CVS

HYPERTENSION

ISH classification of HTN

Category	Systolic BP	Diastolic BP
Normal	<130	<85
High normal	130-139	85-89
Grade 1	140-159	90-99
Grade 2	≥160	≥100

Isolated systolic HTN

SBP >140 ; DBP <90

Seen in : Arteriosclerosis
Fever
Thyrotoxicosis
Patent Ductus Arteriosus
AR
A-V fistula

} high output states

MANAGEMENT

Non pharmacological management

- Weight reduction [BMI <25 kg/m²]
- Physical activity [Brisk walking for 30min]
- DASH diet [Dietary Approach to Stop HTN]
  Diet rich in fruits and vegetables. Low fat diary products with reduced saturated & total fat
- Salt restriction

Medical management-

classes of antihypertensives:

1. ACEi
2. ARBs
3. CCB
4. Thiazide diuretics
5. β blockers
6. α blockers

Stepwise management:

Step 1: A + C low dose

Step 2: A + C high dose

Step 3: A + C + D

↳ thiazide or thiazide like

Step 4: A + C + D + MRA

↳ spironolactone

For diabetic pt: ACEi / ARB

AF: β blockers, Non DHP-CCB

CKD: ACEi / ARB, DHP-CCB, Thiazide like diuretics

Avoid spironolactone

MI: β blockers

Resistant HTN:

SBP > 140 and DBP > 90 despite patient being on 3 antihypertensives one being a diuretic

TYPES

(i) Essential HTN

- Primary HTN
  - w/o underlying cause
- Multifactorial
  - Genetic
  - Dietary
  - Environmental
  - Obesity
  - Metabolic syndrome

(ii) Secondary HTN

- Renal parenchymal disease – CKD
- Renovascular disease – RAS
- OSA
- Coarctation of aorta
- 1° aldosteronism
- Pheochromocytoma
- Cushing Sx
- Hypo & hyperthyroidism
- Acromegaly

Inv: Evaluation of corresponding disease

HYPERTENSIVE CRISIS

SBP > 180 OR DBP > 120

(I) Hypertensive urgency

- Asymptomatic
- No organ impairment

(II) Hypertensive emergency

- A/c impairment in ≥ 1 organ
  - Heart - MI, LV hypertrophy
  - Kidney - AKI
  - Brain - Stroke, encephalopathy
  - Large artery - Aortic dissection
- Also known as:
  - End organ damage
  - HTN mediated organ damage

• Malignant HTN / Accelerated HTN

High BP + Hypertensive retinopathy

↳ Arteriolar spasm
Hemorrhage
Exudate
Papilledema

MANAGEMENT

- Hypertensive urgency & malignant HTN - oral
  [same as HTN]

- Hypertensive emergency - parenteral

  Hypertensive encephalopathy -

  with 2 hrs

  SBP < 160 & DBP < 100

  Do not reduce MAP > 25% in 2 hrs

Preferred drugs: Nitroprusside, Nicardipine, Labetalol } stroke & encephalopathy

Nitroglycerine

Phentolamine - Pheochromocytoma

CONGESTIVE CARDIAC FAILURE

Heart failure describes the clinical syndromes that develop when heart cannot maintain adequate output or can do so only at the expense of elevated ventricular filling pressure.

Left heart failure:

- Reduced LV output
  Increased LA & pulmonary venous pressure
  → A/c left heart failure - Pul. edema
  → Ch. left heart failure - Pul. HTN

Right heart failure:

- Reduced RV output
  Increases RA & systemic venous pressure
  Causes – Chronic lung disease
  Pulmonary embolism
  Pulmonary valvular stenosis

✱ COR PULMONALE –

RV dilatation or dysfunction that occurs secondary to diseases of:

- Lung parenchyma - COPD
- Interstitium – ILD
- Pulmonary vasculature - Pul. HTN
- Skeletal system - Kyphoscoliosis

ETIOLOGY

- Coronary artery disease
- Hypertension
- Regurgitant valvular lesion
- Obstructive valvular lesion
- Arrythmias
- Cor-pulmonale
- Cardiomyopathies

- Myocarditis
- Pericarditis with effusion
- Collagen vascular disease - SLE
- Endocrine conditions - Thyroid disorders
- Obstructive sleep apnoea
- Fluid overload

High output states - Anemia
Fever
Thyrotoxicosis
Beri-Beri
CKD
Pregnancy

CLINICAL FEATURES

- Fatigue
- Dyspnoea
- Orthopnoea
- PND
- Swelling of legs

O/E

- Pedal edema
- Elevated JVP
- Hepatomegaly
  - ↳ CONGESTIVE HEPATOMEGALY
- Ascites
- S3
- Rales or crepitations

Right

Left

COMPLICATIONS

- Renal failure
- Hypokalemia
- Hyperkalemia
- Hyponatremia
- Impaired liver function
  - due to hepatic venous congestion
- Thromboembolism
- Atrial and ventricular tachyarrhythmias
- Sudden death

INVESTIGATIONS

- ECG – to know the cause
- Chest x-ray – Cardiomegaly
  Pulmonary venous HTN
- NT-Pro BNP – Prognostic marker
- Troponin I/T – To r/o MI
- Echo
  To know ejection fraction
  whether systolic or diastolic
- Holter monitoring
  To detect arrythmias
- MRI
  When suspecting amyloidosis, sarcoidosis, hemochromatosis
- Cardiac CT angio
- Nuclear imaging

Treatment of acute heart failure

- Propped up position
- O_2 delivery
  - Nasal prongs, mask, CPAP, mechanical ventilation
- IV morphine
  - Increases venous capacitance
  - Reduce cA pressure
  - Reduce anxiety
- IV diuretics
  - Loop diuretic - furosemide
- Vasodilators
  - Nitroglycerin
  - Nitroprusside
- Inotropes
  - Norepinephrine
  - Dopamine
  - Dobutamine

TREATMENT OF CHRONIC HEART FAILURE

- General measures
  - Salt restriction

- PHARMACOLOGIC THERAPIES

4 PILLARS:

- ARNI / ACE inhibitor / ARB
- Diuretic
  - Mineralocorticoid receptor antagonist
    - eg:- Spironolactone
- β blocker
  - eg:- Metoprolol
    - Bisoprolol
    - Carvedilol
- SGLT2 inhibitor
  - eg:- Dapagliflozin

Other drugs:

- ARNI [Angiotensin Receptor Blocker + Neprilysin inhi]
  - eg:- Sacubitril + Valsartan
- ACEi / ARB
- β blocker
- Loop diuretic
- Aldosterone antagonist
- Hydralazine
- SGLT2 inhibitor
- Isosorbide dinitrate
- Ivabradine

For heart failure with preserved ejection fraction:

- SGLT2 inhibitor
- Diuretics
  to correct fluid overload
- Treat comorbidities

- **NON PHARMACOLOGICAL TREATMENT**

1. Implantable cardiac defibrillators
   In patients who are at risk of sudden cardiac death

2. Cardiac resynchronisation therapy
   In patients with marked conduction system disease

3 Ventricular assist device
   Assist cardiac output by using a propeller, centrifugal or pulsatile pump
   They withdraw blood through cannulae inserted in atria or ventricular apex and pump it into pulmonary artery or aorta

4. Intraaortic balloon pump

5. Coronary revascularization
   - Coronary artery bypass surgery
   - Percutaneous coronary intervention

6. Cardiac transplantation

MITRAL STENOSIS

CAUSES

- Rheumatic heart disease
- Congenital MS
- Mitral annular calcification
  extending to leaflets
- Cor triatriatum
  A septum develops from wall of RA that separates RA into 2
  This narrowes the area of valve
- Left atrial myxoma

PATHOPHYSIOLOGY

- Increase LA pressure
- Pulmonary HTN
- Decrease LV filling
- Low cardiac output

Triggers :- causes decompensation

- Exercise
- Anemia
- Pregnancy
- Thyrotoxicosis
- Infections
- AF

CLINICAL FEATURES:

- 20 - 40 yrs
- Exertional dyspnoea
- Hemoptysis
- Palpitations

- Pulmonary edema
- Right heart failure
- Ortner's syndrome
- Mitral facies
  - ↳ flushed appearance

Ortner's syndrome:

Enlarged LA compress left recurrent laryngeal nerve causing hoarseness of voice

O/E

- Pulse - AF
- BP - Normal [low in severe MS]
- JVP
  - absent a wave - AF
  - giant a wave - pul. HTN
- Apex - Tapping
- Left parasternal heave
- Palpable P2
- Loud S1, P2
- MDM
- Opening snap

Characteristics of murmur

Low pitched, rough rumbling, mid-diastolic murmur best heard over apex with bell of stethoscope with patient in left lateral position

→ Pre-systolic accentuation of MDM murmur

Absent when patient is in AF

INVESTIGATIONS

- ECG → AF
  - P-mitrale
    - ↳ due to LA enlargment
- Echocardiography
  - Dilated LA
  - Area of mitral valve
  - Degeneration & calcification of valve
- CXR

Due to LA enlargment -

- Straightening of left heart border
- DOUBLE DENSITY SIGN
- Elevation of main bronchus
- Splaying of carina

Due to pulmonary HTN -

- Upper lobe diversion
- Prominent pulmonary artery
- Kerly B-lines
- Batwing opacities

TREATMENT

MEDICAL MANAGEMENT

- Heart failure
- AF

INTERVENTION

→ Percutaneous mitral balloon valvulotomy / valvuloplasty

→ Mitral valve replacement

Indications for intervention:

- Symptoms
- Valve orifice area $\leq 1.5 cm^2$

PRINCIPLES OF MANAGEMENT OF CARDIAC ARRYTHMIAS

Anti-Arrythmic Drugs

CLASS I DRUGS

CLASS Ia – Quinidine
Disopyramide
CLASS Ib – Lidocaine
Mexiletine
CLASS Ic – Flecainide
Propafenone

Other drugs

- Atropine sulphate
- Adenosine
- Digoxin

CLASS II DRUGS – β blockers

- Atenolol
- Bisoprolol
- Metoprolol

CLASS III DRUGS-

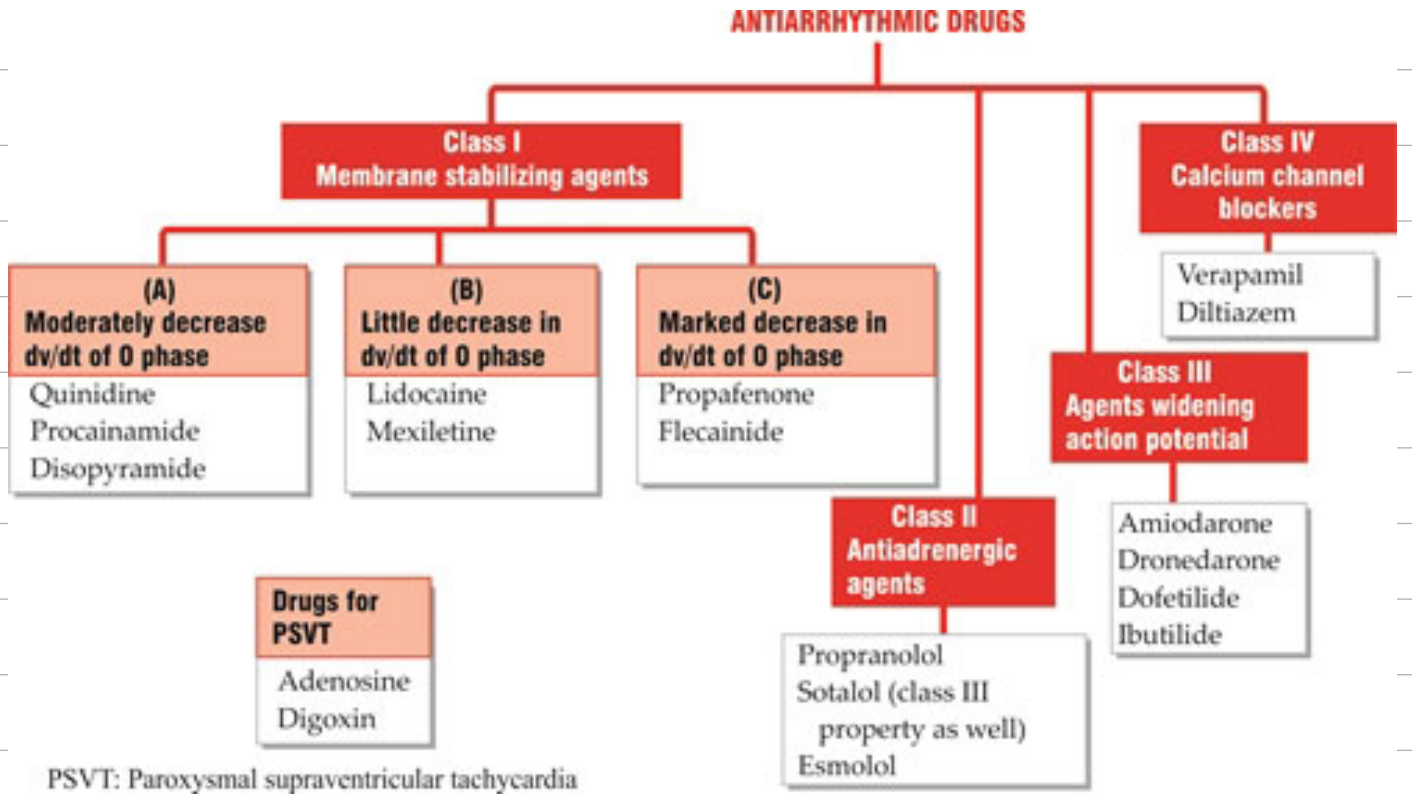
- Amiodarone
- Dronedarone
- Sotalol

CLASS IV DRUGS – Ca Channel Blockers

- Verapamil
- Diltiazem

Non Pharmacological Treatment

- Electrical cardioversion
- Defibrillation
- Temporary pacemakers
- Permanent pacemakers
- Implantable cardiac defibrillator
- Cardiac resynchronisation therapy
- Catheter ablation therapy



PSVT: Paroxysmal supraventricular tachycardia

ACUTE PERICARDITIS

Acute inflammation of pericardium

ETIOLOGY

- Idiopathic
- Inflammatory - SLE
- Infectious - viral
- Renal failure
- Acute MI
- Post MI
- Cancer radiation induced

Dressler's syndrome:

- 1-8 weeks after MI
- Autoimmune reaction
- Immune reaction against cardiac myocytes

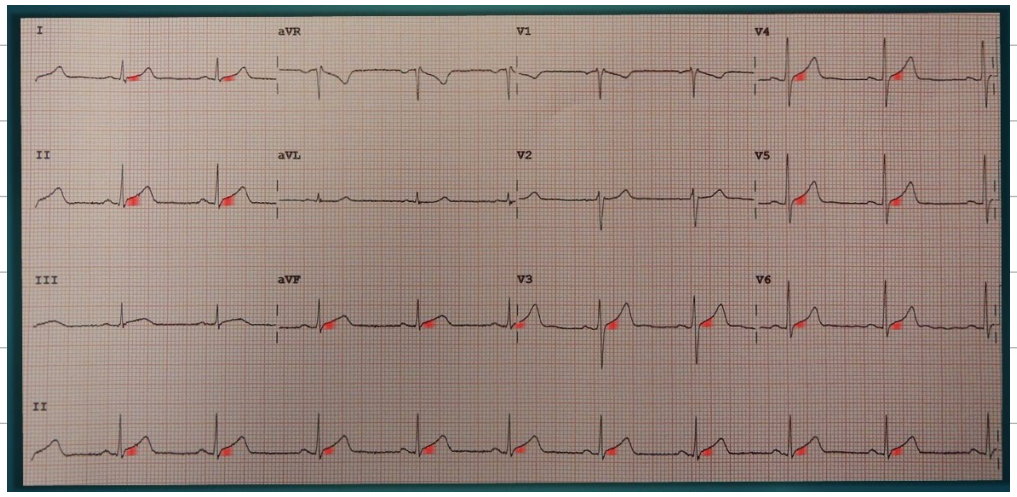
C/F - Fever
Chest pain
Leucocytosis

CLINICAL FEATURES

- Chest pain
  Pleuritic - Increase on inspiration & coughing
- Pericardial rub

INVESTIGATIONS

- ECG - Concave ST elevation
  - ↳ pan ST elevation
  - PR depression
- CXR } To r/o effusion
- Echo }



TREATMENT

- NSAIDs
- Steroids
- Treat the underlying cause

Drug of choice - ~~ASPIRIN~~

CARDIAC TAMPONADE

Rapid accumulation of pericardial fluid under pressure

- Leads to impaired cardiac filling & hemodynamic compromise
- Mostly 2° to a/c pericarditis

CLINICAL FEATURES

- Dyspnoea
- Pulsus paradoxus
- Hypotension
- JVP - elevated
  - prominent x- descent
  - absent y descent
- Muffled heart sounds

BECKS TRIAD - Hypotension
Muffled heart sound
Elevated JVP

INVESTIGATION

- ECG - low voltage complex
  - ELECTRICAL ALTERNANS
- CXR - Cardiomegaly
- Echo - Effusion



ELECTRICAL ALTERNANS

TREATMENT

- Definitive - Thoracotomy & Repair
- Emergency - Pericardiocentesis

CONSTRICTIVE PERICARDITIS

Result of scarring and loss of elasticity of pericardial sac
- May be developed as a sequale of a/c pericarditis

ETIOLOGY

- Idiopathic
- Post viral
- Tuberculous
- Post surgical
- Radiation induced
- SLE, RA
- Neoplasms

CLINICAL FEATURES

- Same as right sided HF
- Chronic dyspnoea
- Pulsus paradoxus - seen only in some pt
- BP- normal
- JVP - elevated

Prominent y descent

Kussmaul sign - Retraction of apical impulse during systole

- Auscultation - Pericardial knock

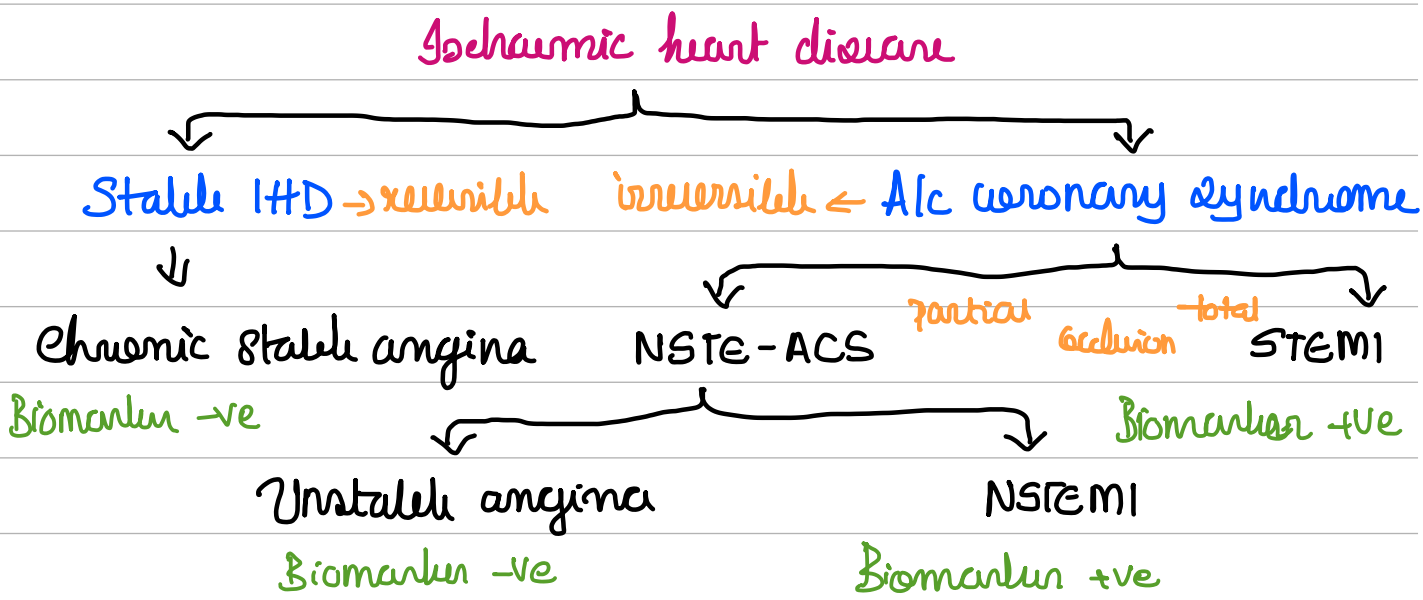
INVESTIGATIONS

- ECG – non specific
  low voltage complex
- CXR – usually normal
  TB – pericardial calcification
- Echo – thickening & calcification

TREATMENT

- Pericardiectomy
- Pericardial resection

ISCHAEMIC HEART DISEASE



RISK FACTORS

Modifiable: Obesity, Smoking
Metabolic Sx, Alcohol
DM, HTN
Dyslipidemia, Hyperhomocystinemia
Sedentary lifestyle

Non modifiable: Age
Gender: M > F
Genetic factors
Race
Previous Hx

PATHOPHYSIOLOGY

Demand - supply mismatch

- Atherosclerosis of coronary vessels
- Imbalance btwn supply & demand
  - Plaques narrow the vessel lumen
  - This decreases blood flow esp during ↑ demand

- Plaque rupture & thrombosis
  In ACS - vulnerable plaque may rupture or erode triggering platelet aggregation & thrombus formation.

- Stable angina occurs when supply is sufficient at rest and inadequate during exertion.

- Unstable angina due to sudden disruption and thrombosis

CHRONIC STABLE ANGINA

Reversible ischaemia

CLINICAL FEATURES:

- Angina
  - Triggered by exertion & emotion
  - Relieved by rest
  - Resting <5min

INVESTIGATIONS

- ECG - normal
  - abnormal during episode
- Biomarker - negative
- TMT - Modified Bruce Protocol
  - ↑ speed every 3min
  - +ve → symptom, ST depression in ECG
- Angiogram
- Dobutamine stress echocardiography
- Myocardial perfusion imaging
  - SPECT
  - PET
- Blood routine
- CXR

TREATMENT:

Alc management:

Short acting nitrates - Sublingual nitroglycerine
0.3 - 0.6 mg
3 times with 5min gap

Prevention of further episodes:

- Anti anginal - β blockers
non DHP CCB
long acting nitrates
isosorbide dinitrate
isosorbide mononitrate
Sustained release nitroglycerin
Ivabradine
Nicorandil
- Anti-thrombotic
only antiplatelets are given anticoagulants are not
→ SINGLE ANTIPLATELET
ASPIRIN 75mg lifelong
→ DUAL ANTIPLATELET - for 1yr than single
given in recent MI or PCI
- Aspirin 75 mg
- P_2Y_{12} receptor inhibitor
- clopidogrel, ticagrelor
- Address risk factors
- Not responding to medical management - PCI / CABG

NSTE - ACS

Two types:

- Unstable angina
- NSTEMI

CLINICAL FEATURES

- Angina triggered by exercise or emotion
- Lasting >5 min

INVESTIGATIONS

- ECG - ST depression
  T inversion
- Biomarker - UA - negative
  NSTEMI - +ve
- Echo - Regional wall motion abnormality
- Blood routine
- CXR

TREATMENT

- Pain relief: Short acting nitrates
  IV nitroglycerin infusion
  IV morphine

- Risk stratification: TIMI / GRACE scoring

- Choice of management strategy:

(i) Immediate invasive
within 2 hr
Indications:
- Hemodynamic instability
- Cardiogenic shock
- Recurrent / refractory pain
- Arrythmias
- Mechanical complications
  - Ventricular septal rupture
  - LV aneurysm
- A/c cardiogenic pul edema

(ii) Early invasive
- Within 24 hrs
- In pt with high TIMI & GRACE score

(iii) Conservative
Invasive after 1-2 wks

In immediate invasive - PCI + stenting

In conservative - PCI / CABG

Grafts used - saphenous vein
internal mammary artery

PCI	CABG
· single vessel disease	triple vessel disease
· double vessel disease	single vessel left main coronary artery disease with multiple occlusions

· Initiation of antithrombotic therapy

• Antiplatelet

Loading dose

Aspirin 300 mg + Clopidogrel 300mg + Atorvastat 80mg

600mg

for immediate & early invasive

• Anticoagulant

Unfractionated heparin 5000 U stat followed by 1000 U/hr infu X 48 hrs

- Prevention of recurrence
  - Dual antiplatelet for 1yr 75mg aspirin + 75mg clopid
    Followed by single antiplatelet
  - Atorvastatin 40mg at night
    Reduce gradually
  - B blockers
  - ACGi / ARBs
    Do prevent remodelling
  - Long acting nitrates
  - Address risk factors

STEMI

- Total vessel occlusion
- Transmural infarct

C/F - More severe & prolonged angina

TREATMENT

- Pain management - IV nitroglycerine
  Short acting nitrates
  IV morphine

- Antiplatelet
  300mg Aspirin + 600mg Clopidogrel + 80mg Atorvastatin

- Revascularisation
  (i) PCI
    - Within 12 hrs
    - Beyond 12 hrs when pt has chest pain
  (ii) Fibrinolysis / Thrombolysis
    - Only upto 12 hrs
    - ↑ risk of bleeding

    Agents used:
    - Streptokinase 1.5 million U / 60min
    - Alteplase
    - Tenecteplase - 30mg IV single bolus

Contraindications of fibrinolysis :

- Previous intracerebral hemorrhage
- A-V malformation
- Malignant intracranial neoplasm
- Stroke in 3 months
- Active bleeding
- Bleeding diathesis

- Repeat ECG

50% ST resolution

YES → Successful → Elective PCI

NO → Failed → Rescue PCI

- Anticoagulation

Unfractionated heparin 5000 U stat followed by 1000 U/hr infu X 48 hrs

- Prevention of recurrence

COMPLICATIONS OF MYOCARDIAL INFARCTION

- Arrythmia
- Heart failure
- Cardiogenic shock
- Sudden death
- Re-infarction
- MR
- Ventricular Septal rupture
- Embolism
  - ↳ Stroke
- Cardiac rupture
- Pericarditis
- Dressler's syndrome
- LV aneurysm

CARDIOMYOPATHIES

- Hypertrophic cardiomyopathy
- Dilated cardiomyopathy
- Restrictive cardiomyopathy
- Miscellaneous
  - Takotsubo cardiomyopathy
  - ARVC
    - ↳ Arrythmogenic right ventricular cardiomyopathy

HYPERTROPHIC CARDIOMYOPATHY

Hypertrophic Obstructive cardiomyopathy

- Most common genetic cardiac disorder
- DC cause of sudden death in young adults
- Autosomal dominant

→ Hypertrophy of ventricles
  - LV >> RV
  - Assymetric septal hypertrophy (ASH)

→ Diastolic dysfunction

Dynamic LVOTO

- Idiopathic hypertrophic subaortic stenosis
- In HOCM,

  During systole, there is anterior motion of mitral valve leaflet

  This reduces the area of LV outflow tract & outflow ↓

In AS there is fixed LVOTO

CLINICAL FEATURES

- Asymptomatic
- Dyspnoea on exertion
- Fatigue
- Palpitation
- Angina
- Pre-syncope
- Syncope
- Arrythmia
- Sudden cardiac death

O/E

- Pulse - pulsus bisferiens
- Apex - Double apical impulse
- Paraclavicular split of S2
- S4 +
- Murmur - ESM over aortic area

  PSM over apex

INVESTIGATIONS

- Echocardiography - LV > RV
  ASH
  Banana shaped heart
- ECG - LVH
  T inversion
- Holter monitoring
- Cardiac MRI

- Biopsy - done during autopsy
  ↳ Myofibrin dysarray

Risk factors for Sudden Cardiac Death

- VT on holter monitoring
- Aborted cardiac arrest
- Max LV thickness > 30 mm
- Unexplained syncope
- Family Hx

TREATMENT

- Enhance diastolic filling – β blockers
  non DHP CCB
- Negative inotropic action – Disopyramide

- High risk of SCD – ICD
- Significant symptoms despite medical therapy
  - Surgical myectomy
  - Alcohol based septal ablation

Drugs to be avoided:

- Drugs that ↓ preload – Nitrates
  Diuretics
  ACEi / ARBs
- Drugs that ↓ afterload – Amlodipine
- Drugs that ↑ contractility – Digoxin

DILATED CARDIOMYOPATHY

- Ventricular dilatation
  LV > RV
- Thinning of myocardial wall
  - Flabby, dilated & globular

→ Systolic dysfunction

ETIOLOGY

- Myocarditis
  - Viral - COVID 19, Coxsackie virus
  - Bacteria - Diphtheria
  - Parasitic - Chagas disease

- Toxins & drugs
  - Chemotherapy
  - Alcohol
- Nutritional
  - Thiamine
  - Selenium
- Endocrine
  - Thyroid
  - Pheochromocytoma
- Sarcoidosis
- Peripartum cardiomyopathy

- 2° to IHD

CLINICAL FEATURES

- Exertional dyspnoea
- Palpitations
- Pedal edema
- Ascites
- SCD

O/E

- Dichrotic pulse
- Hypokinetic & diffuse apex
- Cardiomegaly
- Soft S1
- S3 +
- PSM at mitral area

INV -

- ECG - non specific
- CXR - Cardiomegaly
- Echo - LV > RV
  - Systolic HF
  - ↓ EF
- Cardiac MRI
- Endomyocardial biopsy
  - when Dx is in doubt
  - Ninja star nuclei

Rx same as HF with reduced EF

RESTRICTIVE CARDIOMYOPATHY

- Diastolic dysfunction
- Stiff non compliant ventricles

  RV > LV

  RA also enlarges

ETIOLOGY

- Idiopathic
- Amyloidosis
- Endomyocardial fibrosis
- Hemochromatosis
- Sarcoidosis

C/F - B/L pedal edema

↑ JVP

RVS3, RVS4

AF +/-

INV - ECG - non specific

Echo - Diastolic HF with preserved EF

Rx - SGLT2 inh

Diuretics

TAKOTSUBO CARDIOMYOPATHY
Broken Heart Syndrome

- Intense physical or emotional stress
- May mimic MI

- Surge of catecholamine release

- A/C LV systolic failure

Inv - ↑ cardiac biomarker
ECG - ST elevation
Echo - Apical ballooning
Basal contraction

Rx - Supportive

Arrythmogenic RV Cardiomyopathy
- Autosomal dominant
- RV is replaced by fat

C/F - Right heart failure
Palpitation } arrythmia
Syncope }

Inv - ECG - Epsilon wave 

AORTIC DISSECTION

- Tear in the intima
  & blood directs into media

RISK FACTORS :

- Connective tissue disorders
  - Marfans syndrome
  - Osteogenesis Imperfecta
- Bicuspid aortic valve
- Pregnancy
- Uncontrolled HTN

CLINICAL FEATURES

- Sudden onset tearing or ripping type of pain
- 6th - 7th decade of life
- M > F
- Increased risk of stroke / MI

O/E :

- Unequal / diminished pulses
- ↑ or ↓ BP

Ascending aortic dissection - Anterior chest pain
Descending aortic dissection - Interscapular chest pain

INVESTIGATIONS

If pt is stable - CT / MRI

unstable - Echo

TREATMENT

Type A dissection - Involves ascending aorta

→ urgent surgical intervention

Diseased part is replaced with prosthetic graft

Type B dissection - Involves transverse / descending aorta

- Without organ malperfusion

→ Aggressive BP control

- Sodium nitroprusside + β blocker / CCB

- With organ malperfusion

→ Surgery

PULMONARY HYPERTENSION

- Progressive increase in total pulmonary vascular resistance
- Mean pul artery pressure > 20mm Hg

ETIOLOGY

- Idiopathic
- Connective tissue disease
  - Systemic sclerosis
- Left heart disease
  - MS
- Lung disease
  - COPD
  - ILD
- Chronic thromboembolism
- Miscellaneous
  - Sickle cell anemia
  - Sarcoidosis

C/F

Symptoms: DOE
Presyncope
Syncope
Fatigue

Signs – Hepatomegaly
Pedal edema
Ascites
↑ JVP
Left parasternal heave
Palpable P_2
Loud P_2
RVS3
Wide split S2
PSM of TR

INVESTIGATIONS

- ECG – RV hypertrophy
  RA enlargment
- Echo - RVH, RA enlargment
- Cardiac catheterisation
  To measure exact pressure
- CXR
  Enlarged central pul artery
- CT chest
- ANA

TREATMENT

- Endothelin receptor antagonist – Bosentan
  Ambrisentan
- PDE 5 inhibitor – Sildenafil
  Tadalafil
- Prostacyclin analogues – Epoprostenol
  Iloprostenol
- Prostacyclin receptor agonist

Interventional therapy

- Heart lung transplantation
  - Severe PAH
  - Intractable syncope
  - → Atrial septostomy
    - Unloads RV
    - Improves preload

ACUTE RHEUMATIC FEVER

Immunologically mediated multisystem disease

ETIOLOGY

Immunologically mediated multisystem disease

- Agent - Grp A β hemolytic streptococci
- Host - Susceptible host
  HLA DR_4 & DR_2
- Environment - Living under socially deprived conditions

Agent:

- Throat infection with GABHS
- Molecular mimicry with streptococcal & human antigens
  - N acetyl D glucosamine
  - Streptococcal M protein

PATHOLOGY

- Aschoff bodies – granulomas composed of T lymphocytes plasma cells & macrophages called Anitschkow cells - Chromatin condensed into long, wavy ribbons - Caterpillar cells
- RHD – fibrinoid necrosis in valve cusps & chordae tendinae
- MacCallum's patch - mural endocarditis

TABLE 3.23: 2015 Jones criteria for the diagnosis of ARF	
Low-risk population	**Moderate/high risk population**
ARF incidence ≤2 per 100,000 school-aged children or all-age RHD prevalence of ≤1 per 1000 population year	Children not clearly from a low-risk population.
Major criteria	
Carditis (clinical and/or subclinical)	Clinical and/or subclinical
Polyarthritis	Monoarthritis, polyarthritis, and/or polyarthralgia
Chorea	Chorea
Erythema marginatum	Erythema marginatum
Subcutaneous nodules	Subcutaneous nodules
Minor criteria	
Prolonged PR interval	Prolonged PR interval
Polyarthralgia	Monoarthralgia
Fever ≥38.5°C	Fever ≥38°C
ESR ≥60mm in 1 hour and/or CRP ≥3.0 mg/dL (ESR of ≥30 in high risk population)	ESR ≥30mm in 1 hour and/or CRP ≥3.0 mg/dL
Evidence of preceding streptococcal infection (any one of the following)	
Increased or rising anti-streptolysin O titer or other streptococcal antibodies (anti-DNASE B)	
A positive throat culture for group A B-hemolytic streptococci	
A positive rapid group A streptococcal carbohydrate antigen test in a child whose clinical presentation suggests a high pre-test probability of streptococcal pharyngitis	

CLINICAL FEATURES

- 5-14 years
  - Rheumatic reactivation upto 40yrs
- Latent period - 2-3 wks

ARTHRITIS

- Assymetric
- Migratory polyarthritis
- Predominantly large joints

Jaccoud's arthropathy - Reversible deformity
Affects connective tissues

CARDITIS

- Endocardium
  - Murmur
    - If valvular endocardium is affected
    - Carey coombes murmur
      - Mid diastolic murmur
  - Heart failure

- Myocardium
  - Cardiomegaly
  - Congestive heart failure
  - Heart block

- Pericardium
  - Chest pain
  - Friction rub
  - Effusion

SYDENHAM CHOREA - St Vitus Dance

- Late manifestation
- After 6-8 weeks

ERYTHEMA MARGINATUM

- Painless, maculopapular, non pruritic
- Serpinginous borders with central clearing

SUBCUTANEOUS NODULES

- Round, firm, non tender, mobile nodular lesions
- On extensor aspect of bony prominences

TREATMENT

- Arthritis - Aspirin
- Carditis
  - Mild - Aspirin
  - Moderate to severe - Steroids
- Chorea - Diazepam
  Haloperidol
  Valproate
  Carbamazepine

- Refractory chorea - IV Ig

Primary prophylaxis:

- Oral Penicillin V
  IM Benzathine Penicillin

For penicillin allergy,
- Cephalosporin
- Azithromycin

Secondary prophylaxis

For pt at risk of recurrance

→ Oral penicillin V 250mg BD

→ Inj Benzathine penicillin 1·2 million units every 3-4 wks

CATEGORY OF PATIENT	DURATION OF PROPHYLAXIS
Rheumatic fever without carditis	For 5 years after the last attack or 21 years of age (whichever is longer)
Rheumatic fever with carditis but no residual valvular disease	For 10 years after the last attack, or 21 years of age (whichever is longer)
Rheumatic fever with persistent valvular disease, evident clinically or on echocardiography	For 10 years after the last attack, or 40 years of age (whichever is longer); sometimes lifelong prophylaxis

INFECTIVE ENDOCARDITIS

Infection involving endocardial surface of heart
- valvular endocardium
- mural endocardium
- congenital heart defect
- indwelling cardiac devices
  - CIED - Cardiac Implantable Electronic Device

Prototype lesion - Vegetation - Fibrin
Inflammatory cells
Platelets
Microorganisms

MICROBIOLOGY
- Native valve
  - Community acquired - Strep viridans
  - Health care associated - Staph aureus
- Prosthetic valve
  - < 12 months - Coagulase -ve staph
  - > 12 months - Strep viridans
- IV drug users
  - Right sided - Staph aureus
  - Left sided - Enterococcus
- CIED - CONS
- TAVR - Enterococcus

Atypical organisms - HACEK
Coxiella
Brucella
Bartonella

CLINICAL FEATURES

- Prolonged fever
- Chills & sweats
- Myalgia, arthralgia
- Heart murmur
  - new or worsened regurgitant murmur
- Splenomegaly
- Clubbing
- Neurological manifestation
  - Stroke
- Septic pul emboli

Peripheral manifestations

- Osler's node → painful
- Subungual hemorrhages
- Janeway lesions → painless
- Roth spots
  Hemorrhages with pale centers
- Conjuctival hemorrhages

INVESTIGATIONS

Non specific- Anemia
Leukocytosis
Microscopic hematuria
Elevated ESR
Elevated CRP
↓ serum complement

Specific -

- Blood culture
  3 sets, 20 mL each - 1 aerobic & 1 anaerobic
  over 24 hrs from 3 diff sites, min 2 hrs apart

- Echocardiography
  Vegetations

DIAGNOSTIC CRITERIA

2023 DUKE CRITERIA

MAJOR CRITERIA

1. Microbiologic
   - +ve blood culture
     Typical - 2+ve ; Atypical - 3+ve
   - +ve lab tests
     PCR or Antibody testing

2. Imaging
   - Echo & / CT
   - PET CT

3. Surgical
   Direct inspection during surgery

MINOR CRITERIA

- Predisposition - regurgitant lesion
- Fever
- Vascular phenomenon - conjunctival hemorrhage, Janeway lesion, septic pul infarct, mycotic aneurysm
- Immunologic phenomenon - Osler's node, GN
- Microbiologic
- Imaging

  } any criteria that does not fit into major

- Physical examination - new MR murmur

2 major / 1 major + 3 minor / 5 minor

TREATMENT

Empirical antibiotic therapy

- High dose parenteral bactericidal for 6 weeks

- Native valve endocarditis
  - A/C – Vancomycin + Gentamycin / Cefepime
  - Sub a/c – Vancomycin + Ceftriaxone

- Prosthetic valve
  - <1 yr – Vancomycin + Gentamycin + Cefepime
  - Late – Similar to native valve

Modify based on C/S

- CIED related – Remove the device if possible

- In refractory HF / Valvular abscess
  - Surgery

HIGH RISK CARDIAC LESIONS

when to give prophylaxis before dental procedures

- Prosthetic valves
- LV assist devices
- Prior endocarditis
- Unrepaired cyanotic congenital heart disease

- Completely repaired defect
  during 6 months after repair
- Repaired defect with residual defect
- Surgical or transcatheter pul. artery valve
- Valvulopathy developing after cardiac transplant

Antibiotic regimen for IE prophylaxis

- Oral regimen

  Amoxicillin 2g orally 1 hr before procedure

  OR

- Inj Ampicillin 2g IV 1 hr before procedure

In case of allergy – Azithromycin
Doxycycline
Ceftriaxone