Heart murmurs

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Objectives

• Review the cardiac evaluation
• Distinguish between innocent and pathologic murmurs
• Discuss common innocent murmurs
• Discuss common heart lesions
  – ASD
  – VSD
  – PDA
Cardiac evaluation

• History
  – Poor feeding, diaphoresis, FTT, family h/o CHD

• Vital signs
  – Height, weight, HR, RR, BP

• Inspection
  – Dysmorphism, cyanosis, clubbing

• Palpation
  – Presence and quality of distal pulses; precordium for PMI and thrills, liver
Auscultation

- Rate & regularity
- Heart sounds
- Focus particularly on intensity and quality of S2 and for presence of extra heart sounds (S3, S4)
- Murmurs
- Clicks
- Rub
Cardiac Cycle

- S1: closing of the AV valves
- S2: closing of the semilunar valves
- S3: ventricular overload
- S4: decreased LV compliance
Auscultation

- AORTIC = 2nd ICS
- PULMONIC = 2nd ICS
- ERB’S POINT = 3rd ICS
- TRICUSPID = 4 or 5th ICS
- MITRAL / APEX = 5th ICS
Murmurs

• Secondary to turbulent blood flow
• Assess
  – Intensity / loudness
  – Timing (systolic, diastolic, continuous)
  – Location of maximal intensity
  – Transmission / radiation
  – Quality (high-pitched, blowing, vibratory, harsh, soft)
# Grading of Murmurs

<table>
<thead>
<tr>
<th>Grade</th>
<th>Volume</th>
<th>Thrill</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/6</td>
<td>Very faint, not heard in all positions</td>
<td>No</td>
</tr>
<tr>
<td>2/6</td>
<td>Soft, heard in all positions</td>
<td>No</td>
</tr>
<tr>
<td>3/6</td>
<td>Loud, no thrill</td>
<td>No</td>
</tr>
<tr>
<td>4/6</td>
<td>Loud with palpable thrill</td>
<td>Yes</td>
</tr>
<tr>
<td>5/6</td>
<td>Heard with stethoscope partially off the chest</td>
<td>Yes</td>
</tr>
<tr>
<td>6/6</td>
<td>Heard with stethoscope completely off the chest</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Innocent vs pathological murmurs

**INNOCENT**
- Systolic
- Ejection
- Soft or vibratory
- Grade 1-2/6
- Normal S1, S2
- No extra sounds
- Louder supine

**PATHOLOGIC**
- Diastolic
- Holosystolic
- Harsh
- Grade >= 3/6
- Abnormal Split S2
- Extra sounds (click)
- Louder with standing
Still’s murmur

- Most common innocent murmur, usually found between the ages of 3 and 6
- Thought to be due to turbulence in LV outflow or to vibration of fibrous tissue bands crossing LV lumen
- Typically grade II-III, midsystolic, LLSB, and classically described as “vibratory”
- Decreases with standing
- Increases with fever, exercise, anemia
Pulmonary Flow murmur

- Accounts for 15% of all innocent murmurs
- Heard in infants and school-aged children
- Due to turbulent flow at the origin of the right and left pulmonary arteries
- Grade I-III, midsystolic ejection, heard at the ULSB, higher pitched than a Still’s murmur
- Like Still’s, increases with fever, exercise, and anemia
Peripheral pulmonary stenosis (PPS) of the newborn

• Due to the physiologic relative stenosis of the right and left pulmonary arteries
• Usually disappears by 1 year of age
• Grade I-II, midsystolic ejection, heard at the ULSB with radiation to the axillae and back
PINK vs BLUE heart lesions

Pink (Acyanotic)
• Shunts (L to R):
  – ASD
  – VSD
  – PDA
• Stenosis:
  – AS
  – PS
  – Coarctation
• HLHS

Blue (Cyanotic)
• Tetralogy of Fallot
• Transposition of great arteries
• Tricuspid atresia
• Truncus arteriosus
• TAPVR
• Ebstein’s anomaly
• Single ventricle
Summary of murmurs

<table>
<thead>
<tr>
<th>Systolic murmurs</th>
<th>Diastolic murmurs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aortic stenosis (AS)</td>
<td>Aortic regurgitation (AR)</td>
</tr>
<tr>
<td>Pulmonic stenosis (PS)</td>
<td>Pulmonic regurgitation (PR)</td>
</tr>
<tr>
<td>Mitral regurgitation (MR)</td>
<td>Mitral stenosis (MS)</td>
</tr>
<tr>
<td>Tricuspid regurgitation (TR)</td>
<td>Tricuspid stenosis (TS)</td>
</tr>
<tr>
<td>Mitral valve prolapse (MVP)</td>
<td>Austin-Flint murmur</td>
</tr>
<tr>
<td>Atrial septal defect (ASD)</td>
<td>Continuous murmurs</td>
</tr>
<tr>
<td>Ventricular septal defect (VSD)</td>
<td>Paten ductus arteriosus (PDA)</td>
</tr>
<tr>
<td>Hypertrophic Cardiomyopathy</td>
<td>Combination murmurs</td>
</tr>
</tbody>
</table>


Atrial Septal Defect

**Normal Heart**

**Secundum Atrial Septal Defect**

- Atrial septal defect
- Right Atrium
- Enlarged right ventricle
- Enlarged pulmonary artery
- Left atrium
PRESENTATION & TREATMENT

Symptoms: None in childhood, arrhythmias, easy fatigability, exertional dyspnea in the 3rd decade

Clinical signs include a 2-3/6 SEM at the ULSB and a fixed wide split S2
A large ASD causes right ventricular enlargement

ECHO: Diagnostic

Treatment: Surgical vs. transcatheter closure
Ventricular Septal Defect

- Normal heart
- Ventricular septal defect
- Aorta
- Pulmonary artery
- Left atrium
- Left ventricle
- Right atrium
- Right ventricle
- Left ventricle

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Outlet/Supracristal/Subpulmonar/Infundibular/Juxta-arterial

- 6% VSD / 30% Asians
- Spontaneous closure uncommon

Perimembranous, paramembranous conoventricular

- 80% VSD
- Aneurysm formation / Aortic regurgitation

Muscular
- 20% VSD
- Spontaneous closure common

Inlet/AV canal type

Down syndrome
PRESENTATION AND TREATMENT

This is the most common form of CHD

Clinical signs: Loud 4-5/6, harsh holosystolic murmur, middiastolic rumble and a loud P2

With a small VSD there is normal growth and development
With a large defect there may be CHF (usually at 6-8 weeks), pulmonary infections and delayed growth

Small VSDs close spontaneously depending on the site.
Large VSDs are closed surgically by 6 months of age.
Patent Ductus Arteriosus

It is a connection between the aorta and the pulmonary artery.
Blood Flow to the Body

Patent Ductus Arteriosus
(note change in blood flow direction)

Increased Blood Flow to Lungs

Enlarged Left Ventricle
PDA

• Very common in preterm babies
• Usually closes in the first 2 weeks of life
• Symptoms
  – None if small
  – If large can cause CHF at 6-8 weeks in a term infant
  – In a preterm baby increasing respiratory support usually occurs after day 3 of life.
PDA

Physical exam

• Systolic murmur in a newborn and a continuous “train in a tunnel” murmur in an older child.

• Best heard below the left clavicle.

• A large PDA causes LA and LV enlargement.

Treatment

• Preterm baby
  – it can be closed medically using indomethacin.

• Term baby
  – if still open at 3 months of age then coil closure by cardiac catheterization is the method of choice.
QUESTIONS?