

Project: Ghana Emergency Medicine Collaborative

Document Title: Case of the Week- Aortic Dissection

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Objectives

- Think like an Emergency Physician
- Review the case of MP
- Discuss a differential diagnosis
- Modify the differential diagnosis
- Review treatment for an arrest
- “Guess what I’m thinking”

MP

- 38 year-old male with a history of SVT, transferred from outside hospital with GI bleed

MP – Hospital #1

- Presented to first hospital the previous night after syncopal episode that had no prodrome and no seizure activity
- Was feeling weak, vague abdominal pain and nauseated
- EKG unremarkable, 2 sets of cardiac enzymes negative, improved with ondansetron and morphine
- Discharged with “anxiety”

Any Thoughts?

Differential for Syncope?

Differential Diagnosis in Syncope

BOX 19-1 CAUSES OF SYNCOPE

Focal Hypoperfusion of CNS Structures

Cerebrovascular disease
Hyperventilation
Subclavian steal
Subarachnoid hemorrhage
Basilar artery migraine
Cerebral syncope

Systemic Hypoperfusion Resulting in CNS Dysfunction

Outflow obstruction

Mitral, aortic, or pulmonic stenosis
Hypertrophic cardiomyopathy
Atrial myxoma
Pulmonary embolism
Pulmonary hypertension
Cardiac tamponade
Congenital heart disease

Reduced cardiac output

Tachycardia

Supraventricular tachycardia
Ventricular tachycardia
Ventricular fibrillation
Wolff-Parkinson-White syndrome
Torsades de pointes

Bradycardia

Sinus node disease
Second-degree and third-degree A-V block
Prolonged Q-T syndrome
Pacemaker malfunction
Implanted cardioverter-defibrillator malfunction

Other cardiovascular disease

Aortic dissection
Myocardial infarction
Cardiomyopathy

Vasomotor—neurally mediated (reflex vasodepressor)

Neurocardiogenic (vasovagal)

Emotion

Pain

Situational

Carotid sinus sensitivity

Necktie syncope

Shaving syncope

Miscellaneous reflex

Tussive, sneeze

Exercise/postexercise

Gastrointestinal—swallowing, vomiting, defecation

Postmicturition

Elevated intrathoracic pressure (weightlifting)

Other causes of hypoperfusion

Orthostatic hypotension—volume depletion

Anemia

Drug-induced

CNS Dysfunction with Normal Cerebral Perfusion

Hypoglycemia

Hypoxemia—asphyxiation

Seizure

Narcolepsy

Psychogenic

Anxiety disorder

Conversion disorder

Somatization disorder

Panic disorder

Breath-holding spells

Toxic

Drugs

Carbon monoxide

Other agents

Undetermined causes

Dangerous Causes of Syncope?

Dangerous Causes of Syncope

Table 19-3 **Critical Diagnoses to Consider in Syncope**

Myocardial infarction
Life-threatening dysrhythmias
Thoracic aortic dissection
Critical aortic stenosis
Hypertrophic cardiomyopathy
Pericardial tamponade
Abdominal aortic aneurysm
Pulmonary embolism
Subarachnoid hemorrhage
Stroke
Toxic-metabolic derangements
Severe hypovolemia or hemorrhage

MP – Hospital #2

- 2 episodes of bright red blood per rectum and 1 episode of coffee ground emesis immediately after discharge from the first hospital
- Presented to hospital #2

Modify the Differential?

Differential Diagnosis in Syncope

BOX 19-1

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Focal Hypoperfusion of CNS Structures

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- Hyperventilation
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- Basilar artery migraine
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Systemic Hypoperfusion Resulting in CNS Dysfunction

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- Hypertrophic cardiomyopathy
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- Congenital heart disease

Reduced cardiac output

Tachycardia

- Supraventricular tachycardia
- Ventricular tachycardia
- Ventricular fibrillation
- Wolff-Parkinson-White syndrome
- Torsades de pointes

Bradycardia

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- Second-degree and third-degree A-V block
- Prolonged Q-T syndrome
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Other cardiovascular disease

- Aortic dissection
- Myocardial infarction
- Cardiomyopathy

Vasomotor—neurally mediated (reflex vasodepressor)

- Neurocardiogenic (vasovagal)

- Emotion

- Pain

- Situational

- Carotid sinus sensitivity

- Necktie syncope

- Shaving syncope

- Miscellaneous reflex

- Tussive, sneeze

- Exercise/postexercise

- Gastrointestinal—swallowing, vomiting, defecation

- Postmicturition

- Elevated intrathoracic pressure (weightlifting)

- Other causes of hypoperfusion

- Orthostatic hypotension—volume depletion

- Anemia

- Drug-induced

CNS Dysfunction with Normal Cerebral Perfusion

- Hypoglycemia

- Hypoxemia—asphyxiation

- Seizure

- Narcolepsy

- Psychogenic

- Anxiety disorder

- Conversion disorder

- Somatization disorder

- Panic disorder

- Breath-holding spells

- Toxic

- Drugs

- Carbon monoxide

- Other agents

- Undetermined causes

Dangerous Causes of Syncope

Table 19-3 **Critical Diagnoses to Consider in Syncope**

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Pulmonary embolism
Subarachnoid hemorrhage
Stroke
Toxic-metabolic derangements
Severe hypovolemia or hemorrhage

MP – Hospital #2

- Hemodynamically stable
- Started on pantoprazole drip

Differential Diagnosis for GIB?

Differential Diagnosis for GIB

BOX 22-1

ETIOLOGY OF SIGNIFICANT GASTROINTESTINAL (GI) BLEEDING IN ADULTS*

Upper

Peptic ulcer disease
Gastric erosions
Varices
Mallory-Weiss tear
Esophagitis
Duodenitis

Lower

Diverticulosis
Angiodysplasia
Upper GI bleeding
Cancer/polyps
Rectal disease
Inflammatory bowel disease

*Potential causes listed in decreasing frequency.

MP – Hospital #2

- Risk factors include daily ibuprofen use (800mg BID) for knee pain
- Denies heavy alcohol use
- No history of GI bleed or abdominal ulcers
- No history of diverticulosis/diverticulitis

MP – Hospital #3

- Transferred to us
- Reports lower abdominal pain, non-radiating epigastric pain and lightheadedness

MP

- Past Medical History
SVT
- Surgical History
none
- Medications
Ibuprofen
Flexeril
- Social History
Denies alcohol use, smoking, illicit drugs
- Family History
Heart murmur, no history of GI bleed, ulcer, colonic polyps, diverticulosis/diverticulitis

MP

□ Exam

T 97.7 HR 93 RR 16 BP 192/93 POx 98% RA

General: **Mild distress**

Skin: Dry, no rash, **pale**

Eye: PERRL, **pale conjunctiva**

ENMT: oral mucosa moist

Cardiovascular: **tachycardic, 2/6 systolic ejection murmur heard best at apex radiating to axilla**, no carotid bruit

Respiratory: CTA with symmetric breath sounds

GI: soft, **mildly distended**, hypoactive bowel sounds, no rebound, no guarding, non-rigid, **rectal exam with gross blood present**, normal sphincter tone

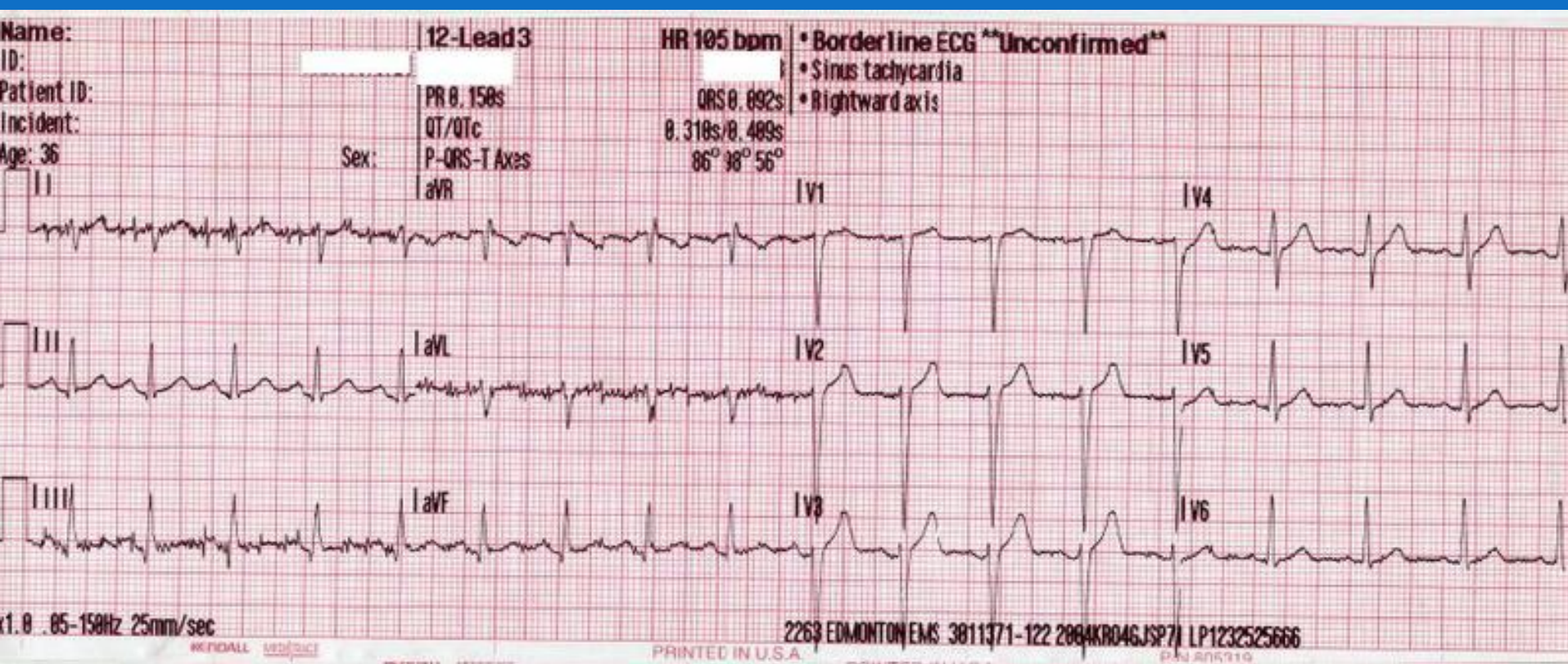
Neurological: A/Ox4, no focal neurologic deficit observed, CN II-XII intact

Now What?

Now What?

- How do you resuscitate MP?

EKG



MP – Hospital #3

- Na 134
- K 4.6
- Cl 107
- CO2 16*
- Glucose 140
- BUN 20
- Cr 1.28*
- Alk Phos 67
- ALT 47
- AST 83
- TBili 1.0
- Amylase 143
- Lipase 79

MP – Hospital #3

- WBC 19
- Hb 13.6
- PLT 215
- INR 1.23
- Trop 0.02

MP – Hospital #3

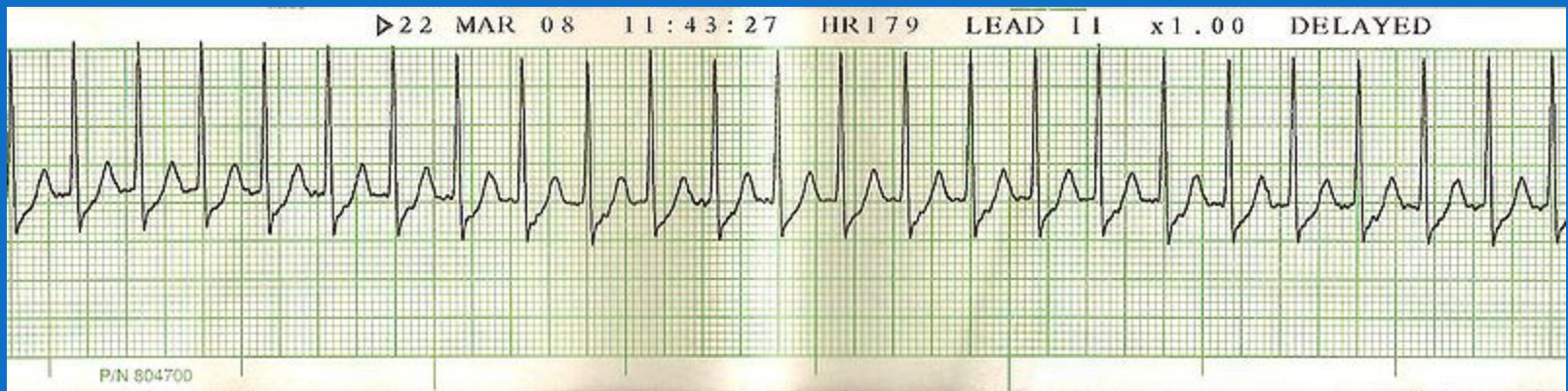
- EKG with sinus tachycardia, no TWI, ST changes or delta waves
- IVF infusing and 2 units PRBCs ordered despite “stable” Hb
- NG tube placed with coffee ground return
- Started on ciprofloxacin and metronidazole for possible diverticulitis

Now What?

MP – Hospital #3

- GI called and will be coming for upper endoscopy
- Called to the room for HR 220, hypotensive, mentating well

EKG

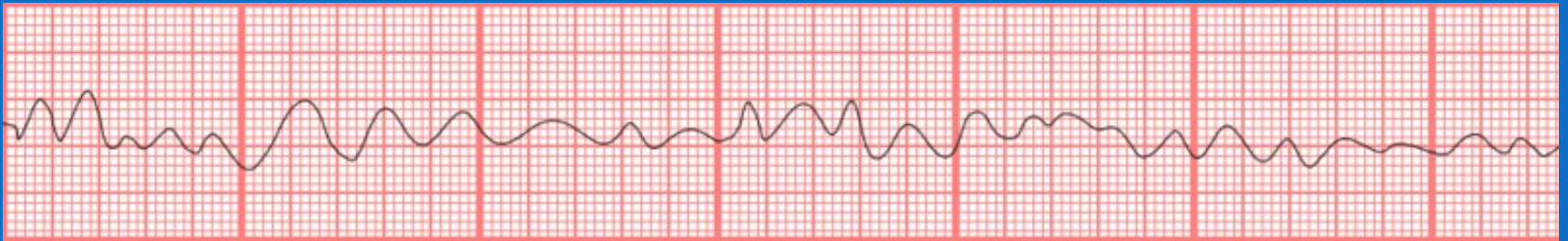


Treatment?

MP – Hospital #3

- Adenosine given (6, 12 and 12mg) with no initial rhythm change
- 30 seconds after 12mg dose of adenosine given MP went unresponsive

Rhythm Strip



Treatment?

Treatment

- Cardioverted with precordial thump, sinus rhythm, mentating well

MP – Hospital #3

- Reassessment, sinus tachycardia with HR 120s and systolic blood pressures 140s
- Mentating well

MP – Hospital #3

- GI performed upper endoscopy which did not show any acute bleeding
- Appeared to be acute duodenitis with diffuse erythema
- Recommended PPI drip and admission

MP – Hospital #3

- Called back to the room for respiratory distress, followed by loss of pulses and respiratory effort

Now What?

Now What?

- ABC's

- Intubated

- Symmetric breath sounds

- Pulseless, does have slow organized electrical activity on the monitor

- Pulses present with compressions

Differential for PEA?

Differential for PEA

- Hypovolemia
- Hypoxia
- H^+ (acidosis)
- Hypo-/Hyperkalemia
- Hypothermia
- Hypoglycemia
- Thrombus (PE/MI)
- Trauma
- Tension Pneumothorax
- Tamponade (Cardiac)
- Toxins

Differential for PEA in this patient

- Hypovolemia
- Hypoxia
- H^+ (acidosis)
- Hypo-/Hyperkalemia
- Hypothermia
- Hypoglycemia
- Thrombus (PE/MI)
- Trauma
- Tension Pneumothorax
- Tamponade (Cardiac)
- Toxins

Differential for PEA in this Patient

- Hypovolemia (GI Bleed)
 - Given blood
 - No change

Differential for PEA in this patient

- Hypoxia
 - Intubated
 - No improvement

Differential for PEA in this patient

- No suggestion of electrolyte abnormality on initial exam (Cr 1.28 but K⁺ normal)
- Repeat blood glucose normal
- Not hypothermic

Differential for PEA in this patient

- Toxins

Received fentanyl and midazolam for the procedure

When do you give Flumazenil?

When do you give Flumazenil?

- ❑ Not on chronic benzodiazepines
- ❑ Not an alcoholic
- ❑ No seizure history
- ❑ Benzodiazepine overdoses are usually treated with supportive care, but consider if patient decompensates in front of you after you gave a benzodiazepine for sedation

Differential for PEA in this Patient

□ Toxins

Received fentanyl and midazolam for the procedure

Given naloxone and flumazenil

No change

Differential for PEA in this Patient

- PE

Differential for PEA in this Patient

□ PE

Can you give thrombolytics with a massive GI bleed?

Differential for PEA in this Patient

- Following a procedure

Differential for PEA in this Patient

- Following a procedure
 - Tension pneumothorax?
 - Cardiac tamponade?

Tension Pneumothorax

Tension Pneumothorax

- Penetrating chest trauma
- Tracheal or bronchial injury
- Occlusive dressing over open pneumothorax
- Positive pressure ventilation

Tension Pneumothorax

- Penetrating chest trauma
- Tracheal or bronchial injury
- Occlusive dressing over open pneumothorax
- Positive pressure ventilation
- Esophageal rupture

Treatment?

Needle Thoracotomy



Cardiac Tamponade

- Acute accumulation of fluid (blood) in pericardium is more associated with tamponade than gradual accumulation

Cardiac Tamponade

- ❑ Penetrating trauma
- ❑ Blunt trauma (rib or sternal fractures)
- ❑ Cardiac or vascular procedures (including central lines that penetrate the RA/RV or SVC)
- ❑ Pneumopericardium (with pneumothorax or pneumomediastinum)

Cardiac Tamponade

□ Pathophysiology

Pericardium usually has 25mL of serous fluid

Pericardium is not rapidly elastic

Can tolerate additional 80-120mL of fluid with little difficulty, but additional 20mL may double intrapericardial pressure

Cardiac Tamponade

- Exam

Cardiac Tamponade

- Exam

Beck's Triad

Cardiac Tamponade

□ Exam

Beck's Triad

- JVD
- Hypotension
- Distant heart sounds

Cardiac Tamponade

- Exam

 - Pulsus paradoxus

Cardiac Tamponade

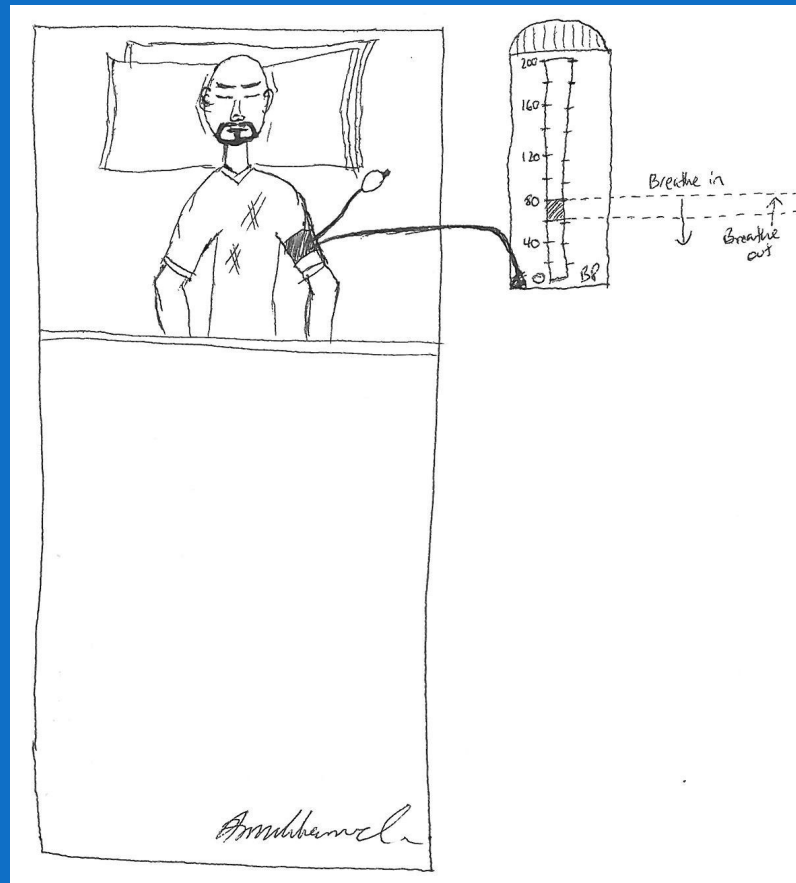
□ Exam

Pulsus paradoxus

- Exaggeration of normal decrease in systolic pressure with inspiration
- $> 12\text{mm Hg}$ is abnormal
- Not pathognomonic (asthma, obesity, heart failure, PE, cardiogenic shock)

Cardiac Tamponade

□ Pulsus paradoxus



Cardiac Tamponade

- Exam
- Ultrasound

Cardiac Tamponade

- Exam
PEA

Treatment?

Pericardiocentesis



Pericardiocentesis

□ Procedure

Attach a precordial (V) lead to the needle immediately after the skin is entered

Advance the needle slowly, while aspirating, until fluid is returned

Do not advance the needle after fluid begins to be returned

If the epicardium is contacted, a current of injury pattern will be seen on the EKG monitor

Pericardiocentesis

Contact with Epicardium

Needle Withdrawn



Pericardiocentesis

- Pericardiocentesis performed
- No return of fluid or air
- No change

MP – Hospital #3

- Code called after 45 minutes without return of spontaneous circulation
- Patient expired approximately 6 hours after arriving at our emergency department

Differential Diagnosis?

Post-Mortum

- Type A aortic dissection from aortic root through iliacs resulting in bowel necrosis

Aortic Dissection

□ Pathophysiology

3 layers of the aortic wall

- Intima, media and adventitia
- Degeneration of the media

Flexion of the ascending aorta and the descending aorta (distal to left subclavian) with each contraction of the heart

Forces of ejected blood weaken the intima

Aortic Dissection

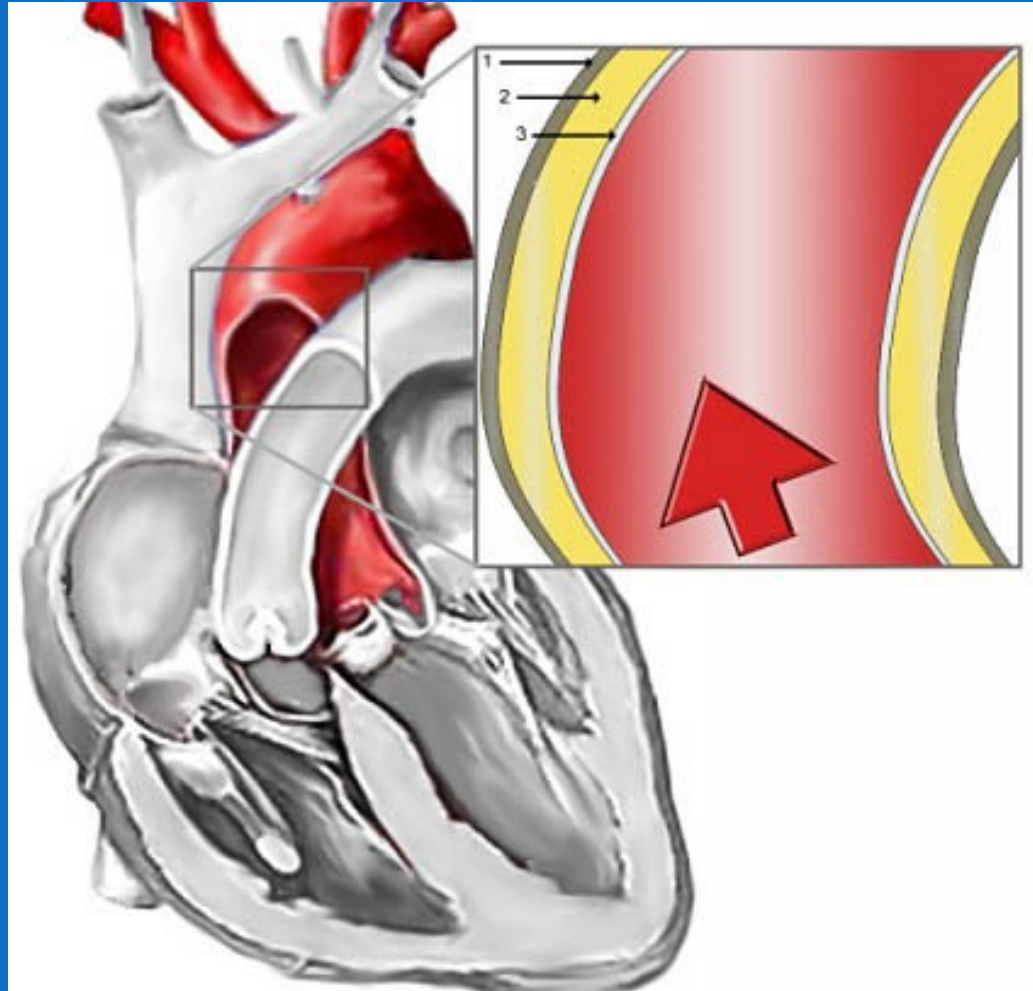
□ Pathophysiology

Column of blood passes through an intimal tear into the media

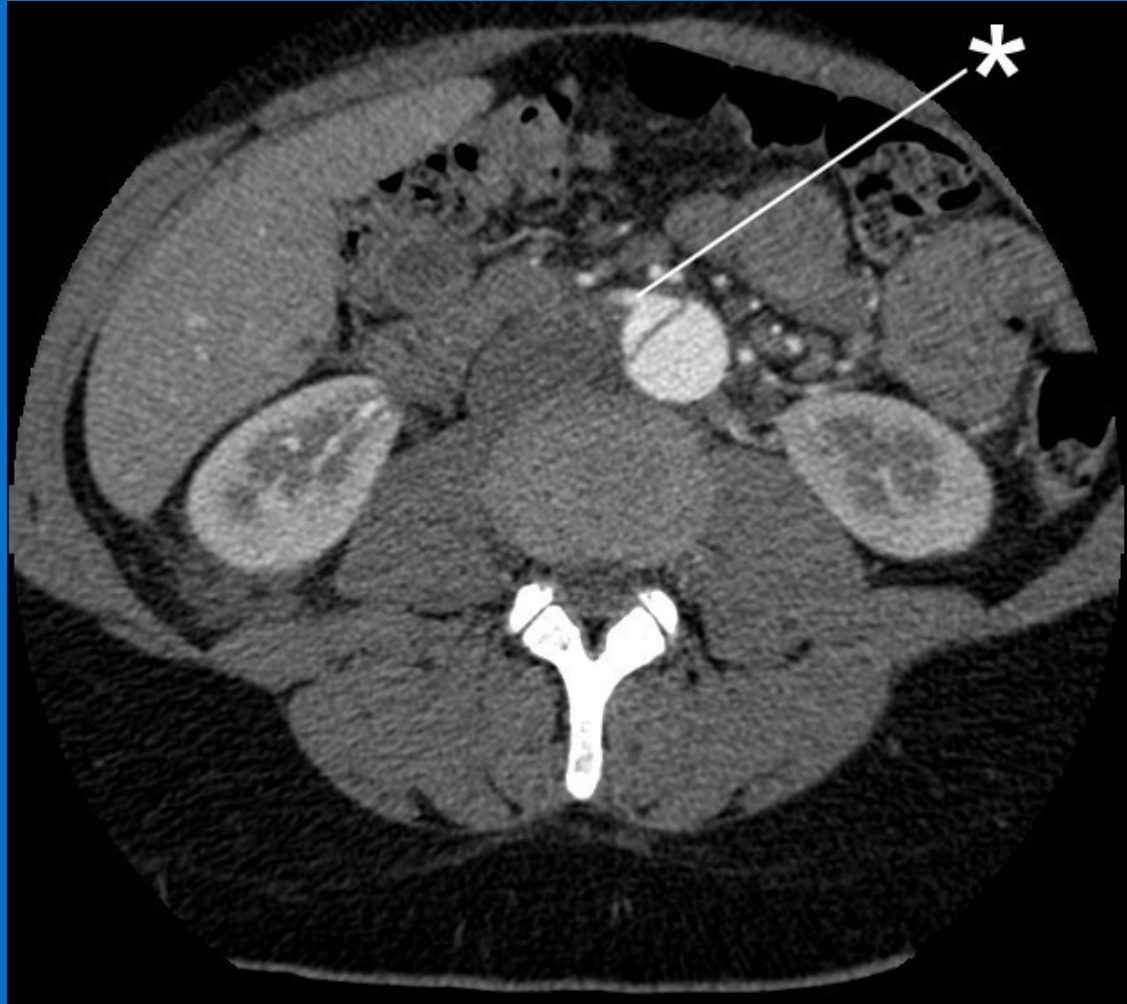
This hematoma can spread both proximally and distally in the weakened media

Hematoma eventually ruptures through the adventitia

Aortic Dissection



Aortic Dissection



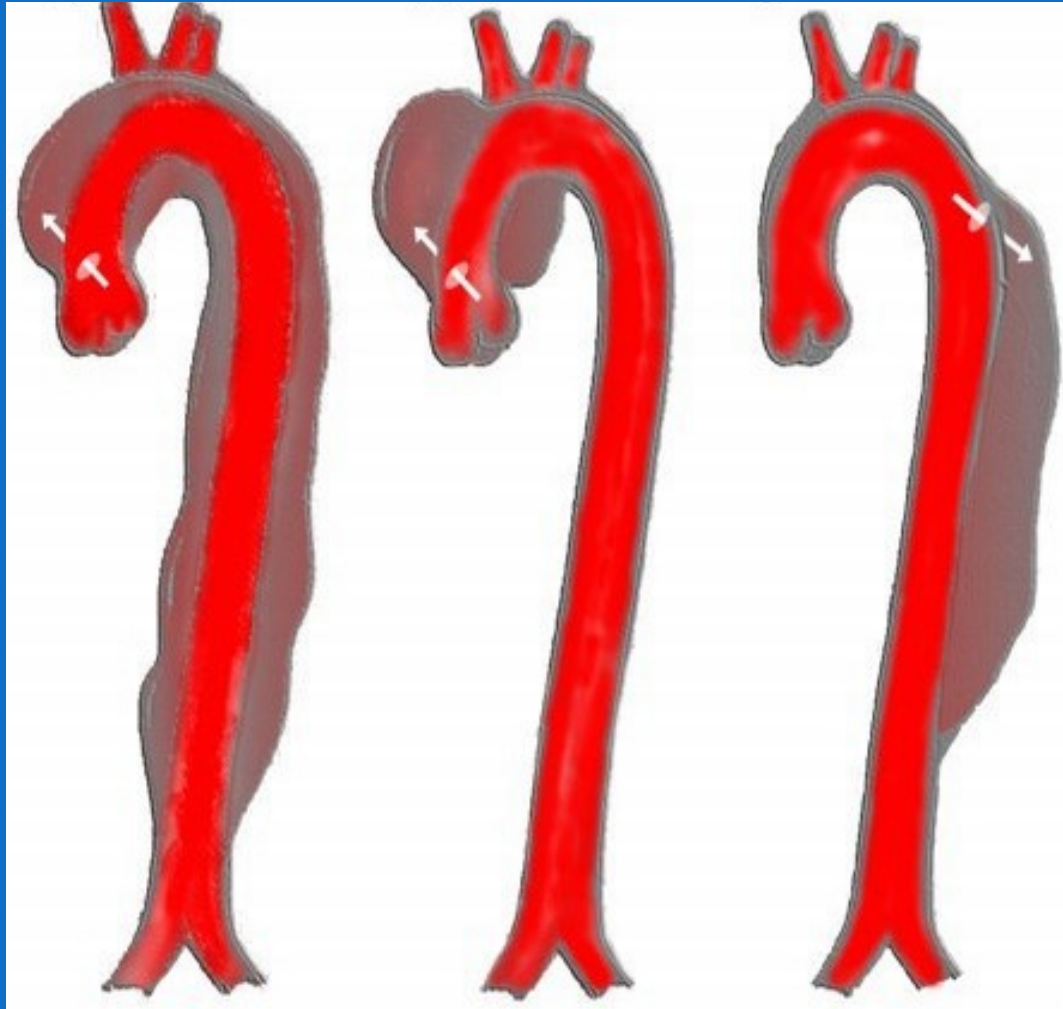
Aortic Dissection

□ Classification

Stanford Classification

- Type A involves the ascending aorta (62%)
- Type B does not involve the ascending aorta (38%)

Aortic Dissection



Aortic Dissection

□ Risk Factors

Male

Age > 40

Hypertension

Connective tissue disorder

Prior cardiac surgery

Bicuspid aortic valve

Family history

Aortic Dissection

□ Symptoms

Pain (90%)

- Excruciating, abrupt, sharp (> tearing)
- Anterior with ascending
- Back with descending involvement
- Migrating (17%)

Visceral symptoms

- Diaphoresis
- Nausea/vomiting
- Severe apprehension

Aortic Dissection

□ Syncope

Present in 9% of dissections

Suggestive of dissecting into the pericardium and tamponade

May be due to hypovolemia

May be due to arrhythmias

Aortic Dissection

□ Symptoms

Depend on where blood flow is compromised

- Stroke/coma
- Pulse deficits/ischemia
- MI (RCA most commonly involved)
- Spinal arteries
- Mesenteric ischemia
- Renal failure

Aortic Dissection

□ Diagnosis

Table 83-2 Sensitivities and Specificities of Imaging Modalities for Diagnosing Aortic Dissection			
TEST	TEE	HELICAL CT	MRI
Sensitivity (%)	98	100	98
Specificity (%)	95	98	98

CT, computed tomography; MRI, magnetic resonance imaging;
TEE, transesophageal echocardiography.
(From Shiga T, Wajima Z, Apfel CC, et al: Diagnostic accuracy of
transesophageal echocardiography, helical computed tomography, and
magnetic resonance imaging for suspected thoracic aortic dissection:
Systematic review and meta-analysis. Arch Intern Med 166:1350–1356,
2006.)

Aortic Dissection

□ Treatment

Opioids to decrease sympathetic tone

Reduce blood pressure (goal SBP: 100-120 mmHg)

Decrease rate of rise of arterial pressure (dP/dT) by keeping HR < 60 to reduce shear forces

β -blockers

Caution with vasodilators which will have reflex increased heart rate (start β -blockade first)

Aortic Dissection

□ Surgery

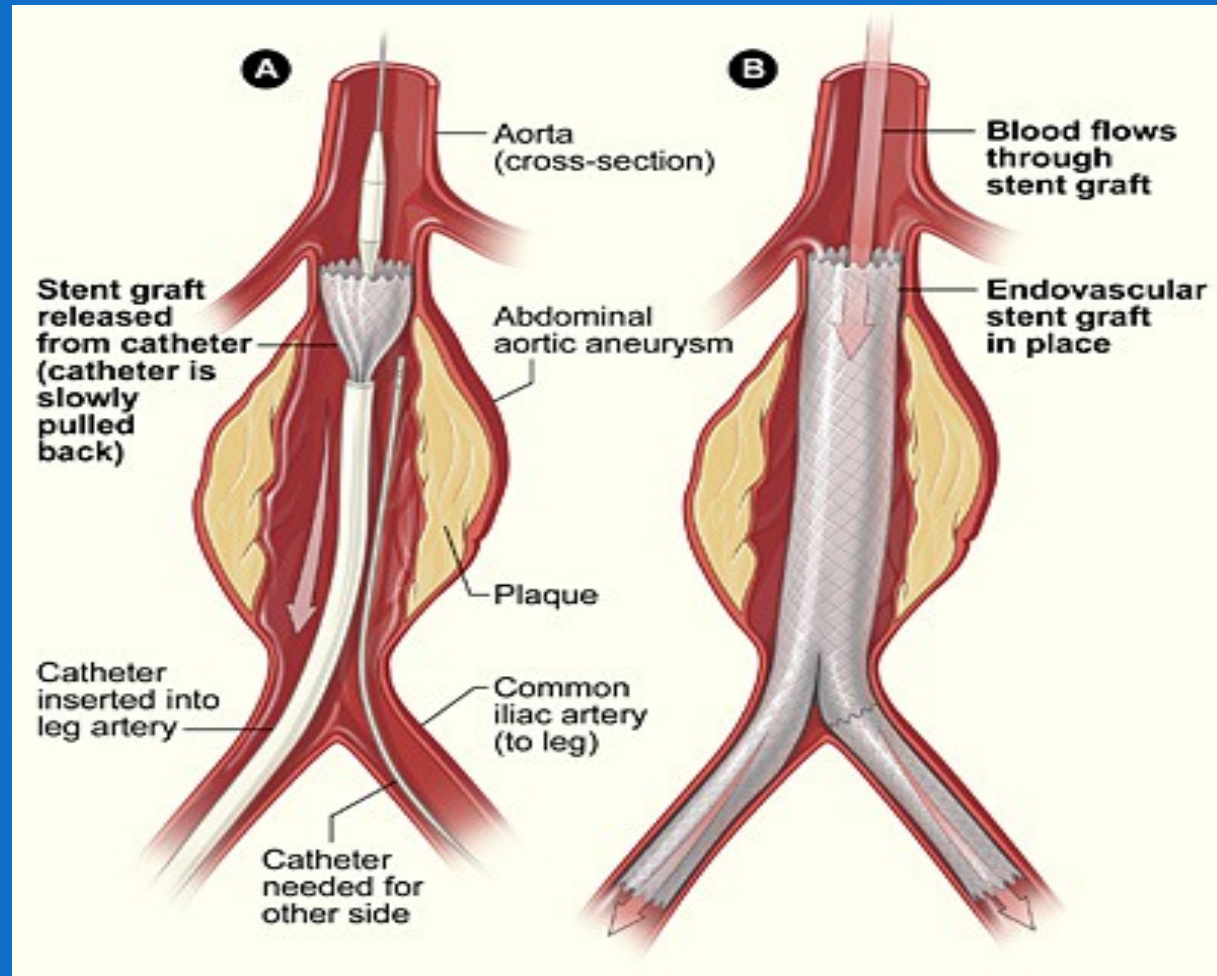
Type A dissections require surgical repair

- Resection of intimal tear and grafting
- Possible AV replacement

Most type B dissections are managed with blood pressure control

- Surgery for continued pain, major arterial trunk involvement, uncontrolled hypertension, frank leak/hemorrhage

Aortic Dissection



Aortic Dissection

□ Interventional Radiology

Some centers are performing interventional fenestration if renal or mesenteric ischemia

