

Part 1: Heart failure

Nov 20, 2019 | 2  | [cardiology,onthepods](#)

James Edwards does a two-part chat with Dr. Sean Lal. Sean's clinical and research interests are in heart failure.

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Heart Failure

In Part 1 we go through what heart failure is. You will learn what diastolic dysfunction is and why it causes heart failure. And we will also go through an example case.

In [Part 2](#) we look at how best to investigate, what are the common precipitants, what type of drugs are used and when to escalate care.

Broadly speaking we have two types, heart failure with preserved ejection fraction (HFpEF) and with reduced ejection fraction (HFrEF).

HFrEF and HFpEF

HFrEF is systolic dysfunction of the left ventricle (LV).

HFpEF (where EF \geq 50%) is becoming increasingly more common. In such a setting, the LV is stiff and non-compliant and there is diastolic dysfunction so the LV doesn't fill as easily. The classic example is a patient with LV hypertrophy (LVH). For example, in the setting of aortic stenosis with comorbidities such as hypertension, obesity, and diabetes.

This is a common cluster of symptoms in the community.

About Dr. Sean Lal

Sean Lal is a clinical academic cardiologist at Royal Prince Alfred Hospital and the [University of Sydney](#) in NSW, Australia. He undertook his training at the University of Sydney, Royal Prince Alfred Hospital and Harvard Medical School.

Part 1: Heart failure

With Dr Sean Lal, Clinical Academic Cardiologist at the University of Sydney and Royal Prince Alfred Hospital, New South Wales, Australia

Introduction

It is easiest to consider heart failure broadly as heart failure with preserved ejection fraction (HFpEF) and heart failure with reduced ejection fraction (HFrEF). HFrEF is systolic dysfunction of the left ventricle (LV). We commonly use a cut-off of ejection fraction (EF) <50%. We regard EF 40-50% as mild systolic impairment and EF <40% significant systolic impairment.

HFpEF (where EF \geq 50%) is becoming increasingly more common. In such a setting, the LV is stiff and non-compliant and there is diastolic dysfunction so the LV doesn't fill as easily. The classic example is a patient with LV hypertrophy (LVH), for example in the setting of aortic stenosis, with comorbidities such as hypertension, obesity and diabetes. This is a common cluster of symptoms in the community. When a patient presents with symptoms of heart failure (e.g. shortness of breath) but have a normal EF, look for echocardiogram features of diastolic dysfunction.

The most common cause of right heart failure is left heart failure.

1. What is diastolic dysfunction and why does it cause heart failure?

- When the mitral valve opens, the LV fills with blood and this happens easily and quickly in young people because the LV is compliant
- As we age, there is a natural physiological tendency for the LV to stiffen so it doesn't fill as easily - this is physiological
- Factors such as hypertension, diabetes, obesity and sleep apnoea can lead to an exaggerated response of this leading to a stiffened, non-compliant LV leading to reduced diastolic filling time and a backup of pressure into the left atrium (LA)
- The LA will often dilate getting a buildup of pressure into the lungs, leading to pulmonary venous hypertension which can lead to shortness of breath. As the LA stretches, this makes a patient prone to arrhythmias such as atrial fibrillation (AF) which is another common comorbidity in patients with HFpEF. The mitral annulus might stretch as well which can cause mitral regurgitation

Case 1

You are asked to see a 60-year-old man who is admitted under respiratory with symptoms of an upper respiratory tract infection (URTI) and shortness of breath. On history, you note he has had some difficulty waking up, shortness of breath at night and some trouble walking upstairs. He is a non-smoker. He has been admitted for intravenous (IV) antibiotics and fluids. You are consulted to see the patient for shortness of breath.

Outline your assessment approach by the bedside

History

- How long has the patient been admitted for? (If a long time - consider pulmonary embolism (PE))
 - NB: Pneumonia can precipitate an exacerbation of heart disease
- Previous admissions for heart failure

- What treatment has been administered so far?
- Does the patient have any known cardiac history?
 - Valvular disease
 - Previous investigations for coronary disease
 - Previous echocardiogram results
 - Previous admissions for heart failure - prognostic factor
 - Risk factors including diabetes and hypertension
 - Smoking history
- Shortness of breath is a common symptom of heart failure
 - Ask about exercise tolerance - we are most interested in a change from baseline (baseline will depend on a person's fitness level)
 - Shortness of breath on exertion - ask about on the flat, up a hill, up a flight of stairs
 - Associated symptoms with shortness of breath including chest pain, light headedness / presyncope, palpitations
 - Orthopnoea is where a patient wakes up short of breath and now might sleep on multiple pillows having previously slept flat. This is a gradual process and suggests pulmonary congestion.
 - Paroxysmal nocturnal dyspnoea (PND) is where a patient wakes in the middle of the night gasping for air and might feel claustrophobic because they are so short of breath.
- Social factors
 - Smoking - a vascular risk factor
 - Alcohol history
 - Quantify - establish whether alcohol consumption is regular or binge drinking
 - Alcoholic cardiomyopathy causes dilation of the LV - usually occurs with 7-10 standard drinks per day for many years but this is an important diagnosis not to miss in a new onset heart failure and echocardiogram evidence of a dilated heart
 - It is possible to reverse heart failure related to alcohol with cessation / reduction of alcohol intake
 - Alcohol can also worsen sleep apnoea
 - Family history
 - Coronary artery disease
 - Heart failure in the family - ask about unexplained deaths particularly in young people

Examination

- Ensure the patient is not in extremis
 - Haemodynamic stability
 - Low blood pressure and tachycardia are cardinal signs of new onset heart failure (tachycardia may also suggest stress response or sepsis) - look for a change in baseline
 - Respiratory rate - observe their effort of breathing too

- Oxygen saturations
- Temperature - a fever may suggest the shortness of breath is related to worsening of pneumonia
- Pulse rate and rhythm
- Peripheries warm and well perfused
- Look at urine output - under-perfused kidneys causes low urine output and a low output state can indicate a more acute form of systolic heart failure where cardiac output is low and the patient cannot maintain adequate perfusing blood pressure - this is what leads to the reflexive tachycardia (aimed at driving cardiac output)
 - You may also see an increasing creatinine on bloods
- Jugular venous pressure (JVP) - is the filling pressure of the heart elevated?
 - JVP can be difficult to visualise particularly in obese patients
 - Look from the angle of the jaw (at the patient's earlobe) and track down to the base of the neck - if you get to the base of the neck and see it, then you can comment that the JVP is not significantly elevated
 - If *external* jugular vein is prominent and elevated, this gives a clue to an elevated right atrial pressure
 - Transmission of the carotid pulse may trick you - use the back of your index finger with some light pressure and you might feel the sensation of the carotid pulse and if you put more pressure on and occlude the pulsation, this suggests it is the JVP
- Chest:
 - Feel the apex beat - if grossly displaced, alerts you to a dilated cardiomyopathy but can be difficult to feel
 - Look for a heave - a sign of right ventricular overload / pulmonary hypertension
 - Auscultate - take particular note of new murmurs including of mitral regurgitation (loud pan-systolic murmur which radiates to the axilla) or aortic stenosis (systolic ejection murmur heard throughout the praecordium)
 - If you hear a light, soft systolic ejection murmur, listen to the carotids because it might be aortic *sclerosis* as opposed to *stenosis* (calcification of heart valves with increasing age is not uncommon)
 - A third heart sound - likelihood of hearing this is low but it classically occurs with a tachycardia and sounds like a galloping rhythm of horse's hooves and is strongly suggestive of new onset heart failure and usually a marker of someone who is quite unwell
- Lungs:
 - Look for signs of pulmonary oedema
 - Reduced air entry at the bases where there may be pleural effusions

- Crackles and crepitations in both lung fields – look for symmetry
- Cardiac wheeze – difficult to tease apart from respiratory wheeze so generally treat both
- Ankle swelling:
 - As we age, venous insufficiency can occur due to inelasticity of veins and this is a common cause of ankle swelling
 - Look to see whether the ankle swelling is associated with other signs of right heart failure, including raised JVP and a heave (although this is a late sign, as it means the right ventricle is failing because of raised pulmonary pressures) and there may also be evidence of hepatic congestion or mild renal failure on blood results
 - It is not uncommon for patients with diastolic heart failure to have peripheral oedema and some new evidence suggests a small dose of frusemide may help relieve this congestion

Related podcasts

- [Part 2: Heart failure](#)
- [Chest Pain](#)
- [Syncope](#)

Related blogs

- [A day in the life of a cardiology registrar](#)
- [The Heart of Australia](#)

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