Heart Murmurs in Kids: Innocent or Guilty?

Robin W. Doroshow, MD
Children’s National Medical Center
Washington, DC
Distinguishing Innocent from Guilty

- The nature of the problem
- How good are doctors at this?
- Why don’t we learn this well?
- What to focus on
- Common innocent murmurs in kids
- Am I done now?
Subsets of Kids with Murmurs

- **asymptomatic**
  - **innocent**
  - **Asx CHD**

- **symptomatic**
  - **innocent**
  - **Sx CHD**
Common Heart Defects in Asymptomatic Children

- ventricular septal defect (small-mod.)
- atrial septal defect (even large)
- patent ductus arteriosus (small-mod.)
- pulmonic stenosis
- aortic stenosis
- coarctation of the aorta
Innocent or Guilty?

**INNOCENT**
- asymptomatic?
- softer?
- lower pitched?
- systolic?
- sounds like a
  - Still’s murmur
  - venous hum
  - etc.

**ORGANIC**
- symptomatic?
- louder?
- higher pitched?
- diastolic?
- sounds like
  - AS
  - VSD
  - etc.
“Hey, I can hear the traffic!”
Innocent Pediatric Murmurs

- 50-60% of infants;
- 90% of school-age children.
- Usually differentiated from organic murmurs by exam only.
False Negative Murmurs

- delay of medical Rx
  - morbidity (FTT, infex, CHF)
  - mortality (exp. sudden death)
  - pursuing other diagnoses

- delay of surgical Rx
  - poorer result
  - higher risk

- inappropriately *un*restricted activity

- poor preparation for surgery & lifestyle

- endocarditis
A Cardiologist’s Nightmare: “H.S. Athlete Dies in Game”

“Basketball Star Collapses on Court
Cleared for Sports by Local Physician”
False Positive Murmurs

- parental concern
- patient anxiety
- unnecessarily restricted activity
- school/social problems
- poor self-image
- economic stress
  - insurability
  - employability
  - cost of evaluation
Accuracy of Murmur Recognition in Pediatric Residents

Gaskin 2000
Skills Don’t Improve after Med School…

…unless you’re a cardiologist

Vukanovic-Criley 2006
Traditional Teaching of Cardiac Auscultation

- Bedside
  - Random exposure
  - No time
  - Limited cooperation
  - Distractions
  - No way to compare
Traditional Teaching of Cardiac Auscultation

- Books, articles, standard lectures
  - It’s a *sound*!
  - Verbal descriptors are a barrier
Auscultation of Murmurs

- SCRIPTS:
  - Site
  - Character
  - Radiation
  - Intensity
  - Pitch
  - Timing
  - Shape
Murmur Intensity

- Grade 1: Barely audible
- Grade 2: Soft, but easily audible
- Grade 3: Moderately loud, but no thrill
- Grade 4: Louder, associated with a thrill
- Grade 5: Heard with stethoscope barely on chest
- Grade 6: Heard with stethoscope off chest

R. Doroshow, MD
Traditional Teaching of Cardiac Auscultation

- Connecting with concepts
  - Physiology/cause of sound
  - Correlating with other timed events
  - Relating to anatomy
  - Depends on learner
Too Much Information!

Roll over the above tracing to pause the animation and review each phase of the cardiac cycle.

www.blaufuss.org
TMI?

- Pressure tracings
- Doppler signal
- Echo image
- Phonocardiogram

www.blaufuss.org
Violin or Flute?
How Does a Violin Make Sound?

R. Doroshow, MD

phys.unsw.edu thinkquest.org
How Does a Flute Make Sound?

Flute pictured as cylinder, length L

\[ \lambda = \frac{2L}{f} \quad \text{Fundamental} \]
\[ \lambda = \frac{L}{f} \quad \lambda = \frac{3L}{2f} \quad \lambda = \frac{5L}{4f} \]

2nd harmonic
3rd harmonic
4th harmonic

\[ f = \frac{f_0}{2} \]
\[ f = \frac{f_0}{3} \]
\[ f = \frac{f_0}{4} \]
\[ f = 5f_0 \]
\[ f = 6f_0 \]
What is the Pediatrician’s Job Here?

- To make a diagnosis? Pulmonic stenosis? or small VSD? 
- That’s my job!
What is the Pediatrician’s Job Here?

…to distinguish the innocent murmur from the pathological one.
How to Improve This Skill

- Get feedback
  - Not practical if you don’t have a cardiologist nearby
- Get lots of practice
  - It doesn’t take real kids
- Learn the innocent murmurs
  - Everything else is guilty
Still’s (Vibratory) Murmur

- age 2-16 yrs but also heard in infants
- about 90% of school-age children!
- early to mid-systolic
- vibratory, musical, or groaning
- LLSB to apex (“hockey stick”)
- louder supine, softer w/ Valsalva
- DDx: VSD, MR
Venous Hum

- age 2-12
- 30-50% of school children
- humming or roaring ("seashell")
- RUSB > LUSB, neck
- sensitive to head position & venous compression; disappears supine
- DDx: PDA, AV malformation
NEXT TIME I PICK UP A SHELL TO LISTEN TO THE OCEAN, STOP ME.
How to Get Experience
How to Get Experience

- Find a website or an app you like
  - Real murmurs
  - Pediatric murmurs
  - Use earbuds
  - Don’t focus on specific diagnosis
- Listen a lot!
Management of the Innocent Murmur

- EXPLAIN to patient & parents and name the murmur.
- RECORD in chart: description and dx.
- Lab tests usually NOT INDICATED.
- Referral NOT INDICATED.
  
  exceptions:
  - dx unclear
  - high risk cases
  - intractable anxiety