

North Carolina Academy of Physician Assistants
Cardiology Review 2017

Morton A. Diamond MD FACP FAHA FACCE

mdiamond@nova.edu

Cell Phone: 954 802 7100

My Cardiovascular Topics...

- **Congenital Heart Disease**
- **Valvular Diseases**
- **Vascular Diseases**
- **“Other Forms of Heart Disease”**

NCAPA

Let's Try to Learn...

- **Asking Questions**
- **“Side-by Side”**
 - **Comparing and Contrasting Different Disorders Having Similar Clinical Presentation**

To Save Time...

Correct Answers to Questions Are in Larger Type

Some Questions Have More than One Correct Answer

I Do Not Have Time to Address Incorrect Distracters

“E” Is for Enrichment

**Additional Clinical Information that Will Help
You on the PANRE**

Please review the “E” slides at your leisure

**You will find the “E” Slides at the end of this
power point presentation**

An Example of Enrichment

A 70-year-old man has claudication. Examination shows absence of bilateral femoral and distal arterial pulses. Which of the following is most likely to be noted in this patient?

- A. Erectile dysfunction**
- B. Loss of proprioception in toes**
- C. Restless legs syndrome**
- D. Retrograde ejaculation**
- E. Autonomic orthostatic hypotension**

An Example of Enrichment

B. Loss of proprioception in toes

Vit. B 12 deficiency; diabetic, uremic, alcoholic peripheral neuropathy

C. Restless legs syndrome

iron deficiency; pregnancy; uremia; parkinson's; diabetes; venous insufficiency; medicines

D. Retrograde ejaculation

genitourinary autonomic dysfunction, usually diabetic

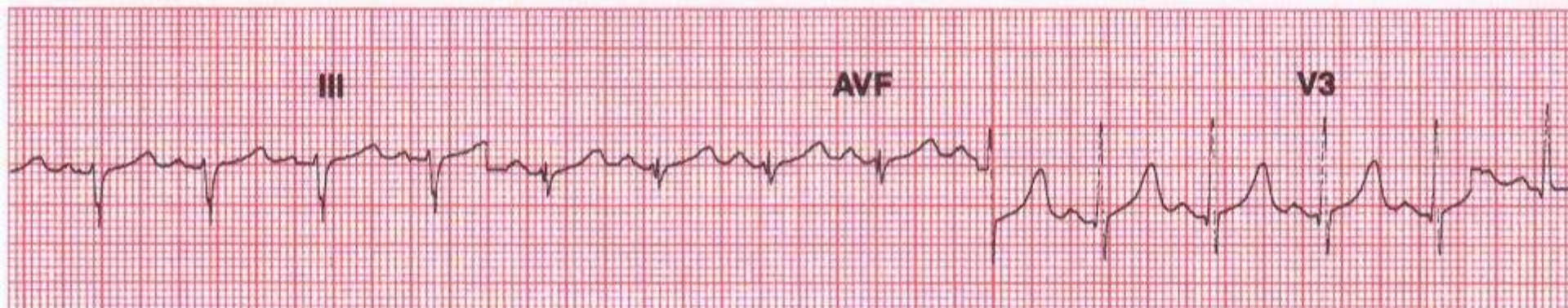
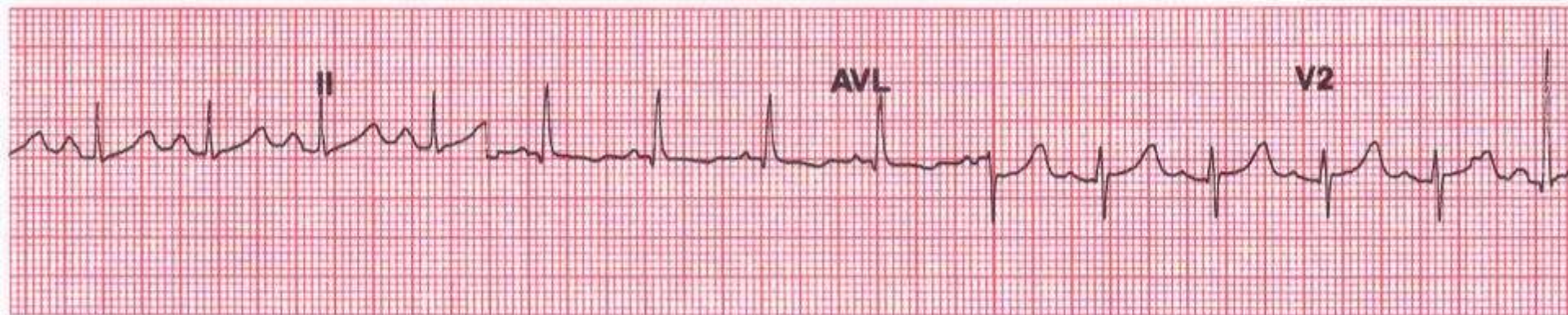
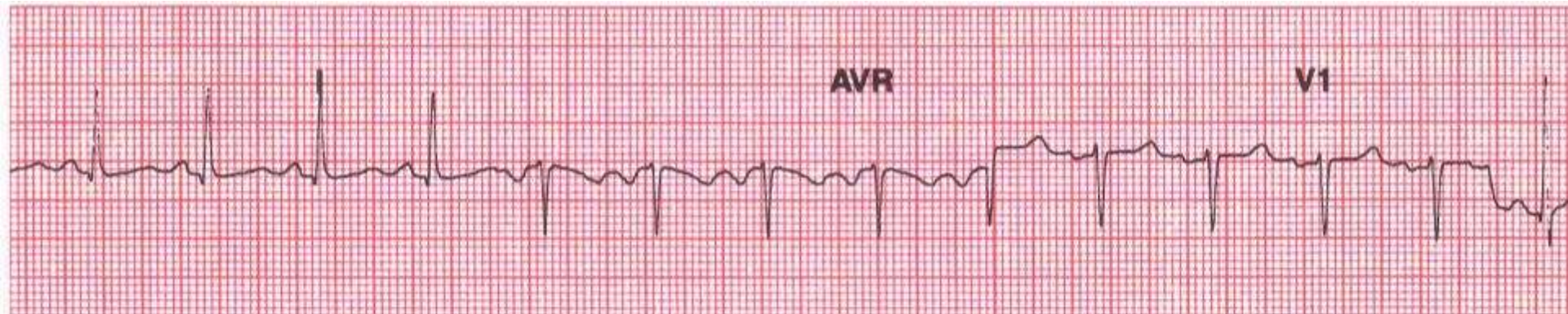
E. Autonomic orthostatic hypotension

cardiac autonomic dysfunction, usually diabetic

LONG QT Interval

- **Can be hard to diagnose !**
- **Genetic, inherited
Ion channel defect**
- **Structurally normal heart**
 - **Normal cardiac exam when
patient is asymptomatic**

Long QT



Long QT Interval

Classic Clinical Presentation

When Sympathetic Nervous System Is Activated

- **Syncope, often with tonic-clonic seizures**
- **Sudden Cardiac Death / Crib Death**
 - **Caused by Torsades de Pointe**
(ventricular tachycardia)

Long QT Interval

Often, Misdiagnosed as Epilepsy !

Mimics of Epilepsy

- **Syncope of any etiology**
- **Hypoglycemia**
- **Postural Orthostatic Tachycardia (POTS)**

An 4-year-old boy faints while running. Upon awakening, vital signs are normal. The patient is alert and pink. Cardiac and neurologic exams are normal. Which of the following is the most likely diagnosis?

- A. Hypertrophic obstructive cardiomyopathy**
- B. 3rd degree atrioventricular block**
- C. Vasovagal syncope**
- D. Long QT interval syndrome**
- E. Congenital aortic valve stenosis**

A 11-year-old boy has long QT syndrome. He is most likely to faint during which of the following?

- A. Vomiting**
- B. Drinking a cold liquid**
- C. Engaged in a heated argument**
- D. Arising quickly from bed**
- E. Venipuncture**

A patient who has long QT syndrome is most likely to have syncope caused by which of the following?

- A. Orthostatic hypotension**
- B. 3rd degree atrioventricular block**
- C. Ventricular tachycardia**
- D. Hypoglycemia**
- E. Atrial fibrillation**

Acquired long QT interval

Acquired long QT syndrome

- **May occur at any age**
- **Occurs with low serum K, Mg, Ca concentrations**
- **Associated with intake of many medicines**

cont'd

Drug-Related Prolongation of QT

- **Drug-Related Prolongation of QT Interval often Occurs in Those Who Have the Genetic Mutation**
- **But, the Long QT Only Appears when the Patient Is Exposed to a Certain Drug**

Drug-Related Prolongation of QT

Drugs that prolong the QT interval

- **Class 1 anti-arrhythmics: procainamide, quinidine**
- **Anti-anginal: ranolazine**
- **Antibiotics: macrolides, quinolones**

Be Careful...

Avoid prescribing a medicine that causes prolongation of QT interval in a patient who has a family history of unexplained sudden death in a child or adolescent.

“Side-by-Side”

Two genetic, inherited conditions:

- **Long QT Syndrome**
- **Hypertrophic Obstructive Cardiomyopathy**

Note the similarity

- **Syncope / Sudden cardiac death**

Note Differences on Physical Examination

An 8-year-old boy faints while running. He awakens spontaneously. Vital signs are normal. An apical lift is felt. A 2/6 ejection murmur is heard medial to the apex. Which of the following is the most likely diagnosis?

- A. Long QT interval syndrome**
- B. Hypertrophic obstructive cardiomyopathy**
- C. Hypoglycemia**
- D. Heightened vagal tone**

**Remember These 2 Causes of Syncope
and Sudden Cardiac Death in Children,
Adolescents and Young Adults**

- **Long QT interval**
- **Hypertrophic Obstructive Cardiomyopathy**

Hypertrophic Obstructive Cardiomyopathy (HOCM)

Focus on HOCM:

- **Autosomal Dominant Inheritance**
- **Structurally Abnormal Heart**
Inappropriate Left Ventricular
Hypertrophy (LVH)
- **Pathophysiology**
Hypercontractile LV
Stiff (non-compliant) LV

HOCM

Classic physical signs in HOCM:

- **Apical lift**
- **S4 gallop = stiff, non-compliant ventricle**
- **Ejection murmur medial to apex**
- **Bisferiens carotid pulse***

*** If dynamic LV obstruction is present**

Clinical presentation in HOCM

- **Syncope**
- **Sudden cardiac death**
- **Dyspnea with effort****
- **Angina pectoris****

(not in long QT syndrome)**

Maneuvers in Heart Murmur Evaluation

A 15-year-old boy faints while playing basketball. Examination shows an apical lift without murmur or gallop. Which of the following maneuvers may be used to suggest the diagnosis of HOCM?

2 correct answers

- A. Valsalva strain**
- B. Amyl nitrite inhalation**
- C. Squatting**
- D. Cold water immersion**

(Making LV Transiently Smaller Brings Out the Murmur)

HOCM

On the other hand...

If the patient suspected of HOCM has a systolic murmur near the apex...

- **Moving from standing to squatting**
- **Hand grip**

Both reduce intensity of the murmur

(Making LV transiently larger reduces intensity of murmur)

A 12-year-old girl has anterior chest pressure radiating into her neck when playing soccer. Symptoms end with 5 min of rest. Vital signs are normal. An apical lift and 3/6 ejection murmur medial to the apex are noted. Which of the following is the most likely diagnosis?

- **Hypertrophic obstr. cardiomyopathy**
- **Mitral valve prolapse**
- **Pre-excitation syndrome**
- **Long QT interval syndrome**

A 12-year-old girl has dyspnea when walking up a flight of stairs. Symptoms spontaneously end with 2 min of rest. Vital signs are normal. An apical lift, 3/6 ejection murmur medial to the apex, and apical S4 gallop are noted. Which of the following is the most likely diagnosis?

- **Long QT syndrome**
- **Mitral valve prolapse**
- **Hypertrophic obstr. cardiomyopathy**
- **Atrial septal defect**

Note How Easy it Is to Write HOCM Questions

3 Good Questions on Hypertrophic Obstructive Cardiomyopathy

One on Syncope

One on angina pectoris

One on dyspnea (diastolic heart failure)

“Side-by-Side”

Long QT

Structurally normal

Genetic, inherited

Exam normal

HOCM

**Structurally
abnormal**

Genetic, inherited

Exam abnormal

cont'd

“Side-by-Side”, cont’d

Long QT

Syncope

SNS Stim

HOCM

Syncope

SNS Stim + / -

Dyspnea

Angina pectoris

Remember....

**Children and Adolescents May Have
Angina Pectoris**

Pre-excitation Syndrome

Pre-excitation syndrome

- **Congenital**
 - **Genetic in 3%**
- **Structurally normal heart**

Therefore: cardiac exam is normal

cont'd

Pre-excitation syndrome

- **Accessory pathways bypass AV node**
- **Patients may have narrow QRS paroxysmal supraventricular tachycardia (PSVT)**
- **Patients may have atrial fibrillation with very fast heart rate (accessory pathway conduction)**
- **AF may rapidly degenerate into fatal ventricular fibrillation**

Pre-excitation syndrome

Clinical Presentation

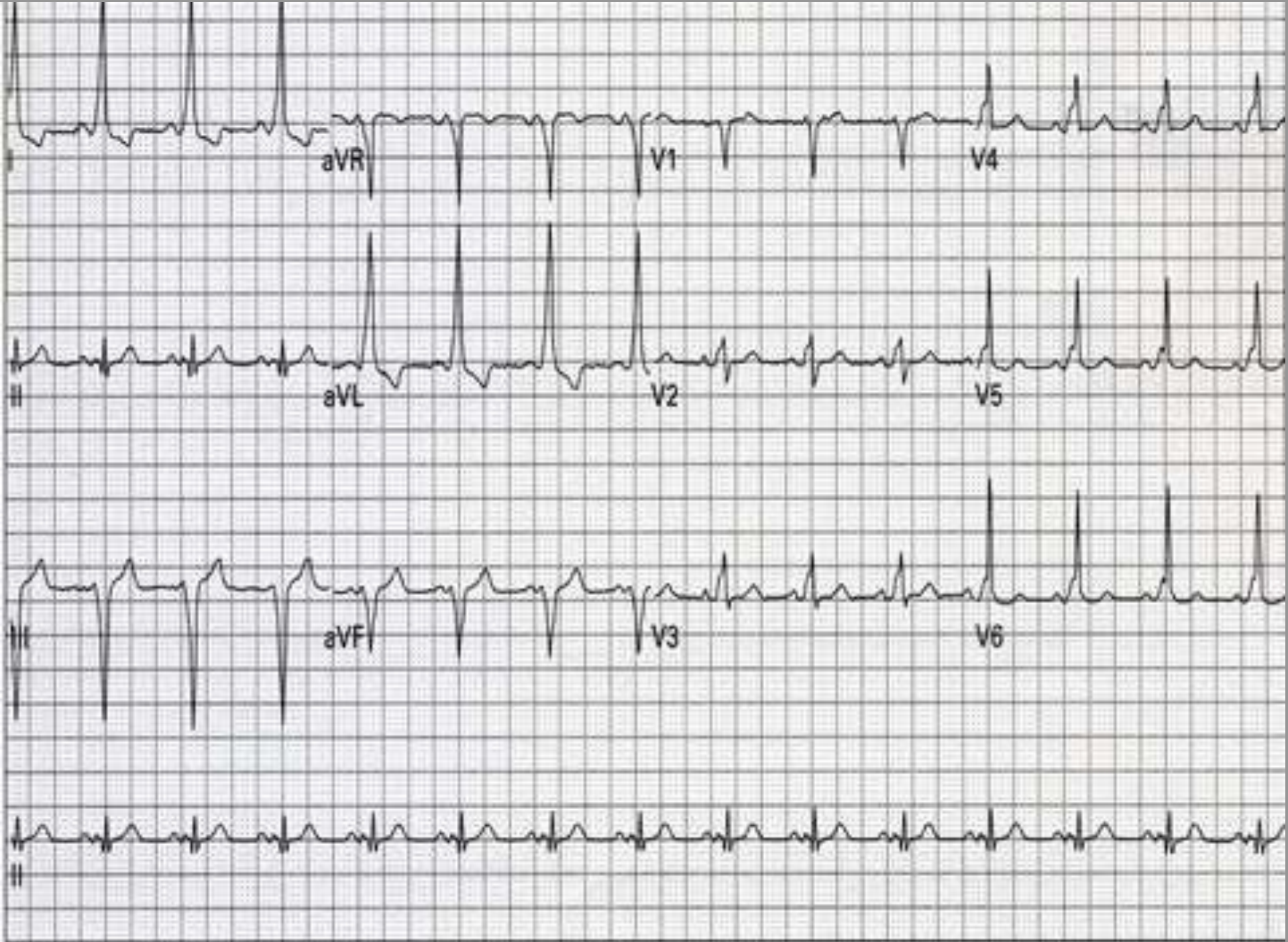
- **Palpitations**
- **Syncope**
- **Sudden cardiac death**

Note similarity to long QT syndrome

Pre-excitation syndrome

- **EKG: short PR interval; delta wave in upstroke of QRS complex**
- **Do NOT give any medication that slows atrioventricular conduction*****

*****With caution they may be used to treat PSVT with narrow QRS complex**



A 14-year-old girl has the sudden onset of very fast heart beat that spontaneously ends in 5 minutes. Electrocardiography shows sinus rhythm, short PR interval and delta wave. Which of the following medicines is contraindicated?

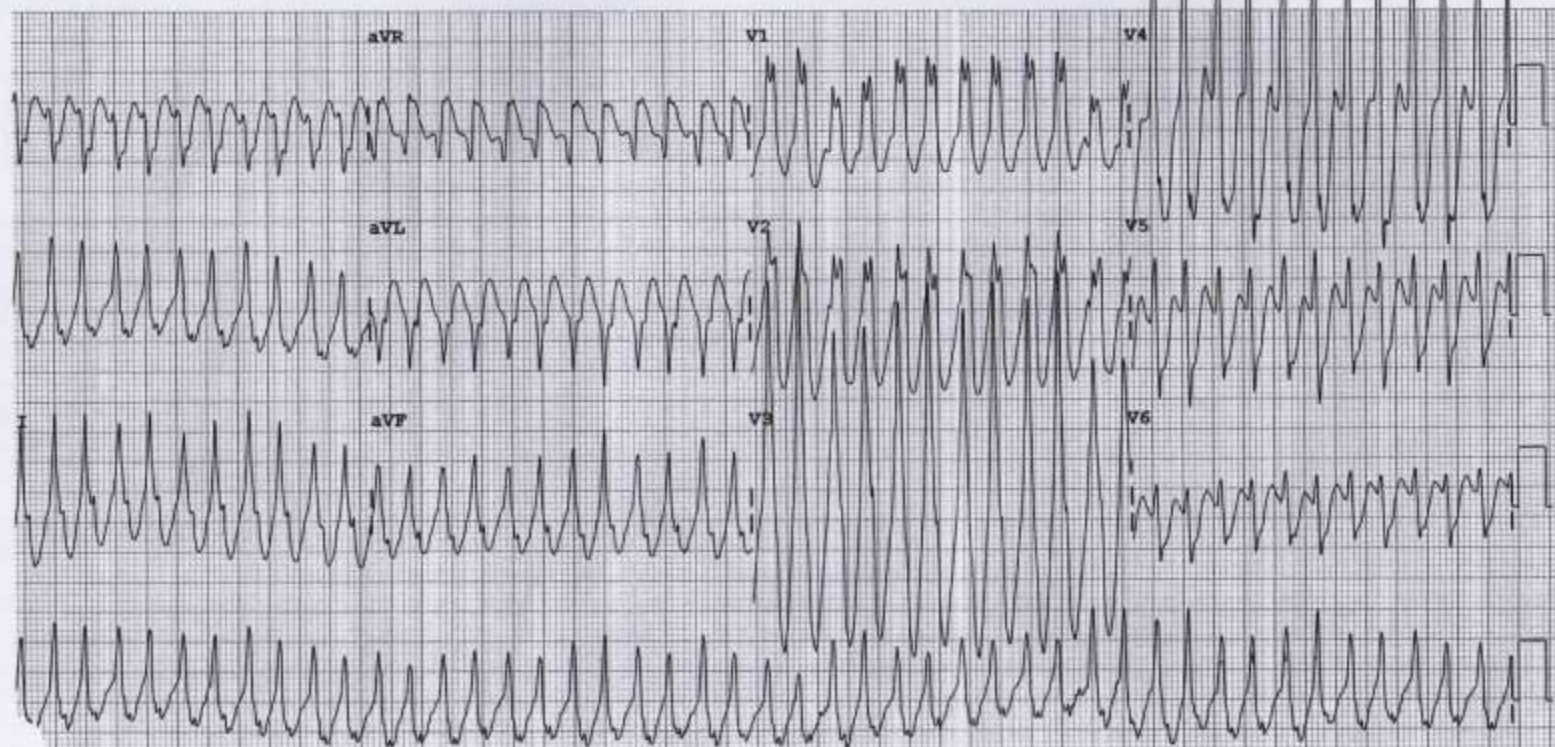
- A. Metoprolol**
- B. Verapamil**
- C. Digoxin**

answer next slide...

**Metoprolol, Verapamil and Digoxin
ARE ALL CONTRAINDICATED**

Because they all slow atrioventricular conduction:

**Thus, promoting conduction through the
accessory pathway that, in turn, can lead
to atrial fibrillation or ventricular
fibrillation**



Let's Review "Side-by-Side"

| | Syncope/SCD | Angina | Exam (pt asx) |
|-------------------|--------------------|---------------|--------------------------|
| Long QT | + | - | NL |
| HOCM | + | + | Abn |
| Pre-excit. | + | - | NL |

cont'd

“Side by Side”

Counseling Is Important...

Family Screening

Long QT

Yes

HOCM

Yes

Pre-excitation

No

Congenital Heart Disease

Atrial Septal Defect (ASD)

- **Pathophysiology:**
 - **Blood moves from left to right atrium**
 - **Right ventricle has increased volume of blood (increased preload) to eject into pulmonary arteries**
- **Usually asymptomatic till adulthood**

Atrial Septal Defect, cont'd

- **Classic signs**
 - **left parasternal lift**
 - **pulmonic area ejection murmur**
 - **fixed splitting of S2 during respiration**

- **Chest radiography: dilated pulmonary arteries and increased pulmonary vascularity**

Examination of an asymptomatic 14-year-old boy shows a left parasternal lift, 2/6 pulmonic area ejection murmur and fixed splitting of S2. Which is the expected abnormality on chest radiography?

(Note: 2 Answers)

- A. Dilated left ventricle**
- B. Pericardial effusion**
- C. Dilated pulmonary arteries**
- D. Dilated aortic root**
- E. Increased pulmonary vascularity**

Ventricular Septal Defect

Key to Diagnosis

- **Holosystolic murmur along lower left sternal border**
- **Compare to tricuspid valve regurgitation**
- **Symptoms, signs, and management depend upon size of defect**

A newborn infant has a holosystolic left sternal border murmur and is diagnosed with a small ventricular septal defect. Which of the following is appropriate counseling to the parents?

- A. Endocarditis prophylaxis is indicated**
- B. Surgical closure should be performed at 12 months**
- C. Spontaneous closure is common**
- D. Familial genetic screening is indicated**
- E. Low sodium solid foods introduced at 5 months**

Endocarditis Prophylaxis

**In 2007 the American Heart Association Made
Major Revisions in Recommendations for
Endocarditis Prophylaxis**

Endocarditis Prophylaxis

Prophylaxis is recommended for patients with:

- **Prosthetic heart valves (bioprosthetic and mechanical)**
- **History of endocarditis**
- **Unrepaired cyanotic congenital defects**
- **Transplanted heart w/ valvular disease**
- **Repaired congenital heart disease w/
residual defects**

Endocarditis Prophylaxis Is No Longer Recommended for Patients with...

- **Bicuspid aortic valve**
- **Acquired mitral and aortic valve disease**
- **Hypertrophic obstructive cardiomyopathy**
- **Ventricular or atrial septal defect**
- **Mitral valve prolapse**

Endocarditis prophylaxis is indicated in a patient who has which of the following conditions?

(Note: 3 correct answers)

- A. Bicuspid aortic valve**
- B. Tetralogy of Fallot**
- C. Prosthetic valve in aortic position**
- D. History of endocarditis**
- E. Mitral valve prolapse**

Endocarditis Prophylaxis

Remember...

- **Endocarditis Prophylaxis Is Intermittent**
- **Rheumatic Fever Prophylaxis Is Continuous**

Coarctation of aorta

Coarctation of aorta

- **Blood pressure high and equal in both arms (~95%)**
- **Lower blood pressure in legs**
- **Radial-femoral pulse lag (why?)**

cont'd

Coarctation, cont'd

- **60% have bicuspid aortic valve**
 - **Echocardiography screening is indicated in patients who have coarctation**
- **~10% have cerebral aneurysm**

Consider screening w/ magnetic resonance angiography

Riding the Escalator

Note the “Escalator” Character of the Questions

A 16-year-old asymptomatic girl has blood pressure of 160/94 mm Hg in both arms. Blood pressure in the left leg is 120/94. Radial-femoral pulse lag is noted. Which of the following is the most likely diagnosis?

- A. Coarctation of aorta**
- B. Patent ductus arteriosus**
- C. Supravalvular aortic stenosis**
- D. Essential hypertension**

Easy...

Up the Escalator in Difficulty

An 8-year-old boy has coarctation of the aorta. Which of the following is the most likely associated congenital heart anomaly?

- A. Ventricular septal defect**
- B. Atrial septal defect**
- C. Patent ductus arteriosus**
- D. Bicuspid aortic valve**
- E. Patent foramen ovale**

Up the Escalator in Difficulty

An 11-year-old boy has coarctation of the aorta. An ejection click is heard at the apex. Which of the following is the most likely cardiac diagnosis?

- A. Mitral valve prolapse**
- B. Hypertrophic obstructive cardiomyopathy**
- C. Bicuspid aortic valve**
- D. Pulmonary valve stenosis**
- E. Ruptured chordae tendineae**

Turning the Question “Around”

An 11-year-old boy has coarctation of the aorta. Which of the following is the most likely sign to be noted on cardiac examination?

- A. Apical S3 gallop**
- B. Holosystolic murmur along left sternal border**
- C. Ejection click**
- D. Fixed splitting of S2**
- E. Apical diastolic rumbling murmur**

Going Up the Escalator in Difficulty

Six years after surgical repair of coarctation, an 18-year-old man suddenly has an unbearable headache, followed in a few minutes by coma. Which of the following is the most likely diagnosis?

- A. Viral meningitis**
- B. Normal pressure hydrocephalus**
- C. Subarachnoid hemorrhage**
- D. Thrombotic stroke**
- E. Cavernous sinus thrombosis**

Marfan Syndrome

- **Autosomal dominant inheritance**
- **A systemic condition affecting connective tissue**
- **Signs: tall w/ hyper-extensible fingers; pectus deformity; ectopic lens**
- **Increased risk of aortic aneurysm**

cont'd

Marfan Syndrome

Cardiovascular Complications

- **Aortic aneurysm**

Fusiform or Dissecting Aneurysm

**The Key Clinical Point: Fusiform
Aneurysm Increases Risk of Dissection
or Aortic Valve Regurgitation**

cont'd

Management of Patient w/ Marfan Syndrome

- **Restricted physical activity**
- **Beta adrenergic blockers**
- **Serial echocardiography to measure aortic root dimension**
- **Aortic root surgery when appropriate**
- **Family screening**



Questions Related to Marfan Syndrome

Moving Up the “Escalator” in Difficulty

Riding the Escalator on Marfan

A 14-year-old girl is 6' 2" tall, has hyper-extensible fingers and pectus carinatum. Marfan syndrome is diagnosed. Which of the following is proper counseling?

(Note: 2 correct answers)

- A. Repeat echocardiography in 5 years**
- B. May participate in wrestling**
- C. Avoid vigorous contact sports**
- D. Endocarditis prophylaxis**
- E. Family screening**

A 14-year-old boy is 6' 4" tall, has hyper-extensible fingers and pectus carinatum. Which of the following is the most common complication?

- A. Dilated cardiomyopathy**
- B. Rupture of chordae tendineae**
- C. 3rd degree atrioventricular block**
- D. Tricuspid endocarditis**
- E. Dissection of aorta**

Riding Up the Escalator in Difficulty

A 14-year-old boy with Marfan syndrome has the sudden onset of severe, tearing chest pain. Thirty minutes later, blood pressure 60/40 mm Hg, pulse 140/min/. Jugular venous pressure is elevated. Which of the following is the most likely diagnosis?

- A. Dilated cardiomyopathy**
- B. Rupture of chordae tendineae**
- C. Tricuspid endocarditis**
- D. Pericardial tamponade**
- E. Pulmonary embolism**

Up the Escalator in Difficulty

A 14-year-old boy with Marfan syndrome has the sudden onset of severe, tearing chest pain. Thirty minutes later, blood pressure 60/40 mm Hg, pulse 140/min/regular. Jugular venous pressure is elevated. Which of the following is the preferred initial diagnostic test?

- A. MRI imaging of the chest**
- B. CT imaging of the chest**
- C. Echocardiography**
- D. Thallium scintigraphy**

Top of the Escalator in Difficulty

A 14-year-old boy with Marfan syndrome has the sudden onset of severe, tearing chest pain. Thirty minutes later, blood pressure 60/40 mm Hg, pulse 140/min/regular. Which of the following abnormalities on echocardiography is most suggestive of pericardial tamponade?

- A. Pericardial effusion**
- B. Dilated right atrium**
- C. Diastolic collapse of right ventricle**
- D. Calcification of aortic root**

A Brief Review of Aortic Dissection

To Diagnose Aortic Dissection

- **Trans-esophageal Echocardiography (TEE)**
- **Computerized Tomography (CT)**
- **Magnetic Resonance Imaging (MRI)**

To Diagnose Pericardial Tamponade

- **Echocardiography**

Before We Leave Congenital Heart Disease

In a patient who has Down syndrome, which of the following is the most likely associated congenital cardiac anomaly?

Answer: *Atrioventricular septal defect*

Before We Leave Congenital Heart Disease

A pre-term infant is diagnosed with patent ductus arteriosus. Intravenous administration of which of the following is the preferred therapy to close the ductus?

- A. Indomethacin**
- B. Metoprolol**
- C. Atropine**
- D. Sildenafil**
- E. Epoprostenol (Caripul)**

cont'd

Patent Ductus Arteriosus

The inhibitor of prostaglandin synthesis

Indomethacin

- **ONLY is effective in pre-term infants**

Before We Leave Congenital Heart Disease

Transposition of the great arteries is the anomaly most commonly noted in a mother who has which of the following conditions?

Answer: Diabetes mellitus

Before We Leave Congenital Heart Disease

The Special Case of Pregnancy

Increased Risk of Fusiform or Dissecting Aneurysm

- **Patients Who Have Marfan Syndrome**
- **Patients Who Have Bicuspid Aortic Valve**
 - **Monthly or Bimonthly Aorta Evaluation**

Topic Valvular Heart Disease

Aortic valve stenosis (AS):

Etiology

- **“Younger” adult patient (~50 yrs); congenital bicuspid valve**
- **Elderly patient (~80 yrs); valve cusp degeneration**

Aortic valve stenosis (AS)

Classic symptoms

- **Angina pectoris**
- **Dyspnea**
- **Syncope (with effort)**

Do You Remember?

The symptom triad

- **Angina pectoris**
- **Dyspnea**
- **Syncope**

reminds you of what other cardiac disorder?

cont'd

I hope that you are thinking of...

Hypertrophic obstructive cardiomyopathy

Note the different age at presentation:

- **HOCM in the child, adolescent, or young adult**
- **AS presenting at ~ age 50 yrs or ~80 yrs**

AS: Classic physical signs

- **Narrow pulse pressure**
- **Apical lift**
- **Ejection murmur in 2nd right intercostal space**
- **S4 gallop**
- **Slow carotid upstroke w/ murmur in 2nd right intercostal space radiating into carotids**

Precept

**We Should Be Paying More Attention to
Pulse Pressure**

You will see why...

An 88-year-old man has severe aortic valve stenosis. Which of the following is the most likely etiology?

- A. Bicuspid aortic valve**
- B. Endocarditis**
- C. Rheumatic fever**
- D. Degeneration of valve**
- E. History of Kawasaki disease**

Which of the following is the primary pathophysiologic abnormality in aortic valve stenosis?

- A. Increased preload**
- B. Increased contractility**
- C. Decreased systemic vascular resistance**
- D. Increased afterload**
- E. Hypovolemia**

cont'd

Afterload Is the Pressure that a Ventricle Must Generate in Order to Eject Blood

Left Ventricle Afterload Is Increased in Aortic Valve Stenosis or Systemic Hypertension

Right Ventricle Afterload is Increased in Pulmonic Stenosis or Pulmonary Hypertension

Syncope during which of the following activities differentiates aortic valve stenosis from vasovagal syncope?

- A. Arising from bed**
- B. Walking**
- C. Argument**
- D. Bowel movement**
- E. Shaving**

cont'd

A “Final Word” about Syncope

- **The common denominator in syncope is transient generalized cerebral ischemia**

(What is transient “localized” cerebral ischemia?)

A brief review of syncope:

- **Syncope when arising: orthostatic hypotension**
 - **check heart rate w/ blood pressure**

cont'd

A “Final Word” about Syncope, cont’d

- **Syncope during argument: myocardial ischemia in older patient; long QT syndrome in child**
- **Syncope caused by arrhythmia often not associated with premonitory symptoms**
- **Acute myocardial infarction in women and elderly: often, syncope w/out chest pain**

cont’d

A “Final Word” about Syncope, cont’d

Neurocardiogenic Syncope (Vasovagal)

- **with prolonged, motionless standing**
- **during emotional distress, e.g., venipuncture**
- **when urinating, defecating, shaving, swallowing**

Which of the following is the preferred diagnostic test to confirm a diagnosis of neurocardiogenic syncope?

- A. Electroencephalography**
- B. Ambulatory cardiac monitoring**
- C. Tilt table testing**
- D. Electrophysiologic cardiac testing**
- E. Edrophonium (Tensilon) test**

“Back To” Aortic Valve Stenosis

- **Left ventricular hypertrophy (LVH) is the heart’s compensation to increased afterload**
- **LVH increases myocardial oxygen demand**
- **This is why patients w/ aortic stenosis get angina pectoris**

Aortic valve stenosis

- **LVH makes the left ventricle STIFF (non-compliant)**
- **A stiff ventricle → increased LA pressure → increased pulmonary capillary pressure → dyspnea**

This is DIASTOLIC HEART FAILURE

A 77-year-old man has dyspnea related to aortic valve stenosis. Which of the following is the pathophysiologic abnormality causing the dyspnea?

- A. Reduced cardiac output**
- B. Increased pulmonary vascular resistance**
- C. Decreased left ventricular compliance**
- D. Decreased left ventricular end-diastolic pressure**
- E. Coronary artery spasm**

Aortic valve stenosis

Treatment of severe AS

Valve replacement

- **Younger patient: mechanical valve**
- **Older patient: bioprosthetic valve**

Why the difference?

Both valves require endocarditis prophylaxis

(cont'd)

Prosthetic Heart Valves

The need for which of the following differentiates a mechanical heart valve from a bioprosthetic valve?

- A. Endocarditis prophylaxis**
- B. Vitamin B12 therapy**
- C. Long-term anticoagulation**
- D. Folic acid therapy**
- E. Serial echocardiographic studies**

Remember

You have to be smart...

If the patient with valve disease is in atrial fibrillation indefinite anticoagulation is necessary

Aortic valve regurgitation

May Be Acute...

- **Endocarditis**
- **Dissection of aorta**

The common presentation of acute, severe aortic valve regurgitation is acute pulmonary edema

Acute aortic regurgitation

Which of the following is a risk factor for dissection of the aorta?

- A. Systemic hypertension**
- B. Marfan syndrome**
- C. Bicuspid aortic valve**
- D. Giant cell arteritis**
- E. Cocaine use**

cont'd

The Same Question, Now Answered

Which of the following is a risk factor for dissection of the aorta?

- A. Systemic hypertension**
- B. Marfan syndrome**
- C. Bicuspid aortic valve**
- D. Giant cell arteritis**
- E. Cocaine use**

ALL ARE CORRECT

Acute aortic valve regurgitation

An 82-year-old hypertensive woman has the sudden onset of severe, tearing posterior chest pain. BP 160/96 mm right arm; BP 126/90 left arm. A new 2/6 LSB diastolic blowing murmur is heard. Which of the following is the most likely diagnosis?

- A. Acute myocardial infarction**
- B. Rupture of chordae tendineae**
- C. Dissection of aorta**
- D. Tension pneumothorax**
- E. Pulmonary embolism**

(Note: I am giving you 2 clues to the diagnosis)

Chronic aortic valve regurgitation

OR... Aortic regurgitation may be chronic

- **Bicuspid aortic valve**
 - **Degeneration of valve cusps**
 - **Hypertension**
 - **Aortic root disease**
- cont'd**

Chronic Aortic Valve Regurgitation

Aortic root disease, cont'd

- **Marfan syndrome**
- **Systemic hypertension**
- **Ankylosing spondylitis**
- **Reactive arthritis**
- **Syphilis**

The symptoms of moderate or severe chronic aortic valve regurgitation

- **Palpitations**
- **Dyspnea: exertional; orthopnea**

Chronic aortic valve regurgitation

Which of the following is the primary pathophysiologic abnormality in chronic aortic regurgitation?

- A. Increased systemic vascular resistance**
- B. Increased preload**
- C. Decreased circulating blood volume**
- D. Decreased ventricular compliance**

Chronic aortic valve regurgitation

Signs

- **dilated LV related to increased preload**
- **hyperdynamic arterial pulses**
- **increased pulse pressure**
- **diastolic murmur (left or right sternal border)**

Complication

- **systolic heart failure**

Systolic HF

Pathophysiology

**Increased preload → LV dilation → Decreased
contractility → Reduced LV ejection fraction →
Decreased stroke volume → Decreased cardiac
output → Weakness / fatigue**

The “Constant” in systolic heart failure

- **Dilated ventricle (increased preload)**
- **The increased preload may be due to:**
 - **Valvular disease**
 - **Primary myocardial disease**

Contrasting Diastolic and Systolic HF

Diastolic HF

- **Stiff (non-compliant) LV → increased left atrial pressure → increased pulmonary venous pressure → dyspnea**
- **Usually (but, not always) associated with increased afterload and LVH**
- **LVH = apical lift**

Treatment of chronic aortic regurgitation

A. Surgery

B. In non-surgical candidates

- ACE Inhibitor
- Beta adrenergic blocker
- Loop diuretic

This is the medicinal treatment of chronic systolic HF of any cause

An 82-year-old woman has a 1 month history of increasing weakness. BP 150/50, pulse 102/min/regular. Apical impulse is in the 6th ICS in anterior axillary line. A 2/6 LSB diastolic murmur and apical S3 gallop are heard. In addition to furosemide and metoprolol, which of the following is the preferred medicine to be administered?

- A. Hydralazine**
- B. Digoxin**
- C. Captopril**
- D. Verapamil**
- E. Doxazosin**

Never, Never

Never administer a calcium channel blocker to a patient who has...

- **Systolic heart failure**
- **Unstable angina pectoris**
- **Acute myocardial infarction**

Mitral Valve Stenosis

Variable clinical presentation:

- **Pulmonary edema**
- **Systemic embolism, esp. w/ atrial fibrillation**
- **Hemoptysis**
- **Exertional dyspnea**

Presence of which of the following differentiates mitral stenosis from aortic stenosis when both patients are in normal sinus rhythm?

- A. Dyspnea**
- B. Angina pectoris**
- C. Syncope**
- D. Hemoptysis**
- E. Embolism**

(Note: 2 correct answers)

Escalator Questions

A 62-year-old man has the sudden onset of a cold, painful right arm. BP 112/64 mm Hg; pulse 130/min/irregularly irregular. The right forearm and hand are pallid and cold. No pulses are felt in the right arm or wrist. Which of the following is the most likely diagnosis?

- A. Brachial artery embolus**
- B. Subclavian steal syndrome**
- C. Polyarteritis nodosa**
- D. Sympathetic neurodystrophy**

A 42-year-old woman has the sudden onset of a cold, painful right arm. BP 112/80 mm Hg; pulse 130/min/irregularly irregular. The right forearm and hand are pallid and cold. No pulses are felt in the right arm or wrist. Which of the following is the most likely associated cardiac diagnosis?

- A. Aortic valve regurgitation**
- B. Constrictive pericarditis**
- C. Mitral valve stenosis**
- D. Mitral valve prolapse (note pulse pressure)**

Where Test-Takers Get “Tricked”

A 56-year-old woman has the sudden onset of a cold, painful right arm. BP 112/80 mm Hg; pulse 138/min/irregularly irregular. The right forearm and hand are pallid and cold. No pulses are felt in the right arm or wrist. Which of the following is the preferred initial management?

- A. Vascular surgical consultation**
- B. Warm compresses to affected arm**
- C. Administration of oral aspirin**
- D. Administration of intravenous heparin**

Mitral Valve Regurgitation

- **May Be Acute**
 - **Endocarditis (leaflet tear or chordae tendineae rupture)**
 - **Papillary muscle rupture (myocardial infarction)**
 - **Trauma**

Mitral Valve Regurgitation

- May Be Chronic
 - Dilated cardiomyopathy
 - Rheumatic heart disease
 - Calcification of mitral annulus
 - Mitral valve prolapse

A 32-year-old man has pulmonary edema caused by acute mitral valve regurgitation. Which of the following is the most likely cause?

- A. Calcification of mitral valve annulus**
- B. Rheumatic heart disease**
- C. Dissection of the aorta**
- D. Endocarditis**
- E. Cardiac amyloidosis**

A 32-year-old man has acute mitral valve regurgitation caused by endocarditis. Which of the following is the most likely cause of the regurgitation?

A. Rupture of papillary muscle

B. Rupture of chordae tendineae

C. Calcification of mitral annulus

D. Myocardial abscess

E. Rupture of ventricular septum

A “Word” About Heart Murmurs

Holosystolic Murmur

- **Mitral regurgitation: loudest at apex; radiates to axilla**
- **Tricuspid regurgitation: loudest along lower left sternal border; generally, little radiation**

Holosystolic murmur, cont'd

- **Ventricular septal defect: loudest along lower left sternal border; generally, little radiation**

Continuous murmur

- **Patent ductus arteriosus (connecting aorta and pulmonary artery)**

Chronic mitral valve regurgitation

Treatment

A. Surgery

B. In non-surgical candidates

- **Loop diuretic**
- **Beta adrenergic blocker**
- **ACE inhibitor**

Three Questions “in one”

A 78-year-old man has a 2 month history of progressive weakness. BP 94/70 mm Hg, pulse 100/min/irregularly irregular. The apical impulse is in the 6th ICS in the anterior axillary line. A 2/6 apical holosystolic murmur is heard. In addition to furosemide, which of the following should be prescribed?

- A. Warfarin**
- B. Doxazosin**
- C. Diltiazim**
- D. Lisinopril**
- E. Metoprolol**

(Note: 3 correct answers)

Imprint this upon your heart

**Valvular disease + atrial fibrillation =
indefinite warfarin therapy****

**** unless contraindication**

Imprint this upon your heart, cont'd

- **Direct thrombin inhibitors (e.g., dabigatran)**
- **Factor Xa inhibitors**
 - **are NOT approved for use in the patient who has atrial fibrillation and valvular disease**

(as of 12/15/16)

Mitral Valve Prolapse

Clinical presentation

- **Sharp, jabbing chest pain (not angina)**
- **Palpitations**
- **Dyspnea**

Mitral Valve Prolapse

Signs

- **Mid-systolic click and (often) late apical systolic murmur**

Treatment

- **Beta adrenergic blocker (for prescribed time)**
- **NO endocarditis prophylaxis**

A 24-year-old woman has a 3 week history of jabbing chest pain and palpitations. Vital signs are normal. An apical mid-systolic click is heard. Which of the following is the preferred initial therapy?

A. Lorazepam

B. Verapamil

C. Metoprolol

D. Digoxin

E. Labetalol

(Not a spelling error!)

A New Topic

A 42-year-old man has a 3 week history of dyspnea. Two years earlier he was stabbed in the left thigh. BP 160/62 mm Hg, pulse 122/min/regular. There is no lid lag or tremor. Bibasilar crackles and an apical S3 gallop are heard. Peripheral pulses are bounding. Which of the following is the most likely diagnosis?

- A. Acquired arteriovenous fistula**
- B. Hyperthyroidism**
- C. Paget's disease of bone**

A Reminder about Pulse Pressure

Increased Pulse Pressure

- **Isolated Systolic Hypertension**
- **Aortic Valve Regurgitation**
- **High Cardiac Output States**
 - **Hyperthyroidism**
 - **Arteriovenous fistula**
 - **Anemia**
 - **Fever**

Topic Cor Pulmonale

Definition

- **Heart disease secondary to lung disease**

Etiology

- **Pulmonary parenchymal or vascular disease**

Cor Pulmonale

Pathophysiology

- **Destruction of the lung vascular bed →**
- **Increased pulmonary vascular resistance →**
- **Pulmonary hypertension → Right heart failure**

The Common Denominator

The Common Denominator in Cor Pulmonale:

- **Increased Pulmonary Vascular Resistance and Pulmonary Hypertension**

Cor Pulmonale

Symptoms

- **Dyspnea**
- **Peripheral edema**
- **Weakness, nausea**

Signs

- **Elevated jugular venous pressure**
- **Peripheral edema**
- **Hepatomegaly, ascites**

Cor Pulmonale

The most common cause of right heart failure is chronic left heart failure (systolic or diastolic)

BUT, this is NOT cor pulmonale

Which of the following is the primary pathophysiologic abnormality in cor pulmonale?

- A. Pulmonary hypertension**
- B. Hypoventilation**
- C. Increased pulmonary blood flow**
- D. Increased pulmonary vascular resistance**

(Note: 2 correct answers)

A 57-year-old man with chronic bronchitis has increasing dyspnea and leg swelling. Exam shows central cyanosis, elevated jugular venous pressure, and 2+ bilateral ankle edema. Which of the following is the most likely diagnosis?

- A. Cor pulmonale**
- B. Nephrotic syndrome**
- C. Cirrhosis**
- D. Left ventricular systolic heart failure**
- E. Superior vena cava syndrome**

Here's a favorite question...

Presence of which of the following differentiates chronic bronchitis from emphysema?

- A. Pulmonary hypertension**
- B. Normal systemic arterial pO₂**
- C. Higher FEV₁ / FVC ratio**
- D. Greater likelihood of atrial fibrillation**

cont'd

Side by Side

| | Chr bronchitis | Emphysema |
|-------------------------|-----------------------|----------------------|
| PA pressure | Elevated | Normal +/- |
| Arterial O2 sat. | Low | Normal + - |
| Arterial pCO2 | Elevated | Normal +/- |
| Cor pulmonale | Yes | No |
| | “Blue Bloater” | “Pink Puffer” |

Topic

Cardiomyopathy

Three Types of Cardiomyopathy

A. Dilated (congestive) → → systolic HF

B. Hypertrophic → → diastolic HF

C. Restrictive (complex physiology)

Hypertrophic Cardiomyopathy (HCM)

- **Genetic (autosomal dominant)**
- **Most common cause of sudden cardiac death in adolescents and young adults**

Hypertrophic Cardiomyopathy (HCM)

Clinical presentation

- **Syncope (w/ exertion or at rest)**
- **Sudden death**
- **Angina pectoris**
- **Dyspnea (diastolic HF)**

Hypertrophic Cardiomyopathy (HCM)

Treatment

- **Diuretic if Dyspneic in lowest possible dose**
- **Beta adrenergic blocker OR**
- **Non-dihydropyridine calcium blocker
(verapamil / diltiazem)**

(cont'd)

Treatment of hypertrophic cardiomyopathy, cont'd

- **Surgery or alcohol septal ablation in selected cases**
- **Screening of family members**

Dilated (Congestive) Cardiomyopathy

Etiology

- **Genetic** (inheritance is variable)
- **Viral infection**
- **Toxins**
 - **Alcohol**
 - **Anthracycline chemotherapy agents**
 - **Cocaine**

cont'd

Known causes of dilated cardiomyopathy, cont'd

- **Peripartum**
- **Myocardial ischemia**
- **Hypertrophic cardiomyopathy**
- **Infiltrative disease**

Treatment of dilated cardiomyopathy

- **Treatment of systolic HF**

“Big Three”

Beta blocker, Loop Diuretic, ACEI

**In selected cases: nitrates / hydralazine /
digoxin**

- **Cardiac transplantation**

A 37-year-old man has fatigue caused by dilated cardiomyopathy. LV ejection fraction is 32%. The patient is in sinus rhythm. In addition to furosemide and metoprolol, which of the following should be prescribed?

- A. Lisinopril**
- B. Doxazosin**
- C. Verapamil**
- D. Digoxin**
- E. Nifedipine**

A 27-year-old woman in the 3rd trimester of pregnancy has fatigue caused by dilated cardiomyopathy. The apical impulse is in the 6th intercostal space in anterior axillary line. An apical S3 gallop is heard. In addition to furosemide and metoprolol, which of the following should be administered?

- A. Lisinopril**
- B. Hydralazine**
- C. Verapamil**
- D. Nifedipine**
- E. Chlorthalidone**

A 27-year-old woman has fatigue caused by dilated cardiomyopathy. LV ejection fraction is 28%. The patient is in sinus rhythm. She is at greatest risk for which of the following?

- A. Sudden cardiac death**
- B. Subarachnoid hemorrhage**
- C. Cirrhosis due to chronic hepatic congestion**
- D. Complete atrioventricular block**
- E. 3rd degree atrioventricular block**

On the Subject of Sudden Cardiac Death...

Risk Factors for Sudden Death

- **Left Ventricular Dysfunction (Low Ejection Fraction)**
- **Left Ventricular Hypertrophy**
- **Myocardial Ischemia**

Watch Out !!!

A 24-year-old woman in her 3rd trimester of pregnancy has fatigue. Systolic heart failure related to peripartum cardiomyopathy is diagnosed. Which of the following should be excluded in therapy?

- A. Isosorbide dinitrate** **2 correct answers**
- B. Valsartan**
- C. Spironolactone**
- D. Digoxin**
- E. Furosemide**

Topic

Pericardial Disease

Acute pericarditis

Etiology

- **Neoplasia (metastatic)**
- **Viral (coxsackie, echo) --- “idiopathic”**
- **Uremia**
- **Autoimmune disease (Systemic Lupus)**
- **Bacterial (Str. pneumo, S. aureus)**

Acute Pericarditis

Classic Symptom

- **Chest pain increased by inspiration and recumbency**
- **But, neoplastic pericarditis is often painless**

- **Electrocardiography: ST segment elevation (in most leads) without T wave inversion**
- **There is NO reciprocal ST segment depression**
- **T waves invert after ST segments have returned to isoelectric line (“baseline”)**

Acute Pericarditis

Acute Pericarditis of Any Etiology Can Cause Pericardial Effusion

- **It Is the rate of fluid accumulation that is clinically important**

Up the Escalator in Difficulty

An 18-year-old man has the sudden onset of severe, sharp anterior chest pain that is increased during recumbency and eased by sitting. Electrocardiography shows diffuse ST segment elevation with upright T waves. Which of the following is the most likely diagnosis?

- A. Acute myocardial infarction**
- B. Pleurodynia**
- C. Erosive esophagitis**
- D. Pericarditis**

let's escalate...

Up the Escalator in Difficulty

A 34-year-old woman has the sudden onset of severe, sharp anterior chest pain that is increased during recumbency and eased by sitting. Examination shows a bilateral malar rash and pericardial friction rub. Which of the following is the expected laboratory finding in the patient?

- A. Platelet count 550,000/microL**
- B. Erythrocyte sedimentation rate 2 mm/hr**
- C. White blood count 2100/microL**
- D. Hypersegmented neutrophiles**
- E. Macrocytes on peripheral smear**

Continuing up the escalator

A 34-year-old woman has the sudden onset of severe, sharp anterior chest pain that is increased during recumbency and eased by sitting. Examination shows a bilateral malar rash and a pericardial friction rub is heard. Which of the following is the preferred initial diagnostic study?

- A. Anti-dsDNA antibody titer**
- B. Complement fixation**
- C. ELISA**
- D. Anti-nuclear antibody titer**
- E. Anti-Sm antibody titer**

A 34-year-old woman has the sudden onset of severe, sharp anterior chest pain that is increased during recumbency and eased by sitting. Anti-nuclear antibodies are present in high titer. Which of the following is the preferred next diagnostic study?

A. Anti-dsDNA antibody titer

B. Complement fixation

C. Anti-Sm antibody titer

D. Anti-nuclear antibody titer

A 54-year-old woman has been receiving intravenous antibiotics for 10 days in treatment of pneumonia. She now has sharp anterior chest pain. EKG shows diffuse ST segment elevation. White blood count is 33,000/microL with left shift. Which of the following is the most likely diagnosis?

- A. Pericarditis due to enterovirus**
- B. Aortic dissection**
- C. Purulent (bacterial) pericarditis**
- D. Acute myocardial infarction**

A 67-year-old woman who has uremia has acute, severe anterior chest pain. A pericardial rub is heard. Six hours later blood pressure is 70/40 mm Hg, pulse 142/min, and respirations 34/min. Jugular venous pressure is elevated. Which of the following is the most likely diagnosis?

- A. Pericardial tamponade**
- B. Constrictive pericarditis**
- C. Cardiogenic shock**
- D. Rupture of ventricular septum**
- E. Gram-negative bacteremia**

A Reminder...

A 67-year-old woman with chronic renal disease has acute pericarditis. Six hours later blood pressure is 70/40, pulse 142/min/regular and respirations 34/min. JVP is elevated. Heart tones are distant. Which of the following is the preferred initial diagnostic test?

- A. CT scan of the chest**
- B. Cardiac catheterization**
- C. MUGA scan of the heart**
- D. Echocardiography**

Pericardial Tamponade

“Forget me not”

The Important Physical Examination Sign

Paradoxical Pulse

(Paradoxical pulse is not a paradox)

Constrictive Pericarditis

Symptoms

- **Fatigue, dyspnea, edema**

Signs Clinically, looks like right heart failure

- **Elevated jugular venous pressure (JVP)**
- **Ascites**
- **Peripheral edema**

Constrictive Pericarditis

Most common cause in U.S.A.

- **Chest irradiation for breast / lung cancer or lymphoma**

Always check the JVP in every patient who has had chest irradiation

A 54-year-old man has a 3 week history of progressive edema and abdominal swelling. Four years earlier he received chest radiation for lymphoma. Exam shows elevated JVP, an enlarged, smooth liver, ascites and bilateral ankle edema. Which of the following is the most likely diagnosis?

- A. Cor pulmonale**
- B. Pericardial tamponade**
- C. Cirrhosis**
- D. Constrictive pericarditis**
- E. Recurrent lymphoma in mediastinum**

A 48-year-old woman has elevated jugular venous pressure, ascites, and peripheral edema. Constrictive pericarditis is diagnosed. Which of the following is most likely noted in her past medical history?

- A. Diabetes mellitus**
- B. Celiac disease**
- C. Hepatitis C**
- D. Sarcoidosis**
- E. Chest irradiation**

Presence of which of the following differentiates constrictive pericarditis from pericardial tamponade?

- A. Elevated jugular venous pressure**
- B. Systemic hypotension**
- C. Distant heart tones**
- D. Kussmaul sign**
- E. Paradoxical pulse**

Endocarditis

What you must know...

Acute

- **Infecting organism: S. aureus**
- **High fever, rapid valve destruction**
- **Tricuspid valve → septic emboli and lung abscess, notably, in IV drug abuser**

Endocarditis

Subacute

- **Organisms: Str. Viridans, enterococci**
- **Low grade fever, arthralgia, embolism**

“Stroke + Fever = Endocarditis”

A 22-year-old intravenous drug abuser has the sudden onset of fever and chills. Examination shows a 2/6 holosystolic murmur along the left lower sternal border. Chest radiography shows a lung abscess. Which of the following is the most likely infecting organism?

- A. *S. aureus***
- B. *Str. Viridans***
- C. *Bacteroides spp.***
- D. *Klebsiella pneumoniae***
- E. *Pseudomonas aeruginosa***

A 32 year-old woman has the sudden onset of left hemiplegia. Blood pressure 130/80 mm Hg, pulse 104/min/regular, oral temperature 101.4 F. A 2/6 apical holosystolic murmur is heard at the apex. Which of the following is the most likely diagnosis?

- A. Endocarditis**
- B. Subdural hematoma**
- C. Subarachnoid hemorrhage**
- D. Giant cell arteritis**
- E. Bland cerebral embolus**

“Other Forms of Heart Disease”

- **Arterial Occlusive Disease**
- **Arteritis**
- **Venous Disease**

Peripheral Arterial Disease

“Locations”

Anatomic location of occlusive disease and pain location

- **Aortoiliac** **Buttock and Hip**
- **Aortoiliac or Common Femoral** **Thigh**
- **Superficial Femoral** **Upper 2/3 Calf**
- **Popliteal** **Lower 1/3 Calf**
- **Tibial or Peroneal** **Foot**

Peripheral Arterial Disease

In addition to claudication and absent femoral pulses, which of the following is most likely to be noted in a patient who has aortoiliac occlusive disease?

- A. Erectile dysfunction**
- B. Loss of proprioception in toes**
- C. Restless legs syndrome**
- D. Retrograde ejaculation**
- E. Autonomic orthostatic hypotension**

On examination of an extremity, which of the following is the weakest predictor of the presence of peripheral arterial disease?

- A. Cool skin**
- B. Shiny, atrophied skin**
- C. Prolonged venous filling time**
- D. Thickened, brittle nails**
- E. Hair loss**

A 79-year-old woman has aching in both calves while walking. Which of the following is the preferred initial diagnostic test for the presence of peripheral arterial disease?

- A. Ankle brachial index**
- B. Invasive angiography**
- C. Magnetic resonance angiography**
- D. Computerized tomography angiography**
- E. Calcium score on radiography of legs**

Be Smart...

After walking 300 feet, a 72-year-old man has bilateral buttocks and upper thigh aching and numbness. The pain is quickly relieved by bending forward. Dorsalis pedis and posterior tibial pulses are normal. Which of the following is the most likely diagnosis?

- A. Herniated lumbar disc**
- B. Cauda equina syndrome**
- C. Aortoiliac occlusive arterial disease**
- D. Transverse myelitis**
- E. Lumbar spinal stenosis**

Arterial Disease

A 77-year-old man has claudication in both legs. In addition to risk factor modification, which of the following is the preferred medicinal therapy?

- A. Warfarin**
- B. Clopidogrel**
- C. Cilostazol (Pletal)**
- D. Vitamin E**
- E. Ticlopidine**

A 77-year-old man has claudication for which cilostazol is prescribed. Which of the following is the mechanism of action of this medication?

- A. Tyrosine kinase inhibitor**
- B. C-1 inhibitor concentrate**
- C. 5-Alpha reductase inhibitor**
- D. Phosphodiesterase inhibitor**
- E. Leukotriene inhibitor**

A 77-year-old man with moderately severe claudication now has new-onset angina pectoris. Which of the following should be excluded in therapy?

- A. Verapamil**
- B. Aspirin**
- C. Isosorbide dinitrate**
- D. Metoprolol**
- E. Clopidogrel**

Giant Cell Arteritis (GCA)

- **Not a Rare Disease**
- **Arteritis Primarily Affecting Branches of External Carotid Artery**
- **However, Involvement of Aorta Is Common**
- **Intracranial Artery Involvement is Rare**

Giant Cell Arteritis (GCA)

- **Symptom Onset May Be Gradual (2/3)
or Sudden (1/3)**

- **Patient May Have Systemic Symptoms**

10% Have Only Systemic Symptoms

(cont'd)

GCA: Systemic Symptoms

Systemic Symptoms:

- **Fever (50%) May Be Spiking**
- **Fatigue**
- **Weight Loss**
- **Polymyalgia Rheumatica (40 to 50%)**

GCA: Focal Symptoms

Focal Symptoms

- **Headache**
 - **Usually in temporal areas,
but may be frontal or occipital**
 - **Always ask about scalp tenderness**
 - **Tender artery felt in 1/2 of cases**

GCA Focal Symptoms, cont'd

- **Jaw Claudication**

An early and specific symptom

- **50% of Cases**
- **May Be Unilateral or Bilateral**
- **What Condition Mimics Jaw Claudication?**
- **Differentiate from Jaw Fatigability**

GCA Focal Symptoms, cont'd

- **Visual Loss An early symptom in GCA**
 - **Amaurosis Fugax**
 - **Ischemic Optic Neuropathy**
 - **If Untreated, Second Eye Likely to Be Affected**

GCA, cont'd

Remember...

- **Aortic Aneurysm (10% of cases)**
 - **Fusiform**
 - **Dissecting**

A 77-year-old woman has a 2 week history of right-sided headaches and scalp tenderness. Giant cell arteritis is diagnosed. Which of the following symptoms is most likely noted by the patient?

- A. Red eye**
- B. New-onset tinnitus**
- C. Jaw claudication**
- D. Paresthesias in the right arm**
- E. Memory loss**

A 77-year-old woman has a 2 week history of right-sided headaches and scalp tenderness. Giant cell arteritis is diagnosed. Which of the following is the preferred initial therapy?

- A. Oral prednisone**
- B. Oral methotrexate**
- C. Intravenous rituximab (Rituxan)**
- D. Cyclosporine**
- E. Interleukin 3**

Important--A New Standard in Therapy

A 77-year-old woman has a 2 week history of right-sided headaches and scalp tenderness. Giant cell arteritis is diagnosed. In addition to prednisone, which of the following is appropriate initial therapy?

- A. Oral aspirin**
- B. Oral methotrexate**
- C. Intravenous rituximab (Rituxan)**
- D. Cyclosporine**
- E. Interleukin 3**

Presence of which of the following differentiates the headache of giant cell arteritis from cluster headache?

- A. Associated with ipsilateral rhinorrhea**
- B. Treated with 100% oxygen**
- C. Associated with scalp tenderness**
- D. Treated with sumatriptan**
- E. Associated with anemia**

(Note: 2 correct answers)

Venous Disorders

Superior vena cava (SVC) syndrome

- **Caused by Obstruction of SVC**
- **Etiology**
 - **Malignancy**
 - **Small cell cancer of lung**
 - **Non-Hodgkin's lymphoma**

cont'd

SVC Syndrome

Etiology, cont'd

- **Non-Malignancy**
 - **Thrombosis Around Central Venous Catheter**

SVC Syndrome

Clinical Manifestations

- **Swelling of Face**
- **Dilated Veins in Arms and on Chest**
- **Elevated Jugular Venous Pressure**
But Patient Is NOT in Right Heart Failure

A 66-year-old woman has a 3 week history of increasing facial swelling and distention of chest wall veins. Superior vena cava syndrome is diagnosed. Which of the following is the most likely underlying cause?

- A. Small cell carcinoma of lung**
- B. Thrombosis of central venous line**
- C. Adenocarcinoma of the breast**
- D. Uremic pericarditis**
- E. Constrictive pericarditis**

(Note: 2 correct answers)

Two Questions in One

Presence of which of the following differentiates superior vena cava syndrome from constrictive pericarditis?

- A. Elevated jugular venous pressure**
- B. Leg edema**
- C. Ascites**
- D. Facial swelling**
- E. Dilation of chest wall veins**

(Note: 2 correct answers)

Side-by-Side

| | SVC Syn. | Constr. P. | Nephrotic Syn. |
|-------------------|-----------------|-------------------|-----------------------|
| Elev. JVP | Yes | Yes | No |
| Ascites | No | Yes | Yes |
| Leg Edema | No | Yes | Yes |
| Arm Edema | Yes | No | Yes |
| Face Edema | Yes | No | Yes |

Venous Disorders

Factors Predisposing to Venous Thrombosis

Virchow's Triad

- **Venous stasis**
- **Vascular endothelial injury**
- **Hypercoagulable state**

In other words...

Common Factors Predisposing to Venous Thrombosis

- **Prolonged sitting**
- **Surgical procedures**
- **Immobilization**
- **Lower extremity injury**

cont'd

Predisposing to Venous Thrombosis, cont'd

- **Medicines**
 - **Estrogen/Progestin oral contraceptives**

- **Inherited thrombophilia**
 - **Factor V Leiden mutation**
 - **Deficiency in protein C, protein S, or antithrombin**
 - **Prothrombin gene mutation**

Oral Contraceptives (OCs) and Vein Thrombosis

Note: There Is Some Variation Amongst Scientific Groups

Estrogen/Progestin OCs Increase Risk of Thrombosis in Those...

- **Who Have History of Thrombosis (DVT or Stroke)**
- **Who Are Older than 39 Years and Smoke 15 or More Cigarettes per Day**

Progestin-Only Contraceptives Do NOT Increase Coagulability

Predisposing to Venous Thrombosis, cont'd

- **Acquired thrombophilia**
 - **Anti-phospholipid (APL) antibody syndrome**
 - **Malignancy**

Anti-phospholipid Antibody Syndrome

Clinical Presentation

- **Venous thrombosis**
- **Recurrent spontaneous abortion**
- **Arterial thrombosis**
- **Thrombocytopenia**
- **Association with systemic lupus eryth.**

Malignancy and Vein Thrombosis (VT)

- **DVT Often Precedes Clinical Appearance of Tumor**
- **Associated with Superficial and Deep Thrombosis**
- **Cancers Most Often Associated with
Hypercoagulable State**
 - **Lung**
 - **Pancreas**
 - **Colon/Rectum**
 - **Kidney**
 - **Prostate**

cont'd

Malignancy and Vein Thrombosis (VT), cont'd

When to Suspect Occult Malignancy

- **Recurrence of VT After Treatment**
- **Bilateral Concurrent VT**
- **Migratory VT**
- **Unusual VT: Hepatic, Portal, or Upper Arm VT**

Venous Disorders

Superficial Thrombophlebitis

Clinical presentation

Superficial Vein

- **Induration**
- **Erythema**
- **Tenderness**
- **Palpable venous cord**

Superficial Thrombophlebitis

Complications

- **Deep vein thrombosis** *Common !*
- **Septic thrombophlebitis**
 - **S. aureus**
 - **Treat with antibiotics and heparin**

Superficial Thrombophlebitis

Treatment of Uncomplicated Case

- **Local heat**
- **Elevation**
- **NSAIDs**

Venous Disorders

Deep Vein Thrombosis (DVT)

- **DVT and Pulmonary Embolism Are Considered Two Manifestations of the Same Disease**
- ***Clinical Criteria Are Used to***
 - ***Determine Probability of DVT***
 - ***Determine Probability of Pulmonary Embolism***

Venous Disorders

Deep Vein Thrombosis

In Patient *Suspected* of Having DVT:

- **History and Physical Exam**
- **Wells Probability Scale**
- **D-Dimer testing**

cont'd

In Patient *Suspected* of Having DVT, cont'd

And, if indicated

- **Compression Ultrasonography or Impedance Plethysmography**
- **Ultrasonography Is Used in Conjunction with D-Dimer value and Wells Probability Score**

D-Dimer

A word about D-Dimer...

D-dimer is elevated in presence of thrombus, but also elevated in malignancy, recent surgery, and normal pregnancy

Serum level (ELISA) > 500 mg/mL is abnormal

A normal value is of greater clinical value than an elevated value

- **D-dimer value, measured by ELISA, < 500 ng/mL excludes deep vein thrombosis and pulmonary embolism with ~ 95% accuracy**
- **D-Dimer should be used in conjunction with Wells score**

Wells Probability Score for Suspected DVT

Points

- **Recent orthopedic casting or paralysis/paresis** +
- **Recent bed confinement > 3 days** +
- **Swelling of the entire leg** +
- **Calf swelling** +
- **Pitting edema** +
- **Collateral non-varicose veins** +
- **Active cancer or cancer treated within 6 months** +
- **An alternative diagnosis is more likely** -

Treatment of DVT

“It Depends”

- **First, Uncomplicated DVT**
 - **After initial* treatment, warfarin for 3 to 6 months**

- **Recurrent DVT or Hypercoagulable State**
 - **Indefinite warfarin therapy**

cont'd

Treatment of DVT

* Initial Treatment

- **For 5 days, while warfarin started at same time**

Choice of:

- **Unfractionated Heparin (check platelet count in 4 days)**
- **Low Molecular Weight Heparin**
- **Fondaparinux (Arixtra) (Factor Xa inhibitor)**

A 66-year-old man has nephrotic syndrome related to diabetes mellitus. Which of the following is the most likely complication?

- A. Bilateral renal artery stenosis**
- B. Deep vein thrombosis**
- C. Livedo reticularis**
- D. Mycotic cerebral aneurysm formation**
- E. Disseminated intravascular coagulation**

Which of the following best characterizes D-Dimer used in diagnosis of deep vein thrombosis?

- A. Degradation product of fibrin**
- B. Anti-thrombin action**
- C. Stimulant of protein C action**
- D. Inhibitor of factor Xa**
- E. Stimulant of fibrinolysis**

A 57-year-old healthy man has deep vein thrombosis of the leg caused by prolonged sitting in his job as a cross-country truck driver. Which of the following is the preferred treatment?

- A. Low molecular weight heparin for 3 months**
- B. Ligation of inferior vena cava**
- C. Warfarin for 3 to 6 months**
- D. Indefinite warfarin therapy**
- E. Warfarin and aspirin for 2 to 3 months**

A 34-year-old woman is being treated for her 2nd episode of deep vein thrombosis related to factor V Leiden mutation. Following initial heparin therapy, which of the following is the preferred management?

- A. Warfarin for 3 months; then, indefinite aspirin**
- B. Fondaparinux (Arixtra) for 3 months**
- C. Indefinite aspirin and clopidogrel**
- D. Dabigatran for 6 months**
- E. Indefinite warfarin therapy**

A 32-year-old woman has deep vein thrombosis caused by anti-phospholipid antibody syndrome. Which of the following serum values should be obtained?

- A. Angiotensin converting enzyme**
- B. Anti-citrillinated peptide antibody titer**
- C. Anti-nuclear antibody titer**
- D. Anti-gliadin antibody titer**
- E. Thyroid peroxidase antibody titer**

An 82-year-old man has deep vein thrombosis of his right leg. He has lost 7 pounds over the past 2 months associated with poor appetite. Examination of the lungs, heart, and abdomen is normal. Fasting blood glucose 165 mg/dL. Which of the following is the most likely underlying cause?

- A. Factor V Leiden mutation**
- B. Adenocarcinoma of pancreas**
- C. Anti-phospholipid antibody syndrome**
- D. Hypertriglyceridemia**
- E. Cushing's syndrome**

A 36-year-old woman who smokes 1 pack of cigarettes daily seeks contraceptive therapy. Her sister has history of deep vein thrombosis. Which of the following is the most appropriate counseling for the patient?

- A. Avoid estrogen/progestin pill**
- B. May take progestin-only pill**
- C. Estrogen/progestin increases risk of ovarian cancer**
- D. Anti-phospholipid antibody testing is indicated**
- E. Genetic testing for Factor V Leiden is indicated**

Presence of which of the following differentiates a popliteal (Bakers) cyst from deep vein thrombosis?

- A. Local warmth**
- B. Leg edema**
- C. Posterior calf ecchymosis**
- D. Interference with knee flexion**
- E. Related to antiphospholipid antibodies**

(Note: 2 correct answers)

The E Slides

Congenital Long QT Interval

E 13

- **Genetic mutations are very complex**
- **There are hundreds of mutations that cause long QT interval on electrocardiography**
- **Medicinal treatment depends upon the specific type of LQT**
 - **Beta adrenergic blockers for LQT1**
 - **Mexilitene for LQT 3**

E 15

The most common cause of fetal and neonatal 3rd degree atrioventricular block is systemic lupus erythematosus in the mother.

5% of childhood cases are also related to this maternal disease.

E 16

Vomiting or drinking a cold liquid are considered “situational syncope” that relate to vagal (parasympathetic) syncope.

The emotional response to venipuncture may also heighten vagal tone and cause syncope.

E 24

Apical Lift = left ventricular hypertrophy

**Apical impulse displaced to the left and
downward on the chest = left ventricular
dilation**

E 29

Cold water immersion (diving reflex) is a vagal maneuver that can be used to terminate paroxysmal supraventricular tachycardia (PSVT).

E 57

Magnetic resonance angiography of brain should be considered in patients who have either coarctation of the aorta or polycystic kidney disease.

The reason: both conditions are associated with an increased incidence of cerebral aneurysm. Rupture of an aneurysm produces subarachnoid hemorrhage.

E 59

Tetralogy of Fallot

- **Cyanotic congenital heart disease characterized by ventricular septal defect, pulmonic stenosis, right ventricular hypertrophy, and “overriding” aorta**

Remember, a bicuspid aortic valve is common in patients who have coarctation of the aorta

E 50

Common causes of pericardial effusion

- **Infection**
- **Autoimmune disease**
- **Cardiac surgery or other procedures**
- **Malignancy**
- **Aorta dissection rupturing into pericardial sac**
- **Hypothyroidism**

E 36

Dyspnea in HOCM is related to diastolic heart failure.

Angina pectoris in HOCM is related to the greater oxygen demand of the increased muscle mass of the ventricle(s)

E 52

The holosystolic murmur in tricuspid regurgitation transiently increases in intensity during inspiration and softens during expiration

The holosystolic murmur in ventricular septal defect does not change during respiration

E 61

Acute rheumatic fever only follows streptococcal pharyngitis

Glomerulonephritis may follow either streptococcal pharyngitis or streptococcal skin infection

E 69

S3 gallop (protodiastolic)

- **Normal in healthy young adults**
- **In patients over the age of 40 years an S3G suggests a dilated ventricle with rapid filling**

E 70

S4 gallop (presystolic)

- **Indicates reduced compliance of a ventricle**
- **May be heard in healthy older persons without any other cardiac abnormality**

E 72

Keys to diagnosis of normal pressure hydrocephalus:

Dementia

Gait disturbance (of any type)

Urinary incontinence

E 85

- **Elevated serum methylmalonic acid is a sensitive test indicating vitamin B12 deficiency**
- **Serum angiotensin converting enzyme level is elevated in 75% of untreated patients with sarcoidosis**

cont'd

E 85

- **5-alpha-reductase inhibitors used in treatment of erectile dysfunction block conversion of testosterone to dihydrotestosterone**
- **Down syndrome associated with**
 - **Hypothyroidism**
 - **Celiac disease**
 - **Leukemia**

E 92

Pathophysiology

- **Afterload is a cardinal determinant of ventricular function (left and right ventricles)**
- **Afterload is a “pressure” determinant, namely, the pressure that a ventricle must generate in order to eject blood**

cont'd

E 92

- **Increased afterload occurs in patients who have either systemic or pulmonary hypertension**
- **Increased afterload occurs in patients who have either pulmonic or aortic valve stenosis**
- **The compensatory response to increased afterload is ventricular hypertrophy**

cont'd

E 106

- **The tilt table test is also used to diagnose postural tachycardia syndrome (POTS)**
- **Patients who have POTs will have an exaggerated increase in heart rate during upright tilt without a decrease in blood pressure (orthostatic hypotension)**

E 133

Presence of which of the following differentiates mitral stenosis from aortic stenosis, both patients in normal sinus rhythm?

- A. Dyspnea Occurs in both, but different pathophysiology**
- B. Angina pectoris Occurs only in aortic stenosis**
- C. Syncope Occurs only in aortic stenosis**

E 112

The need for which of the following differentiates a mechanical valve from a bioprosthetic valve?

- A. Endocarditis prophylaxis** *Both*
- B. Vitamin B12 therapy** *Neither*
- C. Long-term anticoagulation**
- D. Folic acid therapy** *Neither*
- E. Serial echocardiographic studies** *Both*

E 116

In a patient who has headaches, the most specific symptom that suggests giant cell arteritis is jaw claudication.

In contrast, myasthenia gravis causes painless jaw fatigability, not claudication.

E 120

Ankylosing spondylitis

- **An Inflammatory spondyloarthritis**
 - **“Bamboo spine”**
- **Causes aortitis with aortic regurgitation**
- **Uveitis**

cont'd

E 120, cont'd

Uveitis

Think of the following systemic disorders:

- **Ankylosing spondylitis**
- **Reactive arthritis**
- **Crohn's disease / ulcerative colitis**
- **Sarcoidosis**
- **Psoriatic arthritis**
- **Behcet's disease**

E 124

Increased pulse pressure

- **Aortic valve regurgitation**
- **Isolated systolic hypertension**
- **High cardiac output states**
 - **Hyperthyroidism**
 - **Fever**
 - **Anemia**

E 145

Indications for ACE inhibitor therapy

- **Chronic proteinuric renal disease, especially diabetic nephropathy and nephrotic syndrome**
- **Essential hypertension**
- **Isolated systolic hypertension**

E 145

Indications for ACE inhibitor therapy, cont'd

- **Acute ST segment elevation myocardial infarction (STEMI)**
- **Systolic heart failure**
- **Diastolic heart failure associated with hypertension**

cont'd

Mitral Regurgitation MR

E 140

Calcification of mitral annulus → chronic MR

Rheumatic mitral valve disease → chronic MR

.....

Dissection of aorta → acute aortic regurgitation

.....

Primary amyloidosis involves the heart and causes a restrictive cardiomyopathy

Secondary amyloidosis does not affect the heart

E 142

- **Rupture of a papillary muscle and rupture of ventricular septum are potential “mechanical” complications of acute STEMI myocardial infarction**

**FDA Approval
(1/8/16)**

**Venous Thromboembolism (VTE)
Non-Valvular Atrial Fibrillation (AF)**

E 150

| | | VTE | AF | Pregnancy |
|------------|-------------------------|------------|------------|-------------------|
| DTI | Bivalirudin (P) | No | No | No (B) |
| | Dabigatran (O) | Yes | Yes | No (C) |
| ITI | Fondaparinux (P) | Yes | No | Rarely (B) |
| Xal | Rivaroxaban (O) | Yes | Yes | No (C) |
| | Apixaban (O) | Yes | Yes | No (B) |

DTI = Direct thrombin inhibitor
ITI = Indirect thrombin inhibitor

Xal = Factor Xa inhibitor
O = oral; P = parenteral

Common Denominators CD

E 159

The CD in all “Claudications” Is Muscle Ischemia

- **Angina pectoris is claudication of myocardium**
- **Skeletal muscle (peripheral arterial) claudication**
- **Jaw claudication in giant cell arteritis**
- **Intestinal ischemia (“abdominal angina”)**
- **Uterus ischemia (primary dysmenorrhea)**

Elevated Jugular Venous Pressure

E 161

- **Right heart failure of any etiology**
- **Constrictive Pericarditis**
- **Pericardial Tamponade**
- **Superior Vena Cava Syndrome**

E 172

Family Screening in Heart Disease

- **Long QT interval**
- **Hypertrophic cardiomyopathy (HCM)**
- **Dilated cardiomyopathy (if there is familial pattern)**

cont'd

E 172

Risk factors for sudden cardiac death (SCD) in adult who has HCM

- **Unexplained syncope with family hx of SCD**
- **Abnormal blood pressure response to exercise**
- **Asymptomatic ventricular tachycardia**
- **Massive ventricular hypertrophy (3 cm or >)**

- **Prior cardiac arrest**

E 179

Atrioventricular block can be:

- **Physiologic, related to vagal tone or medicines**
- **Anatomic, related to fibrosis, infarction, infiltrative disease**

E 179

The general risk factors for sudden cardiac death

- **Left ventricular dysfunction (reduced ejection fraction)**
- **Ventricular hypertrophy**
- **Myocardial ischemia**

E 187

Macrocytes in peripheral blood smear

- **Macrocytes with megaloblasts in marrow**
 - **Folate or vitamin B12 deficiency**
- **Macrocytes without megaloblasts in marrow**
 - **Hypothyroidism**
 - **Liver disease**
 - **Alcohol intake even without folate deficiency**
 - **Myelodysplastic syndrome**

E 198

- **Paradoxical pulse in pericardial tamponade**
 - **Paradoxical pulse is an exaggeration of the normal difference insystolic blood pressure during inspiration and expiration**
- **Kussmaul sign is noted in constrictive pericarditis**

Lung Abscess: Think of the Following

E 202

Aspiration pneumonia (anaerobic bacteria; often, related to impaired consciousness as in drunken stupor or grand mal seizure)

Tricuspid valve endocarditis (IV drug abuser)

Klebsiella pneumonia (diabetic; alcohol abuser)

cont'd

Lung Abscess: Think of the Following, cont'd

E 202

Nocardia pneumonia

**(immunocompromised pt; pt. on
glucocorticoid therapy)**

**Pseudomonas pneumonia (health-care
equipment)**

E 205

Endocarditis caused by *Streptococcus* bovis

- **A High Association with Colon Tumor**
- **Colonoscopy Is Indicated**

E 209

B. Loss of proprioception in toes

Occurs in Vit. B 12 deficiency; peripheral neuropathy in diabetes, uremia, alcohol abuse

C. Restless legs syndrome

Occurs in iron deficiency; pregnancy; uremia; parkinson's; diabetes; venous insufficiency; adverse effect of medicines

cont'd

E 209, cont'd

D. Retrograde ejaculation

Occurs in genitourinary autonomic dysfunction, usually diabetic

E. Autonomic orthostatic hypotension

Occurs in cardiac autonomic dysfunction, usually diabetic

E 213

- **Pain in spinal stenosis eases with lumbar flexion**
- **Pain in herniated disc worsens with lumbar flexion**

E 228

Presence of which of the following differentiates the headache of giant cell arteritis from cluster headache?

- A. Associated with ipsilateral rhinorrhea** *Cluster headache*
- B. Treated with 100% oxygen** *Cluster headache*
- D. Treated with sumatriptan** *Cluster headache*

E 247

Other Conditions in Which Clinical Criteria are Used:

Think of *Major* and *Minor* Criteria:

- **Acute Rheumatic Fever**
- **Endocarditis**

Mort Diamond

- **Please attend my “Learn Smart, not Hard” Presentations at 7:30 AM on Sun. and Mon.**
- **I Shall Be at the Registration Desk at 6:15 AM on Sunday and Monday for Those Who Wish to Review Any Medical Topic**
- **My Cell Phone Number: (954) 802-7100**