

Heart murmur in children

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Learning objectives

- Become more confident in assessing a child with heart murmur
- Understand how to differentiate between pathological and innocent heart murmurs
- Understand how to investigate a child with a heart murmur



Roadmap

- Normal circulation and heart sounds
- Common causes of heart murmurs
- Innocent Vs pathological heart murmurs
- Diagnosis / Investigations



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Fetal to newborn circulation

before birth after birth

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Shunts in fetal circulation

- Ductus venosus
- Foramen ovale
- Ductus arteriosus
- Shunting at hepatic level
- Preferential streaming of IVC blood
- Shunt blood RV to DAO

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Pulmonary vascular resistance (PVR)

- Number of peripheral pulmonary vessels and their constriction
- 5-10 fold drop in PVR after first few breaths
- Clearance of alveolar fluid during first 4-6 hours

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Normal adult circulation

The diagram illustrates the normal adult circulation. It shows the heart with four chambers: the Right Atrium and Right Ventricle on the right, and the Left Atrium and Left Ventricle on the left. Blood enters the Right Atrium from the Superior and Inferior Vena Cava. It then passes through the Tricuspid Valve to the Right Ventricle, which pumps it to the Pulmonary Artery. From there, it goes to the lungs. Oxygenated blood returns to the Left Atrium via the Pulmonary Vein, passes through the Mitral Valve to the Left Ventricle, and is pumped out to the body through the Aorta. The Aortic Valve is shown between the Left Ventricle and the Aorta. Labels include: Superior Vena Cava, Inferior Vena Cava, Right Atrium, Right Ventricle, Left Atrium, Left Ventricle, Aorta, Pulmonary Artery, Pulmonary Vein, Tricuspid Valve, Pulmonary Valve, and Aortic Valve.

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Normal heart sounds

The graph displays various physiological measurements over time, labeled from 0 to 0.7 seconds. The top row shows Aortic pressure (AC) and LV pressure. The middle row shows RV pressure, LA pressure, and RA pressure. The bottom row shows the ECG with P, QRS, and T waves. Heart sounds S₁, S₂, and S₃ are indicated. The Juqular pulse is shown with points A, G, X, and V. The x-axis is labeled with letters a through h and numerical values from 0 to 0.7.

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What causes heart murmur?

- Turbulence
- Increase in velocity
- Narrow opening
- High pressure gradient
- Systolic or Diastolic heart murmur

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Grading of systolic heart murmur

- Grade 1: very faint
- Grade 2: quiet but heard immediately
- Grade 3: moderately loud
- Grade 4: associated with thrill
- Grade 5: heard with stethoscope partly off chest
- Grade 6: audible without stethoscope

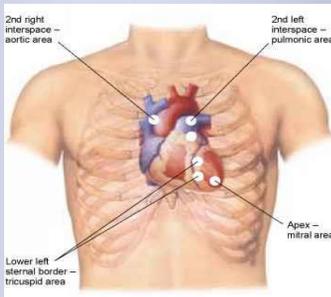


Grading of diastolic heart murmur

- Grade 1: very faint
- Grade 2: quiet but heard immediately
- Grade 3: moderately loud
- Grade 4: associated with thrill



Auscultation areas



Describing heart murmur

- Timing: Systolic / diastolic or continuous
- Intensity / grade
- Character
- Location of maximum intensity
- Radiation
- Heart sounds



Assessing heart murmur in children

- Faster heart rate
- Difficult to examine
- Difficult to do manoeuvres
- Small area to auscultate
- Interference due to chest signs



Murmurs might not be present

- High PVR in newborn!
- Large VSD / PDA
- Transposition of Great Arteries
- Critical aortic stenosis with poor cardiac output
- Neonatal coarctation (duct dependent)



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Epidemiology

- Overall murmur prevalence: 50-80% of all children
- Innocent murmurs > pathologic 10:1
- Age of murmur onset related to pathology
 - Murmur onset at 24 hours of life: 8% pathologic
 - **Murmur onset in neonatal period: up to 54% pathologic**
 - Murmur onset at 6 months of life: 14% pathologic
 - Murmur onset at 12 months of life: 2% pathologic



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Innocent Murmurs

- **Still's Murmur** (Aortic Vibratory Systolic)
 - Most common innocent murmur
- **Venous Hum** of late infancy and early childhood
 - Second most common innocent murmur
- Septal hypertrophy due to myocardial fat deposition
 - Resolves over six months
- Pulmonary Flow Murmur
- Pulmonary branch stenosis murmur
- Physiologic PPS



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Still's murmur

- First described by Dr. George Still (1909)
- Common in children ages 2 to 8 years old
- Signs
 - Low to medium frequency, Systolic Murmur
 - Intensity: Grade II-III of VI (variable)
 - Location: near apex
 - Character: Vibratory, musical
 - Scott's manoeuvre (murmur disappears in extension)
 - Provocative conditions and positions
 - Supine position / Fever / Anaemia



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Venous Hum of late infancy / early childhood

- Common murmur in age 2-5 years
- Represents noisy jugular vein flow
- Signs:
 - Continuous murmur with diastolic prominence (?DDs)
 - Low frequency / Intensity: Grade I to II of VI murmur
 - Best heard in right infraclavicular area
 - Temporarily resolves with manoeuvres
 - Jugular vein compression on affected side
 - Supine position / Turning head to affected side



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Pathological Murmurs

- VSD: 38%
- ASD: 18%
- PS: 13%
- Pulmonary Artery Stenosis: 7%
- AS: 4%
- PDA: 4%
- MVP: 4%
- Others like HOCM etc: 4%



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Pathological murmurs in Diagnosis

Ejection systolic	Aortic stenosis Pulmonary stenosis Coarctation
Pansystolic	VSD Tricuspid incompetence Mitral incompetence
Diastolic	Aortic incompetence Pulmonary incompetence
Continuous	PDA Venous hum / AV malformation



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Cardinal characteristics of pathological murmur

- Harsh murmur
- Pansystolic or diastolic murmur
- Murmur Grade III or more
- Murmur at high Left sternal border
- Early or midsystolic click
- Abnormal S2 Heart Sound



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Pathological murmur S&S

- Evidence of Failure to Thrive
- Shortness of Breath
- Lethargy
- Cyanosis, Clubbing
- Parasternal heave or thrill
- Murmur radiates to back or neck



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History! History! History taking

- Breathlessness
- Exercise tolerance
- Growth compared to peers
- **Poor feeding**
- Weight gain
- Antenatal scans
- Family history
- Past medical history



Examination

- Work of breathing – RR, tachypnoea, cyanosis
- Pulse rate, ? BP (4 limb)
- Apex – location, HR
- Heaves/thrills
- Hepatomegaly
- Clubbing
- Heart murmur assessment



Heart failure

- Results from left to right shunt
- Usually after 4-6 weeks
- Symptoms:
 - Fatigue, breathless, poor feeding, failure to thrive
- Signs
 - ↑RR, ↑HR, displaced apex, normal O₂ sats, oedema, weight gain, poor urine output



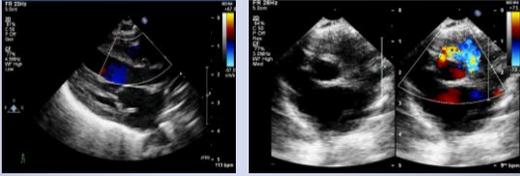
Investigations

- **History and clinical examination**
- Observations
 - RR / HR / BP
 - **Pre and post ductal sats monitoring**
- ECG
- **Echocardiogram**
- Cardiac catheterisation / Cardiac MRI
- Chest x-ray
- Bloods: blood gas, Hb



Ventricular Septal Defect

➤ Most common CHD



VSD

➤ Types: Perimembranous / Muscular / Apical

➤ **Signs and symptoms**

➤ **Severity of symptoms related to:**

- Defect size
- Pulmonary vascular resistance
- Associated cardiac lesions

➤ **Small to moderate VSD**

- Normal P2 component of the Second Heart Sound
- Pansystolic harsh holosystolic murmur
 - Grade II-VI of VI best heard at LLSE



VSD contd..

➤ **Large VSD with significant shunt**

- Includes moderate VSD findings
- Hyperdynamic circulation
- Mid-diastolic flow rumble at apex
- Congestive Heart Failure signs and symptoms

➤ **Marked Pulmonary Hypertension**

- Right Ventricular lift
- Loud P2 component of the S2
- Short systolic ejection murmur at LSE

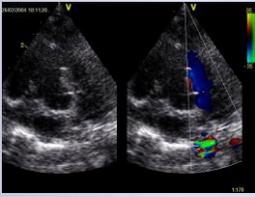


Tetralogy of Fallot

- Commonest cyanotic CHD
- Malaligned VSD, over-riding aorta, RVOT obstruction and RVH
- Heart murmur from VSD (PSM) and RVOT obstruction (ESM)
- Usually don't go in heart failure
- Hypercyanotic spells



Fallot's Tetralogy



Coarctation of Aorta

- **Signs and Symptoms:**
 - Asymptomatic / headache
 - Sudden collapse (usually in neonatal period)
 - Absent femoral pulses
 - High BP in upper limbs
 - Soft systolic murmur over LSE radiating to back
 - Incidental CXR finding (rib notching posteriorly)



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Coarctation of aorta



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Next steps

- Clinical practice – normal heart sounds / heart murmurs
- Remember detailed good history and meticulous clinical examination are essential!
- It's not rocket sign
 - To recognise heart murmur in children
 - to differentiate innocent murmur from pathological murmur in most cases

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Thanks for interacting



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