

CLINICAL SKILLS  
FOCUSED ON THE  
HEART:

DEFFERENTIATION  
OF AN

INNCOENT HEART  
MURMUR  
VERSUS  
CONGEINITAL HERRT  
DISEASE

Department of Pediatrics  
Resident Curriculum

**Clinical Skills Focused on the Heart: Differentiation of an Innocent Heart Murmur versus Congenital Heart Disease**

**I. Essential Clinical Skills and their Interpretation**

- The measurement of blood pressure in the pediatric patient should include selection of appropriate cuff size. The methods for measuring blood pressure include auscultation, Doppler and flush methods. Measurement of blood pressure should include the measurements in both arms and one of the lower extremities. For example, the diagnosis of coarctation of the aorta can almost always be made by blood pressure measurement alone. The Pediatric Resident should be able to interpret blood pressure as a function of age and, therefore, have a definition of 'systemic hypertension' in the pediatric patient.

- The pediatric resident should be able to interpret the clinical cardiovascular examination including:

Interpretation of pulses as increased/decreased and their clinical significance

Precordial activity, particularly in the newborn

Understanding the physiological phases of the first and second heart sounds, and identify the auscultation areas of the precordium:

- 1) Upper left sternal border and the back is the pulmonary valve and pulmonary artery area;
- 2) Upper right sternal border, aortic valve;
- 3) Apex of the mitral valve; and,
- 4) Lower left sternal border is tricuspid valve and the location of a common congenital heart defect known as the ventricular septal defect

**II. Distinguish an Innocent Heart Murmur from Structural Congenital Heart Disease**

- The precise diagnosis of congenital heart anomalies depends on the technology of heart catheterization and echocardiography, but the anomaly is almost always first suspected because of an abnormal physical examination. Cyanosis or symptoms of heart failure will point to a congenital heart defect, but by far the most common indicator of structural congenital heart disease outside the newborn period is the

in the back than at the upper left sternal border. Mild pulmonic stenosis will become louder and often a thrill will appear with exercise. Almost always, there is an associated ejection click with a murmur of pulmonic valvar stenosis. In general, any pathological murmur of pulmonary artery or valve origin will be audible in the back.

One of the most difficult diagnosis to make in childhood is an atrial septal defect because the child is asymptomatic and clinical findings may be subtle. Fixed splitting of the second heart sound is the most useful sign. Normally the second heart sounds splits only on inspiration and becomes single on expiration. With an atrial septal defect the splitting is constant throughout the expiratory cycle. It is helpful to ask the child to 'breath in/breath out' and 'stop breathing.' Normally, the second heart sound is single for the first two or three beats of held expiration, then splits with successive beats. The second heart sound is prominently split from the first beat with an atrial septal defect. In the presence of a soft, high left sternal border systolic murmur and a fixedly split second heart sound the lower left sternal border should be auscultated carefully for a "scratchy" diastolic murmur. This murmur is quite soft and cannot be heard if there is ambient noise. The murmur is one of relative tricuspid stenosis occasioned by the left-to-right shunt at the atrial level. The triad of a high left sternal border systolic murmur, fixed split second heart sound and a lower left sternal border diastolic murmur are pathognomonic findings of an atrial septal defect.

The differential diagnosis of a systolic ejection murmur at the high right sternal border is a bileaflet aortic valve or mild aortic valve stenosis. The association of an apical ejection click with this type of murmur is characteristic of aortic valve disease. The murmur is accentuated by exercise and radiates well into the suprasternal notch or the neck.

A vibratory murmur at the mid left sternal border "Still's murmur" is also common. The quality of this type of innocent murmur is distinctive and has been described as a "twanging string" or vibratory. This murmur may or may not change in intensity with the change in body position. A small ventricular septal defect or discrete subaortic stenosis should be part of the differential diagnosis. The murmur of a small ventricular septal defect is altered by changes in body position or during the strain of a Valsalva maneuver. Both maneuvers would tend to attenuate the murmur of a small ventricular septal defect. The murmur of discrete subaortic membrane is almost indistinguishable from a vibratory murmur. This is not a common lesion, but if the vibratory murmur is at least a Gr. III/VI murmur this diagnosis should be entertained.

presence of a heart murmur. Indeed, the asymptomatic child with a murmur represents a common clinical problem faced by pediatricians.

It is usually possible, in the office and on the basis of a careful physical examination alone, to differentiate an innocent murmur caused by structural congenital heart disease. Surprisingly often a specific cardiac diagnosis can be made or is strongly suspected, just from the clinical examination.

First, however, the murmur must accurately be described in terms of its loudness and the site of maximal intensity and timing. For the purposes of this description, murmurs will be considered as either "loud" or "soft" since even experts may disagree regarding the grading of a murmur. The site of maximal intensity of a murmur is often misjudged, but it can be pinpointed with little effort. One should first listen to the high mid and low right and left sternal borders, apex, and back, and make a judgment about the site of maximal loudness of the murmur. This area should then be compared in turn to every other auscultatory area. Thus, if the murmur initially is loudest at the high right sternal border, place the stethoscope there for a few cardiac cycles and then move it to the high left sternal border, then back to the high right sternal border and then to the low left sternal border, and so on. The timing of the murmur is usually judged by the quality rather than by noting its actual position in the cardiac cycle. For example, a loud, harsh, mid- and low left sternal border murmur in general will occur during systole. Occasionally, the murmur of pulmonic regurgitation has similar qualities and its diastolic timing is often misinterpreted. The timing of a murmur can be confirmed by simultaneously listening to the murmur and feeling a peripheral pulse.

A word about continuous murmurs. The word implies only that the murmur extends through the second heart sound and does not necessarily indicate that the murmur occupies all the cardiac cycle. Also, it is important to know that the to-and-fro and the continuous murmurs are not synonymous terms. A to-and-fro murmur consists of separate systolic and diastolic murmurs with a gap between them and, therefore, is not continuous. Once the murmur is accurately described, a specific clinical diagnosis can often be made.

Innocent heart murmurs are common in childhood from the age of two to ten years. The characteristics of the murmurs are easily recognized and often more than one innocent murmur is present in the pre-school patient. The pediatrician should be able to recognize innocent murmurs and distinguish them from structural congenital heart disease by their nature and associated findings. A very common innocent murmur is a systolic ejection murmur present at the upper left sternal border. A similar murmur is present with pulmonary valve stenosis, an atrial septal defect or coarctation of the aorta. The differential diagnosis of each of these entities is made by the company the murmur keeps. Coarctation of the aorta would be recognized because of difference in pulses and blood pressure between the upper and lower extremities, and the murmur would be more audible

The venous hum murmur is an innocent murmur heard under the left or right clavicle. This venous hum will often change with head turning or pressure over the jugular veins, but the most useful maneuver is to listen to the child in the recumbent position. The murmur of a patent ductus, part of the differential diagnosis, would remain unchanged while the venous hum murmur disappears entirely.

The physical examination remains the most important means of suspecting the presence of congenital heart disease. Structural congenital heart disease can usually be distinguished from innocent murmurs and the urgency of referral often determined on that basis.

### References

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<b>INNOCENT HEART MURMUR VS STRUCTURAL CHD</b>		
<b>INNOCENT MURMUR</b>	<b>STRUCTURAL HEART DISEASE</b>	<b>DISTINGUISHING FEATURES</b>
SEM-ULSB	PSV  ASD  COA	Ejection click  S <sub>2</sub> widely split; TV – diastolic murmur  BP -pulses
SEM – URSB	ASV	Ejection Click
Vibratory – Still’s Murmur	Discrete subaortic stenosis	Unusually loud Still’s murmur in the aortic area
Venous Hum	PDA  Coronary/Cardiac Fistula	Murmur changes with position  Murmur accentuated in diastole
Carotid Bruits	Radiate from Aortic Valve Disease	See Associated Findings
Cranial	Cranial AV Malformation	Continuous and Heard at Nape of AVM