Heart Failure

Definition: Heart failure is the state that develops when the heart can not maintain an adequate cardiac output or can do so only at the expense of an elevated filling pressure.

Classification:

Left, right and bi-ventricular heart failure:

1. Left sided heart failure
2. Right sided heart failure
3. Biventricular heart failure

Forward and backward heart failure

1. Forward failure
2. Backward failure

Diastolic and systolic dysfunction

1. Systolic dysfunction
2. Diastolic dysfunction

High output failure

Acute and chronic heart failure

Compensatory mechanisms activated heart failure

1. Activation of sympathetic nervous system
2. Activation of renin-angioitensin-aldosterone system
3. Vasopressin system
4. Endothelin system

Complications of heart failure:

1. Renal failure
2. Hypokalaemia
3. Hyperkalaemia
4. Hyponatraemia
5. Impaired liver function
6. Thromboembolism
7. Atrial and ventricular arrhythmias

Factors precipitating or aggravating heart failure in patients with pre-existing heart disease

1. Myocardial ischaemia or infarction.
2. Intercurrent illness (e.g. infection)
3. Arrhythmia
4. Inappropriate reduction of therapy
5. Administration of a drug with negative inotropic properties or fluid retaining properties
6. Pulmonary embolism
7. Increased metabolic demand e.g. pregnancy, thyrotoxicosis, anaemia
8. Intravenous fluid overload

Acute left ventricular failure

Differential diagnosis of severe respiratory distress:

- Acute left ventricular failure
- Tension pneumothorax
- Acute severe bronchial asthma
- Acute exacerbation of COPD
- Diabetic ketoacidosis
- Psychogenic hyperventilation

Important causes of acute LVF:

1. Myocardial infarction (MI)
2. Systemic hypertension (HTN)
3. Cardiomyopathy
4. Aortic stenosis
5. Mitral stenosis and mitral regurgitation

Clinical features:

Symptoms:

- Sudden onset of dyspnoea at rest
- Acute respiratory distress
- Orthopnoea and prostration

Signs:

- Cold periphery
- Rapid pulse

- Inappropriate bradycardia or excessive tachycardia
- Blood pressure is usually high (due to sympathetic nervous system activation), may be normal or low if the patient is in cardiogenic shock.
- JVP is usually elevated.
- Auscultation of heart reveals a gallop rhythm, with third heart sound
- Auscultation of the lungs:

    Bilateral basal crepitation

    Expiratory rhonchi

Investigation

1. ECG: Features of MI, ischaemia, LVH
2. CXR: Pulmonary oedema, cardiomegaly
3. Echocardiography
4. Blood tests: Serum creatinine, blood urea, electrolytes, FBC, cardiac enzymes, RBS

Treatment:

1. Propped up position (reduction of pulmonary congestion)
2. Oxygen: High flow, high concentration. Non invasive CPAP of 5 - 10 mm Hg with tight fitting mask.
3. Nitrates: IV glyceral trinitrate 10 - 200 μg/min or buccal glyceral trinitrate 2 - 5 mg titrated upwards every 10 minutes, until clinical improvement occurs or systolic blood pressure falls to <110 mm Hg.
4. Loop diuretic: Furosemide 50 - 100 mg IV.

Intravenous opiates should be used sparingly,

Inotropic agents if no improvement

Intra aortic balloon pump

Causes of isolated right heart failure:

- Chronic lung disease (cor pulmonale)
- Pulmonary embolism
- Pulmonary valvular stenosis

Causes of biventricular heart failure:

- Dilated cardiomyopathy affecting both ventricles
- Ischaemic heard disease affecting both ventricles

- Disease of the left heart leading to chronic elevation of the left atrial pressure, pulmonary hypertension and right heart failure

Chronic heart failure:

Symptoms and signs:

Cause	Examples	Features
Reduced ventricular contractility	MI (Segmental dysfunction) Myocarditis/cardiomyopathy (Global dysfunction	Progressive ventricular dilatation
Ventricular outflow obstruction	Hypertension, aortic stenosis (left heart failure) Pulmonary hypertension, pulmonary valve stenosis (right heart failure)	Initially, high systolic pressure. Later, failure with ventricular dilatation and rapid clinical deterioration
Ventricular inflow obstruction	Mitral stenosis, tricuspid stenosis	Small, vigorous ventricle, dilated hypertrophied atrium. Atrial fibrilation.
Ventricular volume overload	VSD, Right ventricular volume overload (e.g. atrial septal defect) Increased metabolic demand (high output)	Dilatation and hypertrophy
Arrhythmia	Atrial fibrillation Tachycardia cardiomyopathy Complete heart block	See 546 of Davidson
Diastolic dysfunction	Constrictive pericarditis Restrictive cardiomyopathy Left ventricular hypertrophy and fibrosis	See same

Symptoms and signs for Chronic heart failure:

Relapsing and remitting course with periods of stability and episodes of decompensation.

Low cardiac output:

- Fatigue
- Listleness
- Poor effort tolerance
- Cold periphery
- Low BP
- Oliguria and uraemia

Pulmonary oedema with left heart failure

- Basal inspiratory crepitation

Right heart failure

- High JVP
- Dependent peripheral oedema
- Ascites or pleural effusion

Occasionally

- Cardiac cachexia

Investigations:

- CXR
- ECG
- Echocardiography
- S. urea, s. electrolytes, haemoglobin %, thyroid function tests

Management:

General measures

- Weight reduction
- Avoidance of high salt food and added salt
- Regular moderate aerobic exercise within limits of symptoms
- Consider influenza and pneumococcal vaccination

Drug therapy:

- Diuretic therapy

	Starting dose	Target dose
Ace inhibitors		
Enalapril	2.5 mg twice daily	10 mg twice daily
Lisinopril	2.5 mg daily	20 mg daily
Ramipril	1.25 mg daily	10 mg daily
Angiotensin receptor blockers		
Losartan	25 mg daily	100 mg daily
Candensartan	4 mg daily	32 mg daily
Valsartan	40 mg daily	160 mg daily

- Vasodilator therapy

- Beta-adrenoceptor blocker therapy

Bisoprolol started at a dose of 1.25 mg daily, and increased gradually over a 12 week period to a maintenance dose of 10 mg daily.

- Ivabradine
- Digoxin
- Amiodarone

Myocardial Infarction

Characteristics of chest pain:

- Site: Centre of the chest
- Mode of onset: Takes several minutes or longer
- Character: Dull, constricting, chocking or heavy
- Radiation: Either or both arms, throat, jaw, less commonly back, epigastrium
- Associated symptoms: Breathlessness, profuse sweating, nausea, vomiting, palpitation
- Duration: Prolonged
- Ecacerbating factors: Exertion, excitement, cold weather, exercise
- Relieving factors: Not relieved by rest or GTN
- Severity: Severe, fear of death

Symptoms:

- Prolonged cardiac pain
- Anxiety and fear of impending death
- Nausea and vomiting
- Breathlessness
- Collapse

Signs:

- Sympathetic activation: Pallor, sweating, tachycardia
- Parasympathetic activation: Vomiting, bradycardia
- Impaired myocardial function:
    - Hypotension, oliguria, cold peripheries
    - Narrow pulse pressure
    - Raised jugular venous pressure

    - Third heart sound
    - Quiet first heart sound
    - Diffuse apical impulse
    - Lung crepitation
- Tissue damage: Fever
- Complications: Mitral regurgitation, pericarditis

Investigations:

- ECG: ST elevation, T wave inversion, Pathological Q wave
- Plasma biochemical markers: CKMB, Troponin I, Troponin T
- Blood test: Leucocytosis, raised ESR and CRP
- CXR: Pulmonary oedema if LVF
- Echocardiography: Wall motion
- Coronary angiography

Treatment of acute MI:

1. Hospitalization
2. High flow oxygen
3. Intravenous access
4. ECG monitoring
5. Aspiring 300 mg chewed and clopidogrel 600 mg oral
6. Sublingual glyceryl trinitrate
7. Intravenous analgesia
8. Beta blockers
9. Thrombolytic or anticoagulant
10. PCI
11. Detection and management of acute complications
12. CABG

Late management:

- Lifestyle modification:
    - Smoking cessation
    - Regular exercise
    - Weight reduction

        - Avoid red meat, alcohol, egg yolk
        - Avoid excess salt
        - Green leafy vegetable, fruits
        - Sound sleep
    - Drug therapy (secondary prevention)
        - Antiplatelet therapy
        - Beta blocker
        - ACE inhibitor/ ARB
        - Lipid lowering agents
        - Dm, HTN control
    - Implantable cardiac defibrillator in high risk patient

Complications:

- Arrhythmias
- Ischaemia
- Acute circulatory failure
- Pericarditis
- Mechanical
- Embolism
- Impaired ventricular function
- Remodeling
- Ventricular aneurysm

Hypertension

Definition: Sustained diastolic pressure greater than 90 mmHg or a sustained systolic pressure greater than 140 mmHg is called hypertension.

Grading of Hypertension:

	Systolic	Diastolic
Optimal	<120	<80
Normal	<130	<85
High normal	130 - 139	85 - 89
Hypertension		
Grade 1	140 - 159	90 - 99
Grade 2	160 - 179	100 - 109
Grade 3	≥ 180	≥110
Isolated systolic hypertension		
Grade 1	140 - 159	<90
Grade 2	≥ 160	<90

Measurement of Blood Pressure:

- Rest, no exercise at least from 30 minutes before recording
- No smoking, alcohol, coffee, tea at least from 15 minutes before
- Correct sized cuff
- Sitting position
- Remove tight clothing
- Support arm at level of heart
- Palpate brachial artery

Causes of Hypertension:

A. Essential: 95%

B. Secondary:

1. Alcohol
2. Obesity
3. Pregnancy
4. Renal disease:
   - Renal vascular disease
   - Parenchymal renal disease
   - Polycystic kidney disease
5. Endocrine disease:
   - Pheochromocytoma
   - Cushing‘s syndrome
   - Primary hyperaldosteronism
   - Hyperparathyroidism
   - Acromegaly
   - Primary hypothyroidism
   - Thyrotoxicosis
   - Congenital adrenal hyperplasia
   - Liddle‘s syndrome
6. Drugs:
   - Oral contraceptive
   - Corticosteroids
   - NSAID
   - Carbenoxolone
   - Sympathetic agents
7. Coarctation of aorta

White coat hypertension:

20%

Clinical assessment

History:

1. Family history
2. Lifestyle
3. Drugs or alcohol
4. Secondary hypertension e.g. phaeochromocytoma
5. Complications of hypertension e.g. coronary artery disease

Examination:

1. Radio-femoral delay
2. Enlarged kidneys
3. Abdominal bruits
4. Cushingoid facies
5. Features of risk factors: Central obesity, tendon xanthoma
6. Left ventricular hypertrophy
7. Accentuation of A2, fourth heart sound
8. Ophthalmoscopy
9. Generalised atheroma, aortic aneurism, features of PVD

Investigations:

- Urine for blood, protein and glucose
- Blood urea, Serum electrolytes, serum creatinine
- Blood glucose
- Serum total cholesterol, Serum HDL
- 12 lead ECG

To screen secondary hypertension

- CXR
- Ambulatory blood pressure recording
- Echocardiogram
- USG of KUB
- Renal angiography
- Urine for catecholamines
- Urine for cortisol level
- Plasma renin, plasma aldosterone

Treatment:

Non drug therapy:

- Correction of obesity
- Reduction of alcohol intake
- Restriction of salt intake
- Regular physical exercise
- Increase consumption of fruit and vegetables

Antihypertensive drug therapy:

A. ACE inhibitors and ARBs

ACE Inhibitors	
Ramipril	5 - 10 mg daily
Enalapril	20 mg daily
ARBs	
Losartan	50 - 100 mg daily
Valsartan	40 - 160 mg daily

B. Beta blockers

Atenolol	50 - 100 mg daily
Metoprolol	100 - 200 mg daily
Bisoprolol	5 - 10 mg daily

C. Calcium channel blockers

Amlodipine	5 - 10 mg daily
Nifedipine	30 - 90 mg daily

D. Diuretics

Hydrochlorthiazide	12.5 - 25 mg daily
Frusemide	40 mg daily

E. Others

- Both alpha and beta blockers: Carvidelol, labetalol
- alpha Blockers: Prazosin, doxazosin
- Centrally acting: Methyldopa 250 mg 8 hourly, clonidine

- Vasodilators: Hydralazine, minoxidil

Adjuvant drug therapy:

- Aspirin: 75 mg daily
- Statins: Atorvastatin 10 - 20 mg daily

Choice of anti-hypertensive drugs:

Coexisting condition	Choice of drugs
Bronchial asthma or COPD	Other than Beta blockers
Heart block	Other than beta blockera and calcium channel blockers
Diabetes mellitus	ACE inhibitors and ARBs are 1st line
CRF	Other than ACE inhibitors
Gout	Other than thiazide diruetics
Pregnancy	alpha methyldopa, labetolol, nifedipine, hydralazine
PVD	Other than beta blockers

Complications of hypertension:

- CNS
    1. Stroke
    2. Transient cerebral ischaemic attacks
    3. Subarachnoid haemorrhage
    4. Hypertensive encephalopathy
- Retina
    1. Hypertensive retinopathy
    2. Central retinal vein thrombosis
- Heart
    1. Coronary artery disease
    2. Left ventricular failure
    3. Atrial fibrillation
- Kidneys
    1. Proteinuria
    2. Renal failure