Pulmonary hypertension

Clinical Features

1- **Dyspnea** initially on exertion & later at rest .

2- Dull , retrosternal chest pain (due to ↓ coronary blood flow to a marked hypertrophied RV)

3- Syncope or near syncope due to fixed cardiac output.

Signs

Inspection

- **Prominent a wave** in JVP
- **Cyanosis** in late *stage "due to systemic V.C resulting from markedly reduced COP"*

Palpation

- **Left parasternal heave** " RV heave" (due to RV pressure over load → RVE)
- **Palpable PS in pulmonary area** (due to dilated pulmonary artery)

Auscultation

Hear sounds

1- Accentuated S2(P2)+ wide splitting
2- If RSHF " cor pulmonales" → S3 " gallop rhythm "
3- Right ventricular S4.

Murmurs (PS, PR, TR)

4- Ejection systolic murmur (heard at pulmonary area due to **relative PS**)
5- In advanced cases :
- **PR** : Early diastolic murmur .
- **TR** : Pansystolic murmur .

Added Sounds

Systolic Ejection click in pulmonary area

Investigations

ECG	X-ray	Echo	Cardiac catheterization
-RV hypertrophy -RA hypertrophy	-RV enlargement . -RA dilatation . -Enlargement of Pulmonary artery & it's main branches.	-RV & RA enlargement -Detection of heart defects. -Thickened interventricular septum. -Abnormal septal motion due to RV pressure overload.	-Confirm the diagnosis e.g. detection the defect. -Measure pulmonary artery pressure to assess severity. -Measure the O2 level in chambers and arteries.

- **VSD , ASD , PDA causes pulmonary hypertension (Left to Right shunt → increasing pulmonary blood flow)**
  1- **Signs** of pulmonary hypertension
  2- **Symptoms :** ↑pulmonary blood flow → lung plethora (causing **exertional dyspnea** & **recurrent chest infections**) → ↑pulmonary vasculature resistance "pulmonary hypertension" → till pulmonary artery pressure exceeds aortic artery pressure → reversal shunt " Eisenmenger's syndrome" causing **cyanosis** & **Clubbing fingers.**

- **VSD** , **ASD** → causes LCOP (signs & symptoms of LOCP)
- **PDA** →hyperdynamic circulation (similar to peripheral signs of AR)

- RV enlargement : **ASD** - PS
- LV enlargement : **VSD–PDA–coarctation of aorta** – AS
- Biventricular enlargement: **VSD** (Later)

Accentuated S2 in VSD, ASD, PDA: accentuated P2 component

Splitting of S2 :
- **VSD** → Wide splitting .
- **ASD**→ Wide fixed splitting.
- **PDA** → Paradoxical splitting

S3 :
- **VSD** → due to LV volume overload
- **ASD**→ due to RV volume over load

S4 :
- **VSD , ASD , PDA** →if caused pulmonary hypertension

Murmurs : - **ASD**→ Ejection systolic murmur(due to relative PS)
- **VSD** → Pansystolic murmur (left parasternal area.)
- **PDA** → Continuous murmur (Left infraclavicular area)

Thrill :
- **VSD** → left parasternal area.
- **PDA** → Left infraclavicular area (2nd left space) Pulmonary area.

Systolic ejection click :
- **VSD , ASD , PDA** → if caused pulmonary hypertension .

VSD	ASD	PDA
Inspection		
Gian (a) wave	(a) wave equal to (v) wave ?!	Gian (a) wave
If developed pulmonary hypertension → cyanosis , finger clubbing , dyspnea .		
Palpation		
- Palpable P2 - Right ventricular heave - Thrill . - LV volume overload → apex displaced outward and downward (with localized apex)	- Palpable P2 - Right ventricular heave . - Relative stenosis causes **no thrill** - RV volume overload → apex displaced outward only (with diffuse apex)	- Palpable P2 - Right ventricular heave - Thrill . - **Pulse:** is bounding (wide pulse pressure). - **BP:** Low diastolic blood pressure.
Auscultation (shadowed = most important)		
- S2 accentuated with wide splitting - S3 - S4 - Pansystolic murmur with thrill - Murmur of relative **MS** *(due to increase blood flow through mitral valve)* - Murmur of **AR** in high defects *" due to prolapse of a valve leaflet"* - Murmur of relative **PS** (due to RV volume overload) - in advanced:**TR** (RVE → dilated ventricle →affect valve) Systolic Ejection click in pulmonary area	- S2 accentuated with wide **fixed** splitting - S3 - S4 ASD itself doesn't cause murmur : - Murmur of relative **PS** (due to RV volume overload) - Murmur of relative **TS** (if the shunt is large) - in advanced:**TR** (RVE → dilated ventricle →affect valve) Systolic Ejection click in pulmonary area	- S2 accentuated with paradoxical splitting - S4 - Continuous machinery murmur **N.B** *with moderate degree of pulmonary hypertension, the diastolic component of murmur disappears leaving a systolic murmur only.* - Mid-diastolic murmur : may be audible at the apex as a result of the increased volume of blood flow across the mitral valve. Systolic Ejection click in pulmonary area