Pediatric Chest Pain

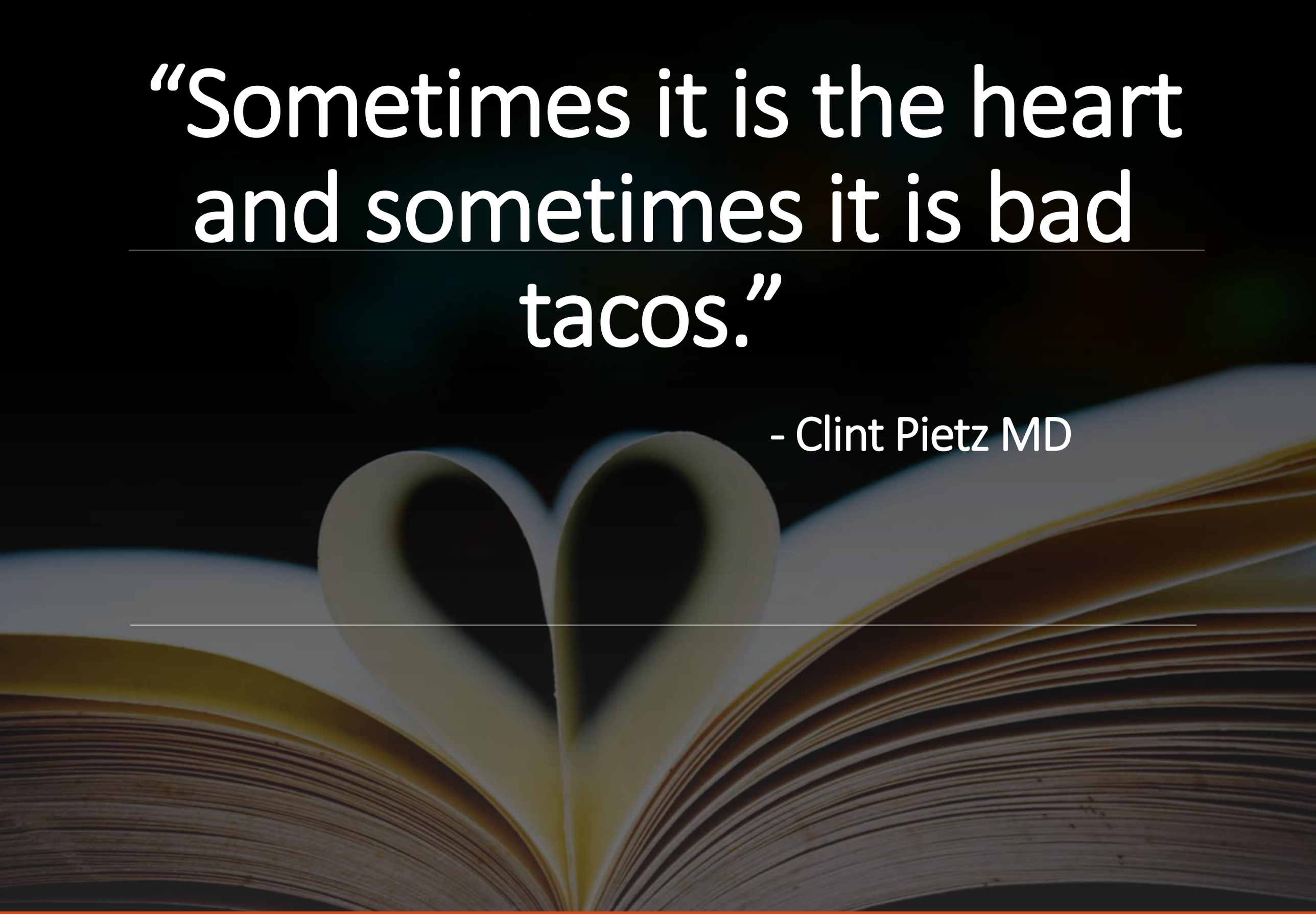
DANIEL WOOD PA-C

UT HEALTH SAN ANTONIO

SKIN, BONES, HEARTS AND PRIVATE PARTS 2021

“Sometimes it is the heart and sometimes it is bad tacos.”

- Clint Pietz MD



Introduction

Pediatric chest pain

Accounts for 650,000 visits in 10 to 21-year-olds.

#2 reason for referral to a pediatric cardiologist

The dilemma

WHAT PATIENTS SUSPECT THE CAUSE.

- Cardiac in origin: 52-56%
- Musculoskeletal: 13%
- Respiratory: 10%
- Skin infection: 3%
- Breast: 3%
- Cancer: 0-12%
- Unsure: 10-19%

WHAT PROVIDERS SUSPECT AS CAUSE

- Idiopathic: 21-45%
- Musculoskeletal 15-31%
- Hyperventilation 0 -30%
- Breast 1-5%
- Respiratory 2-11%
- Gastrointestinal 2-8%
- Cardiac 1-6%

History taking

- Duration
- Onset
- Location
- Quality
- Severity
- Radiation
- Precipitating and Relieving Factors

Significant history

- Association with exertion
- Exertional syncope
- Radiation to back, jaw, left arm, or left shoulder.
- More pain with supine position.
- Temporal association with fever.
- History of systemic inflammatory disease, malignancy, hypercoagulable state myopathy or coagulable state , myopathy or prolonged immobilization.

Significant family history

- Sudden or unexplained death.
- Aborted sudden death.
- Cardiomyopathy.
- Severe familial hyperlipidemia.
- Pulmonary hypertension.

Physical exam

- Vital signs
- Palpation for precordial heave or thrills
- ♡ sounds
- S2, pericardial rub

Significant physical exam findings

- Pathologic murmur, gallop, rub
- Abnormal second sound
- Distant heart sounds
- Hepatomegaly
- Decreased peripheral pulses
- Peripheral edema
- Tachypnea
- Fever over 38.4 degrees C.

Investigations



Musculoskeletal pain: No further work up



Cardiac Troponin



CXR



EKG



Echocardiogram

Greatest game shows of all time!

1. Jeopardy
2. Wheel of Fortune
3. Family Feud
4. Match Game
5. The Price is Right

https://www.tvguide.com/news/greatest-game-shows-1066568/

HPI: 14 yo. who just started school carrying a heavy back with a right sided chest pain x 4 days. Pain is described as sharp, stabbing pain specific to the upper 2 ribs. Exacerbated by deep breathing lasting a few seconds to minutes.

ROS: Denies recent URI symptoms, fever and no reported trauma, and no respiratory difficulties.

PMHx: unremarkable

Vitals:

Temp: 98.9F, RR: 12-20, BP: 110/70, HR: 80,

Physical Exam:

Gen: NAD, Alert

CV: RRR without m/g/r

Lungs: b/l CTA without wheeze

MSK: + pain with crowing rooster. + point tenderness

Name that chest pain! (5 points)

Which of the following is the likely diagnosis in this patient?

a. Costochondritis
b. Tietze Syndrome
c. Slipping rib Syndrome
d. Idiopathic chest wall pain

Costochondritis

- Pain exacerbated deep breath lasting a few seconds to a few minutes.
- Chest wall tenderness can be reproduced by manual palpation.
- No sign of inflammation
- Self limited with intermittent exacerbations in adolescence

HPI: 16 yo who complains of chest pain that comes “out of the blue” that can occur at rest or while exercising. Breathing in can make it worse . Pain is located at the left sternal border.

ROS: Denies recent URI symptoms, fever and no reported trauma, and no respiratory difficulties

PmHx: History of Kawasaki disease

Vitals:

Temp: 98.9F, RR: 12-20, BP: 110/70, HR: 80,

Physical Exam:

Gen: NAD, Alert

CV: RRR without m/g/r

Lungs: b/l CTA without wheeze

MSK: + point tenderness localized with the fingertip to one interspace at the left sternal border around rib 5.

Name that chest pain! (5 points)

Which of the following is the likely diagnosis in this patient?

a. Costochondritis
b. Precordial catch syndrome
c. Slipping rib Syndrome
d. Idiopathic chest wall pain

Precordial catch

- Origin of the pain is unknown, but often associated with poor posture
- Also called Texidor's twinge
- Pain occurs at rest or during mild activity
- Exacerbated by *inspiration*

Kawasaki disease (KD)

- Acute systemic vasculitis, diagnosed by the presence of
- CRASH AND BURN
- Conjunctivitis
- Rash
- Adenopathy (>1.5 cm)
- Strawberry tongue
- Hands and Feet
- And Burn: fever > 5 days.

- Incomplete KD

Treatment and sequela

- **Treatment:**
  - Includes 2 g/kg/day IVIG and high-dose aspirin acutely, then low-dose aspirin for weeks to months.
- **Sequela:**
  - Approximately 5% of children who were promptly diagnosed and correctly treated will go on to have cardiac sequelae
  - Children who have no detected cardiac sequelae by 8 weeks, typically continue to be asymptomatic up to 20 years later.
  - Rate of reoccurrence: 2% infants at higher risk.

Musculoskeletal pain in children

Costochondritis

Precordial Catch

Slipping rib syndrome

Pectus excavatum

Pectus carinatum

Treatment for musculoskeletal pain

- Reassure fears and counsel about benign nature.
- Apply warm compress
- Administer NSAIDs x 1 week.


BOY SCOUTS of AMERICA
SINCE 1910

HPI: 15 yo x 1d with right sided chest pain, Started abruptly while playing basketball. He sat down and the pain started having difficulty breathing.

ROS: denies recent URI

PmHx: Recent smoking cessation

Vitals:

Temp: 99 F, RR: 30, BP: 110/70, HR: 100,

Physical Exam:

Gen: NAD, Alert, tall male

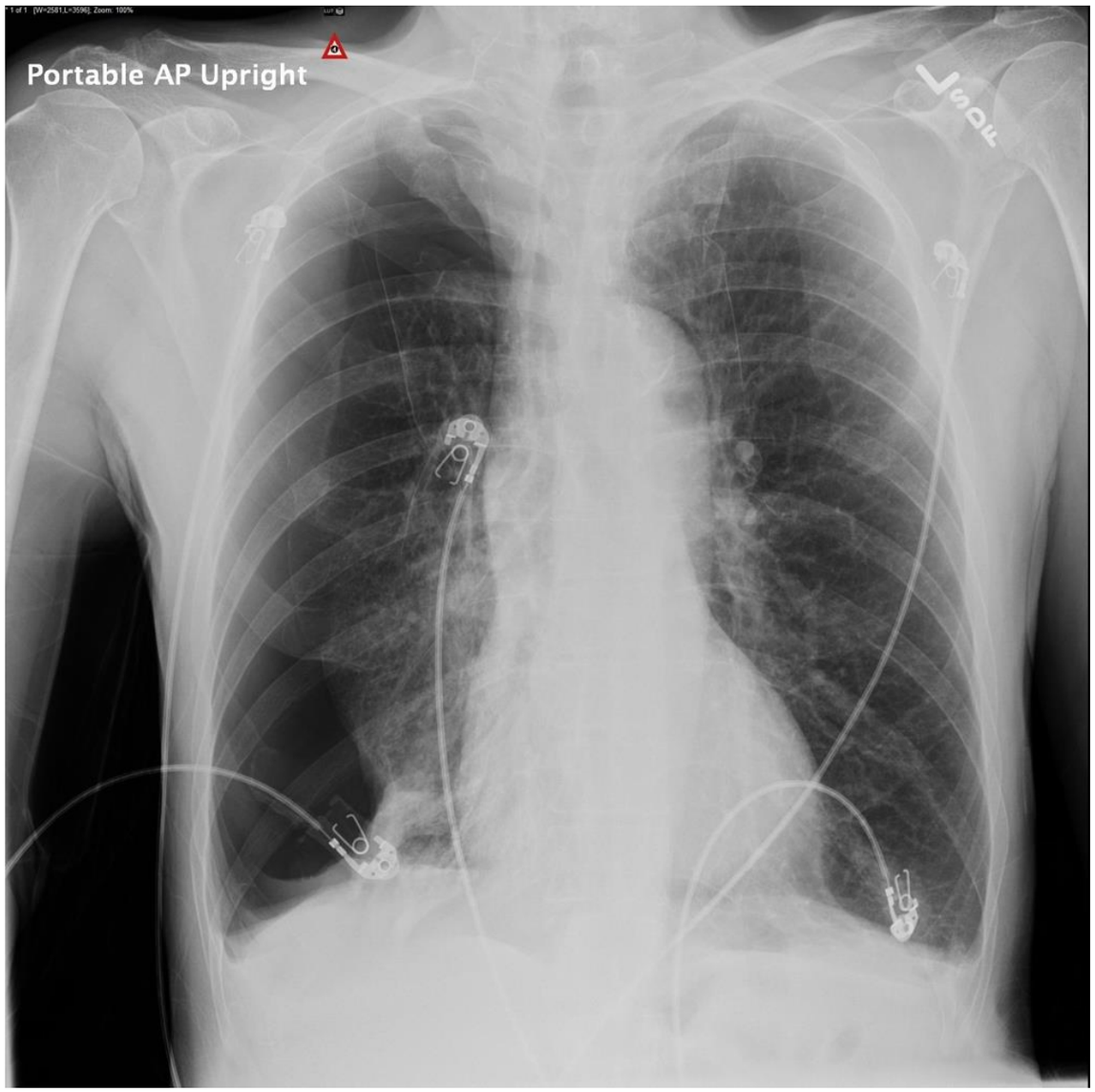
CV: RRR without m/g/r

Lungs: decreased RLL lung sounds without wheeze or rales.

MSK: no issues

Name that chest pain!
(5 points)

CXR



ACCESSED: HTTPS://RADIOPAEDIA.ORG/CASES/CHILDHOOD-PNEUMONIA-1?LANG=US

Which of the following is the likely diagnosis in this patient?

a. Pleuritis
b. Asthma
c. Pneumothorax
d. Pneumonia

Pulmonary causes of chest pain in children

Pneumonia

Asthma

Chronic cough – pertussis

Bronchiecatsis

Pleurisy

Pneumothorax

A 13 yo. with 2 month history of dysphagia and the sensation is described as squeezing or burning, without radiation. He was started on a PPI x 2 month with his PCP, but no improvement. He is scheduled for an appointment with a specialist to treat evaluate.

PMHX: eczema and allergies

Temp: 99 F, RR: 20, BP: 110/70, HR: 80

Physical Exam:

Gen: NAD, Alert

CV: RRR without m/g/r

Lungs: b/l CTA.

Abd: soft, NTND, no HSM

MSK: no issues

Imaging: CXR is normal.

Name that chest pain! (5 points)

Which of the following is the likely diagnosis in this patient?

a. GERD
b. Eosinophilic esophagitis
c. Peptic Ulcer disease
d. Esophageal Spasm

GI causes of chest pain in children

GERD

Esophageal strictures

Foreign Body

Ingestion of caustic substances.

15 yo child with chest pain x 4 days that hurts with inspiration and expiration. Pain is worse with activity and with rest. . Pain can occur all of sudden lasting a “period of time”

ROS: Patient denies any fever, recent URI symptoms or nausea and vomiting.

PmHx: + Anxiety

Temp: 99 F, RR: 20, BP: 110/70, HR: 80

Physical Exam:

Gen: NAD, Alert

CV: RRR without m/g/r

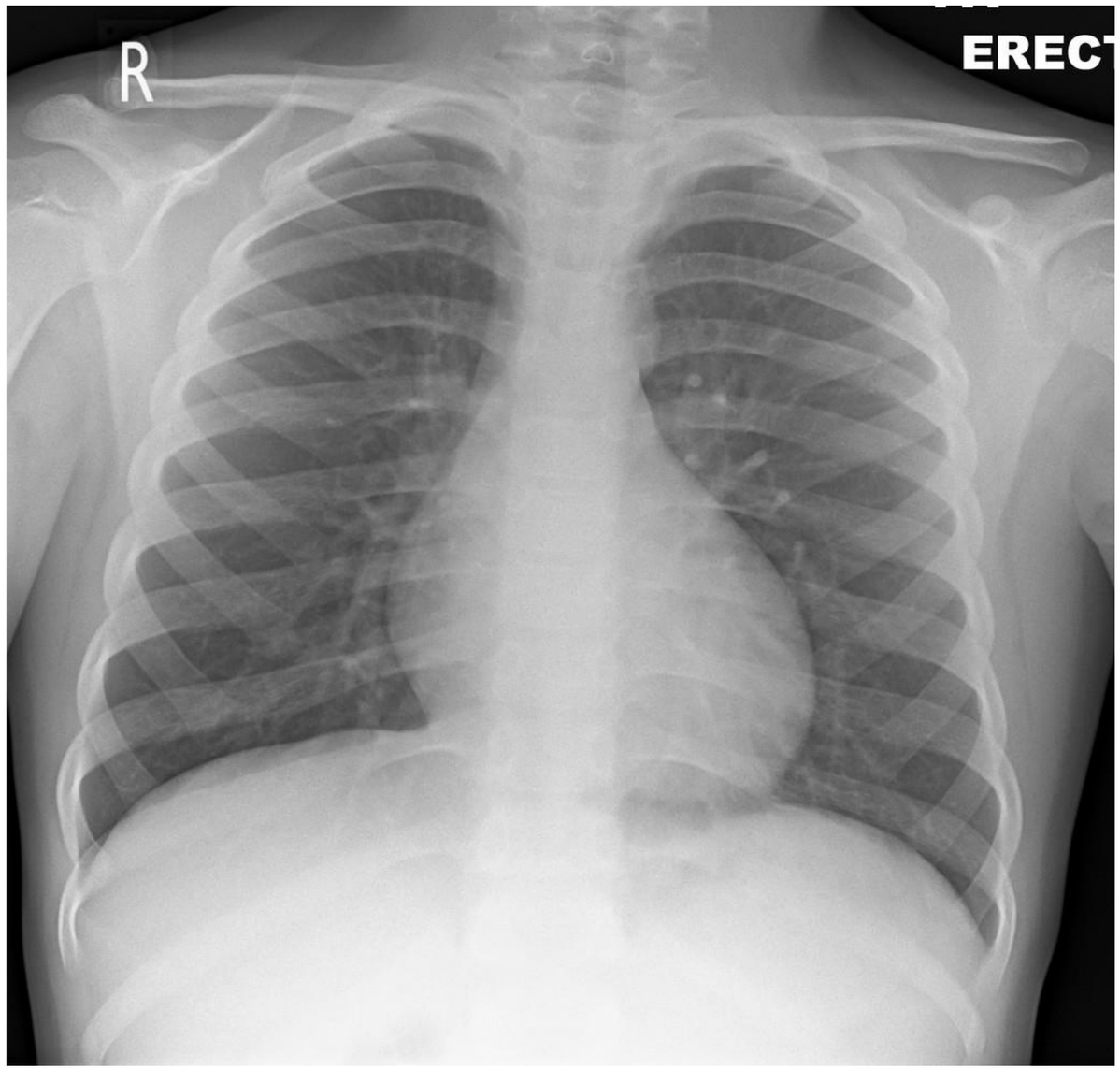
Lungs: b/l CTA without wheeze or rales.

Abd: soft, NTND, no HSM

MSK: no issues

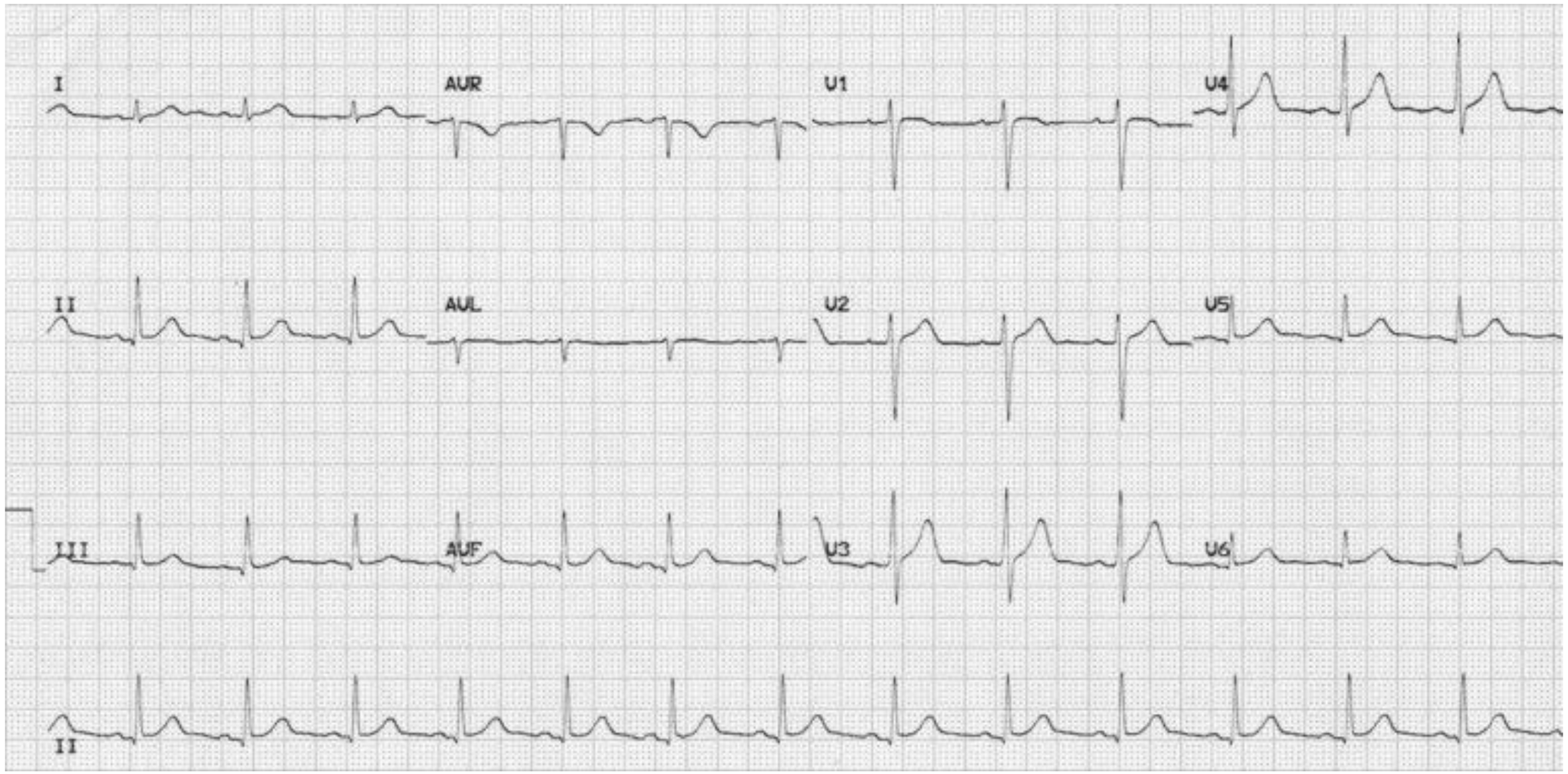
Name that chest pain! (5 points)

Chest x ray



HTTPS://RADIOPAEDIA.ORG/CASES/NORMAL-CHEST-X-RAY-6-YEAR-OLD

EKG



Which of the following is the likely diagnosis in this patient?

a. Costochondritis
b. Idiopathic chest pain
c. Psychogenic chest pain
d. Slipping rib syndrome

Miscellaneous causes of chest pain in children

Depression

Anxiety

Fibrocystic Breast disease

Gyencomastia

Psychogenic chest pain

Herpes Zoster

Name that chest pain! (10 points)

A 12 day old with increased irritability and decreased po intake. x last 24 hours. When you check the weight compared to discharge weight you notice that the weight is 15 grams/day.

Birth Hx: term, no complications,

Temp: 99 F, RR: 30, BP: 70/40, HR: 160's

Physical Exam:

Gen: irritable fussy infant.

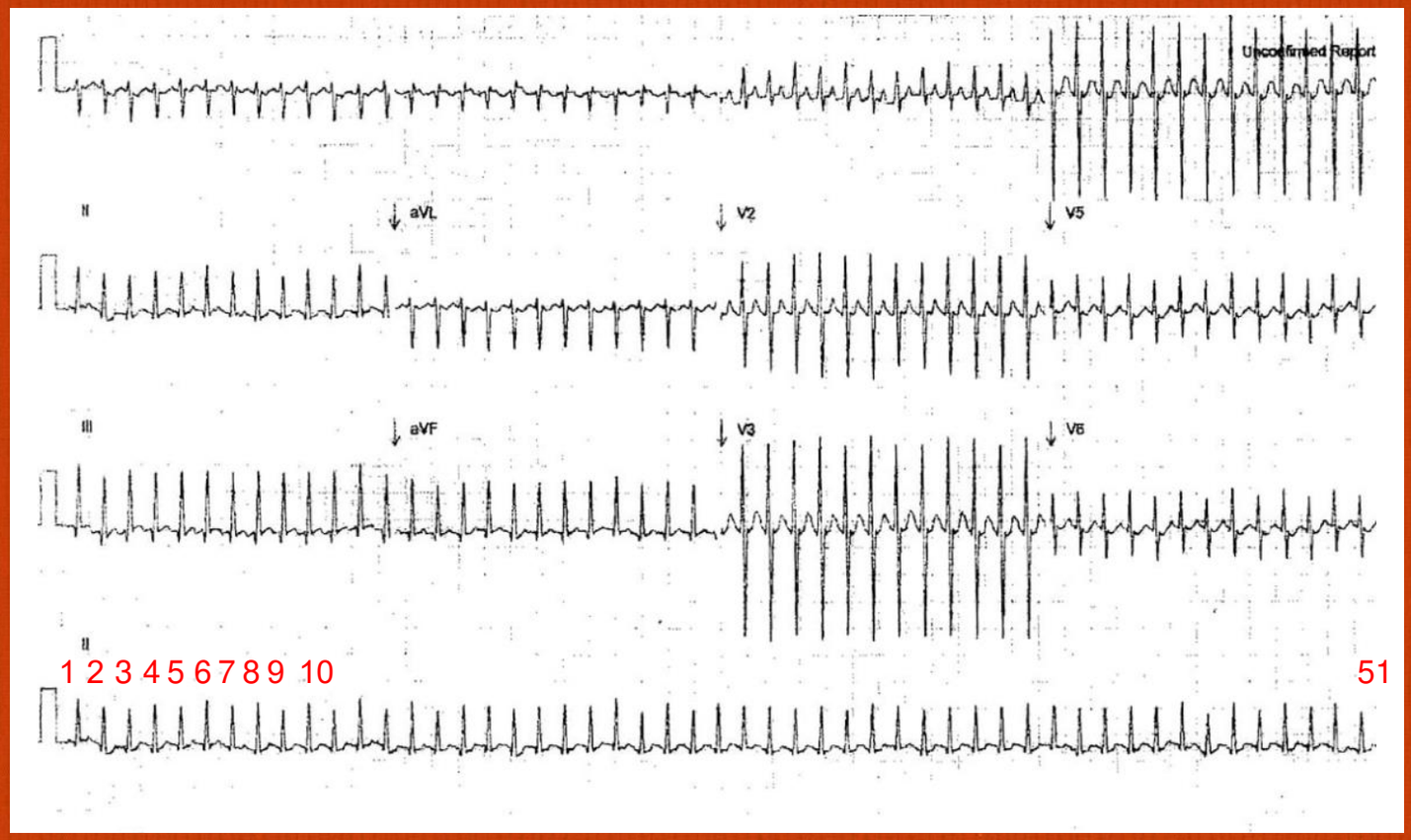
CV: no murmur auscultated

Lungs: b/l CTA.

Abd: soft, NTND, liver 1cm below costal margin

MSK: no issues

EKG


Unconfirmed Report
II
aVL
V2
V5
III
aVF
V3
V6
II
1 2 3 4 5 6 7 8 9 10
51

Which of the following would be the best immediate treatment to administer to this child?

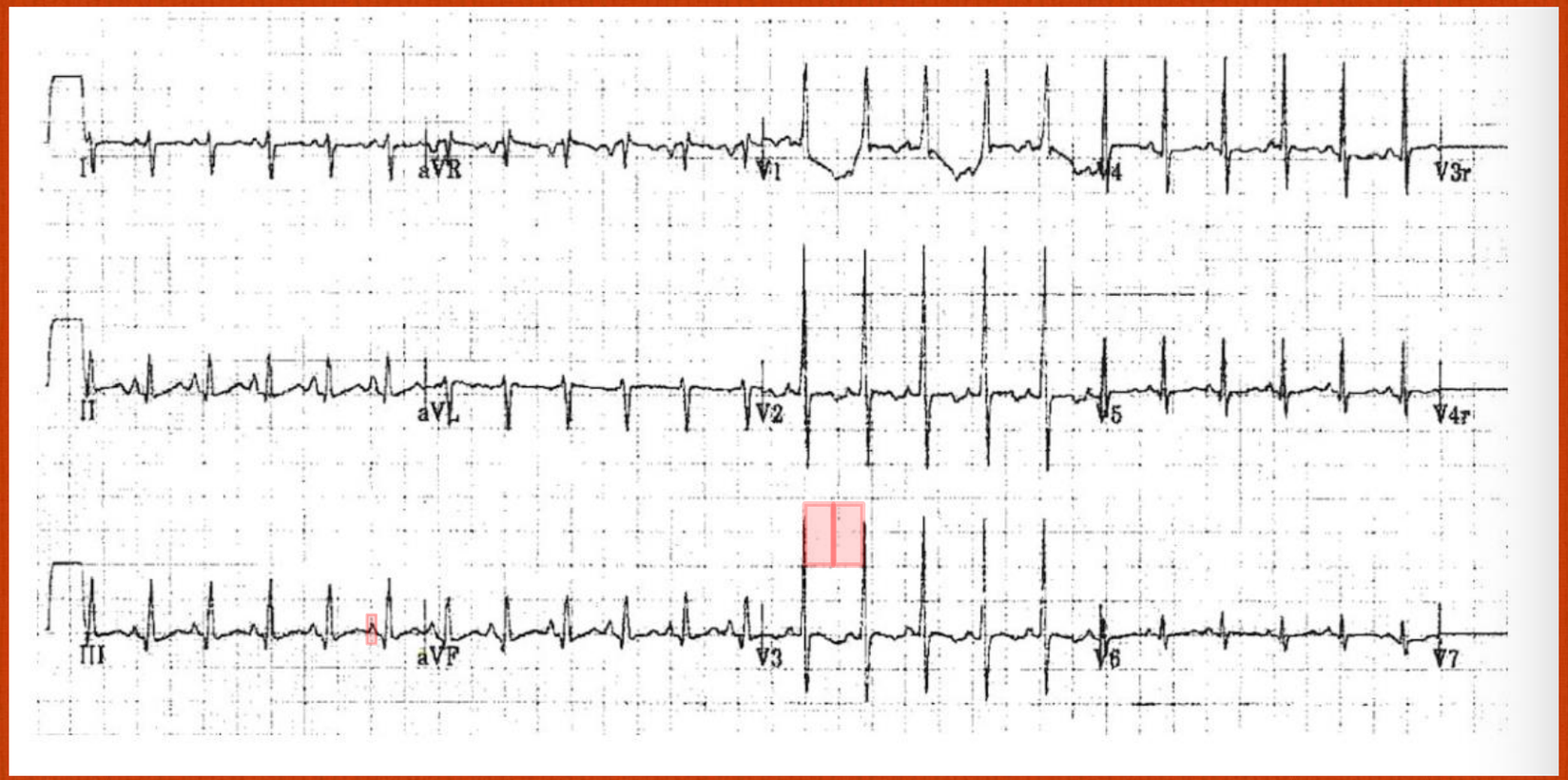
a. Adenosine

b. Amiodarone

c. Defibrillation

d. Synchronized cardioversion

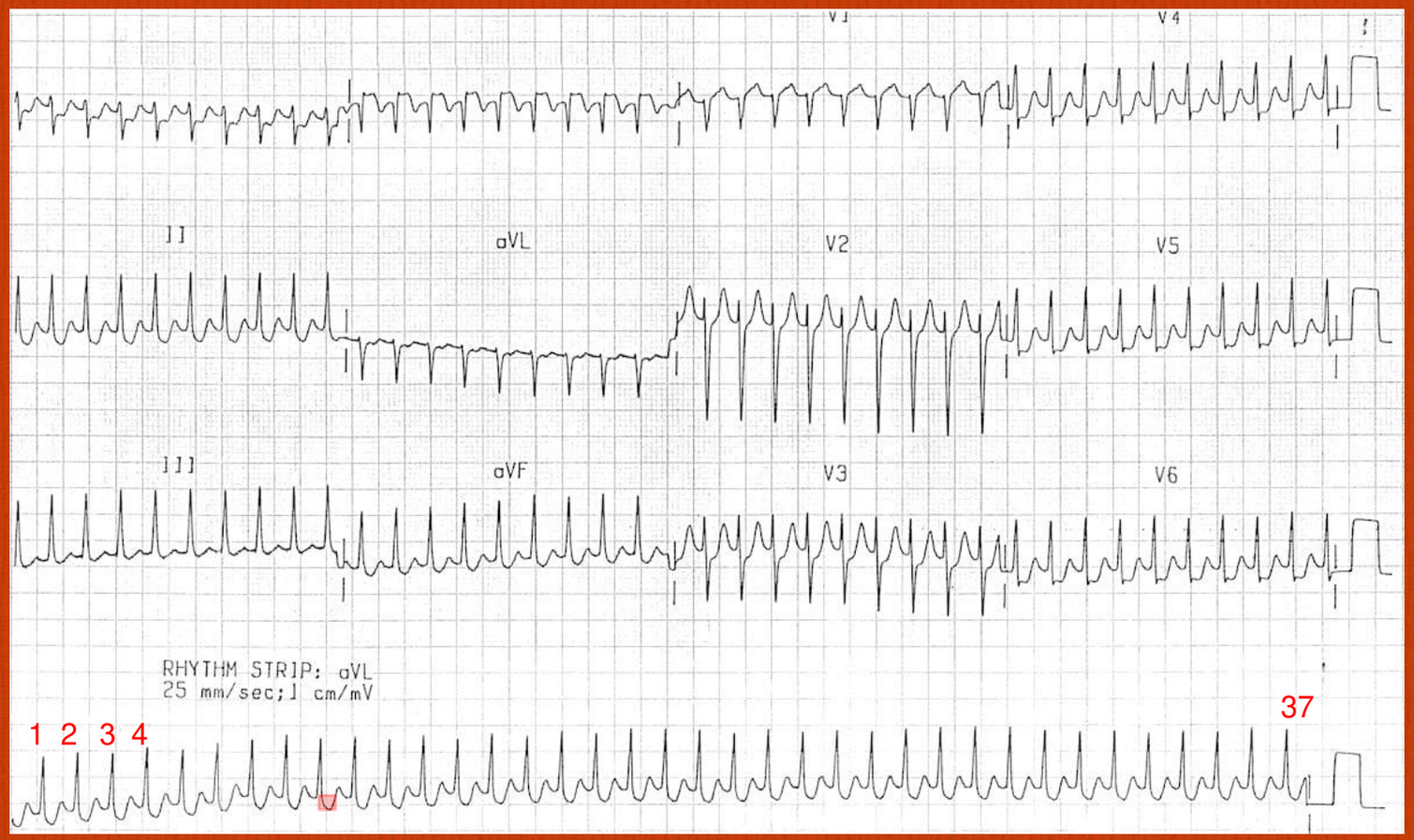
Rhythm After administration of Adenosine



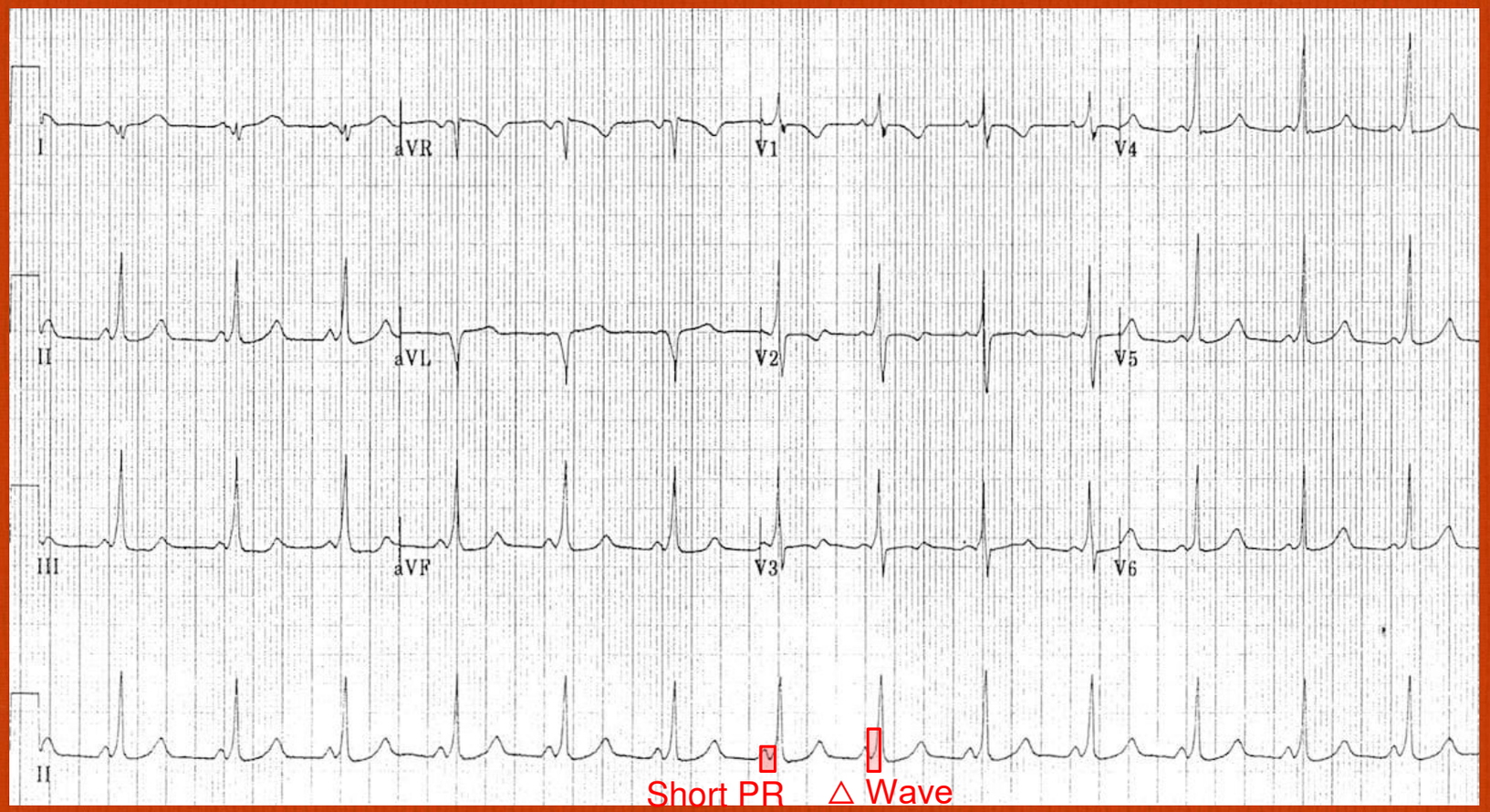
Cardiac symptoms in children

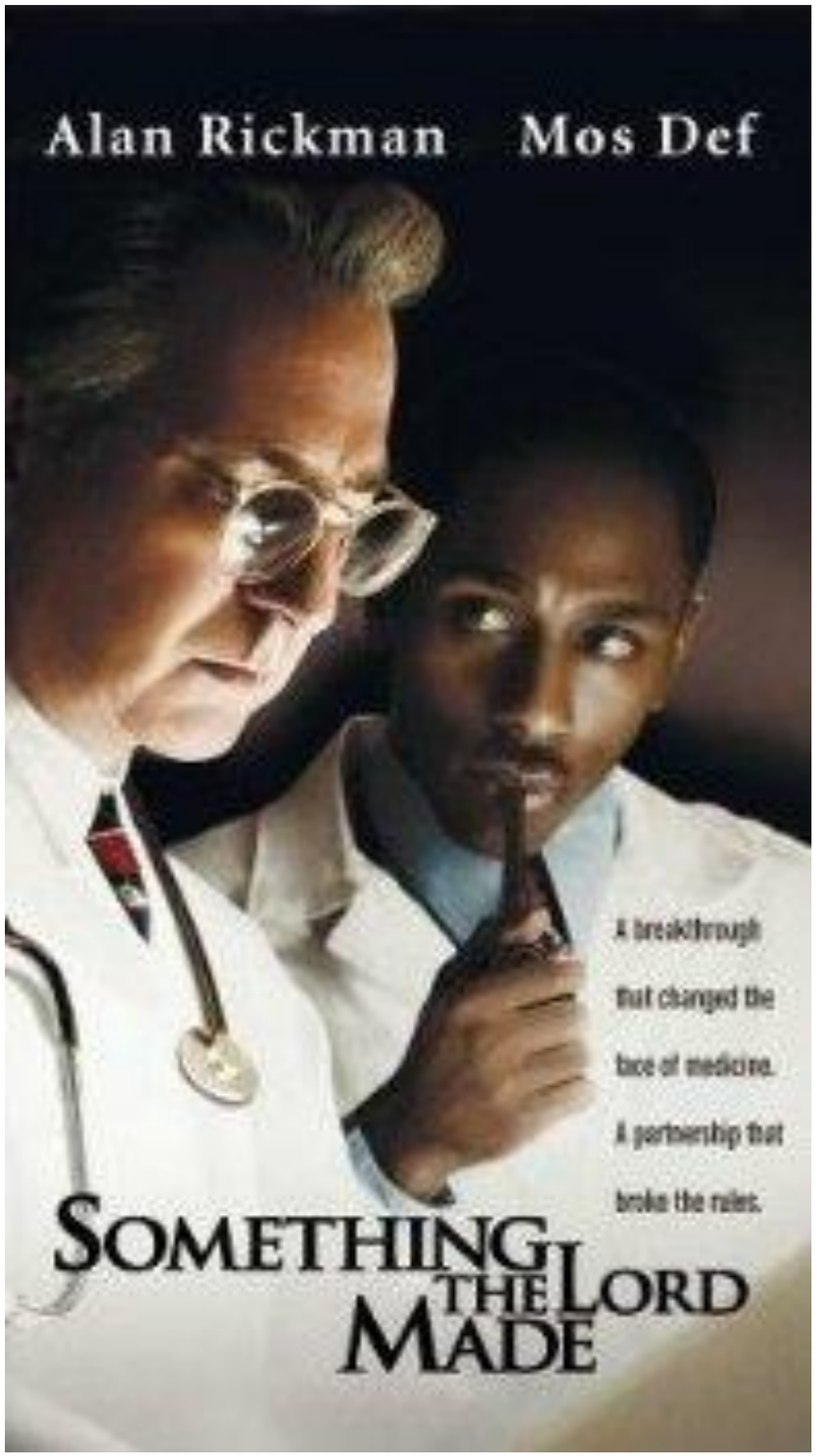
- Poor Feeding
- Irritability
- Nausea
- Vomiting
- Low Energy
- Shortness of Breath

10-Year-old presents with palpitations



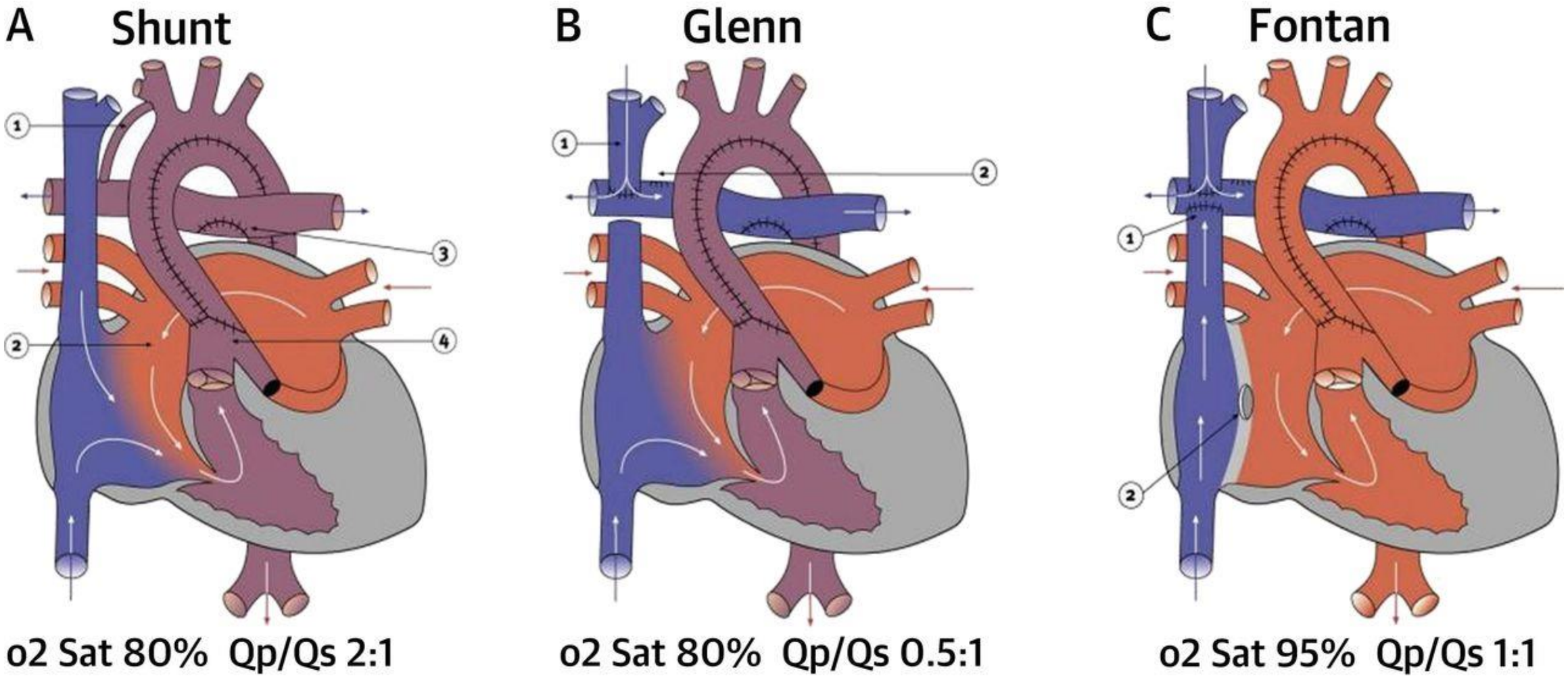
WPW




Alan Rickman
Mos Def
A breakthrough
that changed the
face of medicine.
A partnership that
broke the rules.
SOMETHING THE LORD MADE

Which of the following is the final stage of the single ventricle palliation?

a. Bidirectional Glenn
b. Daymus Kantzeal
c. Fontan
d. Norwood – Sano



Congenital Heart Disease

HTTPS://WWW.ONLINEJACC.ORG/CONTENT/70/6/753

17 yo is playing soccer and has a syncopal episode. Regains consciousness in a few seconds.

- Exam reveals a SEM 3/6 at the base of the heart with radiation to both carotid arteries.
  - 12 lead LVH and ST depression in lead V5 and V6.
  - States sudden midsternal chest pain and lightheadedness prior to passing out.

  ROS: denies any recent URI

Name that chest pain! (10 points)

Which of the following is the best diagnosis in this patient?

a. Aortic stenosis
b. Mitral stenosis
c. Pulmonary stenosis
d. Tricuspid stenosis

Aortic Stenosis

- Valvar Aortic Stenosis is common in children.
- Commonly associated with Coarctation of the Aorta (CoA)
- Most children are asymptomatic
- Often have progressive obstruction and at risk for obstruction and regurgitation
- Diagnosis: physical findings, cardiac catherization, echocardiogram
- Tx:
- Neonate: heart failure
- Child/adolescent
- Valvuloplasty

Acute chest syndrome

- Most common cause of cause of death in children with Sickle cell disease
- Causes: multifactorial: infection and vasoocclusive crisis are most common
- Diagnosis: New pulmonary infiltrates on CXR and 1 of the following
  - Temp> 38.5 C
  - Hypoxemia
  - Tachypnea, wheezing or cough
  - Appearance of work of breathing.
- Acute management:
- Analgesia
- Respiratory support
- Broad spectrum antibiotics

- Previously healthy 14 yo with a 2 day history of substernal chest pain, orthopnea and diaphoresis.
- The symptoms were preceded by 2 days of fever, cough, and sore throat.
- Treated for MSK pain by PCP and sent home.
- Next day……..
- Seen in ED with worsening chest pain
  - VSS
  - PE unremarkable except for pallor

Name that chest pain! (10 points)

ED coarse

- EKG: revealed mild, diffuse ST segment elevation as well as T wave inversion in the lateral leads.
- CBC: normal white blood cell (WBC) count but with 48% neutrophils and 20% bands.
- The troponin-I, creatine kinase-MB (CKMB), and creatine kinase (CK) levels were markedly elevated

Which of the following is the next best step?

a. Order an Echocardiogram
b. Order a chest CT
c. Order a cardiac biopsy
d. Phone a friend for help

Myocarditis

Most common pathogen: Coxsackievirus B

Clinical Presentation:

- Newborns and infants are more severely affected because the immature myocardium has limited ways of adapting to an acute insult.
- Children typically present with sinus tachycardia and gallop on auscultation, cardiomegaly on chest x-ray and small voltages on electrocardiogram.
- Labs: AST
- Imaging: Echocardiogram: reduced function
- Acute treatment: O2 and careful fluid resuscitation
- Mild: diuretics and afterload
- Severe: Inotropy, PPV and ECMO,
- IVIG

16yo male with 1 day history of sharp chest pain that is better sitting up and has difficulty breathing. Denies any recent URI.

PMhx: non contributory

Physical exam
Vitals: T: 99.0, RR: 25, BP: 100/82, P: 100

Gen: Adolescent sitting on table leaning forward

CV: RRR with + rub

Lungs: b/l CTA

Abd: soft, NTND

CXR: cardiomegaly

Name that chest pain! (10 points)

Which of the following is the most likely diagnosis in this patient?

a. Pleural effusion

b. Pericarditis

c. Pneumonia

d. Myocardiits

Pericarditis

History

- Presents as sharp retrosternal chest pain, radiates to the left shoulder
- Aggravated by lying down
- Narrow pulse pressure

Treatment:

- Relief of pain
- Resolution of inflammation
- Prevention of recurrence.

Causes of cardiac chest pain in children

Pulmonary embolus:

- Pulmonary hypertension
- Acute chest syndrome (sickle cell).

Inflammation

- Pericarditis
- Myocarditis
- Coronary artery anomalies:
- congenital or acquired.

Aortic root dissection:

- Marfan
- Ehlers-Danlos IV
- Turner syndrome.

Causes of cardiac chest pain in children

Left ventricular outflow obstruction

- Hypertrophic cardiomyopathy
- Supra-, sub- or valvar aortic stenosis
- Coarctation of the aorta

Arrhythmias

- Heart Block
- Dysrhythmia

Toxic causes of chest pain

- Methylphenidate: risk of dysrhythmia
- Tetrahydrocannabinol (THC) in high-potency marijuana has been linked to myocardial ischemia, ventricular tachycardia, and ventricular fibrillation.
- Synthetic THC: have a higher affinity to cannabinoid receptors, conferring higher potency, and therefore worse adverse effects.
- Cocaine: causes hypertension, tachycardia and MI.

Summary

- Every chest pain patient warrants a through work up.
- History and physical usually arrive you at your dx.
- Musculoskeletal is the most common cause in pediatrics
- Chest pain at rest with normal ECG and echocardiogram is nearly always non-cardiac in origin.