

system. There is increased ventricular wall thickness, decreased left ventricular cavity size and disturbed left ventricular diastolic filling with normal ageing.[12] Increased myocardial stiffness due to fibrosis and deposition of amyloid tissue contributes to diastolic dysfunction. Congestive heart failure with normal systolic function and diastolic dysfunction is common and has been estimated to be present in 40% of patients of 70 years of age compared to 6% of those less than 60 years of age with congestive heart failure.[10] Cohn *et al*[13] demonstrated that diastolic dysfunction in heart failure patients is associated with a better prognosis in terms of mortality compared to those with systolic dysfunction; patients with diastolic impairment also had a higher incidence of systemic hypertension.

How to make the diagnosis

The elderly may present as in the young with the classical symptoms of heart failure. However, because of their lower expectations of functional ability and co-existent diseases they may present late and often atypically. At rest, elderly patients may complain of symptoms of low cardiac output, eg, weakness, tiredness, fatigue. This may make them take to their beds and so the lack of exercise will prevent dyspnoea being an early symptom. Reduced perfusion of an already precarious cerebral circulation caused by a low cardiac output may produce confusion, falls, blackouts and even fits. Falls may result from the skeletal muscle wasting associated with congestive heart failure. This is due to reduced muscle protein synthesis and increased breakdown,[14] and there is a further reduction in blood flow to exercising muscle which again limits exercise capacity. The enforced immobility also results in disuse atrophy. The loss of fat and muscle tissue or undernutrition due to heart failure (cardiac cachexia) is common and has many causes including decreased dietary intake, malabsorption, increased metabolism, and iatrogenic factors (unpalatable salt-free diet and anorexia secondary to digoxin toxicity).[15] The elderly are more likely to be undernourished *per se*[16] due to socioeconomic factors, changes in appetite due to reduction in taste and smell, medical factors, and the extra burden of cachexia associated with heart failure increases both morbidity and mortality.[17] Any of these symptoms in the young patient would provoke urgent medical assistance. It is essential therefore to have an 'open diagnostic mind' when an elderly patient is 'off his/her feet'.[18]

Many of the physical signs of congestive heart failure in the elderly need to be interpreted with caution as they are frequently attributable to other disease processes. Peripheral oedema is most commonly gravitational due to impaired mobility and the treatment is to increase venous return with support stockings and to increase mobility, not to use diuretics. Other causes of oedema may be varicose veins and hypoalbuminaemia. Similarly there are other causes of hepatomegaly and ascites. Although bilateral crackles and signs of pleural effusions may be present, co-existent diseases make these signs so common in the elderly for them to be nonspecific. Elevation of the jugular venous pulse, however, is a more specific sign as is a third heart sound. The prevalence of the fourth heart sound is similar in the healthy and those with cardiac disease over the age of 50 years and so is not a reliable sign of heart failure.

Both the nonspecific symptoms and signs of heart failure in old age and the delayed presentation in this population demands all the physician's clinical skills and acumen so that a diagnosis can be made and investigations and treatment commenced.

Pathophysiology

The pathological changes resulting in stiffer ventricles contributing to diastolic dysfunction in the elderly have been described above. These changes lead to an age-associated decrease in stroke volume and, combined with attenuation of heart rate during exercise, a larger decrease in cardiac output. The excess secretion of antidiuretic hormone in the elderly patient with heart failure explains why they are more likely to develop hyponatraemia than the young. The baroreflex arc requires a greater fall in the 'effective' blood volume to 'trigger' in older people but still leads to peripheral arterial vasoconstriction and damage of left ventricular wall tension. There is increased sympathetic activity in the elderly but adrenogenic inotropic stimulation is less effective because of down-regulation of cardiac beta receptors and an age-related inability of myofibrils to increase calcium uptake and thus increase their contractility. A reduction in renal blood flow with age further jeopardises renal function. Hence, haemostatic mechanisms which counteract the reduction in the 'effective' blood volume, are less efficient in the elderly patient.

Investigations

- blood tests (full blood count, urea and electrolytes, random blood sugar, thyroid function tests)
- chest X-ray
- electrocardiograph
- echocardiograph
- exercise testing
- invasive tests (for selected elderly patients)

Box 2

Guidelines for introduction of ACE inhibitors in the elderly

- hospitalise if at risk, eg, severe heart failure, systolic blood pressure <120 mmHg
- stop potassium supplements and potassium-sparing diuretics
- reduce dose of diuretic for 24–48 hours
- test dose of ACE inhibitors at night (enalapril 2.5 mg, captopril 6.25 mg)
- increase dose slowly over two weeks to captopril 12.5 mg tid and enalapril 5 mg bid
- check blood chemistry after two weeks or before if necessary
- recommended maintenance doses are enalapril 10 mg bid or captopril 25–50 mg tid if the patient can tolerate these

Box 3

Investigations

All patients with heart failure should have baseline investigations (box 2). Echocardiography is essential as this noninvasive technique allows reversible causes of heart failure, eg, valvular and pericardial disease, to be excluded instantly. It provides information about systolic and diastolic function and therefore aids the choice of the correct drugs in treatment. It also allows assessment of prognosis, as patients with systolic dysfunction have a higher mortality.[13]

Exercise testing and invasive investigations (eg, cardiac catheterisation) should be reserved for patients who are being considered for cardiac surgery.[19]

Treatment

The same principles of treating heart failure apply to the older patient as to the young. However, diligence is required when prescribing in the elderly due to age-related pharmacokinetic changes and co-existent morbidity. Pharmacokinetic changes in terms of drug absorption, distribution and elimination are due to changes in body composition, decreased renal function and hepatic function with ageing. Co-existent morbidity in the elderly frequently results in polypharmacy and an increased probability of drug interactions. The consequences of side-effects (eg, orthostatic hypotension causing falls and fractured neck of femur) are more deleterious in old age. These factors should not mean that useful drugs are omitted but they should be used with caution, starting with lower doses, with an awareness of the possible consequences.

DIURETICS

These drugs are often used inappropriately in older people and it is therefore not surprising that they are the commonest group of drugs causing adverse reactions requiring hospital admission.[20] Decreased efficacy of loop diuretics in old age may result in higher doses being needed, eg, 120 mg of frusemide daily. At this stage the introduction of a thiazide diuretic (eg, metolazone 2.5–10 mg daily) is useful. These diuretics should always be used in combination with an angiotensin-converting enzyme (ACE) inhibitor unless there are specific contraindications.

The use of potassium-sparing diuretics (eg, amiloride, triamterene, spironolactone) is limited in the elderly. They are weak diuretics and their use is based on the hypothesis that it is the more powerful diuretics which cause potassium depletion. In the elderly, however, the reduction in renal function may result in these drugs producing serious hyperkalaemia. Their use should therefore be discouraged[21] and they should never be combined with ACE inhibitors.

ACE INHIBITORS

When these drugs are given in combination with diuretics they not only improve symptoms and signs of all grades of heart failure but also reduce mortality and hospitalisation.[22,23] The CONSENSUS study, (mean age, 70 years)[22] showed that, in patients with severe (NYHA grade IV) heart failure, enalapril reduced the one-year mortality by nearly a third.

Side-effects are more common in old age. Hypotension is more common if the patient is dehydrated, has diastolic dysfunction or obstructive valve disease. Guidelines for the introduction of ACE inhibitors in the elderly (box 3) may reduce the incidence of symptomatic hypotension. Renal function may deteriorate and these drugs should not be prescribed if there is suspicion of renal artery stenosis, eg, renal bruit. In the elderly co-prescribing, particularly of nonsteroidal anti-inflammatory drugs, will contribute to renal dysfunction.

In the elderly, ACE inhibitors are often best introduced as an in-patient, particularly if heart failure is severe, systolic blood pressure is low or there is pre-existing renal dysfunction. The recommended maintenance doses of ACE inhibitors in heart failure are not always achieved,[24] but even so this age group should not be deprived of the benefits of these drugs.

HYDRALAZINE AND ISOSORBIDE DINITRATE

These drugs have been shown to improve symptoms, exercise tolerance and survival in patients with heart failure,[25] although the patients were relatively young (mean age 56 years). The second vasodilator heart failure trial,[26] which was a direct comparison of enalapril and the combination of hydralazine and isosorbide dinitrate, showed that the ACE inhibitor was better tolerated and resulted in a lower mortality.

Case history

A 75-year-old woman presented with a four-month history of tiredness, exertional dyspnoea and palpitations. Over the last three weeks she had increasing exertional angina. She had had a myocardial infarction three years previously and was using GTN spray prn for rare episodes of angina. She had stopped smoking after her myocardial infarction.

On examination she was breathless on minimal exertion. Her heart rate was 120 per minute and irregular and blood pressure 160/90 mmHg. Her jugular venous pulse was raised and there was bilateral basal crackles on chest auscultation. There were no heart murmurs.

Management
Baseline blood tests were normal. An ECG confirmed atrial fibrillation with widespread ST depression. A chest X-ray showed cardiomegaly and interstitial oedema. An echocardiogram showed a dilated left ventricle with a poorly moving aneurysmal apical segment. There was functional mitral regurgitation only.

This lady should be commenced on frusemide (40 mg daily) and digoxin to control the ventricular rate. The history of ischaemic heart disease and ischaemic changes on the ECG would encourage an early introduction of a nitrate. In the presence of atrial fibrillation and an aneurysmal apical segment on her echocardiogram she is at risk of thrombo-emboli and should be anticoagulated with warfarin. If there are contra-indications to warfarin then aspirin 300 mg daily should be commenced. Finally an ACE inhibitor should be introduced, if possible.

Box 4

DIGOXIN
Digoxin is the only orally active inotropic agent available. In a group of 20 elderly patients (over 74 years) with congestive heart failure, digoxin has been shown to increase the ejection fraction.[27] Digoxin, however, has a narrow therapeutic index and is mainly eliminated by the kidneys so a smaller dose is required in old age due to reduced renal clearance.

Role of the general practitioner

The general practitioner is in an ideal position for early detection of heart failure. Symptoms of fatigue, weakness, dyspnoea and ankle swelling lead to a full history review to establish an aetiology, if possible, and a clinical examination. If heart failure is thought likely then aggravating factors should be removed, eg, nonsteroidal anti-inflammatory drugs, steroids, and beta-blockers, and the patient should be commenced on diuretics as necessary. Initial investigations should be arranged: chest X-ray, electrocardiogram, full blood count, urea and electrolytes, random blood sugar and thyroid function tests. If direct access echocardiography is available, then almost all cases of heart failure should be referred for this investigation. In a minority of extremely disabled and frail patients, who would not tolerate ACE inhibitors or further surgical intervention, an echocardiogram would not alter management and therefore would not be useful. If systolic dysfunction is confirmed, ACE inhibitors should be commenced (box 3). If the echocardiogram is normal the patient should be reassessed and, if necessary, referred to hospital. The patient should also be referred to hospital if there is evidence of valvular heart disease or deteriorating heart failure and it is thought that the patient would benefit from further intervention.

The chronic nature of heart failure will require intermittent intervention by the general practitioner in terms of medical, social, psychological and family support.

Prognosis

The probability of dying within five years of the onset of congestive heart failure is about 50%.[1,22] In elderly patients and those with severe heart failure the annual mortality is as high as 60%.[22] As already stated, some drugs have been shown to reduce mortality and morbidity and although they should be used with diligence in the elderly, due to the increased likelihood of adverse effects, this age group should not be deprived of their benefits.

Conclusions

Congestive heart failure is a common and lethal condition especially in old age. Its clinical features may be atypical in the elderly. It requires accurate diagnosis and its aetiology should be sought with investigations including echocardiography. Treatment is often difficult due to altered pharmacokinetics, comorbidity and polypharmacy in the elderly but efforts are rewarded with improved quality of life and, hopefully, reduced mortality.

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