

# Children with Heart Murmurs...When to be Concerned?

Shabib A. Alhadheri, MD  
Pediatric Cardiologist  
Children's Heart Clinic  
703-369-9090

Listening to a heart murmur is a routine practice that every primary care physician encounters on a daily basis while examining children. Virtually, all children demonstrate a heart murmur at some point during their childhood.

The practitioner's experience will determine when to refer the child for further evaluation. Profound knowledge of the characteristics of the common innocent vs. pathologic heart murmurs and the natural history of congenital and acquired heart diseases is necessary to achieve this goal.

In most cases, a thorough history and complete physical examination will be sufficient to exclude any pathological causes.

A **heart murmur** reflects **turbulence** of the blood flow through heart structures. It is also related to pressure difference (gradient) as the blood flows through the defects.

## Innocent vs. Pathologic

Most children (50-90 percent) have an **innocent murmur** (benign or functional murmur). All these terms indicate an innocent extra noise of no hemodynamic significance. It also means that the child does not need any activity restriction or special treatment.

An innocent murmur may be accentuated by circumstances that increase cardiac output (hyperdynamic circulation) such as fever, anemia and pregnancy.

Exceptionally, only one percent of children might have an abnormal murmur (**pathologic murmur**). This murmur can be either congenital or acquired from different etiologies.

## Causes of Congenital Murmurs

- atrial or ventricular septal defects, valvular stenosis or regurgitation

## Causes of Acquired Murmurs

- infections; e.g. bacterial endocarditis and myocarditis
- immunologic; e.g. rheumatic fever
- familial conditions, e.g. hypertrophic cardiomyopathy with subaortic stenosis

## Concerning Symptoms from History

May include:

- cyanosis
- chest pain
- dizziness/syncope
- failure to thrive
- recurrent respiratory infections
- wheezing

## Concerning Signs from Physical Examination

May include:

- cyanosis/clubbing/edema
- hepatosplenomegaly
- hyperactive precordium
- palpable thrill or heave
- increased cardiac impulses
- diminished peripheral pulses
- dysmorphic features
- chest deformity
- skin lesions
- joint abnormalities

## Characteristics of Innocent Murmur

- systolic ejection murmur (never diastolic)
- grade 2 or less

- absence of other pathologic sounds
- absence of concerning symptoms and signs
- intermittent (comes and goes)
- minimal radiation
- age beyond neonatal period

## When to Refer to a Pediatric Cardiologist

- a continuous murmur that persists in the supine position
- a regurgitant (holosystolic) murmur
- **a diastolic murmur**
- new onset murmur (+/- stigmata of Rheumatic fever or Infective endocarditis)
- louder murmur than before
- unusual radiation
- a systolic murmur with the following:
  - signs of congestive heart failure or cyanosis
  - significant failure to thrive
  - associated syndrome/anomaly strongly associated with CHD
  - neonates
  - loud (Grade III/VI or higher)
  - associated thrill heard while standing
  - hyperactive precordium
  - single or widely fixed split S2 (? ASD)
  - additional sound(s): (click, gallop, rub)
  - abnormal pulses, absent or weak femoral pulses

## Diagnostic Tools

Extra diagnostic tools might be considered, which may include a chest X-ray for evidence of cardiomegaly or pulmonary edema, electrocardiogram (ECG or EKG), echocardiogram for structural and functional abnormalities, exercise stress test if necessary and blood work if necessary.

**TABLE 1: CHARACTERISTICS OF COMMON PATHOLOGIC HEART MURMURS**

	Small VSD	Medium-Large VSD	ASD	Valvar PS	Valvar AS	MR/MVP	CoA	PDA	AI/PI
<b>Location</b>	LLSB	LLSB	LUSB	LUSB	RUSB	Apex	Back, apex, and/or LUSB	LUSB	LMSB LUSB
<b>Pitch</b>	High	Mixed	Medium	Medium	Medium	High	Low	Mixed	High
<b>Grade</b>	I-IV/VI	II-IV/VI	I-III/VI	I-IV/VI	I-IV/VI	I-IV/VI	I-III/VI	I-IV/VI	I-III/IV
<b>Timing</b>	Early Systole	Holo-systolic	Systolic Ejection	Systolic Ejection	Systolic Ejection	Pansystolic (midsystolic)	Systolic Ejection	Continuous	Early Diastole
<b>Quality</b>	Soft	Harsh	Soft	Variable	Variable	Soft	Soft	Variable	Harsh
<b>Other</b>		Hyper-dynamic precordium	Fixed, widely split S2.	+/-Variable Ejection click (increases with expiration)	+/- Constant Ejection Click. Murmur radiates to carotid a. and apex	Timing during systole varies. Mid-systolic click heard if MVP (earlier when standing from squat)	Diminished BP and pulses in lower extremities. Click if BAV	Bounding pulses	Best heard with leaning forward in held expiration

LLSB – Left lower sternal border  
 LUSB – Left upper sternal border  
 RUSB – right upper sternal border

MR – Mitral regurgitation  
 CoA – Coarctation of the aorta  
 PDA – Patent ductus arteriosus

BAV – Bicuspid aortic valve  
 ASD – Atrial septal defect  
 VSD – ventricular septal defect

MVP – Mitral valve prolapse  
 AI – Aortic incompetence  
 PI – Pulmonic incompetence

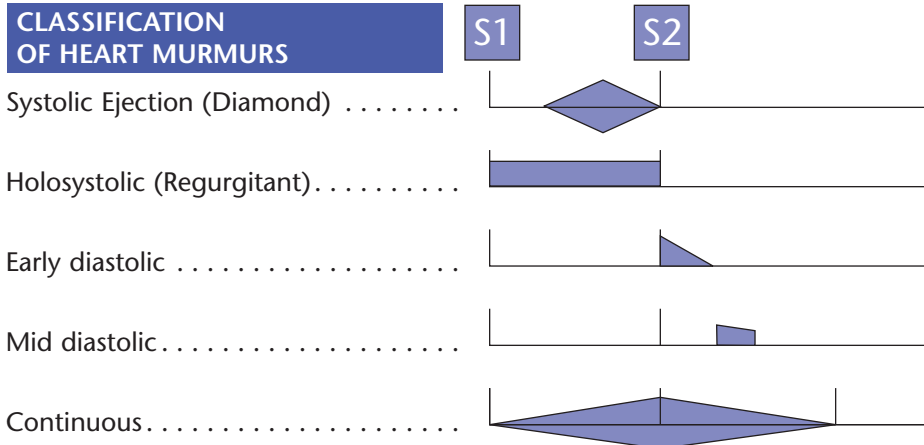
**TABLE 2: CHARACTERISTICS OF COMMON INNOCENT HEART MURMURS**

	Still's	Pulmonary Flow	Carotid Bruit	PPS of Infancy	Venous Hum
<b>Location</b>	LLSB	LUSB	Supraclavicular fossa	RUSB, LUSB, Back & Axillae	R/L Infraclavicular areas
<b>Pitch</b>	Low	Medium	High	Medium High	Medium
<b>Grade</b>	I-III/VI	I-III/VI	I-III/VI	I-II/VI	I-III/VI
<b>Timing</b>	Systolic Ejection	Systolic Ejection	Systole	Systole	Continuous
<b>Quality</b>	Twanging, Vibratory	Blowing	Harsh	Blowing	Blowing
<b>Softer</b>	Standing, straining	Standing, inspiration	Shoulder hyperextension	----	Supine position, jugular pressure
<b>Louder</b>	Supine, Hyperdynamic Circulation state	Supine	Standing	Supine	Upright
<b>Differential Diagnosis</b>	HOCM, Small VSD	ASD, PS	AS	PBS, PS	PDA, AVM

LLSB – lower left sternal border  
 LUSB – left upper sternal border  
 HOCM – hypertrophic obstructive cardiomyopathy

PPS - Physiologic peripheral Pulmonary branch stenosis  
 AVM – arteriovenous malformation

**CLASSIFICATION OF HEART MURMURS**



**SUGGESTED READINGS:**

1. Allen HD, Golinko RJ, Williams RG: Heart murmurs in children: When is a workup needed? Contemporary Pediatrics 1994;11(11):29
2. Pelech AN: The cardiac murmur, When to refer? Pediatric Clinics of North America 1998;2(45) 107
3. Rosenthal A, How to distinguish between innocent and pathologic murmurs in childhood? Symposium on Pediatric Cardiology 1986;1229-1240