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Diastolic heart failure

The condition exists and needs to be recognised, prevented, and treated

Diastolic heart failure refers to the clinical syndrome of heart failure with a preserved left ventricular ejection fraction (0.50 or more) in the absence of major valve disease.[1] About a third of patients with heart failure seen by clinicians have diastolic heart failure as defined above.[2] A simple classification of heart failure into systolic versus diastolic is useful because the two conditions have a distinctive pathophysiology and different prognoses.

Although diastolic heart failure is common in clinical practice worldwide,[3 4 5] its existence has been questioned for several reasons. Firstly, investigators have questioned whether these patients truly have heart failure or if they actually have conditions such as obesity or pulmonary disease that can mimic heart failure.[6] Doubts regarding diastolic heart failure are cast especially because the diagnosis of heart failure is partly a clinical one and prone to error. When the left ventricular ejection fraction is low the diagnosis of heart failure is seldom questioned—clinicians seem more willing to accept a diagnosis of systolic heart failure.[w1] Fortunately the advent of biomarkers such plasma B-type natriuretic peptides should help confirm the presence of heart failure in patients with suspected diastolic heart failure.[w2]

A second area of controversy is that while investigators may agree that some patients with heart failure do have a normal ejection fraction, they doubt if the underlying mechanism is truly left ventricular diastolic dysfunction, as implied by the term diastolic heart failure. Some of these patients have subtle abnormalities of systolic function (although the ventricular ejection fraction is normal).[w3] In some case series the relations between left ventricular pressure and volume on cardiac catheterisation do not conform to a classical pattern of diastolic dysfunction.[7] Partly due to these debates the evidence base for the diagnosis and treatment of diastolic heart failure has lagged behind systolic heart failure (table). Recent guidelines for clinical practice from the National Institute for Clinical Excellence in the United Kingdom focus almost exclusively on the management of systolic heart failure, with a token reference to patients with suspected diastolic heart failure being "referred for specialist assessment."[8]

Clinically patients with diastolic heart failure are elderly, more likely to be women, and often have a raised blood pressure, and associated ventricular hypertrophy.[2] However, clinical characteristics by themselves cannot distinguish reliably systolic from diastolic heart failure.[2] It is therefore important to obtain an imaging study, typically echocardiography, to estimate left ventricular ejection fraction to make this distinction. Specific assessment of left ventricular diastolic function may not be necessary as such abnormalities are universal in patients with diastolic heart failure.[9] Studies have also established that ejection fraction remains fairly invariant in diastolic heart failure, so that treatment of heart failure should be initiated and an imaging study can be obtained once the patient is clinically stable.[10]

Comparison of evidence base for evaluation and treatment of systolic versus diastolic heart failure

Feature	Level of evidence*	
	Systolic heart failure	Diastolic heart failure
Prevalence and risk factors	III	III
Non-invasive diagnostic gold standard	Reduced ventricular ejection fraction (<0.50) on imaging	IV, VII (diagnosis by exclusion of systolic heart failure)
Prognosis	I-III	II, III
Treatment with angiotensin converting enzyme inhibitors, angiotensin receptor blockers, or β blockers	I (Cochrane review+meta-analyses)	II, V-VII
Prevention trials (treatment of asymptomatic precursor condition)	I	None

*I: Evidence from several large, well conducted, randomised controlled trials; II: evidence from a single large, randomised controlled trial or small, well conducted randomised controlled trials; III: evidence from well conducted cohort studies; IV: evidence from well-conducted case-control studies; V: evidence from uncontrolled or poorly controlled studies; VI: conflicting evidence, but tending to favour the recommendation; VII: expert opinion.

P+

Additional references w1-w4 appear on bmj.com

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What is known about diastolic heart failure

- Diastolic heart failure is common in clinical practice
- A diagnosis of diastolic heart failure may be considered in patients with heart failure who have a normal left ventricular ejection fraction (0.50 or more)
- Diastolic heart failure is associated with a mortality risk four times that of controls without heart failure
- Current treatment of diastolic heart failure is empirical
- Prevention of diastolic heart failure can be achieved through better control of hypertension and other cardiovascular risk factors in the community

The pathophysiology of diastolic heart failure is characterised by a low cardiac output that results typically from a ventricle that has thick walls but a small cavity (increased left ventricular mass/volume ratio).[11] The left ventricle is stiff. It relaxes slowly in early diastole and offers greater resistance to filling in late diastole, so that diastolic pressures are elevated. The low cardiac output manifests as fatigue, while the higher end diastolic pressure is transmitted backwards through the valveless pulmonary veins to the pulmonary capillaries, resulting in exertional dyspnoea. These pathophysiological abnormalities trigger neurohormonal activation as happens in systolic heart failure. Symptoms may be unmasked by exercise because, unlike normal people, patients with diastolic heart failure are unable to augment their stroke volume by increasing their left ventricular end diastolic volume (Frank-Starling mechanism). These patients often have an exaggerated response of systolic blood pressure to exercise. Mechanisms contributing to abnormal left ventricular diastolic properties include stiff large arteries, hypertension, ischaemia, diabetes, and intrinsic myocardial changes with or without associated hypertrophy.[11]

The objectives of treatment are similar to those for systolic heart failure—relief of acute symptoms, enhancement of chronic exercise tolerance and quality of life, reduction of hospital readmissions, and improvement of survival. Acute treatment includes relief of precipitating factors, cautious use of diuretics, blood pressure control, relief of ischaemia, and control of ventricular rate in patients with atrial fibrillation. Chronic treatment includes restriction of dietary sodium and control of hypertension. The role of agents that improve left ventricular relaxation is not established. Randomised controlled clinical trials are in progress and will enable replacement of empirical treatment strategies with evidence based ones. A single large randomised clinical trial of patients with heart failure and a preserved left ventricular ejection fraction (>0.40) was recently published (CHARM-Preserved trial).[12] In that trial, treatment with candesartan (an angiotensin receptor blocker) had a modest impact on reducing future hospital readmissions for heart failure compared with placebo.

Mortality of diastolic heart failure patients is four times that of age and sex matched controls without heart failure.[5] The prognosis of diastolic heart failure is generally better than that of systolic heart failure when ambulatory patients are compared, but similar when hospitalised or very elderly patients with heart failure are investigated.

Asymptomatic left ventricular systolic dysfunction can be identified readily with echocardiographic assessment of left ventricular ejection fraction and then treated with angiotensin converting enzyme inhibitors to prevent progression to heart failure.[w4] In comparison the identification of "subclinical diastolic dysfunction" poses a challenge because of the lack of a single, non-invasive gold standard test. We need to develop biomarkers or imaging tests that can reliably identify major diastolic dysfunction, are inexpensive, reproducible, and easy to use and interpret by clinicians. While Doppler echocardiography has aided the diagnosis of diastolic dysfunction, altered transmitral filling patterns are ubiquitous in elderly patients. Important advances in assessment of left ventricular diastolic function (such as colour-M-mode and tissue Doppler imaging) will probably enhance our ability to identify individuals at high risk of developing diastolic heart failure. Currently we do not know at what point along the spectrum of diastolic filling abnormalities an intervention should be considered necessary to prevent progression to heart failure.

Studies are under way also to understand the environmental and genetic underpinnings of raised blood pressure, vascular stiffness, and left ventricular hypertrophy, known precursors of diastolic heart failure. The optimal management of diastolic heart failure and of asymptomatic diastolic dysfunction is work in progress. The best strategy at present to prevent diastolic heart failure is to achieve better control of high blood pressure and other cardiovascular risk factors in the community.

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