Murmur

Definition

Sounds made by turbulence in the heart or blood stream.

Items in description of murmur

1. Timing
2. Shape
3. Location of maximum intensity
4. Radiation
5. Intensity
6. Pitch
7. Quality
8. Others

Timing

1. Murmurs are longer than heart sounds
2. HS can be distinguished by simultaneous palpation of the carotid arterial pulse
3. It can be during systolic, diastolic or continuous

Shape

- Crescendo (grows louder)
  - Pre systolic
  - MS in absence of AF
    - TS in absence of AF
- Decrescendo
  - Early diastolic
  - AR, FR
- Crescendo-decrecendo
  - Ejection mid systolic
  - AS, PS
- Plateau
  - Pansystolic
  - Mid diastolic
  - Late systolic
  - MS, TS
  - Mitral valve prolapse

Location of maximum intensity

- Is determined by the site where the murmur originates
  - e.g. Aortic area, Pulmonary area, Tricuspid area, Mitral listening areas

Radiation

Reflects the intensity of the murmur and the direction of blood flow

<table>
<thead>
<tr>
<th>Site of maximal intensity</th>
<th>Lesion</th>
<th>Site of main propagation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apex</td>
<td>MR</td>
<td>Ant leaflet → axilla</td>
</tr>
<tr>
<td></td>
<td>MS</td>
<td>Post leaflet → base, left sternal border</td>
</tr>
<tr>
<td>A1</td>
<td>AS</td>
<td>Root of neck (Carotid) Apex</td>
</tr>
<tr>
<td>A2</td>
<td>AR</td>
<td>Apex and left sternal border</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A1</td>
</tr>
<tr>
<td>Tricuspid</td>
<td>TR</td>
<td>Right sternal border and apex</td>
</tr>
<tr>
<td></td>
<td>TS</td>
<td>Not propagated</td>
</tr>
<tr>
<td>Pulmonary</td>
<td>PS</td>
<td>Root of neck</td>
</tr>
<tr>
<td></td>
<td>PR</td>
<td>Tricuspid</td>
</tr>
<tr>
<td>Left parasternal</td>
<td>VSD</td>
<td>Concentric</td>
</tr>
<tr>
<td>Left infraclavicular</td>
<td>PDA</td>
<td>Pulmonary</td>
</tr>
</tbody>
</table>

Pitch

- High pitched (SOFT murmur) → MR, TR, AR, PR
- Medium pitched (HARSH murmur) → AS, PS, MR, TR, VSD, PDA
- Low pitched (RUMBLING murmur) → MS, TS

Quality

- Blowing
- Harsh
- Rumbling
- Musical

Variation

1. Variation with respiration → Right sided murmurs change more than left sided
2. Variation with position of the patient
3. Variation with special maneuvers
   - Valsalva/Standing ⇒ Murmurs decrease in length and intensity EXCEPT: Hypertrophic cardiomyopathy, Mitral valve prolapse
### Systolic murmur

**How it happens?**

<table>
<thead>
<tr>
<th>Early systolic murmur</th>
<th>Derived from increased turbulence associated with:</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1. Increased flow across normal S-L valve or into a dilated great vessel</td>
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<tr>
<td></td>
<td>2. Flow across an abnormal S-L valve or narrowed ventricular outflow tract - e.g. aortic stenosis</td>
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<tr>
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<td>3. Flow across an incompetent A-V valve - e.g. mitral regurg.</td>
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<tr>
<td></td>
<td>4. Flow across the interventricular septum</td>
</tr>
</tbody>
</table>

1. Early systolic murmur
   - Acute severe mitral regurgitation
     - Decrescendo murmur
     - Best heard at apical impulse
     - Caused by:
       a. Papillary muscle rupture
       b. Infective endocarditis
       c. Rupture of the chordae tendineae
       d. Blunt chest wall trauma
   - Congenital, small muscular septal defect
   - Tricuspid regurgitation with normal PA pressures

2. Mid systolic murmur
   - Are the most common kind of heart murmur and usually crescendo-decrescendo
   - Innocent: Common in children and young adults
   - Physiologic: Can be detected in hyperdynamic states e.g. anemia, pregnancy, fever, & hyperthyroidism
   - Pathologic: Are secondary to structural CV abnormalities e.g. AS, Hypertrophic cardiomyopathy, PS

**Aortic stenosis**
- Loudest in aortic area; radiates along the carotid arteries
- Intensity varies directly with CO
- A2 decreases as the stenosis worsens
- Other conditions which may mimic the murmur of aortic → Stenosis w/o obstructing flow:
  1. Aortic sclerosis
  2. Bicuspid aortic valve
  3. Dilated aorta
  4. Increased flow across the valve during systole

**Hypertrophic cardiomyopathy**
- Loudest b/t left sternal edge and apex; Grade 2-3 /6
- Does NOT radiate into neck; carotid upstrokes are brisk and may be bifid
- Intensity increases w/ maneuvers that decrease LV volume

3. Pansystolic (Holosystolic) murmur
   - Are pathologic
   - Murmur begins immed. with S1 and continues up to S2
   - Mitral valve regurgitation
     - Loudest at the left ventricular apex
     - Radiation reflects the direction of the regurgitant jet
       a. To the base of the heart = anterosuperior jet (flail posterior leaflet)
       b. To the axilla and back = posterior jet (flail anterior leaflet)
     - Also usually associated with a systolic thrill, a soft S3, and a short diastolic rumbling (best heard in left lateral decubitus
   - Tricuspid valve regurgitation
   - Ventricular septal defect
### Diastolic murmur

<table>
<thead>
<tr>
<th>Types</th>
<th>Early decrescendo diastolic murmurs</th>
<th>Rumbling diastolic murmurs in mid- or late diastole</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Signify regurgitant flow through an incompetent semilunar valve</td>
<td>Suggest stenosis of an AV valve</td>
</tr>
</tbody>
</table>

#### Aortic regurgitation
- Best heard in the 2nd ICS at the left sternal edge
- High pitched, decrescendo
- Blowing quality => may be mistaken for breath sounds
- Radiation:
  i. Left sternal border = assoc. with primary valvular pathology;
  ii. Right sternal edge = assoc. w/ primary aortic root pathology
- Other associated murmurs:
  a) Midsystolic murmur
  b) Austin Flint murmur

#### Mitral stenosis
Two components:
1. Middiastolic - during rapid ventricular filling
2. Presystolic - during atrial contraction; therefore, it disappears if AF develops
- Is low-pitched and best heard over the apex (w/ the bell)
- Little or no radiation
- Murmur begins after an Opening Snap;
- S1 is accentuated

### Continuous murmur

**Characteristic**
- Begin in systole, peak near s2, and continue into all or part of diastole.

**PDA**
- Has a harsh, machinery-like quality

**Cervical venous hum**
- Audible in kids; can be abolished by compression over the IJV

**Mammary souffle**
- Represents augmented arterial flow through engorged breasts
- Becomes audible during late 3rd trimester and lactation

### Innocent murmur

- Also known as flow, benign, normal, non-pathologic, functional, inorganic, or physiologic
- Occur in up to 77% of neonates, 66% of children, and can be increased to up to 90% with exercise or using phonocardiography

### Areas
- Occur at areas of mismatch of normal blood flow volumes with decreasing vessel caliber size
- ♥ e.g. LVOT, RVOT, branch PA’s, etc.
- ♥ Better heard in children due to their thinner chest walls with greater proximity of stethoscope to vessel

### Some maneuvers for innocent murmur
- ♥ Jugular vein compression/turning the head can abolish venous hum
- ♥ Lying the patient perfectly flat is the most reliable method of quieting the hum.
- ♥ Compression of the sub-clavian artery or shoulder extension can abolish supra-clavicular bruit

### Murmur related to maneuvers

#### Standing
- • Mechanism: Decreased afterload, decreased venous return and stroke volume, increased heart rate, increased SVR
- • Decreases AS and MR murmurs, increases HCM and MVP
- • Accentuates the murmur and S4 of sub-AS, MVP, and HOCM

#### Squatting
- • Mechanism: Increases afterload/systemic vascular resistance, initially increased venous return, increased stroke volume, decreased HR => increases venous return and systolic BP
- • Murmur increases in AS and MR, decreases HCM and MV

### Post PVC
- • Makes AS and HCM louder
- • MR is unchanged

### Handgrip
- • Have patient squeeze tennis ball without valsalva
- • Makes AS, HCM, MVP quieter, MR louder

### Maneuvers

#### Valsalva
- • Causes reduction in venous return to Rt heart, eventually Lt heart during prolonged strain
- • Useful for differentiating valvular AS from HOCM
- • Rheumatic MR will fade, while MVP may become more prominent

#### Others
- • Transient arterial occlusion
- • Breath-holding in end-expiration in the upright position or leaning forward
- • Deep breath inspiration in upright position
- • Lower extremity elevation (passive) while lying down
- • Exercise (running in place)
## Characteristics of Heart Murmurs

<table>
<thead>
<tr>
<th>Type of Murmur</th>
<th>Examples</th>
<th>Location</th>
<th>Pitch</th>
<th>Radiation</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Midsystolic</strong></td>
<td>Aortic stenosis</td>
<td>2nd RICS</td>
<td>Medium</td>
<td>Neck, left sternal border</td>
<td>Harsh</td>
</tr>
<tr>
<td></td>
<td>Pulmonic stenosis</td>
<td>2nd and 3rd LICS</td>
<td>Medium</td>
<td>Left shoulder and neck</td>
<td>Harsh</td>
</tr>
<tr>
<td></td>
<td>Hypertrophic cardiomyopathy</td>
<td>3rd and 4th LICS</td>
<td>Medium</td>
<td>Left sternal border to apex</td>
<td>Harsh</td>
</tr>
<tr>
<td><strong>Pansystolic</strong></td>
<td>Mitral regurgitation</td>
<td>Apex</td>
<td>Medium to high</td>
<td>Left axilla</td>
<td>Blowing</td>
</tr>
<tr>
<td></td>
<td>Tricuspid regurgitation</td>
<td>Lower left sternal border</td>
<td>Medium</td>
<td>Right sternum, xiphoid</td>
<td>Blowing</td>
</tr>
<tr>
<td></td>
<td>Ventricular septal defect</td>
<td>3rd, 4th, and 5th LICS</td>
<td>High</td>
<td></td>
<td>Often harsh</td>
</tr>
<tr>
<td><strong>Diastolic</strong></td>
<td>Aortic regurgitation</td>
<td>2nd to 4th LICS</td>
<td>High</td>
<td>Apex</td>
<td>Blowing</td>
</tr>
<tr>
<td></td>
<td>Mitral stenosis</td>
<td>Apex</td>
<td>Low</td>
<td>Little or none</td>
<td></td>
</tr>
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</table>