HEART SOUNDS

By

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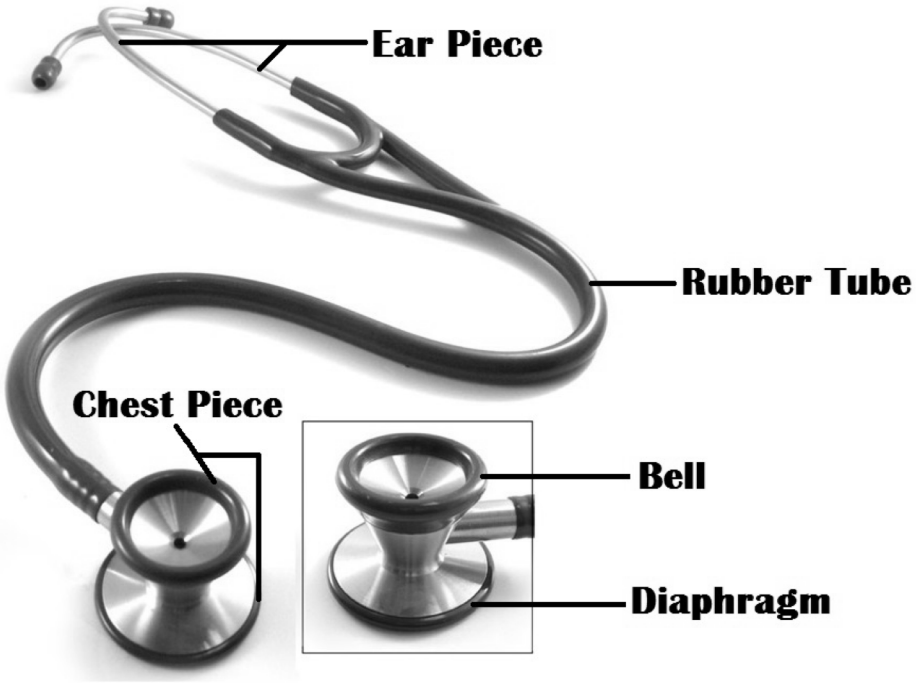
Objectives

- List the different heart sounds and identify the auscultatory areas recommended for auscultation of each.
- Perform heart sound auscultation on a fellow student.
- Describe the physiologic phenomenon behind the generation of each heart sound.
- Identify the timing of sounds in relation to the cardiac cycle.
- Define phonocardiography.
- Identify the major heart sounds on a phonocardiogram and correlate them to the electrical and mechanical events occurring in the heart.

Auscultation Method

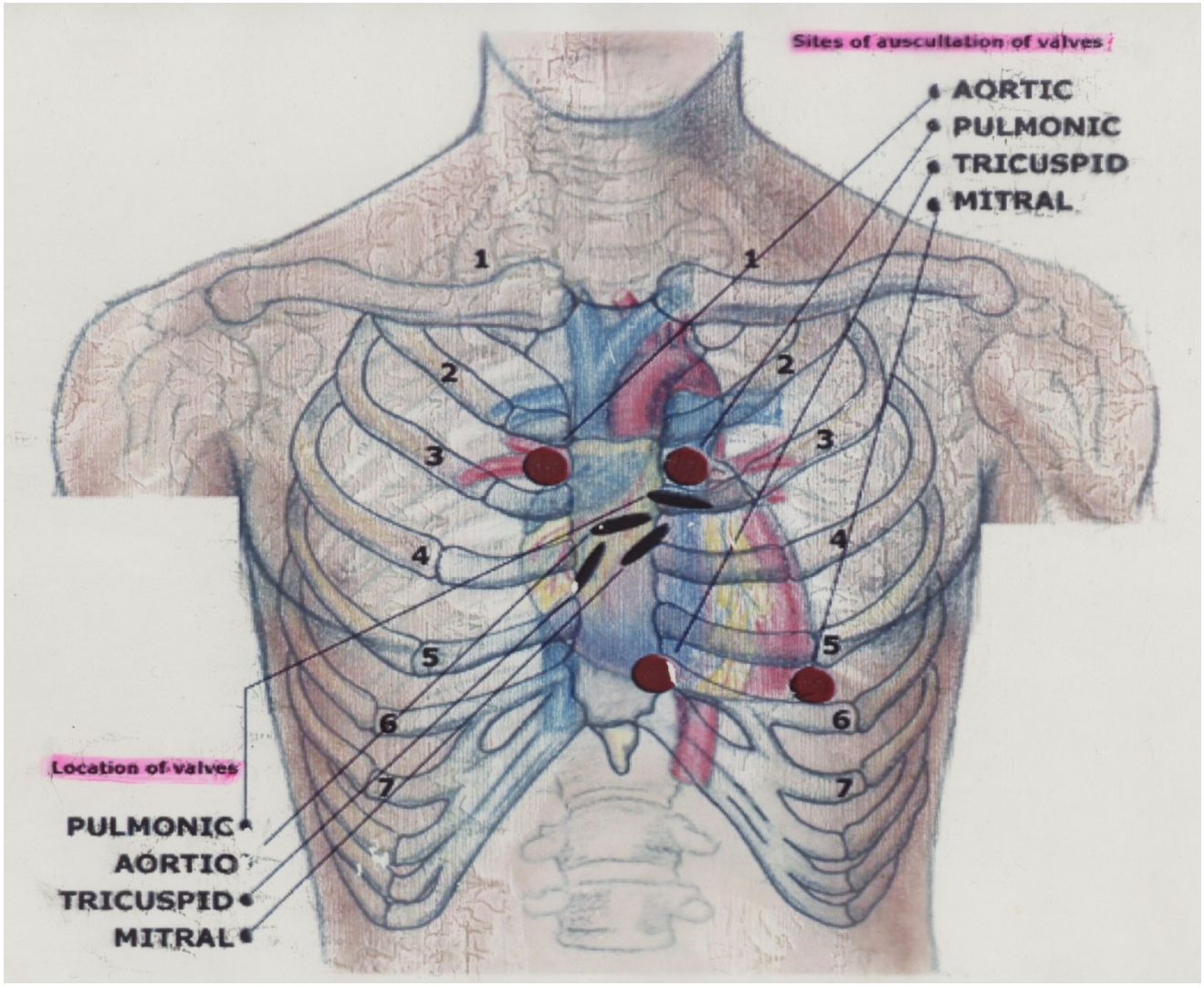
The stethoscope

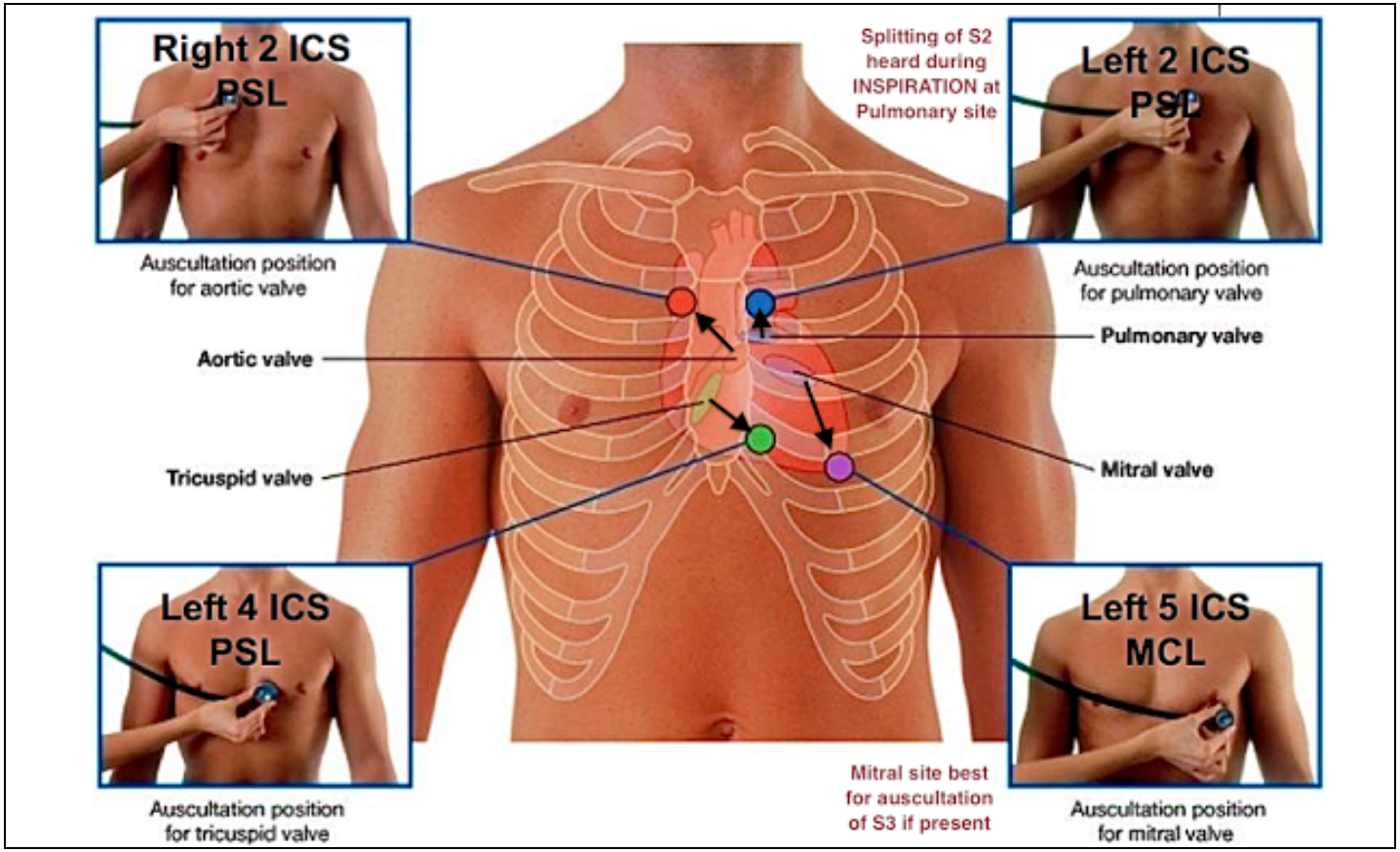


The position of the patient

- The heart should be auscultated when the patient is in the following positions:
- Supine.
- Left lateral.
- Sitting.

Areas of auscultation




Right 2 ICS PSL
Auscultation position for aortic valve
Splitting of S2 heard during INSPIRATION at Pulmonary site
Left 2 ICS PSL
Auscultation position for pulmonary valve
Aortic valve
Pulmonary valve
Tricuspid valve
Mitral valve
Left 4 ICS PSL
Auscultation position for tricuspid valve
Mitral site best for auscultation of S3 if present
Left 5 ICS MCL
Auscultation position for mitral valve

- **The mitral area (apex):** This is found in the left 5th intercostal space, approximately 1 cm medial to the mid-clavicular line.
- **The tricuspid area:** This is found just to the left of the lower border of the sternum.
- **The pulmonary area:** This is found in the left 2nd intercostal space at the sternal border.
- **The aortic area:** This is found in the right 2nd intercostal space at the sternal border.

Phonocardiography

Phonocardiography is the sensitive technique, by which a recording can be made of all four heart sounds by placing a transducer on specific areas of auscultation.

First heart sound (S1)

- It is always normal. It sounds as "**lub**". It is also called S_1.
- It is usually prolonged, but dull in nature.
- It is caused by the closure of AV valves.
- It is best heard when auscultated at mitral and tricuspid areas.
- It occurs at the beginning of ventricular systole in relation to cardiac cycle.
- It occurs just after QRS complex if we relate it to ECG
- Frequency: 50-60 Htz
- Time: 0.15 sec

Second heart sound (S2)

- It is always normal. It sounds as "**dub**". It is also called S_2.
- It is usually short and sharp in nature.
- It is caused by the closure of semi-lunar valves.
- It is best heard when auscultated at aortic and pulmonary areas.
- It occurs at the beginning of ventricular diastole in relation to cardiac cycle.
- It occurs just after T wave if we relate it to ECG.
- Frequency:80-90 Htz
- Time: 0.11 sec

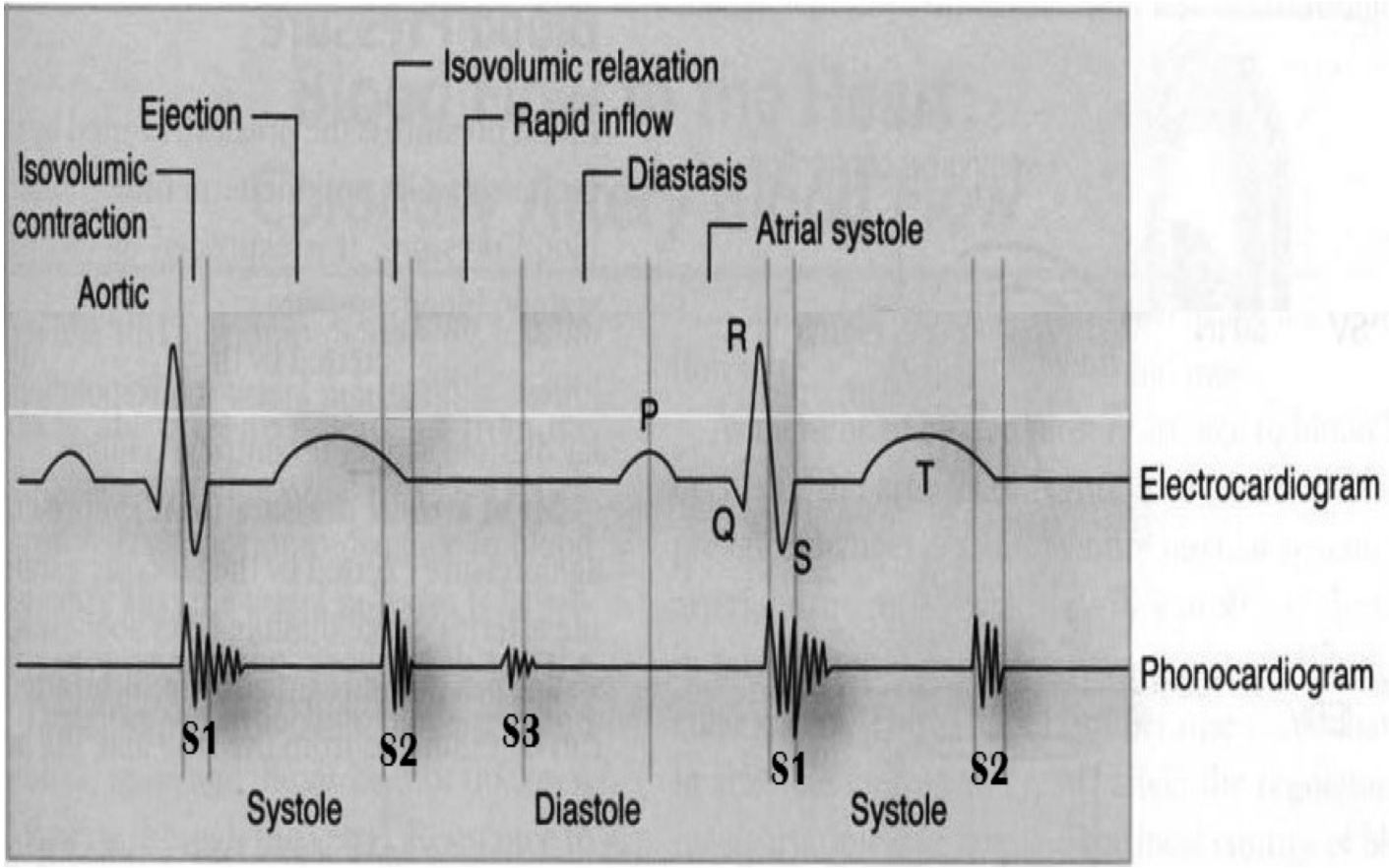
Third heart sound (S3)

- It may be heard normally in children, thin adults, and pregnant women or after exercise. It is also called S_3.
- It is caused by the striking of the blood to the wall of ventricles during rapid filling phase of ventricular diastole.
- It occurs in the early diastole in relation to cardiac cycle (beginning of the middle third of diastole)
- Frequency: 20-30 Htz
- Time: 0.1 sec

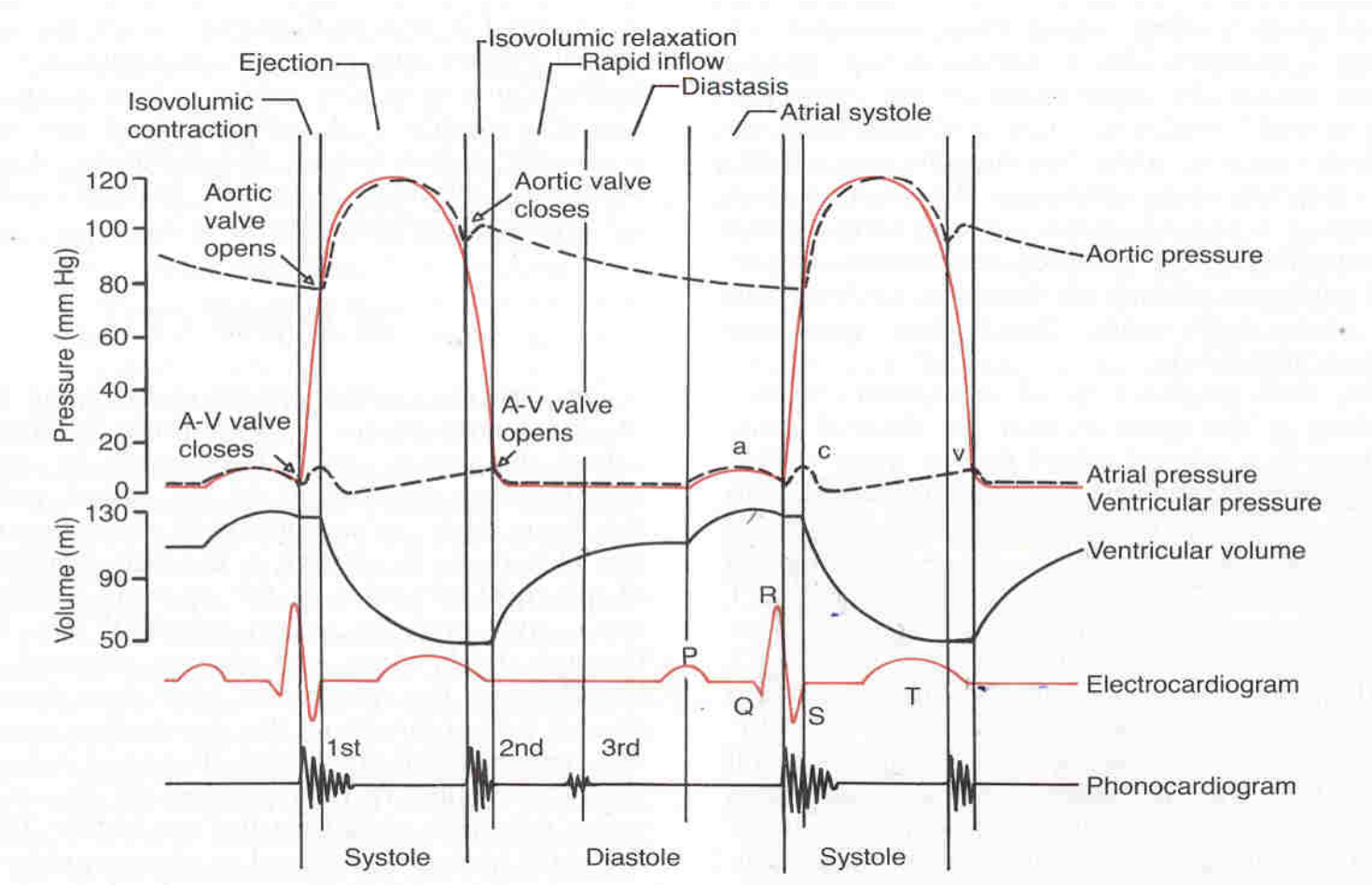
Fourth heart sound (S4)

- It may be heard normally in older people. It is also called S_4.
- It is caused by the forceful contraction of atria.
- It occurs just before the first heart sound during late diastole in relation to cardiac cycle.
- Frequency: < 20 Htz

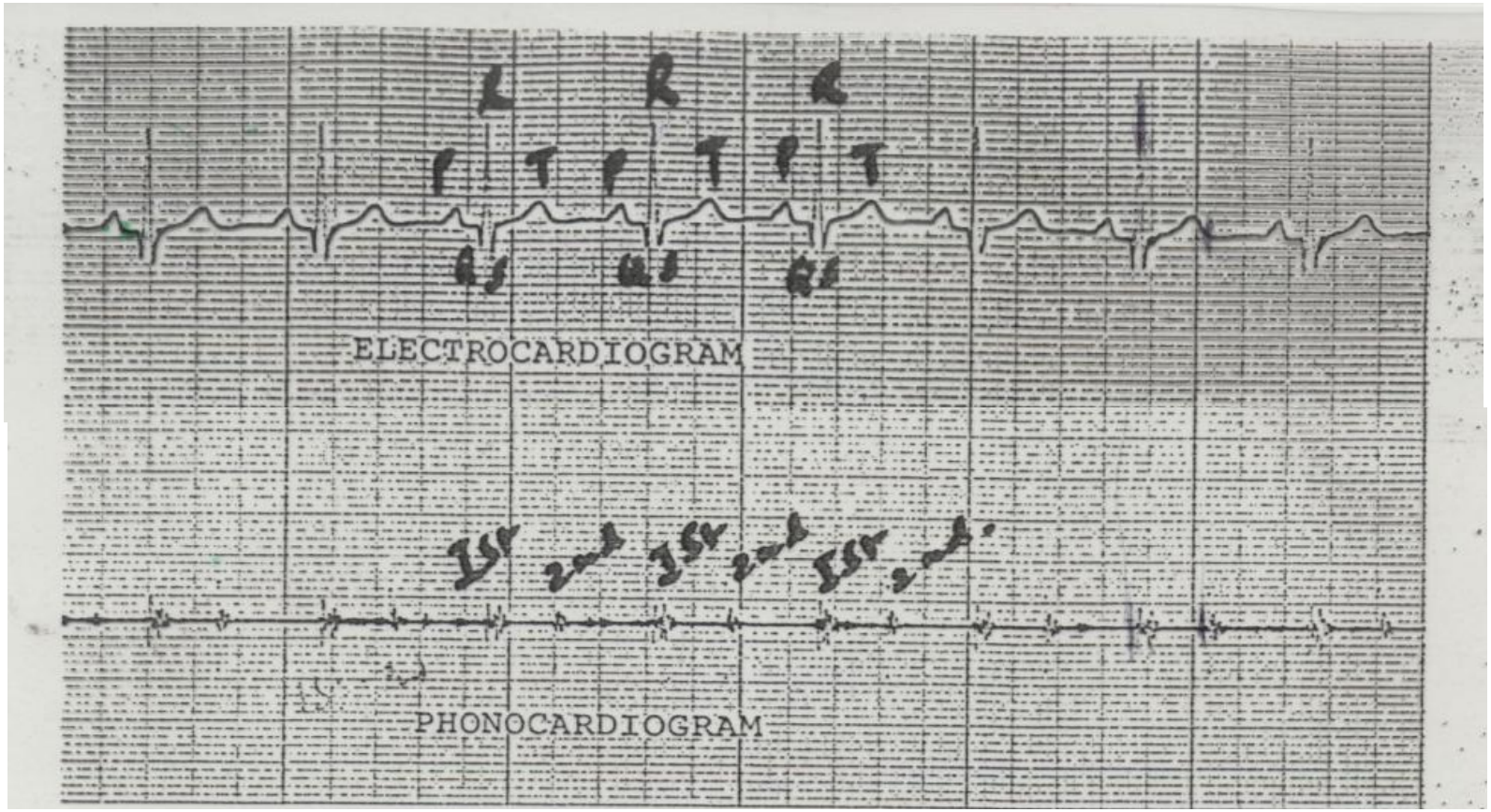
Heart sounds using Phonocardiography



The Events of the Cardiac Cycle



Relationship of heart sound with ECG



Splitting of second heart sound A_2-P_2

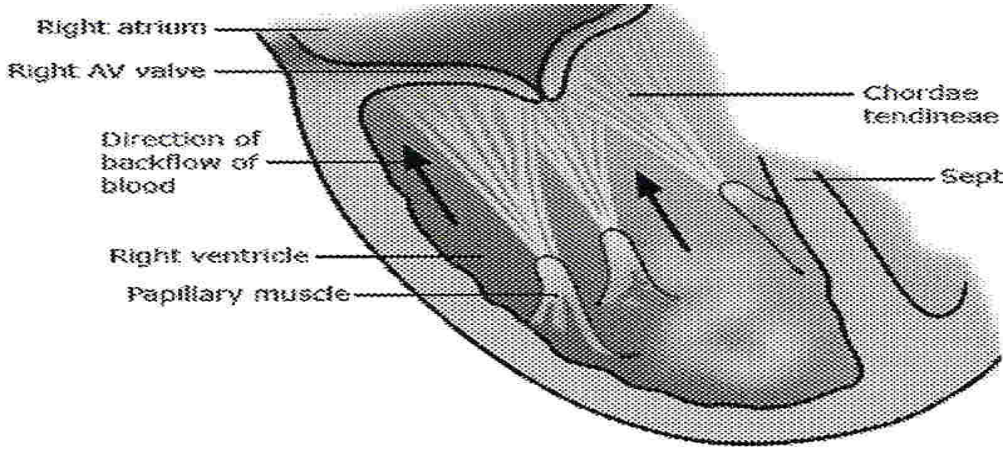
- Physiologic splitting of the 2nd heart sound occurs during deep inspiration, as the chest wall expands and the intra-thoracic pressure falls and leads to increases the venous return into the right atrium. This inspiration-induced increase in venous return delays closure of the pulmonary valve causing the audible splitting of S_2
- When the A2 component splits from the P2 component by more than 0.2 seconds.
- It is auscultated as “dub, dub” over the aortic or pulmonary areas

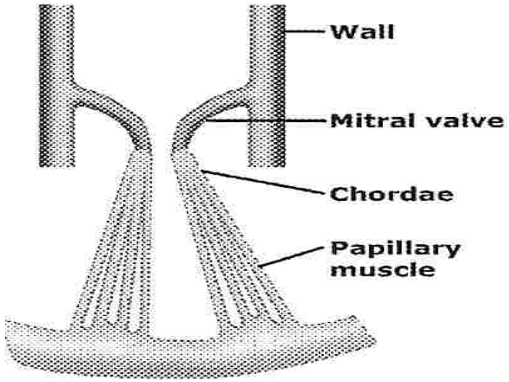
Heart Murmurs

Murmurs are abnormal sounds produced due to abnormal flow of blood through abnormal heart valves e.g. stenosis or regurgitation.

- Systolic murmurs
- Diastolic murmurs
- Continuous Murmurs

Function of papillary muscle & Chordae tendineae





Thank you