Heart failure
- How to recognise and manage, what not to use -

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How to recognise a patient with heart failure?

Dyspnoea

- Reduced exercise capacity
- Orthopnoea
- Paroxysmal nocturnal dyspnoea

Peripheral oedema

Fatigue

- Low cardiac output

Dyspnoea and fatigue

- Reduced exercise capacity
  - NYHA functional class (severity)
- Orthopnoea
  - Sleeping on 2, 3, 4 pillows or in a chair
  - +/- paroxysmal nocturnal dyspnoea

Peripheral oedema

- Classic lower limb pitting oedema
- Ascites
- Pleural effusions

Other causes of pedal oedema

- Medications
  - Calcium channel blockers, prednisone, prazosin, oestrogens, progesterones,
- Hepatic cirrhosis
- Renal disease / nephrotic syndrome
- Venous incompetence
- Obesity
- Thyroid disease
- Cyclical

Causes of heart failure

- Coronary artery disease
- Valve disease
- Cardiomyopathies
- Infective
- Infiltrative
- Storage disorders
- Endomyocardial disease
- Pericardial disease
- Hypertension
- Arrhythmias
- Congenital heart disease
- Drug-induced
  - Chemo/immunotherapy
- Metabolic
- Neuromuscular

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Heart failure definitions

HFrEF
Reduced
Ejection Fraction
≤ 40%

***Significant** systolic impairment*

HFpEF
Preserved
Ejection Fraction
≥ 50%

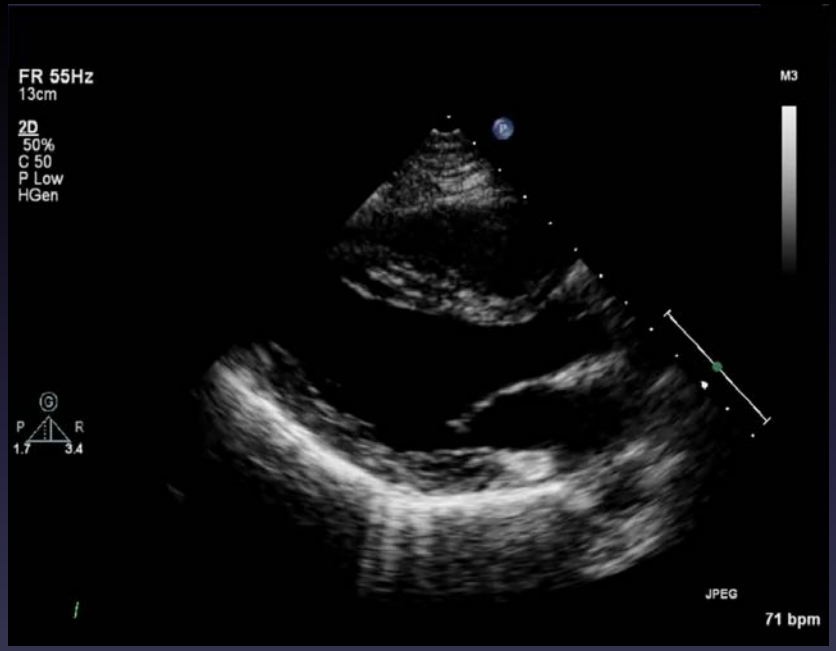
Symptoms with structural/functional cardiac abnormalities and/or raised BNP

HFmrEF
Mildly Reduced
Ejection Fraction
41-49%

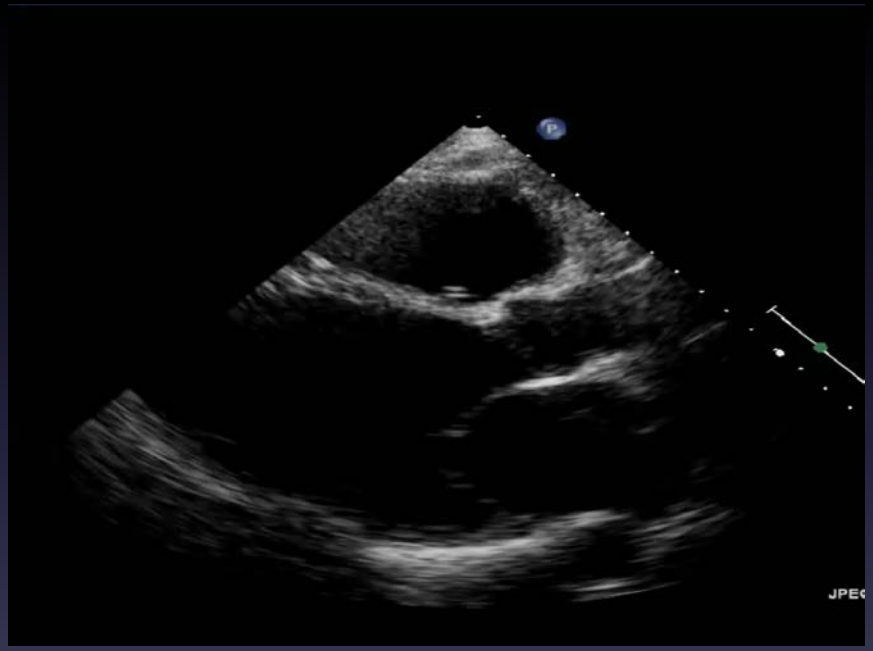
(previously 'mid-range' EF)
Similar to HFrEF, eg. high ischaemic aetiology, medication response

ESC HF Guidelines 2021

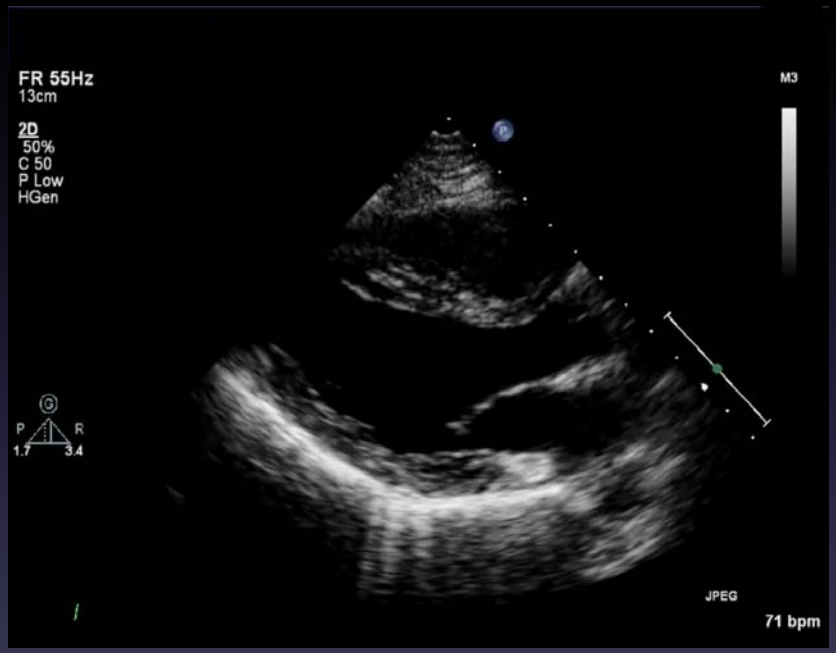
Normal heart



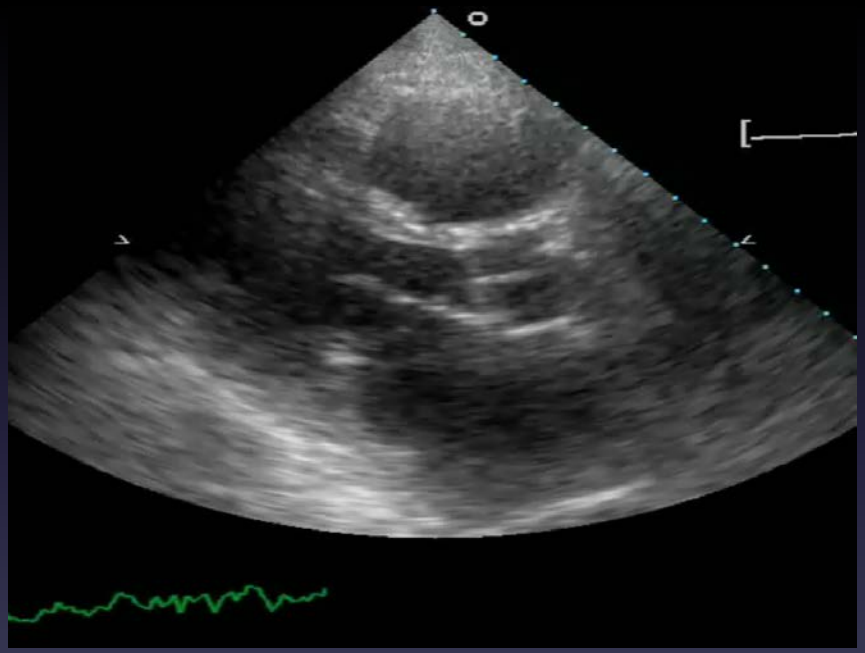
Systolic heart failure (HFrEF)



Normal heart



Diastolic heart failure (HFpEF)



Diagnostic tests in suspected heart failure

- BNP / NT-pro BNP
- 12-lead ECG
- Chest X-ray
- Routine bloods
  - FBC, UEC, TFT, fasting BSL, HbA1c, lipids, iron studies
- Transthoracic echocardiography
- Coronary angiography or CTCA, CMR
- Cardiopulmonary exercise testing, right heart catheterisation

Causes of raised BNP or NT-pro BNP

Cardiac	Heart failure ACS Pulmonary embolism Myocarditis Left ventricular hypertrophy Hypertrophic or restrictive cardiomyopathy Valvular heart disease Congenital heart disease Atrial and ventricular tachyarrhythmias Heart contusion Cardioversion, ICD shock Surgical procedures involving the heart Pulmonary hypertension
Non-cardiac	Advanced age Ischaemic stroke Subarachnoid haemorrhage Renal dysfunction Liver dysfunction (mainly liver cirrhosis with ascites) Paraneoplastic syndrome COPD Severe infections (including pneumonia and sepsis) Severe burns Anaemia Severe metabolic and hormone abnormalities (e.g. thyrotoxicosis, diabetic ketosis)

BNP < 35 pg/ml
or
NT-pro BNP < 125 pg/ml
has good negative predictive value

BNP/NT-pro BNP can be very low in obese patients

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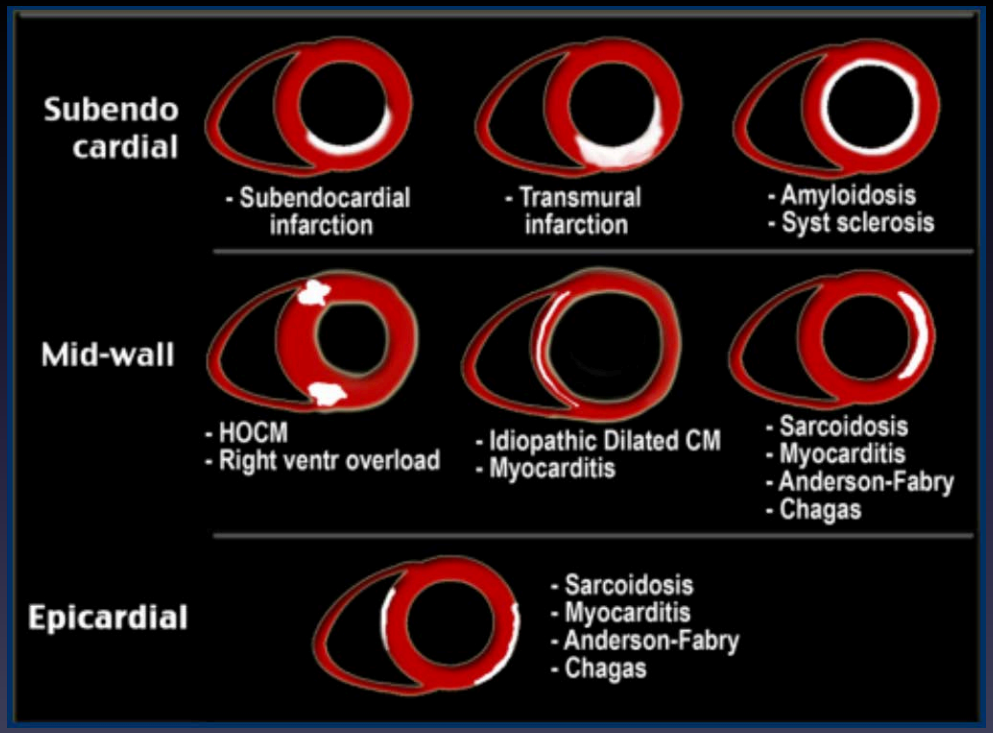
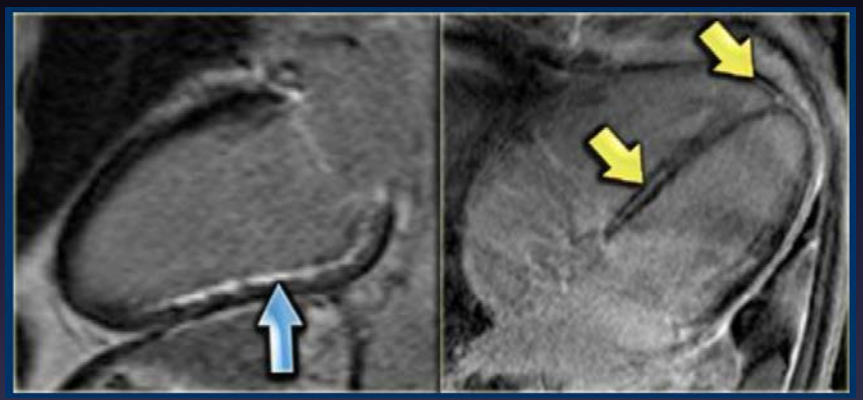
Cardiac MRI

Identifying the aetiology of heart failure





van Es et al. Radiology Assistant

How to manage
- Heart failure with reduced EF -

Aims

1. Reduction in mortality
2. Reduction in hospitalisation
3. Improvement in functional capacity, quality of life

HFrEF Pharmacotherapy

Which of these medications improves *survival* in heart failure

A. Digoxin

B. Ramipril

C. Amlodipine

D. Atenolol

HFrEF Pharmacotherapy

Which of these medications is *contraindicated* in heart failure

A. Digoxin

B. Ramipril

C. Amlodipine

D. Atenolol

HFrEF Pharmacotherapy

Cornerstone therapy

- Target RAAS and sympathetic nervous system
  - ACE-I / ARB or ARNI
  - Cardioselective beta-blocker
  - Mineralocorticoid receptor antagonist

Uptitrate to maximum tolerated recommended dose

HFrEF new pharmacotherapy

SGLT2 inhibitors

- Dapagliflozin and Empagliflozin
- Added to ACEI / ARNI / BB / MRA
- Dapagliflozin – available on PBS
- Empagliflozin – awaiting PBS listing

➢ Reduce the risk of CV death and worsening HF

Improving symptoms of HF

- Diuretics
  - Loop diuretics ± thiazides
- Ivabradine
  - Sinus rhythm, HR ≥ 70bpm, LVEF ≤ 35%, hospitalisation within 1 year
- (Digoxin)
  - Digoxin level < 1.2ng/ml

Patients requiring further treatment

- Hospitalisation for decompensated HF
  - Intravenous diuretics
  - IV dobutamine
  - IV levosimendan
- Early follow-up by Cardiologist or General Practitioner post-discharge

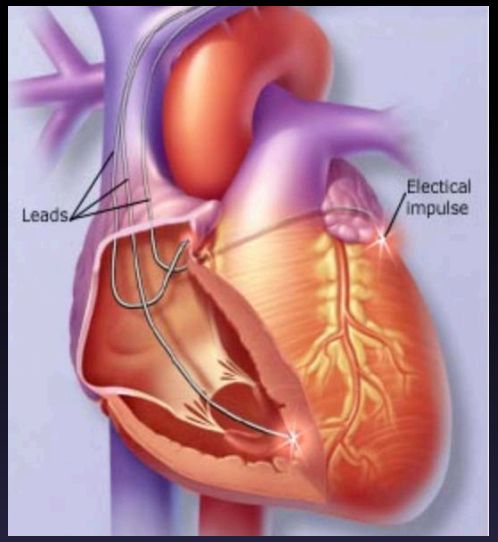
Non-pharmacological therapy

Education of patient

- Fluid restriction (1.2 or 1.5L/day)
- No added salt
- Daily weights
- Titration of diuretics to avoid hospitalisation

Heart failure community nurse follow-up

Cardiac resynchronisation therapy



- Symptomatic patients
- QRS ≥ 150 ms
  - QRS ≥ 130 ms
- LVEF ≤ 35% despite optimal medial therapy
- Sinus rhythm or AV nodal ablation in AF

Antiarrhythmics in heart failure

Which of these antiarrhythmic agents is *preferred* in maintaining sinus rhythm in HF?

A. Sotalol

B. Amiodarone

C. Flecainide

D. Diltiazem

Antiarrhythmics in heart failure

Which of these antiarrhythmic agents is *contraindicated* in heart failure?

A. Sotalol

B. Amiodarone

C. Flecainide

D. Diltiazem

Atrial and ventricular arrhythmias in HFrEF

- Amiodarone
  - Superior efficacy in maintaining sinus rhythm and reducing ventricular arrhythmias in HF
  - Probable reduction in mortality (ventricular arrhythmias)
- Implantable cardioverter-defibrillators (ICD)
  - Reduces risk of sudden cardiac death
  - Secondary prevention
  - Ischaemic CM > > non-ischaemic CM
  - If LVEF ≤ 35% after 3 months of optimal medical therapy

Treating iron deficiency

Ferritin < 100ug/l

or 100-299 if Trans sat < 20%

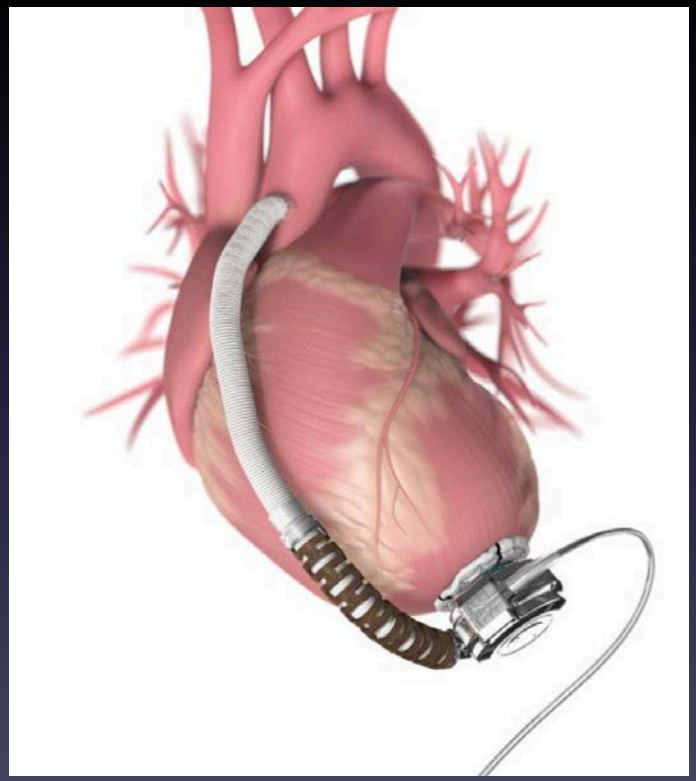
Hb 95-135

Ferric carboxymaltose 1g IV

Improves symptoms and reduces HF hospitalisation

Ventricular assist devices

- Left, right or biventricular assist devices



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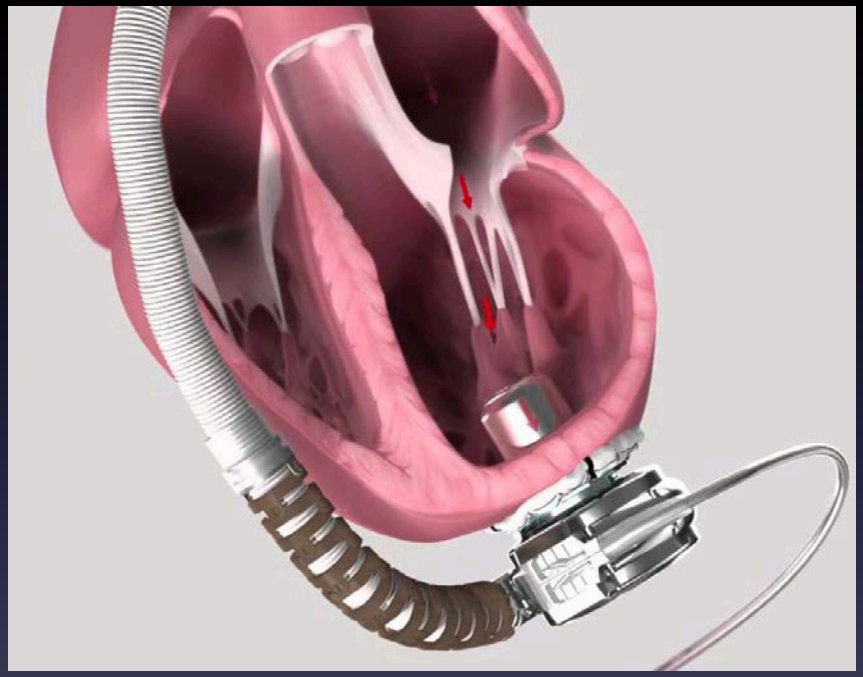

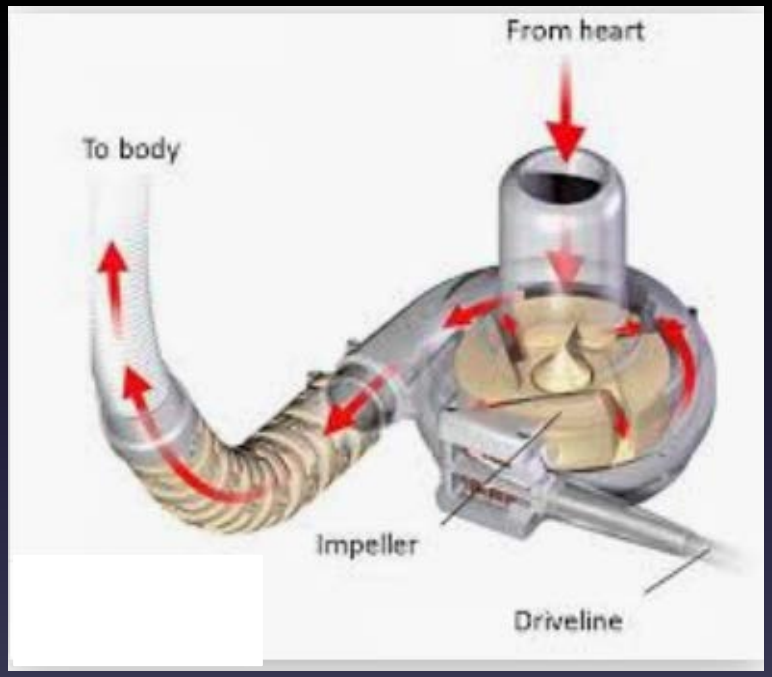

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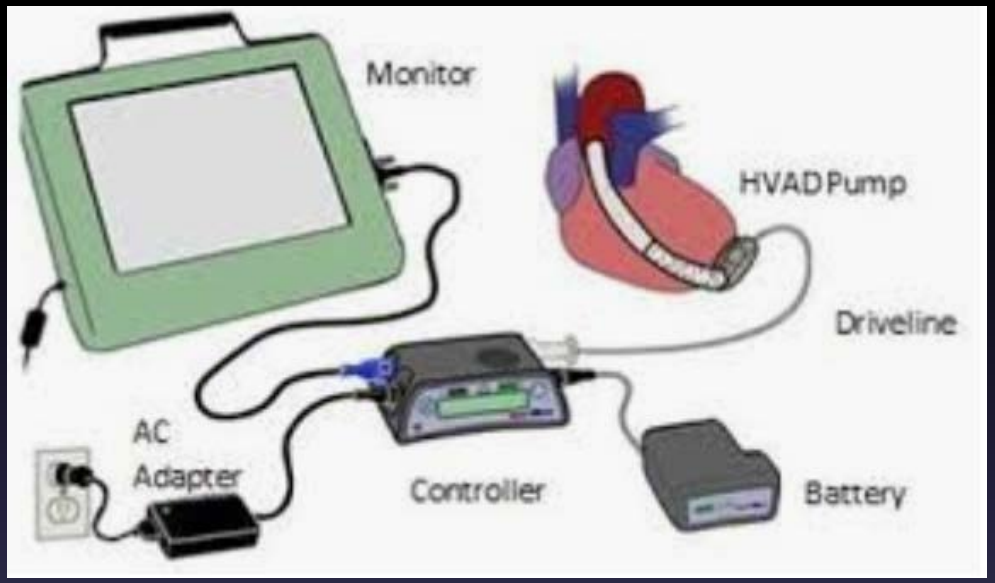


Ventricular assist devices

Indications

- Severe intractable heart failure (L, R or biventricular)
- As a bridge to transplantation

Complications

- GI bleeding, infections, pump thrombosis, haemolysis

Cardiac transplantation

Patients with advanced (end-stage) heart failure

- Frequent hospitalisations
- Symptoms of low cardiac output and congestive heart failure
  - Despite optimal medical and device therapy
- NYHA Class III-IV

Heart failure with mid-range EF and preserved EF

HFmrEF

- LVEF 41-49%
- Features of patients similar to HFrEF
  - Men, younger, IHD, less AF and comorbidities
  - Includes patients who improved from LVEF ≤ 40% or declined from ≥ 50%

HFmrEF

- Diuretics for congestion
- ACE-I, ARB, BB, MRA, ARNI *may* be considered
  - Often patients on these treatments for other indications, therefore should be continued
- Device therapy – insufficient evidence

HFpEF

- LVEF ≥ 50%
- Older patients, female, AF, CKD, non-CV comorbidities more common
- Screen for causes and treat non-CV comorbidities
- Heterogenous condition
- No benefit in ACE-I, ARB, ARNI, BB, MRA
- Diagnostic features:
  - Dilated LA, raised filling pressures (E/e’ > 9), raised NT-pro BNP, raised pulmonary pressures

HFpEF

SGLT2-I

- EMPEROR-Preserved trial
  - Reduced cardiovascular death or hospitalisation
  - However LVEF > 40%
  - Empagliflozin 10mg daily
- The only medication shown to improve survival and hospitalisation in HFpEF.

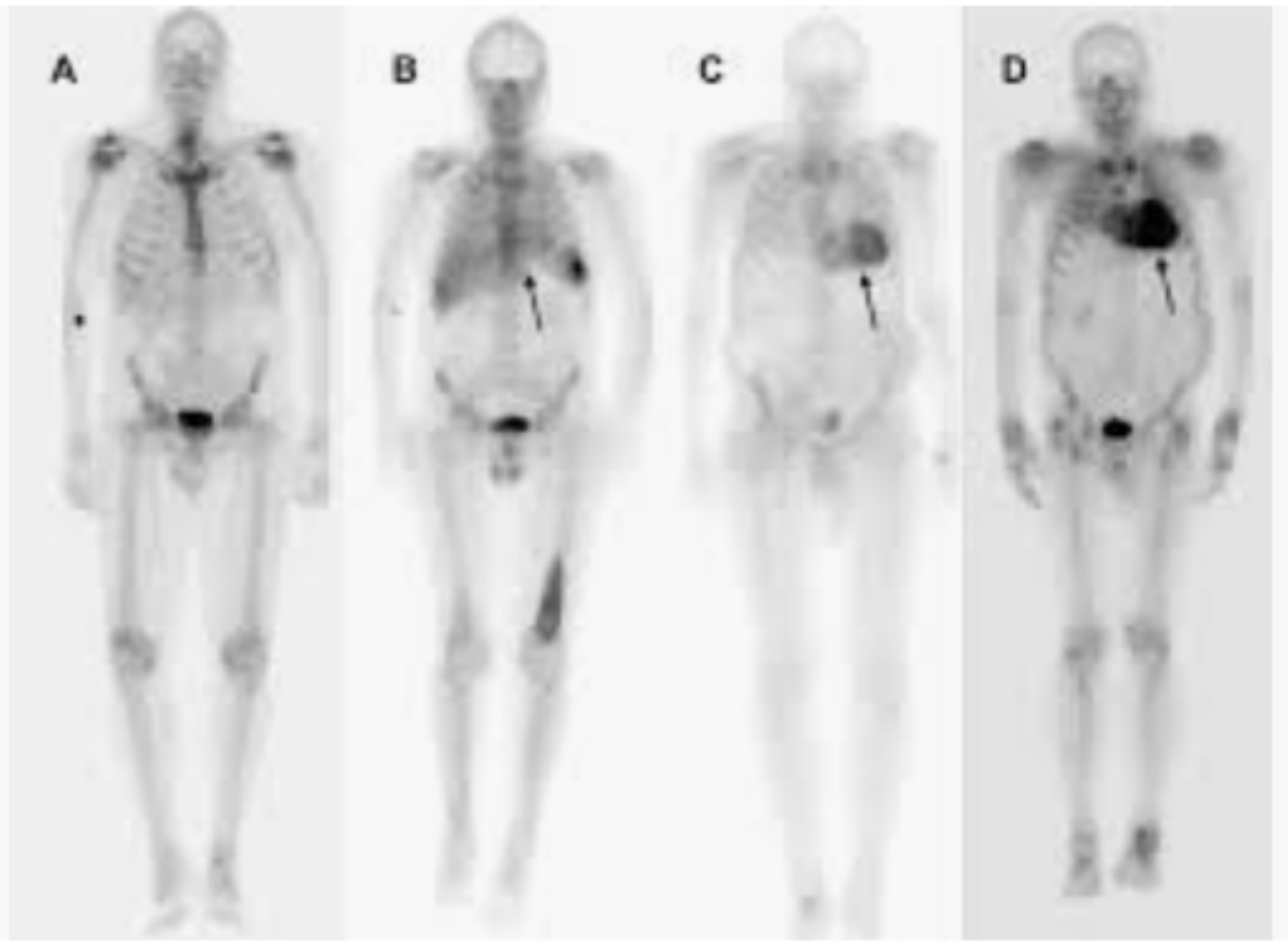
Cardiac amyloidosis

- Can be a cause of HFpEF
- Suspect if LVH
  - Other clues: peripheral neuropathy, bilateral carpal tunnel, other systemic involvement
  - AL: Serum EPG, IEPG, free light chains, urine Bence Jones protein, bone marrow biopsy
  - ATTR: Bone scan
- If AL amyloid – treat the cause (eg. myeloma)
- If ATTR amyloid
  - Clinical trials underway for RNA interference agents – prevents formation of ATTR protein
  - Tafamidis – Stabilises ATTR tetramer (prevent breakdown into monomer)

Circulation. 2016 Jun 14;133(24):2404-12. doi: 10.1161/CIRCULATIONAHA.116.021612. Epub 2016 Apr 22.

Nonbiopsy Diagnosis of Cardiac Transthyretin Amyloidosis.

Gillmore JD[1], Maurer MS[1], Falk RH[1], Merlini G[1], Damy T[1], Dispenzieri A[1], Wechalekar AD[1], Berk JL[1], Quarta CC[1], Grogan M[1], Lachmann HJ[1], Bokhari S[1], Castano A[1], Dorbala S[1], Johnson GB[1], Glaudemans AW[1], Rezk T[1], Fontana M[1], Palladini G[1], Milani P[1], Guidalotti PL[1], Flatman K[1], Lane T[1], Vonberg FW[1], Whelan CJ[1], Moon JC[1], Ruberg FL[1], Miller EJ[1], Hutt DF[1], Hazenberg BP[1], Rapezzi C[1], Hawkins PN[1].



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If AL amyloid – treat the cause (eg. myeloma)

If ATTR amyloid

- Clinical trials underway for RNA interference agents – prevents formation of ATTR protein
- Tafamidis – Stabilises ATTR tetramer (prevent breakdown into monomer)

Case study

- 33yo female G3P3, 2 weeks post-partum
- Dyspnoea, gross pedal oedema, orthopnoea, PND, fatigue
- PMHx – nil significant Rx – Nil regular
- Non-smoker, no alcohol

Case studies

O/E

- BP 100/70mmHg, HR 110bpm, RR 24/min, SaO_2 92% on room air
- JVP mid-neck, HSD no murmurs, chest bibasal crepitations, mild ascites, gross pitting lower limb oedema

Case studies

- Na 131, K 3.8, Creatinine 130, eGFR 45
- Hb 120, ferritin 120, transferrin sats 15%
- LFTs – raised AST and ALT
- NT-pro BNP 14,000
- ECG – sinus tachycardia 110bpm
- Echocardiogram: LVEDD 60mm, ESD 50mm, LVEF 30%, no regional wall motion abnormalities, severe MR, moderate TR, RVSP 50mmHg.

Case studies

- Diagnosis: peripartum cardiomyopathy
- Treatment:
  - Admit to hospital (CCU)
  - IV frusemide (possible infusion), may need IV dobutamine, cardiac monitoring, daily EUCs, K replacement if needed
  - Gradual introduction of cardioselective beta-blockers, ARB/ACE-I or ARNI, MRA, switch to oral frusemide
  - Educate re. condition, fluid restriction, salt restriction, community heart failure nurse follow-up, early follow-up with cardiologist and GP post-discharge

Case studies

- Potential issues that may arise
  - Hypotension (symptomatic or asymptomatic)
    - Accept SBP > 90mmHg (or 85mmHg) if asymptomatic
    - Do not stop BB or ARB/ACE-I/ARNI, but can reduce the dose if symptomatic
  - Over-diuresis
    - Rationalise diuretics, K+ supplements
  - Hyperkalaemia
  - Renal impairment
  - Ventricular arrhythmias
  - Medication expenses, side effects, compliance
  - Social circumstances, family, carers

Case studies

Follow-up: Scenario 1

- Follow-up echocardiogram 1 month
  - LVEF 30%, mild-mod MR, mild TR, RVSP 35mmHg
- Patient euvolaemic, NYHA class II BP 90/50mmHg, HR 50bpm sinus rhythm no AV nodal block
- Follow-up echocardiogram 3 months
  - LVEF 45%, no MR, mild TR, RVSP 20mmHg
  - NYHA Class I-II

Case studies

Follow-up: Scenario 2

- Follow-up echocardiogram 1 month
  - LVEF 30%, mild-mod MR, mild TR, RVSP 35mmHg
- Mild pedal oedema, NYHA class II-III, BP 90/50mmHg, HR 50bpm sinus rhythm no AV nodal block
- Consider readmission to hospital for IV diuresis, IV dobutamine, adding SGLT-2 inhibitor , or increase oral diuretics, check medication compliance and side effects
- Follow-up echocardiogram 3 months
  - LVEF 40%, NYHA class II

Thank you