MEDICINE

RR-8.0

Contents

CVS REVISION - 1

----- Active space -----

Aortic Valve Disorders :

- Ⓝ Aortic valve
  - 3 leaflets/cusps — if ↓ → ↑ risk of stenosis; if ↑ → ↑ risk of regurgitation
  - 3 commissures
  - 1 fibrous annulus

Aortic Stenosis (AS)

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Pathophysiology :

Degeneration/calcification of aortic valve + Inflammation (a/w atherosclerosis) → Aortic sclerosis —Gradient +→ Aortic stenosis.

- Young : Bicuspid valve (BAV).
- Elderly : Degeneration & calcification.

Features :

- BAV → Young patients :
  - NOTCH 1 defect.
  - Associated with aortopathies (mandatory CT aortogram).
- Tricuspid valve : > 60 y/o.

Note → Rheumatic etiology :

- Uncommon for AS.
- Rheumatic fever + Valvulitis —15 – 20 y→ RHD (MS + MR > MS + AR > AR + AS.)
  (MR > MR + AR)

Hemodynamics :

- Aortic valve opens at the end of isovolumetric contraction.
- Ⓝ gradient b/w LV & aorta is zero (LV = 120 mmHg, Aorta = 120 mmHg).
- AS : Valve does not open completely → Gradient ⊕ ∝ Severity of disease.

Note : Gradient = Mean transvalvular pressure gradient (MTPG).

Severe AS : Given by 40/4/1 rule :

- MTPG > 40 mmHg (In sclerosis < 20 mmHg).
- Peak flow velocity > 4 m/s (Across valve).
- Surface area of valve < 1 cm^2 (Normal : 3 – 4).

Compensatory mechanism : To maintain cardiac output.

Concentric LV hypertrophy → ↑ LV mass + ↓ cavity size.

Mild/moderate AS : Asymptomatic	Severe AS : Symptomatic	Very severe AS : LV failure (Poor prognosis)

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Clinical Features :

	Angina	Syncope	Dyspnea
Poor prognosis if untreated after	5 yrs	3 yrs	2 yrs

Angina :

- ↑ LV mass → ↑ O_2 demand.
- ↓ capillary density (w.r.t. wall thickness).
- Tachycardia → ↓ perfusion time.
- Atherosclerosis.

Syncope : D/t LV outflow obstruction → Fixed cardiac output state even when ↑ demand.

Dyspnea : D/t ↑ filling pressure (LVEDP).

↑ LVEDP → ↑ LAP → ↑ PCWP → Fluid escapes into pulmonary interstitium.

Exacerbating factors :

A - Fib :

- Contribution of atria to cardiac output ↑ (25 → 40%).
- Thus, A-fib is fatal in AS.

Systemic HTN :

- Masking of severe AS :
  ↑ SBP → ↑ Aortic pressure → ↓ Gradient (Falsely low).
- Thus, strict BP control needed.

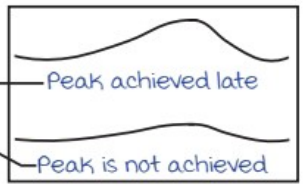
Diagnosis :

1. Transthoracic Echo : To look for 40/4/1 rule.
2. Angiogram : Mandatory (To rule out atherosclerosis).
3. CT aortogram.
4. Dobutamine stress echo : To differentiate b/w
   LV failure d/t AS (vs) Mild AS with Pre - existing LV failure
   Low flow low gradient.

Examination Findings :

Pulse : Slow rising pulse

- Severe AS : Pulsus tardus.
- Very severe AS : Pulsus parvus et tardus.



BP : D/t LVH → masks AS.

JVP : Only elevated in terminal patients (Not relevant).

Apex : Laterally displaced Heaving apex (High amplitude sustained apex).

Heart sounds :

- S1 : (N) (Ejection click → mistaken for loud S1).
- S2 (A2) →
  - Loud : BAV (Young).
  - Soft : Elderly (Calcified valve).
  - Reverse/paradoxical split (P2 → A2) : Severe AS.

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- S3 : Ⓝ/Less than Ⓝ filling of a non-compliant dilated ventricle. → Pathological : LV failure (Very severe AS). OR Ⓝ/more than Ⓝ filling of a hypercompliant ventricle. → Physiological.
- S4 : Specific to AS — d/t healthy LA contraction ⊕ → Non-stenosed mitral valve (No MS). / Hypertrophied, non-dilated LV (no MR, AR).
- Murmur :
  - Harsh ejection systolic murmur with late systolic accentuation.
  - Best heard in aortic area & sitting position.
  - Mixed frequency → Low freq : Loud → Carotids. / High freq : Soft blowing, musical → Apex (Gallavardin phenomenon).

Management :

1. Aortic valve replacement (AVR) :
   a. Done in Severe AS.
   b. Bioprosthetic valves (No anticoagulation needed).
   c. Asymptomatic severe AS : Follow-up → Gradient > 50mmHg OR Symptoms → AVR.
   Note : AS has a risk of sudden cardiac death.
2. Transcatheter Aortic Valve Implantation (TAVI) : If surgery is C/I.
   Not open surgery; no ICU stay.

Aortic Regurgitation (AR)

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CHRONIC REGURGITATION

Etiology :

Root issue :	VS	Valve leaflet issue :
• Syphilis		• Rheumatic cause
• Marfan's syndrome		• Quadricuspid valve
• Ehler Danlos syndrome		• Takayasu arteritis
• Takayasu arteritis		• Ankylosing spondylitis
• Behcet's disease, • IgG4 related disease, • Cogan's syndrome — Specific		

Pathophysiology :

Hemodynamics :

- Ⓝ diastolic gradient between LV (10 mmHg) & aorta (80 mmHg) : 70 mmHg → Favours regurgitation.
- No backleak d/t competent aortic valve.

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Exacerbating factors :

- Nocturnal angina : Bradycardia at night → more filling → Prolonged diastole
  ↓
  Angina ← ↓ Blood to coronary circulation ← ↑ Regurgitation
- Systemic HTN : ↑ Aortic pressure → ↑ Gradient → ↑ Regurgitation.

Relieving factor : Exercise/NTG/Nitroprusside.
Vasodilatation → ↓ Aortic pressure → ↓ Gradient → ↓ Regurgitation.

Compensatory mechanism : Eccentric hypertrophy with dilatation.

Clinical Features :

Mild/moderate AR :

- Asymptomatic (Since ejection fraction is ↑↑).
- Occasional palpitation.
- LVEDP & ESV (End systolic volume) is (N).

Severe AR :

- LV failure (Ejection fraction is (N) to low).
- LVEDP ↑↑ : Dyspnea.
- ESV ↑↑ : S_3 (+) ve.
- ↑ SBP & ↓↓↓ DBP (Almost zero) → Wide pulse pressure → Hill's sign : Lower limb BP exceeds upper limb BP by 20 mmHg.

Examination Findings :

Pulse :

1. Collapsing pulse : High volume (+) → Rapid upstroke & downstroke.
   → III – sustained peak.
2. Bisferiens pulse → Two peaks in systole.
   (AR/AR + mild AS/HCM)

Note : Pseudocollapsing pulse → (N) volume + Rapid upstroke/downstroke + well sustained peak.
(Seen in MR)

BP : Wide pulse pressure.

JVP : Changes only in terminal disease.

Apex : Hyperdynamic apex, down & out.

Heart Sounds :

- S1 : Soft S1 (Premature closure).
- S2 : Delayed A2 / ↑ Blood in LV (+) → Root issue : Loud S2.
  → Leaflet issue : Soft S2.
- S3 : Heard in failure.

For S1 :
- Premature : Soft closure.
- Delayed : Loud closure.

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- S4 : Not heard.
- Murmur : EDM (End diastolic murmur).
  - High pitched, soft blowing.
  - Decrescendo.
  - Austin - Flint murmur : Low pitched d/t displacement of anterior mitral leaflet.
    ↓
    Cole Cecil murmur : Radiates to axilla.

Management :

AVR :

- Done in symptomatic severe AR.
- Asymptomatic patient with 55/50 rule → Ejection fraction ≤ 55 %.
  → LV end systolic diameter > 50 mm.

ACUTE REGURGITATION

Presentations :

Acute pulmonary edema (D/t sudden ↑ LVEDP → ↑PCWP) ± Cardiogenic shock.

Causes :

- Infective endocarditis.
- Aortic dissection : Acute AR + chest pain.
- Rupture of sinus of Valsalva : Acute AR + Right heart failure symptoms.
  - Immediate Mx : NTG/Nitroprusside.
  - Definitive Mx : AVR.

Mitral Stenosis (MS)

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Mitral valve :

- 3D structure.
- Surface area : 4 - 6 cm^2.
- Parts :
  - Annulus.
  - Leaflets with commissures.
  - Chordae.
  - Papillary muscles.
  - Adjacent LV myocardium.

Types of MS :

1. Progressive MS : > 1.5 cm^2
2. Severe MS : < 1.5 cm^2 → Asymptomatic
   → Symptomatic
3. Very severe MS : < 1 cm^2

Etiopathogenesis :

Main etiology : Rheumatic origin.

Main pathology : Commissural fusion → Fish mouth abnormality.

ARF —(15 - 20yrs)→ RHD → MS + MR (m/c).
→ MS + AR.

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Hemodynamics & compensation :

- Normal : Ventricular filling is passive > active & occurs across an open valve.
- In MS :
  - ↑ LAP at rest for ventricular filling.
  - On exertion → ↓ diastole time → ↑↑ LAP for ventricular filling.
  - Very severe MS : LV failure.

↑ LAP for ventricular filling.
↓
↑PCWP —moderate MS→ Dyspnea
↓ severe MS
↑Pulmonary artery EDP → Pulmonary hypertension

- Dyspnea at rest
- RVH
- Hypertensive tricuspid regurgitation

First symptom of :
- AS : Angina
- AR : Palpitation
- MS : Dyspnea on exertion

Clinical Features :

- Pulmonary hypertension related symptoms.
- Pulmonary edema (In tachycardia).
- A - fib.
- Hemoptysis : D/t pulmonary capillary apoplexy.
- Ortner's syndrome : D/t compression of RLN.
- Hoarseness of voice.
- Dysphagia : D/t compression of esophagus.

Examination Findings :

Pulse : Normal.

BP : Normal.

JVP : Elevated (D/t RVH).

Apex : Tapping apex (Loud, ill-sustained S1).

Heart Sounds :

- S1 : Loud S1 → ↑ Velocity of valve closure.
  - Downward position of leaflets (D/t inadequate LV filling).
  - Delayed closure.
- S2 :
  - Loud, palpable P2 d/t Pulmonary HTN.
  - A2 - P2 widening : Pulmonary HTN with RV failure.
- Opening snap (OS) :
  - Seen in organic MS.
  - D/t ↑ LAP.
  - Severity of MS → Long duration of murmur. / Short S2 - OS gap.
- S3, S4 : Not seen.
- Murmur :
  - Low pitched, mid diastolic (MDM).
  - Presystolic accentuation (Absent in A - fib).

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Management :

1. Pulmonary edema → Control heart rate → β - blockers / Verapamil/Diltiazem
2. Anticoagulation : Oral vitamin K antagonists
3. Surgery : Percutaneous mitral balloon valvotomy /commissurotomy
   Upon failure : Mitral valve replacement.
   (1st line for : Calcific MS +/ mod/Severe MR/LA clot)
   ↓
   Dx : Trans esophageal echo

Mitral Regurgitation (MR) 01:10:38

Acute MR :

- D/t posteromedial papillary muscle rupture.
- Seen in inferior wall MI (RCA involvement).

Chronic MR :

1° MR :

- RHD : MS + MR (m/c).
- MVP : Developed countries.
- SLE/Rheumatoid arthritis.

2° MR (Innocent bystander mechanism) :

MR begets MR :
- LV dysfunction → Annular dilatation.
- Annular dilatation → 2° MR.
- 2° MR → LV remodelling.
- LV remodelling → LV dysfunction.

Pathogenesis :

Hemodynamics : Reduction in afterload.

LV - LA gradient >>> LV - Aorta gradient.

(LA = 10mmHg; LV = 120mmHg; Aorta = 120mmHg).

↓

Regurgitation into LA.

- Worsens with hypertension (↑ aortic pressure).
- Relieved by Nitrates : Vasodialation (↓ pressure).

LVEDP Ⓝ / LV ESV Ⓝ / Ejection fraction Ⓝ.

Compensation : Eccentric hypertrophy with dilatation of LV.

Clinical Features :

- Mild/Moderate MR : Palpitation/Asymptomatic.
- Severe MR : LV failure → Ejection fraction Ⓝ/ ↓ ↓ + LVEDP/LVESV ↑ ↑.

Examinations Findings :

Pulse : Pseudocollapsing pulse.

BP : Normal.

JVP: Normal.

Apex : Hyperdynamic apex; displaced down & out.

Heart sounds :

- S1 : Soft S1 d/t → Poor coaptation of leaflet. / ↓ ↓ dp/dt of isovolumetric contraction.
- S2 : Early A2 + Normal P2 → Wide split S2.

Pulse in LV failure :
- Pulsus alternans
- Pulsus dicroticus