Common Pediatric Cardiology Referrals

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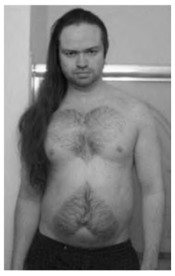
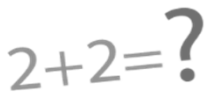
If body hair represented his heart, what is wrong with this?



Pediatric Cardiology = $\int \frac{\left[\cos^{-1}x\left\{\sqrt{(1-x^2)}\right\}\right]^{-1}}{\log_e\left\{1+\left(\frac{\sin(2x\sqrt{(1-x^2)})}{\pi}\right)\right\}}dx$

Pediatric Cardiology = 

The most common reasons for referral

- Chest pains
- Palpitations
- Murmurs
- Syncope

Probably unnecessary referrals

- Dizziness
- “Blue fingers and toes”
- Abnormal EKG
- Abnormal CXR
- FH of heart problems
- HTN with normal cardiac exam

Chest pains - case 1

- 14y/o female seeing you in UC for 1yr h/o chest pains. They are midsternal, sharp, lasts for 10min, and worsens with deep inspiration. Dad says “I’m worried since they all occur when she is doing nothing and my dad just had a heart attack”.

Chest pains - case 2

- 16y/o female is seeing you for a 2 month h/o chest pains. She says that they occur during her HS cross country races. Her chest pains are midsternal, sharp, associated with mild SOB and only occurs with sports/running. They last for about 5 minutes.

Chest pains

- Very frightening for pts and parents (and physicians)
- 2nd most common reason for referral to peds cardio
- 3rd most common “pain” complaint in peds pts (H/A, abd)
- Most common age 8-16y/o
- CP in peds is not the same as CP in adults
- Usually idiopathic and musculoskeletal
- Usually chronic but not serious problem

Saleeb et al, 2011

- 3700 peds CP pts over 10yr span
- Causes of pediatric chest pains:
  - 1. Idiopathic 52%
  - 2. MS 36%
  - 3. Pulmonary 7%
  - 4. GI 3%
  - 5. Cardiac 1%

Chest pains

- Cardiac causes of chest pains in the pediatric population are very uncommon
- They do cause a lot of anxiety for the pt and family.
  - Lipitz et al, 2005 looked at 100 peds pts with noncardiac CP
    - 69% restricted activities
    - 40% had school absences
    - 44% thought they were having a MI
    - 12% thought that they had cancer

Chest pains

- Reassurring features
  - Occurs with inactivity
  - Intensity changes with breathing or positioning
  - Sharp
  - Well localized
  - Chronic
  - FH of CP
  - Can be reproduced

Chest pains

- Slightly worrisome features
  - Occurs with exercise
  - Associated with presyncope or syncope
  - Preceded by racing heart
  - Associated fever
  - +FH (CMP, severe familial hyperlipidemia, pulm HTN, arrhythmias)
  - Abnormal exam (murmur, loud/single S2, gallop)

Chest pains - case 1

- 14y/o female seeing you in UC for 1yr h/o chest pains. They are midsternal, sharp, 7/10, lasts for 10min, and worsens with deep inspiration. Dad says "I'm worried since they all occur when she is doing nothing and my dad just had a heart attack". Your pt adds "I even had one when I met David Beckham".
- What part of the history is reassuring?

Chest pains - case 1

- A. Chest pain is sharp.
- B. Chest pain started 1 year ago.
- C. Chest pain worsens with inspiration.
- D. Chest pain occurs with inactivity.
- E. GF just had a MI.
- F. All of the above.

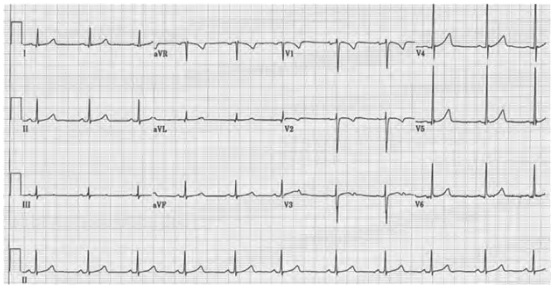
Chest pain - case 1

- What do you want to know about her PE?
  - Vitals
  - heart sounds, murmurs, liver, pulses, chest tenderness
  - lungs
- Her PE is normal and she has no palpable tenderness over her chest. What are you thinking?

Chest pain - case 1

- A. “I’m going to order an EKG”
- B. “I’m going to order an ECHO”
- C. “I’m going to order a STAT troponin I level and NTG”
- D. “Page Dr. Hwang STAT”

Case 1 EKG



Chest pains - case 1

- What do you do next?
  - A. reassurance
  - B. tylenol/motrin PRN
  - C. no PE until she sees peds cardio
  - D. order ECHO

Chest pains - case 2

- 16y/o female is seeing you for a 2 month h/o chest pains. She says that they occur during her HS cross country races. Her chest pains are sharp, associated with mild SOB and only occurs with sports/running. They last for about 5 minutes. Rest of hx is negative as is her PE.
- How is this case different from case 1?

Chest pains - case 2

- What should you do next?
  - A. order an EKG
  - B. order an ECHO
  - C. order troponin I
  - D. give nitroglycerin and ASA

Chest pains - case 2

- EKG is normal. What next?

A. Diagnose her with costochondritis and treat with tylenol PRN.
B. Order an ECHO.
C. Refer to peds cardiology. No sports for now.
D. Order a treadmill.
E. Order a holter.

Chest pains - summary

- Cardiac etiology is extremely rare
- EKG for everyone
- Most are musculoskeletal
- Refer if there is an abnormal cardiac exam, +FH, strenuous exercise, syncope, preceding palpitations, or ischemic changes on EKG

Chest pains – take home message

- CHEST PAINS IN KIDS AND ADOL ARE RARELY CAUSED BY THE HEART!!!!!
- TRY TO REASSURE AND NOT MAKE THE FAMILY MORE ANXIOUS.

Syncope

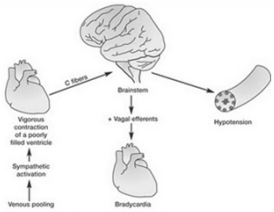
- Usually benign
- Results in a lot of anxiety
- Not uncommon
  - 15-25% have ≥1 syncope prior to adulthood
  - Incidence peaks at 15-19y/o
  - More in females

Syncope

- 3 types
  - Neurocardiogenic (75-80%)
  - Neuropsychiatric
  - Cardiac (very rare)

Syncope

- Neurocardiogenic
  - The most common cause
  - Faint, vasovagal, church syncope
  - Secondary to Bezold-Jarisch reflex
  - Prodrome (black spots, dizziness, nausea, diaph, hypervent)
  - < 1min
  - Quick recovery



Syncope

- Neurocardiogenic
  - Trigger: often present
  - Aura: visual changes, cold sweat, nausea
  - Ictus: often limp
  - Postictus: brief
  - Position: usually standing
- Seizure
  - Trigger: random
  - Aura: déjà vu, epigastric discomfort, behavorial changes
  - Ictus: often tonic and/or clonic
  - Postictus: can be prolonged, lethargy/confusion
  - Position: can be supine

Syncope

- Cardiac
  - Very rare
  - No prodrome, exercise related, associated CP or palp, FH of sudden death
  - Secondary to structural cardiac abnorm, myocardial dysfunction or arrhythmias

Syncope

- Hx is the most important part of the eval (FH, exercise related?)
- Exam is usually normal.
- What tests should I order?

Syncope

- ECHOs?
  - Ritter et al, 2000: Of 480 children with syncope, ECHO did not contribute to the diagnosis in any pt.
- Tilt table?
  - Has poor specificity and sensitivity.
  - McLeod, 2003: 40% of teens with no h/o syncope had a positive tilt table test.
- Holter/event monitors?
  - Saarel et al, 2005: In pts with syncope and presyncope, ambulatory EKGs had zero diagnostic yield.

Syncope - case 3

- 17yr 11mo male seeing you in UC for "syncope during track meet".
- Should you be concerned?

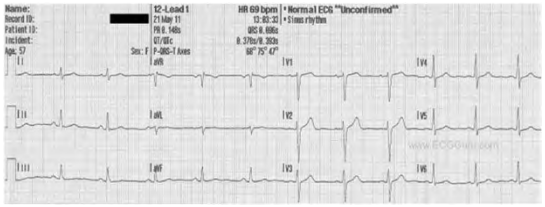
Syncope - case 3

- 17yr old male seeing you in UC for "syncope during a track meet". He had been at a track meet all day yesterday and while waiting for his 1st race at noon, he passed out. His teammate told him that he slowly went to the ground. He woke up after 1 minute and felt fine after drinking a cup of juice. He had woken up late that morning and had missed breakfast. Neg PMH. Neg FH. Normal exam.
- What do you do next?

Syncope - case 3

- A. order an EKG
- B. emphasize fluid and salt intake
- C. peds cardio referral
- D. peds neuro referral

Syncope - case 3



Syncope - case 4

- 17yr 11mo old female with “2 episodes of syncope”. The 1st episode occurred 1 yr ago while taking a shower in the morning. The 2nd one occurred last week while she was running the mile for PE. Her friend told her that she just fell “like a tree”. She does not recall any prodrome and she sustained a small bump on her head. She woke up after 10 minutes and was groggy for 30 minutes.
- How is this case different from the previous one?
- What else do you want to know?

Syncope - case 4

- PMH/PSH: negative
- FH: pat uncle died suddenly at age 32, pat GF s/p defibrillator at age 50 for "unknown reason", dad has h/o palpitations and syncope but does not go to the doctors
- PE: WNL

- What should you do now?

Syncope - case 4

- A. order an EKG
- B. order holter and event monitor
- C. order tilt table test
- D. refer to peds cardio
- E. wait 1 month when she turns 18 and refer to adult cardio

Syncope - summary

- Get a thorough hx
- Cardiac etiology is very rare
- EKG for everyone
- Most are neurocardiogenic
- Refer if associated with exercise, CP, palp, or murmur, or if it occurs frequently

Syncope - take home message

- SYNCOPE IN KIDS AND ADOL ARE RARELY CAUSED BY THE HEART!!!!!
- TRY TO REASSURE AND NOT MAKE THE FAMILY MORE ANXIOUS.

Palpitations

- Another very common complaint
- Most are benign
- People perceive their heart beats differently
- People define palpitations differently
- My goal is to r/o tachyarrhythmias (mainly SVT)

Palpitations

- Hx is the most important part of the eval
  - Type of onset/offset
  - What was the HR?
  - Associated symptoms
  - Duration
  - Frequency

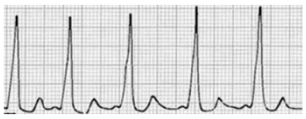
Palpitations

- What tests should I order?

- Everyone should get an EKG
- Holter vs event monitor vs Ziopatch

Palpitations

- Suspicious features for tachyarrhythmia
  - Sudden onset/sudden offset
  - HR > 160bpm
  - Chest pain follows palp
  - Abnormal EKG
    - Delta wave



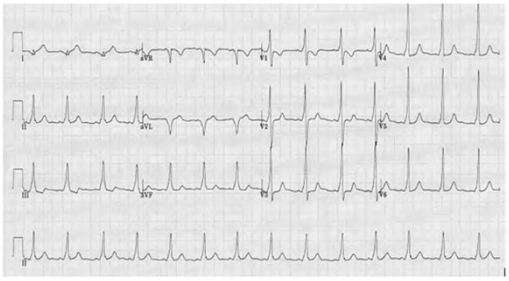
Palpitations

- Reassurring features against tachyarrhythmias
  - Gradual onset/gradual offset
  - No associated signs or symptoms
  - Normal EKG
  - HR < 160bpm
  - Lasts for 1-2 seconds

Palpitations - case 5

- 15y/o female presents to UC with 5mo h/o palpitations with inactivity. They occur once per week and are sudden in onset and offset. She says that she can feel her heart beating in her throat and that it is too rapid to count. No associated symptoms. Lasts from 10 to 30min. One episode resolved with a bowel movement. Rest of history and exam are normal. What do you want to order?

Palpitations - case 5



Palpitations - case 5

- Now what should you do?

- A. refer to peds cardio urgently
- B. refer to peds cardio routinely
- C. instruct pt on taking a pulse
- D. instruct pt on Valsalva maneuvers
- E. order a holter
- F. order an event monitor
- G. refer pt to peds cardio and instruct her to have a BM every 15min until her appt

Palpitations

- Learning points:
  - Get a good history
  - Get an EKG
  - Refer if hx is suspicious for tachyarrhythmia
  - OK to instruct pt/parent on taking a pulse
  - Worse case scenario is that pt has SVT.
    - SVT is rarely tragic and usually associated with either no or mild symptoms

Murmurs

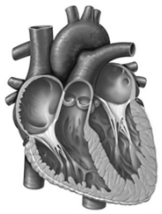
- Very common in children
- Most are innocent
  - AKA normal, functional, benign, physiologic, flow
  - ≤ grade II
  - Can be transient
  - Usually systolic
  - No associated extra heart sounds
- Murmur does not equal heart defect

Murmurs

- When to suspect pathologic
  - Pansystolic
  - Diastolic
  - ≥ 3/6
  - Harsh
  - Abnormal S2
  - Click
  - Increase in intensity when standing

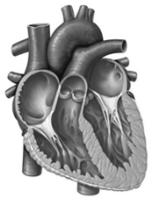
Murmurs

- Stills murmur
  - The most common innocent murmur
  - All ages
  - Short systolic LLSB and apex
  - Vibratory, musical, twangy
  - Etiology is controversial



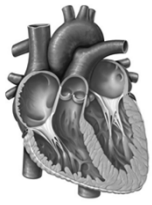
Murmurs

- Peripheral pulmonary stenosis (PPS)
  - Neonatal period
  - Secondary to acute peripheral pulmonary artery branching
  - Soft, short, SEM, bilat chest/axilla/back
  - Resolves by 9m/o



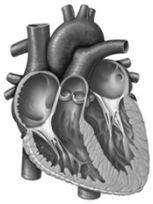
Murmurs

- Pulmonary flow murmur
  - Middle to late childhood
  - Systolic LUSB and may radiate to back
  - $\leq$ grade II
  - Sometimes difficult to discern from pathologic murmurs



Murmurs

- Venous hum
  - Continuous
  - High pitched blowing
  - Usually right infraclav region
  - Loudest while sitting; ceases while supine
  - Secondary to turbulence at jxn of IJV/IV/RSCV



- I don't hear murmurs every day; how can I be 100% sure that it is innocent?
- OK to refer all murmurs.

Murmurs

- Pointers
  - More urgency in neonates than in children and adolescents
  - Refer if you think that it is pathologic or not sure
  - In older pts, may reascultate in 3-6 months
  - In neonates, always obtain O2 sat and check for femoral pulses
  - Lean towards referring if there are CV complaints
  - CXR and EKG may help determining urgency of referral but in general are not helpful

Murmurs - case 1

- 2y/o male seen in UC for an “indoor accident and butt pain”. Mom shows you a video that was recorded in slow motion by the pt’s 13y/o sister…

Murmurs - case 1

Murmurs - case 1

- …You do a full musculoskeletal and neural exam and find nothing wrong. Just to be thorough you do a heart, lung and abdominal exam and find a 2/6 systolic murmur at the LLSB.
- What do you do next?

Murmur - case 1

- A. see him back in 3-6 months
- B. order EKG and CXR
- C. order an ECHO
- D. refer to peds cardio
- E. suspend the pt's drivers license for 1 year

Murmurs - case 2

- You're seeing your last pt Friday afternoon; a 3d/o female with a rash. You are in a great mood because you are going on vacation. However you quickly forget your vacation plans and begin to panic as you hear a 2/6 systolic murmur. Parents say that she is eating well but sometimes breathes very fast for a few seconds.
- What is the most importance difference between this case and case 1?
- What do you do?

Murmurs - case 2

- A. check for femoral pulses and O2 sat
- B. order EKG and CXR and then refer to peds cardio within 1 week
- C. refer to peds cardio within 1 week
- D. order ECHO and if abnormal, refer to peds cardio
- E. have your MA book "follow-up murmur" appt with the rude Attending in the corner office for this afternoon at 4:45PM

Conclusions:

- A. For isoated murmurs, refer urgently for neonates < 2w/o and routinely for > 2w/o.
- B. For chest pains and syncope, definitely refer if associated with exercise.
- C. The worse case scenario for palpitations is SVT and this is rarely tragic.