HEART SOUNDS

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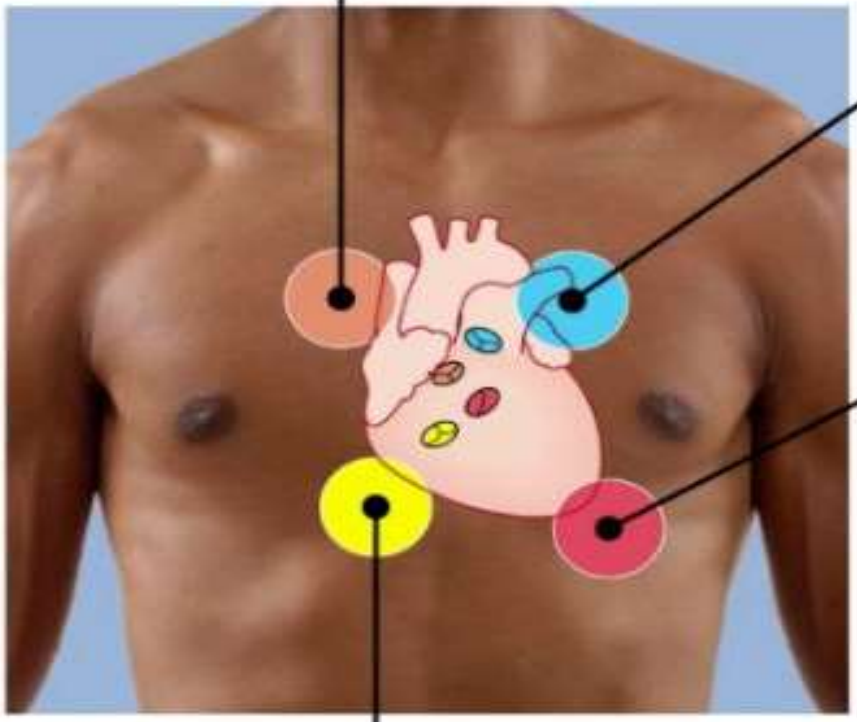


Aortic valve sounds heard in 2nd intercostal space at right sternal margin

Pulmonary valve sounds heard in 2nd intercostal space at left sternal margin

Mitral valve sounds heard over heart apex (in 5th intercostal space) in line with middle of clavicle

Tricuspid valve sounds typically heard in right sternal margin of 5th intercostal space

I. The First Heart Sound :

•**Causes :**

*1. **First** component*:

-Valvular (main cause) : sudden closure of A.V. valves which causes vibration of the valves and the surrounding blood and ventricular wall.

2. ***Second** component*:

- Muscular : vibration of the aortic and pulmonary artery wall or a result of rushing of blood into them during maximum ejection phase.

•**Phases** : * isometric contraction phase.

* 1st part of maximum ejection phase.

•**Duration** : 0.14 - 0.16 sec.

•**Characters** : Audible by stethoscope (heard as lubb) low pitched, soft, long duration and vibration frequency is 25-100 cycle/sec.

•**Site of best hearing :**

*1.**Mitral** component*: Can be heart best in the 5th left intercostal space at the mid-clavicular line (at apex).

*2. **Tricuspid** component* :Can be heart best over the lower right border of the sternum (lower end of the sternum).

II. The Second Heart Sound

•**Causes** : sudden closure of the semilunar valves (aortic and pulmonary artery.).

•**Phase** : isometric relaxation phase.

•**Duration** : 0.1 sec

•**Characters** :

*Audible by stethoscope (heart as dup).

*High pitched, sharp

*Vibration frequency is 100 - 200 cycle/sec.

•**Site of best hearing** :

1.**Aortic** component :

Second right space near the sternum.

2.**Pulmonary** component:

Second left space near the sternum

N.B. :

•**Splitting of the second heart sound :**

* Normally the pressure closing the aortic valve is much higher than that closing the pulmonary valve, so the aortic valve closes before the pulmonary valve leading to split of the second H.S.

* Normally the splitting is very close, so, aortic and pulmonary sounds are heart as one sound.

** The 1st H.S. occurs at the beginning of systole.*

The 2nd H.S. occurs at the beginning of diastole.

** The interval between 1st and 2nd H.S. indicates the **systolic period**.*

** The interval between 2nd and 1st H.S. indicates the **diastolic period**.*

III. The Third Heart Sound :

•**Cause** :ventricular vibration (initiated by rushing of blood into the ventricle).

•**Phase** : Maximum (rapid) filling phase.

•**Duration** : 0.05 sec.

•**Character** :

- Low pitch (soft) very faint.

•**Site of best hearing** :

Mitral area : left 5th intercostal space at mid-clavicular line.

***N.B.** : It can be heard in children.*

•**Its intensity increased in:**

Conditions that increase the volume of blood flowing from the atria to the ventricle .e.g.:- hyper-dynamic circulation

IV. The Fourth Heart Sound :

•**Cause** : atrial contraction.

•**Phase** : atrial systole phase.

•**Duration** : 0.04 sec

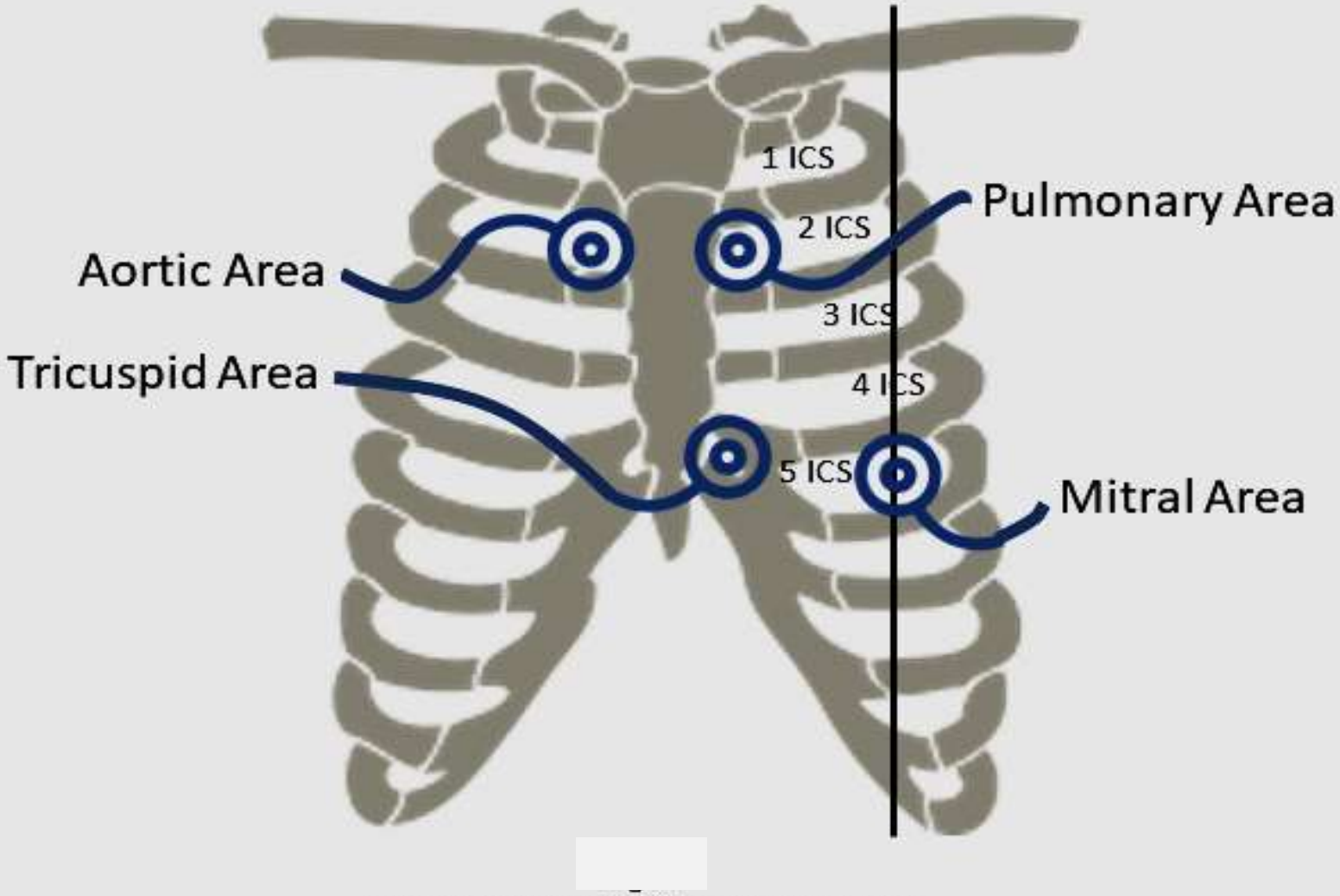
•**Characters** : - **Non audible** by stethoscope (recorded by phonocardiogram).

•the site of best hearing is the mitral area.

N.B. :

It is heard in any condition causing atrial hypertrophy.

H. Sound	1st	2nd	3rd	4th
1.Cause	-1st component: Valvular (main cause) : sudden closure of A.V. valves which causes vibration of the valves and the surrounding blood and ventricular wall. -2nd component: Muscular : vibration of the aortic and pulmonary artery wall or a result of rushing of blood into them during maximum ejection phase.	sudden closure of the semilunar valves (aortic and pulmonary artery.).	ventricular vibration (initiated by rushing of blood into the ventricle).	atrial contraction.
2.Phase	* isometric contraction phase. * 1st part of maximum ejection phase.	isometric relaxation phase.	Maximum (rapid) filling phase.	atrial systole phase.
3.Duration	0.14 - 0.16 sec.	0.1 sec	0.05 sec.	0.04 sec
4.Character	Audible by stethoscope (heart as lubb) low pitched, soft, long duration and vibration frequency is 25-100 cycle/sec.	*Audible by stethoscope (heart as dup). *High pitched, sharp *Vibration frequency is 100 - 200 cycle/sec	- Low pitch (soft) very faint.	- Non audible by stethoscope (recorded by phonocardiogram).
5.Site of best hearing	1.Mitral component: Can be heart best in the 5th left intercostal space at the mid-clavicular line (at apex). 2. Tricuspid component :Can be heart best over the lower right border of the sternum (lower end of the sternum).	1.Aortic component : Second right space near the sternum. 2.Pulmonary component: Second left space near the sternum	Mitral area : left 5th intercostal space at midclavicular line. N.B. : It can be heard in children.	The mitral area.



Areas on the Precordium for Auscultation of Heart.

Thank You