



## ASSESSMENT OF CARDIAC MURMURS IN CHILDREN

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Heart murmurs, which are frequently detected in children, may either be innocent or pathological, and it is important for the clinician to decide which category a murmur falls into. The detection of a cardiac murmur invariably arouses great anxiety. When the murmur is innocent, reassurance is important. On the other hand, with pathological murmurs, important issues need to be discussed with patients and parents. Examples of such issues include the need to review participation in strenuous physical activities, and advise on antibiotic prophylaxis against infective endocarditis.

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## **I. Clues from history which suggest pathological murmur**

1. Turns blue on crying
2. Breathlessness, sweatiness on feeding
3. Inability to keep up when playing with peers or tires easily

## **II. Other significant history**

1. Antenatal history, especially significant infections, maternal diabetes, ingestion of medications/ alcohol - these may be associated with congenital heart lesions
2. Other illness eg anaemia, thyrotoxicosis. These may result in a functional murmur from hyperdynamic circulation.

## **III. Clues from Physical Findings which suggest pathological murmur**

1. Presence of other congenital malformations
2. Tachypnoea/tachycardia
3. Abnormal pulses - bounding pulses in patent ductus arteriosus, poor or absent lower limb pulses in coarctation of aorta
4. Precordial bulge
5. Displaced apex beat
6. Presence of thrill
7. Abnormally loud or fixed second heart sound.  
(Note: Physiological splitting of the second heart sound ie wider splitting in inspiration which narrows in expiration is normal and may lend weight to the diagnosis of an underlying normal heart.)
8. Diastolic murmur. All innocent murmurs are systolic in timing.
9. Loud or harsh murmur
10. Long murmur (eg pan-systolic, throughout systole)

### **Some characteristics of Innocent/Functional Murmurs:**

1. Systolic in nature
2. Usually short in duration
3. Usually soft
4. May be either musical or low-pitched
5. Usually heard along left sternal edge
6. Intensity varies with phases of respiration and posture - usually louder when supine
7. Intensity louder with exercise, anxiety, fever

### **Examples of Innocent/Functional Murmurs:**

1. Peripheral pulmonary stenosis  
- in the very young

- usually present in the clavicular area (left more common than right)
- may radiate and transmit rather widely extending to the axilla
- murmur usually disappears by six months

This murmur is frequently attributed to a 'physiological' growing phenomenon. The branch pulmonary arteries in the newborn period are smaller and come off at a sharper angle, and a murmur is audible from the acceleration of blood flow. As the child grows, the vessels increase in size and the angle becomes less marked.

Important Note: Apart from peripheral pulmonary stenosis, most other murmurs in young infants are pathological.

2. Basal ejection systolic murmur

- preschool and school age
- detected near the pulmonic area
- murmur is high-pitched and blowing
- needs to be differentiated from murmur of aortic stenosis or pulmonary stenosis

The murmur of a stenotic valve is usually harsher in quality, longer and louder. The presence of an ejection click also points to valve disease.

The innocent basal ejection systolic murmurs is produced by eddies that are created from blood that is ejected from the ventricle in systole, disturbing the otherwise relatively stationary blood just above the pulmonary valve.

3. Venous hum

- schoolage
- sounds continuous ie throughout both systole and diastole
- low-pitched
- accentuated in inspiration
- often absent when supine
- may disappear with change of position of head

This murmur is due to blood draining down the collapsed cervical veins to the dilated intrathoracic veins. As the vein walls flutter, a low-pitched murmur, which sounds continuous, is created. It needs to be distinguished from the murmur of a patent ductus arteriosus (PDA) which is also continuous but does not vary with posture.

4. Functional Murmur

A functional murmur may be heard in conditions with hyperdynamic circulation eg fever, anaemia, thyrotoxicosis.

### Structural Lesions which may be missed:

There are some structural lesions which give rise to murmurs closely resembling an innocent murmur (Table 1). These differential diagnoses must be borne in mind and efforts made to exclude them clinically or with the help of investigations such as an electrocardiogram (ECG) or chest X-ray (CXR).

**Table 1. Structural lesions which may be missed.**

Cardiac lesions	Clinical Clues	ECG/CXR
Atrial Septal Defect	Ejection systolic murmur Fixed splitting of 2 <sup>nd</sup> heart sound Mid-diastolic murmur at tricuspid area	RSR' pattern in V1 Right bundle branch block
Pulmonary Valve Stenosis	Ejection systolic murmur $\pm$ ejection click, at 2 <sup>nd</sup> intercostals space Murmur best heard during inspiration	Post-stenotic dilalation of pulmonary artery
Aortic Valve Stenosis	Ejection systolic murmur at aortic area with ejection click	Normal or LVH
Mitral Valve Prolapse	Midsystolic murmur at aortic area with ejection click	
Hypertrophic Cardiomyopathy	Family history Systolic murmur at LSE radiating to aortic area	Abnormal deep Q waves seen LVH

### Investigations

In the ECG, abnormalities of rate or rhythm, or evidence of ventricular or atrial hypertrophy, would suggest underlying cardiac pathology CXR with abnormal cardiac silhouette, plethoric or oligoaernic lung fields would also point to a need for further assessment (Fig 1).

### Reassuring Patients and Parents

The most important aspect of an innocent murmur is the undue anxiety that it causes both to the patient and his family. There is always the worry about the presence of an underlying heart abnormality even when the murmur has been found to be *innocent*. Attention should be paid toward allaying the anxiety of the people concerned rather than concentrating on the murmur itself. It is necessary to emphasise that this extra sound does not signify the presence of any underlying heart disease. As such, the child

should be treated as any normal child. Special precautions are unnecessary, and participation in physical activities is encouraged as it confers no additional risks.

From the family doctor's point of view, the diagnosis of an innocent murmur can sometimes be made confidently after a thorough history and clinical examination, particularly in an older child who is able to co-operate in various manoeuvres (e.g. checking for variation of murmur with phases of respiration). In the younger child, physical examination may be more difficult, due to lack of co-operation and a higher heart rate. In such cases, investigations such as an ECG and/or CXR may help in diagnosis. In other cases, where doubt persists, referral to a paediatric cardiologist may be warranted.

**Fig. 1. Management of Cardiac Murmurs in Children**

