بسم الله الرحمن الرحيم
و ما أوتيتم من العلم إلا قليلاً
صدق الله العظيم
الإسراء اية 58
Heart Sounds

BY

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Introduction

Learning objectives:

1. Know types of normal heart sounds.
2. Know the abnormal heart sounds e.g. murmurs.
3. Know the methods used to detect normal and abnormal heart sounds.
4. Demonstrate, on a living person, where a stethoscope should be placed to auscultate for heart sounds or murmurs.
Introduction

Remember that:
The classical sequence of clinical examination is;
1. Inspection (look)
2. Palpation (feel)
3. Percussion (tap)
4. Auscultation (listen)
Normal Heart Sounds

• There are 4 sounds produced by the heart that are produced vibrations of the cusps of the heart valves.

• 4 cardiac valves;
  1. 2 Atrioventricular (AV) valves (tricuspid and mitral valves)
  2. 2 semilunar valves (aortic and pulmonary valves)
Methods of Detection of Heart Sounds

a) Stethoscope:
2 sounds are only audible by stethoscope

b) Phonocardiograph:
records for 4 sounds → phonocardiogram
# Normal Heart Sounds

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>S₁</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>0.15 second</td>
</tr>
</tbody>
</table>
| **Relation to cardiac cycle** | • Isometric contraction phase  
• Maximum ejection phase |
| **Causes:**          | 3 components:  
a- Valvular component (sudden closure of AV valves)  
b- Ventricular component  
c- Vascular component: |
| **Characters**       | • Soft and low pitched (25-40 Hz) sound.  
• Heard as the word **Lub** by the stethoscope. |
| **Auscultatory sites** | a- Mitral area (M): left 5th intercostal space at MCL  
b- Tricuspid area (T): left 4th intercostal space near sternum |
## Normal Heart Sounds

<table>
<thead>
<tr>
<th><strong>Duration</strong></th>
<th>0.1 second.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Relation to cardiac cycle</strong></td>
<td>• Isometric relaxation phase</td>
</tr>
<tr>
<td><strong>Causes:</strong></td>
<td>sudden closure of semilunar valves (aortic and pulmonary)</td>
</tr>
</tbody>
</table>
| **Characters**     | • Sharp and high pitched (50 Hz)  
                   | • Heard as the word **Dub** by stethoscope. |
| **Auscultatory sites** | a- Aortic area (A): 2<sup>nd</sup> right intercostal space near sternum  
                   b- Pulmonary area (P): 2<sup>nd</sup> left intercostal space near sternum |
## Normal Heart Sounds

<table>
<thead>
<tr>
<th><strong>Duration</strong></th>
<th>0.05 second</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Relation to cardiac cycle</strong></td>
<td>• Terminal part of the rapid filling phase</td>
</tr>
<tr>
<td><strong>Causes:</strong></td>
<td>It is due to vibrations of the relaxed ventricular wall and of the cusps of AV valves</td>
</tr>
<tr>
<td><strong>Characters</strong></td>
<td>• It is a low pitched sound that can sometimes be heard only in children.</td>
</tr>
<tr>
<td><strong>Auscultatory sites</strong></td>
<td>It is best heard at the mitral area, while the person is in recumbent position and leaning to the left side</td>
</tr>
</tbody>
</table>
## Normal Heart Sounds

<table>
<thead>
<tr>
<th></th>
<th>( S_4 )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duration</strong></td>
<td>0.03 second.</td>
</tr>
<tr>
<td><strong>Relation to cardiac cycle</strong></td>
<td>• mid-point of atrial systole → presystolic HS</td>
</tr>
<tr>
<td><strong>Causes:</strong></td>
<td>It is due to vibration of the cusps of the AV valves due to rush of blood from the atria to the ventricles</td>
</tr>
<tr>
<td><strong>Characters</strong></td>
<td>• It is a faint low pitched sound that is normally inaudible both in children and adult.</td>
</tr>
<tr>
<td><strong>Auscultatory sites</strong></td>
<td>If heard abnormally it is heard at the mitral area.</td>
</tr>
</tbody>
</table>
Abnormalities of Heart Sounds

1) Splitting (duplication) of HS:

Definition:
The HS is heard as 2 sounds separated by a very short interval.

Causes:
It is due to asynchronous closure of valves on both sides of the heart.

a) Splitting of the 1st HS:
- It is due to asynchronous closure of the mitral and tricuspid valves.
- Closure of the TV slightly precedes the closure of the MV.

b) Splitting of the 2nd HS:
- It is due to asynchronous closure of the aortic and pulmonary valves.
- The aortic valve closes slightly earlier than the pulmonary.
- This is observed during inspiration.
2) **Triple or gallop rhythm:**

**Def.**
It is an abnormal condition in which three heart sound are heard resembling the sound of a galloping horse.

**Causes and types:**
It occurs in heart failure, it is either;

1. **Protodiastolic gallop** → if the third heart sound is the 3\(^{rd}\) sound.
2. **Presystolic gallop** → if the 4\(^{th}\) heart sound is the 3\(^{rd}\) sound.
Abnormalities of Heart Sounds

3) Murmurs:

Def.,

They are abnormal noisy sounds heard over the heart other than the heart sounds.
Murmurs

**Mechanism of murmurs:**
- They are caused by change in the rate of blood flow:
- The blood flow in vessels may be;
  
  **i) Streamline or laminar flow:**
  - The blood flows in layers or laminae which is faster in the center and slow at the periphery.
  - It is silent flow i.e. produces no sound.
  
  **ii) Turbulence flow:**
  - In which there is an eddy current, i.e. not all particles move in the same moment.
  - The agitation of fluid particles produces a noisy or murmur.
# Murmurs

## Types of murmurs:

It includes 3 types as follow:

<table>
<thead>
<tr>
<th>Time</th>
<th>Systolic murmurs</th>
<th>Diastolic murmurs</th>
<th>Continuous murmurs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Occur during ventricular systole i.e. in the interval between the 1\textsuperscript{st} and 2\textsuperscript{nd} heart sounds.</td>
<td>Occur during cardiac diastole i.e. after the 2\textsuperscript{nd} heart sound</td>
<td>Occur during systolic and diastolic periods (machinery murmur)</td>
</tr>
<tr>
<td>Causes</td>
<td><strong>a- Organic murmur:</strong> due to;</td>
<td><strong>a- Narrowing or stenosis</strong> of mitral or tricuspid valve.</td>
<td>as in case of Patent ductus arteriosus which is a duct present between the aorta and pulmonary artery in foetus and closed at birth.</td>
</tr>
<tr>
<td></td>
<td>i) Narrowing or stenosis of aortic or pulmonary valve.</td>
<td>b- Widening or regurgitation of the aortic or pulmonary valve.</td>
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<tr>
<td></td>
<td>ii) Widening or regurgitation of mitral or tricuspid valve.</td>
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<td></td>
<td>iii) Congenital interventricular septal defect (VSD)</td>
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<td></td>
<td><strong>b- Functional murmurs:</strong></td>
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<td></td>
<td>Present as a result of change in the rate of blood flow as in fever, anemia and exercise.</td>
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</table>
Stethoscope

It consists of 3 parts:

a. Chest piece → consists of 2 parts
Cone of bell → for low pitched sounds
Diaphragm → for high pitched sounds

b. Ear pieces.

c. Rubber tube (50-75 cm).
Stethoscope

Uses of stethoscope:
1. Auscultation of heart sounds.
2. Auscultation of breath sounds
3. Auscultation of intestinal sounds
4. Measurement of ABP.
THANKS

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