

Case Scenarios

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Life-Threatening Chest Pain

- Acute Coronary Syndrome
- Dissecting Aortic Aneurysm
- Pulmonary Embolism
- Tension Pneumothorax
- Cardiac Tamponade
- Esophageal Rupture

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Case 1

- A 70-year-old patient was transferred to our ED under the diagnosis of ACS. His present chief complaint is SOB for more than 2 days (R1 recorded). He consulted another ED and has gotten the treatment of Clexane for 2 days.
- AVPU
- BP 136/72, PR 100/min, RR 18/min, SpO2 97%

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Case 1

- Risk factors: Uncontrolled hypertension
- Physically essentially normal
- Biochemistry including cardiac enzymes was WNL.

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Case 1



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Case 1



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Case 1



Crescent Sign

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Case 1



Crescent Sign

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Case 1



Atheroma

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Case 1



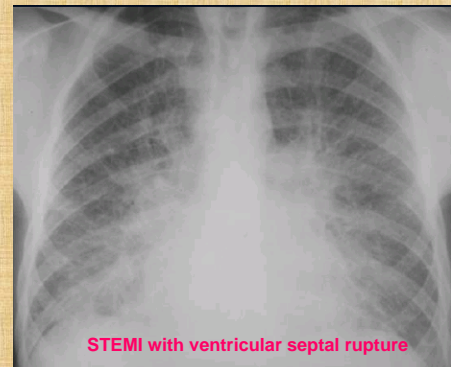
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Case 2

- A 52-year-old female consulted ED due to intermittent chest tightness for one week and progressive dyspnea for 3 days.
- PMH: DM, Hypertension
- AVPU
- BP 108/54, PR 104/min, RR 28/min, SpO2 88%
- Bilateral wheezing
- Gr. III/VI pansystolic murmur over apex

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Case 2



STEMI with ventricular septal rupture

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Mitral Regurgitation Causes

- Thickening of valve leaflets 2° rheumatic disease
- Rupture of the chordae tendinae
 - Posterior leaflet more often-Trauma, Marfan's
- Papillary muscle rupture or dysfunction
 - Acute myocardial infarction
- LV enlargement →dilatation of mitral annulus
 - Any cause of LV enlargement
- LV aneurysm→valvular dysfunction
 - Acute myocardial infarction

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Pansystolic Murmur Causes

- Mitral regurgitation due to valvular involvement in RHD
- Ventricular septal defect (congenital)
- Ventricular septal rupture (acquired, unreperused myocardial infarction)

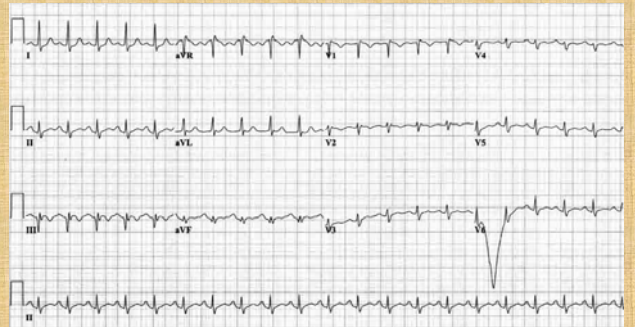
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Case 3

- A 66-year-old male consulted ED due to fever, chest discomfort and progressive dyspnea for 3 days.
- PMH: DM, prostate ca. No travel history.
- AVPU
- BP 116/58, PR 110/min, BT 38°C, RR 24/min, SpO2 93%
- Rapid test: A(+)

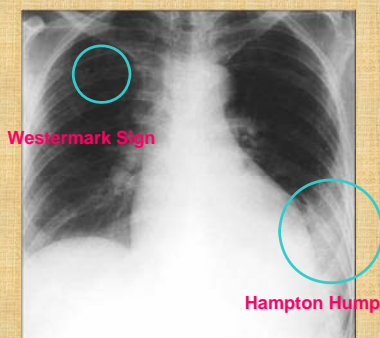
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Case 3



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Case 3



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Case 3



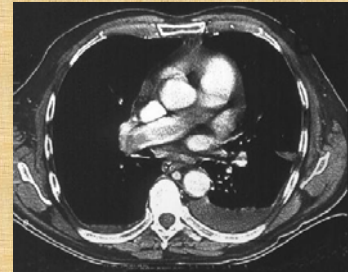
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Case 3

- Hampton Hump
 - Peripheral: pleural-based opacity
 - Wedge-shaped: points to hilum
 - Homogeneous: no air bronchogram
 - Resolves like a “melting ice cube”, not patchy resolution

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Case 3



MPA Pulmonary Embolism

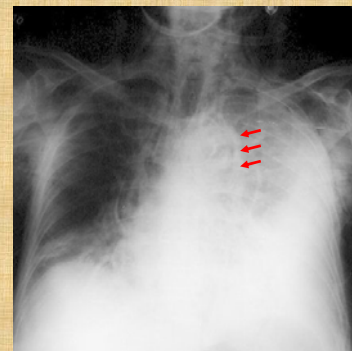
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Case 4

- A 70-year-old male consulted GI clinic due to dysphagia for 1 month. Panendoscope was arranged. Esophageal cancer over lower third of esophagus was impressed.
- Two hours later, he consulted ED due to chest pain and dyspnea.
- AVPU
- BP 108/50, PR 110/min, RR 28/min, SpO2 89%

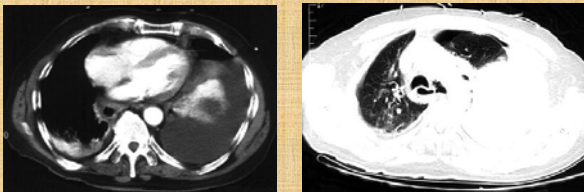
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Case 4



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Case 4



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Case 4

- Boerhaave's syndrome
 - Iatrogenic: endoscope (75%)
 - penetrating injuries
 - blunt trauma
 - severe vomiting
 - caustic ingestion
 - neoplasm

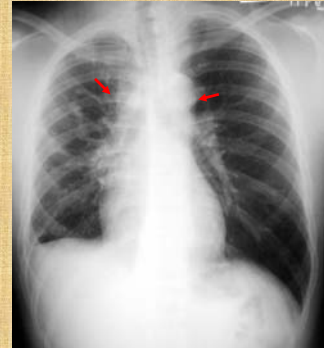
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Case 5

- A 24-year-old patient felt progressive facial edema for more than one month. Severe facial edema was found after sleeping over the night. The symptom can gradually subside after waking up from the bed.
- AVPU
- BP 122/64, PR 100/min, RR 18/min, SpO2 98%

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Case 5



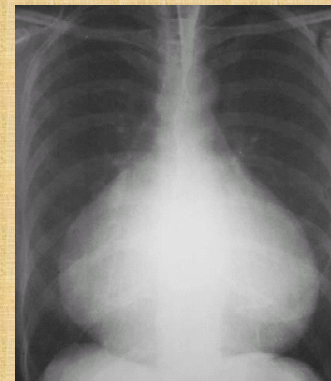
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Case 6

- A 26-year-old man consulted ED due to gradual onset dyspnea and night sweating for 3-4 days. Mild body weight loss of 3 Kgs was noted in recent one month.
- AVPU
- BP 88/44, PR 115/min, RR 24/min, SpO2 94%
- PMH: Nil.

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Case 6



Pericardial Tamponade/Lymphoma

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Case 6

- Differential Diagnosis
 - Panvalvular disease
 - Severe univalvular disease
 - Cardiomyopathy
 - Endomyocardial Fibrosis
 - Pericardial effusion
 - Ebstein's anomaly
 - Uhl's anomaly

Pulmonary
Venous
Congestion

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Case 7

- A 32-year-old man who was admitted with peptic ulcer developed sudden onset dyspnea and chest pain associated with hypotension and tachypnea.
- AVPU
- BP 96/44, PR 118/min, RR 26/min, SpO2 94%
- Precordial examination showed faint heart sound with succussion splash and metallic tinkling sounds.

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Case 7



Pneumopericardium/Tamponade/PPU

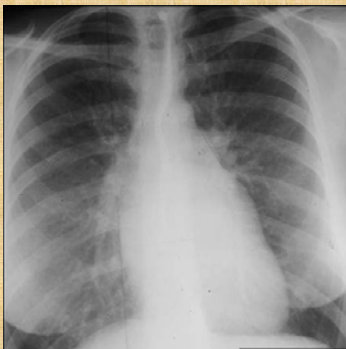
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Case 8

- A 52-year-old female visited ED due to progressive dyspnea for 2 days.
- AVPU
- BP 104/50, PR 112/min, RR 26/min, SpO2 90%
- She was known to have valvular heart disease for 20 years.
- Irregular rhythm and a Gr. II/VI mid-diastolic rumbling murmur over apex were noted.

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Case 8

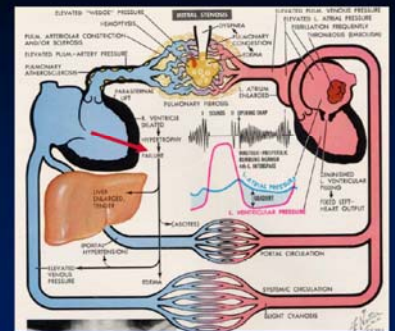


Mitral Stenosis

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Time course of MS in adult

- Mitral stenosis occurs
- Left atrial pressure ↑
- Left atrium enlarges
- Cephalization
- PIE
- PAH develops
- PVR increases
- RV enlarges
- Pulmonic regurg develops
- Tricuspid annulus dilates
- Tricuspid insufficiency
- RV failure



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X-Ray Findings of MS Cardiac Findings

- Usually normal or slightly enlarged heart
 - Enlarged atria do not produce cardiac enlargement; only enlarged ventricles
- Straightening of left heart border
- Or, convexity along left heart border 2° to enlarged atrial appendage
 - Only in rheumatic heart disease

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Mitral Stenosis Cardiac X-Ray Findings

- Small aortic knob due to decreased cardiac output
- Double density of left atrial enlargement
- Rarely, right atrial enlargement from tricuspid insufficiency

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Mitral Stenosis Calcification

- Calcification of valve--not annulus--seen best on lateral film and at angio
- Rarely, calcification of left atrial wall 2° fibrosis from long-standing disease
- Rarely, calcification of pulmonary arteries from PAH

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Mitral Stenosis Pulmonary X-Ray Findings

- Cephalization
- Elevation of left mainstem bronchus (especially if 90° to trachea)
- Enlargement of main pulmonary artery 2° pulmonary arterial hypertension
 - Severe, chronic disease
- Multiple small hemorrhages in lung
 - Pulmonary hemosiderosis

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Etiology of MS

- MS 2° to rheumatic disease 99.8% of cases
- Others
 - Congenital mitral stenosis
 - Infective endocarditis
 - Carcinoid syndrome
 - Fabry's Disease
 - Hurler's syndrome
 - Whipple's Disease
 - Left atrial myxoma

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Pulmonary Edema X-ray Findings

- Staging:
 - I: pulmonary congestion
 - (cephalization)
 - II: butterfly edema pattern
 - III: basal pulmonary edema
 - with/without Kerley's B line
 - IV: III + pleural effusion

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Congestive Heart Failure Causes

- Coronary artery disease
- Hypertension
- Cardiomyopathy
- Valvular lesions
 - AS, MS
- L to R shunts

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Congestive Heart Failure Clinical

- Usually from left heart failure
 - Shortness of breath
 - Paroxysmal nocturnal dyspnea
 - Orthopnea
 - Cough
- Right heart failure
 - Edema

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Left Atrial Pressures Correlated With Pathologic Findings

Normal	5-10 mm Hg
Cephalization	10-15 mm
Kerley B Lines	15-20
Pulmonary Interstitial Edema	20-25
Pulmonary Alveolar Edema	> 25

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Pulmonary Circulation Physiology

- Very low pressure circuit
- Pulmonary capillary bed only has 70cc blood
- Yet, it could occupy the space of a tennis court if unfolded
- Therefore, millions of capillaries are “resting,” waiting to be recruited

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Pressure and Flow

$$\text{Pressure} = \text{Flow} \times \text{Resistance}$$

Normally, resistance is so low that flow can be increased up to 3x normal without increase in pressure

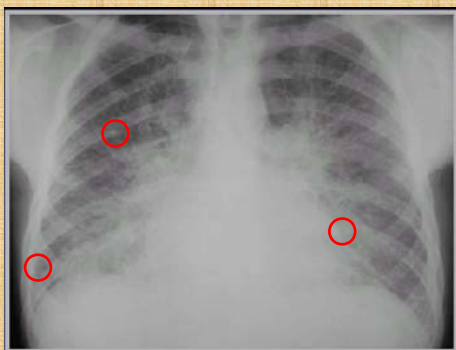
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Pulmonary Interstitial Edema X-ray Findings

- Thickening of the interlobular septa
 - Kerley B lines
- Peribronchial cuffing
 - Wall is normally hairline thin
- Thickening of the fissures
 - Fluid in the subpleural space in continuity with interlobular septa
- Pleural effusions

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Pulmonary Interstitial Edema X-ray Findings



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Kerley B Lines

- B=distended interlobular septa
- Location and appearance
 - Bases
 - 1-2 cm long
 - Horizontal in direction
 - Perpendicular to pleural surface

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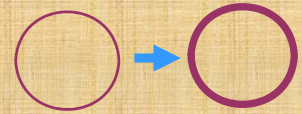
Kerley A and C Lines

- A=connective tissue near bronchoarterial bundle distends
 - Location and appearance
 - Near hilum
 - Run obliquely
 - Longer than B lines
- C=reticular network of lines
 - C Lines probably don't exist

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Peribronchial Cuffing

- Interstitial fluid accumulates around bronchi
- Causes thickening of bronchial wall
- When seen on end, looks like little "doughnuts"



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Fluid in the Fissures

- Fluid collects in the subpleural space
- Between visceral pleura and lung parenchyma
- Normal fissure is thickness of a sharpened pencil line
- Fluid may collect in any fissure
- Major, minor, accessory fissures, azygous fissure

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Fluid in the Fissures

- Lamellar effusions collect beneath visceral pleura
 - In loose connective tissue between lung and pleura
 - Same location for "pseudotumors"

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Cephalization A Proposed Mechanism

- If hydrostatic pressure > 10 mm Hg, fluid leaks in to interstitium of lung
- Compresses lower lobe vessels first
 - Perhaps because of gravity
- Resting upper lobe vessels "recruited" to carry more blood
- Upper lobes vessels increase in size relative to lower lobe

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Left Atrial Pressures Correlated With Pathologic Findings

Normal	5-10 mm Hg
Cephalization	10-15 mm
Kerley B Lines	15-20
Pulmonary Interstitial Edema	20-25
Pulmonary Alveolar Edema	> 25

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Pulmonary Edema

- Cardiogenic
- Non-Cardiogenic
 - ARDS
 - Neurogenic
 - Increased Capillary permeability

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Case 8-1



Mitral Regurgitation

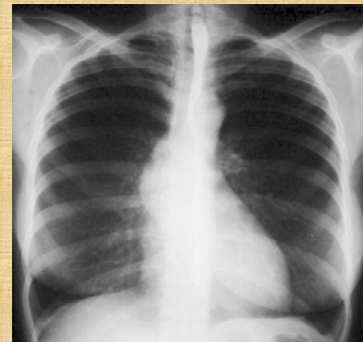
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Mitral Regurgitation X-ray Findings

- In acute MR
 - Pulmonary edema
 - Heart is not enlarged
- In chronic MR
 - LA and LV are markedly enlarged
 - Volume overload
 - Pulmonary vasculature is usually normal
 - LA volume but not pressure is elevated

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Case 8-2



Aortic Stenosis

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Aortic Stenosis X-Ray Findings

- Depends on age patient/severity of disease
 - In infants, AS → CHF/pulmonary edema
- In adults
 - Normal heart size
 - Until cardiac muscle decompensates
 - Enlarged ascending aorta 2° post-stenotic dilatation 2° turbulent flow
 - Normal pulmonary vasculature

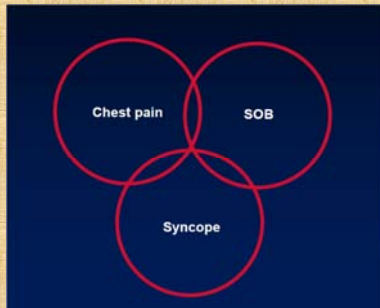
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Post-stenotic Dilatation of Aorta

- From turbulent flow just distal to any hemodynamically significant arterial stenosis
 - Jet effect also plays role
- Occurs mostly with valvular aortic stenosis
 - May occur at any age

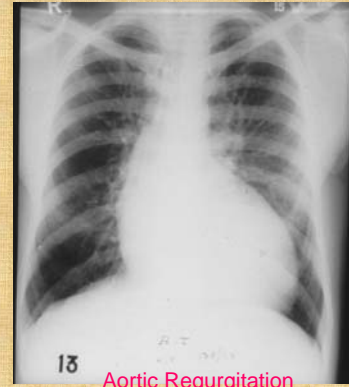
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Aortic Stenosis Clinical Triad



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Case 8-3



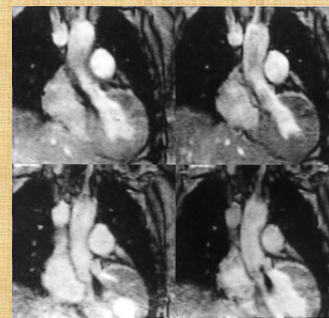
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Aortic Regurgitation X-Ray Findings

- X-ray hallmarks are
 - Left ventricular enlargement
 - Enlargement of entire aorta
- Cine MRI (gradient refocused MRI)
 - “White blood” technique
 - Signal loss coming from Ao valve into LV during diastole
- Color Doppler is also diagnostic

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Aortic Regurgitation MRI Findings



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Aortic Regurgitation Causes

- Rheumatic heart disease
- Marfan's syndrome
- Luetic aortitis
- Ehlers-Danlos syndrome
- Endocarditis
- Aortic dissection

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Case 9

- A 58-year-old male with septic shock is referred to our ED after intubation. At arrival, he complains progressive dyspnea during transportation.
- AVPU
- BP 102/48, PR 102/min, RR 26/min, SpO2 91%
- A CVP was placed via left subclavian vein.
- Breathing sound diminished over left chest.

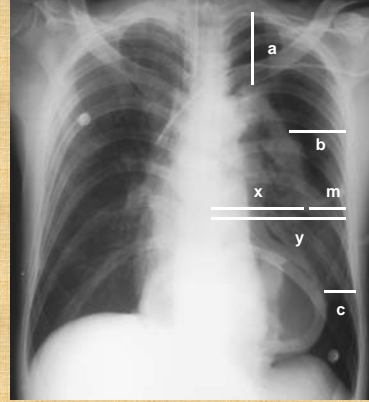
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Case 9



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Case 9



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