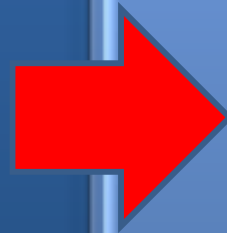


Precordium

= "Vascular" chest

It is the anterior chest surface overlying the heart and great vessels

**Before
Examination**



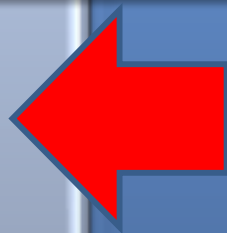
Inspection

**CVS
examination**



Auscultation

Most important



Palpation

No percussion

Before Examination

**Introduce
your self**

**Take
permission**

Explain

**Privacy and
ask for
chaperon**

Good light

**Ideal
Position**

Exposure



Inspection

From the foot of the pt:

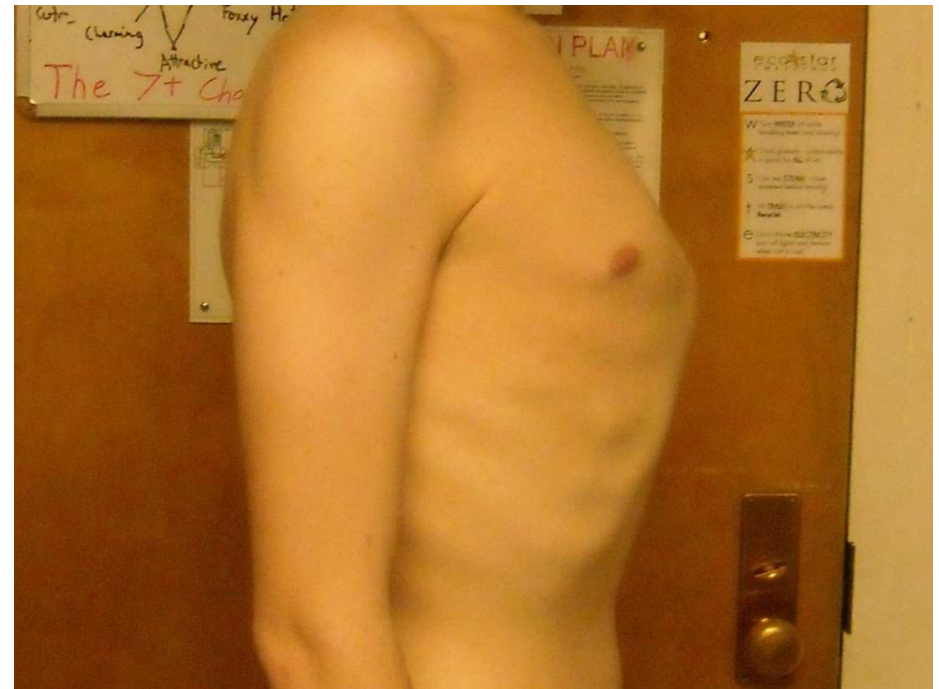
- **Symmetry** *"Chest is symmetrical"*
- **Deformity** *e.g., No pectus excavatum*
- **Moves with respiration** *"Chest moves with respiration"*

Pectus excavatum



Chest Deformities

Pectus carinatum



From the right side:

▪ **Hair distribution** *"Normal hair distribution"*

▪ **Scars** *Examples are coming up...*

▪ **Dilated veins** *Can indicate venous return issues...
"No dilated veins"*

▪ **Visible pulsation and apex beat**

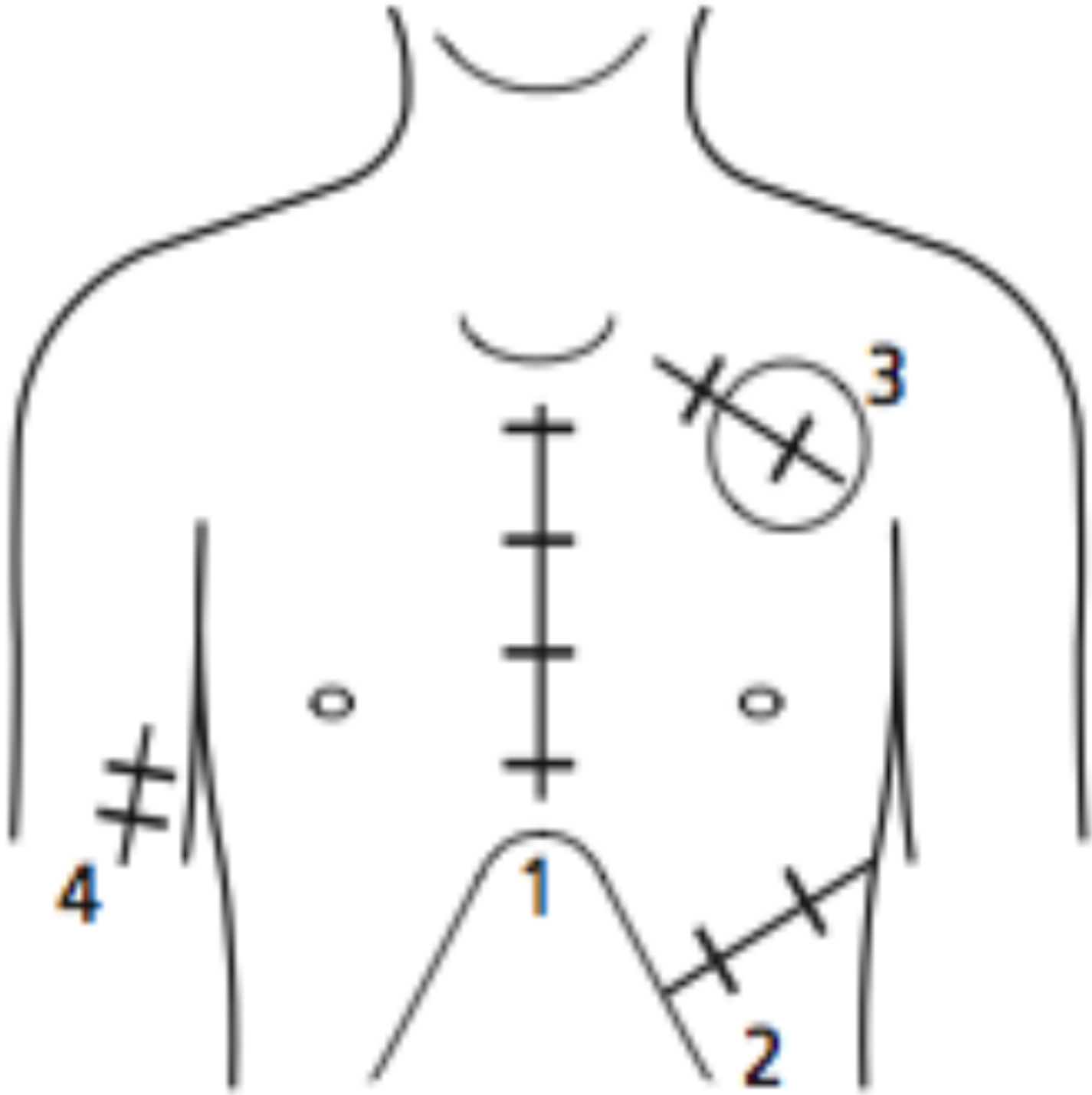
▪ **Skin lesions**

↳ Could be visible or not.

↳ Tachycardia → Normal

*Normal
or
Abnormal*

(Check table 4.9)



Scar	Location	Procedure	Possible surgery
1	Midline	Median sternotomy	Open-heart surgery/CABG
2	Submammary	Anterolateral thoracotomy	Pericardial surgery
3	Left subclavicular		Pacemaker insertion
4	Upper/Lower limb	Vascular conduit	CABG

Open-heart
surgery

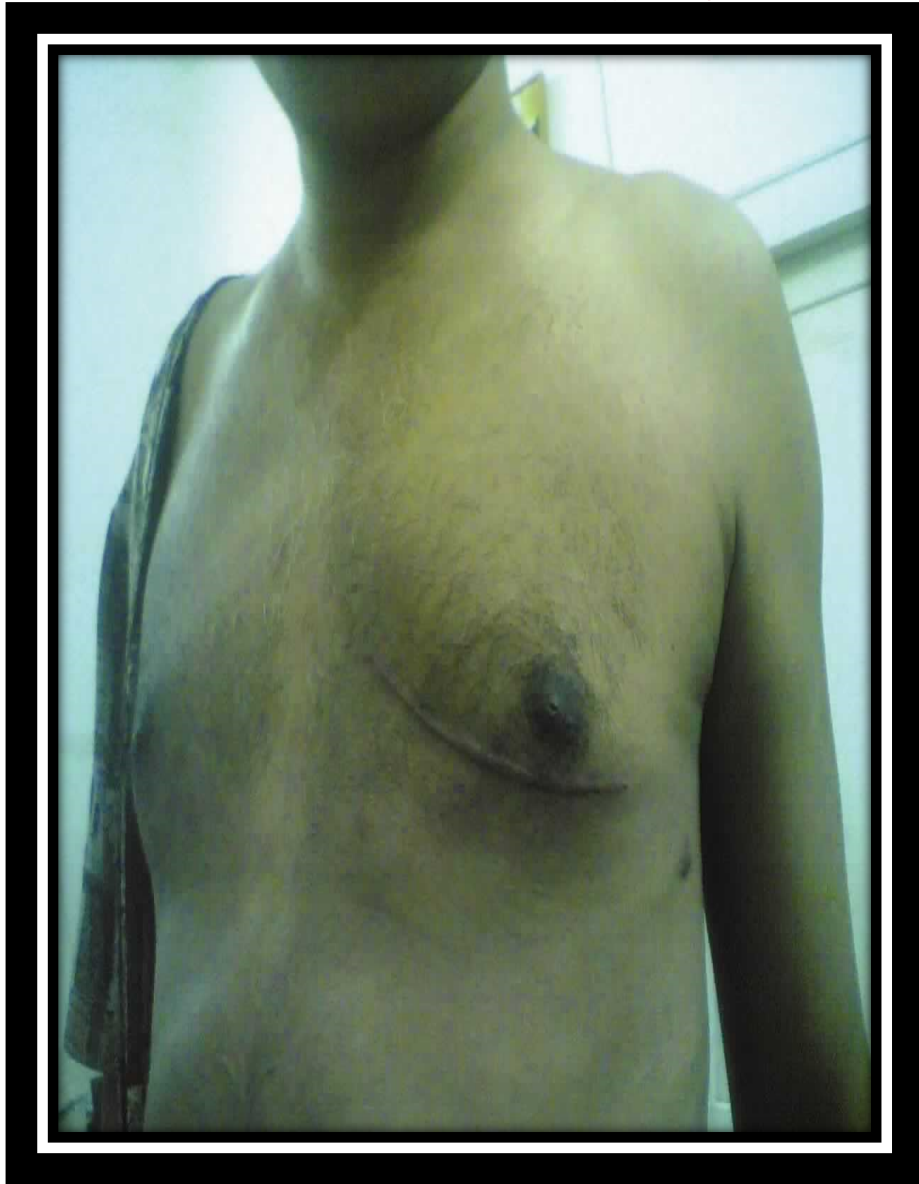


CABG



Vascular conduit
from the leg. Used
in CABG.

Anterolateral thoracotomy
Pericardial surgery

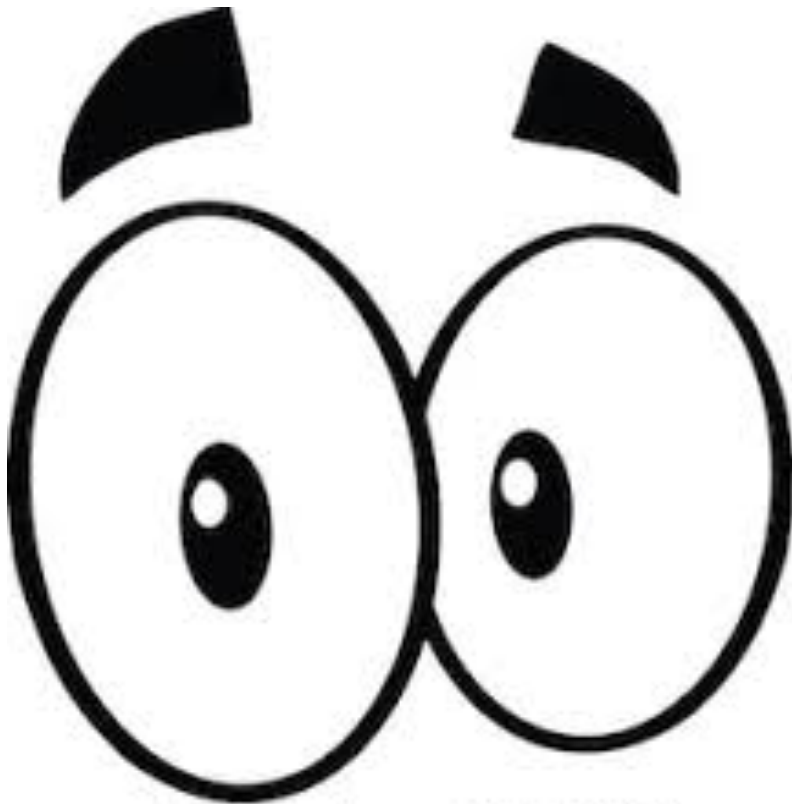


Left subclavicular
Pacemaker insertion



Palpation

- Eye contact
- Ask about tender areas
- *Warm your hands*



shutterstock.com - 177695390



1. Apex beat position and character

Discussed last week

If hard to locate,
ask pt. to roll on
his left side



Find the most palpable point.



Location:



Comment:

Gently tapping my fingers.

- **General palpation** using flat of your right hand over the precordium **for general impression**, **then locate it** by your fingers lying parallel to ICS then locate with 2 fingers.
- **If not palpable**, roll the patient to the left side

** **Position:** Lt 5th ICS, mid-clavicular line

** **Character:** gentle tapping

Abnormal location of apex beat:

could be normal

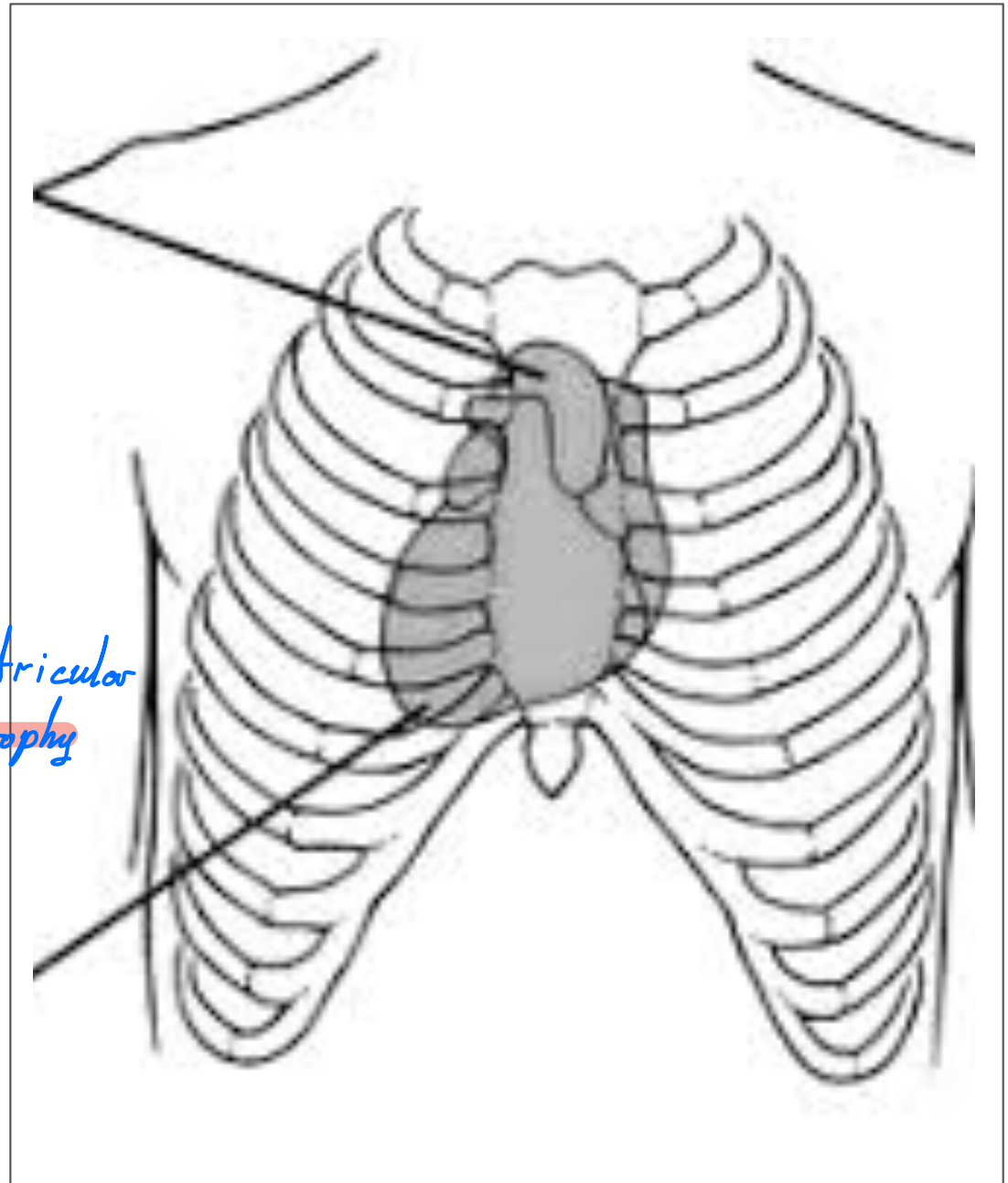
e.g., dilated cardiomyopathy

- Impalpable apex beat
- Displaced inferiorly and laterally
- Palpable on right side

→ i.e., dextrocardia e.g., Left ventricular

Abnormal Character of apex beat: *hypertrophy*

- Forceful pulsation (APICAL HEAVE)
- Tapping apex beat → *Tachycardia*
- Double apical impulse → *HOCM*

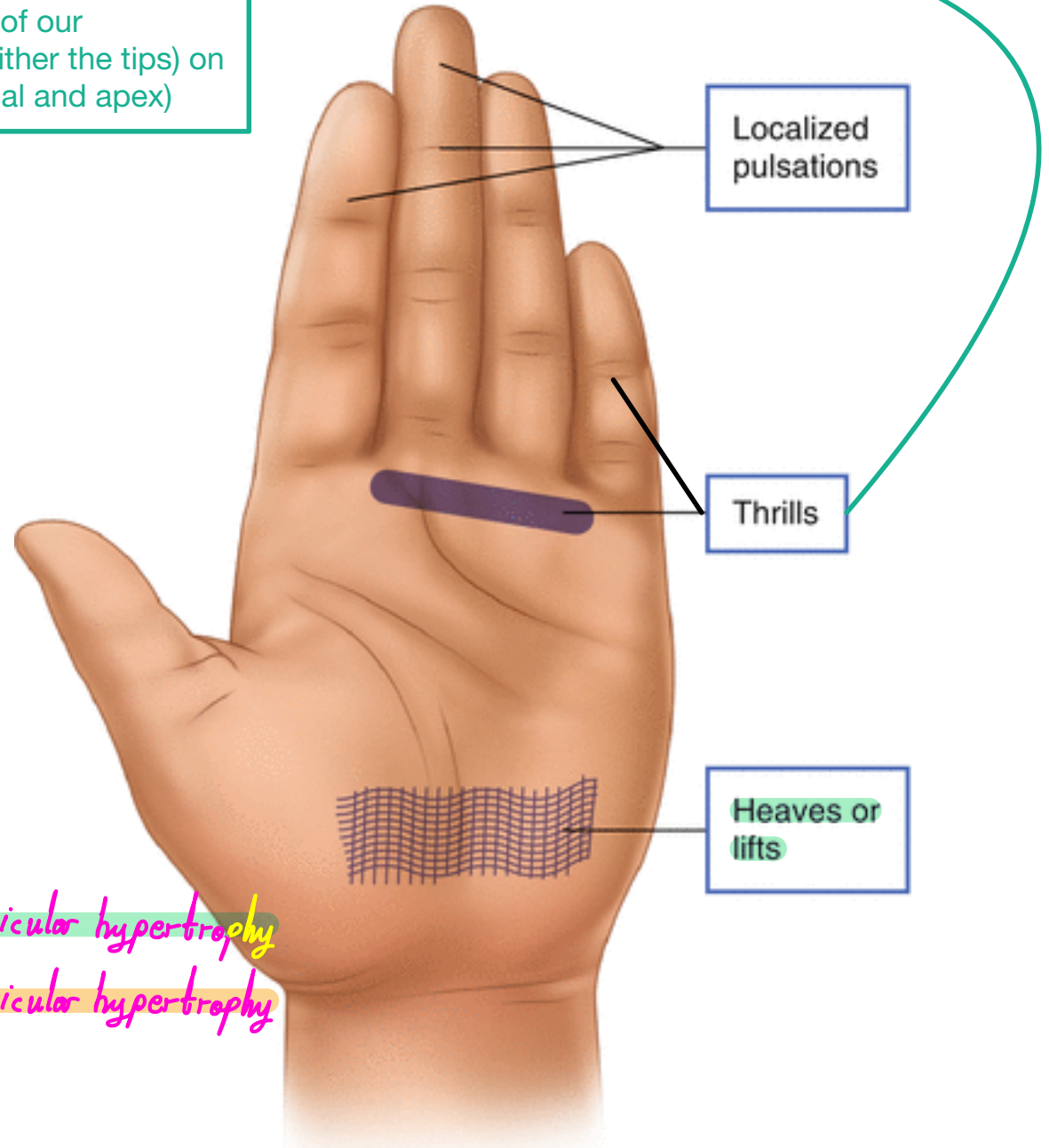


لجنة المساق اعتمدت اخر شي لل examination يكون هيك:

We examine for thrills with the flat of our fingers (vertically) (not the base, neither the tips) on 3 areas (Rt and Lt upper parasternal and apex)

2. Heave

- Abnormal palpable impulse that noticeably lifts your hand
- Palpate with the heel of your right hand firmly over 2 areas:
 - 1) Lt lower parasternal area (hold breath in expiration) → For right ventricular hypertrophy
 - 2) Apex area → For left ventricular hypertrophy





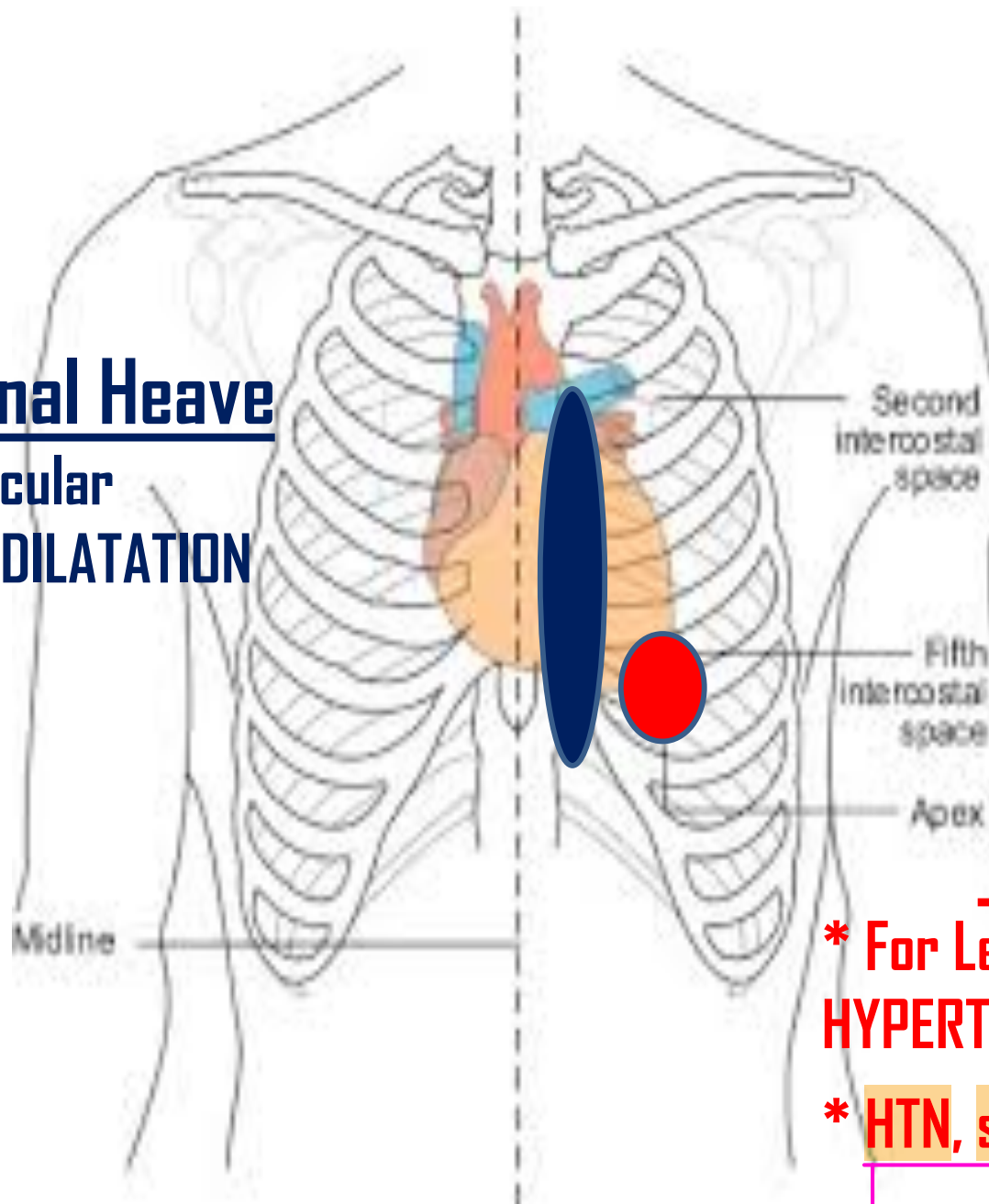
**ASSESS FOR A
PARASTERNAL HEAVE**
RIGHT VENTRICULAR HYPERTROPHY

GEEKY MEDICS

Left parasternal Heave

* For Right Ventricular
HYPERTROPHY or DILATATION

* Pulmonary HTN



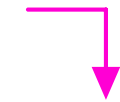
Apical Heave

* For Left Ventricular
HYPERTROPHY

* HTN, severe aortic stenosis

→ Increase the strain on the
left ventricle

3. Thrill



When a murmur is so bad that it becomes palpable!

– The tactile equivalent of a murmur, palpable vibration

(**PALPABLE MURMUR**)

Palpate with the **palmar aspect of fingers** (**PLACED VERTICALLY**) over 3 areas:

④ **Apex**

↳ 4 mentioned in the subgroup:

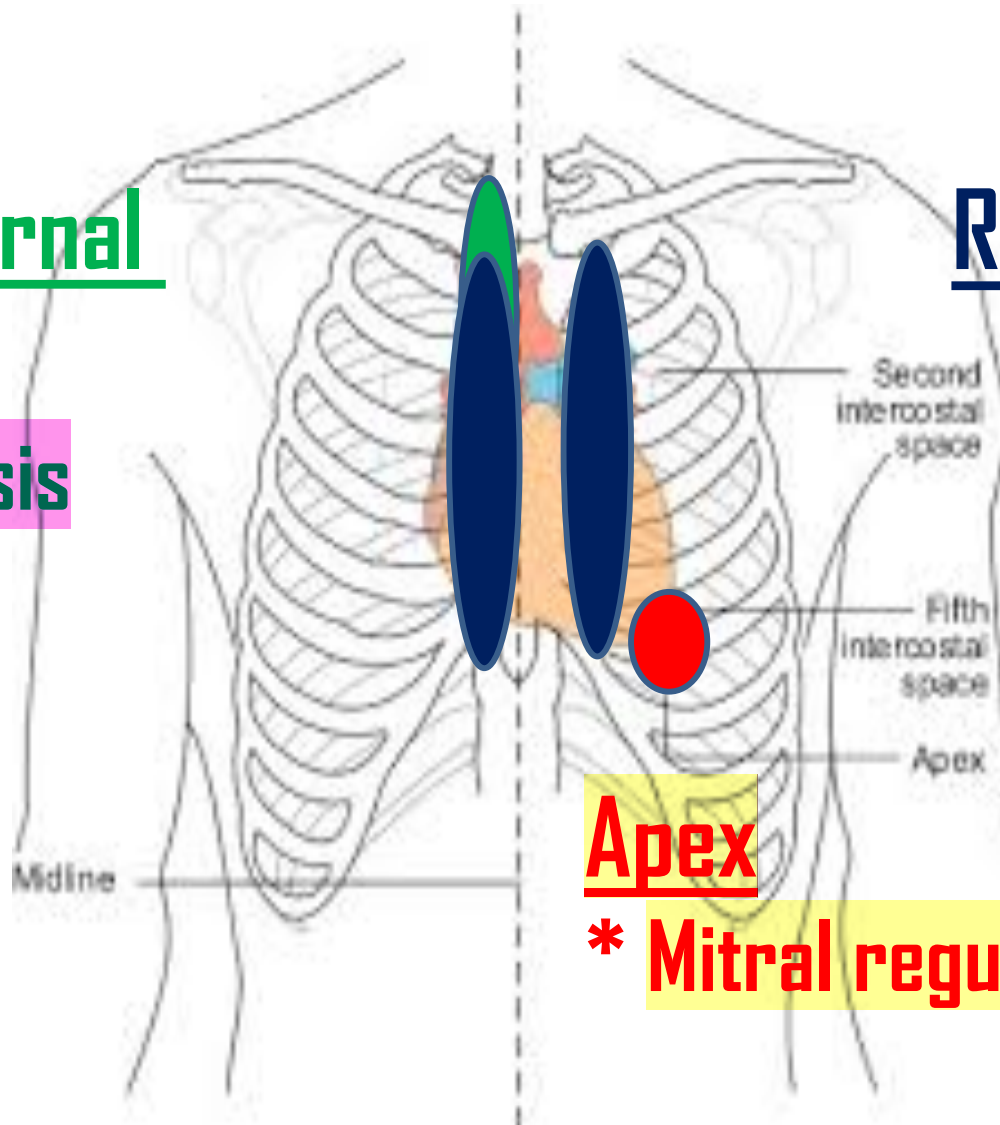
Left parasternal area → ③ *Middle*

Right parasternal area → ① *Superior*

→ ② *Middle*

Rt upper sternal border

* Aortic stenosis



Rt and Lt sternal borders

* VSD

Apex

* Mitral regurgitation

Palpation Summary

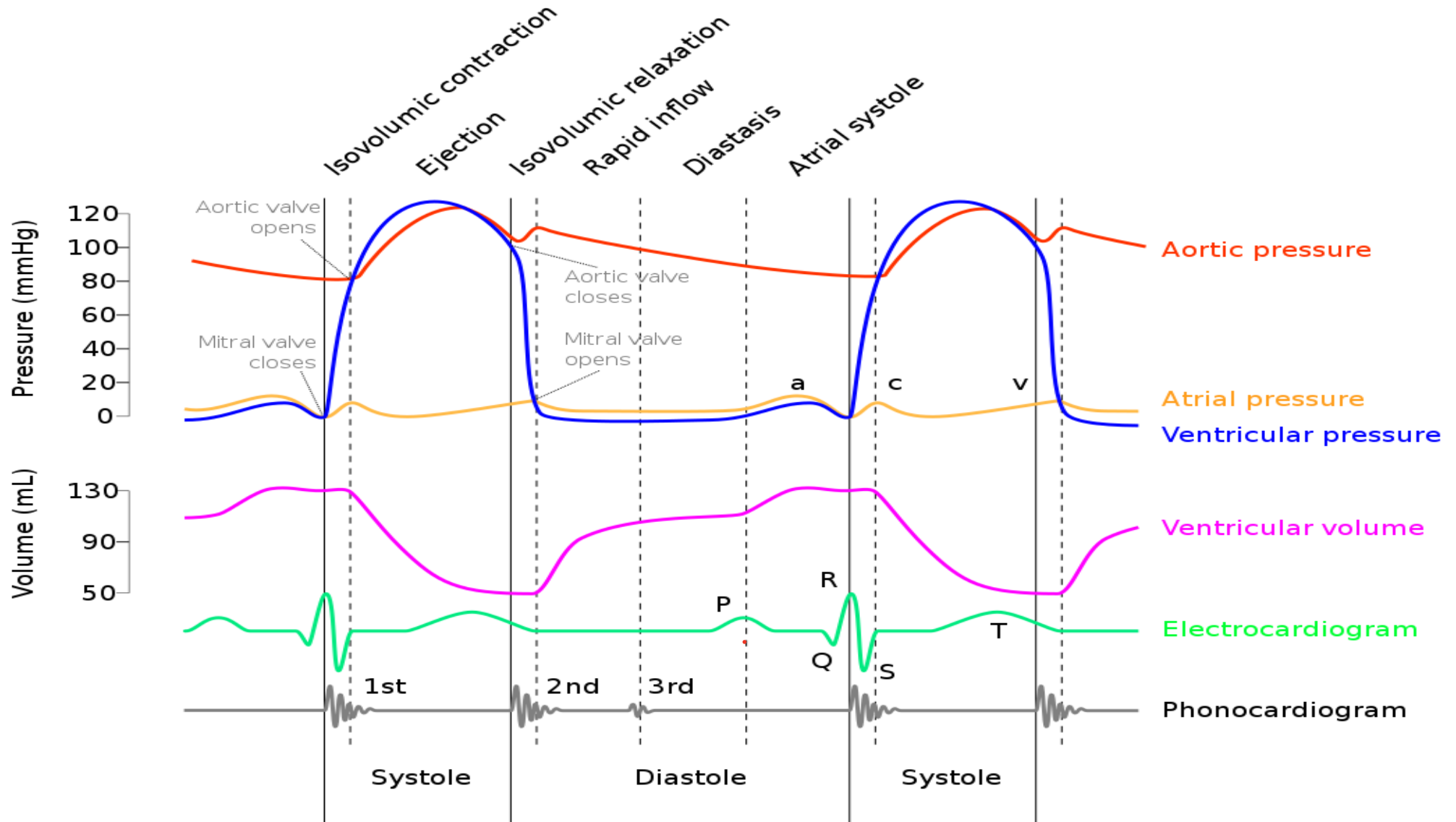
1 pulsation

2 heaves

4 thrills

Auscultation

The Cardiac Cycle

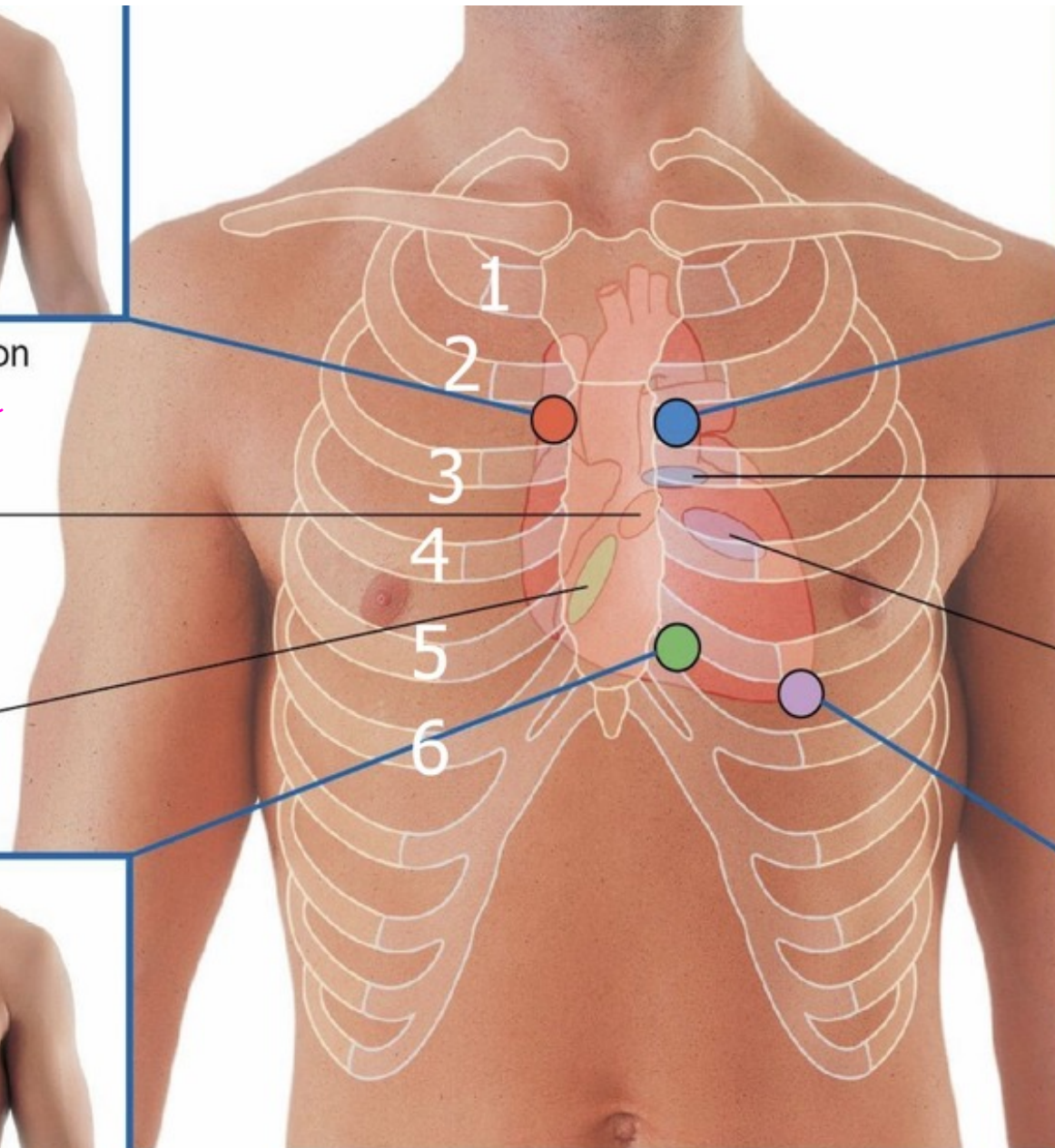




Auscultation position for *aortic valve*



Auscultation position for *pulmonary valve*



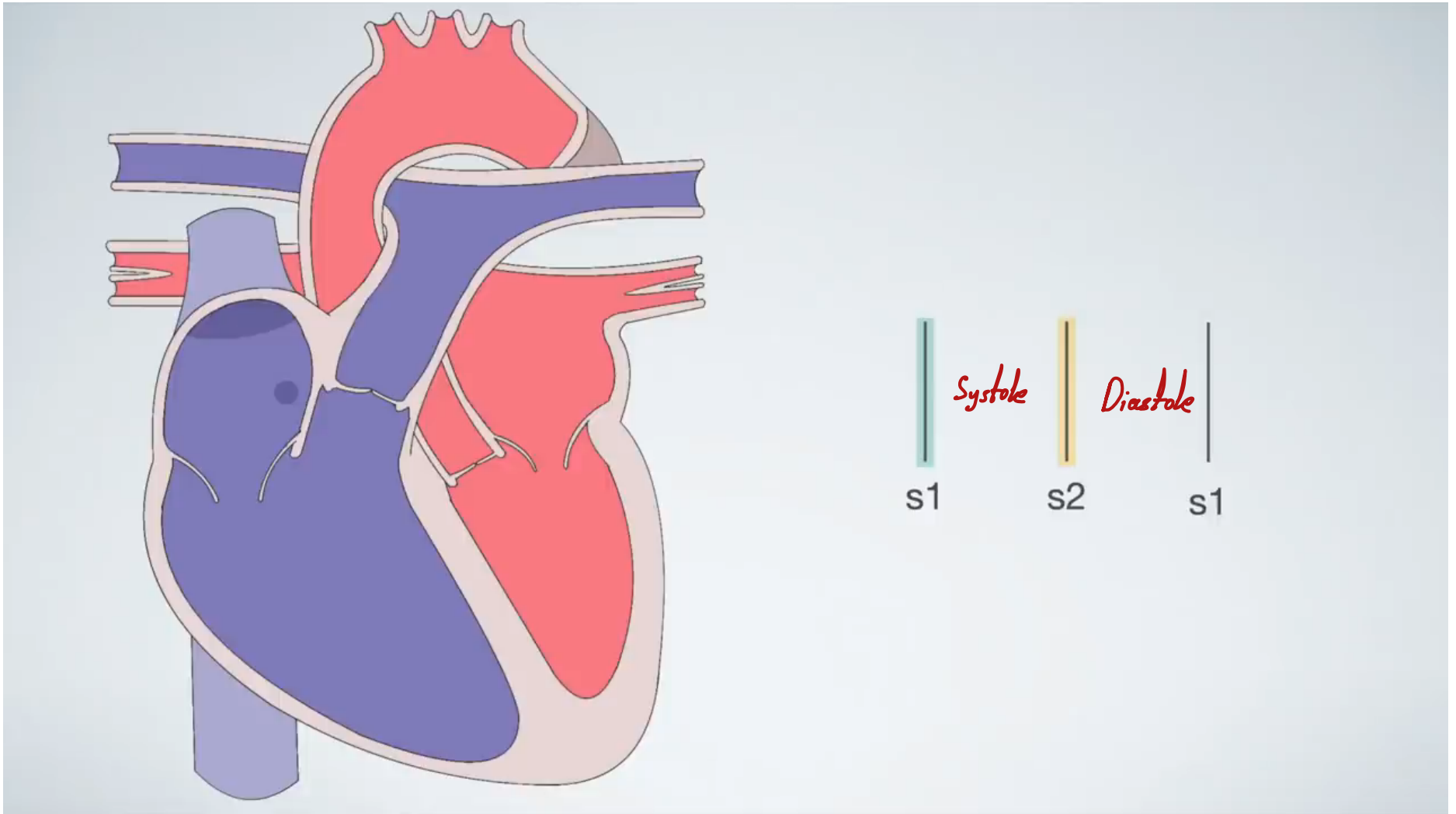
Auscultation position for *tricuspid valve*



Auscultation position for *mitral valve*



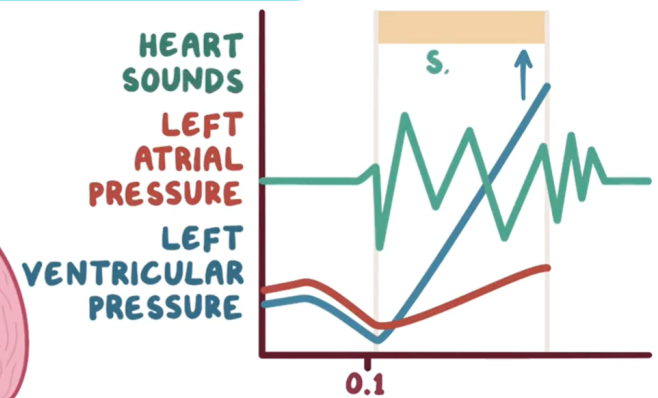
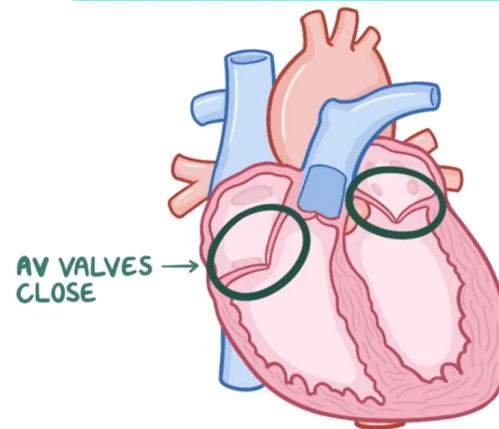
Heart sounds



First heart sound, S1

- Closure of **mitral** and **tricuspid** valve
- At onset of ventricular **systole**
- Heard at the **apex**

2: ISOVOLUMETRIC CONTRACTION



Abnormal intensity of S1

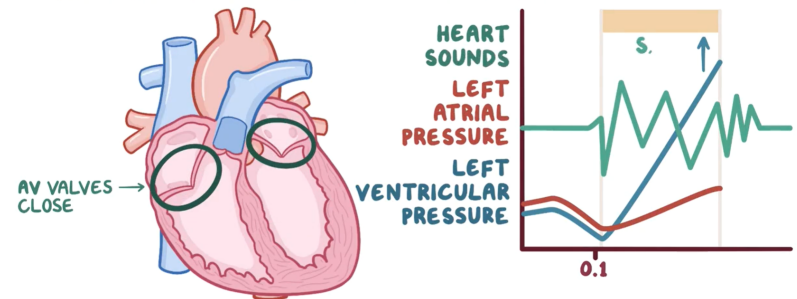
Extra: The PR interval represents the time between atrial depolarization and ventricular depolarization.

Quiet	Loud	Variable
<ul style="list-style-type: none"> Low cardiac output Poor Lt ventricular function Rheumatic mitral regurgitation Long PR interval 	<ul style="list-style-type: none"> Increased cardiac output Large stroke volume Mitral stenosis Short PR interval Atrial myxoma 	<ul style="list-style-type: none"> Atrial fibrillation Complete heart block Extrasystole

The valve closes quickly & loudly

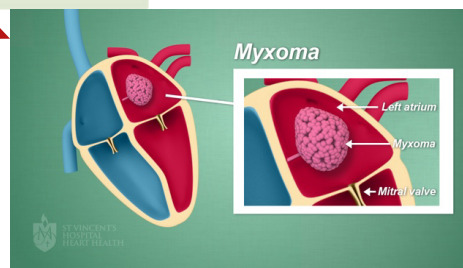
The valve takes its time and closes slowly

2: ISOVOLUMETRIC CONTRACTION



OSMOSIS.org
2022 Edition

Extra:



Second heart sound, S₂

Closure of Aortic and pulmonic valves.

At end of ventricular systole.

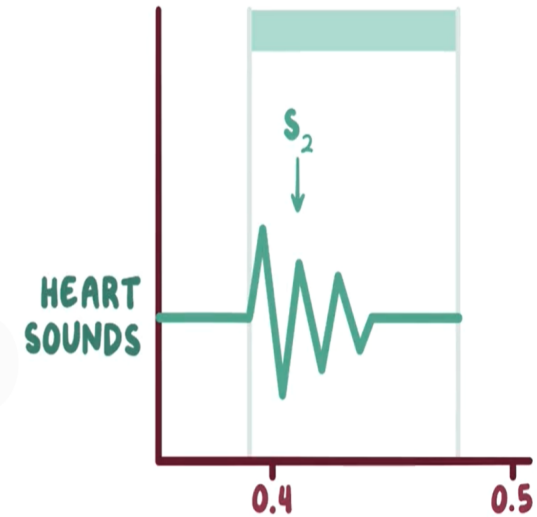
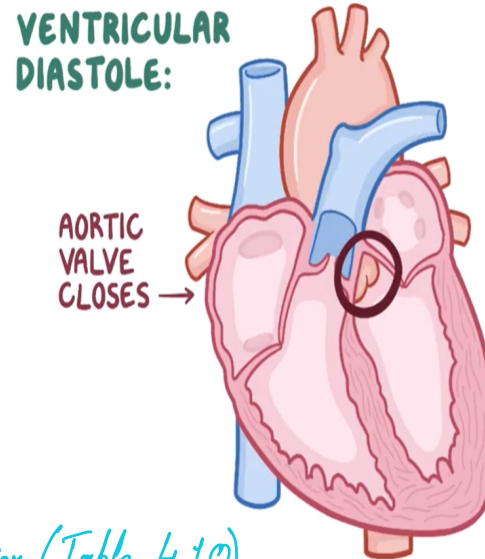
Heard on left sternal edge.

Has 2 components;

Recap: Splitting of S₂ during inspiration (Table 4.10)

1) aortic component A₂

2) Pulmonic component P₂



Notice that both S₁ and S₂ are heard on the left chest.

S2 splitting

- Normally A2 is louder than P2. *and precedes*
- Physiological splitting occurs because LV contraction slightly precedes RV contraction. *A2*
- This splitting physiologically increases at end-inspiration (RV VR-related), and disappears on expiration. *P2*
Right ventricle Venous return increases with inspiration

MEDZCOOL presents

Video

Abnormal intensity and splitting of S2

S2

LOUD

QUIET

Systemic HTN, A2
Pulmonary HTN, P2

Low cardiac output

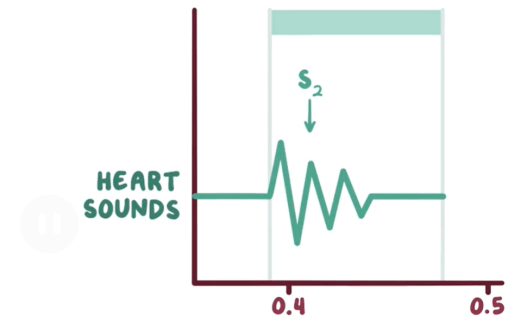
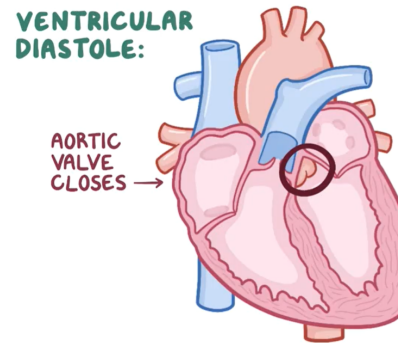
Calcific AS

AR

→ Aortic stenosis

When calcified, it lowers the sound!

→ Aortic regurgitation



SPLIT

①
Widens in inspiration
- Physiological
 OR

Widens in expiration = reversed splitting
Increased strain on Lt. ventricle

Fixed splitting
Occurs in both expiration & inspiration Due to ASD.

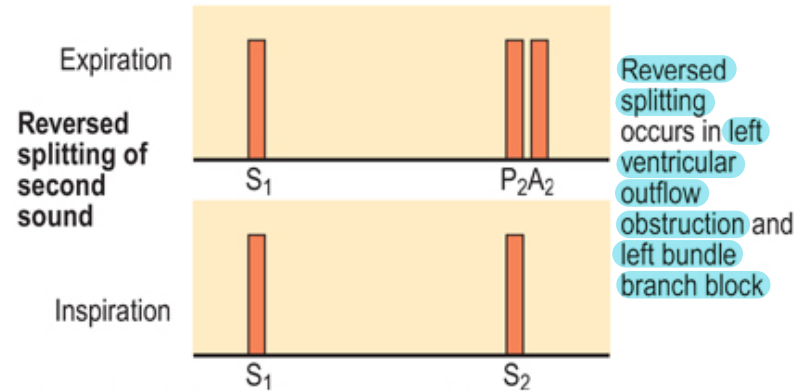
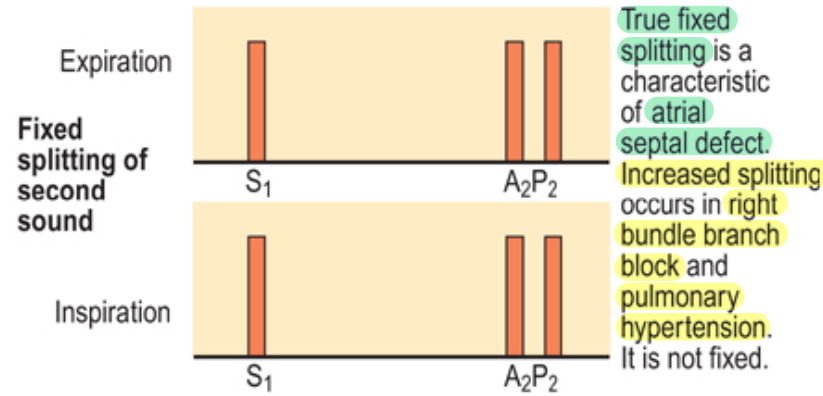
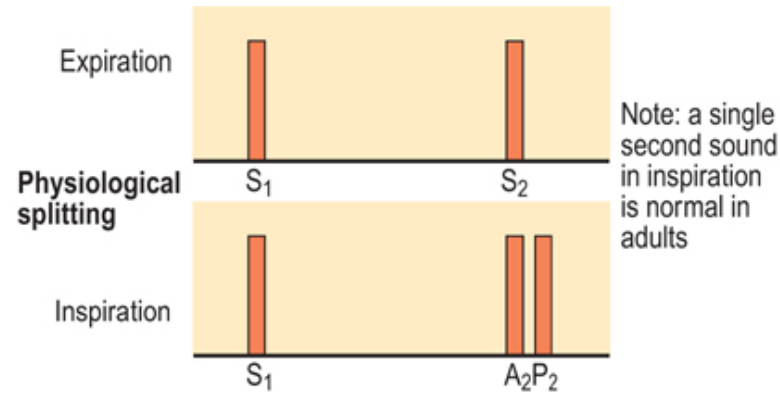
- Pathological:
RBBB *Right Bundle Branch Block*
Pulm. stenosis
P.HTN
VSD *Lt. to rt. shunt*
Splitting occurs

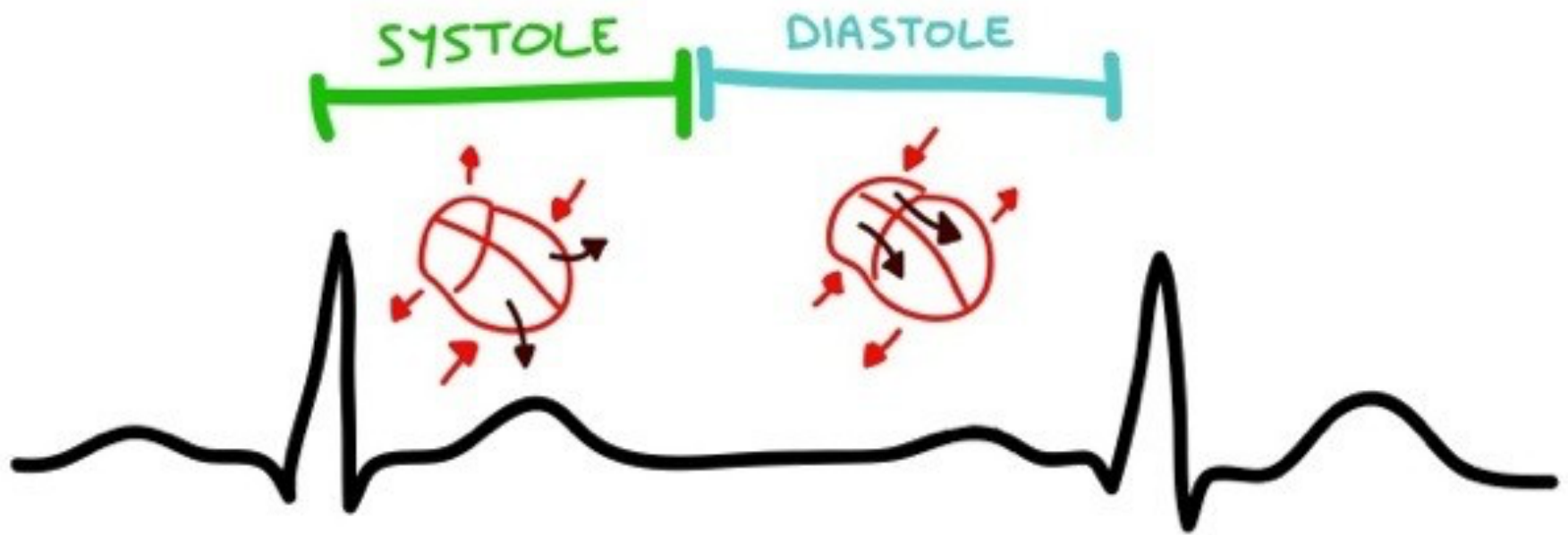
AS *Same effect as AS*
HCM
LBBB *Left Bundle Branch Block*
Ventricular pacing

ASD

All these conditions further delay P2

All these conditions delay A2





Early systole

Late systole

Early diastole

Late diastole

Dilated Ventricle
"TO — RON — TO"

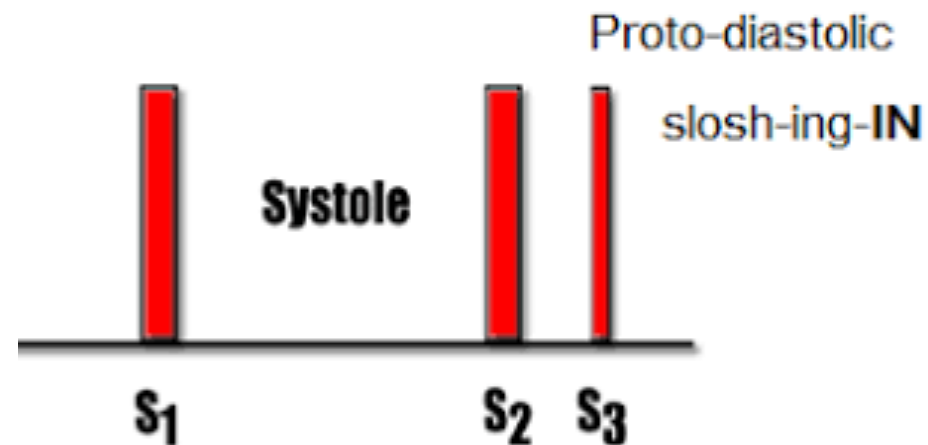
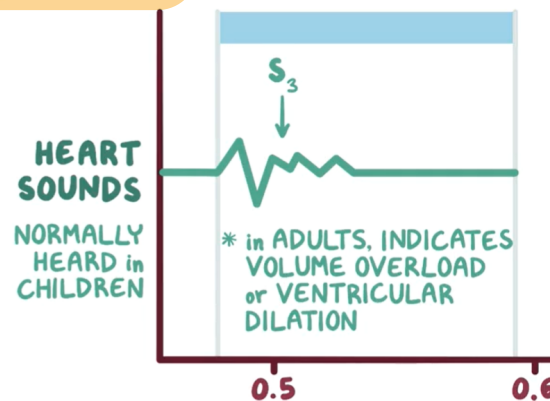
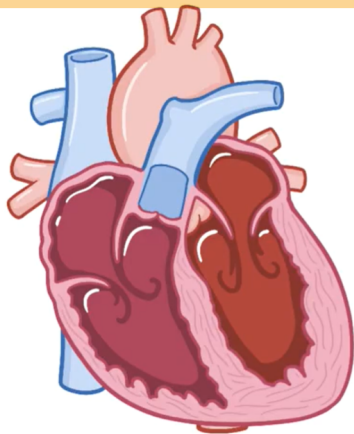
"Stiff Ventricle"
"KEN — TUCK — KY"

sketchymedicine.com

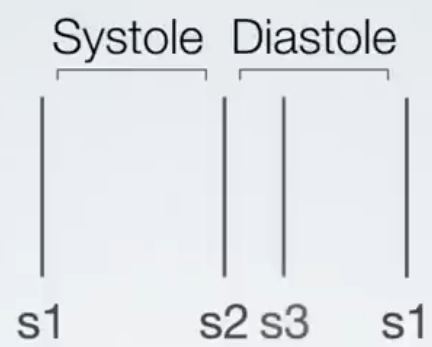
Third heart sound, S3

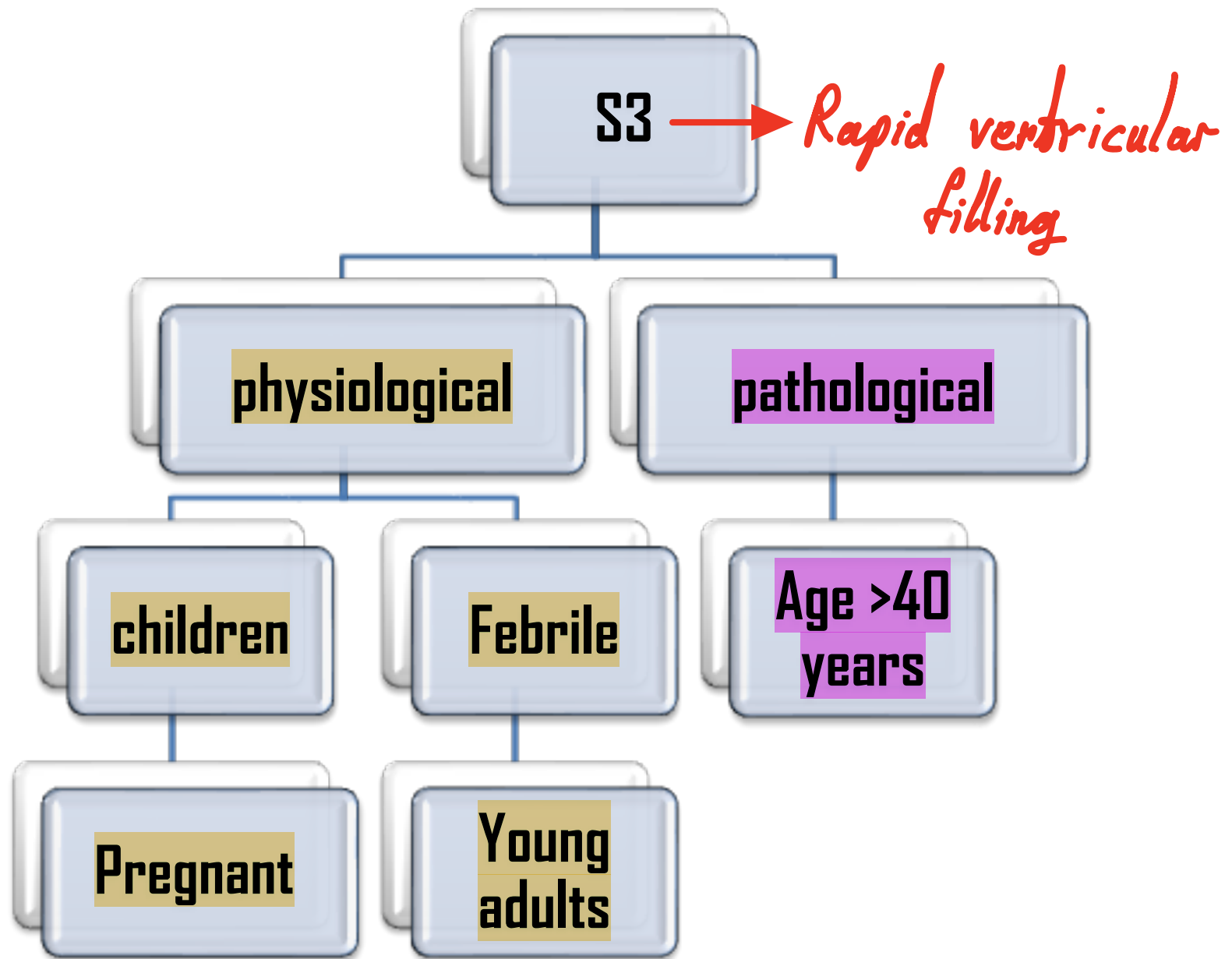
- Low-pitched early diastolic sound.
- Best heard with the bell at the apex.
- Due to rapid ventricular filling immediately after opening the atrioventricular valve

6: RAPID VENTRICULAR FILLING



Video





6: RAPID VENTRICULAR FILLING

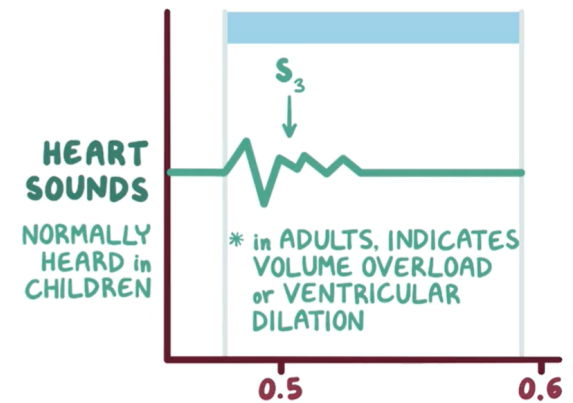
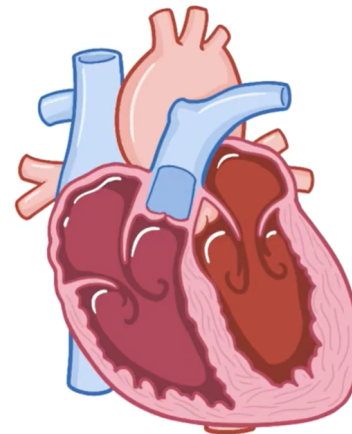
Pathological S3 causes:

1) LV failure

2) MR → *Mitral regurgitation*

- Ventricular gallop = S3
gallop = S3 + tachycardia

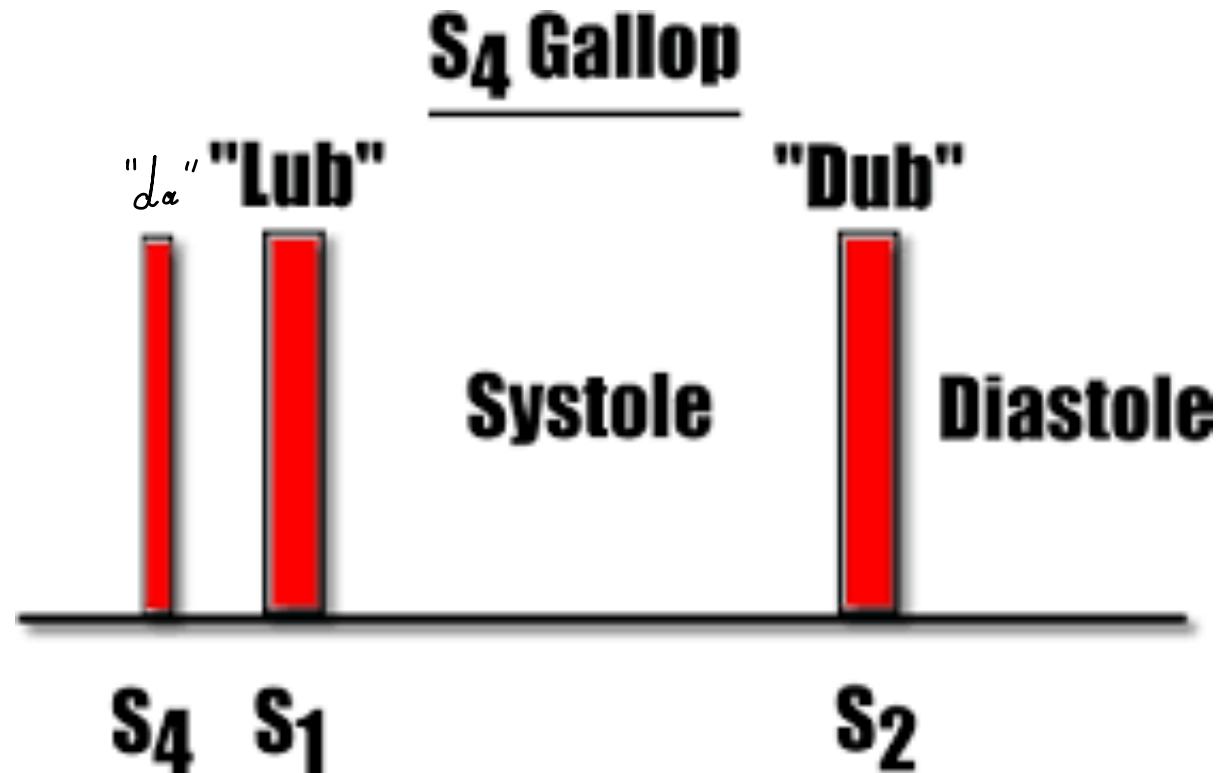
In HF, with quiet S1 and S2



Fourth heart sounds, S4

- ALWAYS PATHOLOGICAL
- Soft low-pitched sound at late diastole.
- Best heard at the apex with the bell.
- It occurs before S1
- Due to forceful atrial contraction against stiff ventricle secondary to LVH.

→ Left Ventricular Hypertrophy



Video



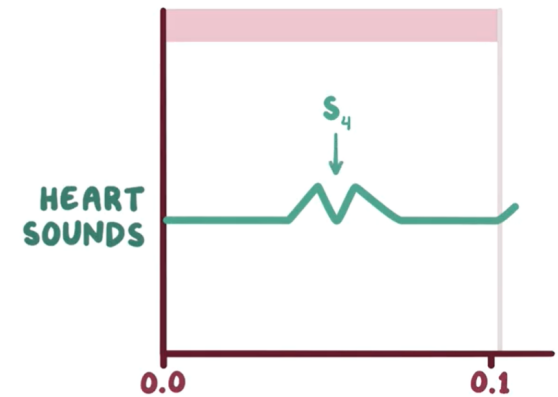
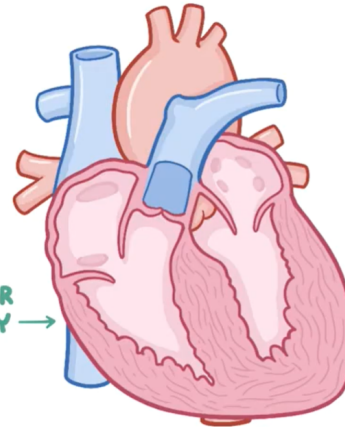
1: ATRIAL CONTRACTION

- **Causes of S4:**

- 1) **HTN**
- 2) **AS**
- 3) **HCM**

All are causes
of Left Ventricular
Hypertrophy

VENTRICULAR
HYPERTROPHY →

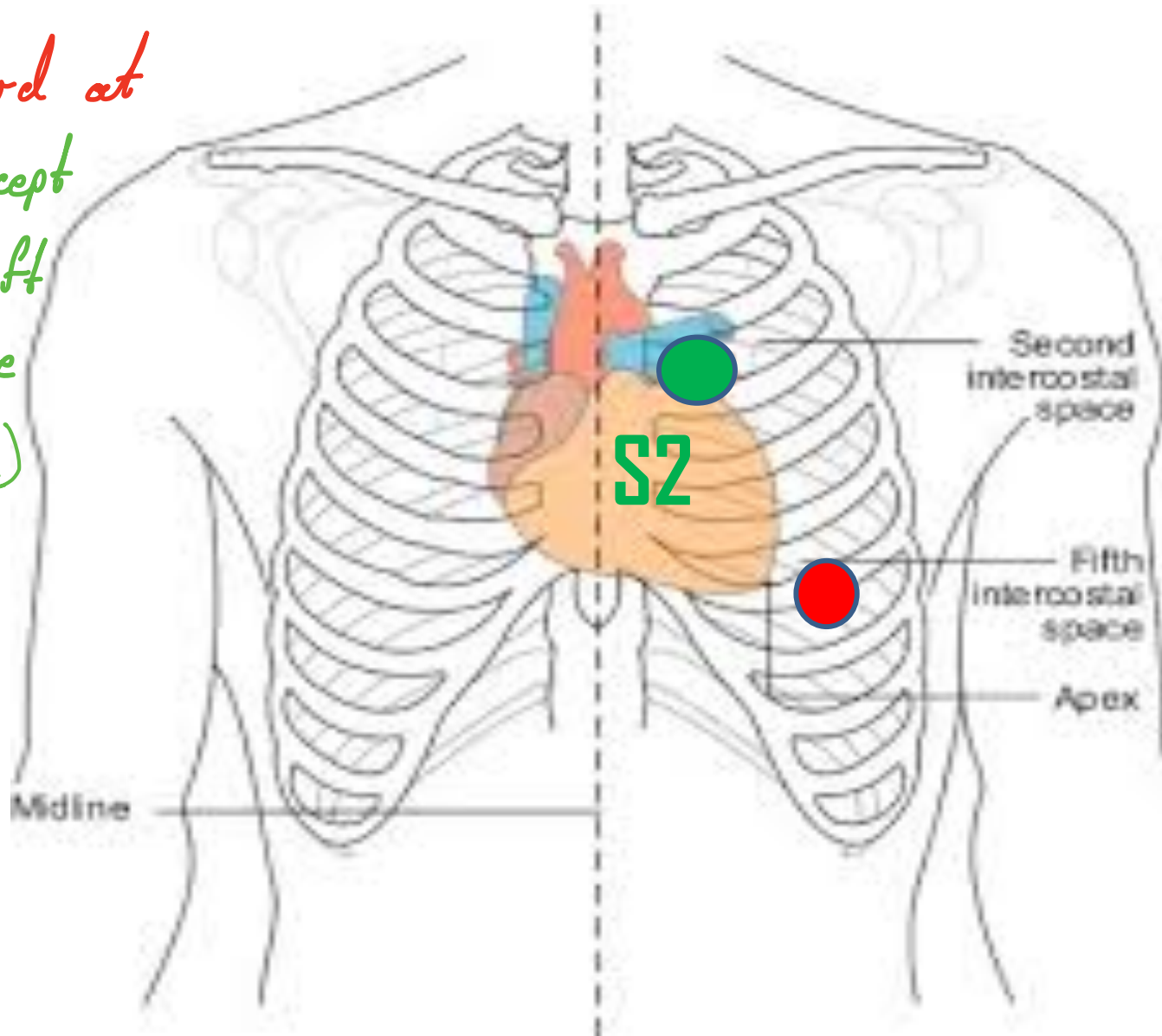


** **CANNOT OCCUR IN CASE
OF ATRIAL FIBRILLATION.**

→ *No synchronized atrial contraction*

- **Atrial gallop = S4 gallop =
S4+ tachycardia**

All are heard at the apex, except S2 at the left 2nd IC space (parasternally)



Using the stethoscope

S2 → Use diaphragm

S1 → Use diaphragm

S3 → Use bell

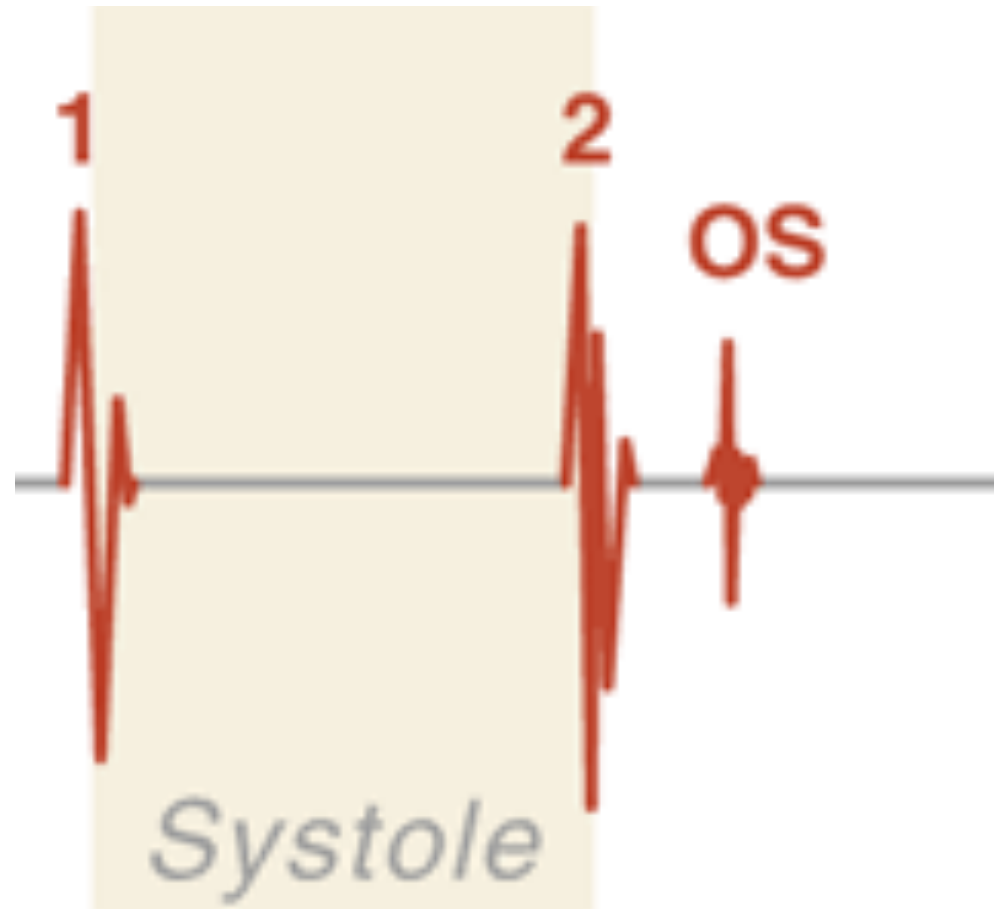
S4 → Use bell



Added Sounds

Opening snap

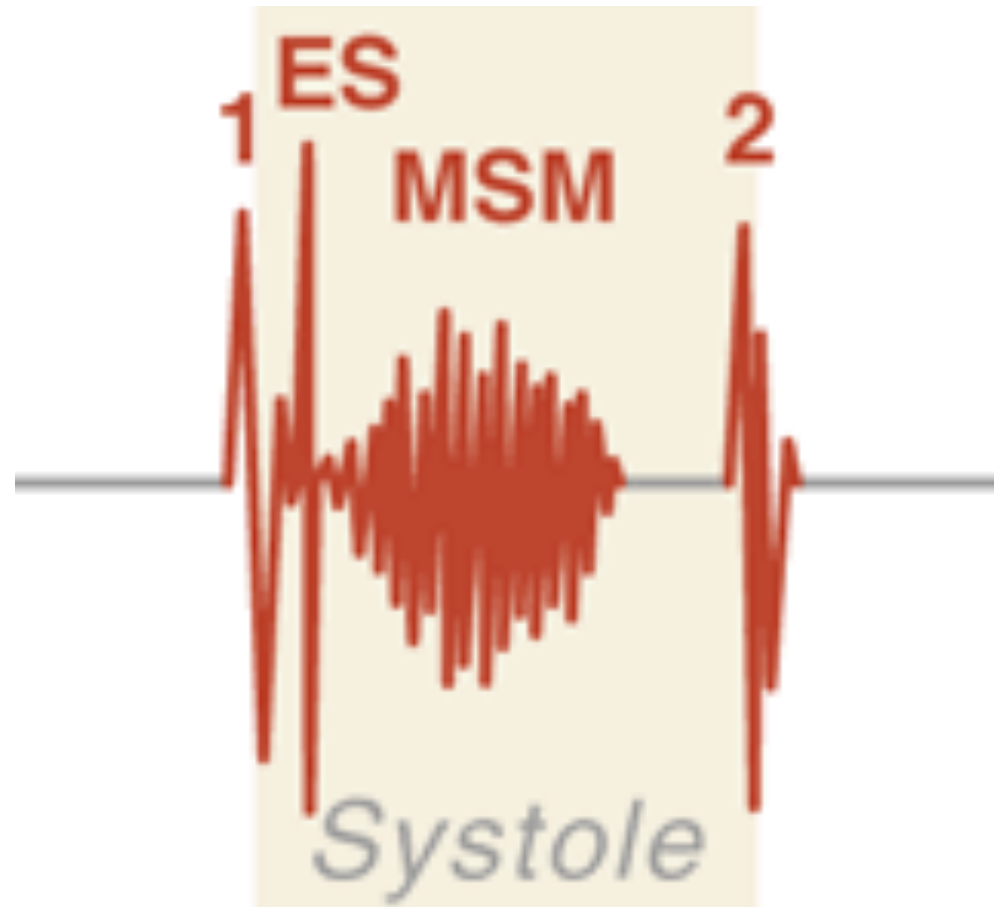
Mitral stenosis



- Sudden opening of **stenosed valve** in DIASTOLE.
- **MS** *mitral*
- **High-pitched, medial to apex** via the diaphragm.
- Just after S2, in **early diastole**.

Ejection click

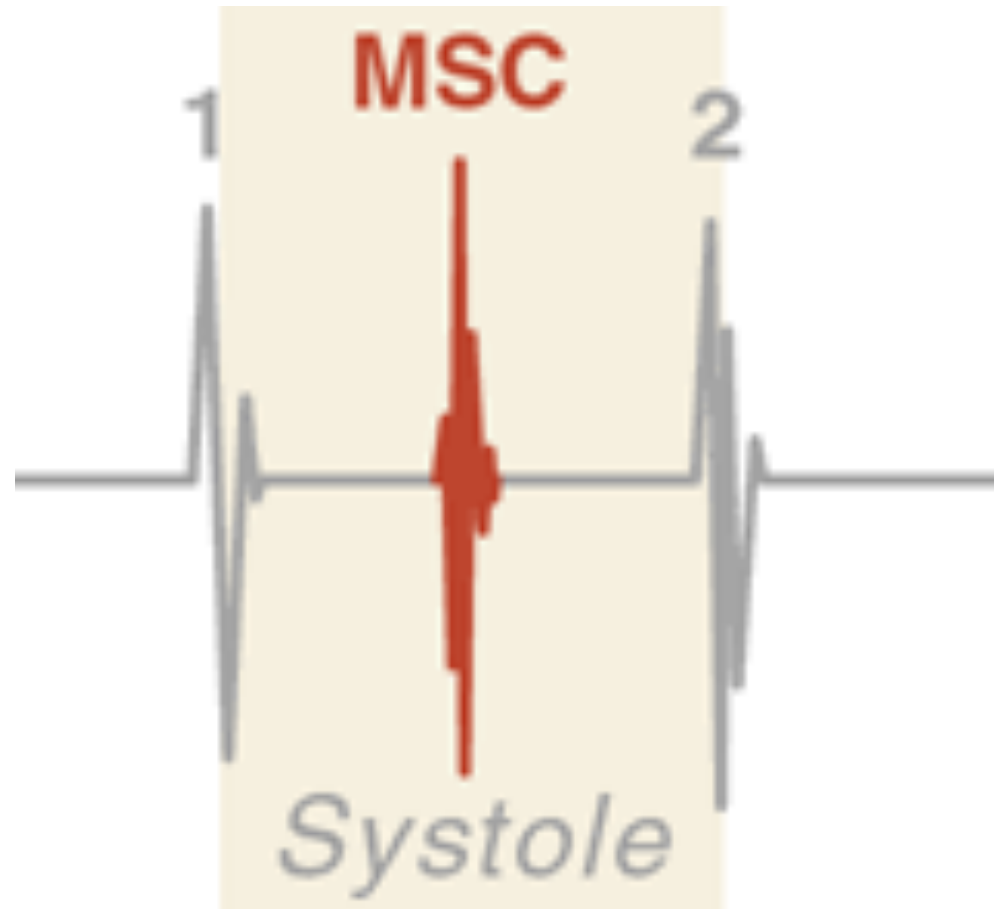
*Aortic
Stenosis*



- Opening of stenosed valve in SYSTOLE.
- Congenital pulmonary/ aortic stenosis.
- High-pitched, at the Rt and Lt upper sternal borders via diaphragm
- Just after S1, in early systole.
- ** if calcific valve (rigid cusps)>> absent sound

Mid- systolic click

*Mitral
prolapse*



- Sudden tensing of prolapsed leaflet during SYSTOLE.
- Mitral valve prolapse.
- High-pitched, at the apex via diaphragm.

mitral

Mechanical Heart Sounds

- High-pitched **metallic** and often palpable.

**Mechanical
mitral valve**

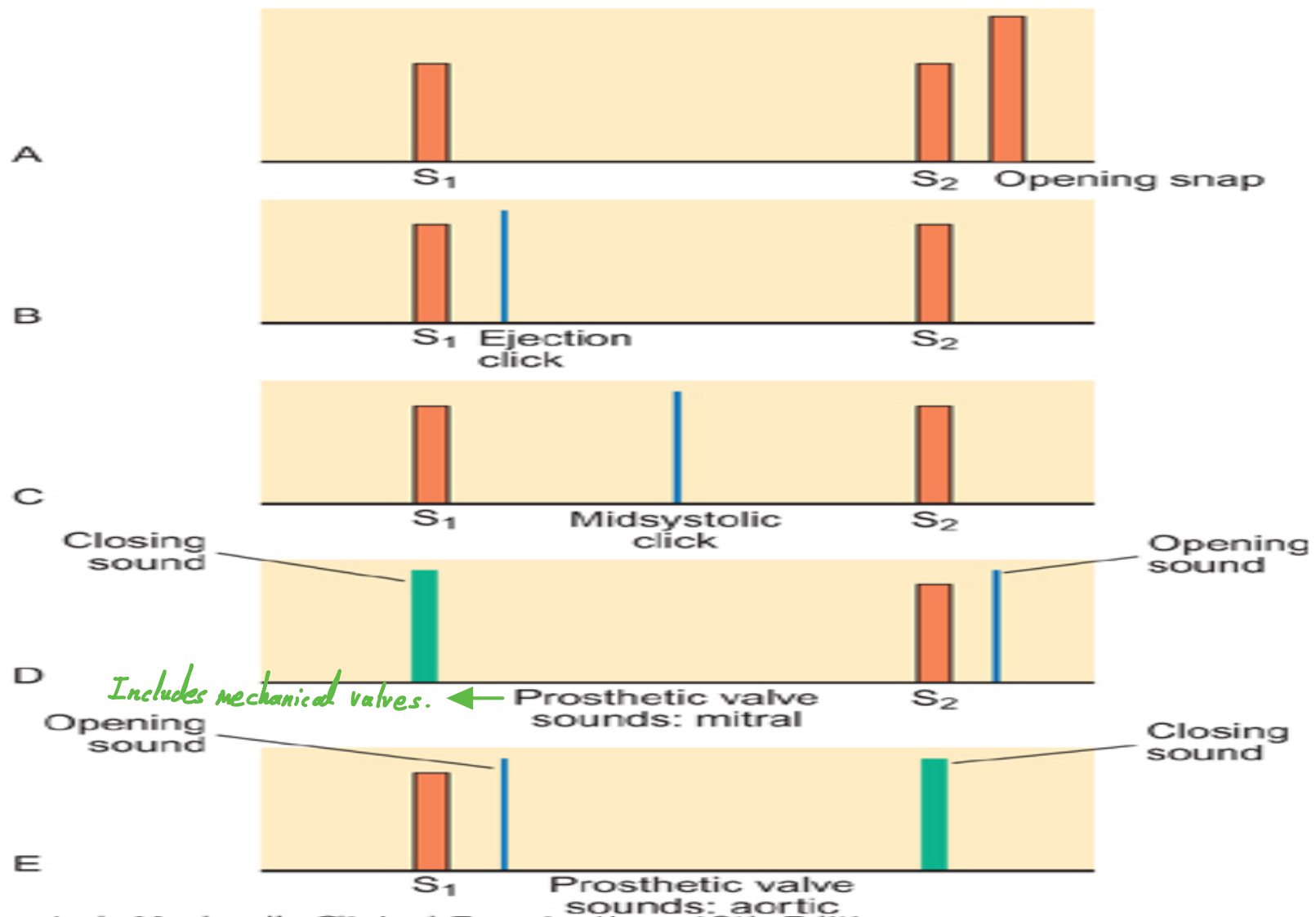
Closure: metallic S1

Opening: opening snap

**Mechanical
aortic valve**

Closure: metallic S2

**Opening: ejection
click**



Includes mechanical valves. ←

Prosthetic valve sounds: mitral

Prosthetic valve sounds: aortic

Pericardial Friction Rub

- Coarse scratching sound. → *Pleura friction with pericardium.*
- With the diaphragm, hold breath in expiration and lean forward.

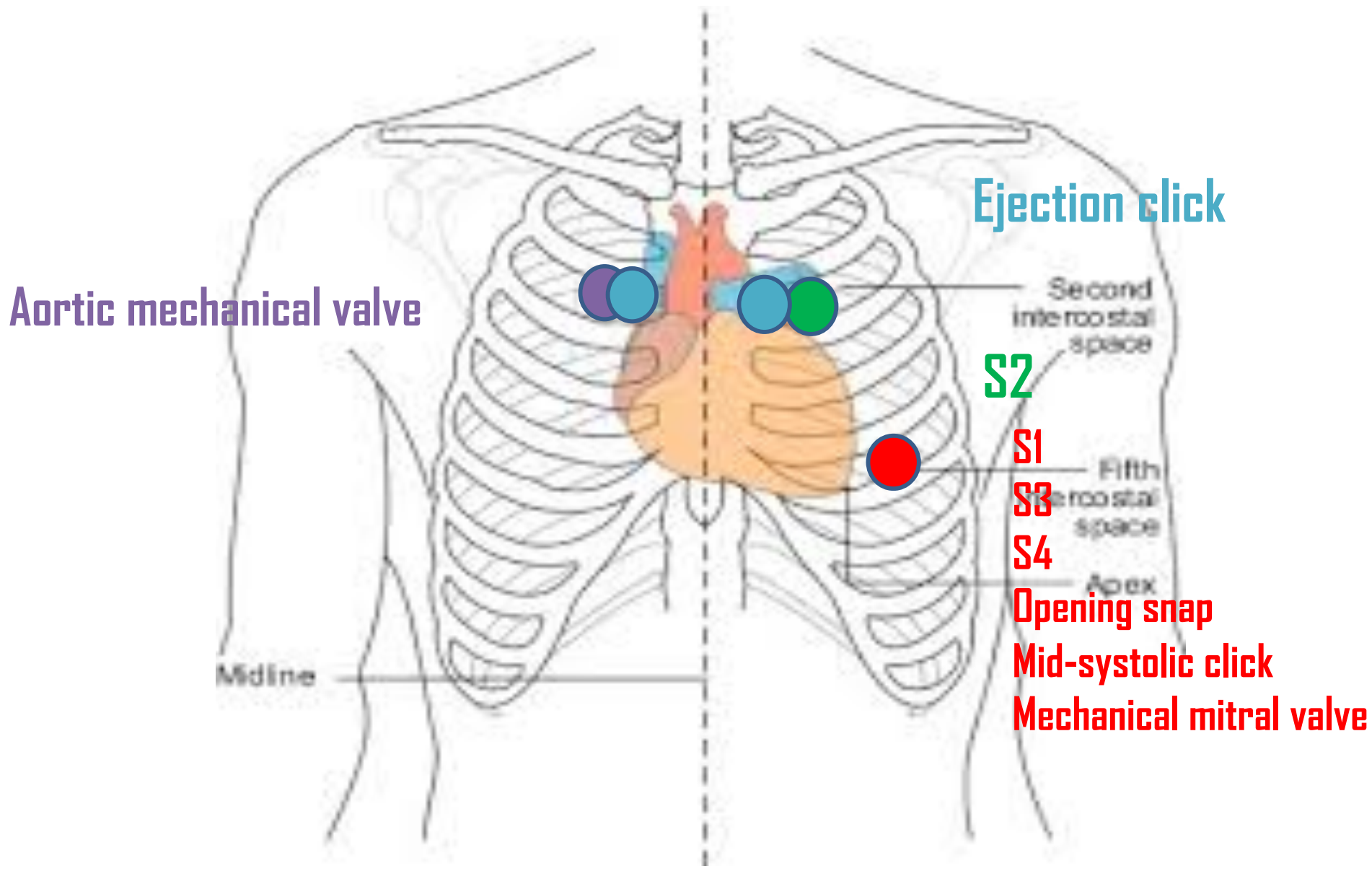
Causes:

- 1) Acute pericarditis → *Pleuritic, postural chest pain (increases when lying flat)*
- 2) Few days post-extensive myocardial infarction

** Pleuropericardial rub

** Pneumopericardium

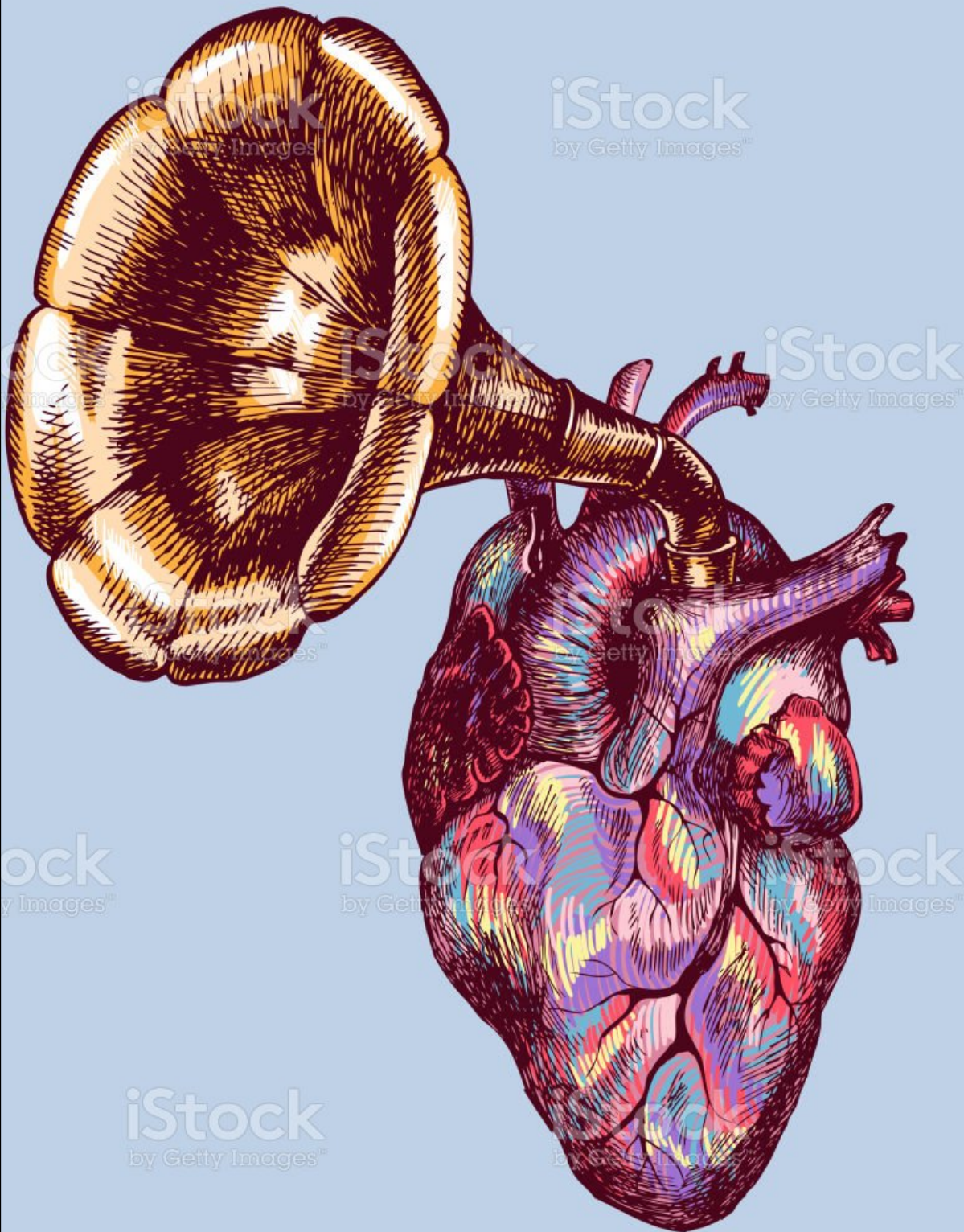




Murmurs

- Heart murmurs produced by:
 - Turbulent flow across an abnormal valve, septal defect or outflow obstruction
 - Increased volume or velocity of flow through a normal valve (innocent murmur)

If outside the heart → Bruit

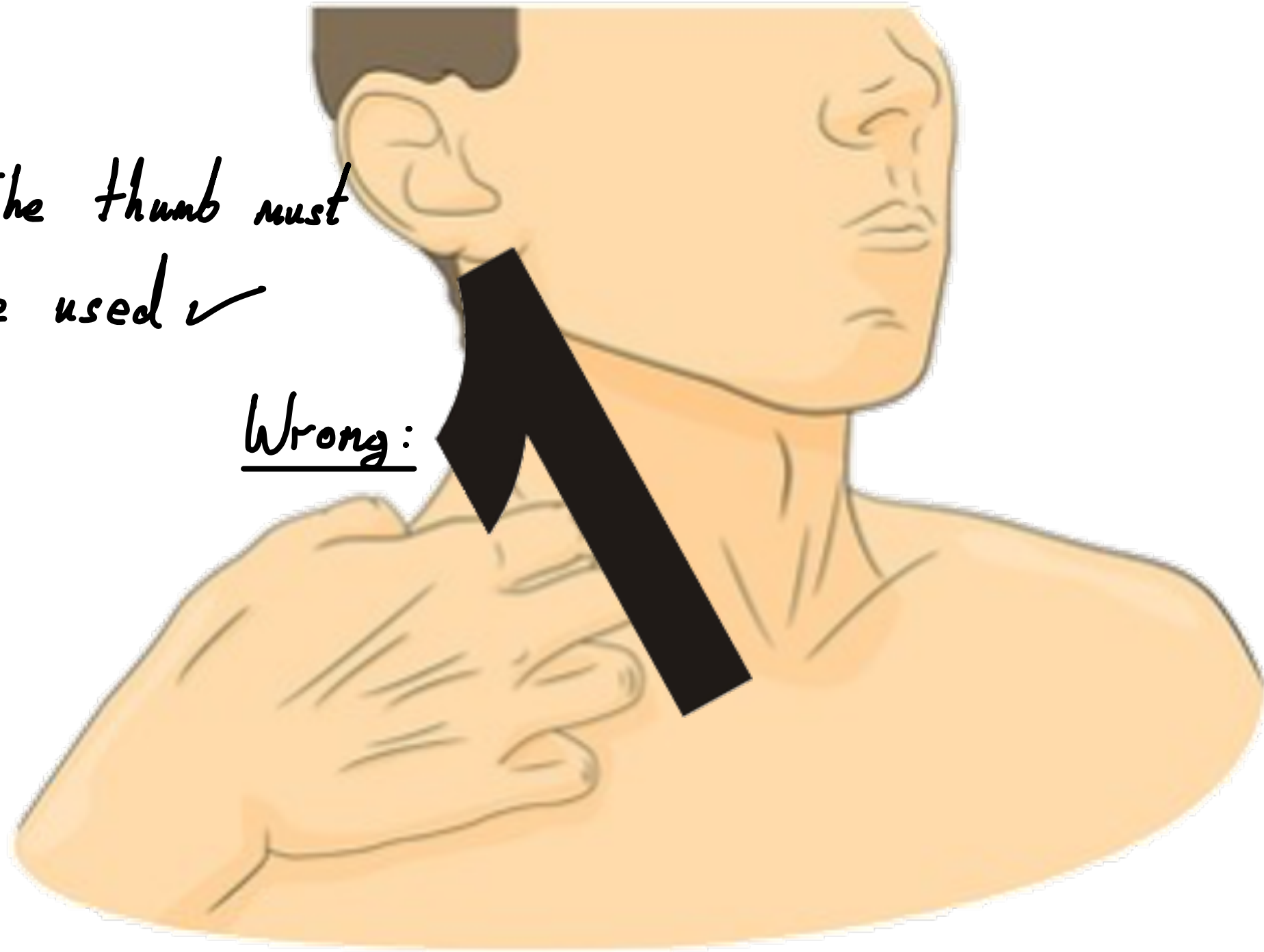


Murmurs

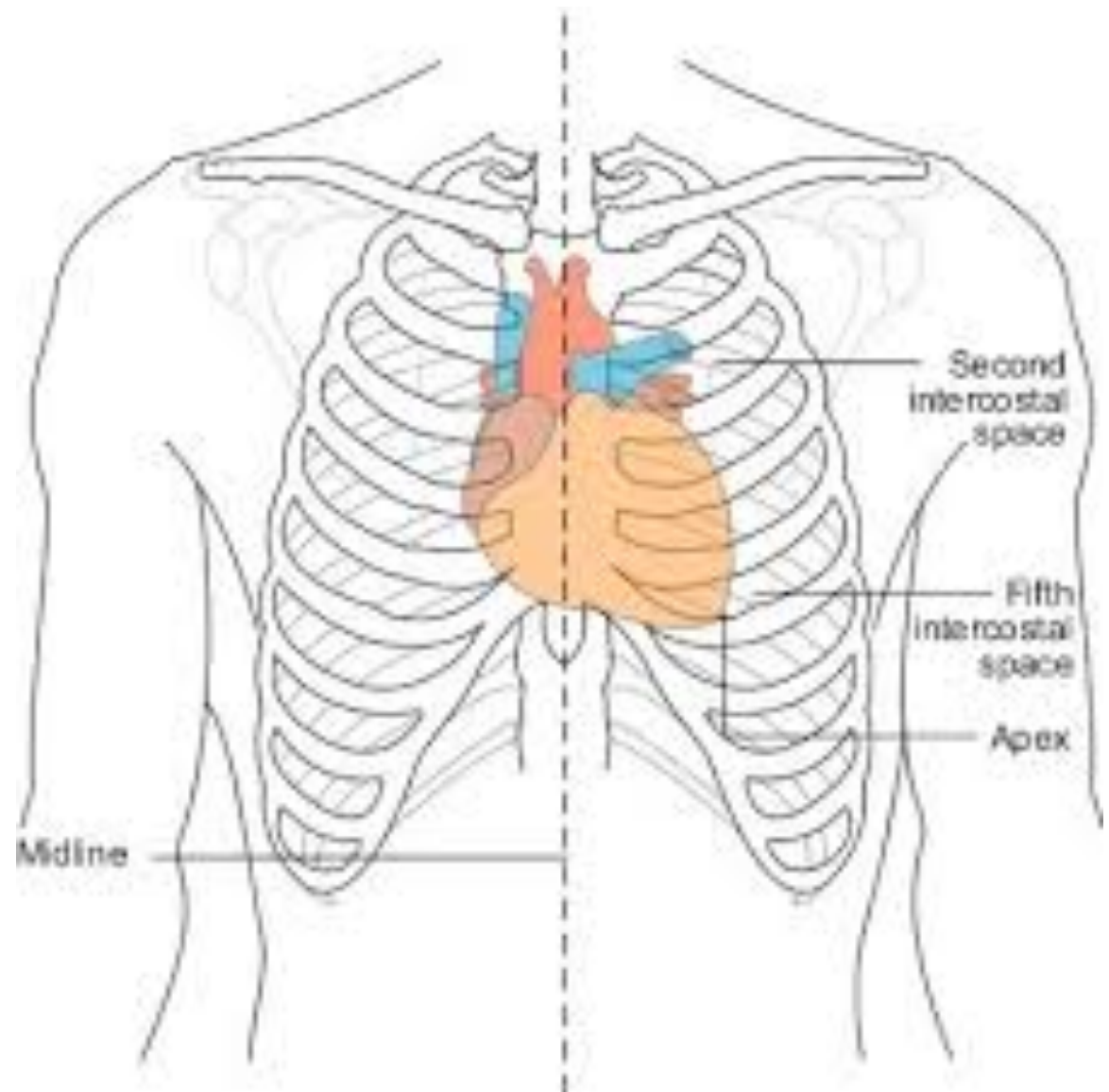
- **Examination includes:**
 - **Timing and duration**
 - **Character/pitch and intensity**
 - **Location and radiation**

The thumb must
be used ✓

Wrong:



Murmurs/Location,
Radiation



Systolic Murmurs

Mid-Systemic



Holosystolic



Diastolic Murmurs



Murmurs/Timing

- **Systolic** murmurs
The interval between S₁ and S₂
- **Diastolic** murmurs
The interval between S₂ to S₁

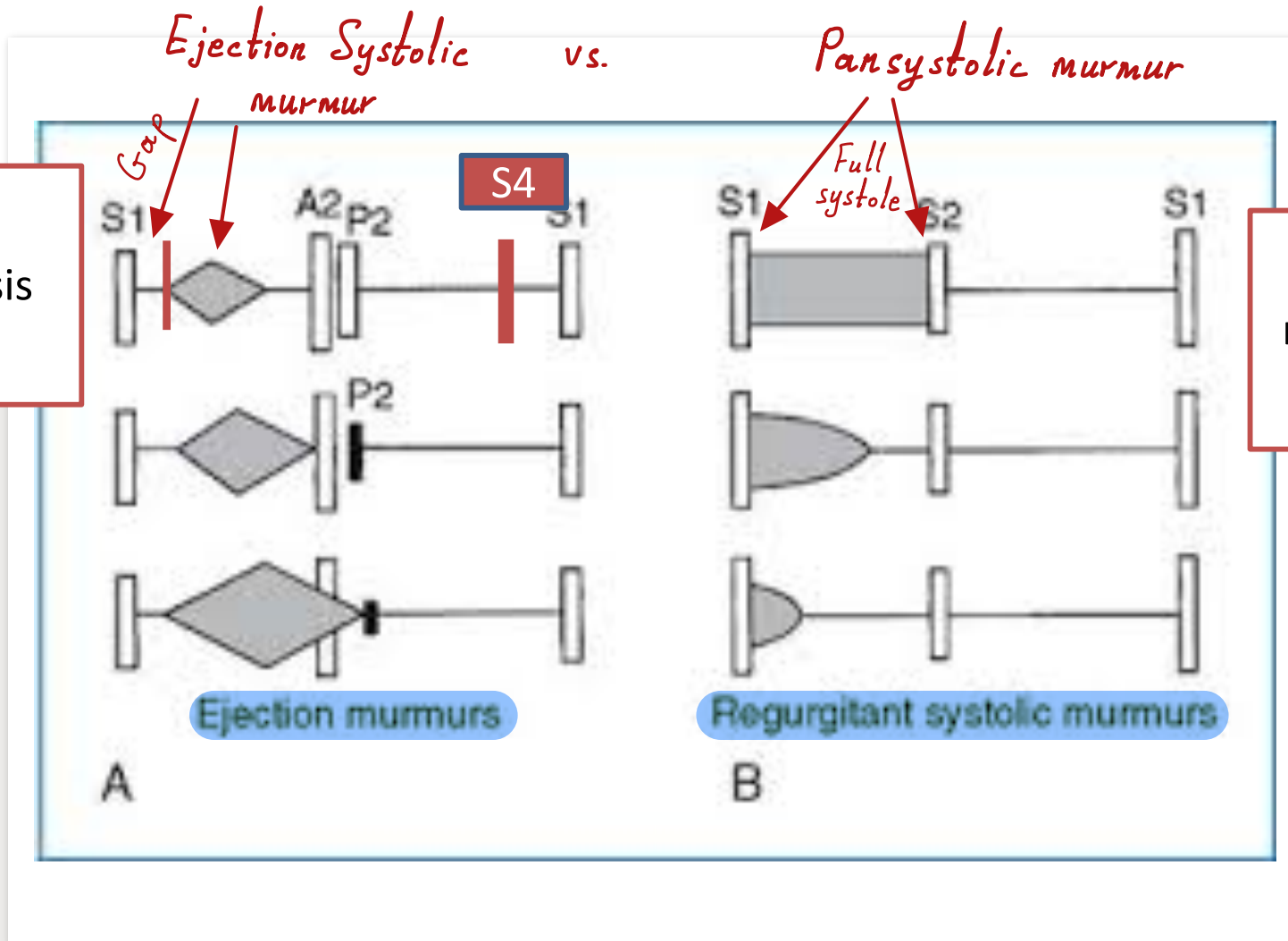


Murmurs

Character and **Pitch**

- **Harsh: AS**
 - **Blowing: MR**
 - **Musical: AS in children (still's murmur)**
 - **Rumbling: MS**
-
- **High-pitched: high pressure gradient**
 - **Low-pitched: low pressure gradient**

Aortic stenosis



Pansystolic murmur: Mitral regurgitation

Murmurs/Duration

Murmurs/Intensity

- The intensity of the murmur does not correlate with the severity of the valve dysfunction
- Change in intensity with time is important, as they can denote progression of a valve lesion
- Rapidly changing murmur can occur with infective endocarditis

Grades of intensity of murmur

Grade 1	Heard by an expert in optimum conditions
Grade 2	Heard by non-expert in optimum conditions
Grade 3	Easily heard, no thrill
Grade 4	A loud murmur, with a thrill
Grade 5	Very loud, over large area, with thrill
Grade 6	Extremely loud, heard without stethoscope

Systolic Murmurs

- ①
- **Ejection systolic murmurs** → *AS, PS*
Caused by **increased flow through a normal valve** (flow or innocent murmur), or by **turbulent flow through an abnormal valve**.
 - **Pansystolic** → *MR, TR*

Systolic Murmurs

Mid-Systemic



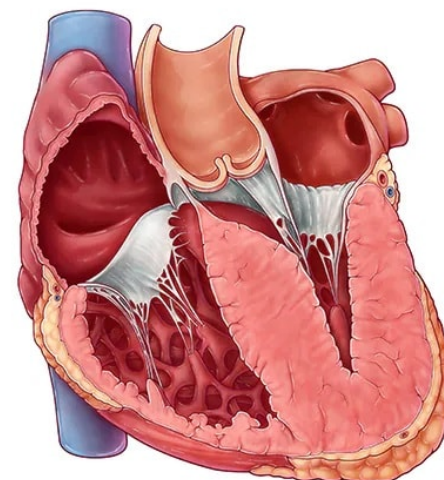
Holosystolic



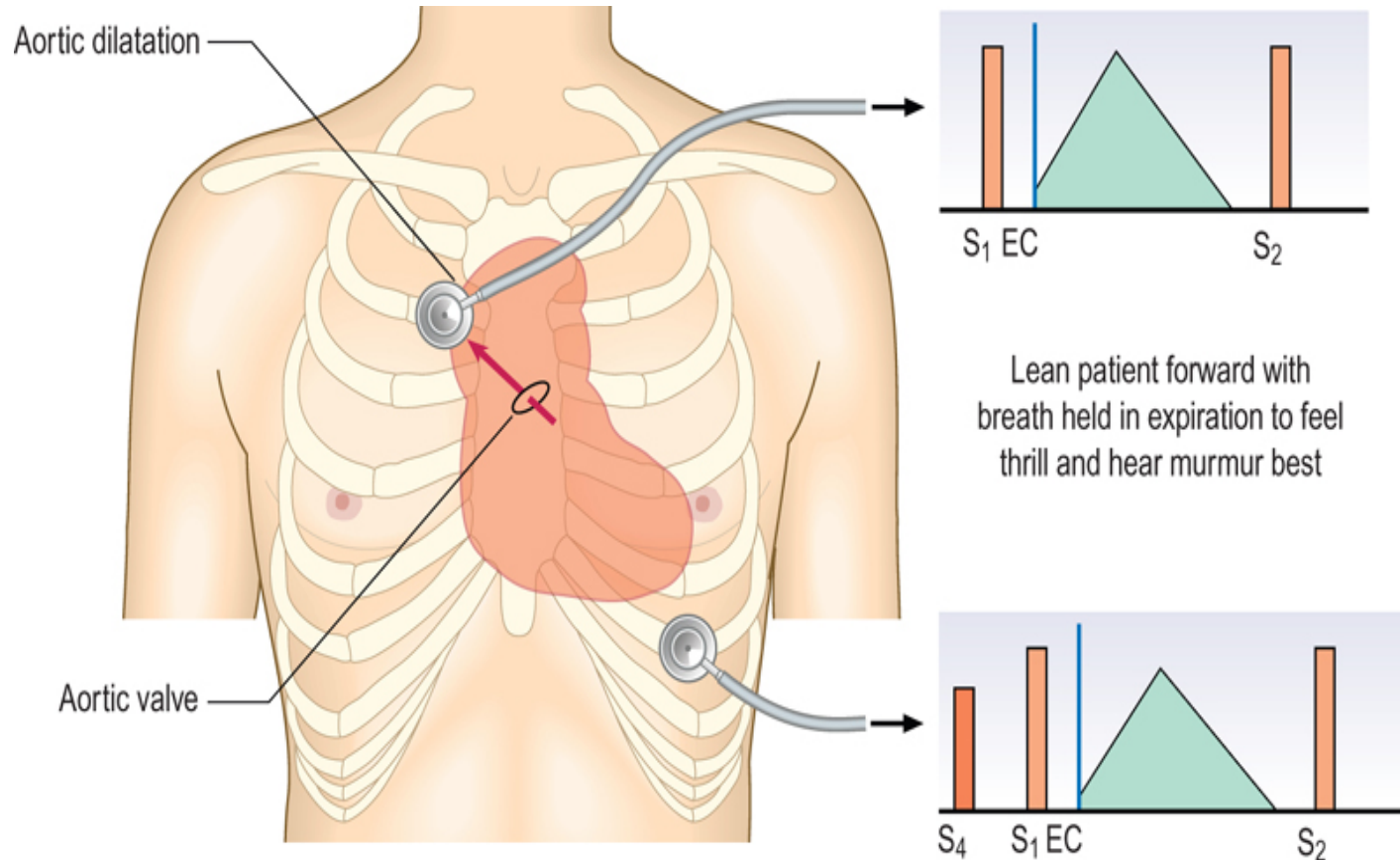
Ejection systolic murmurs

- Increased flow through a normal valve → *Innocent murmur*
 - Sever anemia/ fever/ athletes/ pregnancy
 - ASD (pulmonary flow murmur)
 - Increased stroke volume (aortic regurgitation)
- Normal or reduced flow through a stenotic valve
 - Aortic stenosis
 - Pulmonary stenosis
- Subvalvular obstruction
 - HOCM

↘ *Diastolic murmur*
↘ *Systolic ejection murmur*



Aortic stenosis Murmur



Douglas et al: Macleod's Clinical Examination, 12th Edition.
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Lean patient forward with
breath held in expiration to feel
thrill and hear murmur best

- **Timing:** systolic
- **Duration:** after S₁, peaks mid systolic, decrease before S₂ (Crescendo-decrescendo murmur)
- **Character:** Harsh, Musical in children
- **Pitch:** high (Audible all over the precordium)

- **Intensity:** May be associated with thrill
- **Location:** Right 2nd ICS
- **Radiation:** carotids, suprasternal notch
Not the original location!

❖ May follow ejection click

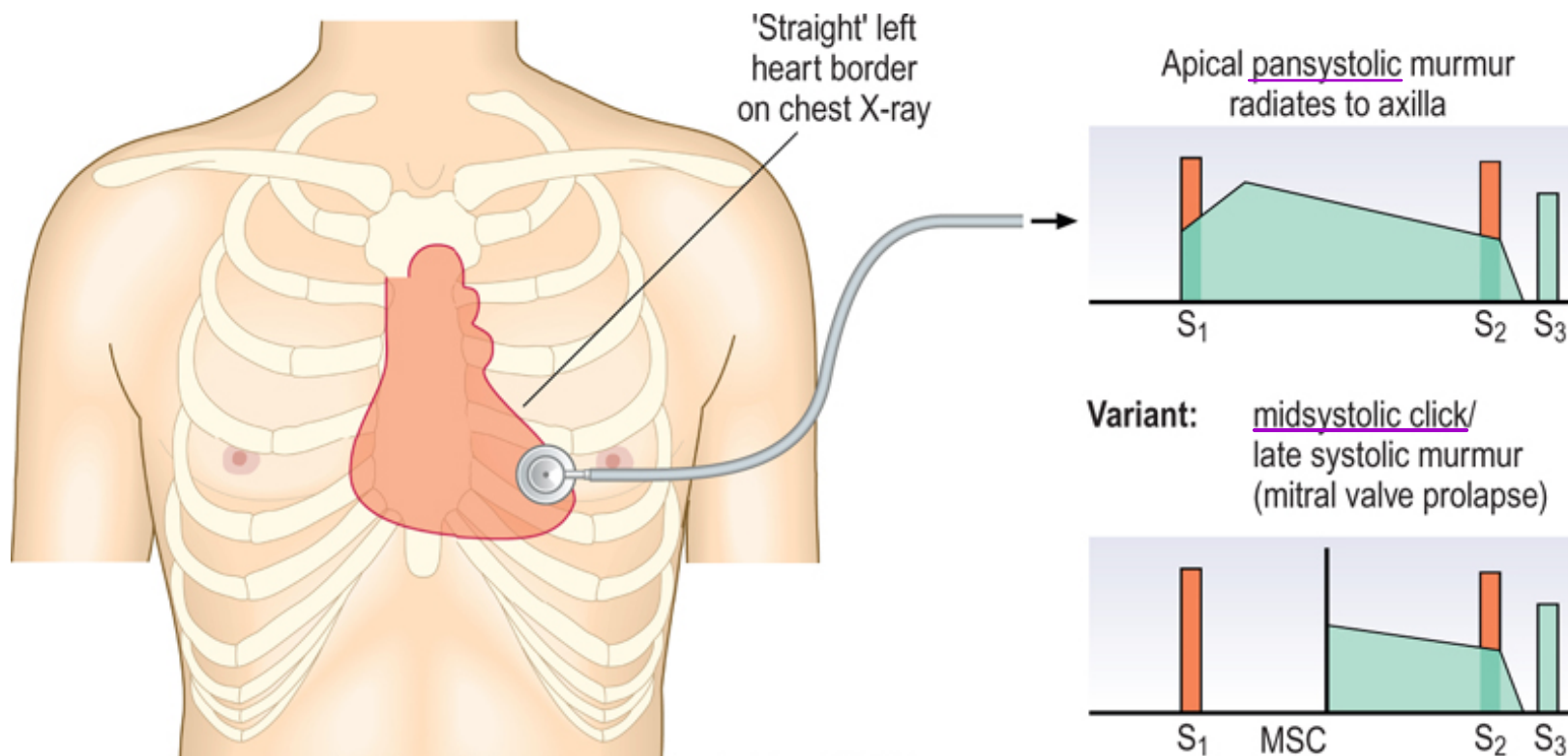
Video

"PULSES PARVUS ET TARDUS"

**PERIPHERAL PULSES
ARE OFTEN
WEAK AND DELAYED**



Mitral Regurgitation murmur



Douglas et al: Macleod's Clinical Examination, 12th Edition.
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- Timing: **systolic**
- Duration: **pansystolic**
- Character: **blowing**
- Pitch: **high**

Intensity: **may feel a thrill**

Location: **apex**

Radiation: **Left axilla**

In mitral valve prolapse, regurgitation begins in mid-systole producing a late murmur

Video

S₁

Systole

S₂

Diastole

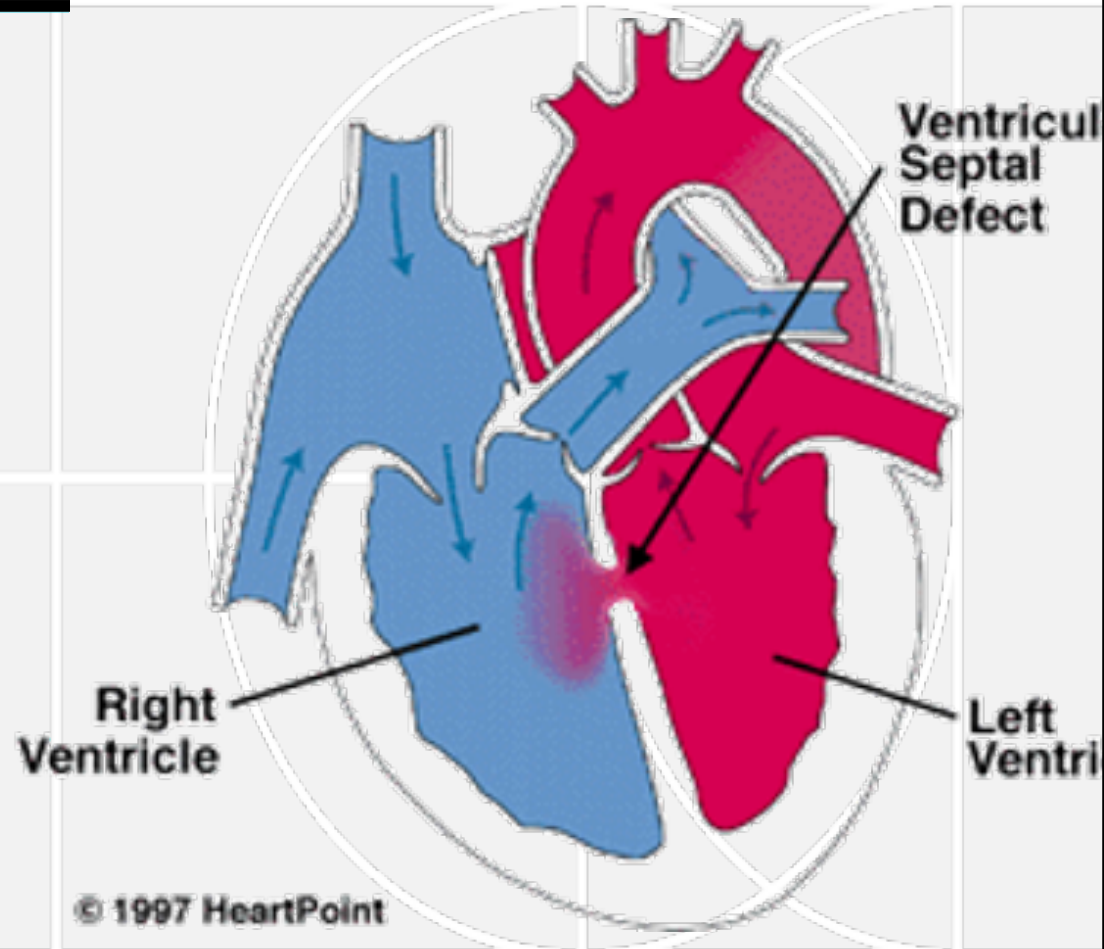
Tricuspid regurgitation

- *Systolic (Pansystolic)*
- Heard at the **lower left sternal edge**
- **Prominent V wave** in the JVP
- **Pulsatile liver**

Ventricular Septal Defect

- Loud murmur
- At the left sternal border
- Radiates to the right sternal border
- Associated with thrill
- Pansystolic
- Acquired VSD in septal rupture post-MI

VSD could complicate MI



Diastolic Murmurs

- Early diastolic murmurs

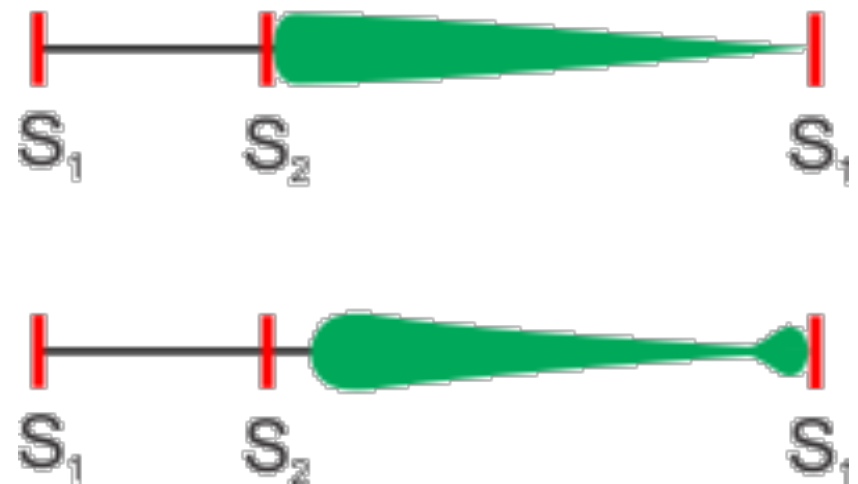
Usually lasts throughout the diastole but are loudest in early diastole

Aortic and pulmonary regurgitation

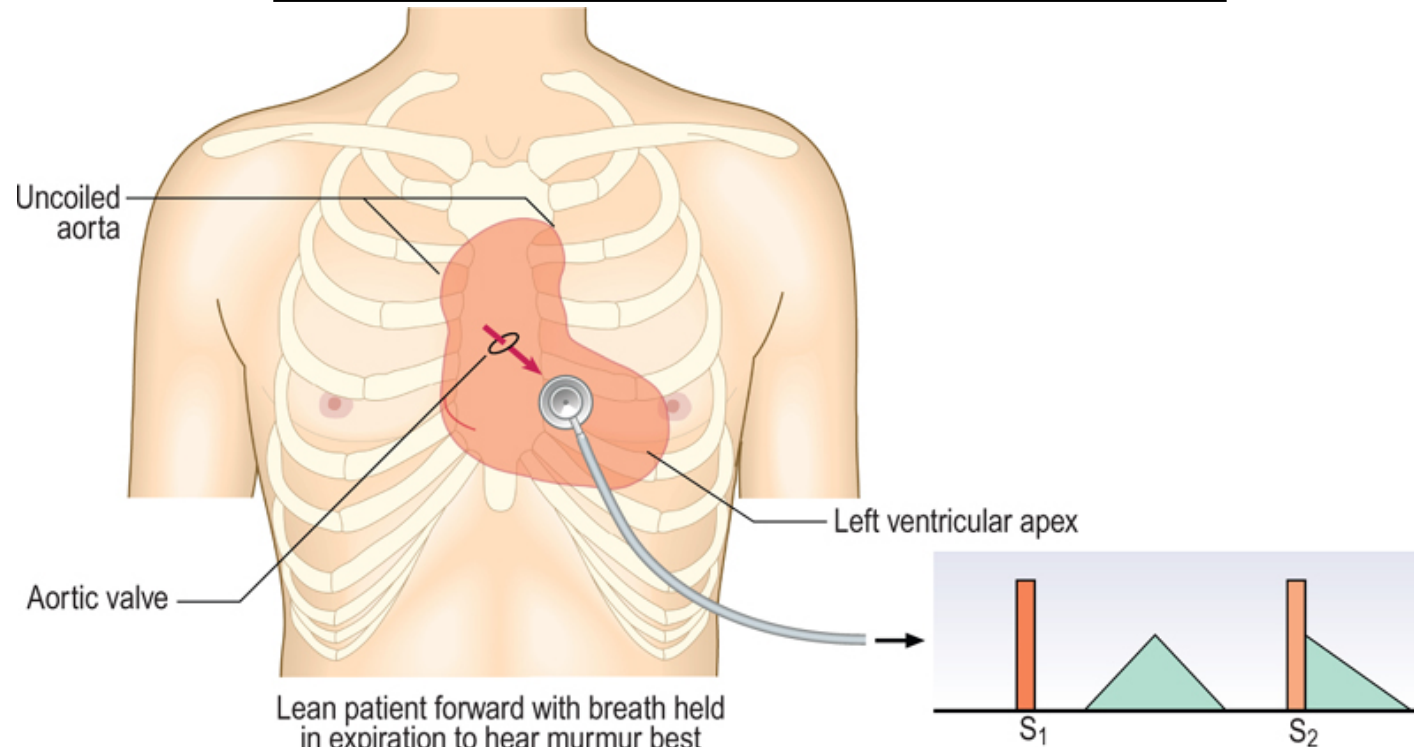
- Mid-diastolic murmurs

Mitral stenosis and Austin flint murmur

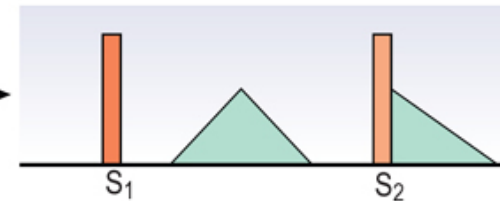
Diastolic Murmurs



Aortic Regurgitation



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- **Timing: early diastolic**
- **Pitch: low (ask the pt to lean forward and hold his breath in expiration)**
- **Location: 2 areas (Rt 2nd intercostal space, Lt third intercostal space- Erb's area)**

Special manoeuvres

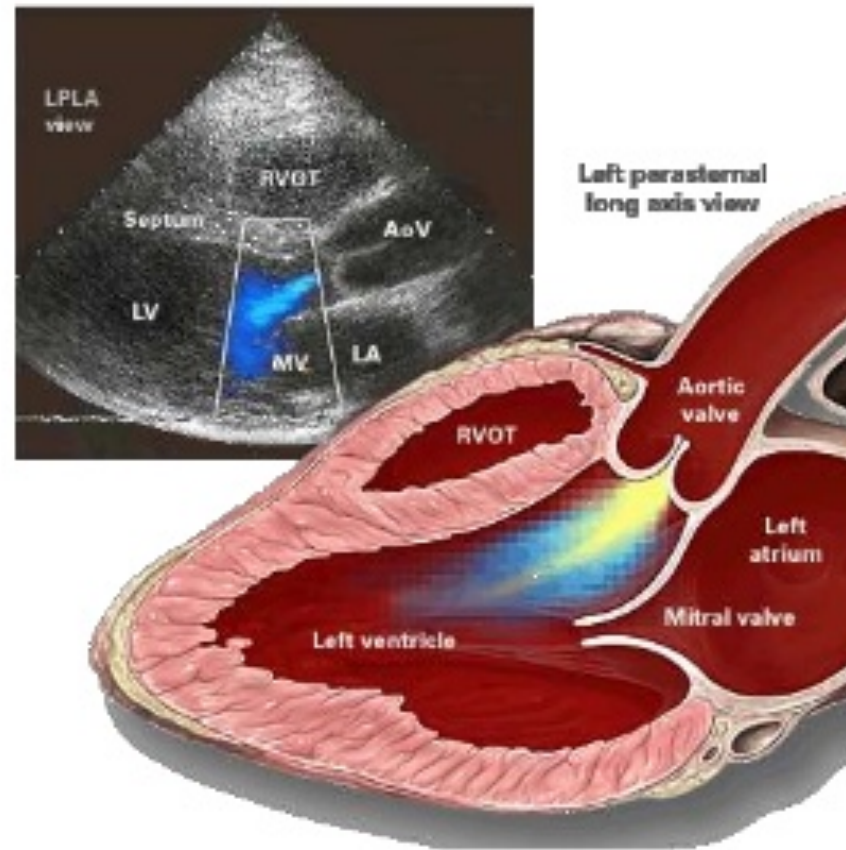
❖ **The duration of the murmur is inversely proportional to the the severity**

❖ **Can be associated with systolic flow murmur**

Recap slide 56

Austin Flint Murmur

- Mid-diastolic murmur that accompanies aortic regurgitation
- Caused by regurgitant jet striking the anterior leaflet of the mitral valve, restricting the inflow to the left ventricle



Pulmonary Regurgitation

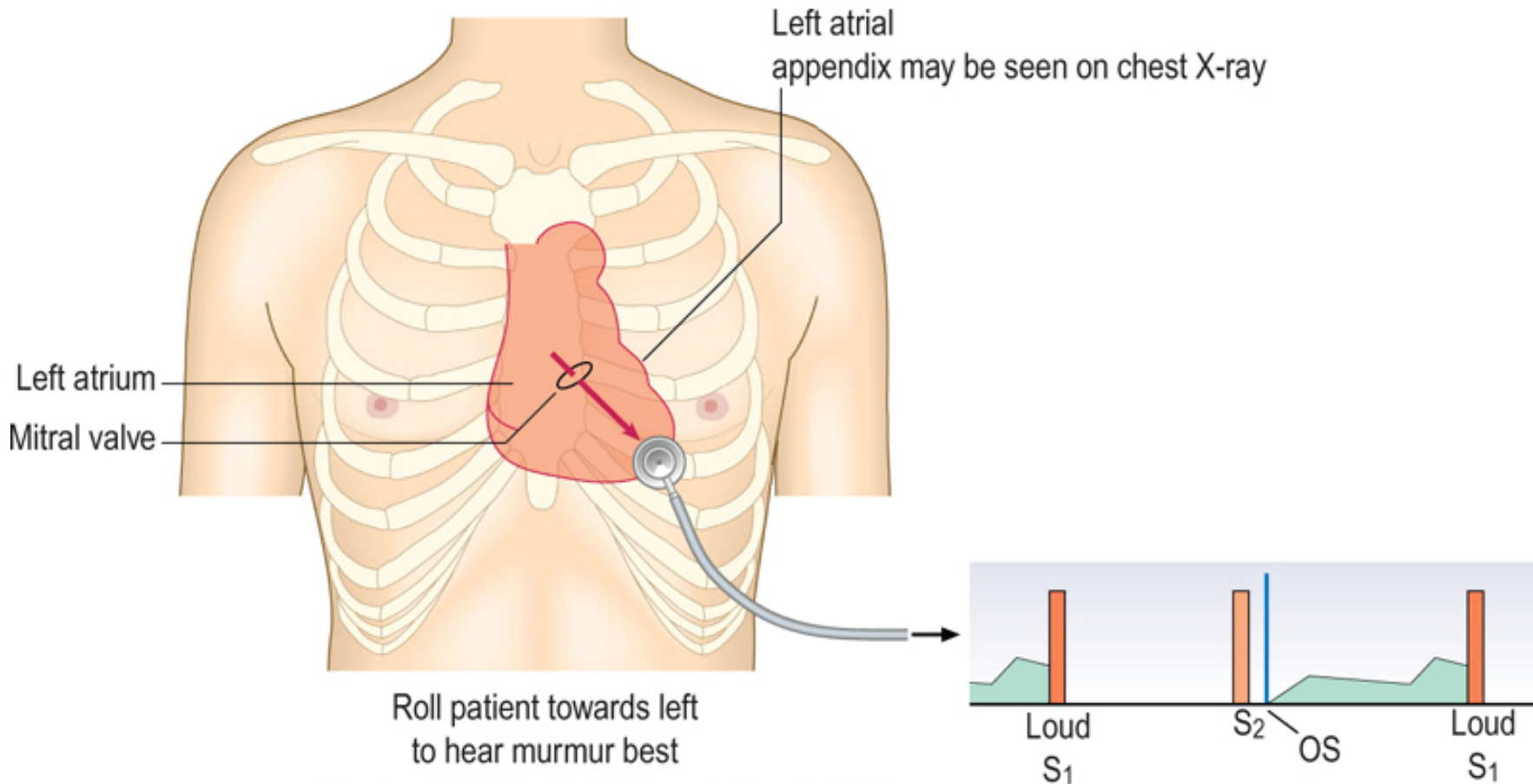
- Pulmonary regurgitation caused by pulmonary dilatation in pulmonary hypertension

Graham Steel murmur

- Congenital defect of the pulmonary valve

- *Rare*

Mitral Stenosis



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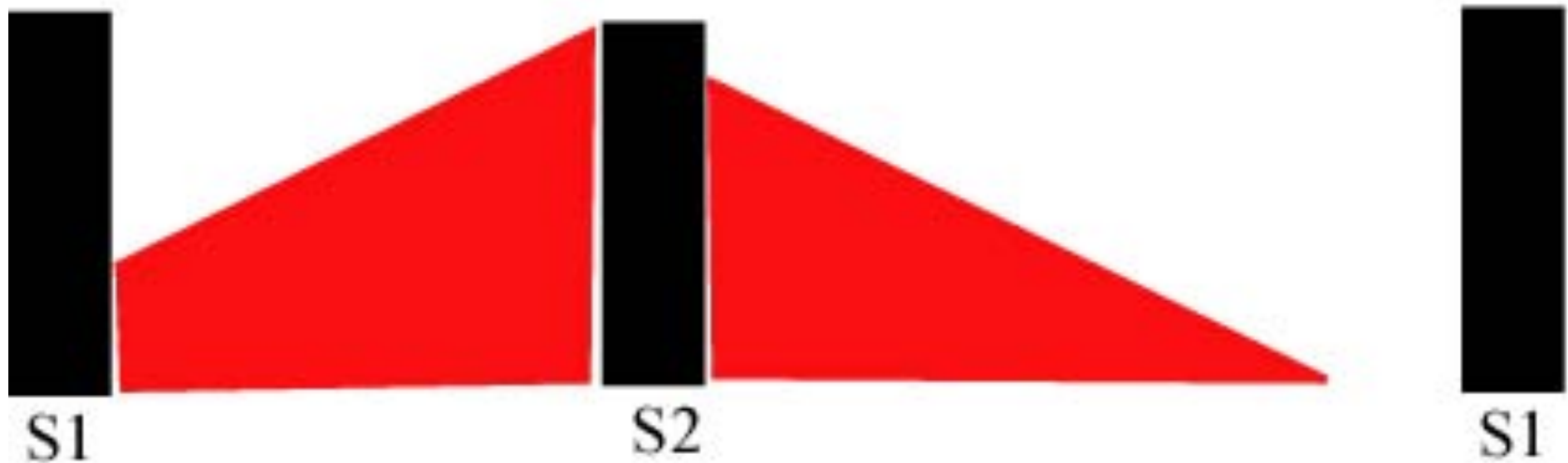
- Timing: late diastolic
 - Character: blowing *Rumbling*
 - Pitch: low (ask the pt to turn to the left)
 - Location: apex
- ❖ May follow opening snap
- ❖ The murmur is accentuated by exercise
- Special manouver.*

Video

Continuous Murmurs

- Rare in adults
- Patent ductus arteriosus is the most common cause
- Timing: systolic and diastolic
- Duration: continuous

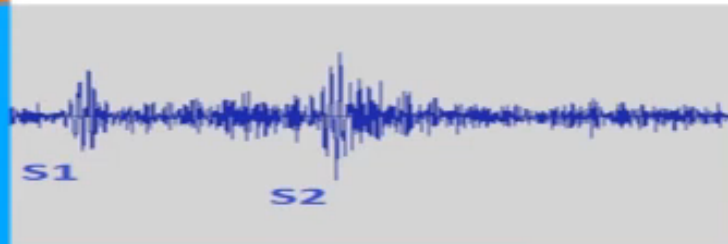
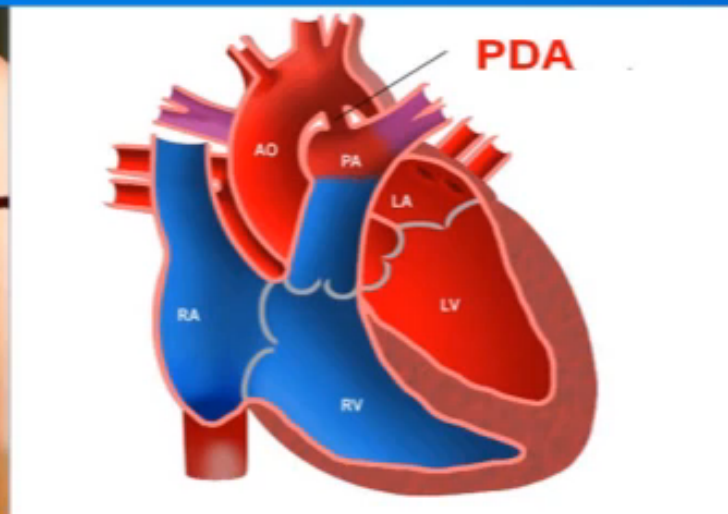
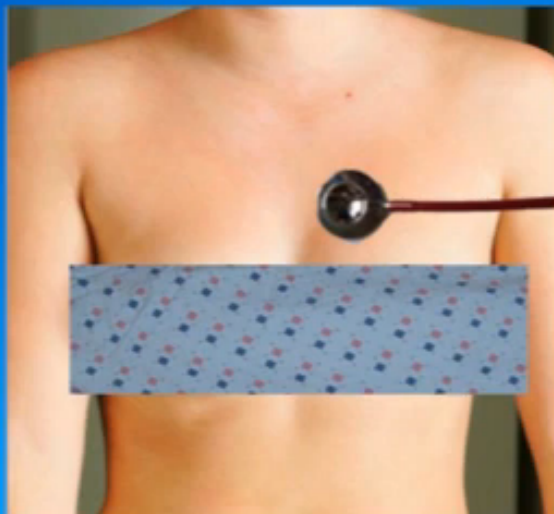
Patent Ductus Arteriosus



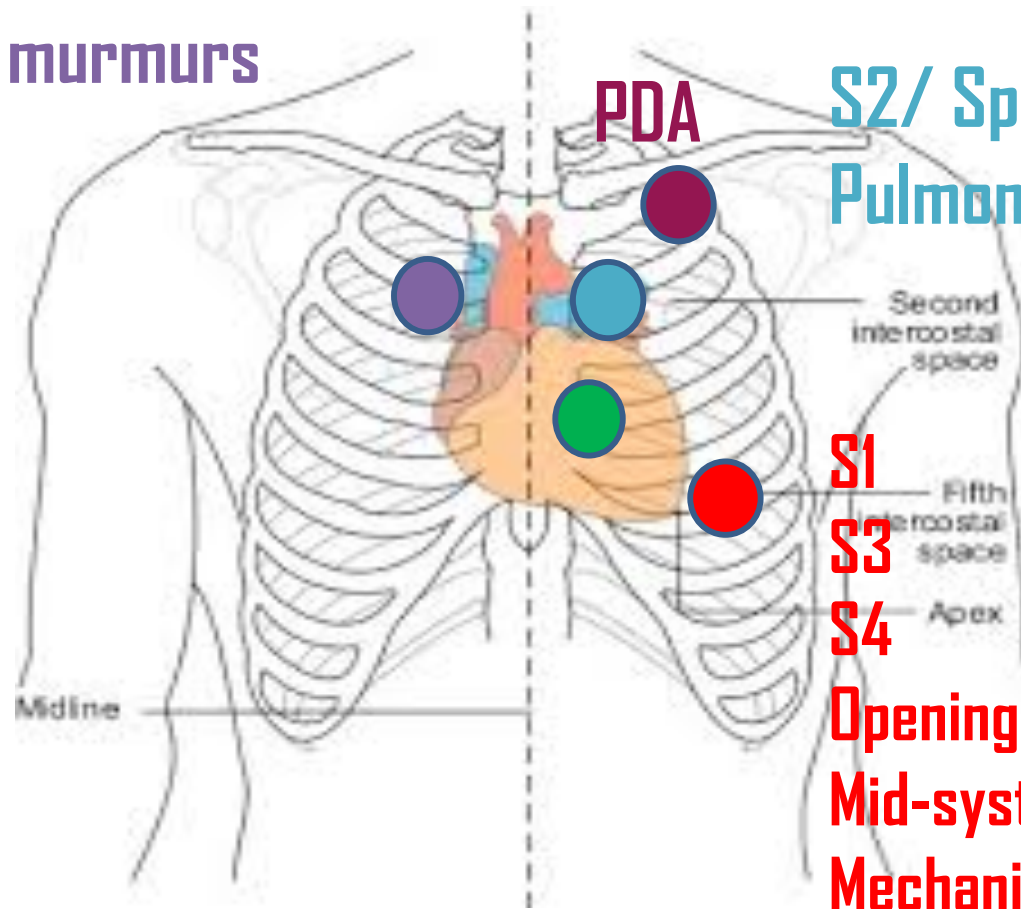
- Character: machinery-like
- Pitch: high pitch, louder in systolic
- Location: left infraclavicular
- Radiation: left scapula

❖ Aortic pressure always exceeds pulmonary pressure, there is continuous ductal flow with the greatest pressure difference in systole resulting in a louder systolic component

PATENT DUCTUS ARTERIOSUS



Mechanical aortic valve
Systolic Ejection murmurs
HOCM
Aortic regurg



Pulmonary murmurs

Tricuspid Regurg/stenosis
Aortic regurg

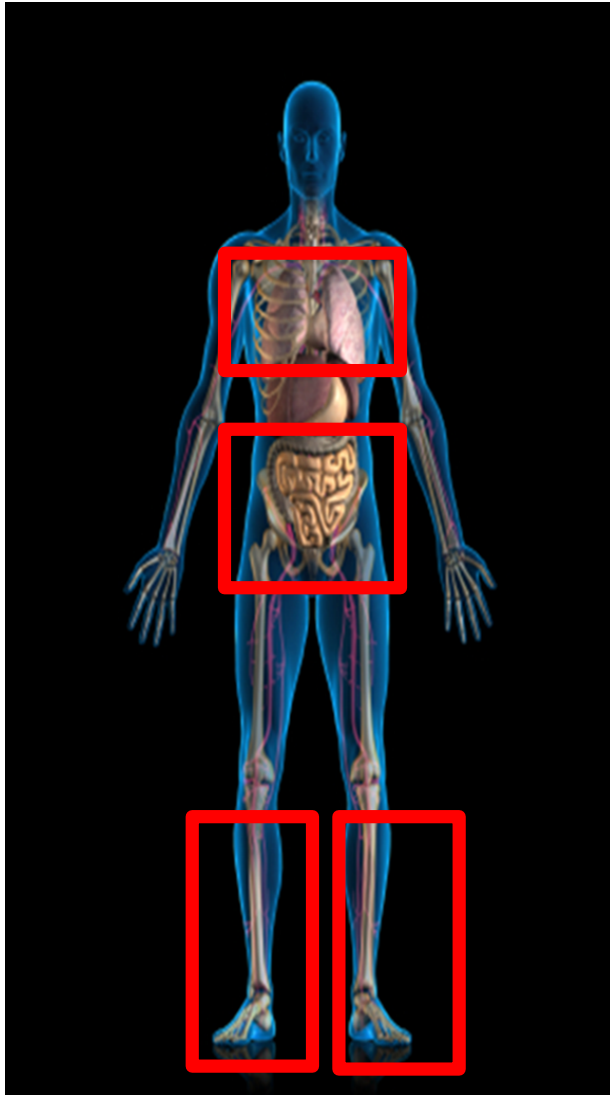
Opening snap
Mid-systolic click
Mechanical mitral valve
Mitral Regurg/Stenosis

Heart auscultation is done

Complete your examination

- Auscultate the lung for crackles and pleural effusion
- Examine the abdomen for ascites
- Auscultate for Bruit
- Examine lower limb/sacrum for edema

Lecture ended here





Aortic Stenosis

- **Slow rising pulse**
- **Displaced apex beat, S4**
- **Apical heave**
- **Thrill over the apex and right upper sternal boarder**
- **Ejection systolic murmur right upper sternal boarder radiating to the carotids**
- **Ejection click**
- **Reversed splitting S2**

Mitral stenosis

- Tapping apex beat
- Opening snap
- Mid-diastolic murmur at the apex
- Loud S1

HOCM

- **Bisferiens pulse**
- **Double apical impulse**
- **Ejection systolic murmur**
- **Reversed splitting S2**

VSD

- **Right and left sternal border thrill**
- **Pansystolic murmur left sternal border**
- **Wide splitting S2**

Tricuspid Regurgitation 2nd to pulmonary HTN

- **Giant V wave in JVP**
- **Left parasternal heave**
- **Wide splitting/ loud S2**
- **Graham steel murmur (if pulmonary artery dilates)**