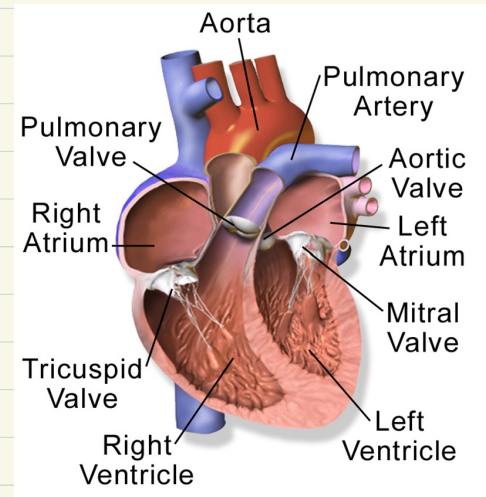
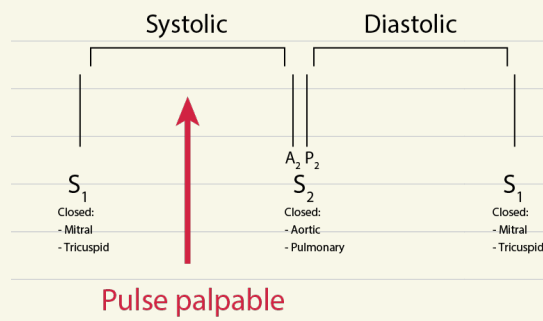


Heart Sounds

غفر الله لجامعها وقارئها ومدرسها
ودارسها.



Systolic : ventricular contraction to eject the blood.

Diastolic : ventricular filling.

Table 1: The pathophysiology of heart sounds & murmurs

Valve type	Systolic		Diastolic	
	Normal	Abnormal	Normal	Abnormal
Aortic & Pulmonary	Opened	Closed Stenosis	Closed	Opened Regurgitation
Mitral & Tricuspid	Closed	Opened Regurgitation	Opened	Closed Stenosis

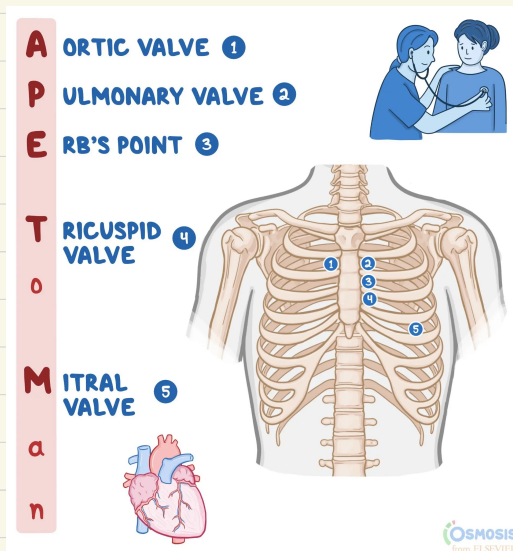
- Stenosis: Abnormal OPENING**
- Regurgitation: Abnormal CLOSURE**

Types of Murmurs that is included and we need to know:

Aortic stenosis, Aortic Regurgitation, Pulmonary Stenosis, Pulmonary Regurgitation, Mitral Stenosis, Mitral Regurgitation, Tricuspid Stenosis, Tricuspid Regurgitation, Atrial Septal Defect, Ventricular Septal Defect, Hypertrophic cardiac myopathy

Using the Diaphragm 📢

Normal heart sounds (total 4 sounds)



1) **Aortic region**: 2nd intercostal space

Rt. Side of the sternum

2) **pulmonary region**: 2nd intercostal space Lt. Side of the sternum

3) **ERB's area**: 3rd intercostal space Lt. Side of the sternum s_2

4) **Tricuspid region**: 4th intercostal space Lt. Side of the sternum

5) **Mitral region**: 5th intercostal space Lt. Side midclavicular line

Last step of your auscultation to use the bell instead of Diaphragm to listen over the apex (for S3&S4) and at the tricuspid region for left S3

Notes about each murmur (S C R I P T) → Timing

Site → Character → Pitch → Intensity → Radiation

Watch this (highly recommended 🙌):

<https://youtu.be/IrWEAucHoA0?si=BQhX4wQFvYOBZTbc>

1. AORTIC STENOSIS

Site: Right 2nd intercostal space (aortic area)

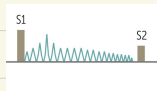
Character: Harsh, crescendo-decrescendo

Radiation: To the carotids (especially right)

Intensity: Loud, increases with expiration and leaning forward

Pitch: Medium

Timing: Ejection systolic (mid-systolic)



Additional clinical findings

- Slow rising pulse*
- Reduced pulse volume*
- Narrow pulse pressure
- Apical heave
- Thrill in aortic region
- Reduced or absent second heart sound over aortic area*
- Radiation of murmur to carotid artery*

*In patients with an ESM, 3 or more of these features make moderate to severe aortic stenosis highly likely

2. AORTIC REGURGITATION

Site: Left 3rd intercostal space (left sternal edge)

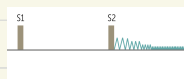
Character: Blowing, decrescendo

Radiation: May radiate to apex or none

Intensity: Soft, best heard when sitting forward in expiration

Pitch: High

Timing: Early diastolic



Additional clinical findings

- Large volume pulse
- Collapsing pulse
- Wide pulse pressure
- Prominent carotid pulsations (Corrigan's sign)
- Displaced apex beat

3. PULMONARY STENOSIS

Site: Left 2nd intercostal space (pulmonary area)

Character: Harsh, crescendo-decrescendo

Radiation: To the back or left shoulder

Intensity: Increases with inspiration

Pitch: Medium

Timing: Ejection systolic

4. PULMONARY REGURGITATION

Site: Left 2nd intercostal space

Character: Blowing

Radiation: Minimal

Intensity: Soft, enhanced with inspiration (Graham-Steell murmur)

Pitch: High

Timing: Early diastolic

5. MITRAL STENOSIS

Site: Apex (usually in left lateral position)

Character: Rumbling, with opening snap

Radiation: None

Intensity: Low, enhanced with exercise or left lateral decubitus

Pitch: Low (use bell)

Timing: Mid-diastolic (with presystolic accentuation in sinus rhythm)

6. MITRAL REGURGITATION

Site: Apex

Character: Blowing, pansystolic

Radiation: To the axilla (especially left)

Intensity: Loudest in expiration, enhanced in left lateral position

Pitch: High

Timing: Pansystolic (holosystolic)



Additional clinical findings

- Displaced apex beat
- Third heart sound

7. TRICUSPID STENOSIS

Site: Lower left sternal border (LLSB)

Character: Rumbling, with opening snap

Radiation: None

Intensity: Increases with inspiration (Carvallo's sign)

Pitch: Low (use bell)

Timing: Mid-diastolic

8. TRICUSPID REGURGITATION

Site: Lower left sternal border

Character: Blowing

Radiation: To right of sternum or epigastrium

Intensity: Increases with inspiration

Pitch: High

Timing: Pansystolic



Additional clinical findings

- Elevated JVP with systolic cv wave
- Pulsatile hepatomegaly
- Right parasternal heave*
- Loud pulmonary component of second heart sound*

*If pulmonary hypertension has developed

Important 🚨!!

- With increasing the Venous return **ALL** the murmurs become more intense **except** HOCM & Mitral Valve Prolapse
- Increasing the After load **will decrease** the stenosis murmurs and **increase** the Regurgitation murmurs
- HOCM murmur can be auscultated in the ERB's area

MANEUVER	CARDIOVASCULAR CHANGES	MURMURS THAT INCREASE WITH MANEUVER	MURMURS THAT DECREASE WITH MANEUVER
Standing, Valsalva (strain phase)	↓ preload (↓ LV volume)	MVP (↓ LV volume) with earlier midsystolic click HCM (↓ LV volume)	Most murmurs (↓ flow through stenotic or regurgitant valve)
Passive leg raise	↑ preload (↑ LV volume)		
Squatting	↑ preload, ↑ afterload (↑ LV volume)	Most murmurs (↑ flow through stenotic or regurgitant valve)	MVP (↑ LV volume) with later midsystolic click HCM (↑ LV volume)
Hand grip	↑↑ afterload → ↑ reverse flow across aortic valve (↑ LV volume)	Most other left-sided murmurs (AR, MR, VSD)	AS (↓ transaortic valve pressure gradient) HCM (↑ LV volume)
Inspiration	↑ venous return to right heart, ↓ venous return to left heart	Most right-sided murmurs	Most left-sided murmurs

4 Auscultation maneuvers: (murmurs)

Watch this (highly recommended 🙌) :

<https://youtu.be/KQ-zBeSBpSM?si=dU3isxGMsHvUcC4N>

● MITRAL STENOSIS

Best heard at: Apex

Patient position: Left lateral decubitus (left side)

Breathing: After expiration (full expiration)

Bell or diaphragm: Bell (low-pitched)

● MITRAL REGURGITATION

Best heard at: Axilla (radiation)

Patient position: supine

Breathing: full expiration

Bell or diaphragm: Diaphragm (high-pitched)

● Aortic STENOSIS

Best heard at: Carotid arteries (radiation)

Patient position: Supine

Breathing: Hold your breath (to not be confused with air sounds in the trachea)

Bell or diaphragm: Bell

● Aortic REGURGITATION

Best heard at: ERB's area (can be heard at the aortic region)

Patient position: Leaning forward slightly

Breathing: Full expiration (Inspiration-Expiration-HOLD)

Bell or diaphragm: Diaphragm

To know: if you heard the AR at the aortic region usually it is related to aortic root dilation but if it is at the ERBs area it is related to valvular disease

Special Murmurs

Murmur	Mimics / Features
Atrial Septal Defect (ASD)	Fixed split S2, systolic murmur → mimics Pulmonary Stenosis
Ventricular Septal Defect (VSD)	Harsh holosystolic murmur at LLSB → mimics Tricuspid Regurg.
HOCM	Harsh ejection murmur at Erb's point, ↑ with Valsalva
Austin Flint Murmur	Functional mid-diastolic murmur at apex in severe AR
Patent Ductus Arteriosus	best heard at the upper left sternal border and radiates over the left scapula. Its continuous character is 'machinery-like' (greater pressure: Louder Systolic)