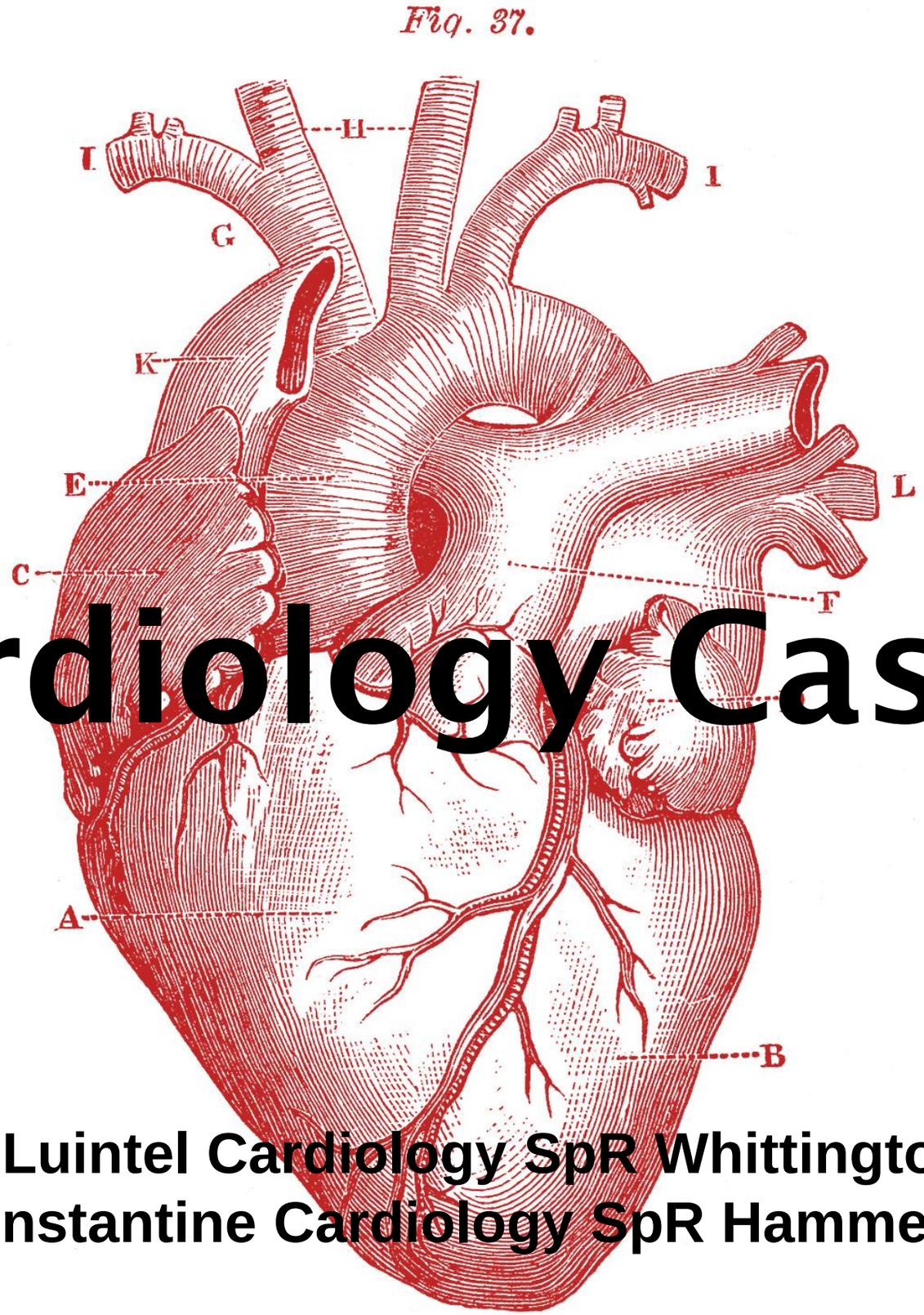

Cardiology Cases

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Outline

- Simple overview of murmurs
- How to present
- Key questions
- Case examples

What comes up?

Common finals cases

Prosthetic valves

AS

MR

AR

Adult congenital heart disease

MVP

VSD/ASD

Rarer finals cases

MS

CCF without murmur

HOCM

Marfans (+AR)

Turners (+AS)

Dextrocardia

Weak pulse(s)

Normal examination

Inspection is key

- This exam can be done in 5 minutes
- Always remember the BP→ it will give you a clue
- There may be a clue in the question, often you can make the diagnosis at the end of the bedside.
- Look at the arm pits, is there an PPM?
- Look for scars, look for a picc line
- Downs Syndrome (AS), Marfans Syndrome (AR, MR), Turners Syndrome + Noonan's syndrome (co-arctation or AS), Ankylosing Spondylitis (AR)

Important points in the exam

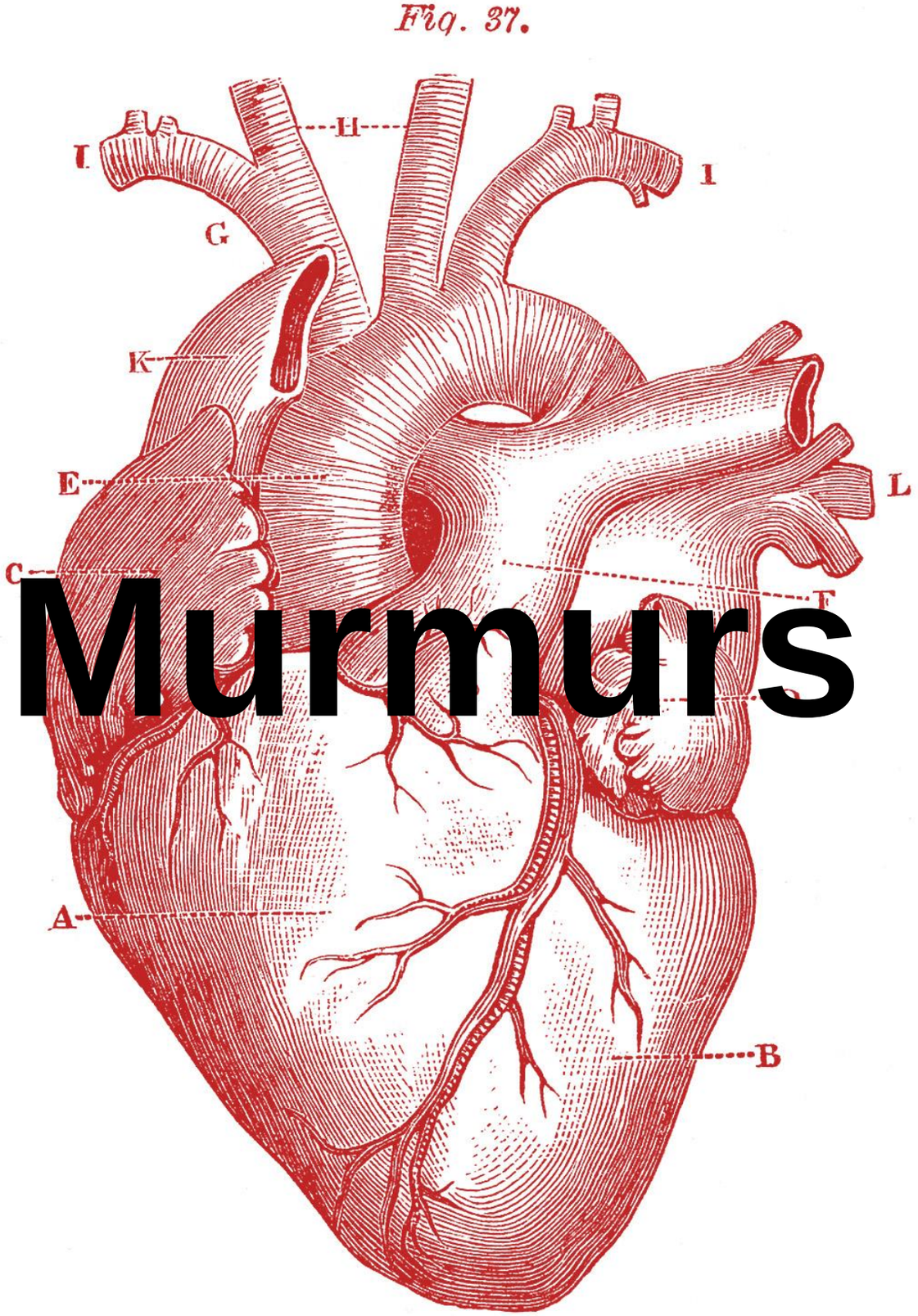
- Collapsing pulse – this is almost diagnostic of AR in exams
- Radial –Radial delay
- Palpate the apex, if its not there feel on the right!!

- Listen to the bases of the lungs, swollen ankles→ heart failure is an important negative

- Ask your patient to sit forward and listen in expiration-> ~Early Diastolic murmur (this is the time to listen to the lungs)

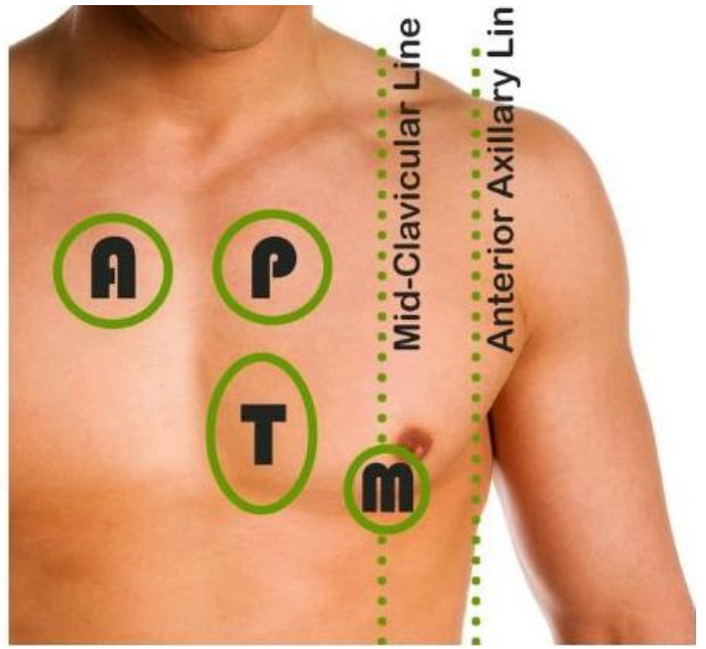
- Ask your patient to roll to the left hand side -> Mitral Stenosis

Murmurs



Auscultating

- 1st heart sound T+M valve closing
- 2nd Heart sound A+P valve closing
- Palpate carotid while listening



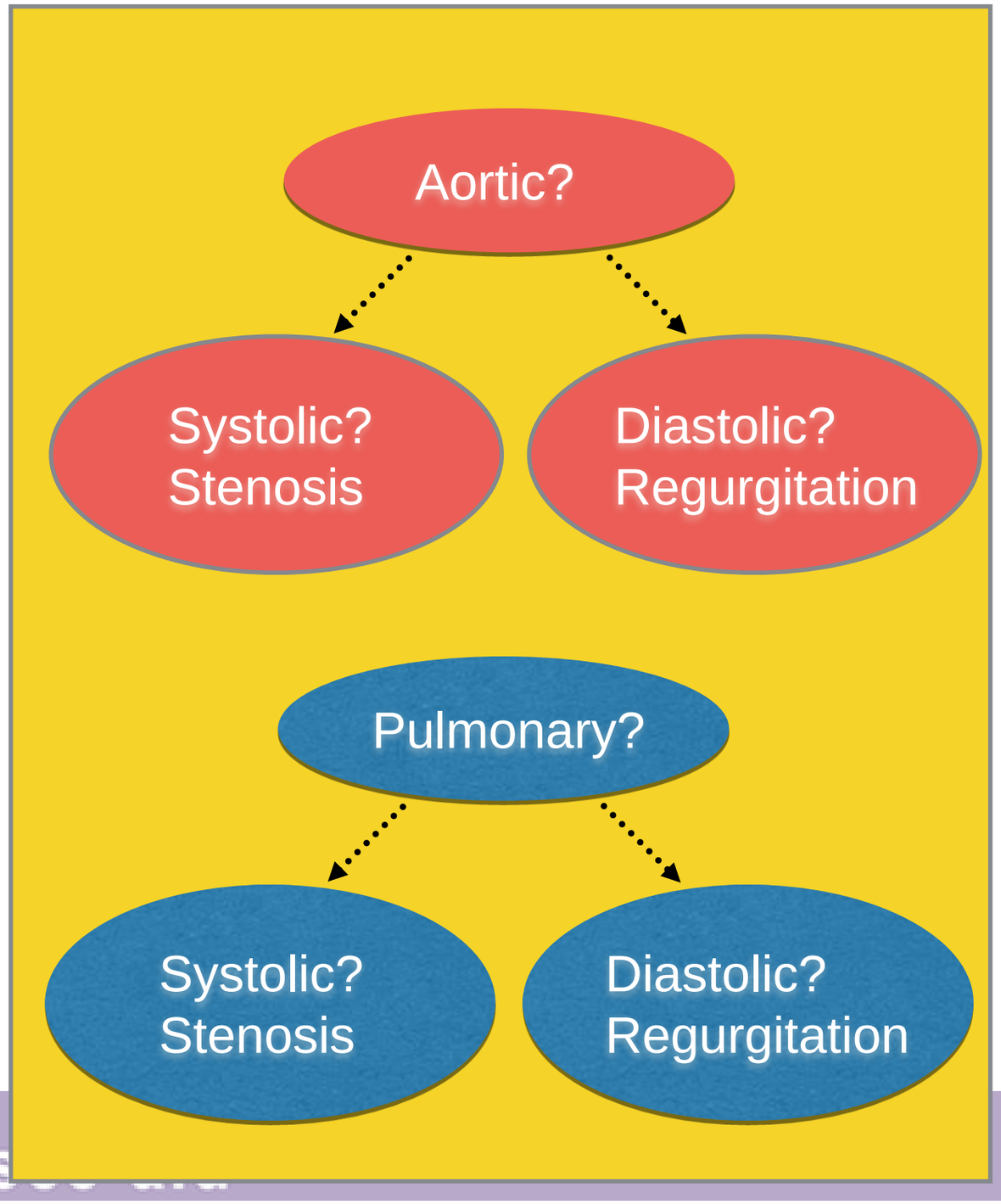
Aortic	Pulmonary
Tricuspid	Mitral

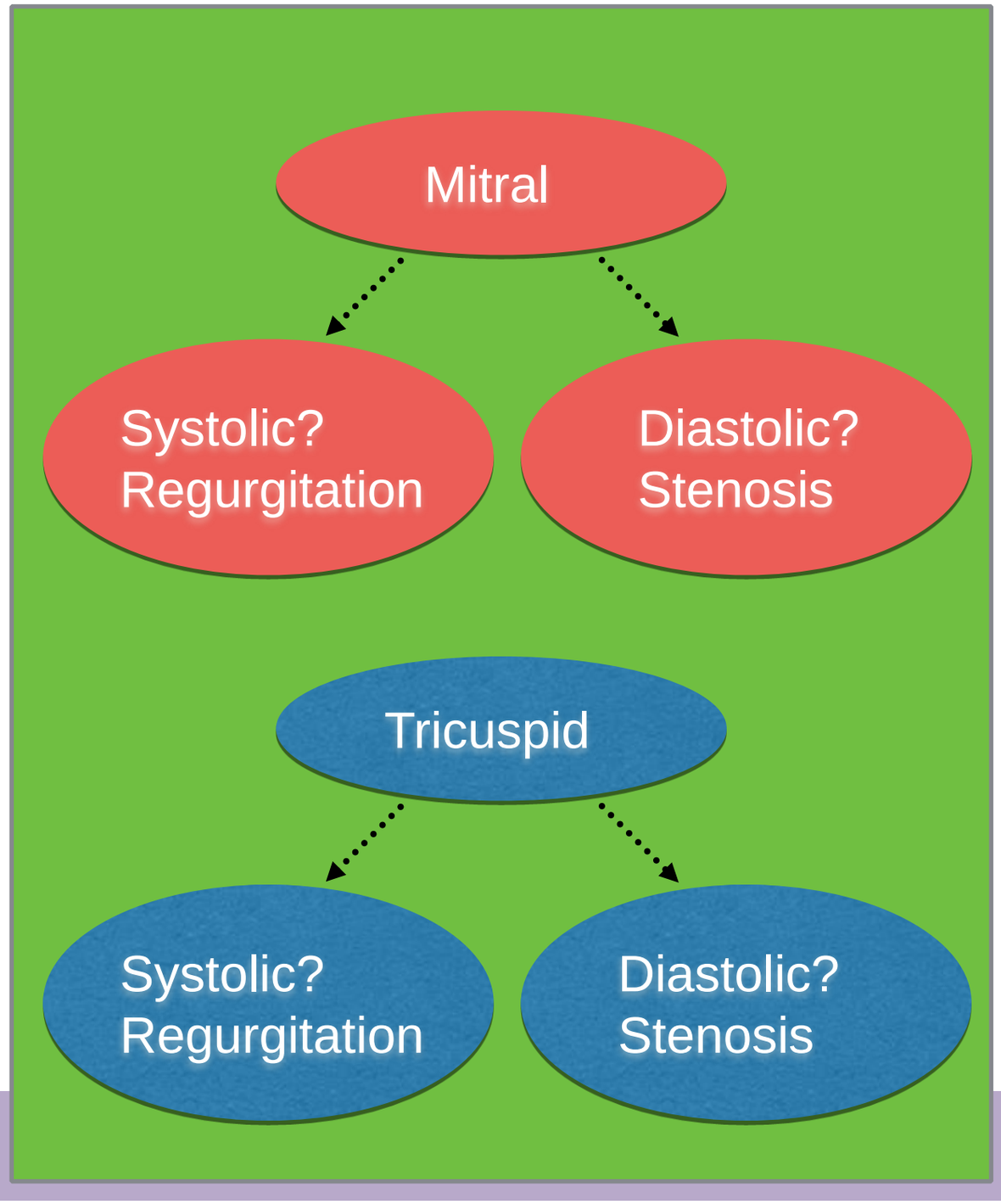
In simple terms:

1. Where is it loudest?
2. Systolic or diastolic?

3. Aortic Stenosis/ Mitral Regurgitation/ Metallic Valve and then the others

In simple terms:





Differentials

ESM Aortic stenosis Pulmonary stenosis *Aortic sclerosis* *HOCM* *Aortic flow murmur*	**PSM** Mitral regurgitation Tricuspid regurgitation *VSD*
EDM Aortic regurgitation Pulmonary regurgitation	**MDM** Mitral stenosis Tricuspid stenosis *Austin-Flint* *Atrial myxoma*

- Four kinds of murmur:

Ejection-systolic murmur (ESM)	Pansystolic murmur (PSM)
Early diastolic murmur (EDM)	Mid-diastolic murmur (MDM)

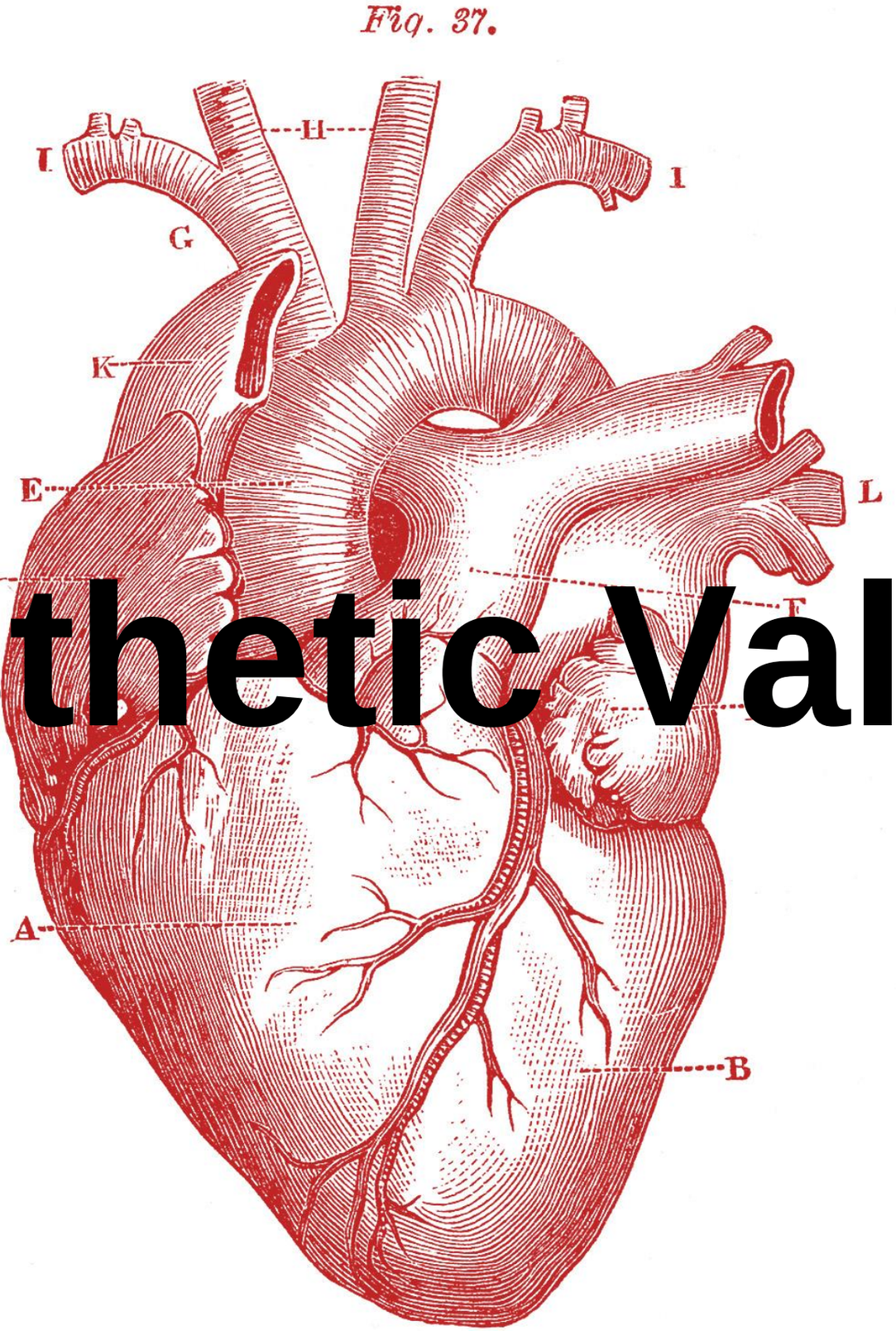
Presentation template

*“I have examined the cardiovascular system of Mr X. Peripherally there was _____. The apex beat was_____. On auscultation, there was _____ murmur loudest in the _____ region and accentuated by *manoeuvre* and *inspiration/expiration*.*

These findings are consistent with a diagnosis of _____.”

Presentation template 2

- *This 65 year old has a diagnosis of x, this is evidenced by the following positive findings…1, 2,3. Of note there was no evidence of infective endocarditis or heart failure.*



Prosthetic Valves

Prosthetic Valves

Mechanical vs. bioprosthetic
If you can hear it, it's mechanical
TYPES
Mechanical prostheses
Ball and cage (*Starr-Edwards*)
Single tilting disc (*Medtronic-Hall, Bjork-Shiley*)
Double-tilting disc (*St Jude's*)
Bioprostheses
Xenografts (porcine, pericardial)
Homografts (cadaveric)

Prosthetic Valves – In the Exam

Scars? Associated with a CABG?

Tunneled line?

Endocarditis?

Bruising?

Jaundice?

Why would someone have a valve replacement?

- Age- Young= Rheumatic fever, endocarditis, congenital heart disease, Severe valvular heart disease
- Older= Senile calcification (AS), Infection as above , Severe valvular heart disease

Prosthetic Valves - Complications

Thromboembolism
Complications of anticoagulation i.e. bleeding
Valve dysfunction (leakage, dehiscence, obstruction)
"ANY PROSTHETIC VALVE REGURGITANT MURMUR SHOULD BE REGARDED AS VALVULAR DYSFUNCTION UNTIL PROVEN OTHERWISE"
Endocarditis
Haemolysis

Mechanical vs Tissue valve

- Mechanical valves last longer
- You need to warfarinise patients with mechanical valves
- Aortic valve- INR 2.5, Mitral Valve : 3

Prosthetic Valves – In the Exam

Aortic or mitral prosthesis?

Depending on the type of valve, there will be 1 or 2 audible clicks

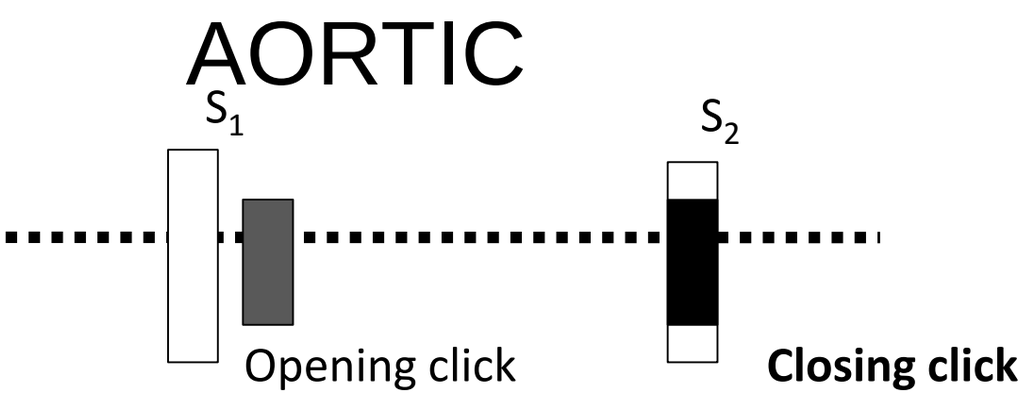
Time the closing (louder) click to the heart sounds (loudest click=closing valve)

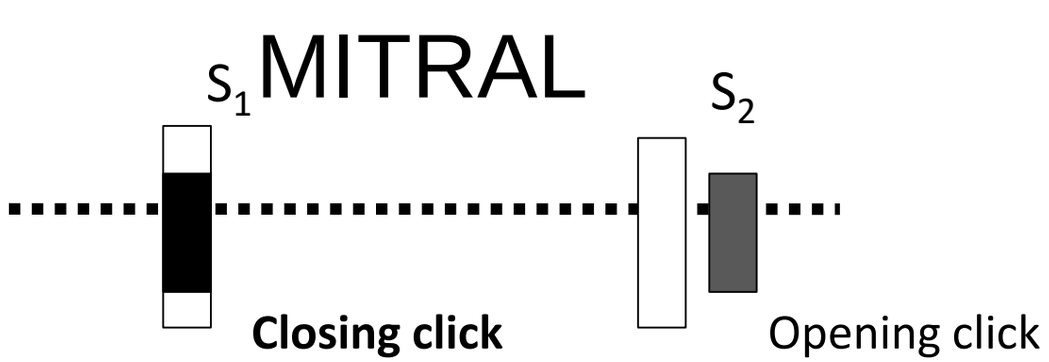
Pacemakers are more commonly associated with AVRs

Click immediately preceding carotid= Mitral

Click following carotid = Aortic valve

Two clicks= Double valve





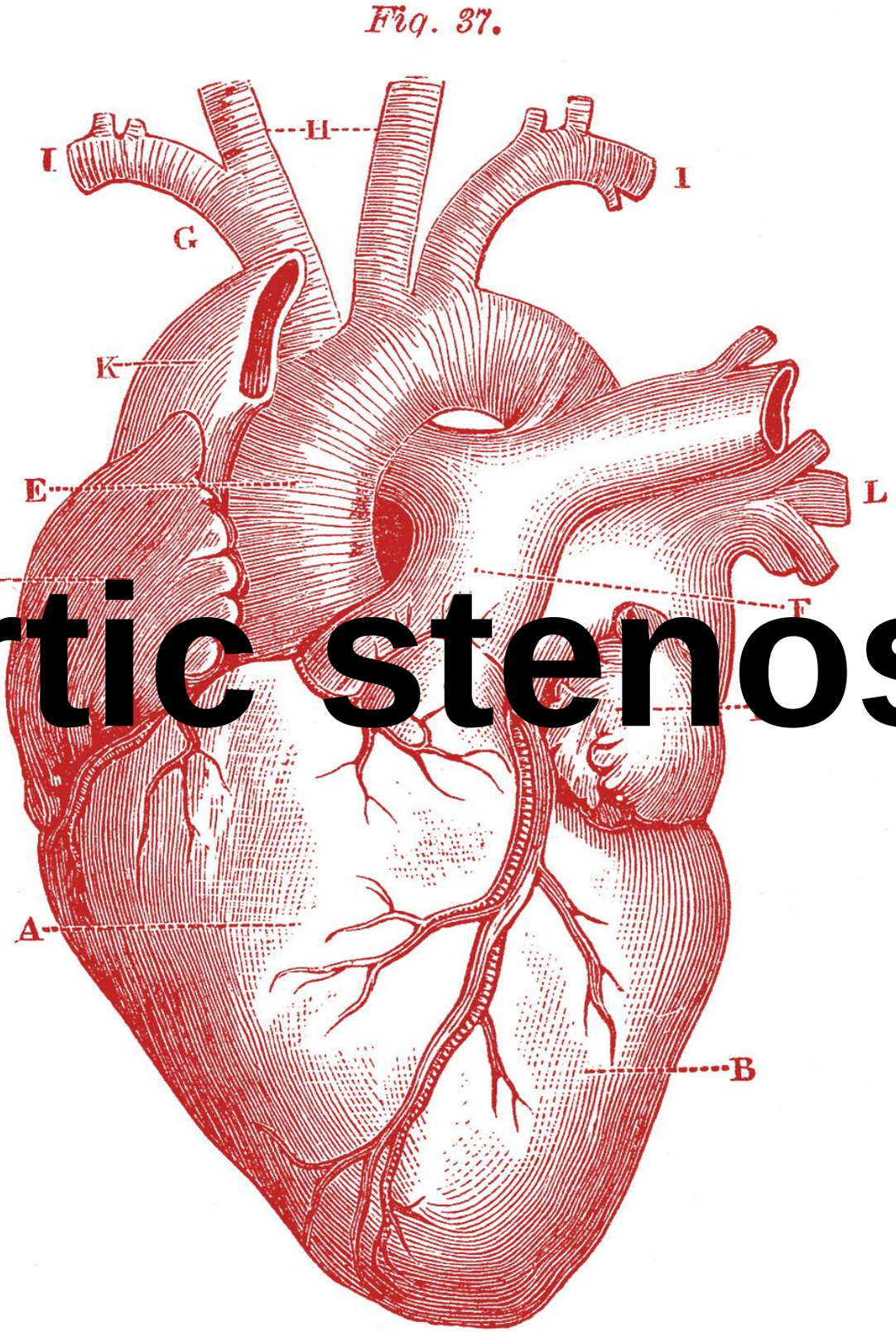
Prosthetic Valves – In the Exam

Presenting a AVR using the checklist:

1. The patient appears comfortable at rest and is haemodynamically stable
2. There are no peripheral stigmata of endocarditis
3. The pulse rate is 70 beats per minute, regular with normal volume and character. The blood pressure is 125/80
4. The venous pressure is not elevated
5. A **prosthetic click can be heard at the bedside**. On examination of the preacordium there is a **midline sternotomy scar**. The apex beat is undisplaced
6. There are no heaves or thrills
7. On auscultation the first heart sound is followed by a **prosthetic click at the second heart sound**
8. The lung bases are clear and there is no peripheral oedema
9. There is no evidence of anaemia
10. Top of my list of differentials would be an **AVR**, which seems to be **functioning well**

Questions

- Why would someone have a prosthetic valve?
- Tell me some of the complications associated with a prosthetic valve?
- What anticoagulation would you give with someone with a prosthetic valve?
- What are the causes of anaemia in a prosthetic valve?



Aortic stenosis

Aortic stenosis

- **Peripheral**: narrow pulse pressure, slow-rising pulse, “thrusting” apex beat

- **Auscultation**: Harsh ESM, radiates to carotids, first heart sound is normal and second is soft / not present

- **Loudest in**: Aortic area, leaning forward, expiration. Note Aortic Stenosis is often heard all over the praecordium.

Presentations

- The pulse rate is 60 beats per minute and regular. It is of a slow rising character. The BP is 100/80 with a narrow pulse pressure. On examination of the praecordium there is an ejection systolic murmur, heard loudest over the aortic area which radiates to the carotids. It is heard best on expiration and leaning the patient forward. The second heart sound is soft. The JVP is not elevated, the lung fields are clear, and there is no peripheral oedema nor stigmata of endocarditis. This is Aortic Stenosis, my differentials…

- This patient has a diagnosis of Aortic Stenosis as evidenced by a slow rising pulse, an ejection systolic murmur heard loudest in the aortic area which radiates to the carotids. He/she has a narrow pulse pressure with a BP of 100/80, and is in a regular rhythm. There is no evidence of heart failure or endocarditis.

Presentation tips

- Always mention relevant negatives in valvular heart disease, heart failure and endocarditis.

- Low volume pulse and slow rising pulse are signs of severe aortic stenosis but the lack of a second heart sound is most important (when assessing severity)

- Remember the left ventricle is hypertrophied, so the LV shouldn’t be displaced (unless very late on).

- Sometimes the murmur is loudest in the apex ???!!, This is Gallavardins phenomenon

Aortic stenosis

- **Differentials?** Aortic sclerosis, HOCM, Pulmonary stenosis and SYSTOLIC MURMURS

Congenital	***Bicuspid valve*** Downs Noonans/Turners Williams' syndrome Co-arctation of aorta
Acquired	***Calcification*** Rheumatic fever Infective endocarditis

Differentials

- Aortic sclerosis- overlaps with aortic stenosis
- VSD- Very loud murmur, all over praecordium, maximal at sternal edge- young
- HOCM- Younger patient, louder in pulmonary area, worse on crouching , pansystolic- young
- Pulmonary Stenosis –rare, normal second heart sound, louder on inspiration
- Mitral regurgitation if you hear it all over the praecordium (might be both).

Aortic stenosis

- **How would you investigate this patient?**

- History and exam: symptoms of AS (angina, syncope, dyspnoea); underlying cause

- Bedside: ECG (LVH, arrhythmia), urine dip

- Bloods: FBC, U+E, LFT, CRP

- Imaging:

  - CXR - LVH, pulmonary oedema, calcified valve

  - **Echo** - Severity and LV function

  - Consider angiogram if going for surgery

Aortic stenosis

- **How would you manage this patient?**
- Conservative - regular follow-up, exercise, smoking cessation etc.
- Medical
  - Diuretics to reduce SOB and preload
  - Optimise cardiovascular risk factors (HTN, DM, cholesterol)
- Surgical
  - Valve replacement (indications: symptomatic or dependent on severity and LVEF).
  - TAVI / balloon valvuloplasty if not a good candidate

Aortic Stenosis

IS IT SEVERE?

Clinical signs of severe AS

Low volume pulse
Slow-rising pulse
Narrow pulse pressure
Heaving apex
Systolic thrill
Reversed splitting of second heart sound
Soft/absent A_2
4^{th} heart sound
Late systolic peaking of a long murmur
Signs of pulmonary HTN/left heart failure

Clinical signs not reflective of severity

Loud murmur
Radiation to carotids

Objective classifications of severity

Aortic valve area < 1.0 cm^2
Mean pressure gradient > 50 mmHg
& symptoms!

Questions?

- How would you differentiate with aortic sclerosis?
- Normal 2nd heart sound, no radiation to carotids, normal pulse character

- What are associated conditions?
- Rectal bleeding- colonic polyps (Heyde's syndrome)
- What are the indications for surgery
- See as before

Mitral Regurgitation

Peripheral: ? Signs of endocarditis, usually in AF,

Auscultation: Displaced and thrusting Apex, Pansystolic murmur loudest in the apex, radiates to axilla.

Loudest: Apex,

Pan-Systolic Murmur?

Mitral Regurgitation
Tricuspid Regurigation
Small VSD
Aortic Stenosis

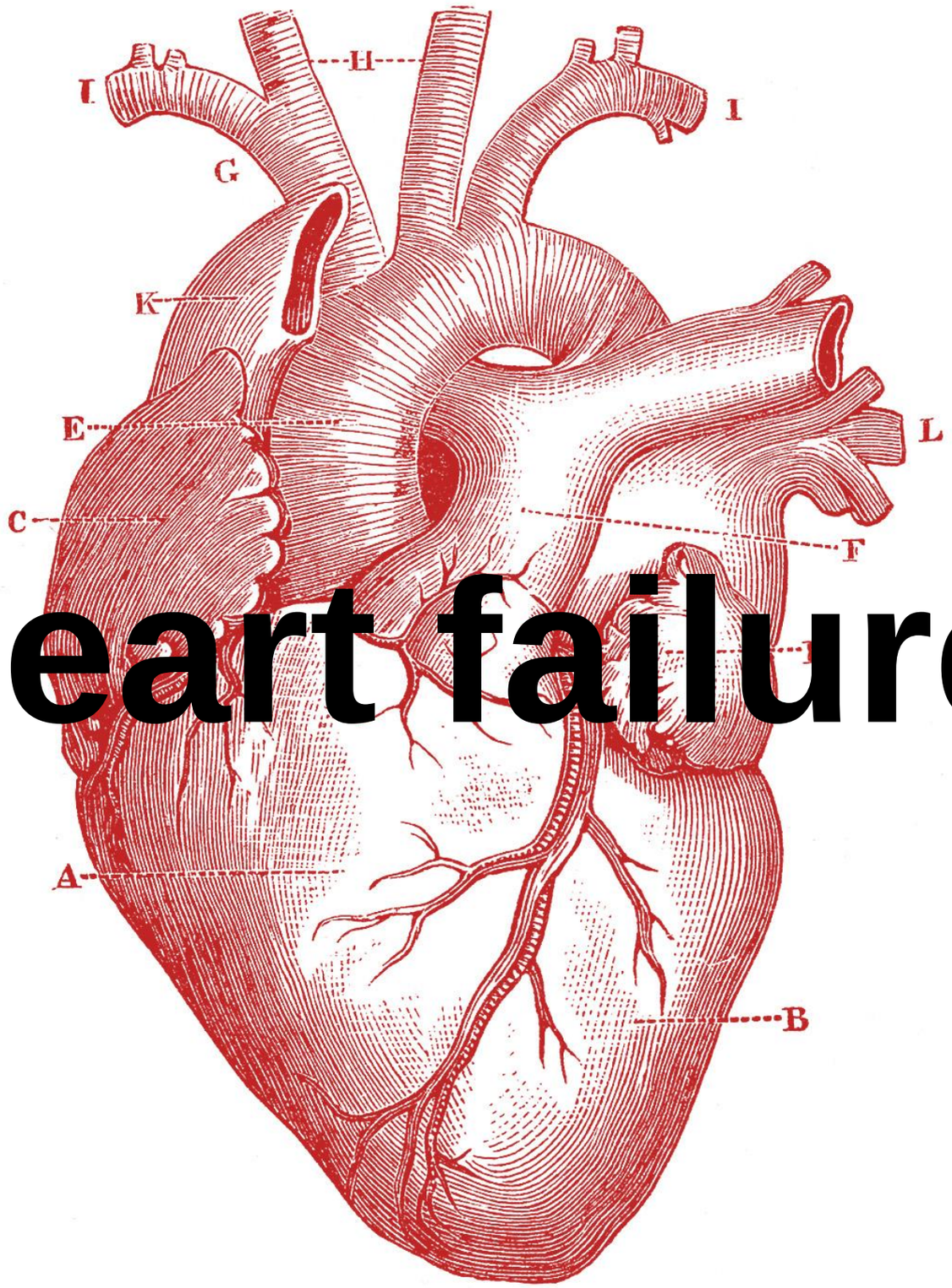
Sign	Pure MR	Pure TR
Pulse	Normal or jerky	Normal
JVP	Normal	Giant '*v*' waves
Palpation	Apical systolic thrill Thrusting displaced apex	Parasternal systolic thrill Parasternal heave
Auscultation	PSM loudest in expiration Radiates to axilla	PSM, Carvallo's sign, no radiation to axilla
Hepatomegaly	None	Pulsatile hepatomegaly

Mitral Regurgitation

1. Haemodynamically stable/ appearance
2. Peripheral stigmata of endocarditis
3. Pulse rate/rhythm/volume/character
4. JVP
5. Scars & Apex
6. Thrills/heaves
7. HS 1 + 2 (3/4)
8. Murmur: Where? Loud? Manoeuvres? Radiation?
9. Lung fields and oedema
10. Anything else that is obvious??
11. The diagnosis is/ at the top of my differential/ my differential would include…

Heart failure

Fig. 37.



Heart failure

- **Peripheral:** SOB, cool peripheries, cyanosis, pitting oedema, ascites
- **Auscultate:** S3, bibasal creps, wheeze

CCF Without a Murmur

Annoying station!

Make sure you:

- Look for any scars of heart surgery/grafting
- Measure/ask for the blood pressure
- Listen carefully to the lung bases
- Look at the level and distribution of oedema
- Do not make up sounds you cant hear…

One investigation is paramount (ECHO)

Heart failure

“I have examined the cardiovascular system of Mr X.

*He was **short of breath at rest**. Peripherally he was **cold** and had evidence of **cyanosis** in his hands, as well as some **pedal oedema.** On auscultation, there were **bibasal crepitations**.*

*These findings are consistent with a diagnosis of **heart failure.**”*

Heart failure

- **How would you investigate this patient?**

- History and exam: fatigue, dyspnoea, PND, orthopnoea

- Bedside: ECG (ischaemia, hypertrophy, AF)

- Bloods: FBC, U+E, BNP

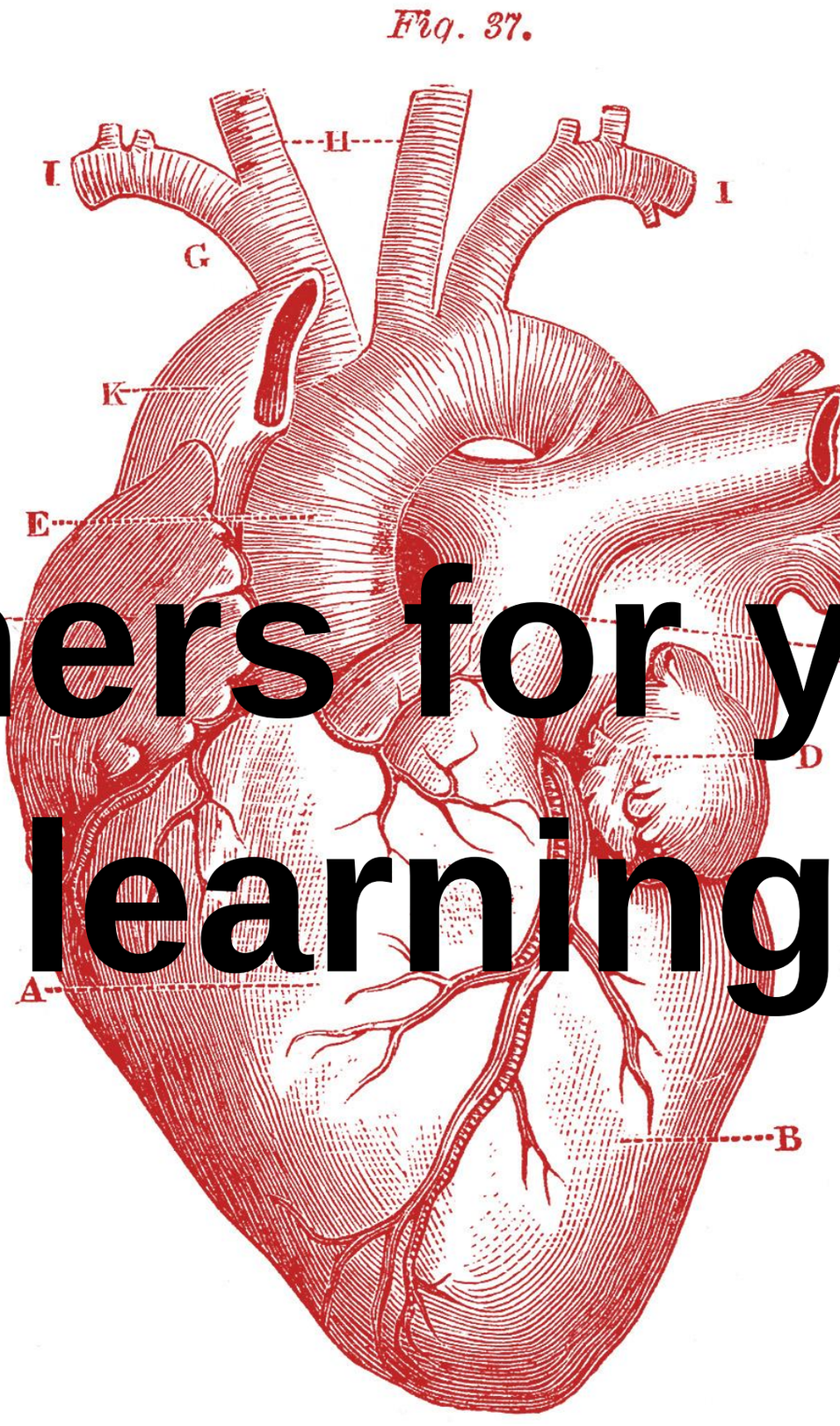
- Imaging: CXR, **Echo**

Heart failure

- **How would you manage this patient?**
- Conservative - regular follow-up, exercise, smoking cessation etc.
- Medical Acute vs Chronic
  - ACEi + B-blocker
  - Diuretics (loop and spironolactone)
  - Digoxin
  - Optimise cardiovascular risk factors (HTN, DM, cholesterol)
- Surgical - cardiac resynchronisation therapy, left ventricular assist device (LVAD) or heart transplant

CCF

Causes of Heart Failure:
- Coronary artery disease
- Chronic pressure overload
  - HTN
  - Obstructive valvular disease
- Chronic volume overload
  - Regurgitant valvular disease
  - Shunting (VSD/ASD, extracardiac)
- Dilated cardiomyopathy
- Chronic arrhythmias
- Pulmonary heart disease (e.g. cor pulmonale)
- High-output states
- Heart failure with preserved ejection fraction
  - HCM
  - Restrictive cardiomyopathy
  - Fibrosis



Others for your learning

Mitral Valve Prolapse

A cause of Mitral Regurgitation
1º (commonest) or 2º (Classically Marfan's)
Associated with some specific signs:
  Mid-systolic click
  Late systolic cruscendo-decruscendo murmur
    Loudest at LLSE
As it becomes more severe, clinically resembles MR

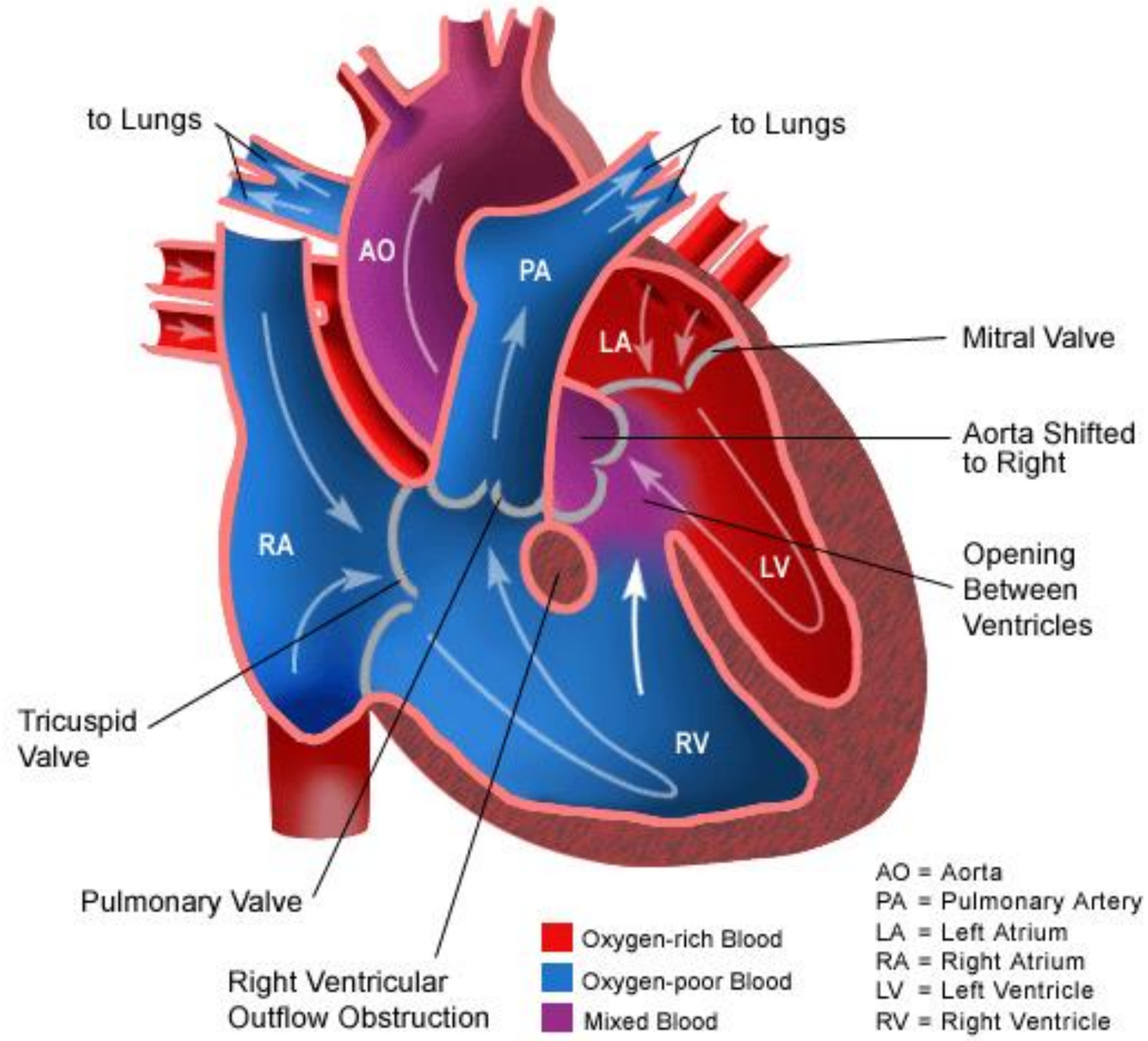
Mitral Stenosis

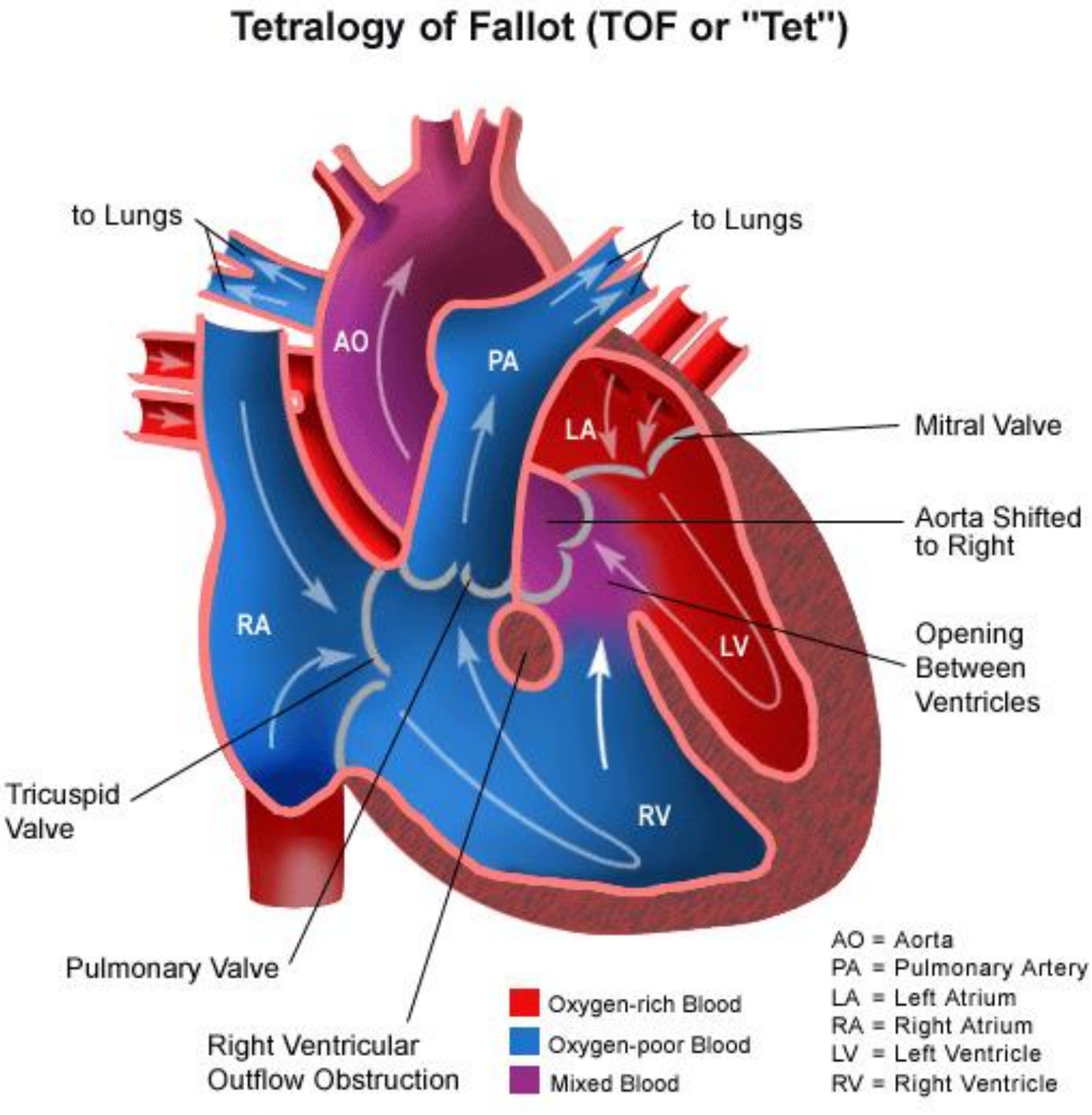
1. Miss Y appears comfortable at rest and is haemodynamically stable
2. There are no peripheral stigmata of endocarditis
3. The pulse rate is 60 beats per minute, **irregular**, of normal volume and character
4. The JVP is not elevated

On examination of the precordium,

5. The apex beat is undisplaced and has a **tapping quality**
6. There are no heaves or thrills
7. On auscultation, the **first heart sound is loud**, the second heart sound is normal. There is an **opening snap in early diastole**
8. Followed by a **MDM** at the **apex**, loudest **in expiration** with the patient in the **left lateral position**
9. The lung bases sound clear and there is no peripheral oedema
10. The diagnosis is **mitral stenosis** without features of heart failure

Tetralogy of Fallot (TOF or "Tet")





Obstruction to RV outflow

Malaligned VSD

Overriding aorta

RV hypertrophy

Tetralogy of Fallot – Palliative Procedure

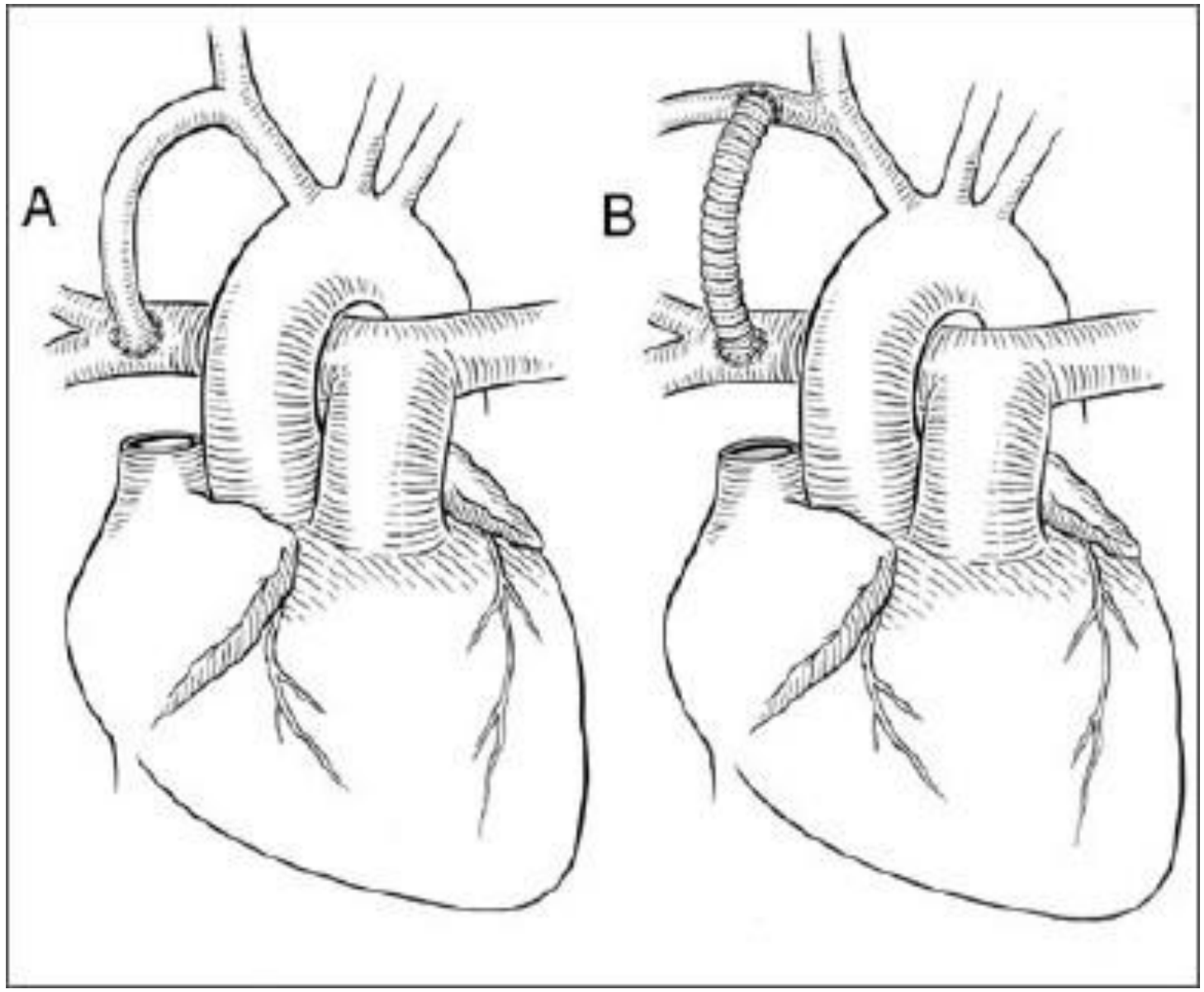
Modified Blalock-Taussig Shunt

<u>"Artificial conduit made between the systemic and pulmonary circulations"</u>

PTFE graft from **subclavian artery** to a side branch of the **pulmonary artery**

Originally: Developed as a stand-alone palliative procedure

Now: Used only in the most severe variants (i.e. with complete pulmonary atresia) or as a bridging procedure



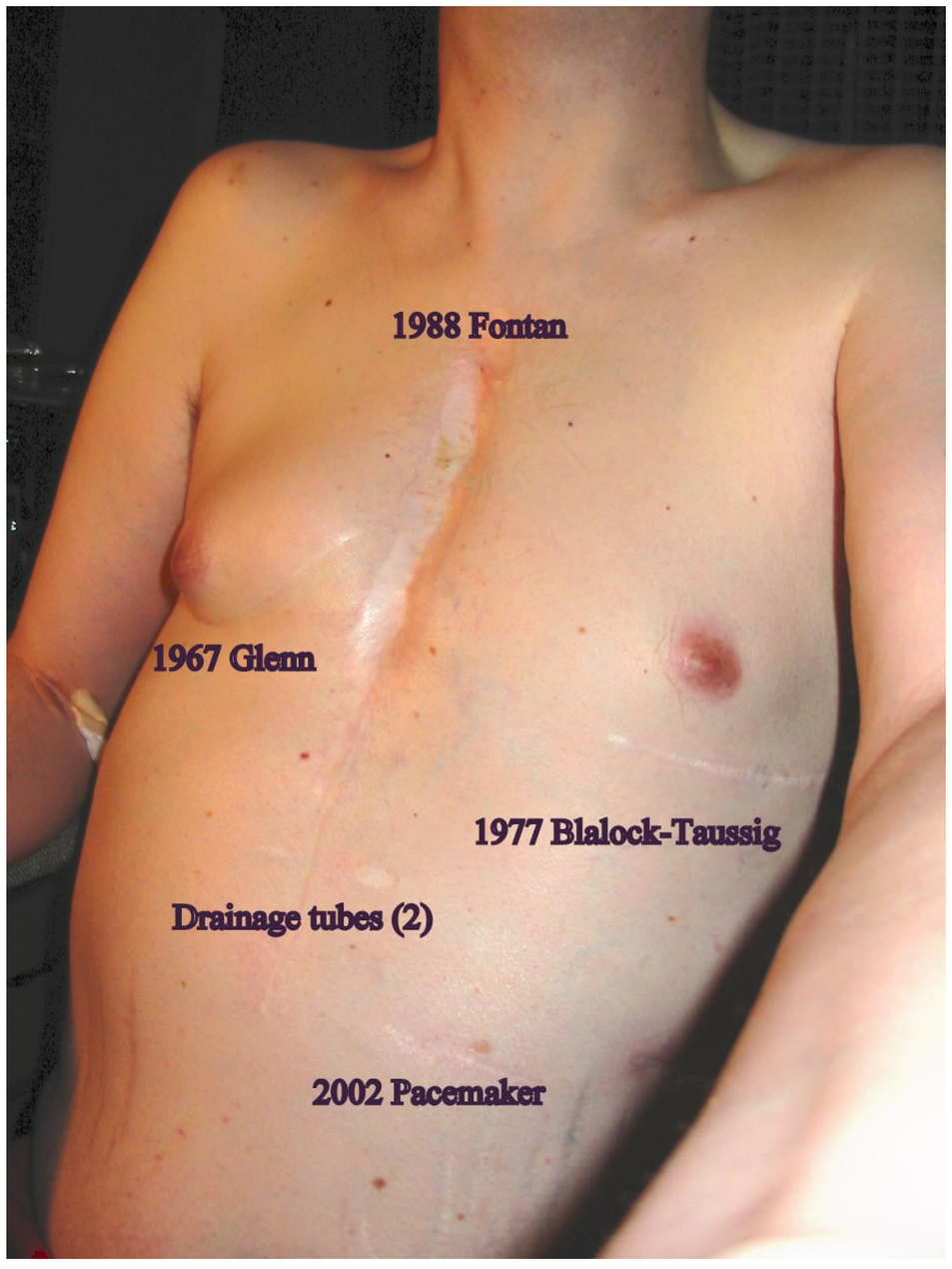
Tetralogy of Fallot – Total Surgical Repair

Early and complete repair is now preferred

1 or 2 stages

Involves closure of the VSD and relief of the RV outflow obstruction

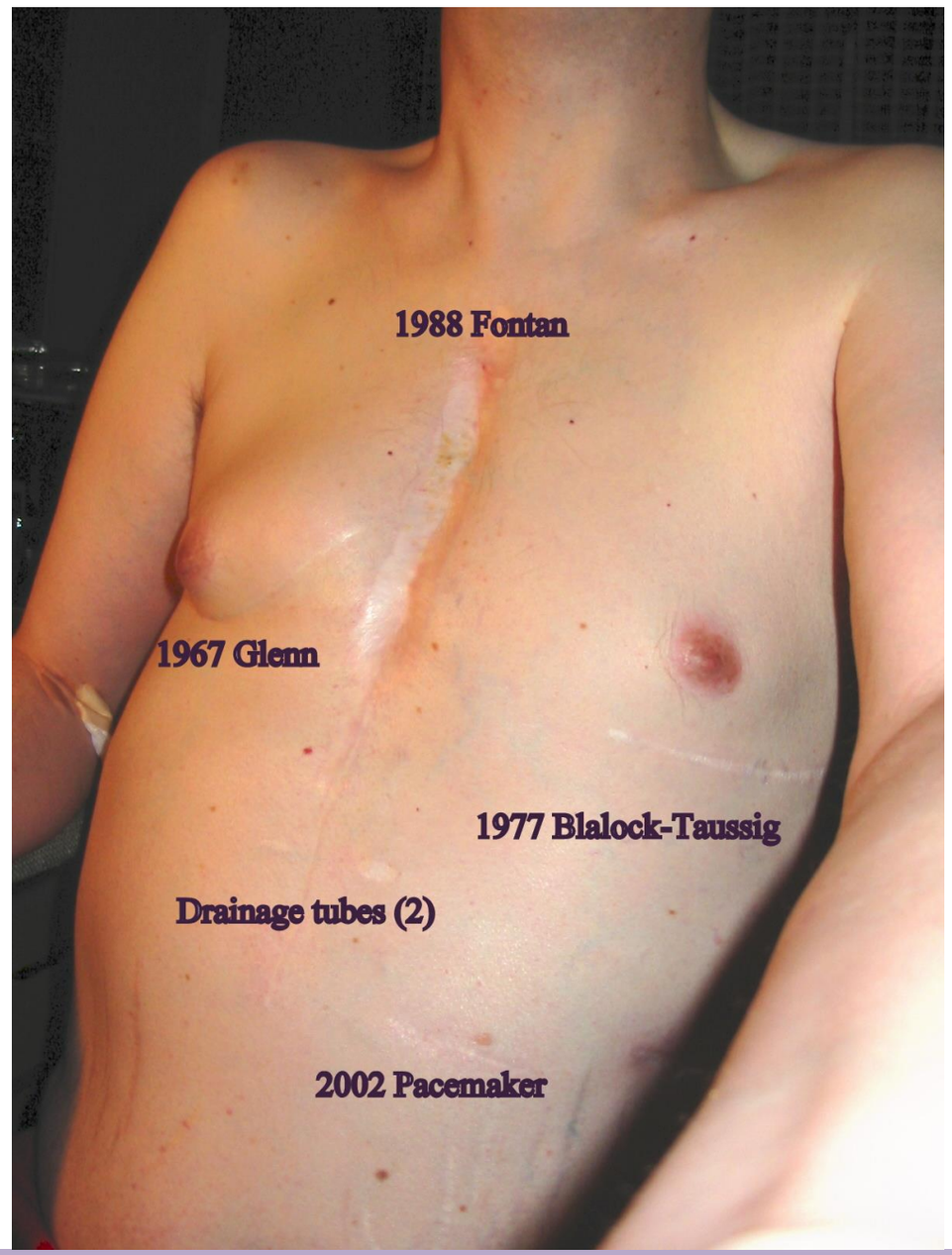
Usually performed within the 1st year of life



Tetralogy of Fallot – The Adult Patient

1. TOF Corrected With B-T-S:

Cyanosis & clubbing
Unilateral weak upper limb pulses (+ BP)
Thoracotomy scar
To-an-Fro continuous murmur of shunt
Murmur of aortic regurgitation



2. Totally Corrected TOF:

No cyanosis, may be clubbing
Median sternotomy ± thoracotomy scar
Murmurs of PR or TR
(Features of residual RVOTO)

2. In both, look for signs of:

Right-heart failure
Arrhythmias (AF, ICD/pacemaker scar)
Inherited syndromes

VSD

1. The patient looks well
2. No peripheral stigmata of endocarditis
3. The pulse is 70 bpm and regular, normal volume and character
4. The JVP is not elevated
5. The apex beat is undisplaced
6. There is a **parasternal thrill**
7. On auscultation, heart sounds 1 and 2 are normal
8. There is a **loud PSM heard all over** the precordium, loudest at the LLSE
9. Lung bases are clear. There is no pedal oedema
10. -
11. The diagnosis is VSD with a left-to-right shunt.

ASD

1. The patient looks well
2. No peripheral stigmata of endocarditis
3. The pulse is 70 bpm and regular, normal volume and character
4. The JVP is not elevated
5. The apex beat is undisplaced
6. There is a **systolic thrill** at the **ULSE**
7. The first heart sound is normal. There is **wide fixed splitting of the 2nd heart sound**
8. There is an **ESM at the ULSE**
9. Lung bases are clear. There is no pedal oedema
10. -
11. The diagnosis is ASD with a left-to-right shunt

Eisenmenger’s syndrome

Don’t panic!
Focus on the basics:

HALLMARKS are:
1. Central cyanosis
2. Pulmonary hypertension

Look for cyanosis & clubbing

High JVP with giant Vs
Parasternal heave
Peripheral oedema
± murmurs of PR and
Test on inspiration!

Eisenmenger’s syndrome

Don’t panic!
Focus on the basics:

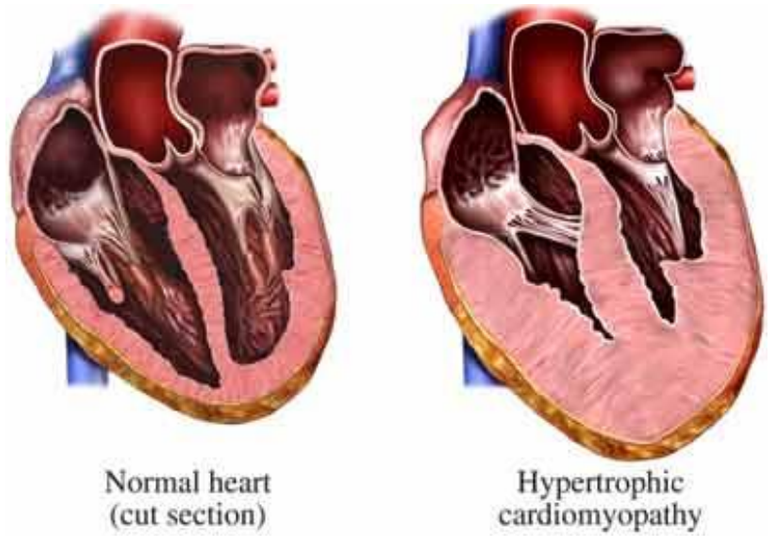
CAUSES ARE:
1. ASD
2. VSD
3. PDA

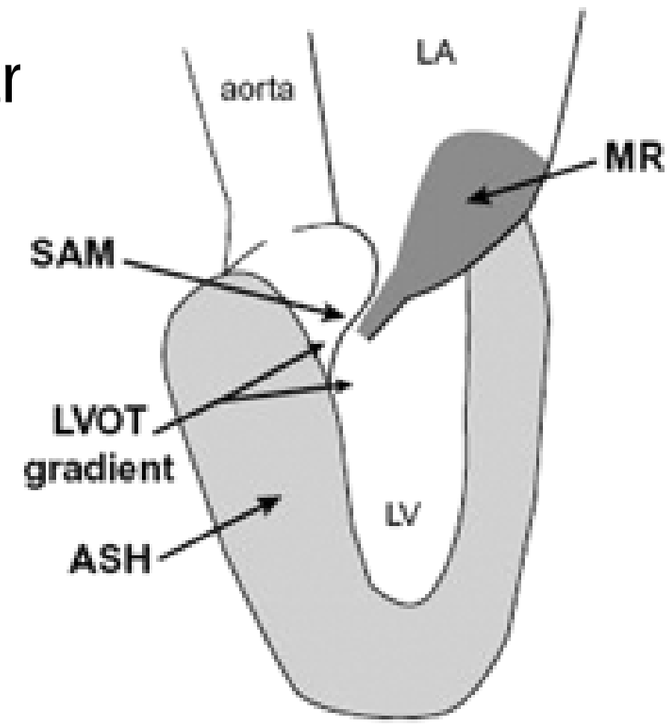
Their murmurs have disappeared!

BONUS ROUND:
Differential cyanosis and clubbing -> PDA
Single 2nd heart sound -> VSD

HOCM

Affects 0.2 % of the population
Genetically heterogenic
  AD, but over 200 mutations
Phenotypically heterogenic
  All have inappropriate myocardial hypertrophy
  Commonest is asymmetrical septal hypertrophy
  25 % have LV Outflow tract obstruction
Fewer have Systolic anterior motion of (anterior) mitr valve leaflet





1. The murmur of <u>LV out flow tract obstructiion</u>

Ejection cruscendo-decruscendo
After HS1 or in mid-systole
Loudest between LSE and apex
Radiates up the sternal border
No radiation to carotids
Diminished by valsalva, squatting, β-blockers
Increased by standing, nitrates, diuretics

2. The murmur of <u>SAM</u>

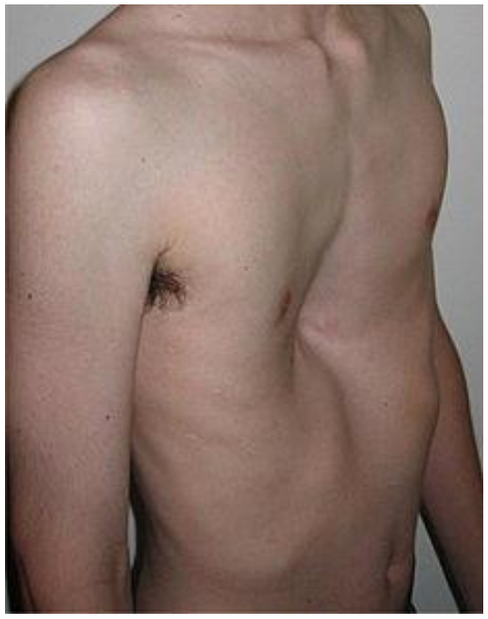
Less common
Additional pan-systolic murmur (MR)
Loudest at apex
Radiates to axilla
May ‘merge’ with LVOTO murmur

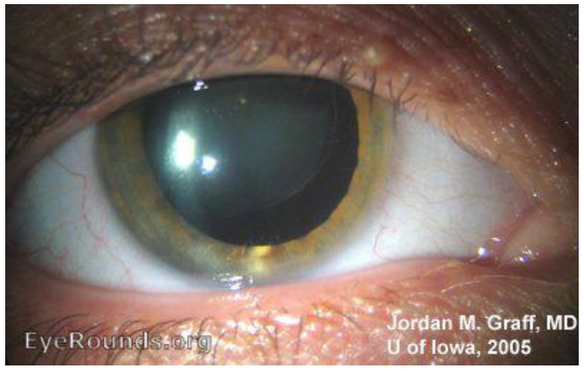
1. + 2. = pansystolic murmur all over the precordium

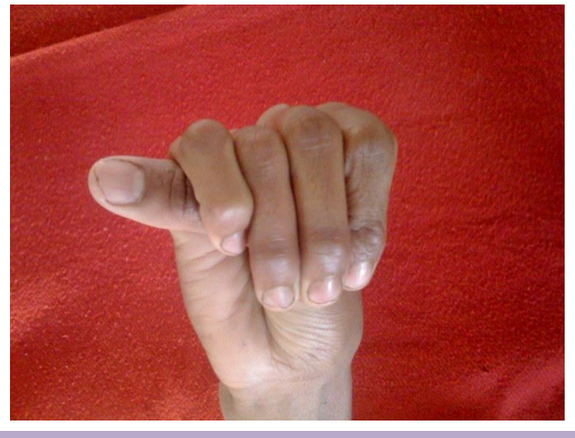
1. Haemodynamically stable/ appearance
2. Peripheral stigmata of endocarditis
3. Pulse rate/rhythm/volume/character
4. JVP
5. Apex
6. Thrills/heaves
7. HS 1 + 2 (3/4)
8. Murmur: Where? Loud? Manoeuvres? Radiation?
9. Lung fields and oedema
10. Anything else that is obvious??
11. The diagnosis is/ at the top of my differential/ my differential would include…

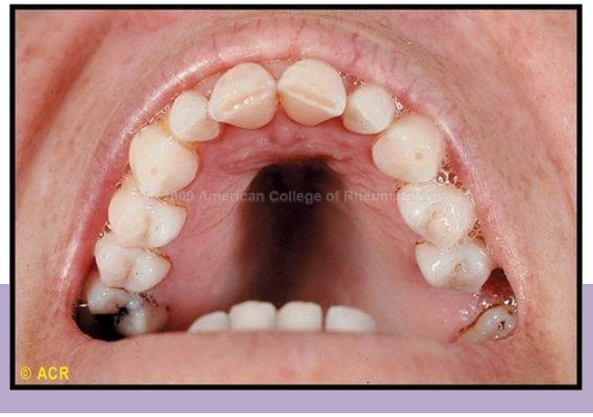
1. Younger patient
2. Peripheral stigmata of endocarditis
3. AF? Jerky pulse? Double carotid impulse?
4. Prominent a waves
5. Double apical impulse, heaving
6. Systolic thrill at LLSE
7. ?Fourth heart sound
8. **ESM at LLSE**, not radiating to carotids +/- **PSM at apex** radiating to axilla
9. The lung bases sound clear. There is no peripheral oedema
10. ?ICD in situ
11. The diagnosis is hypertrophic cardiomyopathy

MARFAN









TURNER*

“Marfanoid body habitus”

General inspection
- Tall Stature
- Disproportionately long limbs

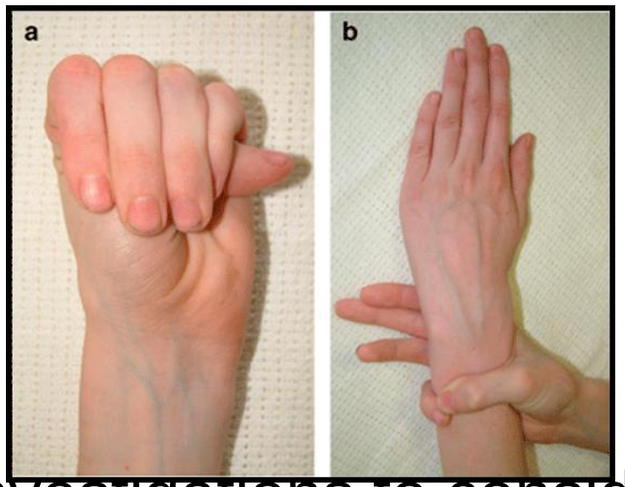
Hands
- Arachnodactyly (Thumb & wrist signs)

Face
- High-arched palate
- Blue sclerae

Precordium
- Kyphoscoliosis
- Pectus excavatum

To complete your examination
- Check for joint hyperextensibility
- Check for pes planus
- Assess mental status
- Perform fundoscopy (ectopia lentis)

Common heart problems
- Aortic root dilatation (70-80 %)
- Aortic regurgitation
- Aortic dissection
- Mitral valve prolapse



Investigations to consider
Echocardiography
Fibrillin-1 gene testing
X-ray hips (protrusio acetabulae)
MRI spine (dural ectasia)

45 XO Females

General inspection

Short stature (ask pt. to stand)

Hands

Nail dysplasia
Short 4th metacarpals
Wide carrying angle (cubitus valgus)

Face & neck

High-arched palate
Webbed neck

Precordium

Square (shield-like) chest
Widely spaced nipples

To complete your examination

Check the blood pressure
Eye examination for strabismus, cataracts, nystagmus
Assess thyroid status; check for goitre
Look for complications of diabetes
Look of complications of osteoporosis (scoliosis, evidence of fractures)

Common Heart Problems

Aortic stenosis (bicuspid valve)
Coarcation of aorta
Hypertension

VS.

Investigations to consider

Echocardiogram
Hormone testing (FSH, LH)
TFTs for hypothyroidism
Glucose testing
Renal ultrasound (horseshoe)
Ophthalmology

Weak Pulses

Weak radial pulse? No other findings?
What do you do?
- Check the other radial pulse
- Radio-radial delay
- Radio-femoral delay
- Any scars?
- Measure the blood pressure

Weak Pulses

Differential diagnosis for a weak/absent radial pulse:

- Examination technique
- Cardiovascular compromise
- Post-procedures
  - Radial artery harvesting
  - Cardiac catheterisation through radial artery
  - Radial arterial line
- Embolic
  - As in AF
- Atherosclerotic
  - Aortic dissection
  - Brachial/ axillary artery occlusion
  - Subclavian steal syndrome
- Vasculitis
  - Takayasu's arteritis
  - Giant cell arteritis
- Structural
  - Cervical rib syndrome
  - Thoracic outlet syndrome

Summary

1. Reviewed the structure of cardiovascular examination
2. Raised awareness of the relevant physical signs
3. Became familiar with the commonest long station cases
4. Formed a structure for presenting at the end of your cardiology long station OSCE

Useful References used here

Form a nerd herd
Ask Dr Clarke website (free)
OHCM
Medical Short Cases for Med. Students – by Robert *et al.*
Clinical Medicine for the MRCP PACES: Volume 1
Core Clinical Skills – by Mehta and Iqbal
Littmann heart sounds CD
A plethora of courses including OSCE aid
And don’t forget… utilise your time on the wards!

PRACTICE!
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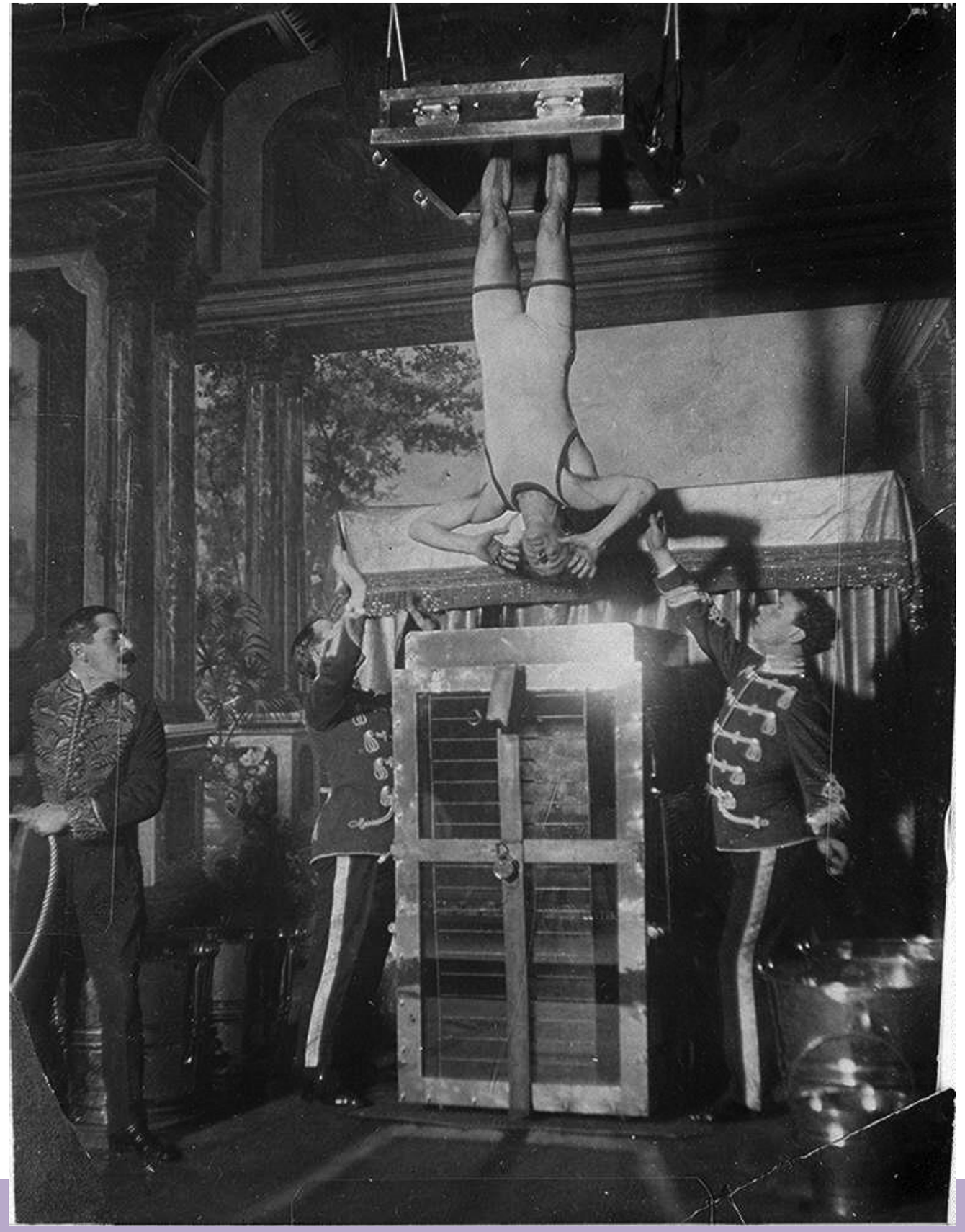

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