សាកលវិទ្យាល័យ ពុទ្ធិសាស្ត្រ
UNIVERSITY OF PUTHISASTRA
FACULTY OF MEDICINE

Approach to the infant or child with cardiac murmur

Prepared by Dr. Prom Vireak, MD,
Pediatrician

Deputy Dean for Clinical Affairs,
Faculty of Medicine

Objectives

- By the end this lecture, you will be able to
  - Take appropriate history about child with murmur.
  - Make proper cardiac examination.
  - Describe the cardiac murmur.
  - Differentiate between pathologic and innocent murmur.

Introduction

- Heart murmurs are common infants and children.

  https://youtu.be/W8gg2S-mvSQ
- Heart diseases in children can be classified as congenital or acquired.
- The incidence of congenital heart disease(CHD) is 4-8 per 1,000 live birth.
- Several environmental and genetic risk factors are associated with incidence of different type of CHD.

Case Study

- A 12 months boy is brought to the hospital by his mother who complained that her child has not gained weight well. He's now weight 6kg. He was born vaginally without perinatal complication.
- The child has frequent lungs infection. The nurse at Health Center refers the patient to you because he heard murmur on auscultation and concerns that the child might have congenital heart disease.

What is your approach to the child?

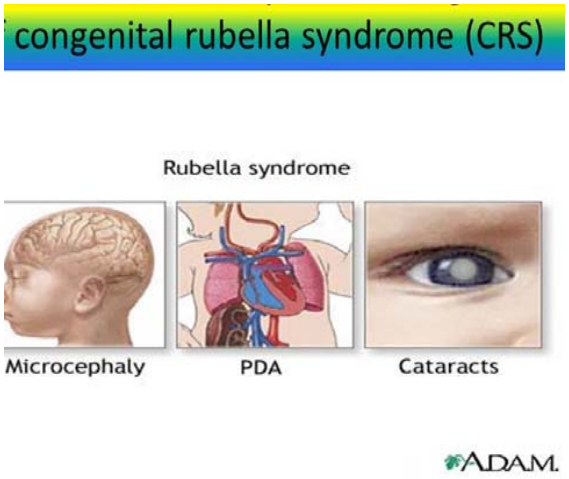
Approach to child with murmur

1. History Taking
   - Maternal history
   - Patient history
   - Family History
2. Cardiovascular Examination
   - Inspection
   - Palpation
   - Auscultation
   - Percussion
3. Investigation

History

History Taking

- Maternal History
  - Pregnancy: certain maternal medical condition can be associated with development of congenital cardiac disease in fetus.
    - In-utero infection: Rubella
    - Preeclampsia= septal defeat
    - Diabetes: TGA, VSD, PD
    - Hypertension: ASD, VSD
    - Mother age > 40years= AVSD
    - Cigarette smoking in first trimester= Truncus arteriosus, ASD
    - Alcohol or substance abuse= ASD, VSD
    - Medication: Retinoic acid, NSAID, Lithium….



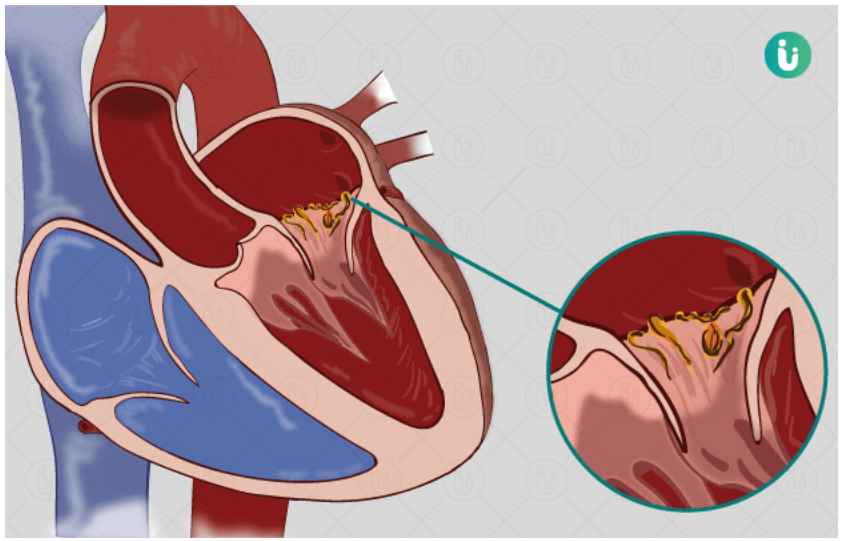
History Taking

2. Patient history = Post natal history and present history

- Low birth weight
- Poor weight gain
- Cyanosis (crying?)
- Recurrent lungs infection
- Poor feeding, short feeding
- Exercise intolerance
- Squatting history
- Chest pain

History Taking

- Family history
  - CHD in family, risk around 3%
  - Rheumatic fever
  - Rheumatic heart diseases



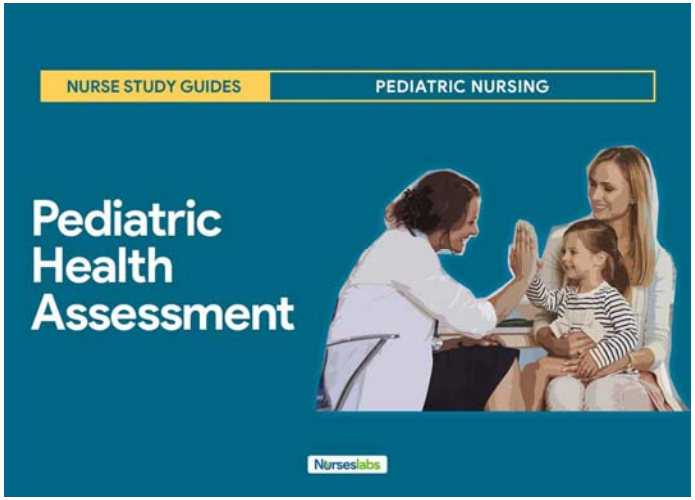
Physical Examination

Physical Examination on Child with Cardiac Murmur

Reminder:

The best chance to do examination:

- Sleeping
- On mother laps
- Breastfeeding
- Be familiar with patients



Physical Examination on Child with Cardiac Murmur

- **Vital Sign**
  - Respiratory Rate
  - Heart Rate= vary with age (bradycardia or tachycardia)
  - Blood pressure= lower/upper limps
    - Mean systolic pressure= 90 + Age(years)
    - Mean diastolic pressure= 55 + Age(years)
  - Saturation Oxygen (SaO2)
  - Obtain length/height and weight

Age (years)	Respiratory rate (per minute)	Heart rate (per minute)
<1	30–40	110–160
1–2	25–35	100–150
2–5	25–30	95–140
5–12	20–25	80–120
>12	15–20	60–100

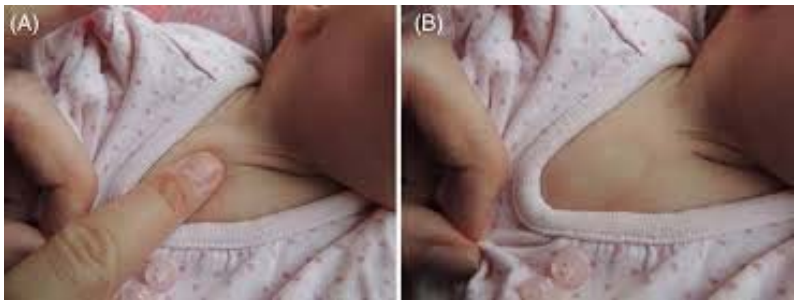
Physical Examination on Child with murmur

General Appearance:

- State of health and appearance
  - Alert, sick,
  - Sleepy,
  - Irritable/restless
  - Dyspneic
  - Comatose….

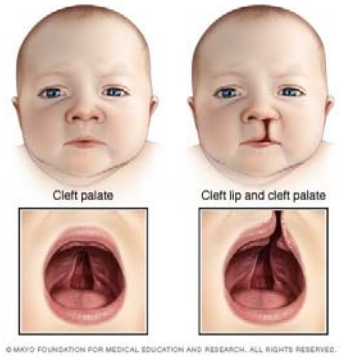
Skin:

- Pallor or cyanosis
- Mottling skin
- CRT (<2s)
- Cold extremities, sweating



Physical Examination on Child with Cardiac Murmur

- HEENT (Head, Ears, Eyes and Throat)
- Dysmorphic features of the child
  - Associated with cardiac anomalies
  - Associated with genetic syndromes
  - Lips or tongue cyanosis
- Neck: neck vein distension (older child)

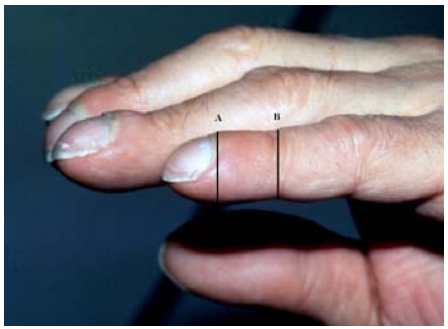


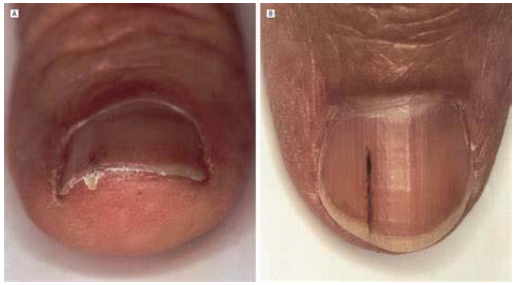
Physical Examination on Child with Cardiac Murmur

- Chest:
  - Inspection: symmetric of the chest
    - Pectus excavatum
    - Pectum carinatum
  - Assessment respiratory rate and accessory muscles use
    - Tachypnea= increased pulmonary blood flow
    - Dyspnea = increasing pulmonary congestion
  - Lungs sound:
    - Wheezing
    - Crackles

Physical Examination on Child with Cardiac Murmur

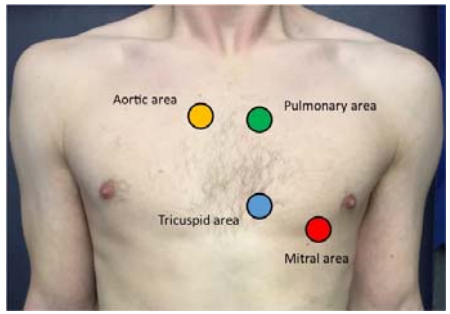
- Cardiac examination:
  - Inspection:
    - Inspect precordium for presence of precordial bulge
    - Extremities:
      - Clubbing
      - Splinter hemorrhage
      - Janeway/Osler's Note





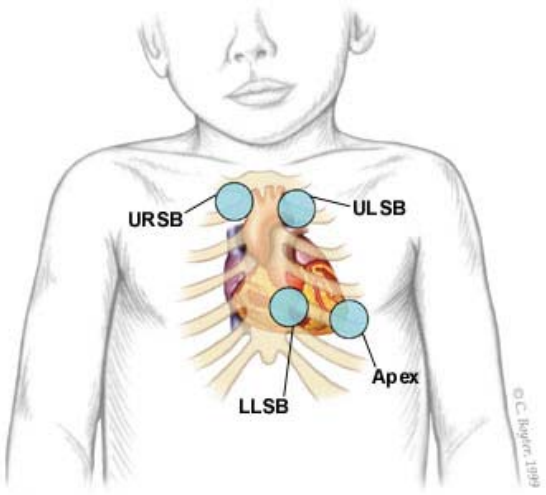
Physical Examination on Child with Cardiac Murmur

- Cardiac examination
  - Palpitation
    - Palpate on the left sternum:
      - Note the ventricle lifts (cardiomegaly)
    - Thrill on different location
      - 2nd right intercostal space= Aortic Area
        - Thrill = aortic stenosis
      - 2nd left intercostal space = Pulmonary Area
        - Thrill= Pulmonary stenosis
      - 5th left Intercostal space=Tricuspid Area
        - Thrill= VSD
      - Apex= Mitral Area
        - Thrill= mitral valve regurgitation or stenosis
    - Palpate peripheral pulse
      - Bounding pulse = PDA
      - Weak pulse
      - Unequal upper and lower limps = CoA



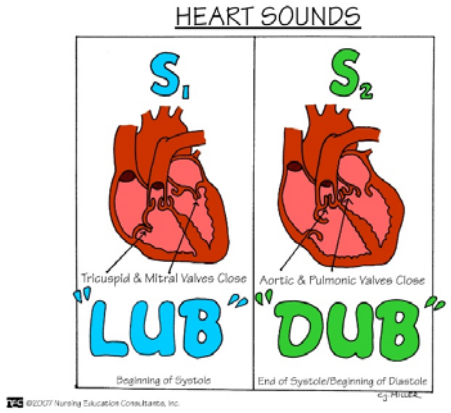
Physical Examination on Child with Cardiac Murmur

- Cardiac examination
  - Auscultation:
    - 4 areas with left mid axillary and back area
      - Aortic area = upper right sternal border
      - Pulmonary area= upper left sternal border
      - Tricuspid area= lower left sternal border
      - Mitral area= apex



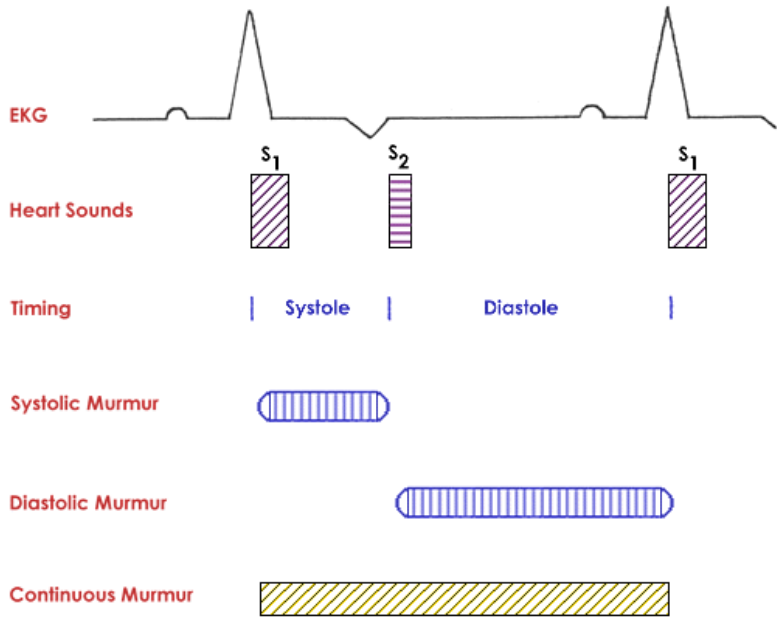
Physical Examination on Child with Cardiac Murmur

- Cardiac examination
  - Auscultation
    - Heart Sound
      - S1 (first heart sound)
        - Closure of mitral and tricuspid valves
      - S2(second heart sound)
        - Closure of aortic and pulmonary valves
      - S3 (third heart sound)
        - Low sound
        - Usually in children= physiologic
        - Early filling ventricle
        - Ventricular gallop “lub-dub-ta”= congestive heart failure (adult)
      - S4 (forth heart sound)
        - Pathologic, always
        - Low pitch presystolic sound
        - Usually in adult
        - Atrial contraction (stiffness of ventricle)
        - Eg. Hypertrophic cardiomyopathy



Physical Examination on Child with Cardiac Murmur

- Cardiac examination
  - Auscultation
    - Heart murmur or pathologic murmur= 3 types
      - Systolic murmur
      - Diastolic murmur
      - Continuous murmur



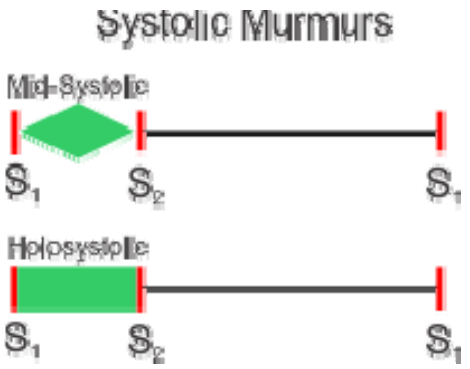
Systolic murmur

- Systolic murmur
  - Begin with or follow S1 but end before S2
  - Holosystolic murmur= pansystolic murmur
    - Being abruptly with S1 and continue with same intensity to S2

    (e.g VSD) https://youtu.be/MzORJbyHTT0
  - Ejection murmurs= mid-systolic murmur
    - Cresecendo-descresendo or diamond shape murmur

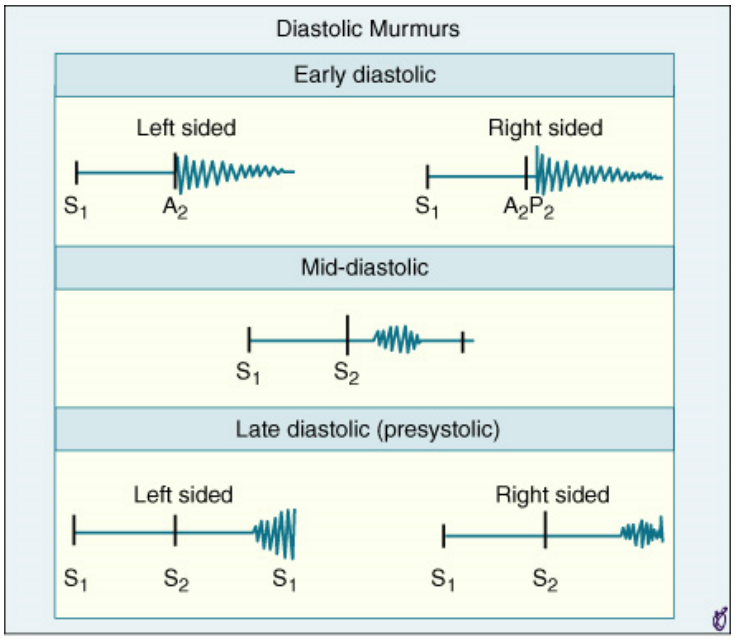
    (Eg. AS, PS)

    https://youtu.be/W8gg2S-mvSQ



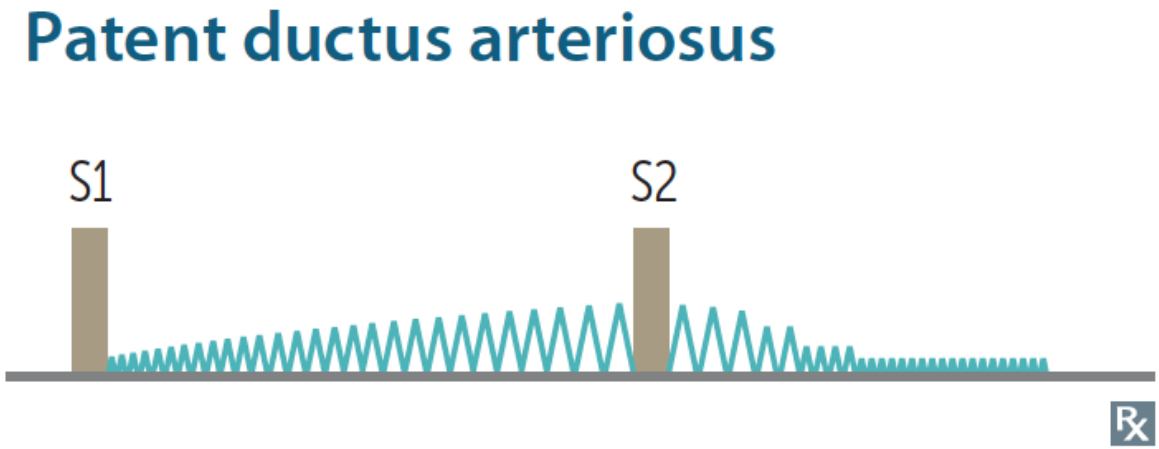
Diastolic Murmur

- Diastolic murmur start at or after S2 and end before or at S1.
  - Early diastolic murmurs= start with S2 and end before S1
  - Mid-diastolic murmur= start after S2 and end before S1
  - Late diastolic (presystolic) murmur: start after S2 and extend up to S1



Continuous murmur

- Continuous murmur is caused by flow through arteriovenous or systemic pulmonary communication = PDA.
- Murmur extend from S1-S2-S1 = machinery murmur



Grade	Description
Grade I	Very faint, may only be heard by an expert, not heard in all positions, no thrill
Grade II	Soft, heard in all positions, no thrill
Grade III	Moderately loud, no thrill
Grade IV	Loud and associated with a palpable thrill
Grade V	Very loud, with thrill, heard with the stethoscope partly off the chest
Grade VI	Loudest, with thrill, heard with the stethoscope entirely off the chest (just above the precordium, not touching the skin)

Physical Examination on Child with Cardiac Murmur

- Cardiac examination
  - Auscultation
    - Pathologic murmur= 3 types
      - Systolic murmur
      - Diastolic murmur
      - Continuous murmur
    - Radiation
      - Systolic ejection murmur at LUSB
        - Radiate to carotid = artic stenosis
        - Radiate to back = Pulmonary stenosis
        - Radiate to back = branch pulmonary artery stenosis
      - Holosystolic murmur at apex
        - Radiate to left axilla= mitral regurgitation
    - Pitch: high(VSD), low(mitral stenosis), musical (innocent murmur)

Describe of cardiac murmur

- Heart beat (S1,S2)
- Location of murmur
- Type of murmur
- High pitch or low pitch
- Radiation of murmur
- Associated thrill

Eg.

- Cardiac Auscultation:
  - Systolic murmur (ejection) at LLSB, with thrill 4/6, radiation to the axillary area, high pitch, no gallop rhythm.

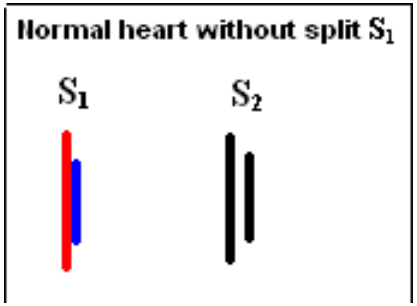
Physical Examination on Child with Cardiac Murmur

- Auscultation
  - Innocent murmur might be heard in 80% children in case:
    - Severe anemia
    - Skinny child
    - Fever
    - Hyperthyroidism

Characteristic of innocent murmur

- 10 “S”
  - Symptom free
  - Systolic, always
  - Short duration
  - Split S2 (https://youtu.be/98HM1fr3cq4)
  - Soft (grading 1-2)
  - Small area of coverage
  - Sitting/standing- varies with posture
  - Sternal depression- benign murmurs with pectus excavatum
  - Special tests normal
  - Physical Signs normal

https://youtu.be/uFyWHPfrRak



Physical Examination on Child with Cardiac Murmur

- Abdomen:
  - Assess on the size of liver
  - Hepatomegaly in children with other signs, considering of congestive heart failure
  - Ascites (rare in children)

Imaging Studies

- Routine tests for heart murmurs
  - Chest x-ray
  - Heart Ultrasound
  - ECG
  - Refer to pediatric cardiologist

11M/F

VS: T=37C, HR=110bpm, SaO2=92%, BP=NA

GA: irritable crying

Skin: cyanosis of extremities, cold and sweating

HEENT: nasal flaring, with lips cyanosis

Lungs: Moderate respiratory distress, intercostal and suprasternal retraction and chest indrawing, wheezing an crackles bilateral

Heart:

- Inspection: pectum carinatum, precordium
- Palpation: cardiac lift near axillary line, CRT = 4s, weak and rapid pulse
- Auscultation: Systolic murmur (ejection) at LLSB, with thrill 4/6, radiation to the axillary area.

Abdomen: soft but hepatogemaly around 2cm

What is your impression?

Answer: Cardiogenic shock due to congestive heart failure, concerning CHD (VSD)

Conclusion

- Approach to the child with murmur
  - Maternal and birth history
  - Looking for abnormal syndrome
  - Physical examination of heart and the affected organs
  - Describe of cardiac murmur
    - Heart beat (S1,S2)
    - Location of murmur
    - Type of murmur
    - High pitch or low pitch
    - Radiation of murmur
    - Associated thrill
- Differentiate pathologic murmur and innocent murmur

References:

- Pediatric Protocol for Malaysian Hospital (3rd Edition), Hussain Iman Hj et al.
- Pediatric cardiology: essential pocket guide (3rd Edition). Walter Johnson and James Mollers
- Harrison's Cardiovascular medicine (17th Edition), Joseph Loscalzo
- Retrieved from www.uptodate.com

THANK YOU