

Chest

1997-2008

2008 Chest

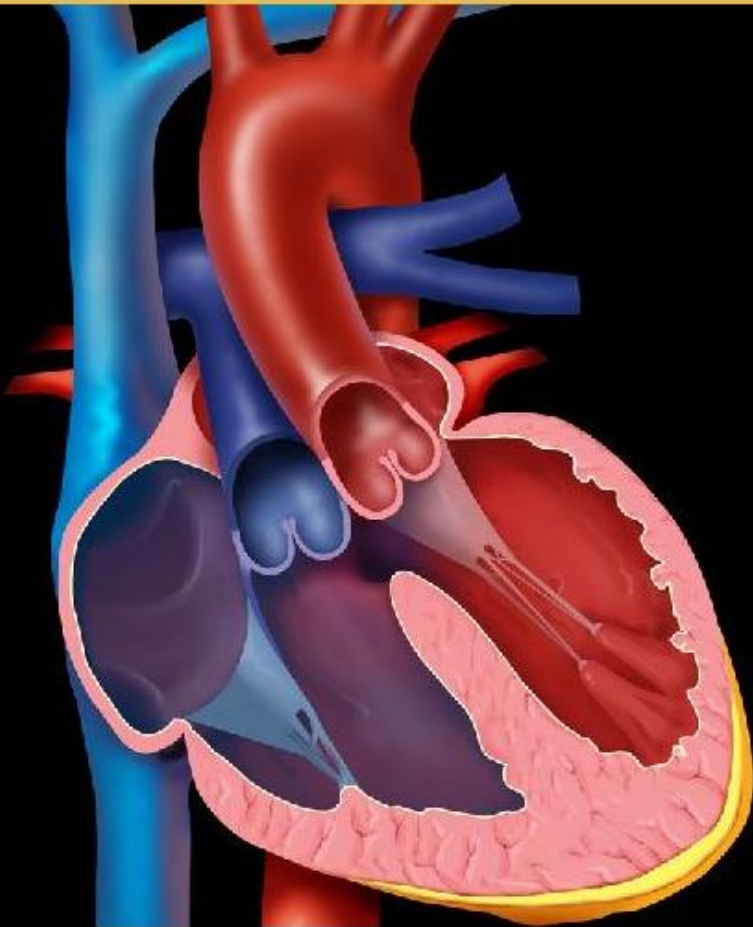
- L-Transposition (Recall):
 - A. AV discordance, Arteriovent concordance
 - B. AV/Arterioventricular discordance
 - C. Atrioventricular Discordance, Ventriculoarterial Discordance
- L-Transposition of Great Vessels.
 - A. Artioventricular concordance Arterioventricular concordance
 - B. Every other possible combination
- L-Transposition of Great Vessels.
 - Artioventricular concordance Arterioventricular concordance
 - ArtioventriculardiscordanceArterioventriculardiscordance
 - Every other possible combination
- L transposition
 - A. Arteriorventricular concordance and Atrioventricular discordance
 - B. And multiple variations of this

2008 Chest

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Levo-Transposition of the Great Arteries

- Commonly referred to as congenitally corrected transposition of the great arteries (CC-TGA)
- Acyanotic heart defect
- Aorta and PA are transposed
- The Aorta is anterior and to the Left of the PA
- The Morphological LV and RV are also transposed
- In segmental analysis= Atrioventricular Discordance (ventricular inversion) with ventriculoarterial discordance
- Blue blood is pumped from the RA into the morphological LV (which lies on the right side of the heart), then through the pulmonary artery to the lungs. The red blood then returns, via the pulmonary veins, to the LA from which it is pumped into the morphological RV, then through the aorta



Graphic shows left-sided ascending aorta, connected to left-sided morphological right ventricle (trabeculated). Right-sided pulmonary artery is connected to right-sided left ventricle. Note high VSD.

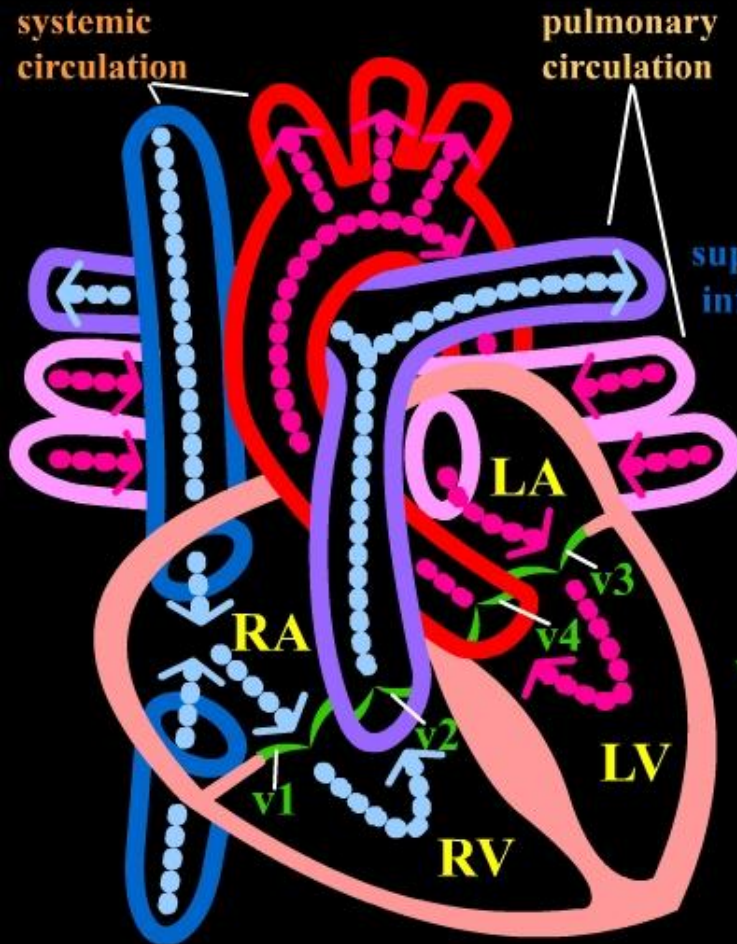


Axial cardiac CT shows pulmonary artery (white open) to lie to the right of the L-looping ascending aorta (white arrow). Note dilated left atrium.

Dextro-Transposition of the Great arteries

- Also referred to as complete transposition of the great arteries
- Cyanotic congenital heart defect
- The aorta and PA are transposed
- In segmental analysis = Ventriculoarterial discordance with atrioventricular concordance or just ventriculoarterial discordance
- Blue blood from the right heart is pumped immediately through the aorta and circulated to the body and the heart itself, bypassing the lungs altogether, while the left heart pumps red blood continuously back into the lungs through the pulmonary artery. In effect, two separate “circular” (parallel) circulatory systems are created.

Normal



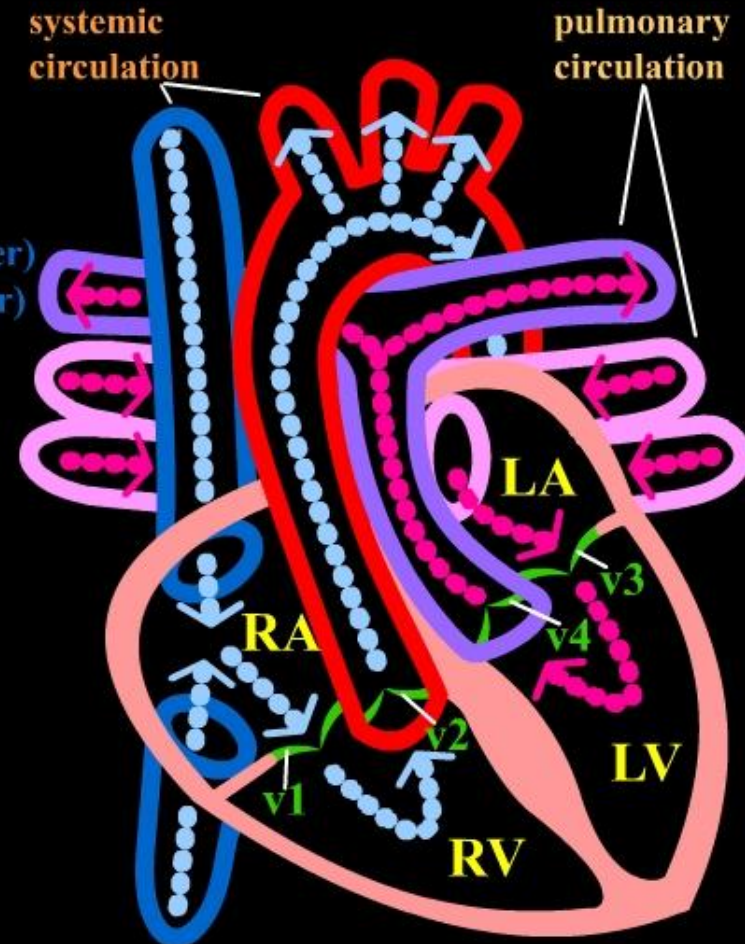
aorta
pulmonary artery
pulmonary veins

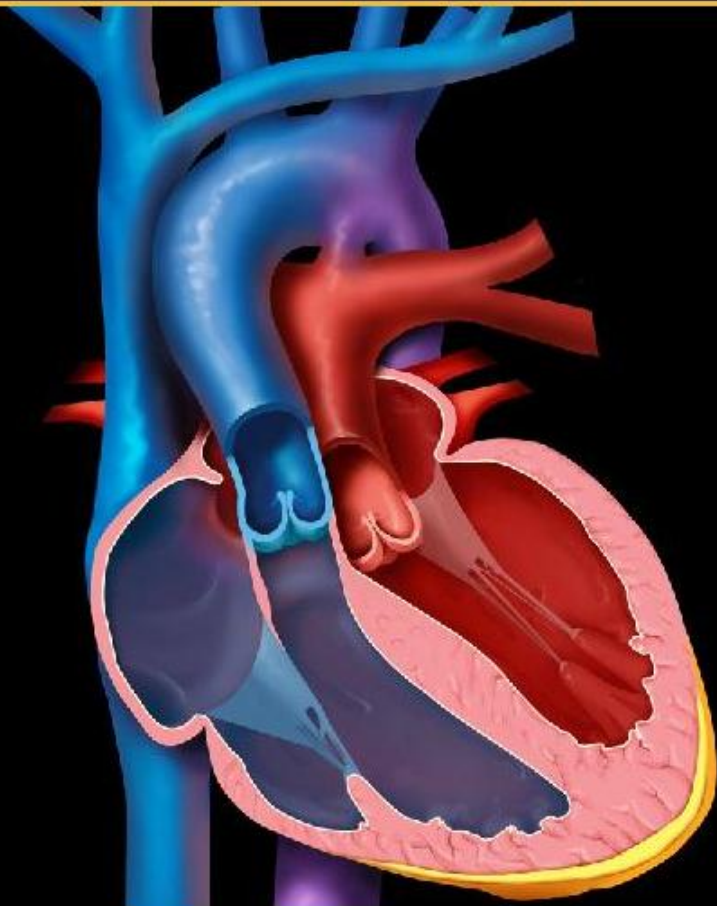
vena cavae:
superior vena cava (upper)
inferior vena cava (lower)

RA = right atrium
RV = right ventricle
LA = left atrium
LV = left ventricle
v1 = tricuspid valve
v2 = pulmonary valve
v3 = mitral valve
v4 = aortic valve

deoxygenated blood
oxygenated blood

d-TGA

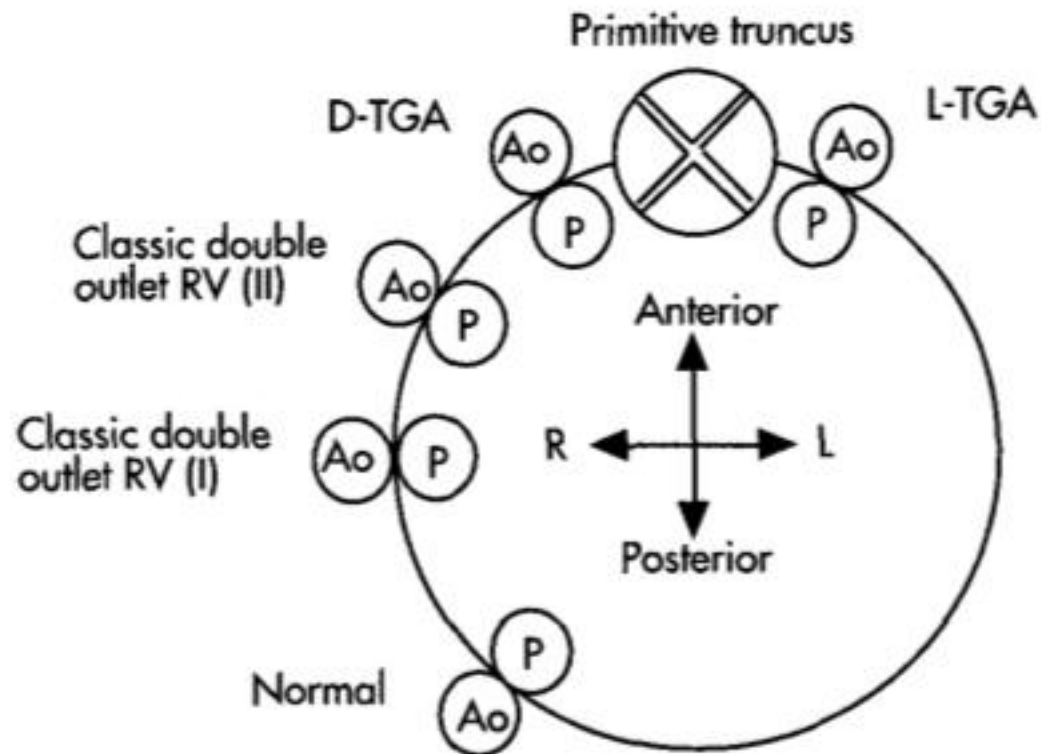




Graphic shows anteriorly-placed aorta, connected via infundibulum to right ventricle, and posteriorly-placed pulmonary artery, directly connected to left ventricle.



Axial MR cine, same patient as previous panel, shows pulmonary artery bifurcation (arrow) positioned anteriorly to ascending aorta (open arrow), with normal branch pulmonary arteries. (Both images courtesy of L. Sena, MD).



RV

- Characteristics of a RV
 - Infundibulum (tunnel of myocardium) separating the AV and Semilunar Valves
 - Moderator Band
 - Corrugated Surface of the Right Ventricular aspect of the septum

- L- TGA = Atrioventricular Discordance (ventricular inversion) with ventriculoarterial discordance
- D-TGA = Ventriculoarterial discordance with atrioventricular concordance or just ventriculoarterial discordance

Chest?

- Calcification in the coronary artery is significant because (recall variant):
 - It is source of emboli
 - It is marker for stenosis
- There is calcification in a coronary artery on cardiac CTA. What does this imply:
 - **Implies there is a region of stenosis at the calcification**
 - The source of thromboembolic event
 - Correlates to an area of prior plaque ulceration
- Coronary atherosclerotic calcification on CTA...
 - Most likely predicts an area of stenosis

Chest Answer

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 - Most likely predicts an area of stenosis

Coronary Calcifications

- Represents atherosclerotic changes in the intima and the internal elastic membrane of the coronary arteries
- most frequently calcified site:
 - 1. LAD
 - 2. left circumflex artery
 - 3. RCA
- increases with age and may be part of the normal aging process
- Generally, in pts <60, there is a strong correlation btw calcification and severity of atherosclerosis; the association is not as strong in older pts.
- influenced by risk factors such as increased cholesterol and lipids, smoking, HTN, and a family history of CAD.
- **There is a correlation btw calcification and the severity of coronary stenosis; however, some severe stenoses may not be calcified and some heavy calcifications may not denote stenotic arteries**

Chest?

- CT coronary angio shows RCA lesion. What to do (new)?
 - CABG
 - Invasive angio
 - Medical management
 - Stent
- Coronary CTA shows severe/hi grade stenosis of the RCA...what to do next?
 - A) Invasive coronary angiogram
 - B) Bypass
 - C) Medical mangagment
 - D) Angioplasty and stenting
- Coronary CTA shows severe/hi grade stenosis of the RCA...what to do next?
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Chest?

- CT coronary angio shows RCA lesion. What to do (new)?
 - CABG- not indicated
 - Invasive angio
 - Medical management
 - Stent (? It's possible)
- Coronary CTA shows severe/hi grade stenosis of the RCA...what to do next?
 - A) Invasive coronary angiogram
 - B) Bypass- not indicated
 - C) Medical mangagment
 - D) Angioplasty and stenting (? Its possible)
- Coronary CTA shows severe/hi grade stenosis of the RCA...what to do next?
 - Invasive coronary angiogram
 - Bypass- not indicated
 - Medical mangagment
 - Angioplasty and stenting (? Its possible)
- High grade stenosis of the right coronary artery on CTA. What is the next step?
 - Diagnostic coronary angiogram
 - Angioplasty and stent
 - CABG
 - Do nothing
 - Medical management

INDICATIONS/CONTRAINDICATIONS: INDICATIONS FOR CORONARY BYPASS SURGERY

- **ANATOMY**

- Left main coronary artery disease
- Triple-vessel disease involving the proximal left anterior descending coronary artery with normal or diminished ejection fraction
- Double-vessel disease involving the proximal left anterior descending coronary artery with normal or diminished ejection fraction

- **SYMPTOMS**

- Unstable (crescendo) angina
- Postmyocardial infarction
- Angina
- Acute coronary occlusion after percutaneous transluminal coronary angioplasty
- Symptoms unsuccessfully controlled with medical therapy
- Controlled symptoms, but with unacceptable lifestyle

Chest Answer

- Any pt with severe CAD should be referred to a cardiologist for angiography and possible interventional therapy or surgery
- Severe CAD by CCTA is soft or hard plaque with vessel narrowing (stenosis) of 70% or greater
- 50% of left main coronary artery is considered severe CAD
- those with stenosis >70% underwent catheterization and pts with intermediate lesions or uninterpretable sccans underwent nuclear stress testing.

http://www.proscan.com/filelib/FileCabinet/CCTA/CCTA_Physician_Guide.pdf?FileName=CCTA_Physician_Guide.pdf

<http://www.emcreg.org/pdf/monographs/cta.pdf>

Chest?

- Lateral wall ischemia seen which vessel...

A) LAD

B) Circumflex

C) RCA

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- LAD

Circumflex

- RCA

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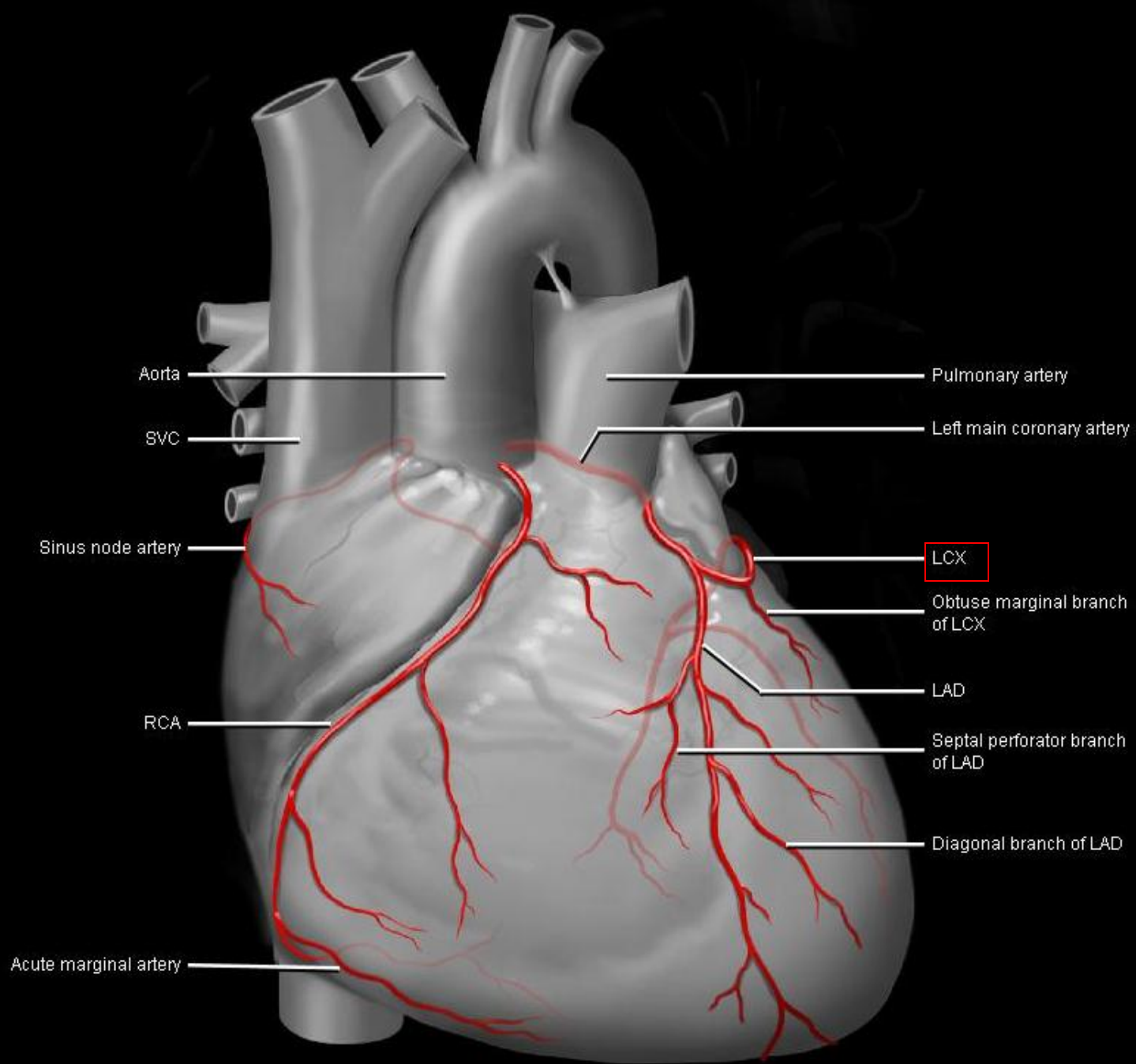
C) RCA

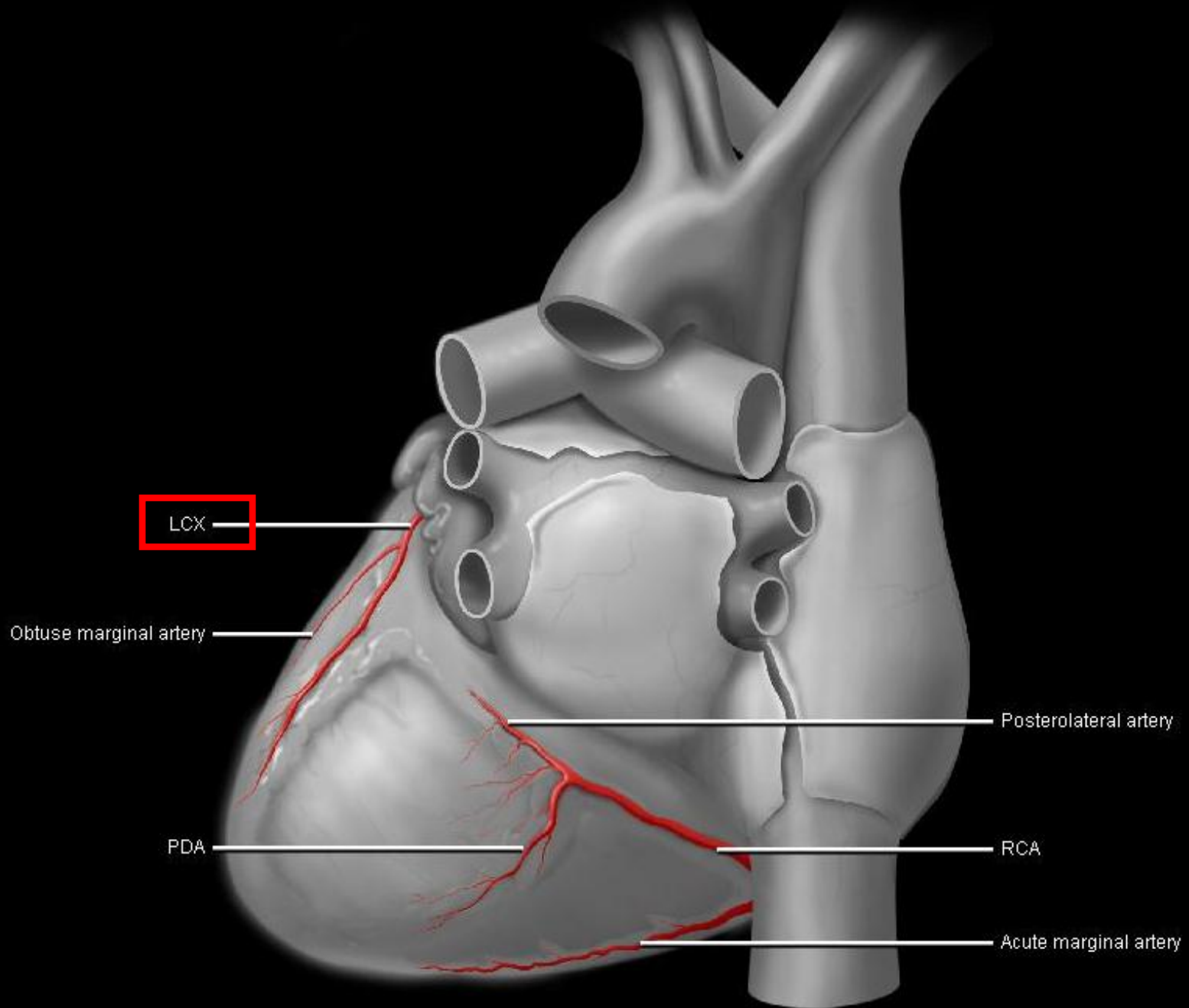
- Lateral wall ischemia seen which vessel...

- LAD

Circumflex

- RCA



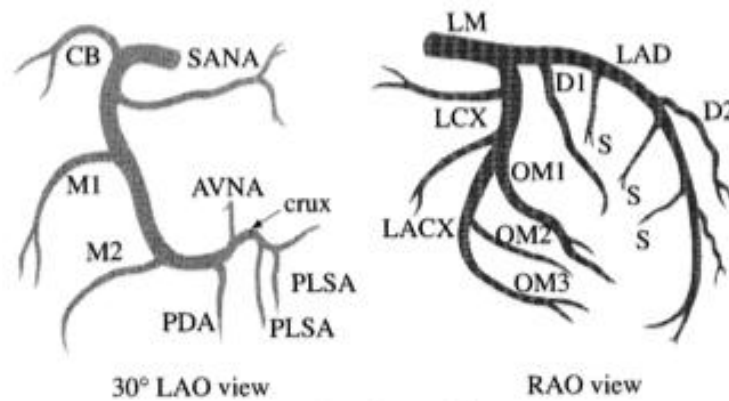


Coronary Artery Territory

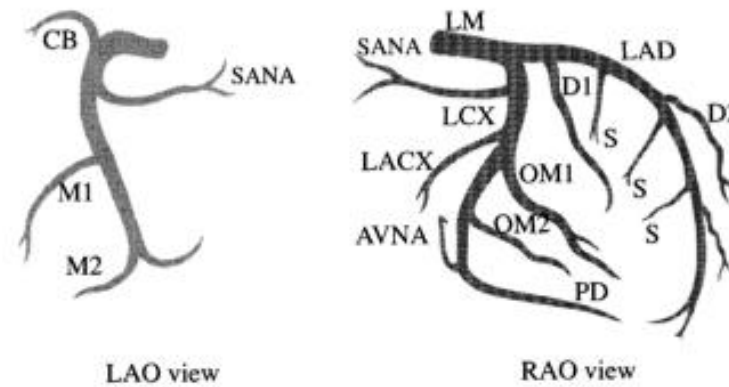
- Septum = LAD
- Anterior wall = LAD
- Lateral Wall = LCX
- Posterior Wall = RCA
- Inferior/ Diaphragmatic wall = RCA
- Apex + Inferolateral wall = watershed areas

Coronary Artery Dominance

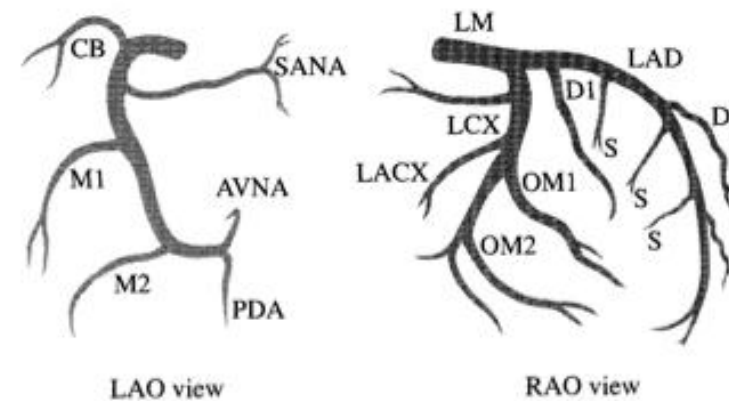
- Determined by the origin of the posterior descending artery (PD), which supplies the inferior portion of LV
- - from RCA in 85%
- From LCX in 10%
- RCA + LCA = codominance/balanced supply (5%)



Right Dominant System



Left Dominant System



Balanced Circulation

Chest?

- On cardiac MRI a patient presents with left lateral wall akinesis with signal abnormality. Which coronary lesion is affected?
- Left circumflex artery
- Right coronary artery
- Left coronary artery
- LAD

Chest?

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- Left circumflex artery
- Right coronary artery
- Left coronary artery
- LAD

Chest?

- On cardiac MRI there is abnormal signal on T₁ in the lateral wall of the left ventricle without delayed enhancement. What is the most likely etiology:
- Myocardial ischemia
- Myocardial infarction
- Myocarditis
- Amyloidosis

Chest?

- On cardiac MRI there is abnormal signal on T₁ in the lateral wall of the left ventricle without delayed enhancement. What is the most likely etiology:
- Myocardial ischemia
- Myocardial infarction
- Myocarditis
- Amyloidosis

Chest?

- On cardiac MRI there is abnormal signal on T1 in the lateral wall of the left ventricle without delayed enhancement. What is the most likely etiology:
- Myocardial ischemia-
- Myocardial infarction- infarcted tissue would demonstrate delayed enhancement
- Myocarditis
- Amyloidosis

MRI- Ischemic Heart Disease

rest Cine

- An essential feature of normal myocardium includes the preservation of normal contractile fx
- Viable myocardium may appear dysfunctional as a result of either acute reversible ischemic insults (myocardial stunning) or a chronic, gradual decrease in blood supply (hibernating myocardium)
- Thinning of the myocardial wall at rest is a reliable feature of scarred tissue resulting from extensive myocardial injury and remodeling
- Systolic wall thickening at rest or during dobutamine stress of greater than 2mm as determined by ECG gated breathhold MR cine sequences, is considered a reliable marker of viability.
- Thus, significant myocardial thinning or lack of endocardial thickening are reliable indicators of nonviable myocardial tissue

MRI- Ischemic Heart Disease

Stress Cine Imaging with Dobutamine

- Evaluates an important parameter of muscle viability – contractile reserve
- Low dose dobutamine stimulation with cine MR has been shown to be a reliable means of differentiating viable from nonviable myocardium
- Higher doses of dobutamine are used mainly to evaluate pts for coronary stenosis or cardiac ischemia

MRI- Ischemic Heart Disease

Adenosine Stress MR

- Gd-DTPA is useful as a contrast and perfusion agent
- Viable myocardium
 - exhibits gradual signal enhancement and
 - washout with the passage of the T₁ enhancing contrast agent
- New or old infarcted myocardium
 - First Pass Images --- exhibits decreased signal enhancement (hypoenhancement)
 - Delayed Images--- hyperenhancement (5-15 minutes after injection of Gd-DTPA)
- The addition of adenosine stress further accentuates the baseline perfusion defect in hibernating myocardium and helps differentiate normal from near normal regions in stunned myocardium
- Analogous to the detection of contractile reserve with low dose dobutamine- vasodilator induced perfusion defects detect myocardial perfusion reserve

MRI Ischemic Heart Disease

Evaluation of Cardiac Viability

- Delayed Hyperenhancement

- T₁WI acquired 5-30 min after the administration of an IV bolus of Gd-DTPA demonstrates the presence of necrosis as areas with increased signal intensity
- Retention of contrast agent== nonviable myocardium regardless of the age of the infarct.
- The smaller the area of late enhancement, the higher the probability of mechanical improvement

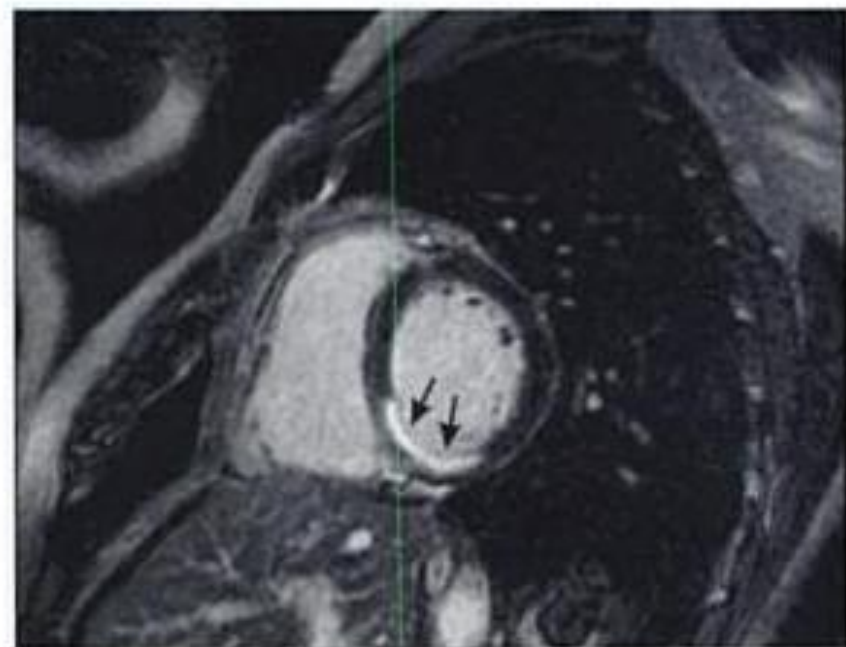
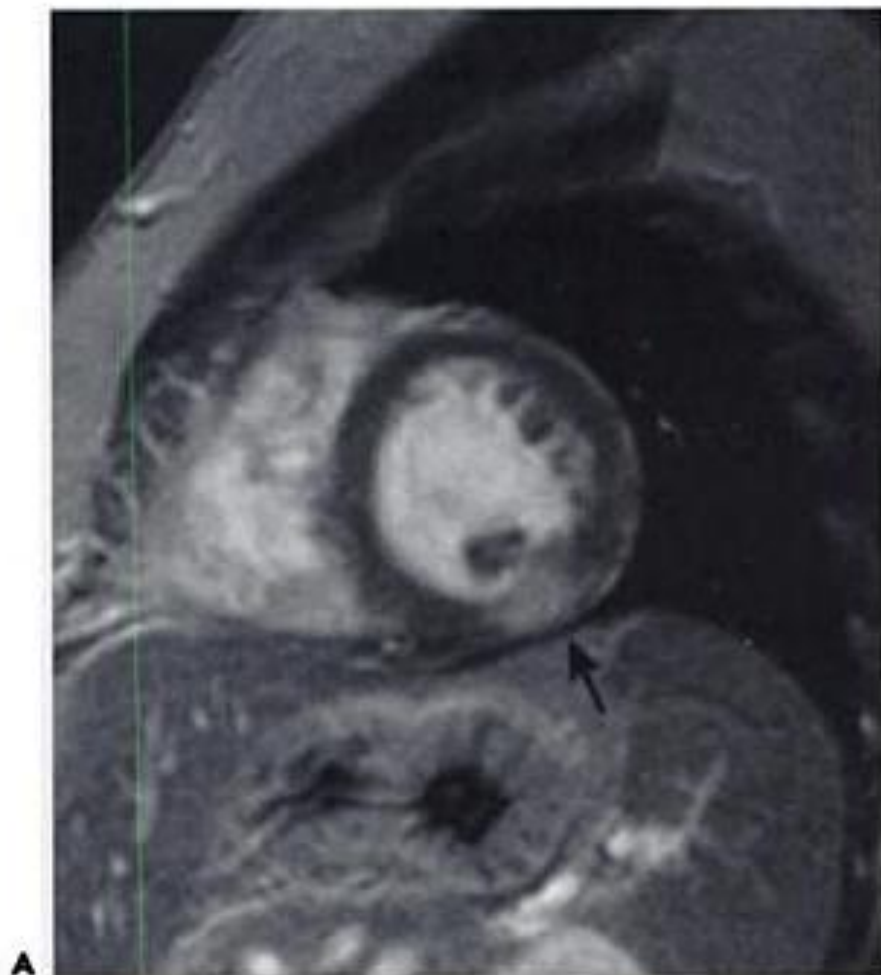


Figure 9-25 Delayed contrast-enhanced imaging in two separate patients demonstrates (A) transmural postero-lateral (arrow) and (B) subendocardial postero-septal (arrows) enhancement patterns. Subendocardial MIs are more likely to demonstrate wall-motion recovery after revascularization.

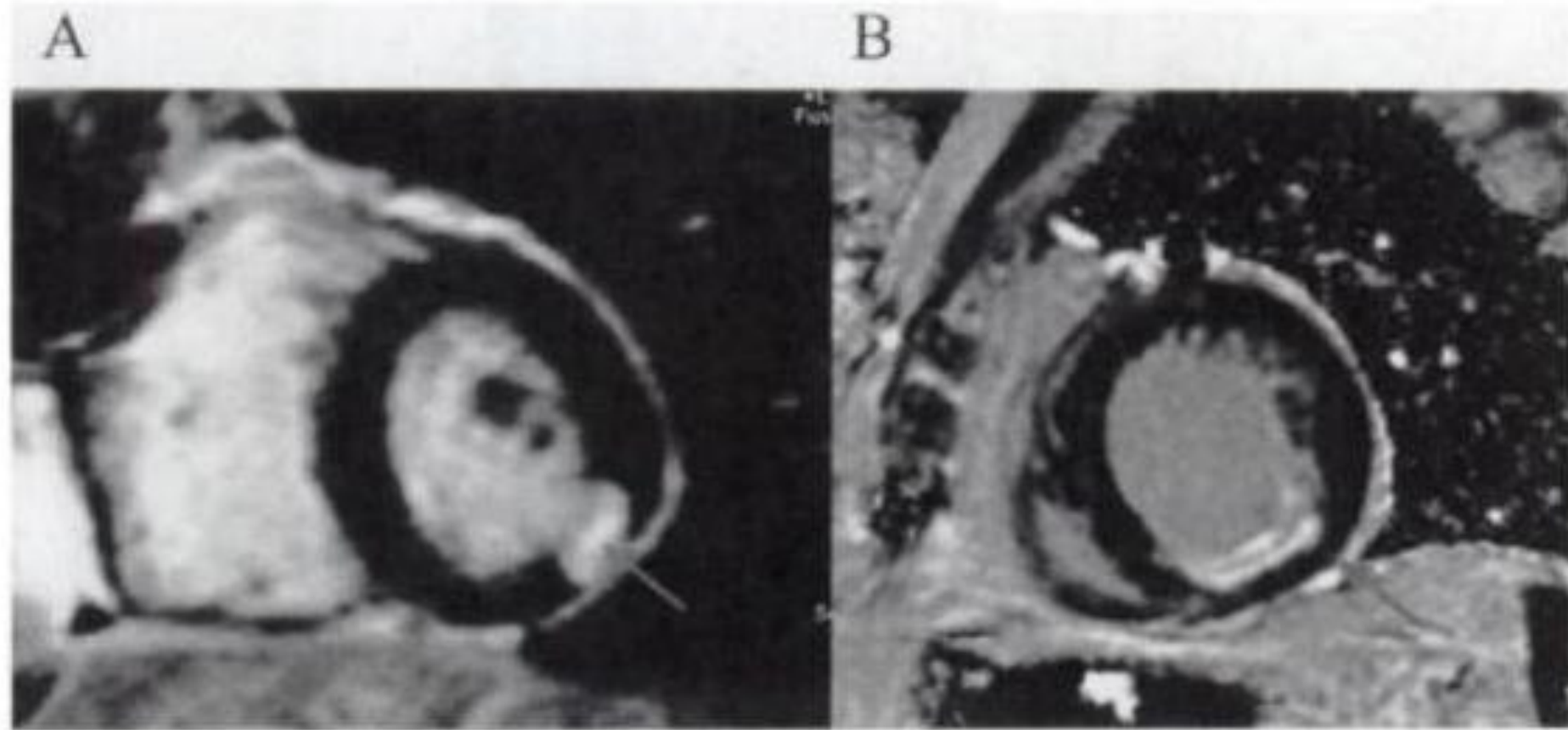


FIGURE 21-13 Delayed hyperenhancement showing transmurular (A) and subendocardial (B) scarring involving the inferolateral (A) and inferior (B) walls.

Chest?

- On cardiac MRI, the left ventricle is akinetic but does not demonstrate delayed enhancement on post contrast imaging. What does this likely represent (Recall variant)?
 - Infarct
 - Hibernating myocardium
 - Retroaortic left coronary artery.

Chest?

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 - Infarct- would demonstrate delayed hyperenhancement
 - Hibernating myocardium
 - Retroaortic left coronary artery.

Chest?

- On perfusion study a patient has septal wall akinesis with no delayed enhancement on cardiac MRI images. What is the etiology:
- Hibernating myocardium
- Myocardial infarction

Chest?

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- Hibernating myocardium
- Myocardial infarction

Chest?

- Hypoperfusion and delayed enhancement is seen at the lateral wall of the left ventricle. What artery supplies this region?
 - A) LAD
 - B) Left circumflex
 - C) main RCA
 - D) main LCA
 - E) PDA

Chest?

- Hypoperfusion and delayed enhancement is seen at the lateral wall of the left ventricle. What artery supplies this region?
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Chest?

- Cardiac MRI shows transmural delayed enhancement of the lateral wall of the left ventricle. What is the next step:
- Medical management
- CABG
- Coronary angioplasty
- Coronary stent

Chest?

- Cardiac MRI shows transmural delayed enhancement of the lateral wall of the left ventricle. What is the next step:
- Medical management- it's too late for love the tissue is already gone
- CABG
- Coronary angioplasty
- Coronary stent

Chest?

- Delayed enhancement on MRI, what is the treatment (Recall)?
 - Medical
 - Angioplasty
 - CABG

Chest?

- What is a branch of the RCA?
 - A) acute marginal
 - B) obtuse marginal
 - C) diagonal
 - D) septal
- Which is a branch of the RCA (recall)?
 - Acute marginal
 - Obtuse marginal
 - Diagonal
 - Ramus
 - Septal perforators

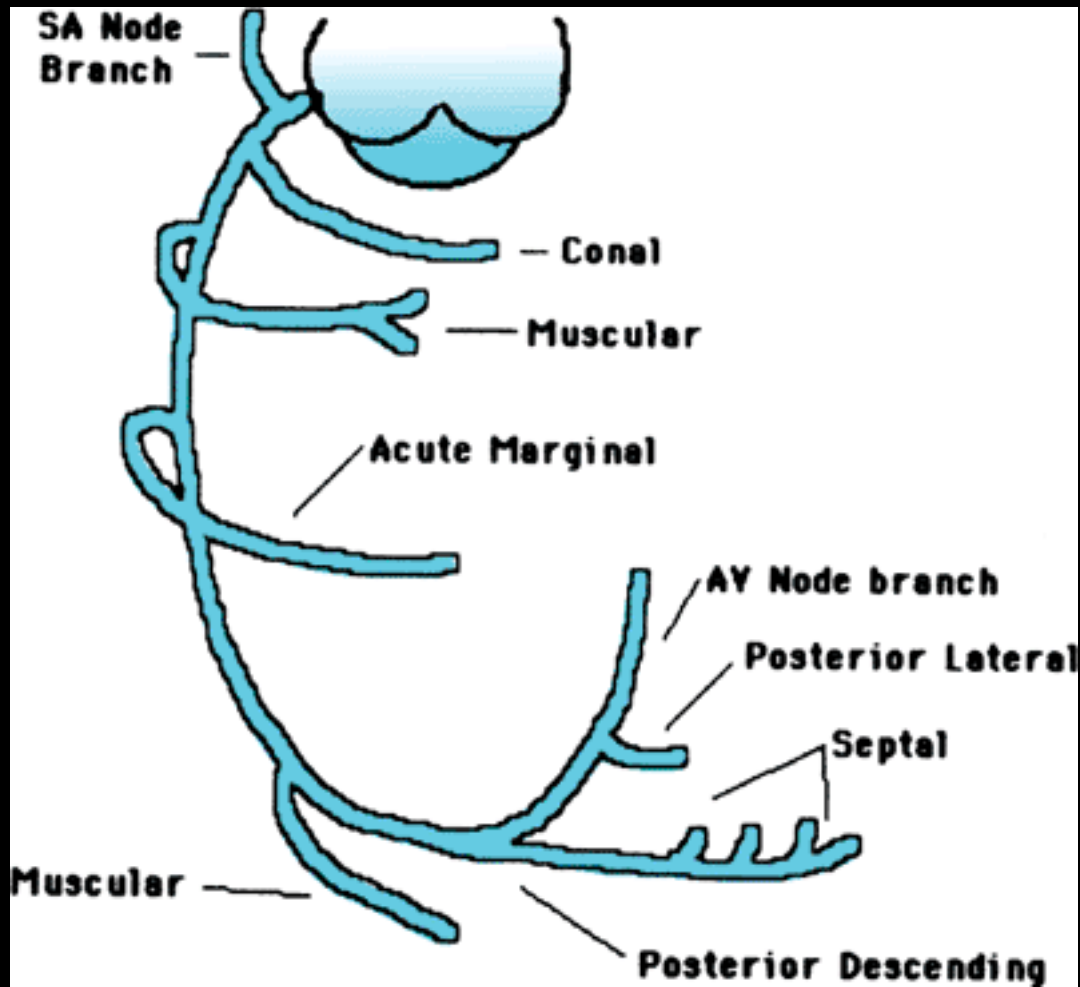
Chest?

- What is a branch of the RCA?
 - A) acute marginal
 - B) obtuse marginal- circumflex
 - C) diagonal- LAD
 - D) septal- LAD
- Which is a branch of the RCA (recall)?
 - Acute marginal
 - Obtuse marginal- circumflex
 - Diagonal- LAD
 - Ramus
 - Septal perforators- LAD
- Which of the following is a branch of the right coronary artery:
 - Acute marginal
 - Diagonal
 - Obtuse marginal
 - Ramusintermedius

Right Coronary Artery

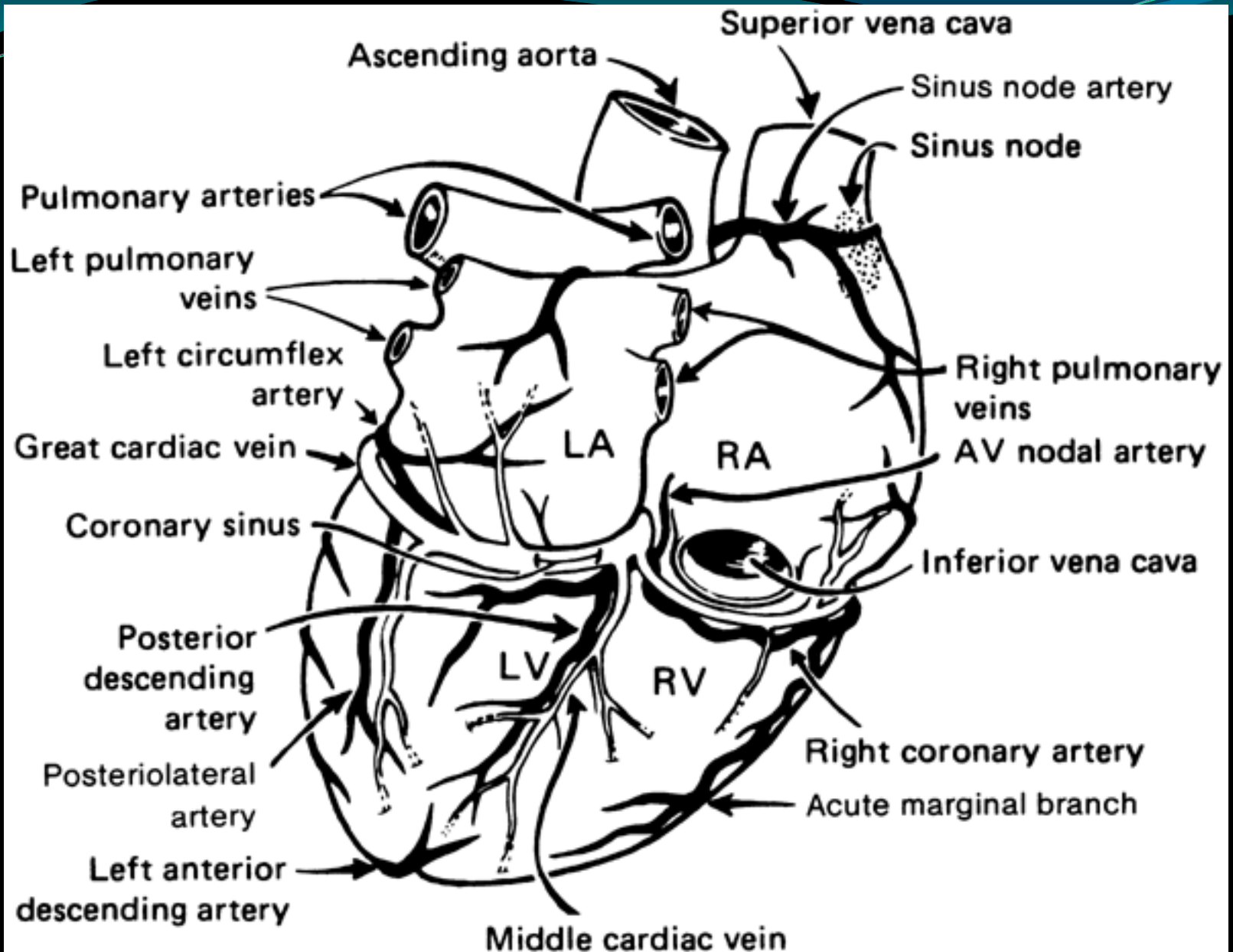
- supplies the
 - RA
 - RV
 - a portion of the posterior and inferior surfaces of the left ventricle
 - AV node
 - bundle of His in 90% of hearts
 - the sinus node in 55%
- It originates behind the right aortic cusp and passes behind the pulmonary artery, coursing in the right AV groove laterally to the right margin of the heart and then posteriorly.
- The major branches of the right coronary artery, in order of origin, are as follows:
 - Conus branch
 - Sinus node artery
 - Right ventricular branches
 - Right atrial branch
 - Acute marginal branch
 - AV nodal branch
 - Posterior descending branch
 - Left ventricular branch
 - Left atrial branch

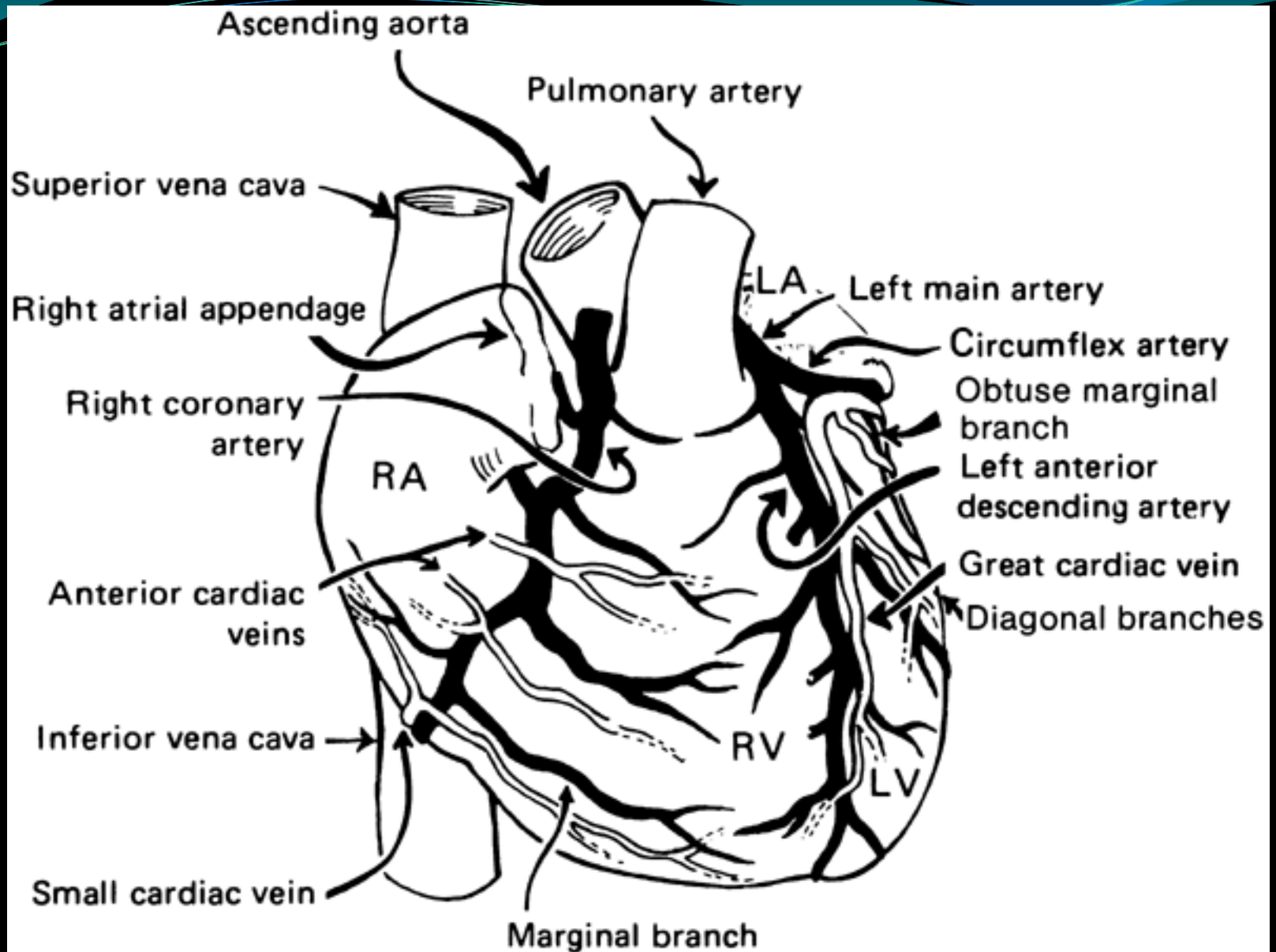
Normal Right Coronary Artery



LAD & Circumflex

- Circumflex Branches (in order of origin)
 - Atrial circumflex branch
 - Sinus node artery
 - **Obtuse marginal branches**
 - **Posterolateral branches**
- **LAD Brances (in order of origin)**
 - First diagonal branch
 - First septal branch
 - Right ventricular branch
 - Minor septal branches
 - Second diagonal branch
 - Apical branches





Chest?

- Thrombus in left atrium, what is the most likely cause (Recall)?
 - A. Fib
 - Left ventricular infarct
- A left atrial thrombus is present. What is the most likely cause:
 - Atrial fibrillation
 - Ventricular tachycardia
 - Ventricular fibrillation
- cta atrial thrombus is associated with:
 - A fib
 - PAC's
 - A flutter

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Chest?

- Pt in car accident, thrown against steering wheel, now with holosystolic murmur and pulmonary edema, what is the most likely cause (Recall)?
 - Aortic transection
 - Aortic valve rupture
 - Papillary muscle rupture
 - Interventricular septal rupture
- A 30 year old man is in a MVC and strikes his precordium on the steering wheel. He presents with chest pain, pulmonary edema and a holosystolic murmur. What is the most likely etiology:
 - **Rupture of the interventricular septum**
 - Papillary muscle rupture
 - Rupture of an aortic cusp
 - Aortic root injury
- Young guy in accident with chest thrown into steering wheel. Has precordial chest pain and holosystolic murmur.
 - Papillary muscle rupture
- Young guy in accident with chest thrown into steering wheel. Has precordial chest pain and holosystolic murmur.
 - A) Papillary muscle rupture

Injury to Cardiac Valves, Papillary Muscles, Chordae Tendineae, and Septum

Nonpenetrating injury to the heart may cause rupture of the valves, especially in patients with preexisting disease of these structures. Parmley and associates, in a series of 546 cases of blunt cardiac trauma, reported a 9% incidence of injury to the valves. The aortic, mitral, and tricuspid valves were involved in decreasing order of frequency.⁵⁶ Moront and colleagues described a case of rupture of the interventricular septum and tricuspid valve after an MVA. The patient presented 4 days after injury with shortness of breath and substernal pain. The lesion was successfully repaired. The investigators pointed out that the rare ventricular septal rupture following blunt trauma occurs commonly in the muscular portion of the septum near the apex.⁵⁸ The only two documented cases of perimembranous rupture of the septum were associated with tricuspid valve injury.

New onset of a harsh holosystolic murmur of mitral regurgitation signifies a papillary muscle rupture. New loud musical murmurs may indicate valvular lesions. When severe acute left ventricular failure ensues as a consequence of these lesions, early operative intervention is indicated. Septal rupture should be suspected in all patients with abnormal murmurs and should be investigated by Doppler echocardiography and cardiac catheterization, if necessary. Treatment of these lesions should be individualized. Small septal defects and those that are associated with small shunts and mild symptoms may be managed with medical therapy. A number of them may close spontaneously. Large defects with left-to-right shunts with a Q_p/Q_s ratio of 2:1 or greater need operative correction.^{57,58}

**Trauma By Ernest Eugene
Moore, David V. Feliciano,
Kenneth L. Mattox**

pg27

Chest?

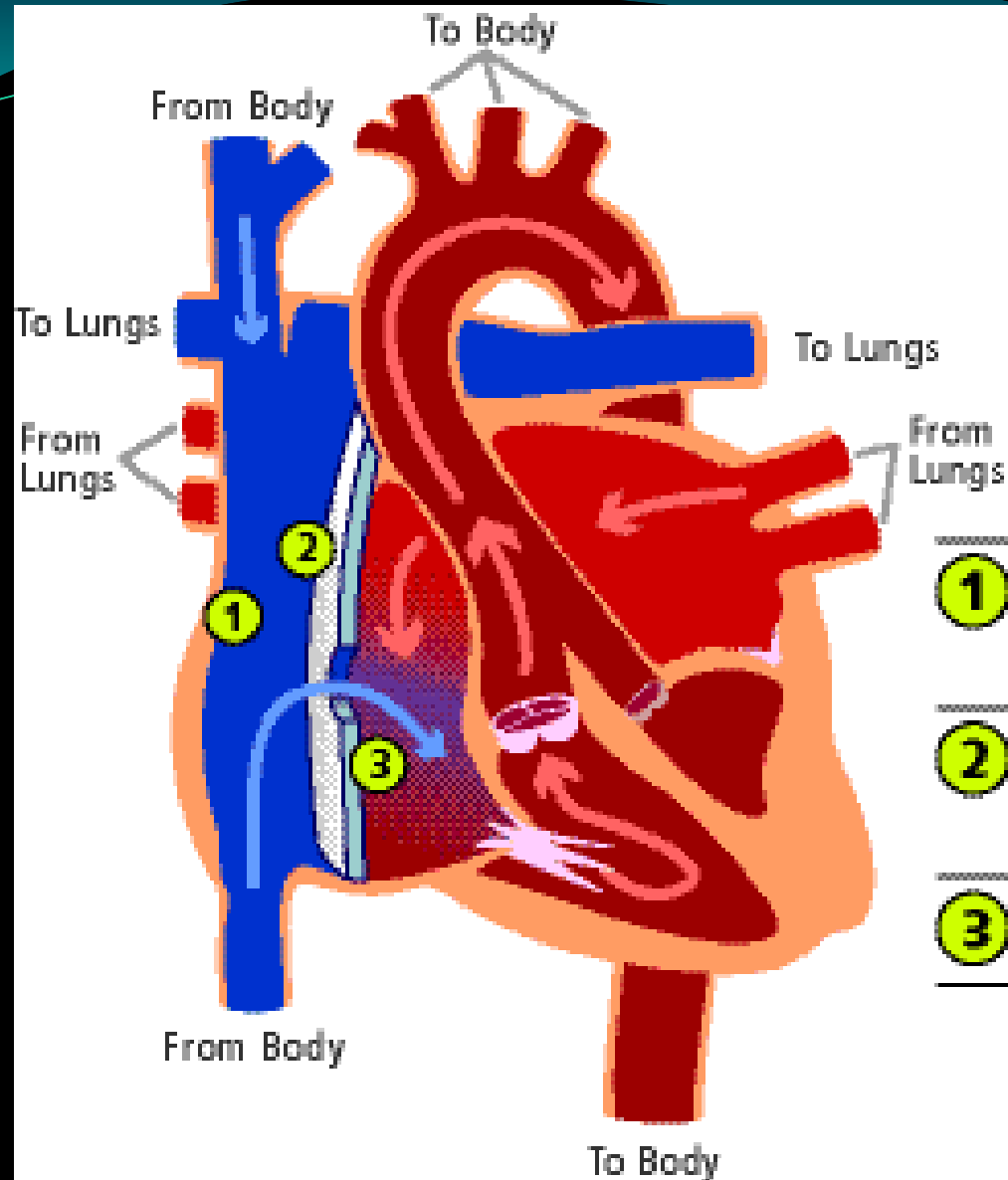
- Fontan procedure is for (new):
 - Tricuspid atresia
 - TOF
 - ASD
 - Transposition
- What is the Fontan procedure used to treat:
 - **Tricuspid atresia**
 - Transposition of the great arteries
 - Tetralogy of Flow
 - Ebstein's anomaly
- Fontan procedure is for...
 - TOF
 - Tricuspid atresia
 - DORV
- Which congenital heart defect is treated with the Fontan procedure?
 - A) Transposition
 - B) Tetralogy of Fallot
 - C) Tricuspid atresia
 - D) DORV

Chest?

- Fontan procedure is for (new):
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 - D) DORV

Fontan Procedure

- A palliative surgical procedure
- Involves diverting the venous blood from the right atrium to the pulmonary arteries without passing through the morphologic RV
- Today used for a child with only a single effective ventricle either due to defects of the heart valves ([tricuspid atresia or pulmonary atresia](#)) or an abnormality of the pumping ability of the heart ([hypoplastic left heart syndrome](#)), or has complex CHD where a biventricular repair is impossible or inadvisable



1

Patch removed from
right atrium

2

Wall (baffle) built in
right atrium

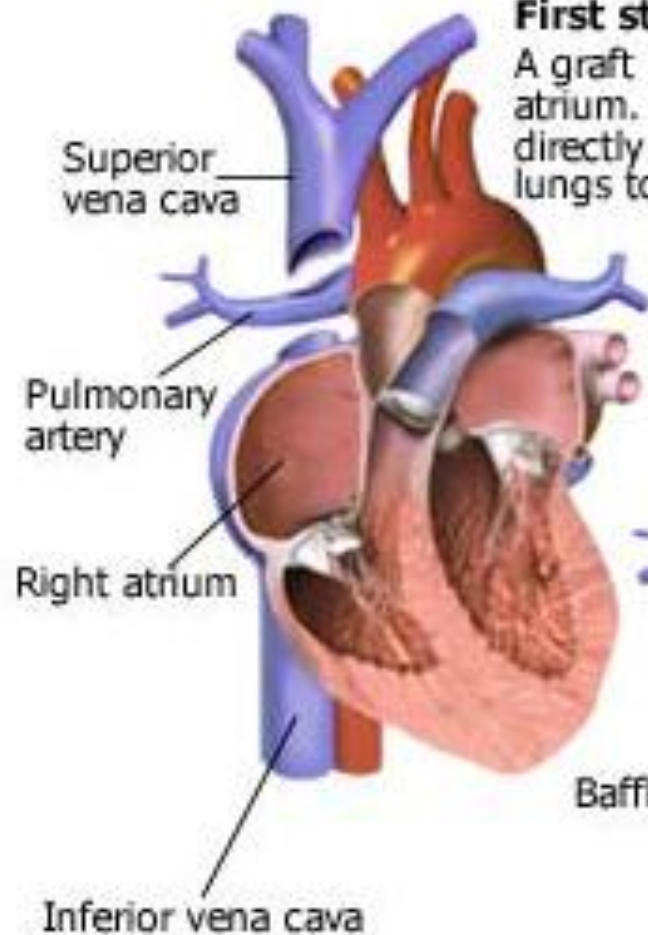
3

Small hole left in baffle

Fontan Procedure

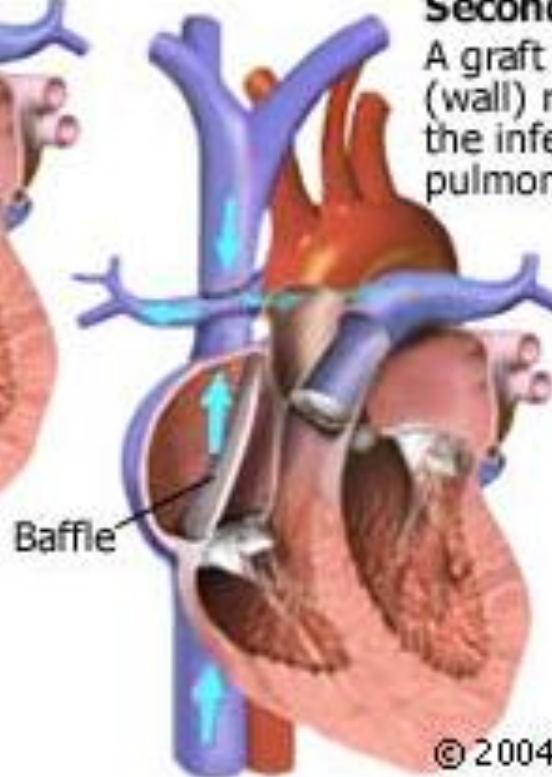
First stage: Bi-directional Glenn:

A graft re-routes blood flow to bypass the right atrium. Blood flows from the superior vena cava directly to the pulmonary artery and then to the lungs to pick up oxygen.



Second stage: Fontan:

A graft and an internal baffle (wall) re-route blood flow from the inferior vena cava to the pulmonary artery.



Chest?

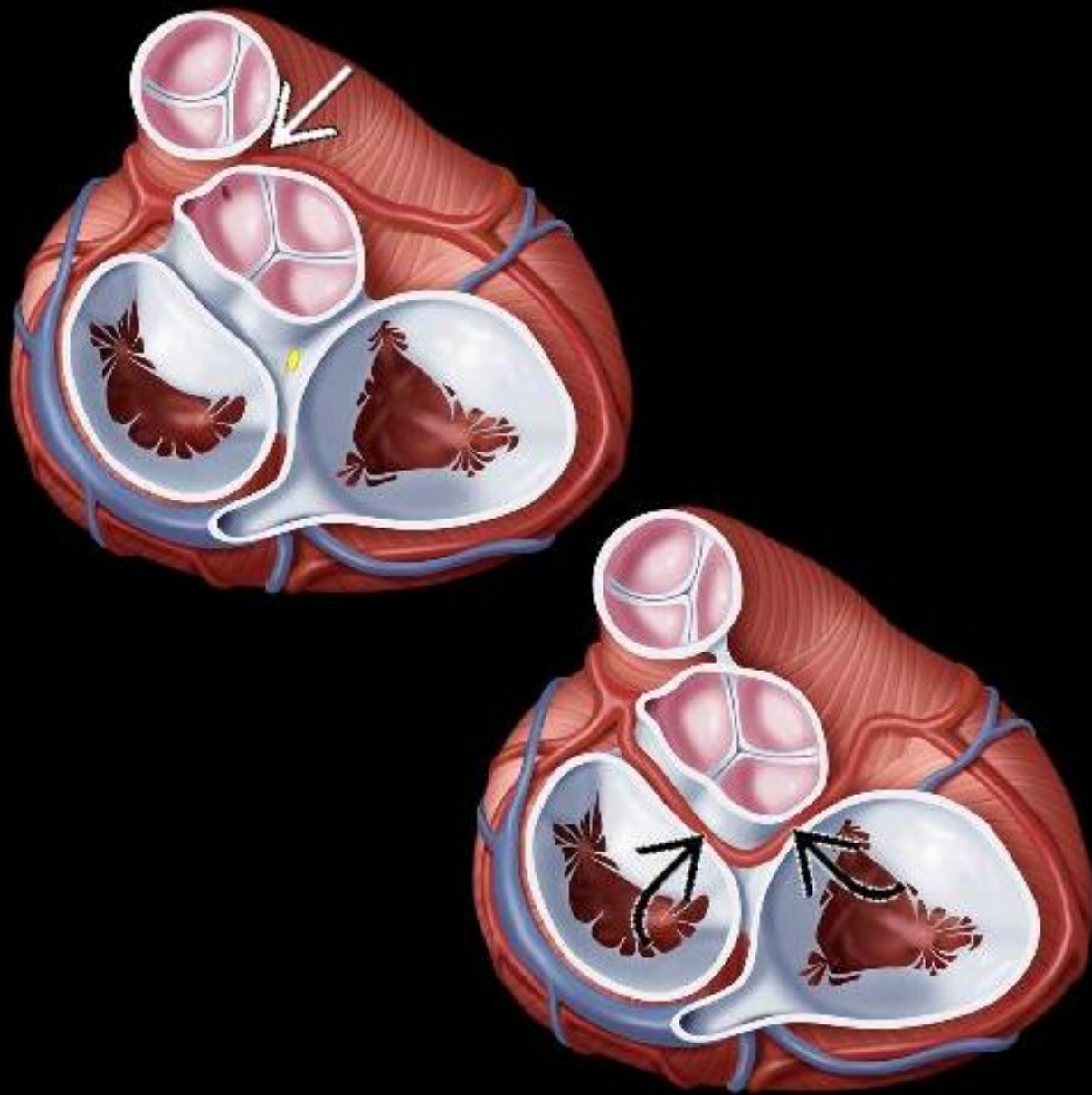
- Right coronary comes off left cusp and courses posterior to aorta, what to do (new):
 - CABG
 - Stent
 - Reimplantation
 - Do nothing
- The right coronary artery originates from left coronary cusp and passes behind the aorta. What is the next step:
 - Reimplantation
 - CABG
 - **Do nothing**
 - Stent

Chest?

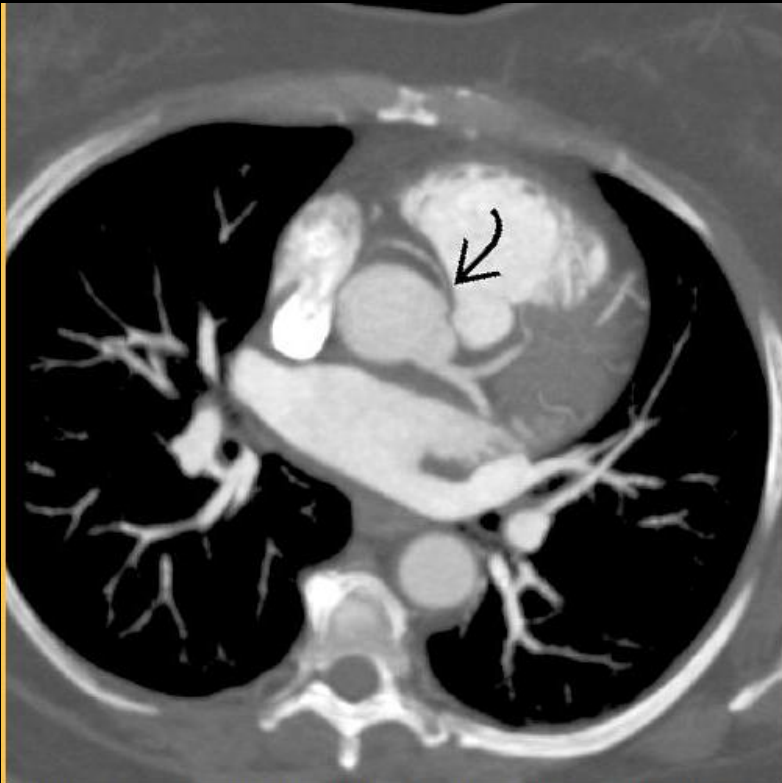
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 - Reimplantation
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 - Do nothing
 - Stent

Anomalous RCA

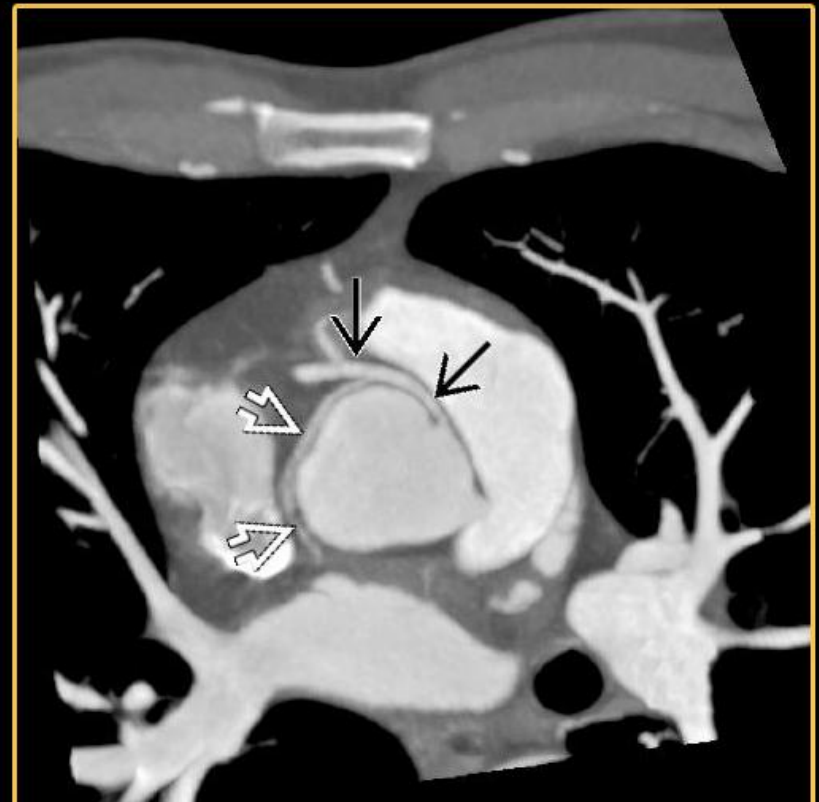
- Patient Position/Location
 - Origin of malignant anomalous RCA is variable
 - Typically arises from left coronary cusp between origin of LM and anterior commissure
 - May arise from left main (LM)
 - May arise superior to sino-tubular junction, either above left SOV or above junction of right and left SOV
 - Courses between anterior aspect of aortic root and posterior pulmonary artery wall
 - Benign variant is uncommon
 - Arises from left SOV and courses posterior and inferior to aortic root



Posterior view graphics show relationship between anomalous RCA & aorta & pulmonary artery. Malignant variant: RCA between Ao and PA (white arrow), benign variant: RCA posterior to aorta (black curved).



Oblique coronary CTA shows RCA originating from anterior edge of left sinus of Valsalva and coursing between the pulmonary artery and ascending aorta (malignant variant).
 Note: Narrowed ostium (black curved).



Oblique coronary CTA in a different patient shows anomalous RCA (black arrow) originating from left SOV & also taking a malignant course. Note: Sino-atrial nodal branch (white open).

Chest?

- What part of heart most susceptible to ischemia (new)?
 - Subendocardium
 - Subepicardium
 - Left ventricular apex

Chest?

- What part of heart most susceptible to ischemia (new)?
 - Subendocardium
 - Subepicardium
 - Left ventricular apex

Chest Answer

- The relatively poor perfusion of the **subendocardium** causes more intense **ischemia** of this portion of the wall (compared with the subepicardial region)- Harrison's Principles of Medicine
- During systole, LV **subendocardium** is exposed to a higher pressure than the subepicardial layer. Indeed, the systolic intraventricular pressure may be higher than the peak LV systolic pressure. Because of these differences in tissue pressure, the subendocardial layer is more susceptible to ischemia in the presence of coronary artery disease, pressure-overload hypertrophy, or pronounced tachycardia concomitant with compromised regional myocardial perfusion flow, a greater intraventricular-aortic pressure gradient, or reduced total diastolic flow, respectively. Coronary blood flow is also compromised when aortic diastolic pressure is reduced (e.g., severe aortic insufficiency), and this observation may also adversely affect perfusion, particularly in the presence of a critical coronary stenosis. Pg 224 Clinical Anesthesia
- I remember that the heart muscle is perfused from the outside in and therefore the subendocardium has less perfusion and is at increased risk.

Chest

- What is stenosed in TOF (new)?
 - Pulmonary Artery
 - Subvalvular right ventricular infundibulum
 - Supravalvular PA
- (Ans: B Subvalv RV infund)
- In TOF, where is the outflow obstruction?
 - **Subpulmonic, infundibular**
 - Pulmonary valve
- tof where is the pulmonary stenosis
- Aortic valve
- Pulmoniv valve
- Subpulmonic, infundibular septum
- Supravalvular

Chest

- What is stenosed in TOF (new)?
 - Pulmonary Artery-
 - Subvalvular right ventricular infundibulum
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 - Supravalvular

Pulmonary Subvalvular Stenosis = (Pulmonary Infundibular Stenosis)

TOF

1. Subvalvular or valvular right Ventricle outflow tract stenosis,
2. VSD
3. Overriding aorta
4. RV hypertrophy



Graphic shows subvalvular and valvular pulmonary stenosis with hypoplastic pulmonary artery, VSD, muscular RV hypertrophy, and overriding aorta receiving mixed blood from RV and LV.

TOF

1. Pulmonary Stenosis

- A narrowing of the right ventricular outflow tract and can occur at the pulmonary valve (valvular stenosis) or just below the pulmonary valve (infundibular stenosis). Infundibular pulmonic stenosis is mostly caused by overgrowth of the heart muscle wall (hypertrophy of the septoparietal trabeculae) however the events leading to the formation of the overriding aorta are also believed to be a cause. The pulmonic stenosis is the major cause of the malformations, with the other associated malformations acting as compensatory mechanisms to the pulmonic stenosis. The degree of stenosis varies between individuals with TOF, and is the primary determinant of symptoms and severity. This malformation is infrequently described as *sub-pulmonary stenosis* or *subpulmonary obstruction*.

2. Overriding Aorta

- An aortic valve with biventricular connection, that is, it is situated above the VSD and connected to both the RV and the LV. The degree to which the aorta is attached to the RV is referred to as its degree or “override”. The aortic root can be displaced toward the front (anteriorly) or directly above the septal defect, but it is always abnormally located to the right of the roof of the pulmonary artery. The degree of override is quite variable, with 5-95% of the valve being connected to the RV.

3. VSD

4. RVH

Chest?

- On a transverse MRI image what abnormality causes clockwise rotation of the intraventricular septum (recall)?
 - Pulmonary artery hypertension
 - LV hypertrophy
- What cause the clockwise rotation of the interventricular septum:
 - Pulmonary arterial hypertension
 - Tricuspid atresia

Chest?

- On a transverse MRI image what abnormality causes clockwise rotation of the intraventricular septum (recall)?
 - Pulmonary artery hypertension- paradoxical septal motion or flattening of the septum
 - LV hypertrophy- leads to left axis deviation
- Tulane- What causes the clockwise rotation of the interventricular septum:
 - Pulmonary arterial hypertension- paradoxical septal motion or flattening of the septum, convexity of the septum towards the left ventricle
 - Tricuspid atresia-
- I'm not sure what they are referring to. I searched for answers to this question for too long. I think they may mean rotation referring to axis. The septum is more rotated clockwise and to the left with Ebstein's Anomaly and so I would probably choose Tricuspid atresia.

Cardiac MRI

- Distortion of the normal shape of the **interventricular septum** has been reported in situations of **right ventricular (RV) pressure and/or volume overload** such as pulmonary hypertension. In the presence of increased systolic pressure in the RV, the **interventricular septum flattens and sometimes even bows leftward into the left ventricle (LV)**. **Severe leftward ventricular septal bowing (LVSB)** is often considered to be associated with an unfavorable prognosis in pulmonary hypertension
- **Interventricular Septal Configuration at MR Imaging and Pulmonary Arterial Pressure in Pulmonary Hypertension**¹ *Radiology* 2005;234:710-717
- *I couldn't find where anyone referred to this as clockwise or counterclockwise. It also causes paradoxical septal motion.*

Visualization of Ebstein's anomaly of the tricuspid valve by two-dimensional and standard echocardiography

M Matsumoto, H Matsuo, S Nagata, Y Hamanaka and T Fujita

Circulation, Vol 53, 59-79

- Seven patients with Ebstein's anomaly were studied by two-dimensional echocardiography, with and without stop-action technique, and by standard echocardiography. Sagittal two-dimensional echocardiograms visualized a small functional right ventricle and a large atrialized right ventricle. These two parts of the chamber were separated by the anterior tricuspid leaflet and its chorda tendineae. The echocardiograms corresponded to the findings of the right ventriculogram. In horizontal two-dimensional echocardiograms a huge anterior tricuspid leaflet, atrialized right ventricle, and a displaced septal tricuspid leaflet, intervening between the functional right ventricle and the sinus portion of the functional right ventricle, were visualized. The origin of the septal tricuspid leaflet was clearly shown to be abnormal in five cases. The left ventricle was small with distinct clockwise rotation of the interventricular septum. Two-dimensional echocardiography provided information useful in evaluation of the functions of the right ventricle and the tricuspid valve and determination of what surgical procedure to follow.

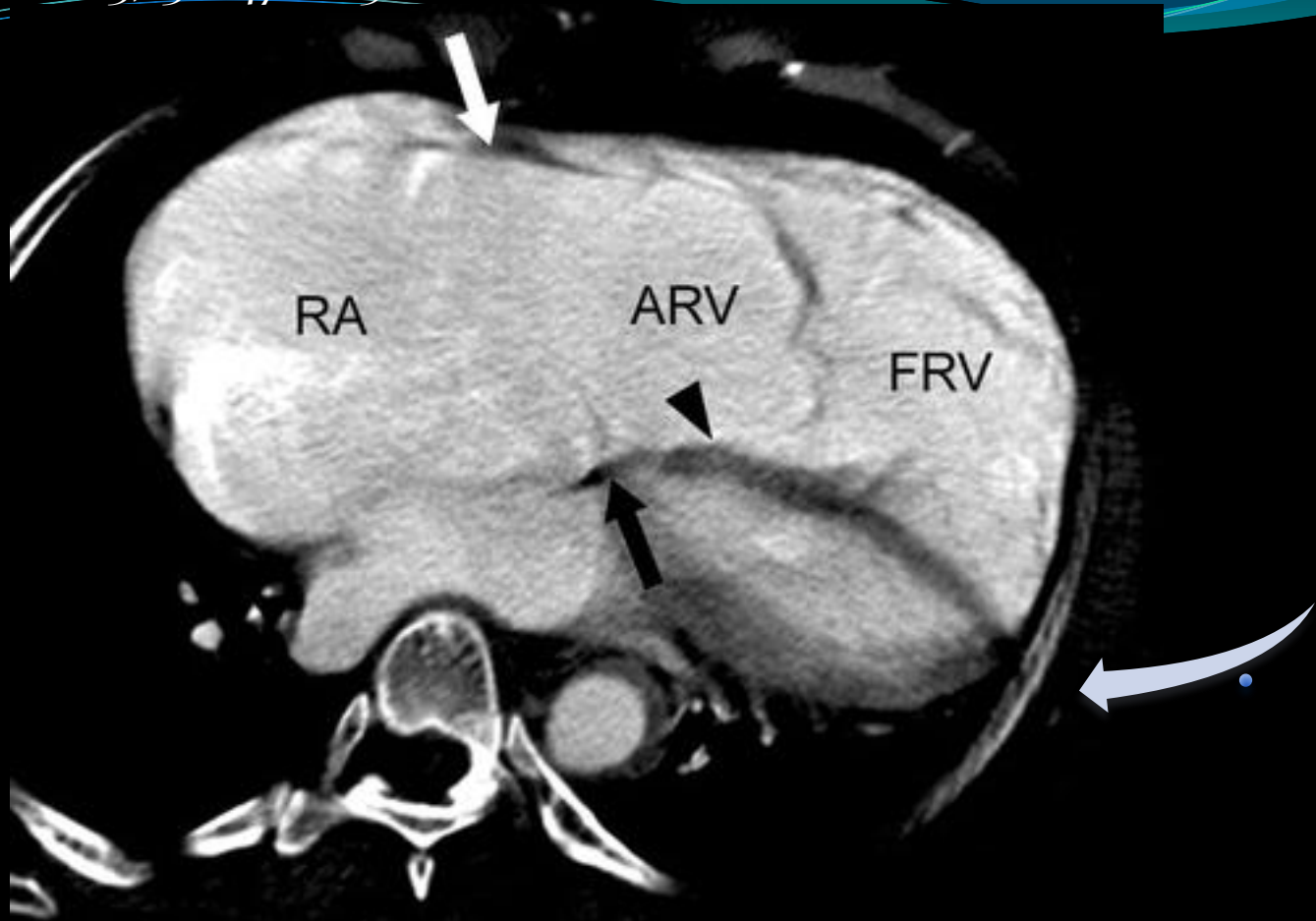
Rotation of the Heart

- Rotation of the heart results from enlargement of individual cardiac chambers and influences significantly the configuration of the cardiomediastinal silhouette. Left ventricular enlargement leads to dextrorotation. Conversely, right ventricular enlargement leads to levorotation. The axis of rotation is nearly vertical and extends from the top of the aortic arch through the anterior wall of the left atrium and the proximal interventricular septum. Pericardial defect, deformity of the thoracic skeleton, and lower lobe atelectasis can also lead to cardiac rotation. An understanding of this concept facilitates the interpretation of chest radiographs in patients with heart disease. The terms clockwise and counterclockwise rotation of the heart should be abandoned.

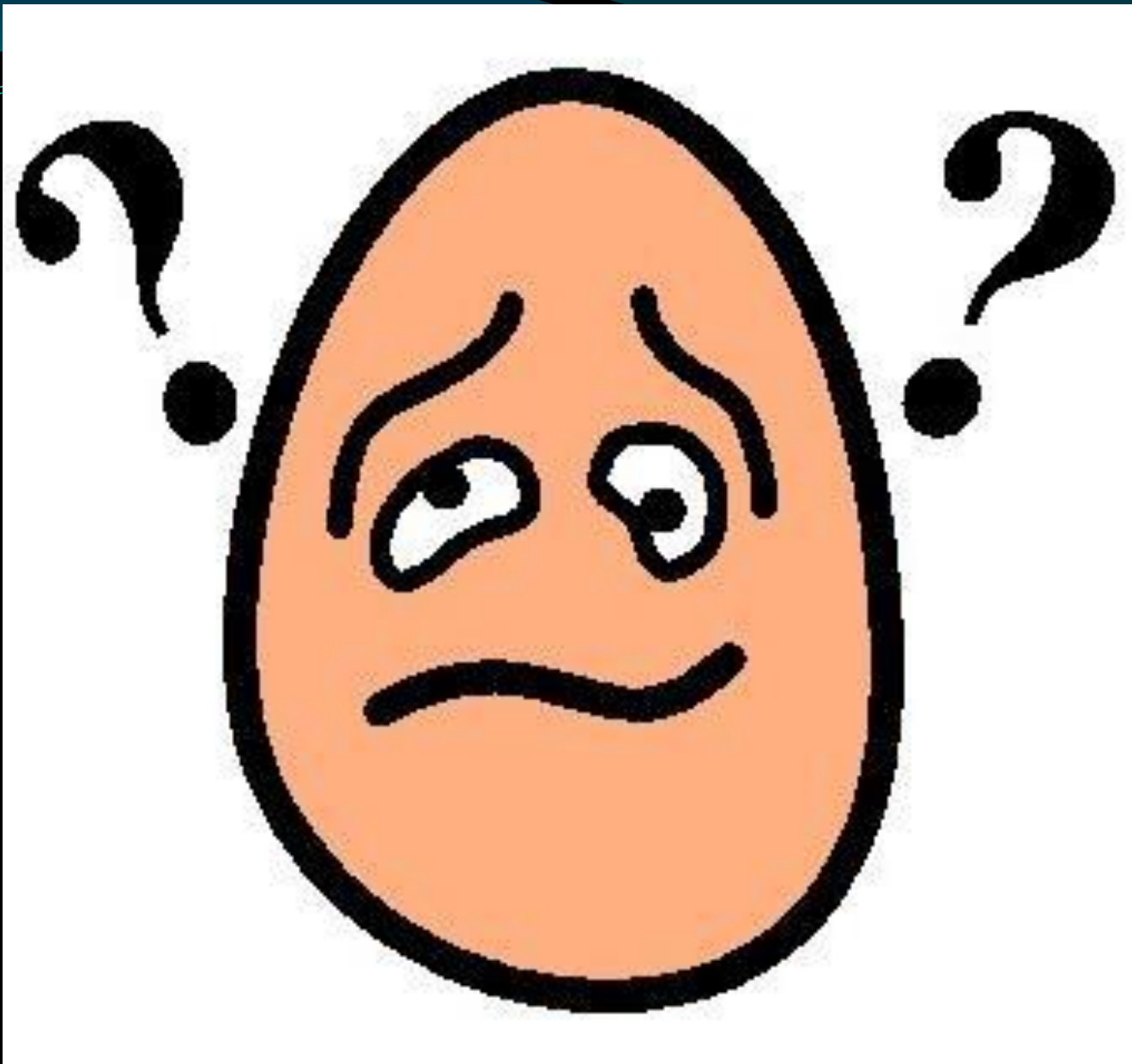
Cardiac Valve Disease: Spectrum of Findings on Cardiac 64-MDCT

AJR 2008; 190:W294-W303

- Additional described CT abnormalities in Ebstein's anomaly include clockwise rotation of the heart from the enlarged right heart chambers, dilatation of the right atrial appendage, and contrast reflux into enlarged IVC and hepatic veins from tricuspid regurgitation.



Ebstein anomaly. Oblique axial CT scan shows apical displacement of the septal and posterior leaflets of the tricuspid valve (arrowhead) from the atrioventricular junction (arrows). Note the dilated right atrium (RA), atrialized right ventricle (ARV), and functional right ventricle (FRV). Clockwise rotation of the heart and posterior bulging of the ventricles are also seen.



Chest?

- Most common cause of abdominal aortic stenosis (Recall)?
 - Takayasu
 - Buerger
 - Temporal
 - PAN
 - Kawasaki's

Takayasu

- **Takayasu arteritis is an inflammatory disease of unknown etiology affecting aorta and its main branches**
- Idiopathic chronic arteritis characterized mainly by inflammation of aorta anywhere along its course and its main branches
- Anatomic Findings
 - Concentric wall thickening of aorta and other involved vessels
 - Vessel wall edema during active inflammation
 - Multifocal stenoses
 - Vascular dilation
 - Aneurysm formation
 - Aortic involvement: aortic arch > descending aorta > ascending aorta > abdominal aorta
 - Other systemic artery involvement: left subclavian artery > left common carotid artery > brachiocephalic artery > renal arteries
- Clinical Symptoms
 - Fever, myalgias, arthralgias, weight loss typically present for months to years before more specific features of disease become evident
 - Most common vascular manifestation is diminished or absent pulses, associated with limb claudication, blood pressure discrepancies
 - Vascular bruits, often multiple, affecting carotid, subclavian, and abdominal arteries
 - Hypertension, usually reflecting renal artery stenosis
 - Aortic regurgitation due to dilatation of ascending aorta and separation of valve leaflets
 - Left heart failure associated with hypertension, aortic regurgitation, dilated cardiomyopathy
 - Pulmonary symptoms
- Incidence/Prevalence and Epidemiology
 - Occurs most commonly in Japan, South East Asia, India, Mexico, and Brazil, usually between 10 and 40 years of age
 - Female to male ratio ranges from 10:1 in Japan to 3:1 in South Africa
 - Abdominal aorta and renal artery involvement are considerably more common in other South Asian countries
- MRI is modality of choice for assessment of patients with suspected or proven **Takayasu arteritis**

TAKAYASU ARTERITIS

- = PULSELESS DISEASE = AORTITIS SYNDROME
- = AORTOARTERITIS = IDIOPATHIC MEDIAL AORTOPATHY
- = AORTIC ARCH SYNDROME
- = granulomatous inflammation of unknown pathogenesis affecting segments of aorta + major aortic branches + pulmonary arteries limited to persons usually <50 years of age

◊ The only form of aortitis that produces stenosis / occlusion of the aorta!

Etiology: probably cell-mediated inflammation

Incidence: 2.6 new cases/million/year;
2.2% (at autopsy)

Age: 12–66 years; M:F = 1:8; especially in Orientals

Histo: (a) Acute stage: granulomatous infiltrative process focused on elastic fibers of media of arterial wall consisting of multinucleated giant cells, lymphocytes, histiocytes, plasma cells

(b) Fibrotic stage (weeks to years): progressive fibrosis of vessel wall resulting in constriction from intimal proliferation / thrombotic occlusion / aneurysm formation (from extensive destruction of elastic fibers in the media); ultimately leads to fibrosis of intima + adventitia

◊ Morphologically indistinguishable from temporal arteritis!

- prepulseless / systemic phase of a few months to a year = nonspecific systemic signs + symptoms of fever, night sweats, weakness, weight loss, myalgia, arthralgia
- ◊ Mean interval of 8 years between onset of symptoms and diagnosis
- pulseless phase = signs + symptoms of ischemia of limb (claudication, pulse deficit, bruits) + renovascular hypertension
- erythrocyte sedimentation rate (ESR) >20 mm/hour in 80%

Location:

Type I : classic pulseless type = brachiocephalic trunk + carotid arteries + subclavian arteries

Type II : combination of type I + III

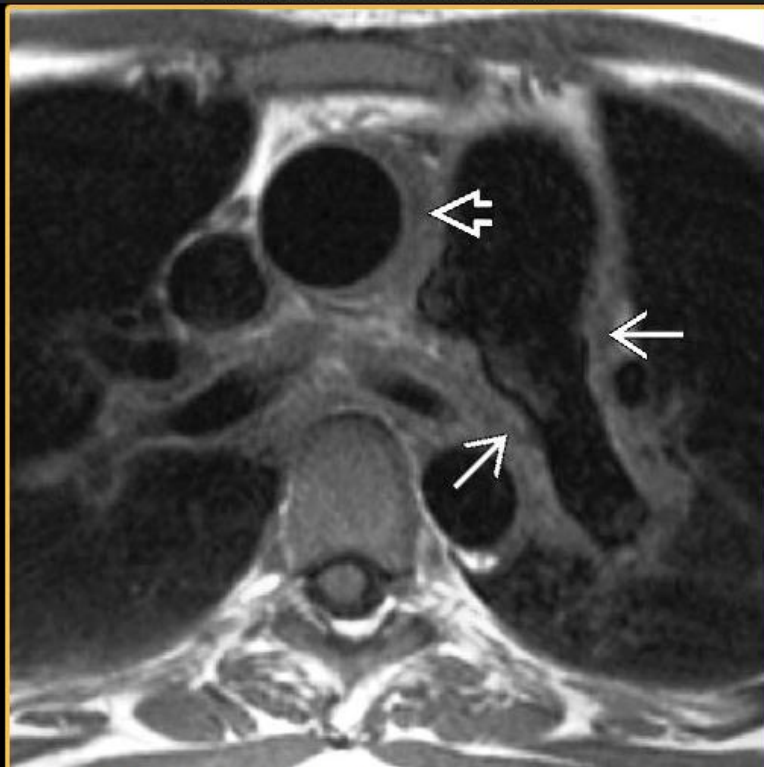
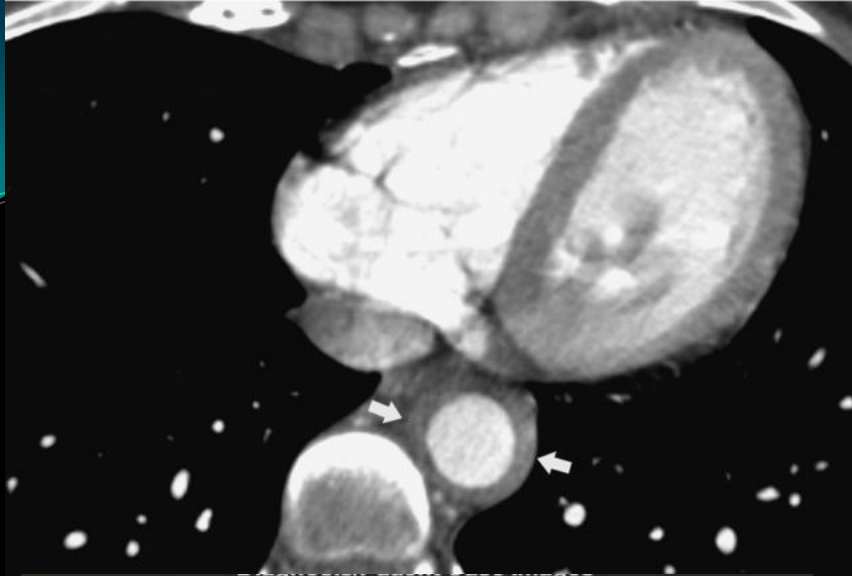
Type III : atypical coarctation type = thoracic and abdominal aorta distal to arch + its major branches

Type IV : dilated type = extensive dilatation of the length of the aorta + its branches

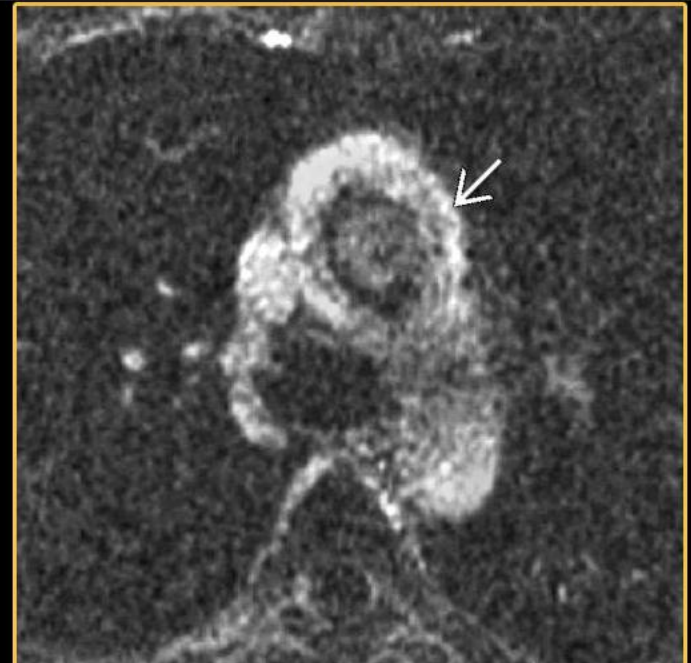
Commonly involved: left subclavian artery (<50%), left common carotid artery (20%), brachiocephalic trunk, renal arteries, celiac trunk, superior mesenteric artery, pulmonary arteries (>50%)

Infrequently involved: axillary, brachial, vertebral, iliac arteries (usually bilaterally), coronary arteries

Takayasu



Axial T1WI MR shows diffuse thickening of the ascending aorta (white open) and the pulmonary artery (white arrow). Patients with Takayasu arteritis who have pulmonary artery involvement may develop pulmonary arterial hypertension.



Axial T1WI FS MR following Gadolinium administration shows diffuse enhancement (white arrow) of the thickened wall of the ascending aorta. Wall enhancement such as this suggests active disease.



Sagittal grayscale ultrasound shows patchy thickening (white arrow) of the intima of the carotid artery.

Buerger Disease

BUERGER DISEASE

- = THROMBANGITIS OBLITERANS
- = idiopathic recurrent segmental obliterative vasculitis of small + medium-sized peripheral arteries + veins (panangitis)

Incidence: <1% of all chronic vascular diseases; more common in Israel, Orient, India

Etiology: unknown

Histo:

- (a) acute stage: multiple microabscesses within fresh / organizing thrombus; all layers of vessel wall inflamed but intact; internal elastic lamina may be damaged; multinucleated giant cells within microabscesses (PATHOGNOMONIC)
- (b) subacute stage: thrombus organization with little residual inflammation
- (c) chronic stage: lumen filled with organized recanalized thrombus, fibrosis of adventitia binds together artery, vein, and nerve

Associated with: cigarette smoking (95%)

- instep claudication ± distal ulceration (symptoms abate on cessation of smoking + return on its resumption)
- Raynaud phenomenon (33%)

Location: legs (80%), arms (10–20%)

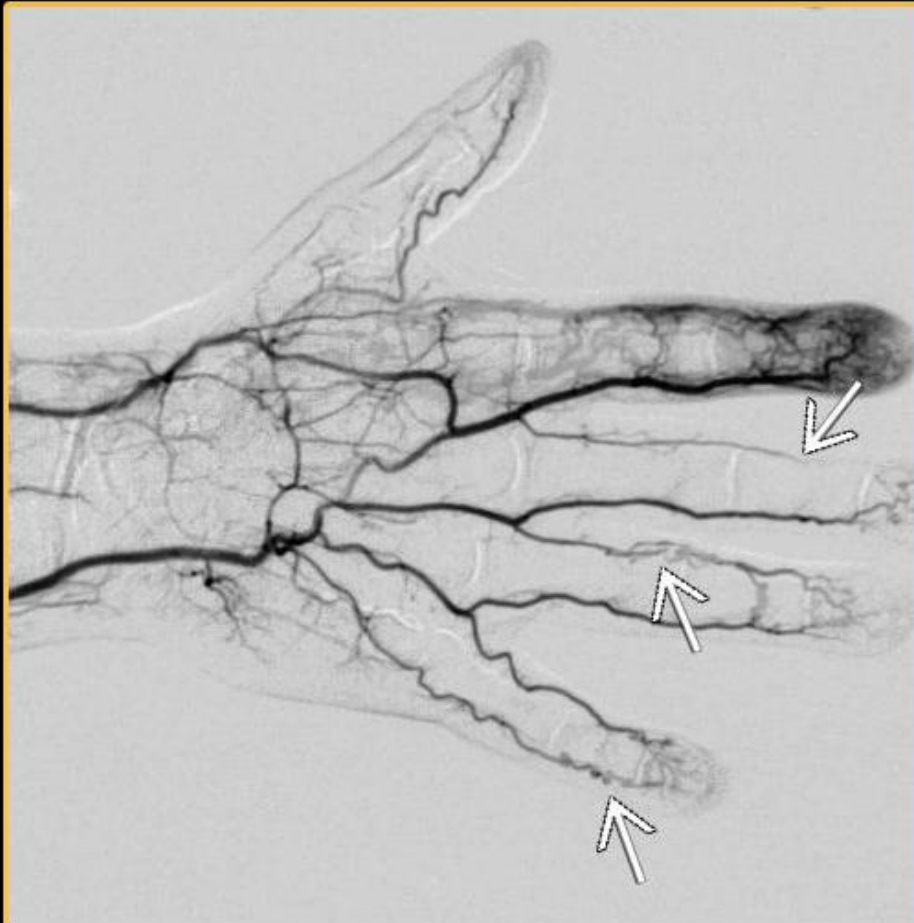
Site: starts in palmar + plantar vessels with proximal progression

- ✓ superficial + deep migratory thrombophlebitis (20–33%)
- ✓ arterial occlusions, tapered narrowing of arteries
- ✓ abundant corkscrew-shaped collaterals
- ✓ direct collateral following the path of the original artery (Martorell sign) in 80%
- ✓ skip lesions = multiple segments involved with portions of arterial wall remaining unaffected
- ✓ absence of generalized arteriosclerosis / arterial calcifications (90%)

Buerger Disease



Arteriogram of the wrist also shows distinctive "corkscrew" collateral vessels (white arrow) as well as multiple segmental occlusions (white open) involving small and medium-sized arteries in a patient with Buerger disease.



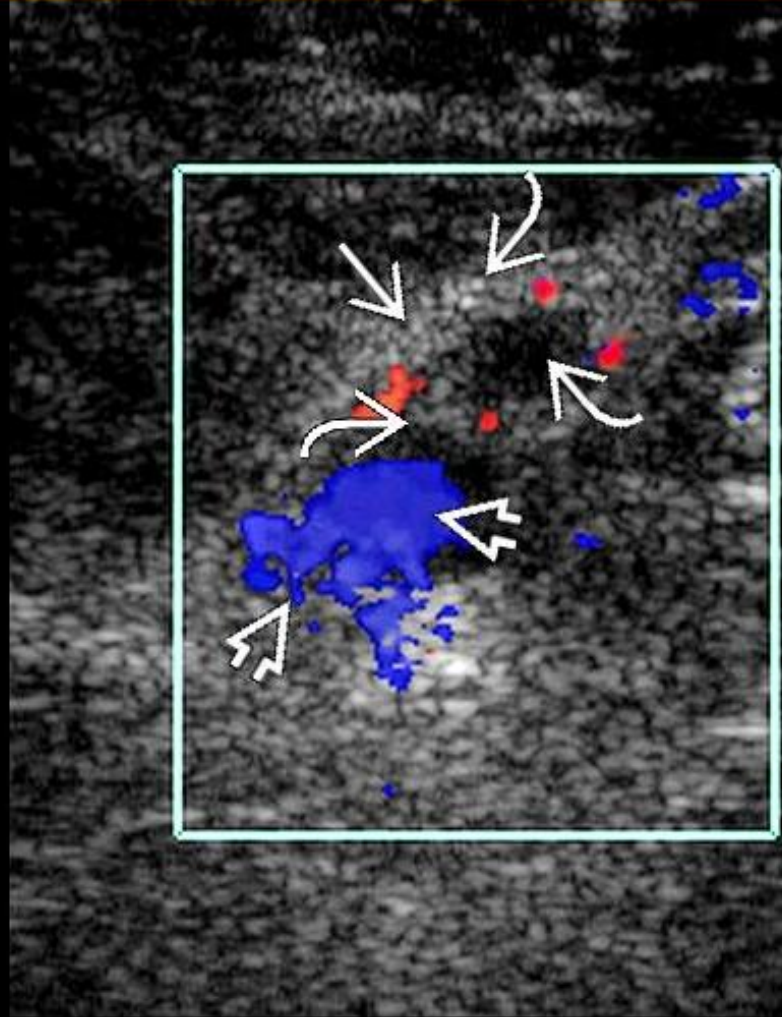
DSA in a young male patient with a long-standing history of smoking shows several focal occlusions (white arrow) of the digital arteries. This clinical history and the disease distribution is typical of Buerger disease.



Magnified DSA of the digital arteries in the same patient as previous image, shows the "corkscrew" collateral vessels (black open) within the vasa vasorum of the occluded segments of the digital arteries, serving to bypass the occlusions.

Buerger Disease

Buerger Disease



Axial color Doppler ultrasound shows patent thick-walled vein (white open) adjacent to occluded posterior tibial artery (white arrow). Small arterial collateral vessels (white curved) course within the vasa vasorum of the occluded artery.

Temporal Arteritis

- Temporal arteritis, or giant cell arteritis, is a common systemic vasculitis of unknown etiology
- In general, temporal arteritis can be thought of as a vasculitis involving medium-to-large arteries originating from the aorta.
- The clinical findings are a result of decreased blood flow and include jaw or tongue claudication; extremity stiffness; scalp tenderness; and visual changes with anterior ischemic optic neuropathy (AION), amaurosis, or optic atrophy leading to blindness in as many as 60% of patients.
- Temporal arteritis (giant cell arteritis) occurs in an estimated 15-30 per 100,000 persons. It almost exclusively affects individuals older than 50 years and is believed to have a prevalence as high as 1 case per 500 individuals in this age group. The female-to-male ratio for temporal arteritis (giant cell arteritis) is 4-6:1. The incidence of temporal arteritis (giant cell arteritis) is lower in blacks than in whites.
- Temporal arteritis (giant cell arteritis) can affect any medium or large artery, but the clinical signs and symptoms are usually related to the inflammation that occurs in the branches of the external carotid artery. Temporal arteritis is caused by inflammation of the internal elastic lamina of the arterial wall. Intradural cranial arteries have no elastic lamina. For this reason, temporal arteritis seldom affects the cerebral circulation.

Polyarteritis Nodosa

▼ KEY FACTS

Terminology

- Systemic vasculitis causing necrotizing inflammation of small and medium-sized vessels, resulting in microaneurysms, occlusions, and strictures

Imaging Findings

- Multiple aneurysms of varying sizes
- Smooth segmental narrowing of vessels; stenosis and occlusions of larger vessels

Pathology

- General path comments: Diagnosis made by tissue biopsy in association with angiography
- Aneurysms typically seen at vessel branch points
- Necrotizing arteritis with pleomorphic cellular infiltrate in vessel walls

Clinical Issues

- Subacute presentation with vague symptoms: Fever, weight loss, malaise, headache, myalgia
- Spectrum of disease from single organ involvement to polyvisceral failure
- Glucocorticoids as first line treatment; remission in 50% of patients
- Addition of cyclophosphamide; remission or cure in 90%

Diagnostic Checklist

- Rapid diagnosis necessary due to progression to life threatening complications

PAN

IMAGING FINDINGS

General Features

- Best diagnostic clue
 - Multiple 1-5 mm peripheral aneurysms
 - Occlusions
 - Irregular stenoses
- Patient Position/Location
 - Kidneys (70-80%)
 - GI tract, peripheral nerves, skin (50%)
 - Skeletal muscles and mesentery (30%)
 - CNS (10%)
 - Heart, testicles, lung, and spleen rarely involved

CT Findings

- NECT
 - Multiple, often less than 1 cm, renal and hepatic aneurysms appear as low attenuation structures
 - Wedge-shaped infarcts may be seen in kidney
- CECT
 - Often see thickening of the wall of medium-sized arteries
 - Multiple small renal infarcts consistent with fibrinoid necrosis and vascular thrombosis
 - May see perirenal and retroperitoneal hemorrhage from aneurysm rupture
 - Infarcted bowel may appear thickened, perforated, or obstructed from stricture
 - Liver aneurysm formation may result in interstitial hepatitis and cirrhosis

- CTA
 - Multiple aneurysms of varying sizes
 - Smooth segmental narrowing of vessels; stenosis and occlusions of larger vessels
 - Thickening of wall of medium-sized arteries
 - May provide noninvasive, rapid diagnosis

MR Findings

- MRA
 - Multiple aneurysms of varying sizes
 - Demonstrates organ involvement, with regions of ischemia/infarction
 - Less invasive than angiography; no contrast, no radiation
 - Useful to suggest diagnosis, monitor disease progression and response to therapy
 - New technology overcomes traditional limitations of flow artifacts, long acquisition times, and misregistration due to multiple breath-holds

Ultrasonographic Findings

- Color Doppler
 - Operator dependent
 - Microaneurysms appear as small hyperechoic structures
 - Spectral analysis may demonstrate vascular lesions with arterial flows
 - Occasionally aneurysms are too small to detect with color flow

Angiographic Findings

- Conventional
 - Multiple microaneurysms, ectasia, stenoses, intra-arterial thrombosis, and occlusions
 - Aneurysms may be small, difficult to detect, or isolated to one organ
 - Aneurysms may resolve in disease remission
 - Findings predominately in visceral arteries
 - Extremities and small branches of aorta rarely involved
 - Helps confirm clinical impression when biopsy is lacking or results are inconclusive

Imaging Recommendations

- Best imaging tool
 - Angiography considered traditional gold standard
 - CT and MR are less invasive and provide evidence of end-organ damage

▼ CLINICAL ISSUES

Presentation

- Most common signs/symptoms
 - Subacute presentation with vague symptoms: Fever, weight loss, malaise, headache, myalgia
 - Spectrum of disease from single organ involvement to polyvisceral failure
 - Renal: Hypertension, renal insufficiency, vascular nephropathy (HTN, oliguric renal failure), hemorrhage
 - GI: Ischemia, abdominal pain, weight loss, infarction, bowel perforation, hemorrhage, pancreatitis, appendicitis, and cholecystitis
 - Peripheral neuropathy: Mononeuritis multiplex, often asymmetric neuropathy with sciatic involvement
 - Cardiac: Coronary arteritis, congestive heart failure
 - Skin: Palpable purpura, infarctions, and ulcerations
 - Ophthalmologic: Retinal vasculitis, retinal detachment, cotton-wool spots
 - Brain, eyes, pancreas, lungs, testicles, ureters, breasts, and ovaries rarely involved
- Clinical Profile
 - Clinical symptoms related to ischemia
 - Arthralgia and peripheral neuropathies often symptomatic early
 - No association with ANCA
 - ESR and CRP may correlate with disease activity

Demographics

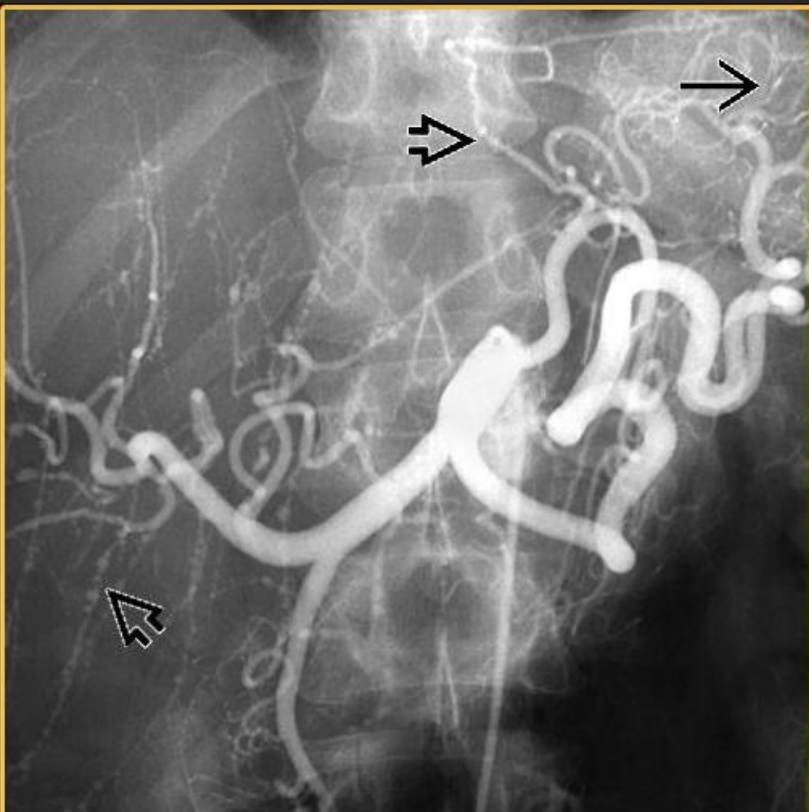
- Age: Most common in 5th-7th decade
- Gender: 2:1 male to female

Natural History & Prognosis

- Fulminant disease, 5-year survival < 15%
- Relapse in 40% of patients; median survival 33 months
- 50% of patients with abdominal involvement develop acute surgical abdomen with mortality of 12.5%
- Five factor score (FFS) estimates prognosis
 - Scores renal, GI, cardiac, and CNS involvement
 - Low score correlates with better 5-year survival

Treatment

- Glucocorticoids as first line treatment; remission in 50% of patients
- Addition of cyclophosphamide; remission or cure in 90%
- HBV associated PAN requires the addition of antivirals
- Plasma exchange/plasmapheresis may have added benefit in refractory cases
- Large aneurysms may be treated by catheter embolization to avoid risk of rupture
- Surgery may be needed to treat GI complications



Catheter angiography shows more subtle liver involvement. Multiple segmental branches have a beaded appearance with multiple small aneurysms (black open). Splenic vessels may also be involved (black arrow).



Catheter angiography shows florid case of polyarteritis nodosa. Multiple aneurysms throughout the kidney, multiple subsegmental branches. Larger vessels are not involved in this process.

KAWASAKI SYNDROME

= MUCOCUTANEOUS LYMPH NODE SYNDROME

= acute febrile multisystem vasculitis of unknown cause involving large + medium-sized + small arteries with a predilection for the coronary arteries

Incidence: average of 1.1:100,000 population per year

Histo: panvasculitis

Age: <5 years of age (in 85%); peak age of 1–2 years;
M:F = 1.5:1

Associated with: polyarthritis (30–50%), aseptic meningitis (25%), hepatitis (5–10%), pneumonitis (5–10%)

- fever >5 days
- mucosal reddening (injected fissured lips, injected pharynx, strawberry tongue) in 99%
- nonpurulent cervical lymphadenopathy (82%)
- maculopapular rash on extensor surfaces (99%)
- bilateral nonpurulent conjunctivitis (96%)
- erythema of palms + soles with desquamation (88%)

@ Cardiovascular system (1/3)

1. Coronary artery abnormality (15–25%)

- ✓ coronary artery aneurysm: LCA (2/3), RCA (1/3); proximal segment in 70%; 48% regress, 37% diminish in size
- ✓ coronary artery stenosis (39%) due to thrombus formation in aneurysm + intimal thickening
- ✓ coronary artery occlusion (8%) in aneurysms >9 mm

2. Myocarditis (25%)

3. Pericarditis

4. Valvulitis

5. Atrioventricular conduction disturbance

✓ intestinal pseudoobstruction

✓ transient gallbladder hydrops

Prognosis: 0.4–3% mortality (from myocardial infarction / myocarditis with congestive heart failure / rupture of coronary artery aneurysm)

Rx: aspirin (100 mg/kg per day) + gamma globulin

DDx: infantile polyarteritis

Chest?

- Blalock Taussig shunt connects what (Recall)?
 - Subclavian artery to ipsilateral pulmonary artery
 - Subclavian artery to contralateral pulmonary artery
 - Right atrium to main pulmonary artery

Chest?

- What is the connection of a Blalock-Taussig shunt (from

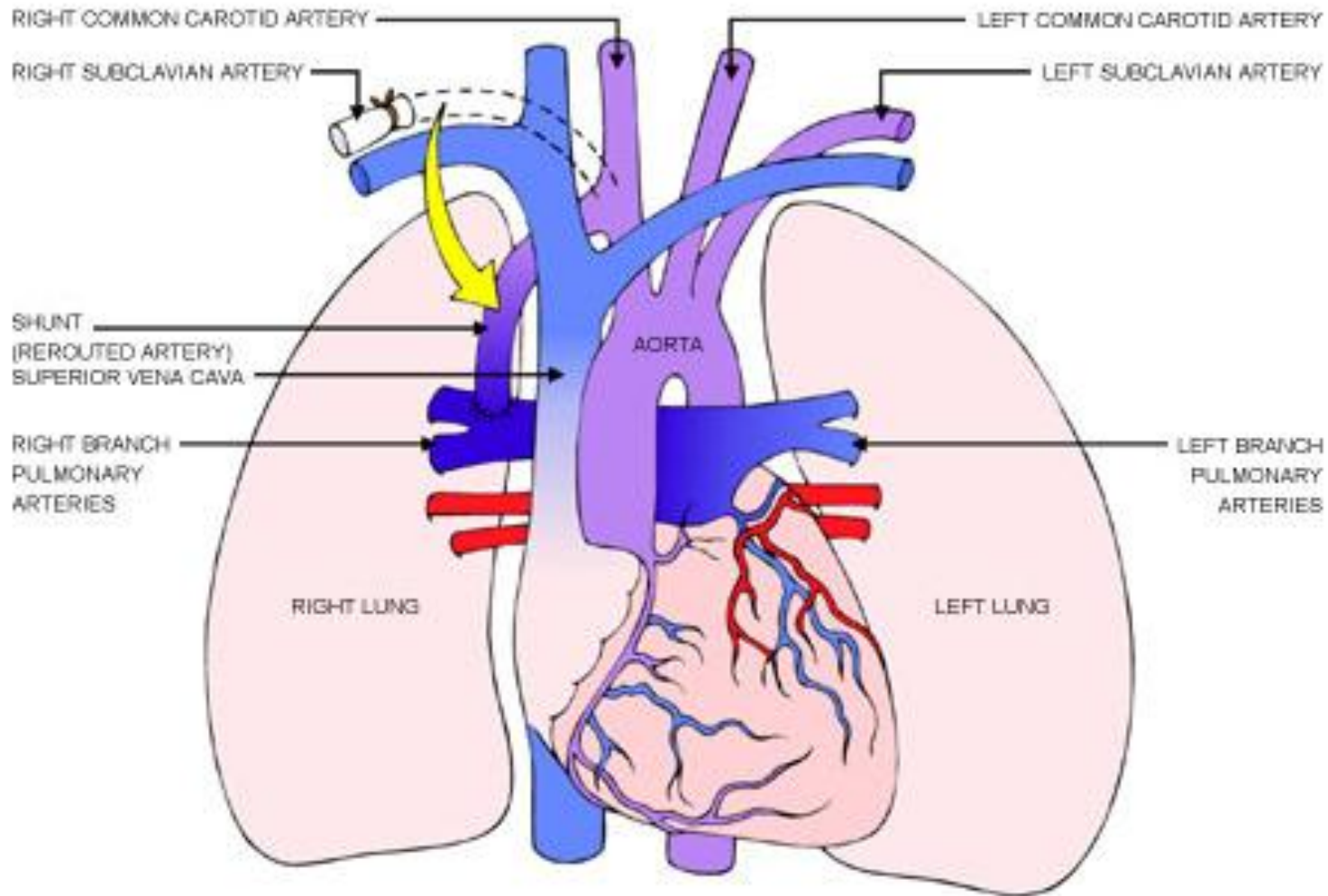
Where to where)

- Subclavian artery to ipsilateral pulmonary artery
- SVC to ipsilateral pulmonary artery
- Ascending aorta to pulmonary artery (or vein?)
- Unilateral subclavian to pulmonary artery

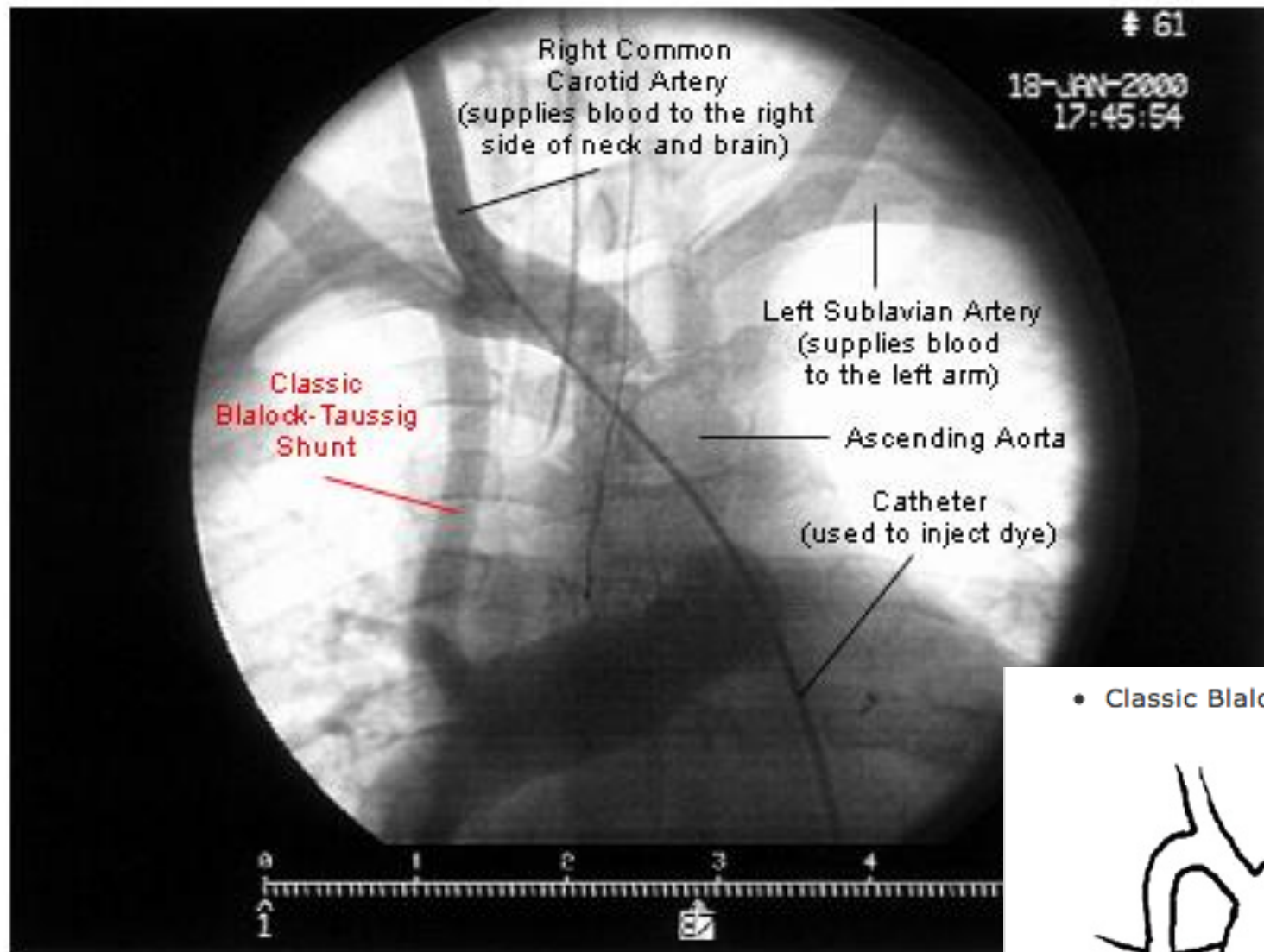
Blalock-Taussig Shunt

- One branch of the subclavian artery or carotid artery is separated and connected with the pulmonary artery. The lung receives more blood with low oxygenation from the body. The first area of application was tetralogy of Fallot.
- The procedure is no longer in use in its original form. Now a length of artificial tubing, 3 to 4 millimeters in diameter, is sewn between either the subclavian or the carotid artery and the corresponding side branch of the pulmonary artery, thus obviating the need to cut off blood supply and making it easier to regulate the blood flow to the lungs. Wikipedia
- A surgically created connection between a systemic artery and the pulmonary artery (PA) is termed a systemic-to-pulmonary artery shunt or, more commonly, a BT shunt (after Blalock and Taussig)

Heart Picture Gallery: **Blalock-Taussig Shunt**



This is how a Blalock-Taussig Shunt looks in the heart.



- Classic Blalock-Taussig shunt



This is an angiocardiogram picture of a Blalock-Taussig Shunt

Chest?

- Which is not a cause of unilateral Rib notching (Recall)?
 - Aberrant Right subclavian
 - Brachial artery stenosis
 - AVM
 - Stenosis between innominate and left carotid

Chest?

- Which is not a cause of unilateral Rib notching (Recall)?
 - Aberrant Right subclavian
 - Brachial artery stenosis
 - AVM
 - Stenosis between innominate and left carotid

unilateral rib notching

- aortic coarctation
 - proximal to left subclavian artery ==> RIGHT
 - anomalous right subclavian artery ==> LEFT
- subclavian artery stenosis / atresia
 - ==> IPSILATERAL
- Blalock-Taussig shunt
 - anastomosis of subclavian artery to pulmonary artery
 - for Tetralogy of Fallot
 - ==> IPSILATERAL

PLAIN FILM DIAGNOSIS OF COMMON CARDIAC ANOMALIES IN THE ADULT

Radiologic Clinics of North America - Volume 37, Issue 2 (March 1999)

- Rib notching in coarctation of the aorta is usually bilateral. It may not be seen in as many as 25% of adult patients.
- Unilateral rib notching can occur in coarctation, especially if there is an anomalous origin of the right subclavian artery. The vessel in these cases is low-pressured because it arises just distal to the coarctation. Notching then is limited to the left ribs.
- Rib notching can also occur in other conditions, such as neurofibromatosis or when there is an increased blood supply to an upper extremity, such as occurs with a peripheral arteriovenous malformation. The collateral circulation in these cases is from the internal mammary to the intercostals, to the lateral thoracic artery to the axillary artery. The same collateral pathway is responsible for unilateral rib notching when there is occlusion or stenosis of a subclavian artery

Patients with aortic coarctation develop **rib notching** gradually; it is most common in adolescents and is rare in children under age 7. The first two ribs are uninvolved because the first and second intercostal arteries arise from the superior intercostal branch of the costocervical trunk of the subclavian artery and therefore do not communicate with the descending thoracic aorta. Coarctation may produce **unilateral left rib notching** when the aortic narrowing occurs proximal to an aberrant right subclavian artery. **Unilateral right-sided notching** occurs when the coarctation is proximal to the left subclavian artery. Additional causes of **unilateral inferior rib notching** include subclavian artery obstruction and surgical anastomosis of the proximal subclavian artery to the ipsilateral pulmonary artery (Blalock-Taussig procedure)

Rib Notching

Rib notches (localized erosions of ribs) are considered characteristic of *coarctation of the aorta* (seen in 80% of cases). Rib notching due to coarctation occurs in ribs 3 to 9 (Fig. 13.13). The notches are usually located in the inferior margin of the ribs unless tortuous intercostal arteries are large enough to erode the superior surface of the adjacent rib. Rib erosions due to coarctation commonly appear after 6 to 12 years of age. Unilateral right-sided notching indicates coarctation proximal to the left subclavian artery and left-sided notching points to an anomalous origin of the right subclavian artery (take-off below coarctation). Several other conditions may cause rib notching, as follows:

- obstruction of the abdominal aorta (thrombosis)
- obstruction of the subclavian artery (Blalock-Taussig procedure for Fallot's tetralogy, Takayasu's arteritis, arteriosclerosis obliterans)
- pulmonary oligemia (tetralogy of Fallot, absent pulmonary artery or pulmonary atresia or stenosis, pseudotruncus arteriosus, Ebstein's anomaly, pulmonary emphysema)
- pulmonary or intercostal arteriovenous malformation
- obstructions of the superior vena cava or subclavian vein
- neurofibromatosis or intercostal neurinoma (Fig. 13.3)
- periosteal irregularities mimicking rib notches occur in hyperparathyroidism, tuberous sclerosis, thalassemia, collagen diseases, and sometimes without any known reason (idiopathic notching).

Notching of superior surface of ribs may occur in certain connective tissue diseases, such as rheumatoid arthritis, systemic lupus erythematosus, scleroderma and Sjögren's syndrome. Superior surface notching may occur in hyperparathyroidism, neurofibromatosis, restrictive lung disease, poliomyelitis, Marfan's syndrome, osteogenesis imperfecta and progeria.

ARTERIAL

1. **Coarctation of the aorta** — **rib** signs are unusual before 10 years of age. Affects 4–8th ribs bilaterally; not the upper two if conventional. **Unilateral** and right-sided if the coarctation is proximal to the left subclavian artery. **Unilateral** and left-sided if associated with an anomalous right subclavian artery distal to the coarctation. Other signs include a prominent ascending aorta and a small descending aorta with an intervening notch, left ventricular enlargement and possibly signs of heart failure.
2. **Aortic thrombosis** — usually the lower ribs bilaterally.
3. **Subclavian obstruction** — most commonly after a Blalock operation (either subclavian-to-pulmonary artery anastomosis) for Fallot's tetralogy. **Unilateral rib notching** of the upper three or four ribs on the operation side.
4. **Pulmonary oligemia** — any cause of decreased pulmonary blood supply.

VENOUS

1. Superior vena caval obstruction.

ARTERIOVENOUS

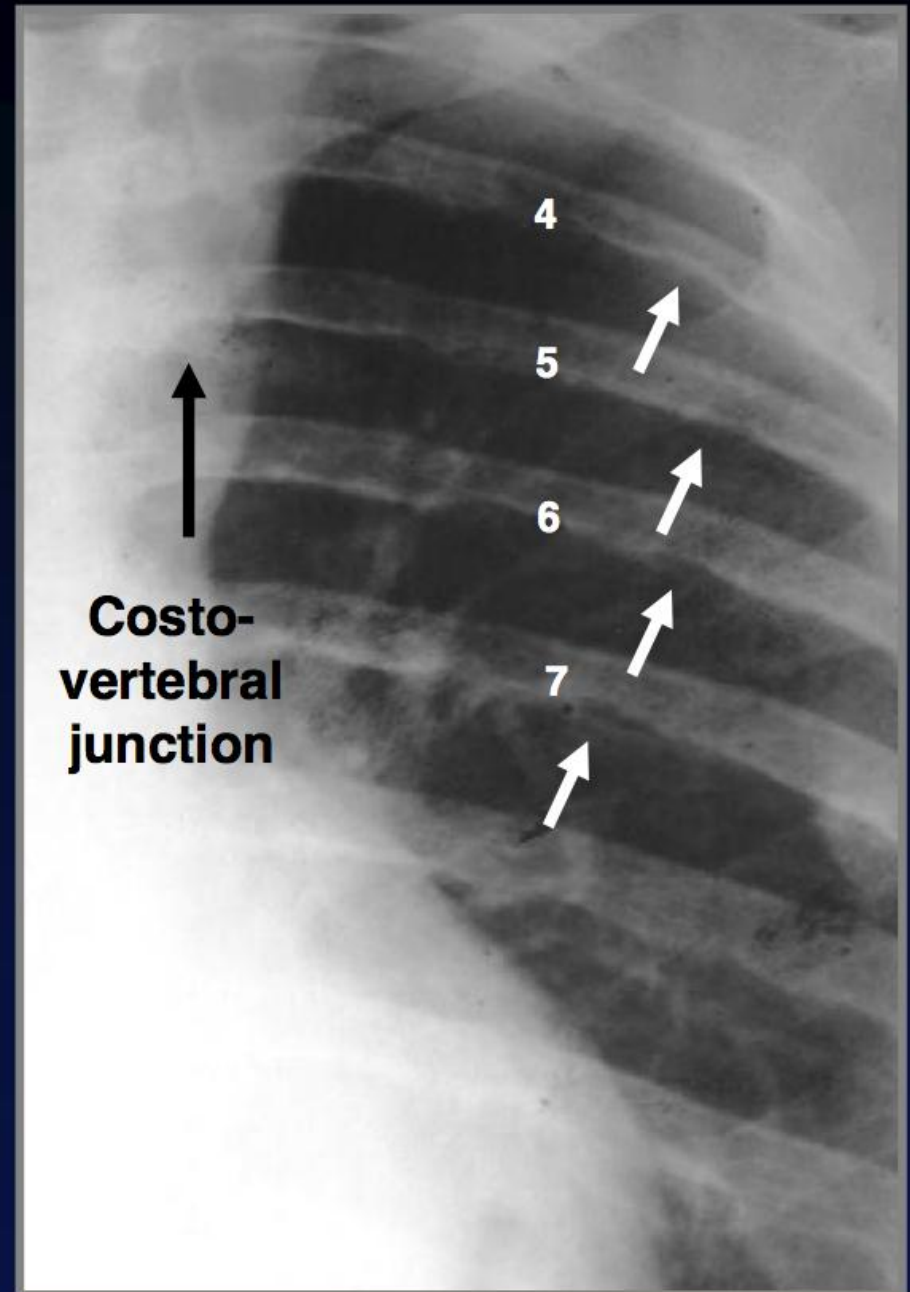
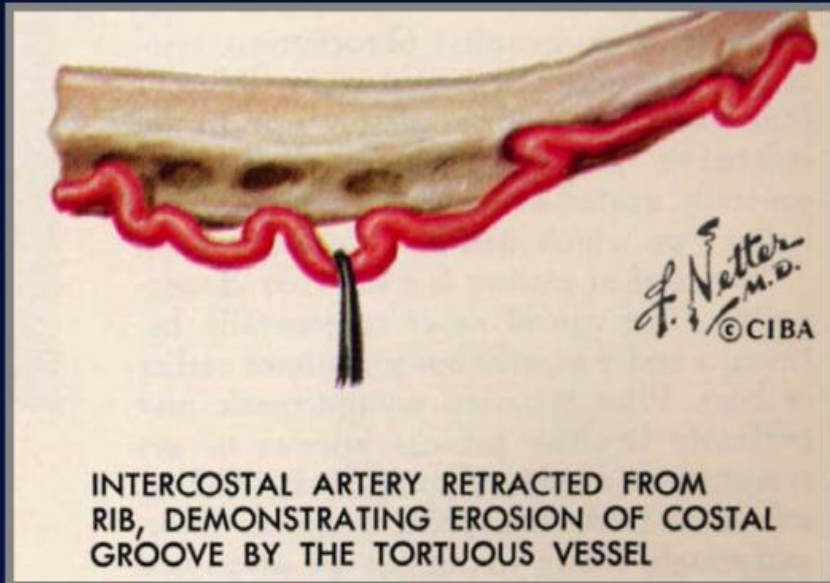
1. Pulmonary arteriovenous malformation.
2. Chest wall arteriovenous malformation.

NEUROGENIC

1. **Neurofibromatosis*** — 'ribbon ribs' may also be a feature.

Rib Notching in Coarctation

Regresses after coarct is repaired



Chest?

- Anterior pericardial calcifications, dilated IVC and hepatic veins (Recall)?
- RV infarct
- LV infarct
- Constrictive pericarditis
- Restrictive cardiomyopathy

Chest?

- Anterior pericardial calcifications, dilated IVC and hepatic veins (Recall)?
- RV infarct
- LV infarct
- Constrictive pericarditis
- Restrictive cardiomyopathy

Chest?

- A patient has anterior pericardial calcifications, dilated left and right atria, dilated IVC and hepatic veins. What is the most likely etiology:
- Constrictive pericarditis
- Restrictive cardiomyopathy
- Dilated cardiomyopathy

Chest?

- A patient has anterior pericardial calcifications, dilated left and right atria, dilated IVC and hepatic veins. What is the most likely etiology:
- Constrictive pericarditis
- Restrictive cardiomyopathy
- Dilated cardiomyopathy

Constrictive Pericarditis

- In a patient with diffuse pericardial calcification on radiographs and appropriate clinical symptoms of constrictive physiology, the diagnosis of CP can be reliably made. The absence of calcification does not exclude the disease, and further testing should include an extensive workup in the echocardiography laboratory, with an assessment of the Doppler velocities across the mitral and tricuspid valves during inspiration and expiration. Because complete surgical pericardiectomy is usually effective (but not without a risk of morbidity and mortality), most patients also undergo simultaneous right- and left-sided heart catheterization, with a measurement of various pressures during inspiration and expiration.
- Calcification suggests likelihood of constrictive pericarditis, at times isolated to right side of heart
- Associated signs of hepatic venous congestion, enlargement of atria, dilated SVC and IVC
- Lack of pulmonary edema

CONSTRICTIVE PERICARDITIS

= fibrous thickening of pericardium interfering with filling of ventricular chambers through restriction of heart motion

Age: 30–50 years; M:F = 3:1

Etiology:

- A. IDIOPATHIC
- B. INFECTIOUS / INFLAMMATORY
 - 1. Viral (Coxsackie B)
 - 2. Tuberculosis (formerly most common)
 - 3. Rheumatoid arthritis
- C. TRAUMATIC
 - 1. Cardiac surgery (most common)
 - 2. Radiotherapy to mediastinum
- D. UREMIA = chronic renal failure
- E. NEOPLASTIC = tumor invasion

Causes of acute pericarditis:

mnemonic: "MUSIC"

Myocardial infarction (acute)

Uremia

Surgery (cardiac)

Infection

Cancer

- dyspnea
- abdominal enlargement (ascites + hepatomegaly)
- peripheral edema
- pericardial knock sound = loud early-diastolic sound
- neck vein distension
- Kussmaul sign = failure of venous pressure to fall with inspiration
- prominent X and Y descent on venous pressure curve
- ✓ linear / plaque-like pericardial calcifications (50–70%):
predominantly over RV, posterior surface of LV, in atrioventricular groove
- ✓ dilatation of SVC (77%), azygos vein (69%)
- ✓ small atria; occasionally compensatory dilatation of nonconstricted portions, eg, LA enlargement (20%)
- ✓ normal / small-sized heart (enlargement only due to preexisting disease)

- ✓ normal pulmonary vascularity / pulmonary venous hypertension (43%)
- ✓ straightening of heart borders:
 - ✓ straight / concave on right side
 - ✓ squared on left side
 - ✓ pericardial tenting
- ✓ increase in ejection fraction (small EDV)
- ✓ pleural effusion (34% bilateral, 26% right PE)

CT:

- ✓ epicardium = visceral pericardium >2 mm thick
- ✓ dilatation of SVC + IVC
- ✓ reflux of contrast into coronary sinus
- ✓ flattening of right ventricle + curvature of interventricular septum toward left
- ✓ pleural effusion + ascites

ECHO (nonspecific features):

- ✓ thickening of pericardium
- ✓ rapid early filling motion followed by flat posterior wall motion during diastasis period (= period between early rapid filling and atrial contraction)

Cx: protein-losing enteropathy (increased pressure in IVC + portal vein)

DDx: cardiac tamponade, restrictive cardiomyopathy (eg, amyloid)

Chest?

- Phase contrast imaging, limit set to 200 cm/s, velocity is 300 cm, what is the artifact (Recall)?
 - Aliasing
 - Gibbs truncation
 - Motion

Chest?

- Phase contrast imaging, limit set to 200 cm/s, velocity is 300 cm, what is the artifact (Recall)?
 - Aliasing
 - Gibbs truncation
 - Motion



Classification of Cardiac MR Imaging Artifacts according to Cause

Nonspecific MR imaging–related artifacts

Inadequate SNR due to positioning errors

Patient not positioned at center of magnet

Surface coil not centered around heart

Cardiac ghost due to malpositioned ECG electrodes

Ghosts of heart and chest wall due to faulty breath hold

RF interference from electronic devices (monitoring devices, drip stands, injection systems) near the magnet

Artifacts specific to cardiac imaging sequences and parameters

Cine (functional) imaging: flow- and cardiac gating–related artifacts, bands

Parallel imaging: aliasing artifacts and increased image noise

First-pass contrast-enhanced (perfusion) imaging: dark rim (truncation, magnetic susceptibility) and aliasing artifacts

Delayed contrast-enhanced (viability) imaging: effects of incorrect TI, suboptimal delay at contrast-enhanced imaging, B_1 field inhomogeneity, motion, poor ECG gating, long T1 species, short T1 in fat, and volume averaging

Phase contrast imaging: aliasing artifacts caused by inappropriate maximum velocity settings, imaging plane malalignment, and partial-volume averaging

Dark-blood (morphologic) imaging: artifacts related to suboptimal timing of data acquisition

Artifacts caused by ferromagnetic materials inside or on the patient (embedded foreign objects, prosthetic cardiac valves, external pacemaker wires, surgical wires and clips)

Note.—ECG=electrocardiographic, RF=radiofrequency, SNR=signal-to-noise ratio, TI=inversion time.



Chest?

- What medication is commonly given prior to coronary CTA (new)?
 - Nitro
 - Adenosine
 - Dipyridamol
- given before cta is ?
 - Sublingual nitroglycerin
 - Dobutamine
 - Aminophylline
 - Dopamine
- What is given to Coronary CTA patients prior to scan...
 - A) Nitroglycerin
 - B) Theophylline
 - C) Beta Blockers not a choice.

Chest?

What medication is commonly given prior to coronary CTA (new)?

- Nitro
- Adenosine
- Dipyridamol
- given before cta is ?
 - Sublingual nitroglycerin
 - Dobutamine
 - Aminophylline
 - Dopamine
- What is given to Coronary CTA patients prior to scan...
 - A) Nitroglycerin (correct)
 - B) Theophylline
 - C) Beta Blockers not a choice.

Chest?

- what do you do in 90 heart rate before CTA
 - Atenolol
- Patient has HR of 90bpm. Which medication would you give prior to coronary CTA?
 - Beta blocker
 - Adenosine
- Patient here for coronary CTA with HR of 90...what do you give them...
 - A) Beta blockers
- Patient here for coronary CTA with HR of 90...what do you give them...
 - Beta blockers

Chest?

- Which of the following medications would you give routinely for coronary CTA?
- **Sublingual Nitroglycerin**
- Adenosine
- Aminophylline
- Dobutamine
- Dipyridamole
-
- Answer: A
-
- References:
- **Coronary CT Angiography.** *Journal of Nuclear Medicine.* Vol 47: No 5 797-806.

Coronary CTA-Beta Blockers

Beta Blockers (IV)- to reduce heart rate

- intravenous β -blocker (metoprololtartrate, Lopressor;)
- Metoprololtartrate is commonly used and readily available. β_1 -adrenoreceptor antagonists' selectivity minimizes bronchospasm.
- Other β -blockers are likely to have similar effects on heart rate.
- Contraindications to the use of β -blockers include severe chronic obstructive pulmonary disease, asthma, sensitivity to β -blockers, second- or third-degree heart block, and hypotension (systolic blood pressure < 100 mm Hg).
- In the absence of contraindications, we inject an initial bolus of 5 mg of metoprololtartrate with the patient already on the scanner table and begin preparations for scanning.
- If the ventricular response is unsatisfactory—that is, if the average heart rate remains higher than 70 beats per minute—we inject up to two additional doses (maximum, 15 mg) of metoprololtartrate.
- After administering three doses, we commence scanning, regardless of the heart rate, which is eventually achieved after β -blocker administration.

Beta Blockers- oral

- Alternative means of controlling the heart rate
- Regimen should be commenced the night before scanning with an initial dose of 50-100 mg of metoprololtartrate
- 30-60 minutes before scanning, another oral dose is given and followed by a third dose in the absence of an adequate ventricular response

If contraindications to Beta Blockers

- May try calcium channel blockers
- CCBs can be administered IV (diltiazem, 0.25 mg per kg of body weight (up to 25mg total) or in an oral regimen of 30 mg of regular release diltiazem

Coronary CTA- Nitroglycerin

- administer nitroglycerin to dilate the coronary vessels for better visualization
- suppress coronary artery spasms that may mimic stenosis at CT angiography, especially in younger individuals.
- 0.4-mg nitroglycerin tablet sublingually 2 minutes before scanning in patients referred for CT angiography with suspected coronary artery disease.
- Sublingual spray can be used alternatively.
- Contraindications to nitroglycerin use include hypotension, early myocardial infarction, severe anemia, increased intracranial pressure, and known hypersensitivity to nitroglycerin.
- We also do not give nitroglycerin to patients who have recently taken nitrate-based medication for erectile dysfunction because of the potential for hypotension-induced syncopal or near-syncopal episodes.

Chest?

- What gives increased EF (Recall)?
 - AI
 - Aortic stenosis
- increased LVEF
 - Aortic insufficiency
 - Diastolic
- What causes an increase ejection fraction:
 - **Aortic insufficiency**
 - Aortic stenosis

Chest?

- What gives increased EF (Recall)?
 - AI- decreased EF over time and increased initially (statdx)?
 - Aortic stenosis- The elevated left ventricular end-diastolic pressure causes a corresponding increase in pulmonary capillary arterial pressures and a decrease in ejection fraction and cardiac output. Emedicine- Aortic Stenosis
- increased LVEF
 - Aortic insufficiency- decreased EF or increased (statdx)?
 - Diastolic- dysfx results in preserved LVEF

Primary care of the older adult By Mary M. Burke, Joy A. Laramie

In older patients mild aortic insufficiency may be chronic, and a compensatory increase in ventricular systolic ejection fraction may occur, resulting in little or no hemodynamic compromise. Over time, LV may result. At the point that significant LVH develops, the stiffened, thickened ventricular walls might lend to diastolic dysfunction (i.e., decreased filling), or LV wall hypertrophy could result in outflow tract obstruction, compromising the ability of the heart to increase ejection fraction and compensate for the aortic insufficiency. If there is hypertension that is not optimally controlled, this increased peripheral resistance also negatively affects the ability of the heart to increase ejection fraction and compensate for the aortic insufficiency. In general, the aging heart is less able to increase ejection fraction with exercise.

Cardiac Valvular Disease- Mettler

pg 154-155

- AR
 - Quantification of aortic regurgitantfx (indicating severity of disease)
 - LVEF important clinical parameter
 - As the resting LVEF declines below about 55% pt prognosis worsens
 - Evaluation of pts with known AR during exercise has been used to predict the appropriateness of timing of valvular surgery by determining whether LVEF fails to rise to rise or actually falls during exercise, as a measure of reduced LV contractile reserve
- MR
 - Declining LV dysfunction as measured by LVEF correlates with a poor prognosis
 - As LVEF falls below about 60% prognosis becomes unfavorable
 - Pts with combined LV and RV dysfx have an even worse prognosis
- Idiopathic Hypertrophic Subaortic Stenosis
 - Radionuclide findings include a markedly elevated LVEF and small LV cavity with asymmetric thickening of the upper portion of the ventricular septum

13. How does chronic aortic insufficiency cause left ventricular failure?

In aortic insufficiency, the entire stroke volume is ejected into a high-pressure system (the aorta). The increase in diastolic volume due to regurgitation leads to ventricular dilatation. Ventricular hypertrophy occurs to normalize wall stress. The increased stroke volume causes enlargement of the left ventricle and the aortic root. Ventricular compliance is increased so that end-diastolic pressure does not become elevated until the ventricle can no longer keep up with the extra volume. End-diastolic volume then increases without an increase in the regurgitant fraction. End-systolic volume also increases, but both ejection fraction and forward stroke volume decrease. As the compliance of the ventricle falls, diastolic pressure rises and dyspnea occurs.

<http://emedicine.medscape.com/article/150490-overview>

- As long as LV wall stress is maintained in the normal range, the LV preload reserve, contractility, and ejection fraction (EF) remain within the normal range. This is the chronic compensated stage. During this phase of the disease, most patients remain asymptomatic for decades because chronic AR generally is a slow and insidious disease with very low morbidity during a long asymptomatic phase.
- In acute AR, the normal-sized left ventricle poorly tolerates the sudden large volume imposed on it. The left ventricle poorly accommodates the abrupt increase in end-diastolic volume, and diastolic filling pressure increases rapidly and dramatically. This leads to an acute decrease in forward stroke volume, and, although tachycardia develops as a compensatory mechanism to maintain cardiac output, this often is insufficient. The rise in LV filling pressure is transmitted to the left atrium, pulmonary veins, and pulmonary capillaries, leading to pulmonary edema and congestion. Acute AR usually is severe and rapidly leads to LV decompensation and/or failure and cardiogenic shock.



Chest?

- What is the 4 chamber view good to look for (Recall)?
 - AV canal defect
 - Ventricular septum-
- Standard 4 chamber ultrasound view of heart is best for...
 - AV Canal
- 4 chamber view is best for evaluating which heart defect?
 - AV Canal
 - Aortic stenosis
 - Tetralogy of Fallot

Chest?

- What is the 4 chamber view good to look for (Recall)?
 - AV canal defect
 - Ventricular septum- it is an AV canal defect
- Standard 4 chamber ultrasound view of heart is best for...
 - AV Canal
- 4 chamber view is best for evaluating which heart defect?
 - AV Canal (correct)
 - Aortic stenosis- outflow tract evaluation
 - Tetralogy of Fallot- would be on outflow tract views

There are several cardiac anomalies which are particularly difficult to detect even with an optimal sonographic exam. These include patent ductus arteriosus (PDA), secundum atrial septal defect (ASD), small ventricular septal defect (VSD), mild degrees of aortic or pulmonary valve stenosis, total anomalous pulmonary venous return, and coarctation of the aorta. PDA and secundum ASD (the most frequent type of ASD) are rarely, if ever, diagnosed prenatally as the ductus arteriosus and foramen ovale are normally patent in the fetus. Small VSDs, mild degrees of aortic or pulmonary valve stenoses, total anomalous pulmonary venous return, and coarctation of the aorta are sometimes difficult to diagnose because the lesion is small or produces only minor changes in the appearance of the 4 C or outflow tract views. It is important for parents to be aware of these limitations of fetal cardiac sonography. Because ASDs and small VSDs are relatively common lesions, it is particularly important for parents who have a previous child with one of these lesions to understand the limitations of sonography.

Table 30-1 Summary of abnormalities to consider on each view

- I. Four-chamber view
 - A. Septal defect
 1. Ventricular septal defect
 2. Atrioventricular canal defect
 - B. Left ventricle relatively smaller than right ventricle
 1. Hypoplastic left heart syndrome
 2. Coarctation
 3. Severe intrauterine growth restriction
 4. Total anomalous pulmonary venous return
 - C. Right ventricle relatively smaller than left ventricle
 1. Pulmonary atresia/severe pulmonary stenosis
 2. Critical aortic stenosis
 3. Tricuspid atresia
 - D. Enlarged right atrium
 1. Ebstein's anomaly
 2. Other tricuspid valve anomalies: dysplasia, absent leaflets, Uhl's anomaly
 3. Pulmonary atresia/severe pulmonary stenosis
 - E. Mass within cardiac chamber
 1. Tumor
 2. Distinguish from echogenic foci, prominent moderator band
- II. Outflow tract evaluation
 - A. Overriding of the aorta
 1. Tetralogy of Fallot
 2. Truncus arteriosus
 3. Pulmonary atresia with VSD
 - B. Absence of "criss-crossing" of aorta and pulmonary artery
 1. Complete transposition
 2. Double-outlet right ventricle
 3. Corrected transposition

Pediatric Body CT By Marilyn J. Siegel

Horizontal Long-Axis Plane (Four-chamber View)

The horizontal long-axis plane or four-chamber view is prescribed from the vertical long-axis (two-chamber) view. Images are acquired parallel to the long axis of the left ventricle (Fig. 5.3). This plane displays the relationship of the four cardiac chambers to each other on a single image and is ideal for the assessment of atrial and septal defects and the tricuspid and mitral valves. This image plane can also be obtained by prescribing oblique transverse images from the short-axis scout.

Echocardiography By Bonita Anderson

Table 2.6: Abnormalities Detected from the Apical Views:

Apical Views	Detectable Abnormalities
Apical 4 Chamber	● dilatation of atria and ventricles ● abnormal relationships of cardiac crux such as: - mal-alignment of IVS and IAS - Ebstein's anomaly (Figure 2.24) - aortic override of IVS ● abnormalities of AV valves and subvalvular apparatus: - stenosis, prolapse, flail leaflets - ruptured chordae - annular calcification - vegetations ● RWMA's ● ventricular septal defects (eg. congenital, post myocardial infarction) ● intracardiac masses: - size - point of attachment

Chest?

- Pulmonary sling is most associated with (new):
 - Tracheal stenosis
 - Tracheal cleft
- What do you see with pulmonary sling?
 - Tracheomalacia
 - Tracheal stenosis
 - Tracheoesophageal Fistula
- Anomalous origin of the left pulmonary artery from the right pulmonary artery is most associated with which of the below?
 - A) laryngeal abnormality
 - B) Tracheomalacia
 - C) Tracheal stenosis
 - D) Tracheoesophageal Fistula

Chest?

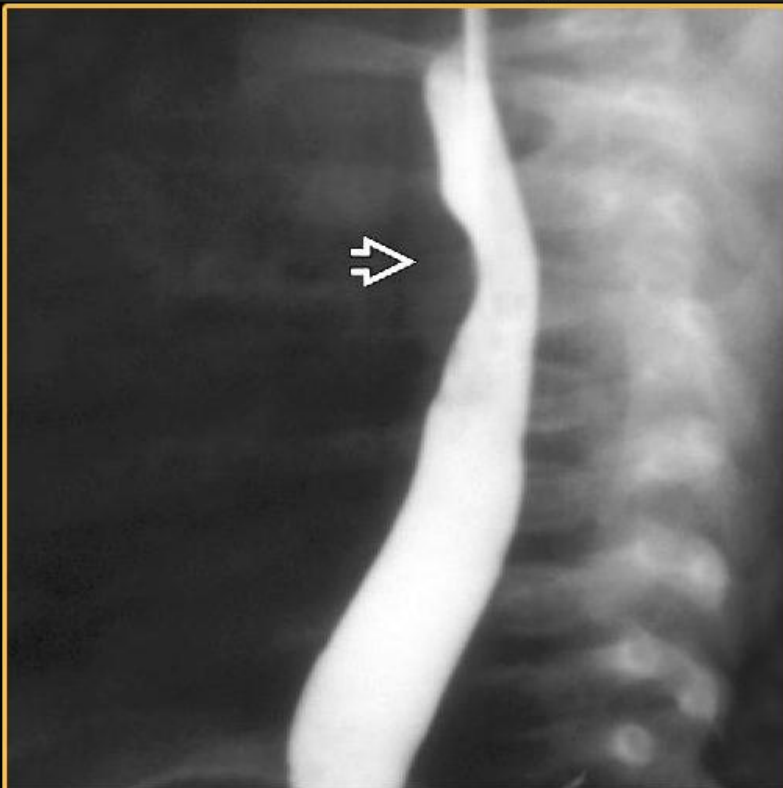
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 - A) laryngeal abnormality
 - B) Tracheomalacia
 - C) Tracheal stenosis
 - D) Tracheoesophageal Fistula

Pulmonary Sling

- Left Branch PA originates from proximal right PA forming a “sling” around distal trachea as it passes leftward btw the trachea and the esophagus

Imaging Findings

- Only vascular ring to course between the trachea and esophagus
- Type I: Carina in normal location at T4-5 ⇒ predominant hyperinflation of right lung
- Type II: Low carina (T6), with “ring-sling” complex: Diffuse stenosis of intermediate left bronchus (ILB), complete cartilage rings, multi-level absence of membranous portion of trachea ⇒ bilateral hyperinflation
- Only vascular ring associated with asymmetric lung inflation and aeration
- Lateral view: Round soft tissue density between distal trachea and esophagus
- Barium swallow: Pulmonary sling is the only vascular ring that leads to an anterior indentation on the esophagus
- Left PA arises from the right, rather than the main PA
- Degree of tracheal compression typically severe
- When complete tracheal rings are present, the trachea will have a very round (rather than oval) appearance with an abnormally small diameter
- Best imaging tool: CTA faster and logistically easier than MR in critically ill infants on a ventilator



Lateral upper GI shows typical anterior indentation on esophagus (arrow) by type I LPA sling.



Axial T1WI MR shows type 1A left pulmonary artery sling (white curved), originating from the proximal right pulmonary artery (white open) and encircling and compressing the distal trachea (white arrow).

Chest?

- vagus enters diaphragm with
- Esophagus

Chest?

- vagus enters diaphragm with
- Esophagus

Chest?

- Kid with lobar pneumonia, otherwise healthy, with cavity on CXR (Recall variant)?
 - H. Influenza
 - S. pneumoniae
 - Mycoplasma
- (Staph was NOT a choice)
- d. Mycobacterium tuberculosis

Chest?

- Kid with lobar pneumonia, otherwise healthy, with cavity on CXR (Recall variant)?
 - H. Influenza
 - S. pneumoniae
 - Mycoplasma
- (Staph was NOT a choice)
- d. Mycobacterium tuberculosis

Chest?

- A previously healthy child has lobar pneumonia with cavitation and a pleural effusion. What is the most common cause:
- Streptococcus
- Mycoplasma
- Klebsiella

Chest?

- A previously healthy child has lobar pneumonia with cavitation and a pleural effusion. What is the most common cause:
- Streptococcus
- Mycoplasma
- Klebsiella

Chest?

- A previously healthy 5 y/o child presents with a lobar opacity which has central cavitation. What is the most likely organism? (Staph was not given as a possible answer)
 - A) TB- rare in younger kids
 - B) Streptococcus - yes
 - C) Klebsiella – yes it can but strep is more common
 - D) Mycoplasma- rare
 - E) Haemophilus influenzae

Moffet's pediatric infectious diseases By Randall G. Fisher, Thomas G. Boyce, Hugh L. Moffet

Cavities or Lung Abscess

The bacteria that produce necrotizing pneumonia include *S. aureus*, gram-negative enterics, and anaerobes.^{388–393} Prior to the advent of good anaerobic culture techniques, *S. aureus* was the most frequently recovered organism. A review of the literature since then reveals that *Bacteroides fragilis* is the most common pathogen, followed by *S. aureus*, alpha-hemolytic streptococci, peptostreptococcus, and *Pseudomonas aeruginosa*. *E. coli* and *Klebsiella pneumoniae* are the most common gram-negative organisms found in lung abscesses. The pneumococcus is a rare cause of cavitory disease in childhood; a series of 3 pediatric cases in which typical lobar pneumonia was followed in several days by the appearance of pneumatoceles or frank abscess has been reported.³⁹⁴ In adults, additional infection with anaerobes is usually present.³⁸⁸ Group A streptococci have been recovered from lung abscesses.³⁹⁵ *H. influenzae* and *M. pneumoniae* have been reported as rare causes of cavitory pneumonia or a lung abscess.^{389,390} Fungi, especially *Aspergillus*, have to be considered in the immunocompromised host. In patients with HIV/AIDS, *Nocardia*, *Pneumocystis*, and *Rhodococcus equi* should be added to the differential diagnosis.³⁹⁶

Mycobacteria or Fungi

Tuberculosis is a possible cause of pulmonary cavitation in teenagers³⁸⁴ and, rarely, in younger children.³⁸⁵ Histoplasmosis, sporotrichosis, coccidioidomycosis, cryptococcosis, actinomycosis, nocardiosis, and blastomycosis should also be considered.^{386,387} Sporotrichosis is a rare cause of chronic pulmonary disease with cavitation. Although the skin ulcerations usually respond dramatically to iodide therapy, the rare pulmonary form usually responds only to amphotericin B or itraconazole.

Clinical handbook of pediatric infectious disease By Russell W. Steele

Pulmonary Abscess

Pulmonary abscess follows cavitation of suppurative lung infections. Very young, immuno-compromised, or chronically ill children are most frequently affected. Precipitating factors may include aspiration, operation, or coma. Staphylococcus is the most frequently involved organism and α - and β -hemolytic streptococci, *Pseudomonas*, *Escherichia coli*, and *Klebsiella* are also seen. Careful bacteriologic examination for anaerobic organisms may yield *Peptostreptococcus*, *Peptococcus*, *Bacteroides melaninogenicus*, or *Bacteroides fragilis*. The empiric choice of antimicrobial therapy is clindamycin or penicillin G for those with allergy. Antibiotics must be continued for 6 weeks. Bronchoscopic aspiration of contents will allow additional assessment of anatomic pathology, including retained foreign body examination. Lobectomy with thoracostomy drainage may be needed for chronic thick-walled abscesses, which have not responded to 2 weeks of medical management.

PEDIATRICS Vol. 110 No. 1 July 2002, pp. 1-6 Clinical Characteristics of Children With Complicated Pneumonia Caused by *Streptococcus pneumoniae* The frequency of children who are hospitalized with pneumococcal pneumonia complicated by necrosis, empyema/complicated parapneumonic effusion, and lung abscess seems to be increasing. The factors that contribute to this increase are unclear; therefore, the objective of this study was to describe and compare the relative frequency, clinical characteristics, and outcome of hospitalized children with complicated pneumonia with those of children with uncomplicated pneumonia caused by *Streptococcus pneumoniae* in the era of antibiotic resistance.

Chest?

- Which of the following is used to evaluate Wegner's Granulomatosis?
 - C-anca
 - P-anca
 - Antibasement membrane
- wegner's
 - c-anca
 - P-anca
 - I don't care- anca
- Which test is usually positive in Wegener's?
 - A) p-ANCA
 - B) c-ANCA
- What is the most common laboratory marker for Wegner's granulomatosis (new)?
 - P-anca
 - C-anca
 - ANA

Chest?

(3) Facial nerve paralysis
Dx: (1) c-ANCA (cytoplasmic pattern of antineutrophil
cytoplasmic autoantibodies): 96% sensitive for
generalized disease, 99% specific
(2) Lung / renal biopsy

- Which of the following is used to evaluate Wegner's Granulomatosis?
 - C-anca
 - P-anca
 - Antibasement membrane
- wegener's
 - c-anca
- Which test is usually positive in Wegener's?
 - A) p-ANCA
 - B) c-ANCA
- What is the most common laboratory marker for Wegner's granulomatosis (new)?
 - P-anca
 - C-anca
 - ANA

Chest?

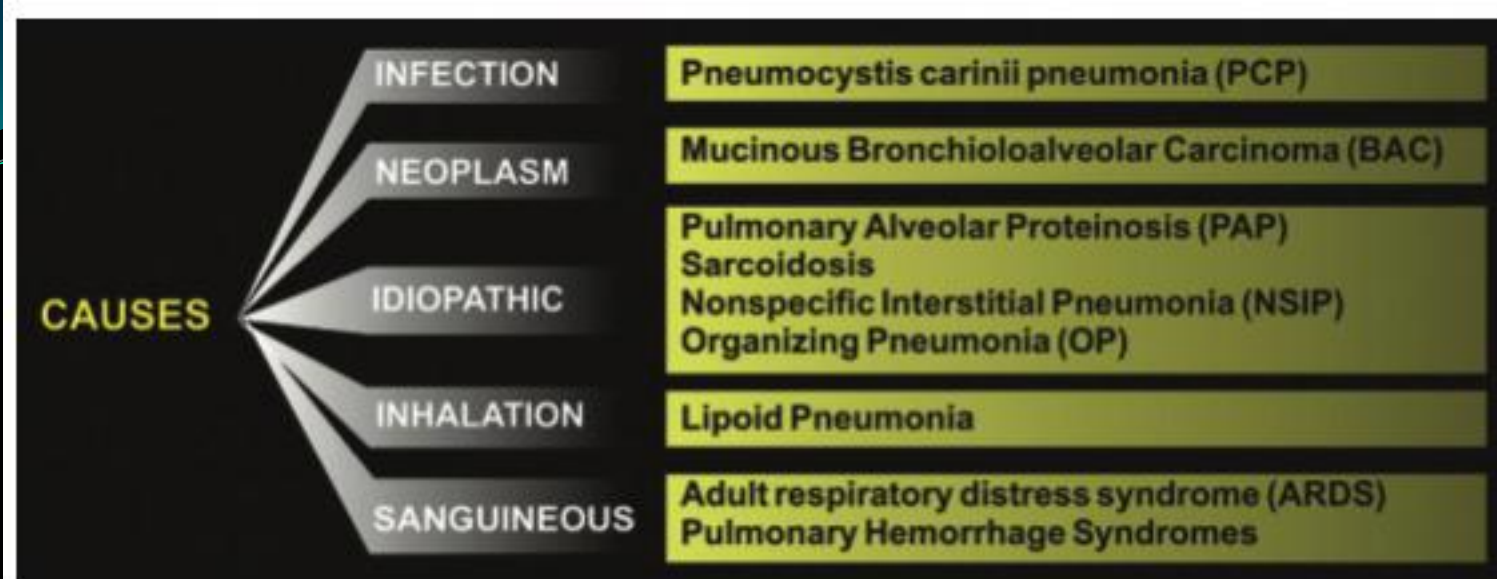
- On chest CT, crazy paving is most classically found with (new):
 - PAP
 - Hemorrhage
 - Edema
 - Lymphangitic carcinomatosis
- Crazy paving pattern is most characteristicly associated with...
 - Alveolar proteinosis
 - Lipoid pneumonia
- Which of the following is the classically associated with the crazy paving pattern bilaterally:
 - Alveolar proteinosis
 - Lipoid pneumonia
 - Bronchoalveolar carcinoma
 - Infection
- Crazy paving pattern is most characteristicly associated with...
 - A) Alveolar proteinosis
 - B) Lipoid pneumonia

Chest?

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 - A) Alveolar proteinosis
 - B) Lipoid pneumonia

Crazy Paving

- The crazy-paving sign is a pattern seen on thin-section computed tomographic (CT) images of the lungs. It is characterized by a reticular pattern superimposed on ground-glass opacity
- In the crazy-paving sign, ground-glass opacity may reflect the presence of airspace or interstitial abnormalities; the lines of reticular opacities may represent interlobular septal thickening, thickening of the intralobular interstitium, irregular areas of fibrosis, or a preponderance of an airspace-filling process at the periphery of lobules or acini
- The differential diagnosis of crazy-paving sign includes
 - *Pneumocystis carinii* pneumonia,
 - mucinous bronchioloalveolar carcinoma
 - sarcoidosis,
 - lipoid pneumonia
 - adult pulmonary hemorrhage syndromes
 - respiratory distress syndrome
 - Acute radiation pneumonitis
 - Drug induced pneumonitis
- Johkoh et al reported 46 patients showing the crazy-paving sign on thin-section CT images, the most common causes included **adult respiratory distress syndrome** (n = 8), **bacterial pneumonia** (n = 7), **acute interstitial pneumonia** (n = 5), and, despite its rarity, **alveolar proteinosis** (n = 5). Others were drug-induced pneumonitis (n = 3), radiation pneumonitis (n = 3), pulmonary hemorrhage (n = 3), chronic eosinophilic pneumonia (n = 2), diffuse alveolar damage superimposed on usual interstitial pneumonia (n = 2), cardiogenic edema (n = 2), mycoplasma pneumonia (n = 2), obstructive pneumonia (n = 1), tuberculosis (n = 1), *P. carinii* pneumonia (n = 1), and bronchiolitis obliterans organizing pneumonia (n = 1). Also, the highest prevalence of crazy-paving sign in this study was seen in pulmonary alveolar proteinosis (100%), diffuse alveolar damage (67%), acute interstitial pneumonia (31%), and adult respiratory distress syndrome (21%)

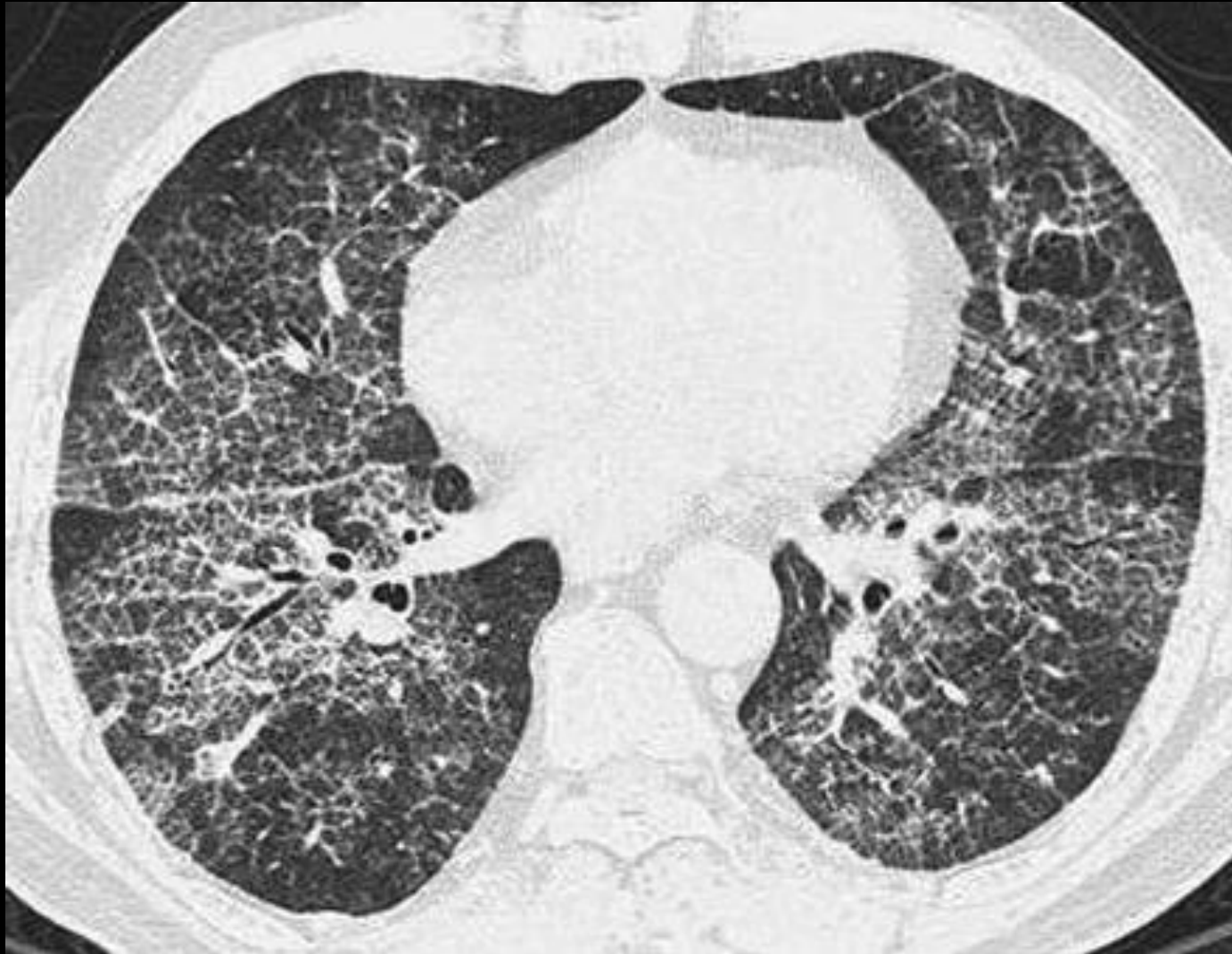


Radrounds

What Can Cause "Crazy-Paving" Pattern?

- CLASSIC: Pulmonary alveolar proteinosis
- COMMON: Pneumocystis jirovecii pneumonia (PCP), pulmonary edema (ARDS), pulmonary hemorrhage
- NOT COMMON: Bronchioloalveolar carcinoma, alveolar sarcoidosis, nonspecific interstitial pneumonitis (NSIP), Cryptogenic organizing pneumonia (COP), lipoid pneumonia
- Our case is a patient with biopsy proven pulmonary alveolar proteinosis.

Crazy paving- I'm going crazy!!



Chest?

- Proximal muscle weakness with multiple bilateral pleural based masses (Recall), what is the most likely cause?
 - Thymoma
 - Benign fibrous tumor of pleura
 - Mesothelioma
 - Calcified pleural plaques
- A woman presents with proximal muscle weakness and has multiple pleural based nodules on CXR. What is the most likely etiology:
- **Thymoma**
- Benign fibrous tumor of the pleura
- Lady with proximal muscle weakness and pleural thickening seen in CT
- Benign fibrous tissue of the pleura
- Thymoma

Chest?

- Proximal muscle weakness with multiple bilateral pleural based masses (Recall), what is the most likely cause?
 - Thymoma-
 - Benign fibrous tumor of pleura- asymptomatic, 5% ass. With hypoglycemia, can be single or multiple
 - Mesothelioma
 - Calcified pleural plaques
- A woman presents with proximal muscle weakness and has multiple pleural based nodules on CXR. What is the most likely etiology:
 - Thymoma-
 - Benign fibrous tumor of the pleura-asymptomatic, 5% ass. With hypoglycemia, can be single or multiple
- Lady with proximal muscle weakness and pleural thickening seen in CT
 - Benign fibrous tissue of the pleura- asymptomatic, 5% ass. With hypoglycemia, can be single or multiple
 - Thymoma-

ANS: B: thymoma

- - unilateral nodular thickening, thymoma has no gender predilection. Metastasizing thymoma (benign appearing pleural or parenchymal seeding) or malignant thymoma (pleural thickening, often unilateral).
 - (*Danhert*)
- Myasthenia Gravis has proximal limb weakness
 - emedicine



PANIK!!!

Chest?

- Tree in bud opacities seen, which is least likely (new)?
 - TB
 - ABPA
 - Dyskinetic cilia
 - Bronchiolitis obliterans
- Old woman with tree in bud, RML and lingual bronchiectasis on chest CT, what is the most likely cause (Recall)?
 - MAI
 - MTB
 - S. pneumonia
- Tree in bud pattern in the RML and lingual
 - MAI
- All of the following are associated with a tree in bud pattern on CT EXCEPT:
 - Fungal infection
 - Tuberculosis
 - **Tuberous sclerosis**
 - Respiratory bronchiolitis

Chest?

- Tree in bud opacities seen, which is least likely (new)?
 - TB
 - ABPA
 - Dyskinetic cilia – I don't know but how common is this really? Kartagener's?
 - Bronchiolitis obliterans
 - It can occur in all of the above
- Old woman with tree in bud, RML and lingual bronchiectasis on chest CT, what is the most likely cause (Recall)?
 - MAI
 - MTB
 - S. pneumonia
- Tree in bud pattern in the RML and lingual
 - MAI
- All of the following are associated with a tree in bud pattern on CT EXCEPT:
 - Fungal infection
 - Tuberculosis
 - Tuberous sclerosis
 - Respiratory bronchiolitis

Tree-in-bud opacities are nearly always the result of inspissated (*ie*, frequently aspirated) secretions lodged within centrilobular bronchioles, accounting for a branching configuration when coursing parallel to the CT scan plane.⁹³²³³ Normal bronchioles, which have a diameter of < 1 mm and a wall thickness of < 0.1 mm, are below the limit of HRCT scan spatial resolution.³⁴ The presence of inspissated secretions results in bronchiolar distension and increased density, allowing their direct visualization. Not surprisingly, in many cases there is also evidence of coexisting bronchiectasis. Another frequently encountered finding in patients with bronchiolar disease is so-called *mosaic attenuation*.³³ In these cases, bronchiolar occlusion results in air-trapping, hypoxia of the poorly ventilated lung units with resultant reflex vasoconstriction and air-trapping. This combination of findings causes decreased attenuation of the affected areas of the lung with blood flow redistributed to normal lung. The hypoattenuated diseased lung is therefore surrounded by hyperattenuated, overperfused normal lung, resulting in heterogeneous-appearing mosaic attenuation.

While classically described in patients with an endobronchial spread of tuberculosis, in fact, tree-in-bud opacities can be identified in virtually any type of infectious bronchiolitis. This includes *Mycobacterium tuberculosis*, *Mycobacterium avium-intracellulare*, bacterial, viral, and fungal infections, and allergic bronchopulmonary mycosis. This pattern is also frequently encountered in patients with AIDS in whom recurrent episodes of bronchial infection are frequent.³⁵ Differential diagnosis also includes *follicular bronchiolitis*, an entity that is characterized by the presence of hyperplastic lymphoid follicles and germinal centers occurring along the bronchovascular bundles.³⁶

Most often, infectious bronchiolitis results in clusters of tree-in-bud opacities. When they are widespread and diffuse, the differential diagnosis includes "Asiatic panbronchiolitis."³⁷³⁸ This entity has a well-established predilection in Japanese, Chinese, and Korean populations, appears to show a genetic predisposition, and is usually seen in association with chronic sinusitis. Diffuse tree-in-bud opacities are also frequently encountered in patients with cystic fibrosis and viral bronchiolitis.

It cannot be overemphasized that in the vast majority of cases the finding of tree-in-bud opacities should be taken as being indicative of bronchiolar infection. While tree-in-bud opacities have been described³⁹ as occurring in patients with pulmonary vascular tumor emboli, in our experience this entity is exceedingly rare. As noted in one retrospective study⁹ of 141 patients with a variety of airway diseases, including bronchiolitis obliterans, bronchiolitis obliterans-organizing pneumonia, HP, respiratory bronchiolitis (RB), and pneumonia, among others, the finding of tree-in-bud opacities was identified in association only with pneumonia and/or bronchiectasis in 17% and 25% of cases, respectively. Even in patients with panbronchiolitis, while no consistent infectious agent has been associated with this disease, interestingly, most individuals respond, at least initially, to low-dose erythromycin therapy.³⁸⁴⁰ Some authors⁴¹ have suggested that the therapeutic efficacy of macrolide agents may emanate from their inhibition of proinflammatory cytokines, and from mucus and water secretion from airway epithelial cells.

Pictorial Essay: Multinodular Disease^{*A High-Resolution CT Scan Diagnostic Algorithm}
Suhail Raoof, MD, FCCP, Alexey Amchentsev, MD, Ioannis Vlahos, MD, Ajay Goud, MD, and David P. Naidich, MD, FCCP

Immunologic Disorders

Allergic bronchopulmonary aspergillosis is an immunologic hyperimmune response to airway colonization with *Aspergillus*, usually seen in patients with asthma. The fungus proliferates in the proximal bronchi, acting as an antigenic stimulus for the production of IgE and IgG antibodies. The inflammatory reaction causes mucoid impaction in the central airways, which leads to damage of the bronchial wall and subsequent bronchiectasis. The CT findings include central bronchiectasis with an upper lobe predominance and mucoid impaction [5] that has a similar appearance to the finger-in-glove appearance on chest radiographs. In some cases, extension of mucoid impaction to the bronchioles can have a tree-in-bud pattern on CT (Fig. 8).

Congenital Disorders

Cystic fibrosis is a hereditary disease of the exocrine glands, transmitted as an autosomal

recessive trait. Abnormal secretions are produced by the salivary and sweat glands, pancreas, large bowel, and tracheobronchial tree. Chronic inflammation and infection lead to progressive bronchial wall damage and subsequent bronchiectasis. The CT findings include bronchial wall thickening, bronchiectasis, bronchiolectasis, and mucus plugs. Large amounts of bronchiolar secretions can produce a tree-in-bud pattern on CT scans [2].

Dyskinetic cilia syndromes are inherited abnormalities of ciliary structure and function. One of these syndromes, Kartagener's syndrome, is characterized by the clinical triad of situs inversus, sinusitis, and bronchiectasis. Abnormal ciliary motion in the respiratory tract results in recurrent bronchial infections that lead to bronchiectasis. Airway damage can extend to the smaller airways, and this can lead to bronchiolectasis and centrilobular opacities (tree-in-bud) on CT (Fig. 9).

Pictorial Essay

CT Patterns of Bronchiolar Disease: What Is "Tree-in-bud"?

Jannette Collins¹, Donna Blankenbaker¹, Eric J. Stern²

Chest?

- Subcarinal lymph node is N in the TNM staging of lung cancer (recall-variant)?
 - N₀
 - N₁
 - N₂
 - N₃

Chest?

- Subcarinal lymph node is N in the TNM staging of lung cancer (recall-variant)?
 - N₀
 - N₁
 - N₂
 - N₃

TNM STAGING OF LUNG CANCER

Supraclavicular	Scalene(ipsi-/contralateral)	Mediastinal	Subcarinal	Hilar	Peribronchial (ipsilateral)	LYMPH NODE (N)					
(contralateral)	(ipsilateral)	(contralateral)	(ipsilateral)	(contralateral)	(ipsilateral)						
+	+	+		+		N3	Stage IV M1 (any T, any N)				
-	-	-	+ & / +	-		N2	Stage III B				
-	-	-	-	-	+ & / +	N1	Stage II A	Stage II B			
-	-	-	-	-	-	N0	Stage I A	Stage I B	Stage II B		
							T1	T2	T3	T4	PRIMARY TUMOR (T)
							a&b&c	any of a,b,c,d	(a&c)/b/d	(a&c)/d	Criteria
							≤ 3 cm	> 3 cm	any	any	a. Size
							No invasion proximal to the lobar bronchus	Main bronchus (≥ 2 cm distal to the carina)	Main bronchus (< 2 cm distal to the carina)	-	b. Endo-bronchial location
							surrounded by lung or visceral pleura	Visceral pleura	Chest wall **/ diaphragm/ mediastinal pleura/ parietal pericardium	Mediastinum/ trachea/heart/ great vessels/ esophagus/ vertebral body/ carina	c. Local Invasion
							-	Atelectasis/ obstructive pneumonitis that extends to the hilar region but doesn't involve the entire lung	Atelectasis/ obstructive pneumonitis of the entire lung	Malignant pleural/peri-cardial effusion or satellite tumor nodule(s) within the ipsilateral primary-tumor lobe of the lung	d. Other

Stage 0
(Tis, N0, M0)

METASTASES (M)
M0 : Abscent
M1 : Present
Separate metastatic tumor nodule(s) in the ipsilateral nonprimary-tumor lobe(s) of the lung also are classified M1

Tis : Carcinoma *in situ*

Staging is not relevant for Occult Carcinoma (Tx, N0, M0)

* Including direct extension to intrapulmonary nodes
** Including superior sulcus tumor
(& : and) (/ : or) (& / : and /or)

FIGURE 1. TNM staging of lung cancer.

Chest?

- HIV pos male with acute shortness of breath, pulmonary opacities, not Gallium avid, what is the most likely cause (Recall)?
 - Kaposi
 - PCP
 - Lymphoma
 - Septic emboli

Chest?

- HIV pos male with acute shortness of breath, pulmonary opacities, not Gallium avid, what is the most likely cause (Recall)?
 - Kaposi- gallium (-) but thallium (+)
 - PCP- gallium + in 60-70% of cases
 - Lymphoma- gallium and thallium positive
 - Septic emboli
 - MAI, TB, Acute Infections- usually gallium + and thallium – but may show faint thallium uptake.

Immunocompromised Pts and Gallium Scans

- Does not depend on acute pyogenic response
- Therefore it is the choice for detecting and evaluating the varied opportunistic pulmonary infections and adenopathies common in pts with compromised immune system due to AIDS, antineoplastic chemotherapy, or immunosuppression after organ transplant
- Should always be interpreted in comparison with recent chest radiographs
- A normal gallium scan in the presence of a focal mass infiltrate on the chest radiograph suggests the diagnosis of Kaposi sarcoma, which does not accumulate gallium.
- Bilateral intense diffuse homogeneous pulmonary uptake of gallium is the classic appearance of PCP and occurs in 60-70% of cases. Frequently + before CXR.

Chest?

- 26 year old Asian with cough, fever, eosinophilia and migratory lung opacities (new)?
 - Ascariasis
 - Pneumonia infection
 - Kaposi

Chest?

- 26 year old Asian with cough, fever, eosinophilia and migratory lung opacities (new)?
 - Ascariasis
 - Pneumonia infection
 - Kaposi

Chest?

- A previously asymptomatic 26 y/o asian man presents with cough, fever, eosinophilia. CXR reveals migratory pulmonary opacities. What is the most likely etiology:
- ABPA
- Ascariasis
- Pneumonia
- Atypical community acquired pneumonia

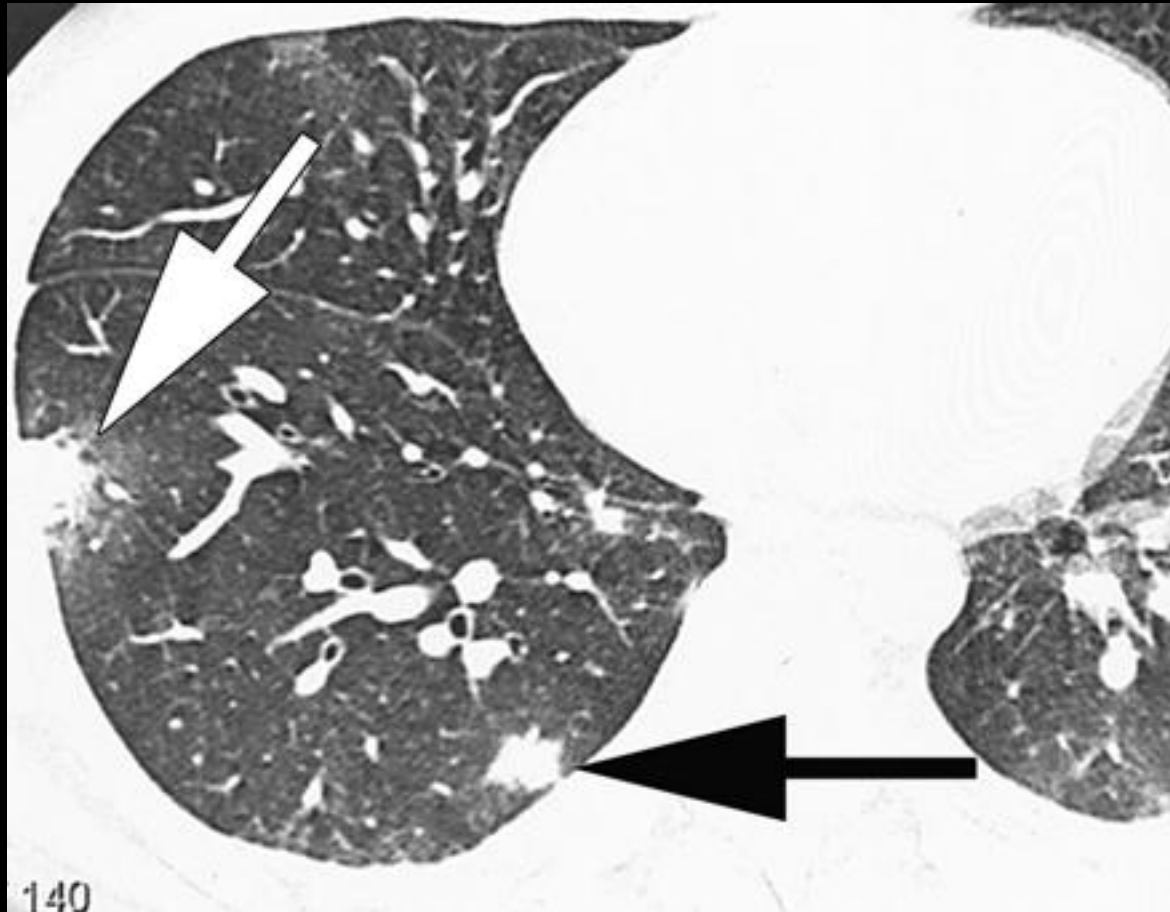
Chest?

- A previously asymptomatic 26 y/o asian man presents with cough, fever, eosinophilia. CXR reveals migratory pulmonary opacities. What is the most likely etiology:
- ABPA- ABPA is typically seen in patients with long-standing asthma or cystic fibrosis.
- Ascariasis
- Pneumonia
- Atypical community acquired pneumonia

Eosinophilic Lung Diseases: A Clinical, Radiologic, and Pathologic Overview

RadioGraphics 2007;27:617-637

- In many developing countries, *Ascaris lumbricoides* is the most common cause of peripheral blood eosinophilia with pulmonary opacities. *A. lumbricoides* was responsible for the pulmonary opacities in most of Loeffler's patients
- Two mechanisms of pulmonary eosinophilic infiltration in parasitic infestations have been postulated: direct invasion (eg, *Ascaris*, *Schistosoma*, and *Filaria* species; *Paragonimus westermani*; *Ancylostoma duodenale*) and allergic reaction (*Entamoeba histolytica*, *Toxocara canis*, *Clonorchis sinensis*). In cases of *Clonorchis* infestation, immunologic stimulation from the life cycle of *C. sinensis* in humans may cause the pulmonary opacities manifesting as single or multiple migrating nodules
- Simple Pulmonary Eosinophilia (SPE), or Loeffler syndrome, was originally reported as a benign AEP (Acute eosinophilic pneumonia) of unknown cause characterized by migrating pulmonary opacities, increased peripheral blood eosinophils, minimal or no pulmonary symptoms, and spontaneous resolution within 1 month. In some patients, these clinical characteristics may prove to be secondary to the presence of parasites, ABPA, or drugs
- The differential diagnosis for migratory pulmonary opacities includes pulmonary hemorrhage, pulmonary vasculitis, cryptogenic organizing pneumonia, and recurrent aspiration



C sinensis infestation in a 25-year-old man.

Chest?

- Young woman with mild, progressive SOB. (They showed a CT scan with upper lobe interstitial thickening and bronchiectasis with lower lobe nodular opacities but no cysts or mediastinal adenopathy as far as I can see...obviously, take this with a grain of salt): (This was the ONLY question with an image.) (new)
 - Sarcoid
 - LCH
 - Kaposi
 - BO
 - Silicosis
- Two images were given showing upper lobe interstitial lung disease with some GGO in a 32yo with progressive dyspnea and SOB. Dx???
- Two images were given showing upper lobe interstitial lung disease with some GGO in a 32yo with progressive dyspnea and SOB. Dx???
- CT image of the chest with cystic areas in the upper lung zones and nodules in the lower lung zones. What is the likely diagnosis?
 - A) langerhans cell histiocytosis
 - B) Sarcoid

Chest?

- CT images were provided showing two images:
- Upper lobe – extensive fibrotic changes with sparing of the periphery
- Lower lobe – no fibrosis at base, scattered nodules within the lung
- What is the most likely diagnosis:
 - Sarcoidosis
 - EG
 - Tuberculosis
 - Respiratory bronchiolitis
 - Asbestosis
- two slices of CT chest: upper image was of bronchiectasis and ground glass
- Lower image was of small nodules, maybe in a subpleural distribution? 32 y/o with mild dyspnea
 - EG
 - Sarcoid
 - TB
 - Kaposi
 - BO

Discussion

- TB is usually unilateral
- BO- bronchiectasis and airtrapping
- Kaposi's= AIDS related, thickening of the bronchovascular bundles, $CD4 < 100$, reticular nodular pattern with basilar predominance
- Respiratory Bronchiolitis- centrilobular ground glass nodules, more predominant in upper lung zone
- I think it is a toss up btw Sarcoid and EG-

CT Findings

- HRCT
 - Respiratory bronchiolitis
 - HRCT often normal (sensitivity 25%)
 - Micronodular faint centrilobular opacities
 - Patchy ground-glass opacities (abnormal lobules adjacent to normal lobules)
 - Ground-glass opacities tend to be more widespread
 - Predominant upper lung zones
 - May have associated centrilobular emphysema if older
 - Respiratory bronchiolitis-interstitial lung disease
 - Upper lobe centrilobular nodules more pronounced
 - Distinct reticular pattern (from mild fibrosis) primarily in lower lobes
 - Centrilobular emphysema more common
 - Mild bronchial wall thickening
 - May be combined with other sequelae of smoking (bronchogenic carcinoma)

RB-ILD

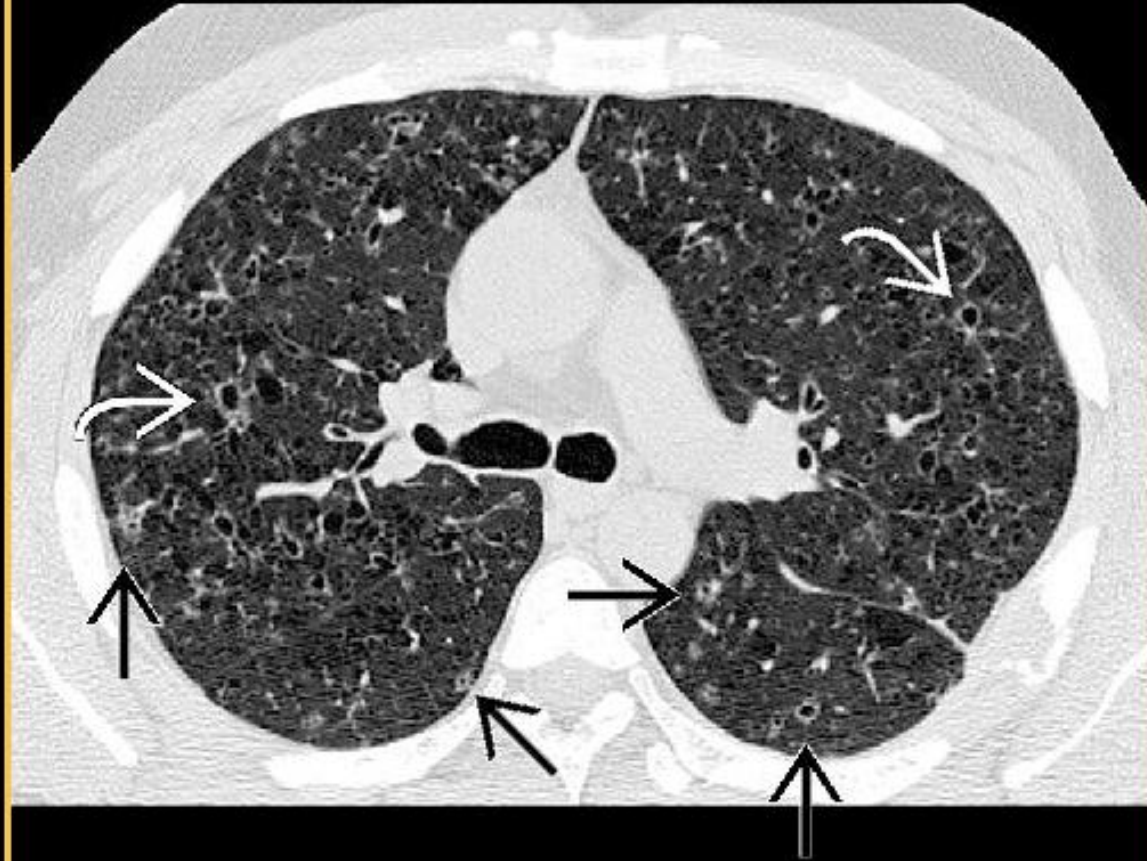


Axial HRCT shows patient with RB-ILD. Peripheral ground-glass opacities (open arrows) are combined with centrilobular emphysema (arrows). Subpleural regions show very subtle signs of fibrosis.

Langerhans Cell Histiocytosis (Pulmonary Histiocytosis X or EG)

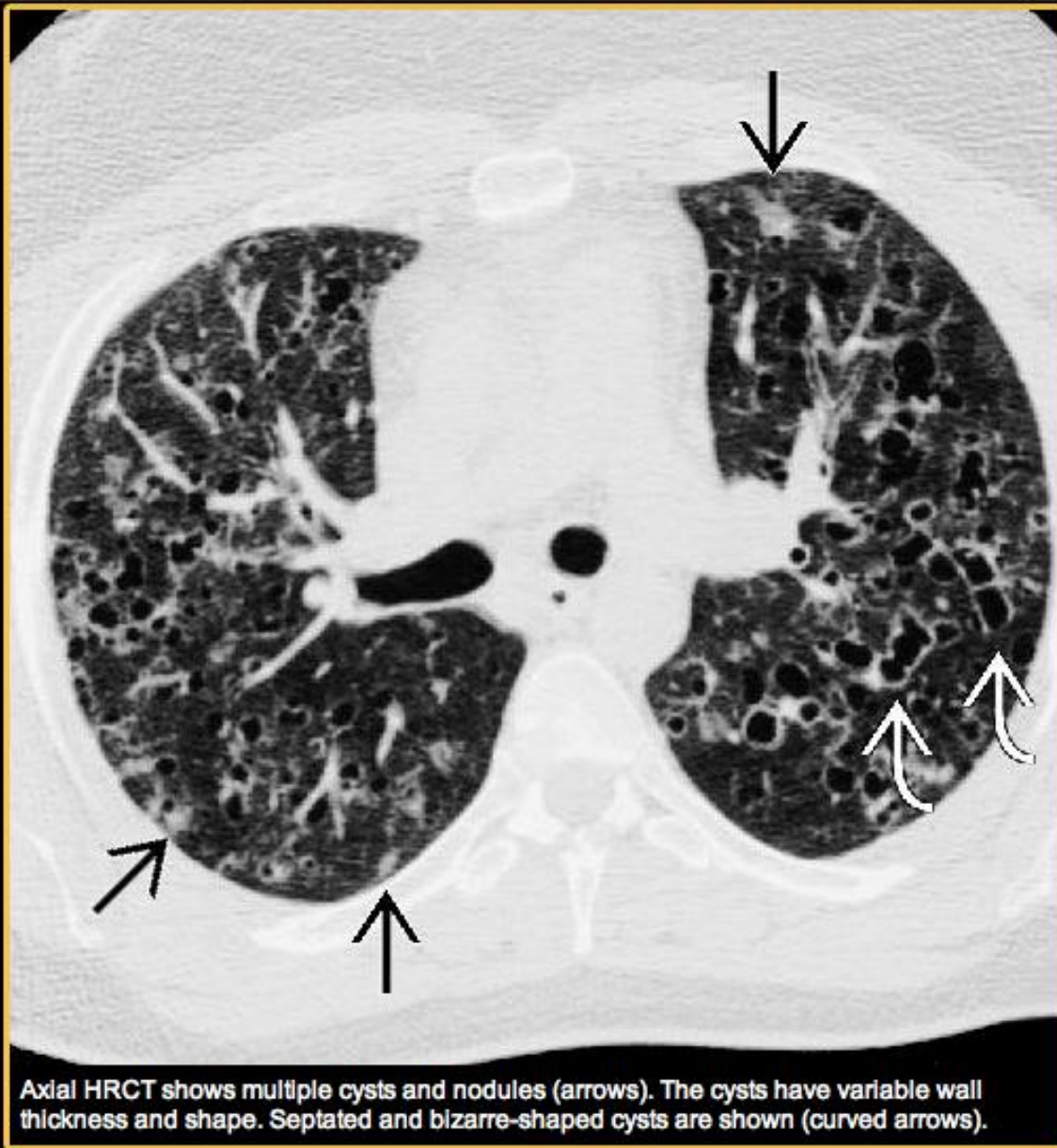
- Lung involvement in 40%; may be an isolated abnormality
- 90% of adult pts are smokers
- Most pts are young or middle aged adults (avg age 32 yrs)
- Granulomas in early stages
- Lung cysts late in course
- Cysts irregular in shape
- Upper lobe predominance
- Spares costophrenic angles
- Nodules or cavitory nodules in some, centrilobular in location
- Up to 20% present with pneumothorax
- Associated hilar or mediastinal LN enlargement or lytic bone lesions may also be present
- Thoracic Imaging pg 567-568

Langerhans



Axial HRCT in same patient shows small cavitory nodules (arrows) and cysts (curved arrows) that were imperceptible on the frontal radiograph.

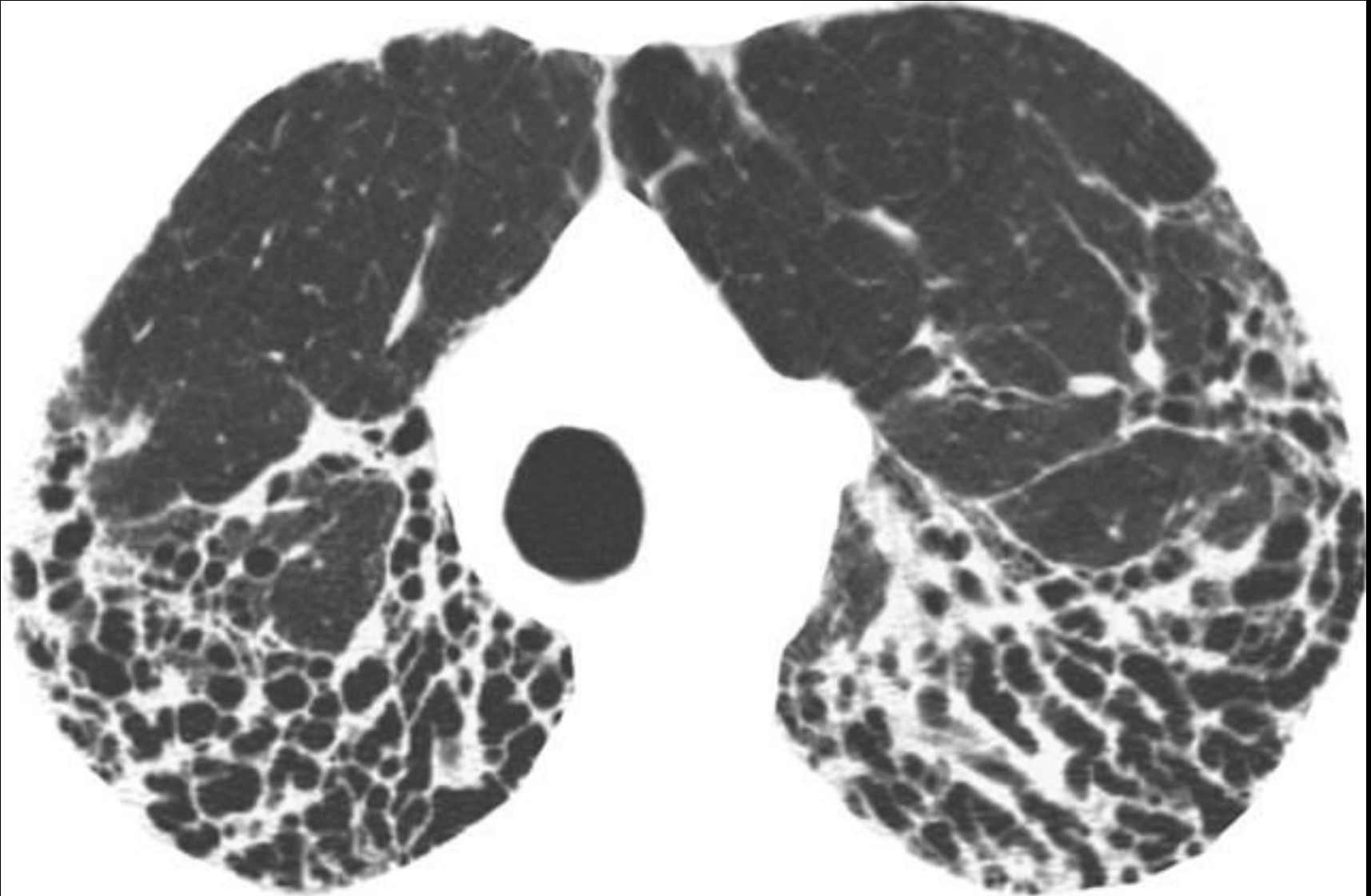
Langerhans

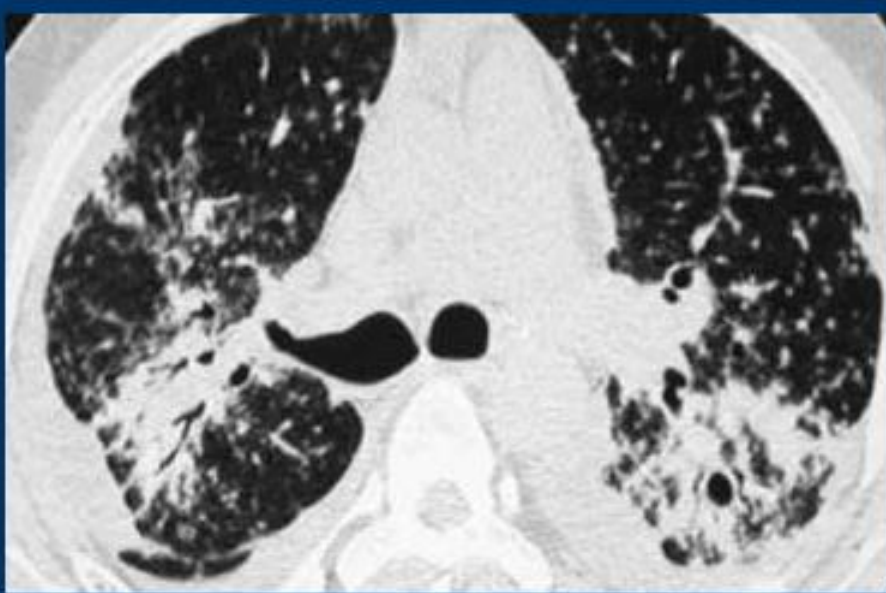


Sarcoidosis

- Can look like anything
- HRCT
 - Typically shows small nodules (few mm in diameter)
 - Perilymphatic distribution
 - Frequently predominate in relation to 1) the parahilarperibronchovascularinterstitium (vessels and bronchi) 2) interlobar fissures and 3) the peripheral subpleural regions. A distribution of nodules in relation to these three regions is highly suggestive of sarcoidosis
 - Upper lobe predominance is common but not invariable
 - Often patchy in appearance
- May have large nodules and masses with or without air bronchograms (appearing like consolidation), rarely cavitate, galaxy sign with peripheral nodules usually present
- Ground Glass Opacity
 - Can sometimes be seen
 - May be superimposed on a background of interstitial nodules
 - Usually reflects the presence of numerous very small granulomas
- Reticular Opacities and Fibrosis
 - Pts with stage 2 and 3 disease
 - Persistent reticular pattern and may be associated with honeycombing,
 - Areas of fibrosis are also usually patchy in distribution
 - Usually have an upper lobe predominance
 - Areas of emphysema or air filled cysts may also be seen in the peripheral lung
 - Most common early HRCT Finding of fibrosis is posterior displacement of the main and upper lobe bronchi associated with irregular reticular opacities. Progressive fibrosis leads to masses of peribronchovascular fibrous tissue with central conglomeration of parahilar bronchi and bessels typically most marked in the upper lobes. This finding is frequently associated with traction bronchiectasis; the only other diseases that commonly result in this appearance are silicosis and talcosis

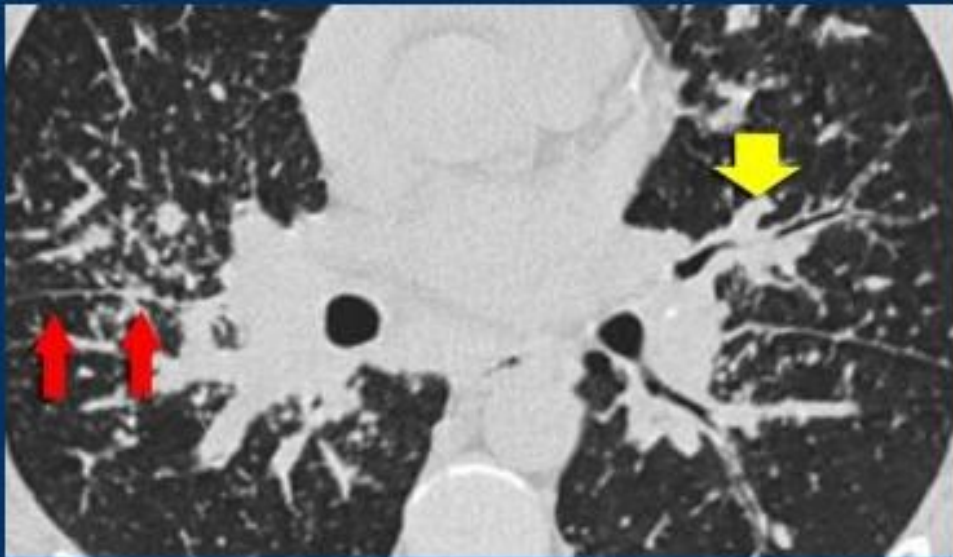
High-resolution CT at the level of the upper lobes shows architectural distortion, posterior displacement of the upper lobe bronchi, extensive traction bronchiectasis and bronchiolectasis, and a few subpleural cysts, consistent with honeycombing. The patient was a 46-year-old man with chronic **sarcoidosis**.



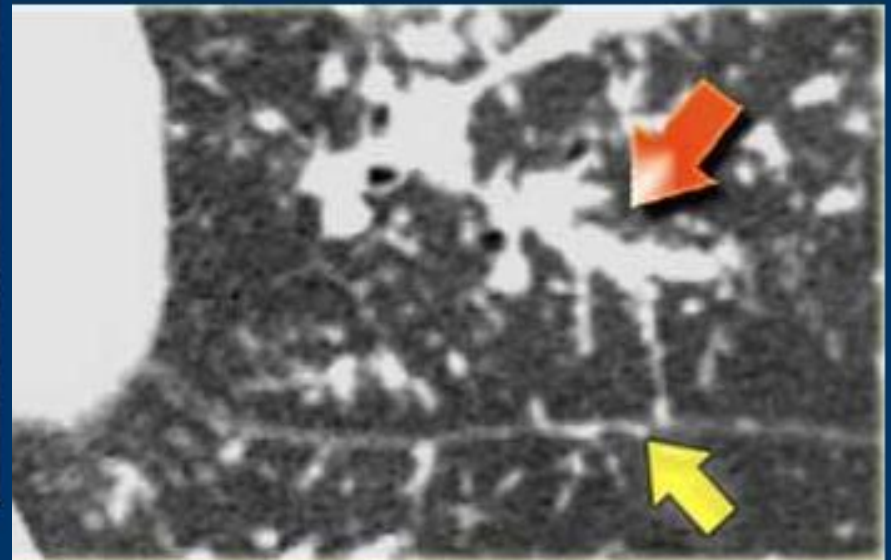


On the left another case of stage IV sarcoidosis. Notice the distribution of the conglomerate masses of fibrosis in the posterior part of the lungs. In addition there are multiple small well-defined nodules. Some of these nodules have the typical subpleural distribution.

Sarcoidosis with fibrosis in the upper lobes. Typical HRCT findings.



Sarcoidosis: typical presentation with nodules along the bronchovascular bundle and the fissures. Notice the partially calcified node in the left hilum.



Lung Disease

- Langerhans cell histiocytosis
 - Minimal adenopathy, lacks peribronchial distribution, cysts more common

VERSUS

Sarcoid

- Often upper lobe, nodules located in lymphatics and will also be seen along pleura
 - Unusual for nodules of Langerhans cell histiocytosis
- Lymphadenopathy, hilar/mediastinal; nodule cavitation, very rare
- Endstage disease: Upper lobe fibrosis, cysts, honeycombing
 - Resembles end stage Langerhans cell histiocytosis

**Upper Lobe Lung Disease:
Physiologic Correlates**

Review¹

Table 1

**Pathologic Conditions Localized in
the Upper Lobes due to Ventilation-
Perfusion Imbalance**

Centrilobular emphysema

 Secondary to cigarette smoking

 Secondary to chronic cadmium inhalation

Smoke inhalation

Cystic fibrosis

Cyanotic pseudofibrosis

Acute mitral regurgitation (right upper
 lobe)

Neurogenic pulmonary edema

Upper Lobe Lung Disease: Physiologic Correlates

Review¹

Table 2

Pathologic Conditions Localized in the Upper Lobes due to Delayed Lymphatic Clearance

Granulomatous disease

Sarcoidosis

Eosinophilic granuloma

Berylliosis

Pneumoconiosis

Silicosis

Coal miner's disease

Hard metal disease

Stannosis

Kaolinosis

Shaver's disease

Fuller's earth pneumoconiosis

Infection

Chronic histoplasmosis

Tuberculosis (secondary)

Sporotrichosis

Inhaled antigen

Extrinsic allergic alveolitis (chronic)

Allergic bronchopulmonary aspergillosis

Bronchocentric granulomatosis

Miscellaneous

Pulmonary lipogranulomatosis (apple
gluttony)



Chest?

- Sarcoidosis can be mistaken pathologically for (new):
 - Berylliosis
 - NSIP
 - DIP
 - UIP
 - RBILD
- Which of the following can be confused with sarcoidosis on transbronchial lung biopsy:
 - DIP
 - EG
 - NSIP
 - RBILD
- transbronchial biopsy of sarcoid
- transbronchial biopsy of sarcoid looks like what
 - DIP
 - RBILD
 - NSIP
 - EG
 - Berylliosis

Chest?

- Sarcoidosis can be mistaken pathologically for (new):
 - Berylliosis
 - NSIP
 - DIP
 - UIP
 - RBILD
- Which of the following can be confused with sarcoidosis on transbronchial lung biopsy:
 - DIP
 - EG
 - NSIP
 - RBILD
 - I think they forget the right answer here
- transbronchial biopsy of sarcoid looks like what
 - DIP
 - RBILD
 - NSIP
 - EG
 - Berylliosis

Dail and Hammar's pulmonary pathology By David H. Dail, Joseph F. Tomashefski, Philip T Cagle, Samuel P. Hammar, Carol F Farver

Inhaled Environmental Exposures

Berylliosis

The pathologic features of chronic berylliosis are very similar to sarcoidosis in that the granulomas are also dis-

tributed along the lymphatics. Since the 1930s and 1940s, when sarcoidal lung disease was first observed in beryllium workers,^{8,226-229} pathologists have struggled with this distinction. However, some report subtle differences between the two diseases pathologically. Carrington¹¹⁶ studied open lung biopsies from 13 patients with confirmed pulmonary berylliosis, contrasted with 48 patients with sarcoidosis. He found less necrosis in the berylliosis granulomas (one berylliosis biopsy versus 15 sarcoidosis biopsies) and less vasculitis (8% of berylliosis biopsies versus 42% of sarcoidosis biopsies). However, he concluded that the pathologic features of both diseases overlapped considerably and no definitive distinction could be made on histology alone. A history of beryllium exposure, a positive blood lymphocyte proliferation test, and the presence of beryllium in the lung tissue using mass spectrometry²³⁰ are helpful in distinguishing these two entities.^{231,232} However, the absence of beryllium in the tissue analysis does not exclude the diagnosis (see Chapter 26).²²⁴

Chest?

- Patient with LIP can most often be seen with (new):
 - RA
 - Sjogren
 - Scleroderma
 - Lupus
- LIP is associated with what CVD:
 - Scleroderma
 - SLE
 - Sjogrens
 - Polymyositis
- Which connective tissue disorder is most associated with Lymphocytic interstitial pneumonia?
 - A) Lupus
 - B) Rheumatoid
 - C) Sjogren's
 - D) Polymyositis
 - E) Sarcoid
- Lymphocytic interstitial pneumonia is associated with which collagen vascular disease?
 - Sjogren's
 - SLE

Chest?

- Patient with LIP can most often be seen with (new):
 - RA
 - Sjogren
 - Scleroderma
 - Lupus
- LIP is associated with what CVD:
 - Scleroderma
 - SLE
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 - Polymyositis
- Which connective tissue disorder is most associated with Lymphocytic interstitial pneumonia?
 - A) Lupus
 - B) Rheumatoid
 - C) Sjogren's
 - D) Polymyositis
 - E) Sarcoid
- Lymphocytic interstitial pneumonia is associated with which collagen vascular disease?
 - Sjogren's
 - SLE

Incidence/Prevalence and Epidemiology

- Rare condition
- Occurs in patients with underlying autoimmune disease or immunodeficiency (Sjögren's syndrome, autoimmune disorders, dysproteinemia, acquired immunodeficiency syndrome); Idiopathic LIP is rare
- Average clinical presentation is 50-60 years
- Women are affected twice more commonly than men

[Read more](#)

What The Referring Physician Needs To Know

- Usually occurs in association with underlying immunologic disorder, most commonly Sjögren syndrome
- Approximately 80% of patients have serum dysproteinemia, most commonly polyclonal hypergammaglobulinemia
- Radiographic findings nonspecific
- Presumptive diagnosis can be made in proper clinical context based on HRCT
- Definitive diagnosis requires surgical lung biopsy

Chest?

- Which is true about pulmonary AVM (new)?
 - 1/3 associated with osler-weber-rendu
 - Only dx by angio
 - Typically have 1 feeding artery
 - Typically upper lobe
- What is the treatment for a pulmonary AVM:
 - **Metallic coils**
 - PVA
 - Ethanol
- Which of the following is TRUE regarding pulmonary AVM
 - **Usually has a single feeding artery**
 - Predominantly occurs in the upper lobes
- Pulmonary AVM which is true
 - Single feeding artery
- Pulmonary AVM
 - Treated with coils
- Pulmonary AVM which is true
 - A) Single feeding artery
 - B) 30% associated with Osler-Weber-Rendu (70% per emedicine)
 - C) upper lobe predominate (lower lobe per emedicine)
- Pulmonary AVM
 - A) Treated with coils

Chest?

- Which is true about pulmonary AVM (new)?
 - 1/3 associated with osler-weber-rendu- (it is higher ~70%)
 - Only dx by angio- false
 - Typically have 1 feeding artery- true
 - Typically upper lobe- typically lower lobe
- What is the treatment for a pulmonary AVM:
 - Metallic coils
 - PVA
 - Ethanol
- Which of the following is TRUE regarding pulmonary AVM
 - Usually has a single feeding artery
 - Predominantly occurs in the upper lobes
- Pulmonary AVM which is true
 - Single feeding artery
- Pulmonary AVM
 - Treated with coils
- Pulmonary AVM which is true
 - A) Single feeding artery
 - B) 30% associated with Osler-Weber-Rendu (70% per emedicine)
 - C) upper lobe predominate (lower lobe per emedicine)
- Pulmonary AVM
 - A) Treated with coils

Pulmonary AVMs

- Most of congenital PAVMs associated with hereditary hemorrhagic telangiectasia (70%)
- Hereditary Hemorrhagic telangiectasia - Also known as Rendu-Osler-Weber syndrome, HHT is a condition which is transmitted in an autosomal dominant pattern, and characterized by arteriovenous malformations (AVM) in the skin, mucous membranes, and visceral organs
- Best diagnostic clue: Nodules with feeding artery and draining vein
- Single (66%) or Multiple (33%)
- Round or oval nodule of uniform density
- Lobulated but sharply defined
- Located in lower lobes (50-70%) in medial third of the lung
- Clinical Issues= epistaxis presenting feature in HHT due to associated nasal telangiectasia (80%), hemorrhagic complications increased in pregnancy, CNS complications (TIA, Migraine, cerebral abscess, seizures) = (40%), recurrence possible but rare, treat all AVMs with feeding artery > 3mm in diameter, may have hemoptysis, cyanosis, clubbing, hemorrhage, paradoxical embolism to CNS
- Calcification is rare
- Pulsations and changes in size with Valsalva and Mueller maneuvers
- Infarcts may develop after embolotherapy- more common with peripheral AVMs, often heralded by pleurisy and pleural effusion
- Right to left shunt with low resistance, hypoxemia uncorrected with 100% O₂
- Pts with HHT also may have intracerebral AVMs (5-13%) and hepatic AVMs (2-17%)
- M:F = 1:2
- Treatment of Choice= selective embolization- intravascular coils or balloons: polyvinyl alcohol (Ivalon), wool coils, stainless steel coils.

Chest?

- What asbestos related disease has shortest latency period (new)?
 - Benign pleural effusion
 - Diaphragmatic calcifications
 - Pleural plaques
 - Mesothelioma
 - Lung CA
- Which of the following has the shortest latency period associated with asbestos exposure:
 - **Pleural effusion**
 - Calcified pleural plaque
 - Mesothelioma
- Shortest latency in a patient with exposure to Asbestos?
 - Benign pleural effusion
 - Pleural plaques
 - Mesothelioma
- Shortest latency in a patient with exposure to Asbestos?
 - A) Benign pleural effusion
 - B) Pleural plaques
 - C) Mesothelioma
 - D) Calcification at the diaphragm

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 - A) Benign pleural effusion
 - B) Pleural plaques
 - C) Mesothelioma
 - D) Calcification at the diaphragm

- The spectrum of asbestos-related thoracic diseases includes benign pleural effusion, pleural plaques, diffuse pleural thickening, rounded atelectasis, asbestosis, mesothelioma, and lung cancer
- Pleural plaques are the most common manifestation of asbestos exposure, occurring after a **latent period of approximately 20-40 years.**
- Calcification occurs later, often **30-40 years following exposure.**
- Diffuse pleural thickening is less specific for asbestos exposure than is the presence of pleural plaques, since thickening also may be seen following tuberculous (TB) pleuritis, hemothorax, and empyema. Usually, the latent period is approximately 15 years.
- Benign, asbestos-related pleural effusions are often the earliest manifestation of asbestos-related disease, typically occurring **within 10 years after exposure.** Diffuse pleural thickening not uncommonly develops following resolution of the effusion
- Malignant pleural mesothelioma - The disease is frequently seen in the absence of any other manifestations of asbestos exposure and usually develops after a long latent period of 35-40 years.
- Bronchogenic carcinoma is estimated to develop in 20-25% of heavily exposed asbestos workers. A latency period of 25-35 years is usual.

Chest?

- What is the characteristic chest CT appearance of Lymphangitic carcinomatosis(Recall)?
 - Beading of interlobular septa with polygonal arcades
 - Bronchovascular nodules and thickening
 - Interstitial septal thickening
- Lymphangitic carcinomatosis is most associated with what finding on CT:
 - **Nodular thickening of the interlobular septa with polygonal arcade formation**
 - Smooth interlobular thickening in a parahilar distribution
 - Multiple nodules

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 - Smooth interlobular thickening in a parahilar distribution
 - Multiple nodules

Lymphangitic Carcinomatosis

AJR 2001; 177:501-519

- Lymphangitic carcinomatosis can be recognized by the characteristic appearance of irregular, nodular, or "beaded" interlobular septa forming polygons; irregular and nodular thickening of the bronchovascular core structures in the secondary lobule; and thickening of the central bronchovascular interstitium at the lung hila. This pattern represents the perilymphatic distribution of disease. There may be associated enlarged lymph nodes, pleural effusions, and thick or nodular fissures. With the advent of chemotherapy, these findings may remain fairly stable or slowly progress on CT over several months

Lymphangitis carcinomatosa



Chest?

- Status post BMT with small nodules and groundglass halo (Recall)?
 - Fungal pneumonia
 - Aspiration
 - Bacterial pneumonia
 - Viral pneumonia
- A patient is 2 weeks status bone marrow transplant. CT reveals multiple nodules with ground glass halos. What is the most likely etiology:
 - **Fungal infection**
 - Acute GVH disease
 - Lymphoproliferative disorder
- Status post bone marrow transplant...2 weeks later patient develops pulmonary nodules and GGO, most likely etiology?
 - Fungal
 - Bacterial
 - Mets
- Status post bone marrow transplant...2 weeks later patient develops pulmonary nodules and GGO, most likely etiology?
 - A) Fungal
 - B) Bacterial
 - C) Mets

Chest?

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 - C) Mets

CT halo sign: the spectrum of pulmonary diseases
Y R Lee, MD, Y W Choi, MD, K J Lee, MD, S C Jeon, MD, C K Park, MD and J-N Heo, MD

British Journal of Radiology (2005) 78, 862-865

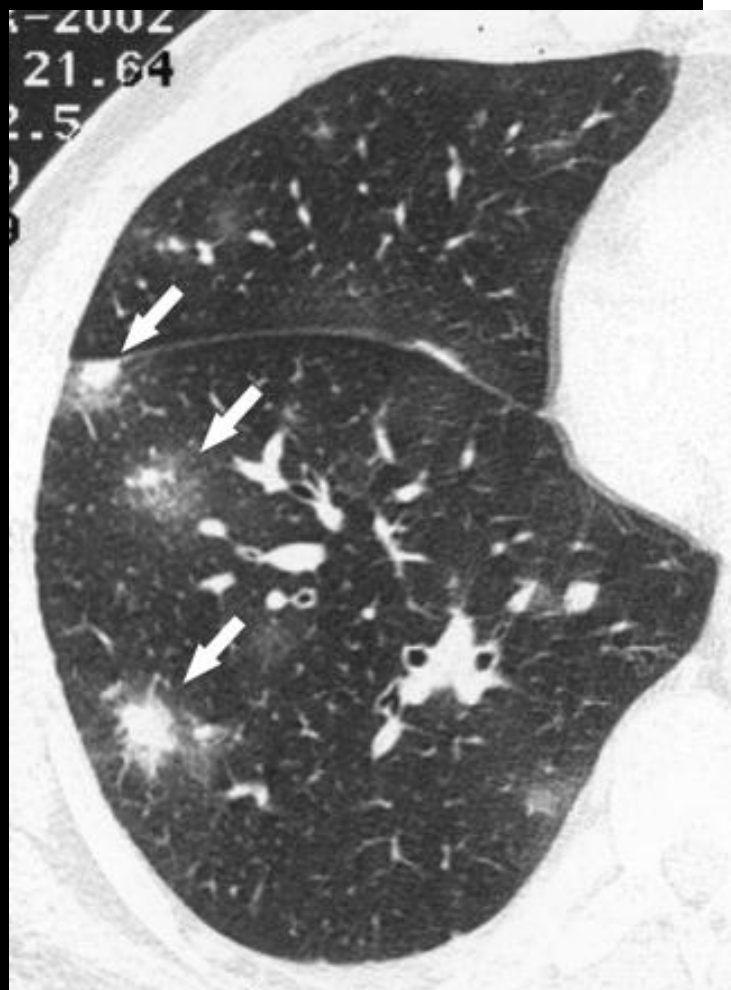


Table 1. List of diseases showing the CT halo sign

Infectious diseases

Fungus; aspergillosis^a, mucormycosis, candidiasis, coccidioidomycosis, cryptococcosis

Septic embolism

Mycobacteria; tuberculosis, *Mycobacterium avium* complex

Rickettsia; *Coxiella burnetii*

Virus; herpes simplex virus, varicella-zoster virus, cytomegalovirus, myxovirus

Neoplastic diseases

Primary tumours; squamous cell carcinoma, Kaposi sarcoma, bronchioloalveolar carcinoma^b, adenocarcinoma

Metastatic tumours; angiosarcoma, choriocarcinoma, osteosarcoma, melanoma, hydatidiform mole, metastatic tumours from gastrointestinal malignancies

Lymphoproliferative disorders

Non-neoplastic, non-infectious, inflammatory diseases

Wegener's granulomatosis

Eosinophilic lung disease; parasitic infestation (schistosomiasis), simple pulmonary eosinophilia, hypereosinophilic syndrome

Pulmonary endometriosis

Organizing pneumonia

Hypersensitivity pneumonitis

Iatrogenic injury; transbronchial lung biopsy, catheter-induced pulmonary pseudoaneurysm

^aThe most common condition showing the CT halo sign in immunocompromised patients.

^bThe most common condition showing the CT halo sign in immunocompetent patients.

Chest?

- Which of the following is NOT seen in carotid stenosis:
- Reversal of flow in the vertebral artery
- **Decreased diastolic flow**
- Increased peak systolic velocity
- Parvus/tardus waveform distally

Chest?

- Which of the following is NOT seen in carotid stenosis:
- Reversal of flow in the vertebral artery
- Decreased diastolic flow
- Increased peak systolic velocity
- Parvus/tardus waveform distally

**A day without anxiety is
like a day without sunshine...**

I'm just
no good unless
I get my eight
hours.



Search: Djidun378

©2006

Chest?

- A patient is undergoing nuclear stress test with adenosine and experiences chest pain and nausea. What is the next step:
 - Stop adenosine infusion and look at EKG
 - Give nitroglycerine
 - Give aminophylline
- What is therapy of patient having adenosine complication?
 - Stop adenosine
 - Nitroglycerin
 - Aminophylline

Chest?

- A patient is undergoing nuclear stress test with adenosine and experiences chest pain and nausea. What is the next step:
 - Stop adenosine infusion and look at EKG
 - Give nitroglycerine
 - Give aminophylline
- What is therapy of patient having adenosine complication?
 - Stop adenosine
 - Nitroglycerin
 - Aminophylline

■ Adenosine is a direct coronary arterial vasodilator and results in a 3.5 to 4 fold increase in myocardial blood flow. Myocardial regions supplied by diseased coronary arteries have an attenuated hyperemic response. Depending upon the severity of coronary stenosis and coronary flow reserve limitation, relative flow heterogeneity is induced. In patients with severe CAD, true ischemia may also be induced because of a coronary steal phenomenon. Since the myocardial tracer uptake is proportional to the regional myocardial blood flow, an unequal distribution of radiotracer occurs in the myocardium. Adenosine results in a modest increase in HR and a modest decrease in both systolic and diastolic blood pressure.

■ Indications for Stopping Adenosine Infusion and/or Administering Aminophylline

- Severe hypotension: Systolic pressure <80mmHg or 20mm Hg fall which persists
- ST depression: >3mm beyond baseline EKG without angina or >2mm with angina
- Persistent 2nd or 3rd degree heart block
- Severe chest discomfort, dizziness, dyspnea, HA, nausea, syncope or dysrhythmia
- Wheezing

■ Reversal of Adenosine

- The half life of adenosine is <10 seconds. Thus the adverse effects are generally rapidly self limiting. Treatment of any prolonged adverse effect should be individualized and directed toward the specific effect.
 - 1. stop infusion- most effects resolve within 30-60 seconds post infusion
 - 2. if symptoms persist administer aminophylline 125mg IV by slow infusion (1 minute). Dosage may be repeated in 5 minutes if no response
 - Aminophylline administration should be delayed 1 minute post radionuclide administration

<http://www.icanl.org/icanl/pdfs/Adenosine%20Stress%20Test%20Procedure.pdf>

Chest?

- A patient has focal pulmonary edema in the right upper lobe. What is the most likely etiology:
 - Mitral stenosis
 - Mitral regurgitation
 - Aortic stenosis
 - Aortic insufficiency
- Isolated right upper lobe edema seen in?
 - Mitral regurg
- Isolated right upper lobe edema seen in?
 - A) Mitral regurg
 - B) Mitral stenosis

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 - Mitral stenosis
 - **Mitral regurgitation**
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 - Aortic insufficiency
- Isolated right upper lobe edema seen in?
 - **Mitral regurg**
- Isolated right upper lobe edema seen in?
 - A) **Mitral regurg**
 - B) Mitral stenosis

Pulmonary edema localized in the right upper lobe accompanying mitral regurgitation.!

W Gurney and L R Goodman May 1, 1989 Radiology, 171, 397-399.

- Focal patterns of pulmonary edema are confusing and often mistaken for the more common causes of focal lung disease, pneumonia, infarction, or aspiration. The authors report four cases of right upper lobe edema secondary to mitral regurgitation. The pathogenesis believed to be responsible for this condition is the vector of blood flow from the left ventricle to left atrium, which may be targeted at the right superior pulmonary vein, locally accentuating the forces for edema formation in the right upper lobe. Pulmonary edema accompanying mitral regurgitation should be suspected whenever right upper lobe consolidation develops in a patient with known or suspected mitral valve disease. The presence of interstitial edema in the remainder of the lungs can help in the differentiation of this condition from pneumonia and other disorders.

Chest?

- A patient experiences blunt chest trauma. Which of the following is TRUE:
 - A normal chest x-ray excluded aortic injury
 - A normal CECT has a very high negative predictive value for aortic injury
 - The most common injury is at the aortic root
 - Angiography has a high mortality rate
- Patient with blunt/acute aortic trauma.
 - Normal CT has 98% NPV
- Patient with blunt/acute aortic trauma.
 - A) Normal CT has 98% NPV
- what is true about aortic injury after accident
 - CT has a 98% NPV
 -
- What is sensitivity

Chest?

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- Patient with blunt/acute aortic trauma.
 - A) Normal CT has 98% NPV
- what is true about aortic injury after accident
- CT has a 98% NPV
-
- What is sensitivity

- The negative predictive value is the proportion of patients with negative test results who are correctly diagnosed.

Chest?

- A patient receives IV contrast for a chest CT. He develops progressively worsening shortness of breath and bronchospasm. What is the next step:
- 1-3mL epinephrine, 1:1000 subcutaneously
- 1-3mL epinephrine, 1:1000 IV
- 1-3mL epinephrine, 1:10,000 subcutaneously
- **1-3mL epinephrine, 1:10,000 IV**

Chest?

- A patient receives IV contrast for a chest CT. He develops progressively worsening shortness of breath and bronchospasm. What is the next step:
- 1-3mL epinephrine, 1:1000 subcutaneously-
- 1-3mL epinephrine, 1:1000 IV – the dose here would be 0.1 to 0.2 ml
- 1-3mL epinephrine, 1:10,000 subcutaneously
- 1-3mL epinephrine, 1:10,000 IV

Urticaria	- Discontinue injection, if not completed - No treatment needed in most cases - Hi-receptor blocker: Diphenhydramine (Benadryl) PO/IM/IV 25-50 mg or	<i>If severe/widely disseminated:</i> Alpha-agonist (arteriolar and venous constriction): Epinephrine SC (1:1,000) 0.1-0.3ml (if no cardiac contraindication)
Facial/Laryngeal Edema	- Alpha-agonist (arteriolar and venous constriction): Epinephrine SC (1:1,000) 0.1-0.2 ml or if hypotension evident, then give epinephrine (1:10,000) slowly IV 1.0 ml, repeat O₂ 6-10L/Min (via mask)	<i>If not responsive to therapy or for obvious laryngeal edema (acute), seek appropriate assistance (code blue)</i> Consider intubation
Bronchospasm	O₂ 6-10ml/min via mask - Monitor: ECG; O₂ saturation (pulse oximeter); BP - Beta agonist inhalers: Alupent, Brethaire, Albuterol Epinephrine SC (1:1,000) 0.1-0.2 ml, if hypotensive give (1:10,000) <u>slowly</u> IV 1.0 ml Repeat prn up to a max. 1.0 mg	<i>Alternatively:</i> 1. Aminophylline: 6.0mg/kg IV in D5W over 10-20 min (loading dose); then 0.4-1.0 mg/kg/hr, prn 2. Call for assistance (CODE) for severe bronchospasm or if O ₂ sats <88 persists
Hypotension with Tachycardia	- Legs up 60 degrees or more (preferred) or Trendelenberg position - Monitor: ECG, pulse ox, BP O₂ 6-10L/min (via mask) - Rapid administration of large volumes of isotonic Ringer's Lactate or NS	<i>If poorly responsive:</i> Epinephrine SC(1:1,000) 0.1-0.2mL, if hypotensive give (1:10,000) <u>slowly</u> IV 1.0 ml, repeat prn up to max. 1.0 mg <i>Call Code Blue and/or transfer to Emergency Department for further care.</i>
Hypotension with Bradycardia-Vagal Reaction	- Monitor vital signs - Legs up 60 degrees or more (preferred) or Trendelenberg position - Secure airway; give O₂ 6-10L/min(via mask) - Secure IV access; push fluid replacement with Ringer's Lactate or NS - Give atrophine 0.6-1 mg IV slowly if patient does not respond quickly to above. - Repeat atrophine up to a total dose of 0.04 mg/kg (2-3 mg) in adults.	<i>Call Code Blue and/or transfer to Emergency Department for further care.</i>

Chest?

- A middle age woman comes in with cough and CT shows RML and lingularatelectasis with scattered nodules and bronchiectasis. What is the most likely organism:
- MAI
- Aspergillus
- Klebsiella
- Pseudomonas

Chest?

- A middle age woman comes in with cough and CT shows RML and lingularatelectasis with scattered nodules and bronchiectasis. What is the most likely organism:
- MAI
- Aspergillus
- Klebsiella
- Pseudomonas

MAI

Imaging Findings

- Airspace opacities, masses, nodules
- Thin walled cavities; thick walled cavities, less common
- Bronchiectasis, distributed mainly in the right middle lobe and lingula
- Tree-in-bud pattern: Branching centrilobular nodules
- Nodules < 10 mm; 10-30 mm
- With AIDS, hilar-mediastinal lymphadenopathy, pleural effusions

Chest?

- Which of the following parameter is most important for evaluating COPD:
 - FEV₁
 - **FEV₁/FVC**
 - FVC
 - DLCO
- Preop v/q scan done prior to lung resection
 - Predicts FEV₁ postop
- You monitor COPD by?
 - Fev₁
 - Fev₁/FVC ratio
- What is the best way to assess/workup someone with COPD?
 - A) FEV₁
 - B) FEV₁/FVC
 - C) functional residual capacity
 - D) tidal volume
 - E) other choices not remembered
- Preop v/q scan done prior to lung resection
 - A) Predicts FEV₁ postop (correct)
 - B) Used for determining resectability

Chest?

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 - FEV₁/FVC
 - FVC
 - DLCO
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 - DLCO
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 - A) Predicts FEV₁ postop (correct)
 - B) Used for determining resectability

Family medicine By Mark B. Mengel, L. Peter Schwiebert

TABLE 70-1. CLASSIFICATION OF COPD BY SEVERITY

Stage	Characteristics
0: At Risk	• Normal spirometry • Chronic symptoms (cough, sputum production)
I: Mild COPD	• $FEV_1/FVC < 70\%$ • $FEV_1 \geq 80\%$ predicted • With or without chronic symptoms (cough, sputum production)
II. Moderate COPD	• $FEV_1/FVC < 70\%$ • $30\% \leq FEV_1 < 80\%$ predicted (IIA: $50\% \leq FEV_1 < 80\%$ predicted) (IIB: $30\% \leq FEV_1 < 50\%$ predicted) • With or without chronic symptoms (cough, sputum production, dyspnea)
III. Severe COPD	• $FEV_1/FVC < 70\%$ • $FEV_1 < 30\%$ predicted or $FEV_1 < 50\%$ predicted plus respiratory failure or clinical signs of right heart failure

FEV_1 , forced expiratory volume in one second; FVC: forced vital capacity; respiratory failure: Pao_2 less than 60 mm Hg with or without $Paco_2$ greater than 50 mm Hg while breathing room air at sea level.

Adapted with permission from Pauwels RA, et al: Global strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease. NHLBI/WHO Global Initiative for Chronic Obstructive Lung Disease (GOLD) workshop summary. Am J Respir Crit Care Med 2001;163(5):1256.

July 1, 2005 The Journal of Respiratory Diseases. Vol. 5 No. 7 Can treatment really improve lung function? **Managing COPD: How to deal with the most common problems** SANDRA G. ADAMS, MD, MS

- The severity of COPD is based on the forced expiratory volume in 1 second (FEV_1) and the ratio of FEV_1 to forced vital capacity (FVC).⁴ Patients with COPD classified as stage 0 have a normal FEV_1 and a normal $FEV_1:FVC$, but they have respiratory symptoms and risk factors (such as smoking). Patients with COPD classified as stage I, II, III, or IV have an $FEV_1:FVC$ of less than 70%, and staging is based on the FEV_1 . The FEV_1 cutoff points are used for simplicity but have not been clinically validated. FEV_1 does not consistently predict disability or mortality among patients with COPD, but it is useful for guiding therapy.⁴ Patients with very severe COPD (stage IV with an FEV_1 of less than 30% of predicted) should be screened for the need for long-term supplemental oxygen therapy.⁴

Perioperative Pulmonary Management- emedicine

- COPD is one of the most important risk factors for postoperative pulmonary complications.
- Patients with severe COPD (forced expiratory volume in 1 s [FEV₁] <40% predicted) are 6 times more likely to have a major postoperative complication.
- Similarly, an FEV₁ <60% predicted was found to be an independent predictor of increased mortality in patients undergoing coronary artery bypass graft (CABG) procedures
- **Preoperative evaluation - lung resection**
 - The significant predictors of mortality were age older than 60 years, extended resection, chronic heart or lung disease, and **low FEV₁**.
 - Spirometry - **FEV₁ is the primary value used to determine resectability.**
 - **FEV₁ predicts pulmonary reserve** and is a strong predictor of postoperative pulmonary complications. Patients with a preoperative FEV₁ of greater than 2 L (or 80% predicted) will be at average risk of complications following a full pneumonectomy, and a value of 1.5 L predicts acceptable risk following lobectomy. Use of the predicted value is recommended in women and older or shorter patients, as an absolute FEV₁ cutoff is more likely to unjustly exclude such patients from surgery.
 - Measuring diffusion capacity is a noninvasive method to assess pulmonary circulation. Findings reflect the volume of the pulmonary capillary bed. Diffusion capacity is reportedly a good predictor of morbidity and mortality after lung resection. A diffusion capacity of less than 60% predicted is associated with a patient mortality rate of 24%. A diffusion capacity of less than 40% with borderline FEV₁ values is associated with high mortality and morbidity, and surgery may be prohibitive
- Quantitative radionuclide perfusion scanning is an alternative method and is particularly recommended for predicting lung function following pneumonectomy. This study provides a relative perfusion for each area of the lung (expressed as a percentage), so the percentage of function remaining can be determined by subtracting the percentage of the area(s) that will be resected from 100%

Current medical diagnosis & treatment By Stephen J. McPhee, Lawrence M. Tierney, Maxine A. Papadakis

3. Pulmonary function testing—Many patients with NSCLC have moderate to severe chronic lung disease that increases the risk of perioperative complications as well as long-term pulmonary insufficiency following lung resection. All patients considered for surgery require spirometry. In the absence of other comorbidities, patients with good lung function (preoperative $FEV_1 > 2$ L) are at low risk for complications from lobectomy or pneumonectomy. If the FEV_1 is less than 2 L, then an estimated postoperative FEV_1 should be calculated. The postresection FEV_1 may be estimated from considering preoperative spirometry and the amount of lung to be resected; in severe obstructive disease, a quantitative lung

perfusion scan may improve the estimate. A predicted post-lung resection $FEV_1 > 800$ mL (or $> 40\%$ of predicted FEV_1) is associated with a low incidence of perioperative complications. High-risk patients include those with a predicted postoperative $FEV_1 < 700$ mL (or $< 40\%$ of predicted FEV_1). In these patients—and in those with borderline spirometry—cardiopulmonary exercise testing may be helpful. A maximal oxygen uptake ($\dot{V}O_2$) of > 15 mL/kg/min identifies patients with an acceptable incidence of complications and mortality. Patients with an $\dot{V}O_2$ of < 10 mL/kg/min have a very high mortality rate at thoracotomy. Hypoxemia and hypercapnia are not independent predictors of outcome.

Chest?

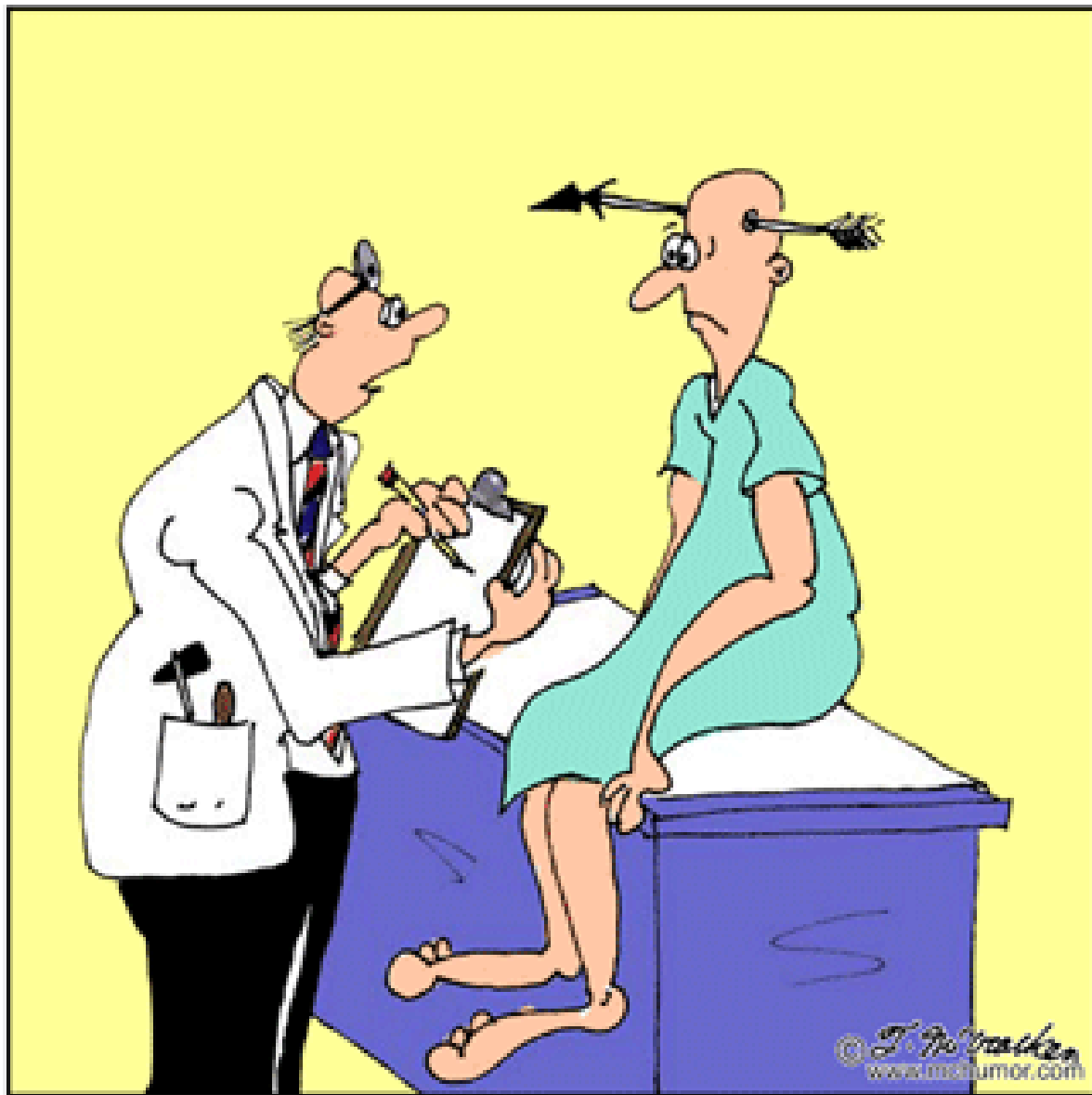
- Which of the following is TRUE regarding endotracheal intubation:
- **The ET tube moves caudally with neck flexion**
- Cuff inflation prevents aspiration
- ET tube moves caudally with neck extension

Emergency procedures and techniques By Robert Rutha Simon, Barry E. Brenner

mandible is at T1. The tube moves significantly with movement of the head. In one large study, the tube moved an average of 1.9 cm toward the carina with flexion from the neutral position and 1.9 cm away from the carina with extension. With lat-

Chest?

- Which of the following is associated with PTLD:
- Ebsteinbarr virus
- A question with only one choice. I loves those kind. I hope I get lots of these on my boards!



“Off hand, I'd say you're suffering from an arrow through your head, but just to play it safe, I'm ordering a bunch of tests.”

Chest?

- The 2nd most common takeoff of the left vertebral artery?
 - b/t the left subclavian and left carotid
- The 2nd most common takeoff of the left vertebral artery?
 - A) b/t the left subclavian and left carotid

VERTEBROBASILAR SYSTEM

The vertebral arteries are the first branches of the subclavian arteries (95%). The left vertebral artery arises directly from the aortic arch (between left subclavian and common carotid) in 5%. The left artery is dominant in 50%; in 25% the vertebral arteries are codominant; in 25% the right artery is dominant. Vertebral arteries usually course through the C6-C1 vertebral foramina (but may start at C4) and then the foramen magnum.

Segments and branches of vertebral arteries

Cervical segment (extradural segment)

- Muscular branches
- Spinal branches
- Posterior meningeal artery

Intracranial segment (intradural)

- Anterior spinal artery (ASA)
- Posterior inferior cerebellar artery (PICA)

Basilar artery

- Anterior inferior cerebellar artery (AICA)
- Superior cerebellar artery (SCA)
- Brainstem perforating arteries
- Posterior cerebral arteries (PCA)

Posterior
thalami

Chest?

all have bronchiolitis except:

- Tuberous sclerosis

Tuberous Sclerosis

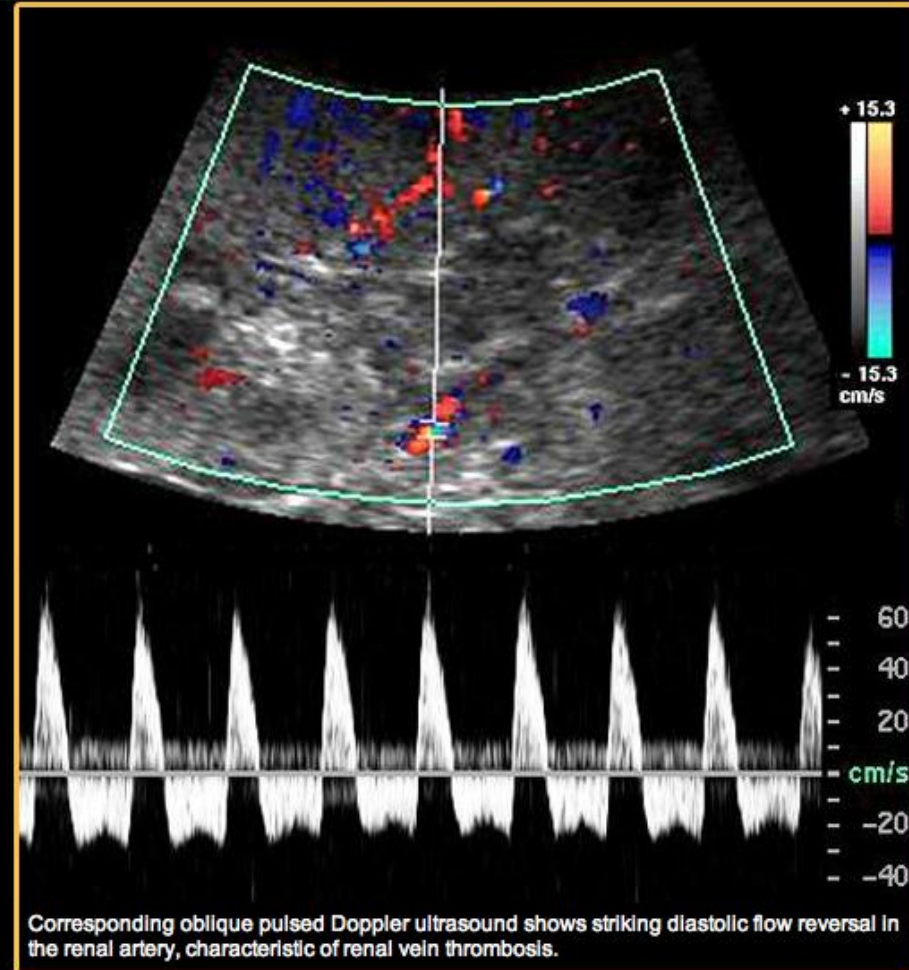
- AD
- Seizures, MR, and adenoma sebaceum
- Associated with angiomyolipomas of the kidneys, cardiac rhabdomyomas and retinal phacomias
- 1% will have lung disease virtually identical to that of LAM
 - Cystic lung destruction
 - Chylous effusions
 - Lungs cysts, round in shape
 - Diffuse distribution
 - Involves the costophrenic angles
 - Nodules occasionally seen.

Bronchiolitis

- Inflammation of small airways
- Acute Bronchiolitis= viruses (RSV, parainfluenza, adenovirus and rhinovirus), Mycoplasma pneumonia and Chlamydia spp.
- Bacterial and fungal organisms involving the large airways may also result in infectious bronchiolitis
- CXR- peribronchiolar thickening, perihilar linear opacity, and peribronchiolar consolidation, often bilateral
- Airtrapping
- Patchy areas of atelectasis, bronchial wall thickening and mosaic perfusion

Chest?

- pandiastolic flow reversal
- RVT



Chest?

- systolic anterior motion is related to
 - Hypertrophic cardiomyopathy
 - Ruptured papillary muscle
 - Mitral valve prolapse
 - Dilated CMO

Chest?

- systolic anterior motion is related to
 - Hypertrophic cardiomyopathy
 - Ruptured papillary muscle
 - Mitral valve prolapse
 - Dilated CMO

Echocardiography

By Bonita Anderson

Systolic Anterior Motion of Mitral Valve Leaflets

Systolic anterior motion (SAM) of the **anterior** mitral valve leaflet refers to the marked and abnormal forward movement of the **anterior** mitral leaflet toward the LVOT in systole (Figure 10.13). This abnormal mitral valve **motion** occurs due to the Venturi effect or suction of the mitral valve apparatus into the LVOT. In patients with HOCM, **anterior** displacement of the papillary muscles toward each other has also been found to contribute to this phenomenon.

Although this finding is considered very specific for hypertrophic obstructive cardiomyopathy, the mere presence of SAM of the **anterior** mitral leaflet is not a reliable indicator of a coexistent LVOT gradient. In fact, it is the pattern of SAM of the **anterior** mitral leaflet that predicts the degree of obstruction. The magnitude of the LVOT pressure gradient is dependent upon three important variables: (1) the closeness of the **anterior** mitral leaflet to the interventricular septum, (2) the onset of SAM to the onset of SAM-septal contact, and (3) the duration of SAM-septal contact (Figure 10.14) ²⁷.

Hence, low pressure gradients occur when SAM of the **anterior** mitral leaflet does not contact the interventricular septum, or when SAM-septal contact occurs late in systole and is of short duration.

Clinical diagnostic ultrasound By Grant M. Baxter, Paul L. P. Allan, Patricia Morley

Mitral valve effects

HCM produces signs within the mitral valve and these are best assessed with apical four-chamber and parasternal long axis views utilizing both M-mode, 2D and Doppler echocardiography. The most well-known sign is that of SAM (Fig. 11.9), yet its aetiology remains unclear. It is either secondary to abnormal displacement of the papillary muscles in systole [38], a venturi effect (the cusps being drawn into the low pressure created by high blood flow in the left ventricular outflow tract) [39] or secondary to abnormal mitral cusp coaptation at the onset of systole in association with the small left ventricular cavity [40]. There does appear to be a direct relationship between the presence and duration of SAM and the presence of left ventricular outflow gradient measured at cardiac

catheterization [41]; but whether it is a reliable indicator of left ventricular obstruction is debatable.

Mitral regurgitation is a well-recognized association of HCM and is a frequent association of both SAM and intra-ventricular gradients [42]. This is usually easy to visualize using colour flow imaging that shows a jet of 'mosaic' colour directed anteriorly within the left atrium that may sometimes be difficult to differentiate from the turbulent jet seen in the outflow tract. The severity of the regurgitation appears to be related to the presence of SAM and the severity of the outflow tract gradient. Its aetiology remains unclear but is probably secondary to distortion of the mitral apparatus [42].

Chest?

- Young man with mild SOB, found to have PA pressure of (74/20) pcwp < 12 with negative VQ scan, normal left atrium on chest x-ray and no thrombus seen on chest CTA. Most likely cause (NEW)?
 - Primary pulmonary hypertension (plexogenic pulmonary arteriopathy)
 - Chronic PE
 - Mitral stenosis
 - Pulmonary venocclusive disease

Chest?

- Young adult with progressive SOB. Radiographic findings include enlarged pulmonary artery, interstitial edema and Pulmonary artery pressure 75/40 with wedge pressure of 12. Patient had a normal VQ scan. What is the etiology?
- Mitral stenosis
- Pulmonary venocclusive disease
- Idiopathic pulmonary hypertension
- Left ventricular diastolic failure
- Chronic thromboembolism

Chest?

- Young lady with Normal V/Q scan, pulmonary arterial pressures of 70/40 and PCWP of 12. DX?
- Primary Pulmonary HTN
- Venocclusive disease
- Chronic thromboembolism
- Mitral Stenosis

Chest?

- Young lady with Normal V/Q scan, pulmonary arterial pressures of 70/40 and PCWP of 12. DX?
 - A) Primary Pulmonary HTN
 - B) Venocclusive disease- would have elevated PCWP
 - C) Chronic thromboembolism- normal V/Q excludes this dx per statdx and uptodate. They would have elevated PA pressures and a normal PCWP. V/Q scan usually shows several segmental or larger mismatched defects
 - D) Mitral Stenosis- would have elevated PCWP

Table 26.1 -- NORMAL PULMONARY ARTERIAL PRESSURES

Arterial pressure phase	Mean pressure (mmHg)
Systolic	25
Diastolic	8
Mean	15
Mean wedge	5

- Correlation of the Stage of Radiographic Pulmonary Venous Hypertension with Pulmonary Venous Pressure (as measured by the pulmonary capillary wedge pressure [PCWP])
- PCWP is normal (8–12 mmHg) the chest radiograph is not expected to demonstrate any specific abnormality related to pulmonary venous pressure.
- Mild PCWP elevation (12–18 mmHg)
 - associated with upper lobe venous distension.
- PCWP increase (19–25 mmHg) leads to interstitial oedema (peribronchial cuffing, Kerley lines).
- >25 mmHg airspace opacities are seen. Although not accurate, these correlates serve to give an approximation of intravascular pressure.

PAH

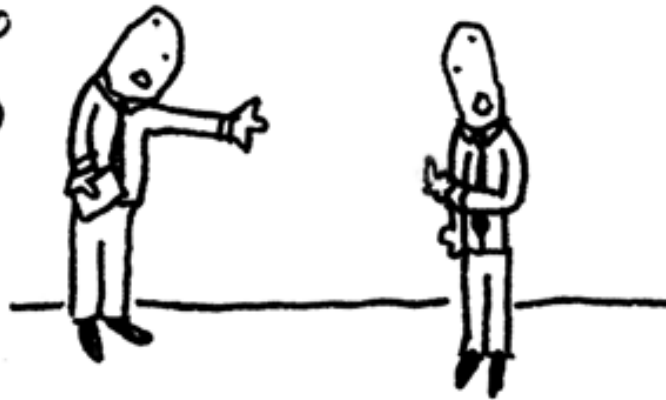
- defined as an elevation in mean pulmonary arterial pressure above 30 mmHg during exercise (and 25 mmHg at rest).
- Arterial pressure may be considered as a function of blood flow and vascular resistance.
- Vascular resistance depends upon the cross-sectional area of the vascular bed.
- The pulmonary vessels are more compliant than their systemic counterparts owing largely to their thin walls and also (and perhaps more importantly) their larger diameter.
- Furthermore, the pulmonary bed can also respond to increasing flow by opening up additional vascular channels.
- These features allow considerable latitude in the system; nonetheless, hypertension will occur when these mechanisms become insufficient to cope with increasing flow.

Table 26.4 -- CAUSES OF PULMONARY ARTERY HYPERTENSION

Chronic lung disease, e.g. chronic obstructive pulmonary disease, interstitial pneumonia
Pulmonary embolic disease
Pulmonary venous hypertension
Intracardiac shunts (left-to-right or bidirectional)
Pulmonary arteritides
Idiopathic

where is the report
you were supposed to
write this morning

Where are the
chest
Recalls?



oh, i have it, it's in
my pocket, uh... oh
HERE IT IS

i have another
report, would you
like that one too



2007

2007

- **Which of the following will cause an increased dose in CT**
 - Increased kvp
 - Faster spinning of gantry
 - Increased Table speed
 - Increased tube current

Increased tube current

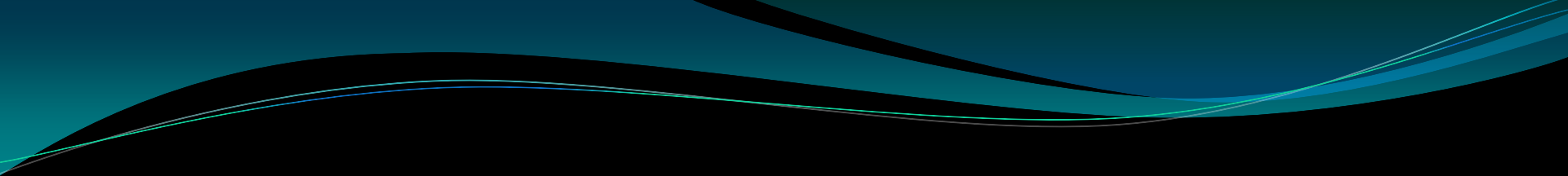
- The effective dose is directly equal to the tube current and the scan time.
- Increasing the x-ray tube potential from 80 to 140 kvp increases the patient dose by a factor of five.
 - *HUDA p 132*
- As everyone knows, radiation exposure is the product of tube current (mA) and time (sec).
 - *Radiation Dose on Pediatric CT: Losing Track of Time, AJR*

- Most important risk factor to have an infarct with PE
 - Left ventricular failure
 - Clot burden
 - Central clot
 - Emphysema
 - Pulm fibrosis

Clot burden

- Only 15% or less of thromboemboli cause pulmonary infarction.
- Most likely to occur with peripheral emboli and in patients with heart failure or circulatory shock.
 - *Essentials of Chest p 183*

- Best test for detecting vascular calcium
 - CTA with MIPS
 - 2D TOF MR
 - 3D TOF MR
 - DSA angio



CTA with MIPS

- Hypertrophic osteoarthropathy is not caused by:
 - Mesothelioma
 - RTA
 - Bronchogenic carcinoma
 - IBD

RTA

- Hypertrophic pulmonary osteoarthropathy (HPOA) occurs in approximately 4-17% of patients with bronchogenic carcinoma and 20-35% of patients with pleural mesothelioma.
- Abdominal disorders that cause HPOA include liver cirrhosis, ulcerative colitis, Crohn disease, amebic and bacillary dysentery, gastrointestinal tract polyposis, gastrointestinal tract neoplasms (gastric and pancreatic), lymphoma of the bowel, Whipple's disease, and biliary atresia.

- **What is the most common cardiac manifestation of SLE**
 - a. pericarditis
 - b. coronary atherosclerosis
 - c. aortic valve disease
 - D. myocarditis

a. Pericarditis

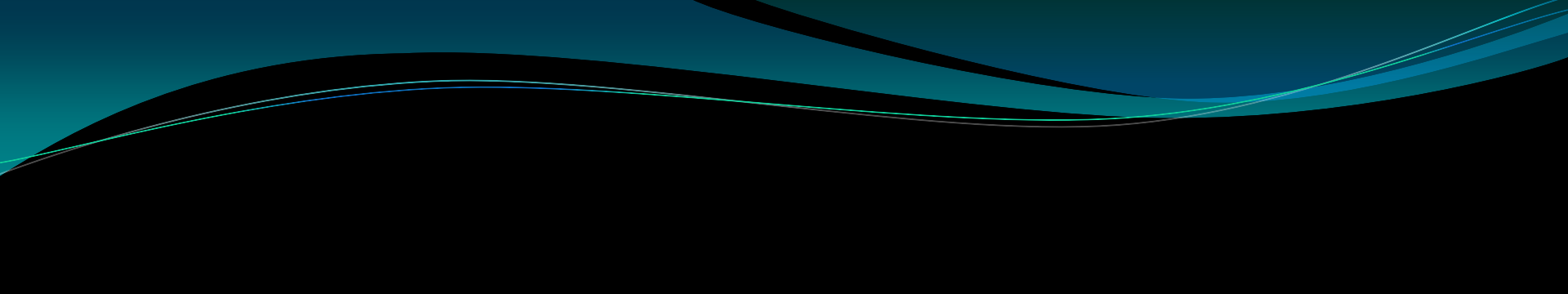
- Pericarditis that manifests as chest pain is the most common cardiac manifestation of SLE and may occur with or without a detectable pericardial effusion.
 - *emedicine*

- **Which of the following best characterizes UIP?**

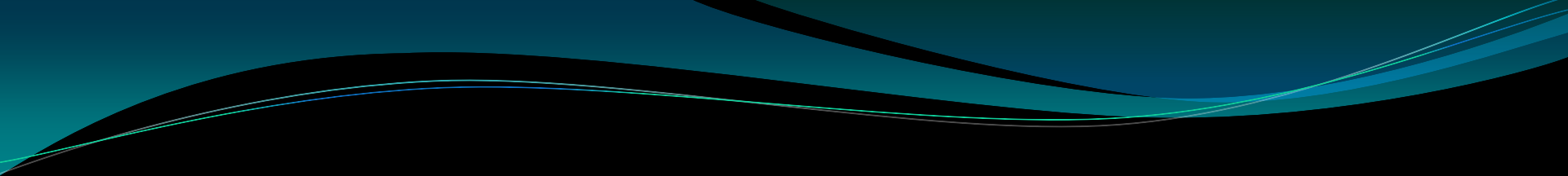
- a. must have fibrosis
- b. predominately upper lobe
- c. central opacities greater than peripheral
- d. need inspiration/expiration CT to confirm

a. must have fibrosis

- Primarily at the lung bases and subpleural (peripheral) areas.
- aka: idiopathic pulmonary fibrosis (IPF)
 - *CHORUS notecard*

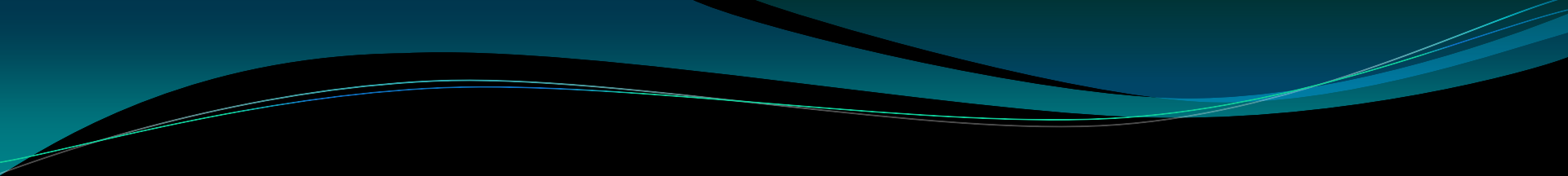
- 
- **40 year old male diagnosed with aortic stenosis**
 - Bicuspid valve
 - Atherosclerosis

Bicuspid valve

- 
- **What is the most common cause of late-onset lung transplant failure?**
 - PTLD
 - Bronchiolitis Obliterans
 - CMV
 - Stenosis of bronchial anastomosis

Bronchiolitis Obliterans

- BO is a common sequela of lung transplantation, representing chronic rejection, and bone marrow transplantation, where BO represents chronic graft-versus-host disease.
 - *Chest Essentials p 199*
- Infection is the leading cause of death in the early postop period (48%).
- Development of chronic rejection occurs in >50% and is BO.
 - *Chest Essentials p 245*

- 
- **Pt undergoing pulmonic and tricuspid valve replacement**
 - Carcinoid syndrome related to liver mets
 - Bronchial carcinoid
 - Localized carcinoid of the appendix

Carcinoid syndrome related to liver mets

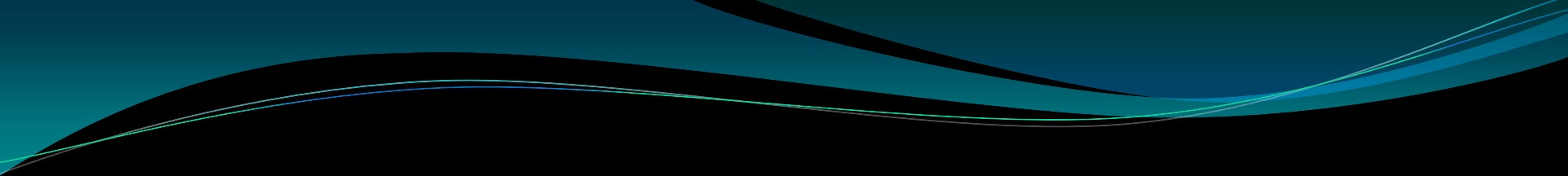
- Carcinoid syndrome is rare unless liver mets are present.
 - *CE p 226*

- All of the following can present with pleural effusions except:
 - a. LAM
 - b. TB
 - c. Rheumatoid
 - d. UIP

d. UIP

- Pleural involvement is the most common thoracic manifestation of RA, typically with pleural effusions or pleural thickening.
 - *CE p 33, 43*
- Chylothorax in LAM 50-75%
- TB with effusion in 40% adults
 - *Dahnert*

- **Which of the following will most likely make evaluation of coronary CTA difficult**
 - a. Calcium score > 400
 - b. HR of 65
 - c. systolic BP > 200
 - d. systolic BP < 90



a. Calcium score > 400

- **Delayed post contrast T1 imaging shows a subendocardial focus of enhancement. What does this represent?**
 - Infarction
 - Ischemia
 - Stunned myocardium
 - Hibernating myocardium

Infarction

- It is widely accepted that delayed enhancement in the proper location and given the appropriate clinical setting represents infarction,
 - *Radiology: Contrast-enhanced MR Imaging of the Heart: Overview of the Literature*¹

- **Cine MR shows a dyskinetic lateral wall of LV; Post contrast gadolinium shows transmural enhancement of the lateral wall. What is the best treatment.**
 - a. Medical management
 - b. angioplasty of L circumflex
 - c. angioplasty of LAD
 - d. CABG

a. Medical management

- AJR

Ischemic Cardiomyopathy:

Value of Different MRI Techniques for Prediction of Functional Recovery After Revascularization

being considered for revascularization. At the segment level, MRI helps to distinguish between myocardial infarction (characterized by delayed contrast enhancement and segmental contractile dysfunction), viable but ischemic myocardium (characterized by segmental contractile dysfunction without delayed contrast-enhancement), and normal myocardium. For

- **What is the most common cause of a dilated left superior pulmonary vein**
 - a. SVC obstruction
 - b. SVC duplication
 - c. azygous duplication of IVC
 - d. coarctation of aorta
 - One of the answers was “left sided SVC”

SVC obstruction

- These right-to-left shunts are typically associated with superior vena cava obstruction, usually caused by malignant tumor and rarely caused by benign conditions.
 - *AJR: Systemic-to-Pulmonary Venous Shunt in Superior Vena Cava Obstruction Revealed on Dynamic Helical CT*

- **Which is true of the lateral CXR**

- a) the anterior wall of the bronchus intermedius is well seen
- b) the pulmonary venous confluence is inferior to upper lobe bronchi
- c) the RUL bronchus is more often seen than the LUL bronchus

confluence is inferior to upper lobe bronchi

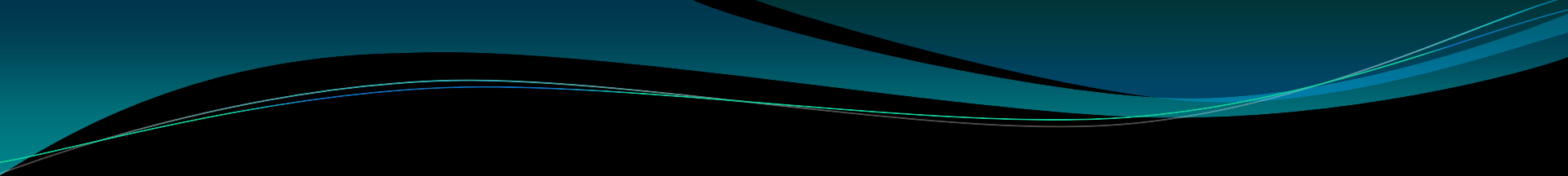
- *CE p 4*

- **What finding on CT is most specific for unresectable lung cancer.**
 - a. supraclavicular lymph node
 - b. pleural effusion
 - c. tracheal invasion
 - d. >3cm pleural surface contact
 - E. adrenal node

c. tracheal invasion

- Limitations of CT include the inability to determine mediastinal or chest wall invasion with certainty, lymph nodes, and cannot determine malignant from benign pleural effusion
 - *CE p 222-223*

- Which of the following cardiac imaging agents has the highest first pass rate?
 - Thallium
 - Sestamibi



Thallium

- **What is the sequence used to calculate EF in cardiac MR.**
 - a. T1 echo
 - b. Multiple short axis cine images
 - c. multiple fast spin short axis GRE
 - d. Cine had axial vs longitudinal

Cine short axis GRE

- **Protocols for acquisition of quantitative information are predicated on short-axis gradient reversal acquisition**
 - **Cardiac MR Imaging: A Guide for the Beginner; Radiographics**
 - **emedicine**

- **What N stage is given for right upper lobe lung cancer with an involved right paratracheal lymph node?**
 - N₁
 - N₂
 - N₃

N2

- N2 Metastasis to ipsilateral mediastinal and/or subcarinal lymph nodes
 - *CE p 222*

- **Most commonly seen with aortic stenosis**
 - a. angina
 - b. dilatation of aortic knob
 - c. LV dilatation

Angina

- In most children and adults with severe pure aortic stenosis, the left ventricle is a small cavity that is hypercontractile and has the usual signs of hypertrophy.
 - *CE p 258*
- Angina occurs in approximately two thirds of patients with critical aortic stenosis
- The transverse arch or aortic knob is not enlarged
- Calcification of the aortic valve is diagnostic of aortic stenosis
- **Poststenotic dilatation of the ascending aorta is a common finding.**
- The dilatation is characteristically located in the ascending aorta and increases convexity of the right lateral aspect of the ascending aorta.
 - emedicine

- **What is the most hyper-enhancing mediastinal mass**
 - a. lymphoma
 - b. paraganglioma
 - c. goiter
 - d. thymoma

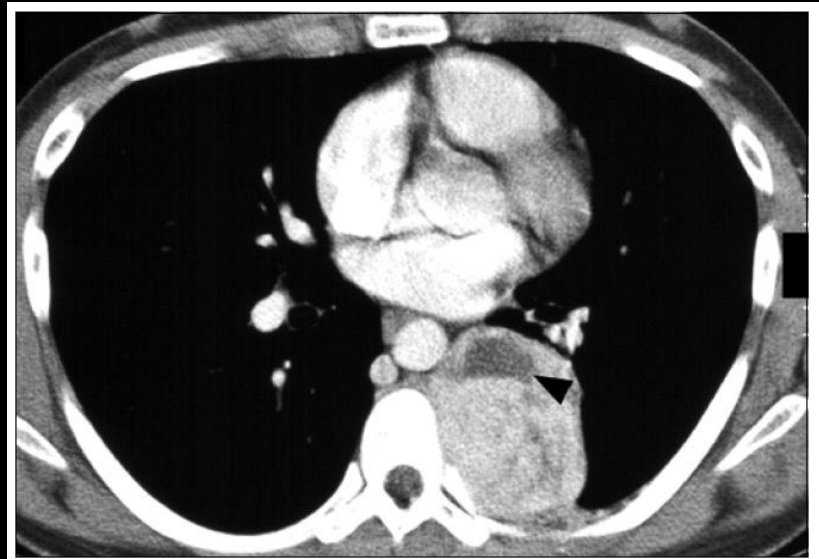
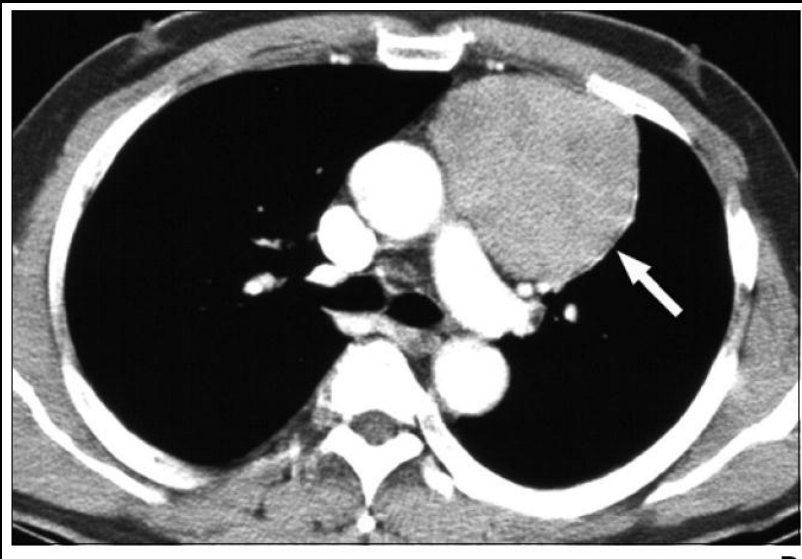
Goiter

- Intense enhancement >25 HU
- Coarse clumped calcifications
 - *Brant and Helms*

Fig. 10—51-year-old man with aortic body tumor.

A, Chest radiograph shows large mass (*arrow*) projecting from left side of mediastinum.

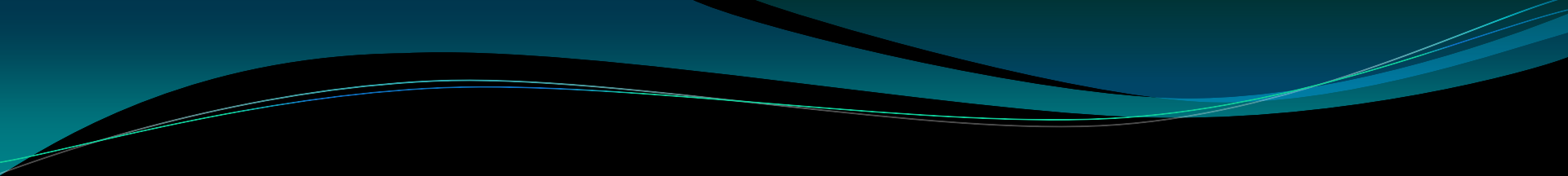
B, Contrast-enhanced CT scan shows large tumor (*arrow*) with mild homogeneous enhancement in anterior mediastinum.



- **Pt with anomalous LCA presents with angina – ischemia; what is the underlying mechanism?**
 - “steal” from LCA to the pulmonary artery

“steal” from LCA to the pulmonary artery

- anomalous left coronary artery from the pulmonary artery (ALCAPA)
- In the final stage, collateral flow is inadequate, retrograde flow into the pulmonary artery persists, and myocardial steal continues. At this stage, adults may present with signs of myocardial ischemia
 - *Emedicine: Anomalous Left Coronary Artery From the Pulmonary Artery: Surgical Perspective*

- 
- **Pulmonary AVMs should be best treated with**
 - a. gelfoam
 - b. alcohol
 - c. coils
 - d. Ivalon

c. coils

- Embolization with coils/detachable balloons
 - *Dahnert*

- **Which foregut malformation is most likely to communicate with tracheobronchial tree.**
 - a. CCAM
 - b. sequestration
 - c. congenital lobar emphysema
 - d. bronchogenic cyst

Answer: A CCAM

- CCAMs represent an overgrowth of the terminal portion of the bronchial tree. While their bronchial structures are disorganized, some bronchial communication may be present (Caffey 452-455). Dahnert and Fraser/Pare say that they are an intralobar mass of disorganized pulmonary tissue that almost always communicate with the bronchial tree and have normal vascular supply and drainage but delayed clearance of fetal lung field.
- As for bronchogenic cysts, they may be mediastinal (85%) or intrapulmonary (15%). They are budding anomalies from the primitive foregut and don't communicate with the bronchial tree.
- Neither intralobar nor extralobar sequestrations connect to the tracheobronchial tree or the pulmonary arteries. By definition they are collections of lung tissue that do not have a normal connection to the bronchial tree.

- **Which of the following pulmonary syndromes is associated with brain abscess**
 - a) hereditary hemorrhagic telangiectasia
 - b) sequestration
 - c) CCAM

A) hereditary hemorrhagic telangiectasia

- Osler/weber/rendu is associated with pulmonary AVM— it is associated with system embolic disease as well as brain abscesses—
- Thoracic requisites

- **LAM can often look similar to which of the following on HRCT**
 - a. EG
 - b. TB
 - c. UIP
 - d. acute interstitial pneumonitis

a. EG

- Cystic lung diseases

- **Cause of unilateral lung perfusion defect on V/Q scan**
 - Swyer James
 - Bronchogenic CA
 - PE
 - Hypoplastic/Agenesis of pulm artery
 - Mucous plug

Bronchogenic CA

- Controversial question, but bronchogenic cancer is the most common to do this

- **A middle-aged woman demonstrates nodules and bronchiectasis in the middle lobe and lingula – what is the most likely organism?**
 - MAI/MAC

MAI/MAC

- Lady windameer disease

- **A patient s/p lung tx for sarcoidosis presents with new mediastinal/hilar LAD and pulm nodules**
 - a) recurrent sarcoid
 - b) acute interstitial pneumonitis
 - c) chronic rejection
 - d) alveolar proteinosis

a) recurrent sarcoid

- *Recurrent sarcoid granulomas in a transplanted lung derive from recipient immune cells*
- *European Respiratory Journal*

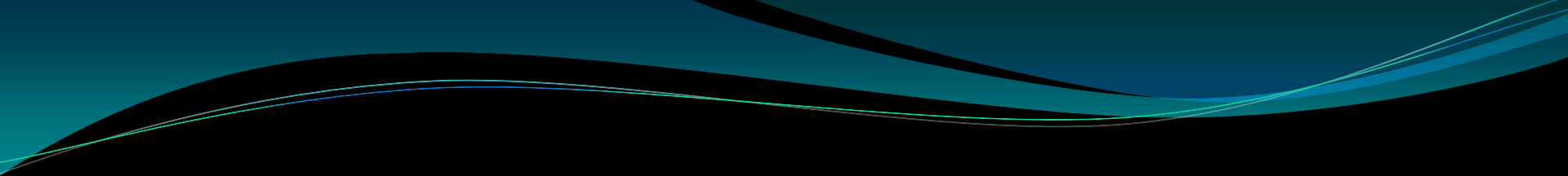
- **Where are the granulomas of sarcoid located:**

- a) centrilobular interstitium
- b) alveolar wall
- c) peribronchial lymphatics
- d) interstitium

c) peribronchial lymphatics

- Pathologic evaluation of patients with sarcoidosis show that the distribution of the granulomas are along the lymphatics in the peribronchovascular interstitium
 - uhrad.com

- **Pt with liver laceration and multiple fractures 3 days later develops dyspnea, petechiae and patchy GG opacities on CT**
 - a) pulmonary contusion
 - b) fat embolism
 - c) pulmonary hemorrhage
 - d) allergic/hypersensitivity pneumonitis



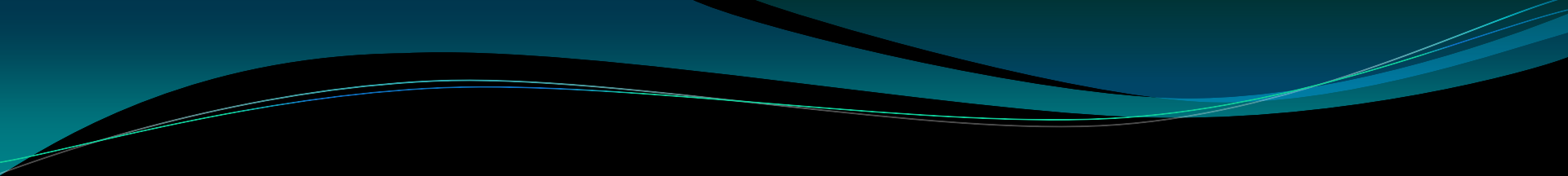
b) fat embolism

- **What is the normal rate of contrast injection for a CTA?**
 - 3-5cc/sec
 - 8-11cc/sec
 - 13-15cc/sec

3-5cc/sec

- *AJR: MDCT Angiography of Acute Chest Pain: Evaluation of ECG-Gated and Nongated Techniques*

- **A beta blocker is given prior to starting a cardiac CTA. The patient's HR drops to 38 bpm. What is done?**
 - Adenosine
 - Atropine
 - Epinephrine
 - saline



Atropine

- **What is left in place for an orthotopic heart transplant?**
 - a. aorta
 - b. posterior wall left atrium
 - c. left ventricle

b. posterior wall left atrium

- Orthotopic Heart Transplant: The **orthotopic procedure** begins with the surgeons performing a **median sternotomy** to expose the **mediastinum**. The **pericardium** is opened, the **great vessels** are **dissected** and the patient is attached to **cardiopulmonary bypass**. The failing heart is removed by transecting the great vessels and a portion of the **left atrium**. The **pulmonary veins** are not transected; rather a circular portion of the left atrium containing the pulmonary veins is left in place. The donor heart is trimmed to fit onto the patients remaining left atrium and the great vessels are **sutured** in place. The new heart is restarted, the patient is weaned from cardiopulmonary bypass and the chest cavity is closed.

- *Wikipedia*

- **Why is CTA of the pulmonary veins performed**
- a) cardiac transplant
- b) atrial fibrillation
- c) right ventricular dysplasia
- d) left atrial myxoma

b) atrial fibrillation

- *[http://www.terarecon.com/downloads/news/casestudy_s
hen_3dctamappingforep.pdf](http://www.terarecon.com/downloads/news/casestudy_shen_3dctamappingforep.pdf)*

- **On CT or MR which of the following features is suggestive of cardiac tamponade**
 - a) narrowed SVC
 - b) dilated pulmonary veins
 - c) flat contour of the RV and RA wall

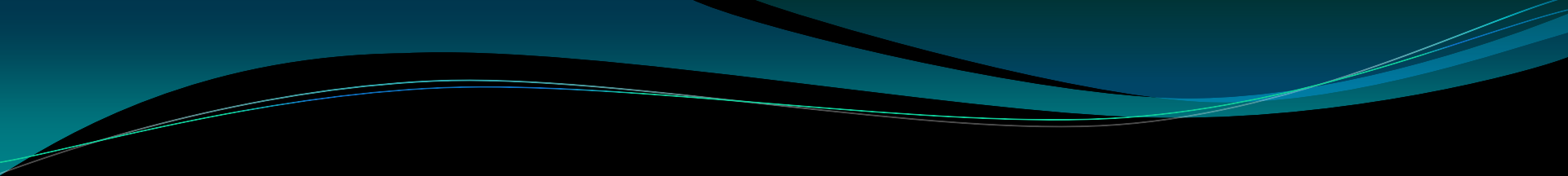
c) flat contour of the RV and RA wall

- Computed tomographic (CT) findings associated with **cardiactamponade** include pericardial effusion, usually large, with distention of the superior and inferior venae cavae; reflux of contrast material into the azygos vein and inferior vena cava; deformity and compression of the **cardiac** chambers and other intrapericardial structures; and angulation or bowing of the interventricular septum.
 - *Imaging Findings in CardiacTamponade with Emphasis on CT: Radiographics*

- **What finding on CT is least specific in aortic blunt trauma?**
 - A. Pseudoaneurysm
 - B. Intimal flap
 - C. Contrast extravasation
 - D. Mediastinal hematoma
 - E. Periaortic hematoma

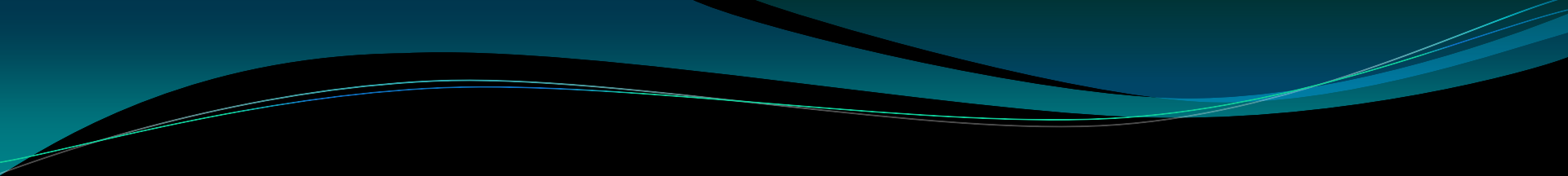
D. Mediastinal hematoma

- Mediastinal hematoma is an indirect sign of aortic injury; it is not specific- can be seen in multiple other causes
 - Cardiac requisites
- Direct signs of aortic injury are confirmed on CT, including aortic caliber change at the site of injury, focal outpouching of contrast consistent with pseudoaneurysm and intraluminal flap.
 - *CE p 115*

- 
- **What is the most common type of ASD?**
 - Ostium primum
 - Ostium secundum
 - Sinus venosus

Ostium secundum

- CE p 252

- 
- **What is most worrisome for a false aneurysm of the heart?**
 - a. emboli
 - b. pump failure
 - c. rupture

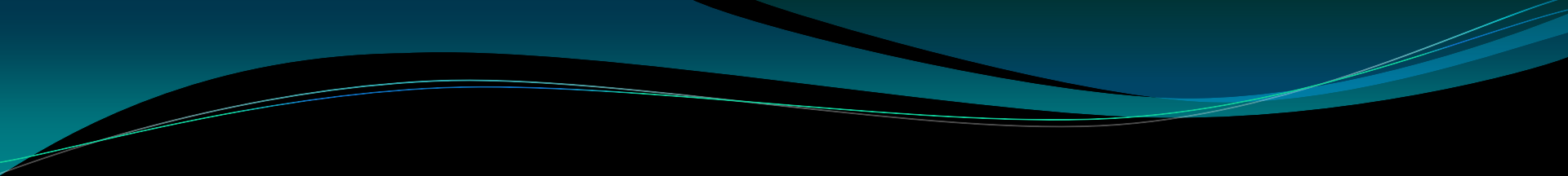
c. rupture

- The 2 types of aneurysms are true and false. A true aneurysm is made of damaged myocardial wall. A false aneurysm is actually a rupture, whereby the wall of the aneurysm is not myocardium, but rather, an external containing boundary (eg, pericardium). A functional left ventricular (LV) aneurysm, a forme fruste variant of a true aneurysm, protrudes during ventricular systole but not during diastole, and it consists of fibrous tissue with or without myocardial fibers
- False aneurysms usually have a mouth that is considerably smaller than its maximal diameter.
- True LV aneurysms (in contrast to pseudoaneurysms) have low and decreasing risk of rupture as the density of fibrous tissue increases over time
 - emedicine

- **On chest CT which of the following findings can correlate to post-operative lungfunction**
 - a) distribution of emphysema
 - b) histogram analysis of attenuation
 - c) size of pulmonary artery

b) histogram analysis of attenuation

- We used the manufacturer-provided program, Pulmo (Siemens) [19] to semiautomatically extract the lung parenchyma (Fig. 1A,1B,1C). Lung parenchyma was first outlined from the mediastinum and chest wall by a default range of -200 and -1024 H. After applying dual thresholds of -500 and -910 H, three segments in the lung parenchyma were generated. White area below -910 H denoted emphysema, black area above -500 H denoted tumor and atelectasis, and gray area between -500 and -910 H denoted the normal lung parenchyma. The attenuation histogram of quantitative CT integrated from multiple slices encompassing both lungs entirely was further segmented between -500 and -910 H to represent the "functional lung volume" [16]. Visual inspection of the functional lung volume maps, as in Figure 1A, could satisfactorily exclude the area of emphysema by the lower threshold (-910 H), and by the threshold of -500 H, we could exclude the areas of tumor-related air-space loss, such as tumor itself and postobstructive atelectasis or areas of non—tumor-related air-space loss, such as fibrosis and atelectasis due to previous tuberculosis. The computer calculation took an average of 5 min to complete for a patient.
 - Prediction of Postoperative Lung Function in Patients with Lung Cancer: AJR

- 
- **What are the branches of the LAD called**
 - a) obtuse marginal
 - b) diagonal
 - c) acute marginal

b) diagonal

- LAD branches: diagonal and septal
- Circumflex: obtuse marginal
- RCA: acute marginal

- **What causes pulmonary edema**

- a) hydrostatic pressure greater than plasma oncotic pressure
- b) pulm artery pressure greater than system artery pressure
- c) plasma oncotic pressure greater than hydrostatic pressure
- d) pulm artery pressure greater than pulm vein pressure

a) hydrostatic pressure greater than plasma oncotic pressure

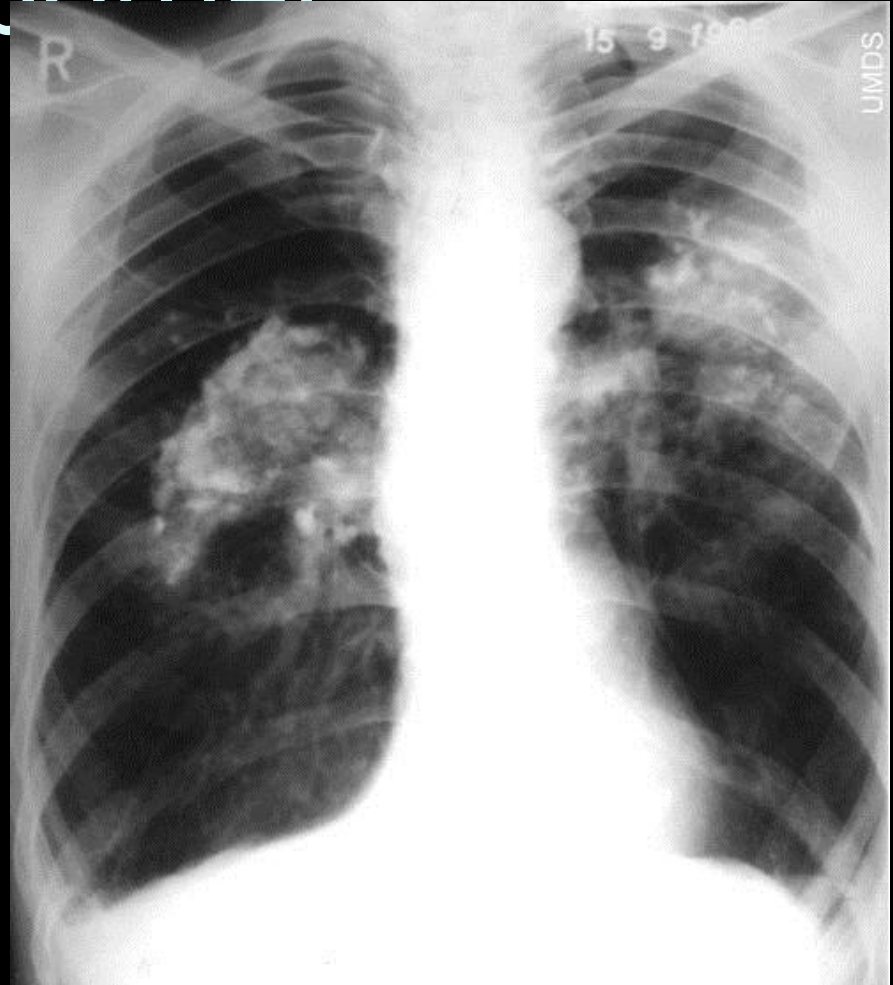
- Pulmonary edema refers to extravasation of fluid from the pulmonary vasculature into the interstitium and alveoli of the lung. The formation of pulmonary edema may be caused by 4 major pathophysiologic mechanisms: (1) imbalance of Starling forces (ie, increased pulmonary capillary pressure, decreased plasma oncotic pressure, increased negative interstitial pressure), (2) damage to the alveolar-capillary barrier, (3) lymphatic obstruction, and (4) idiopathic or unknown mechanism.
- Cardiogenic pulmonary edema (CPE) is defined as pulmonary edema due to increased capillary hydrostatic pressure secondary to elevated pulmonary venous pressure
 - *emedicine*

- **Progressive massive fibrosis has what appearance:**
 - a. asymmetrical
 - b. spherical shape
 - c. sharp lateral border
 - d. contains cystic spaces

c. sharp lateral border

- The masses usually have sharp outer margins but ill defined inner borders. As the lesions progress, the nodularity secondary to simple pneumoconiosis may reduce, as nodules are "consumed" within the masses, and compensatory emphysema develops more peripherally. Note the lack of lung markings in the right upper zone in this case.

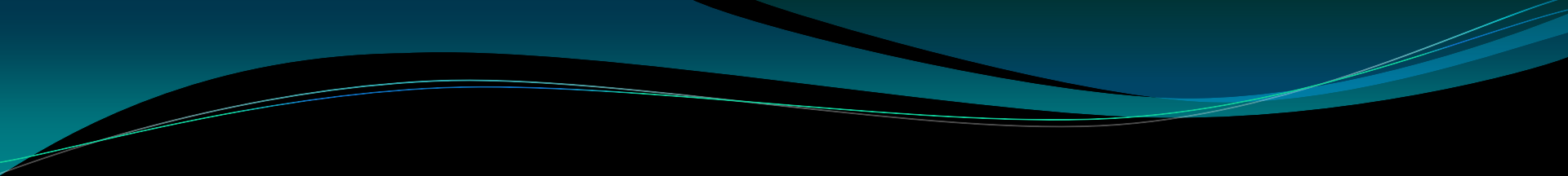
- *The Scottish Radiological Society*
- *Dahnert*



- **Patient s/p bone marrow transplant now with obstructive symptoms on PFTs. Next test.**
 - a. v/q scan
 - b. HRCT in inspiration/expiration
 - c. pulmonary angiogram

b. HRCT in inspiration/expiration

- Looking for BO

- 
- **What is the most common cause of SVC syndrome**
 - a. mediastinal fibrosis
 - b. lymphoma
 - c. bronchogenic cancer

c. bronchogenic cancer

- Malignant Lesion (80-90%)
 - Bronchogenic cancer (>50%)
 - Lymphoma
 - *Dahnert p 477*

- **Alcoholic cardiomyopathy is characterized by which of the following**
 - a. LV systolic dysfunction only
 - b. RV systolic dysfunction only
 - c. LV diastolic and systolic dysfunction
 - d. LV diastolic dysfunction only

c. LV diastolic and systolic dysfunction

- In summary, it appears that in asymptomatic male alcoholic patients, the most prominent early finding was LV dilation and an increase in LV mass. Diastolic dysfunction appears to be an early finding; however, patients may have both diastolic and/or systolic dysfunction
 - *Alcoholic Cardiomyopathy**
 - *Incidence, Clinical Characteristics, and Pathophysiology*
 - *Chest*

- **All of the following entities are likely to present as upper lobe disease EXCEPT?**
 - a. Silicosis
 - b. UIP
 - c. Sarcoid
 - d. TB
 - e. Cystic fibrosis

b. UIP

- Primarily at the lung bases and the subpleural areas
 - *CE p 34*

- In cardiac MR, a T₁ inversion sequence is applied. The inversion sequence is used to null out what.
 - a. normal myocardium
 - b. aorta
 - c. infarct
 - d. fat
 - e. blood

a. normal myocardium

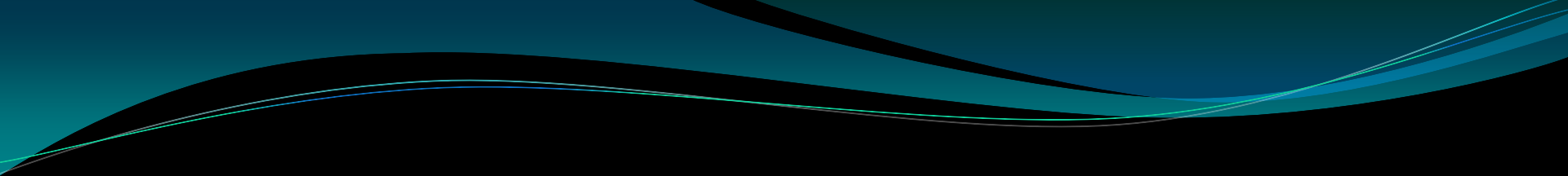
- After the contrast has washed out of other regions (5-10 min), it is retained in the altered cells of a myocardial infarction (10-20 min). Thus, T₁-sensitive inversion recovery imaging set to null (blacken) normal myocardium (typically 250 microseconds) produces a "scar map."
 - *Cardiac MRI - Technical Aspects Primer: emedicine*

- **What is the most common cause of restricted cardiomyopathy?**
 - a. amyloid
 - b. alcohol
 - c. vasculitis

a. amyloid

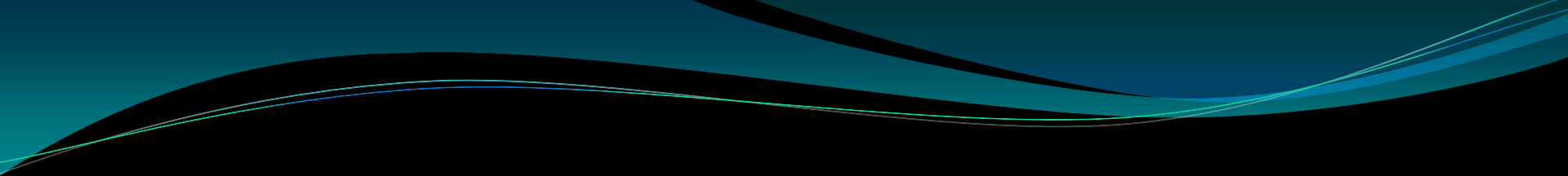
- primary amyloidosis is the most common cause of RCM in the United States
 - *Emedicine: Goswami, Restrictive Cardiomyopathy*

- In a hypoxic patient and normal PCO_2 , administration of 100% oxygen shows no improvement in PaO_2 . What is the most likely cause?
 - a. Left to right shunt
 - b. Right to left shunt
 - c. Hypoventilation
 - d. Diffusion abnormality
 - e. V/Q mismatch



b. Right to left shunt

- **Which of the following is initial treatment for cirrhotic hydrothorax?**
 - a. medical treatment
 - b. chest tube
 - c. TIPS
 - d. Thoracotomy



a. medical treatment

- **In total anomalous pulmonary venous return, what forms the left/upper side of the “snowman”?**
 - a. pulmonary artery
 - b. pulmonary vein
 - c. right sided aorta
 - d. vertical vein

d. vertical vein

- Snowman / Figure of 8 configuration of cardiac silhouette = dilated SVC + left vertical vein
 - Dahnert

- **Regarding coronary CTA:**
 - A. Retrospective gating is the best method
 - B. Gating not necessary for Calcium scoring

A. Retrospective gating is the best method

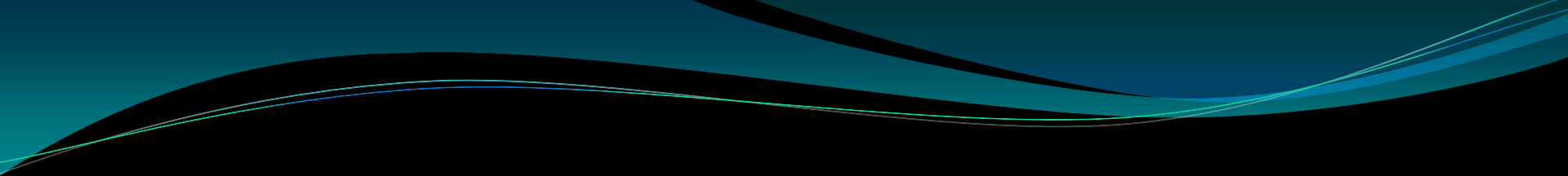
- **Prospective** ECG triggering uses the ECG signal to control scanning, so that X rays are generated and projection data are acquired only during **cardiac** diastole, more than half the rotation of the gantry.
- In retrospective techniques, partially overlapping MDCT projections are continuously acquired, and the ECG signal is simultaneously recorded.
- **Prospective** triggering techniques have important limitations. They are sensitive to heart rate changes and arrhythmias, but they have limited spatial z-axis resolution in order to cover the entire heart in a single breath-hold. They are effective only for heart rates of less than 90 beats per minute and perform poorly with arrhythmias, such as in atrial fibrillation.
- To overcome these limitations, retrospective ECG **gating** techniques are commonly used, at the expense of a higher radiation dose. Retrospective **gating** techniques allow faster continuous **cardiac** volume coverage, improved z-axis resolution, and imaging of the entire **cardiac** cycle for functional analysis.
- Gating is used for calcium scoring
 - *ECG-Gated Cardiac CT:AJR*
 - *Coronary Artery Calcium Scoring Using 16-MDCT and a Retrospective ECG-Gating Reconstruction Algorithm : AJR*

- Enlarged Left superior intercostal vein indicates:
 - TAPVR with obstruction
 - SVC obstruction

SVC obstruction

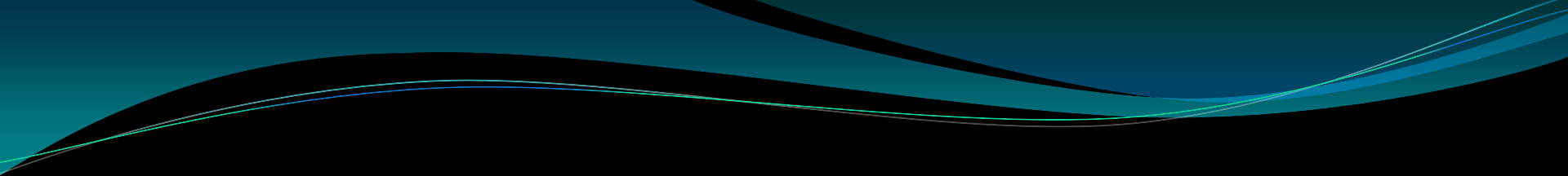
- *The normal and abnormal left superior intercostal vein AC Friedman, E Chambers, and S Sprayregen*
- A study of 500 normal erect posteroanterior chest radiographs was undertaken to determine the incidence of visualization and size of the left superior intercostal vein in normal individuals. The vein produces a small "nipple" lateral to the aortic knob on 1.4% of normal erect posteroanterior chest films; its diameter can be up to 4.5 mm in normal patients. Dilatation of the vein beyond 4.5 mm is a useful sign of a circulatory abnormality warranting further study. Dilatation may be due to absence of the inferior vena cava, hypoplasia of the left innominate vein, congestive failure, portal hypertension, Budd-Chiari syndrome, or superior or inferior vena caval obstruction. The differential diagnosis of an enlarged left superior intercostal vein includes mediastinal mass, especially lymphadenopathy, and aneurysm of the arch of the aorta.
- AJR

- Why do we do CT Thorax for pre-operative planning for partial pneumectomy for emphysema? (N)
 - Determine the type of emphysema
 - Determine the amount of disease
 - Determine the distribution of disease



Determine the amount of disease

- Regarding coronary CTA, which is true/false: (V)
 - Ventricular size is best determined with retrospective vs. prospective gating (*T*)
 - Afib: retrospective vs. prospective gating (*Retro*)
 - Calcium scoring does/does not require cardiac gating (*does*)
 - Radiation dose is higher/lower with prospective vs. retrospective gating (*higher with retrospective*)



2006

- 22. What is true about aortic vascular disease:
- A. The vasa vasorum supplies the outer wall of the vessel
- B. Injury to blood vessels causes histiocytes to release prostaglandins
- C. The intima is 5-10 cells thick
- D. Platelets release heparan sulfate to begin the clotting pathway

A. The vasa vasorum supplies the outer wall of the vessel

- What is most often associated with coarctation of the aorta:
 - VSD
 - ASD
 - Bovine arch
 - Bicuspid aortic valve

Bicuspid valve

- Bicuspid aortic valve is the most common congenital cardiac malformation. The valves are by nature stenotic, and they usually begin to calcify in the 3rd or 4th decade. Patients usually present before the 4th decade. Bicuspid aortic valves are associated with coarctation of the aorta – 25-50% of patients with coarctation have bicuspid aortic valves. Bicuspid valves are more common in males than females.

- **Regarding blunt aortic injury:**
 - A. CT has a greater than 98% negative predictive value for the diagnosis of a clinically significant traumatic aortic injury
 - B. There is a high incidence of associated aortic injury with fracture of the first rib.
 - C. Most injuries are seen at the aortic root

A. CT has a greater than 98% negative predictive value for the diagnosis of a clinically significant traumatic aortic injury

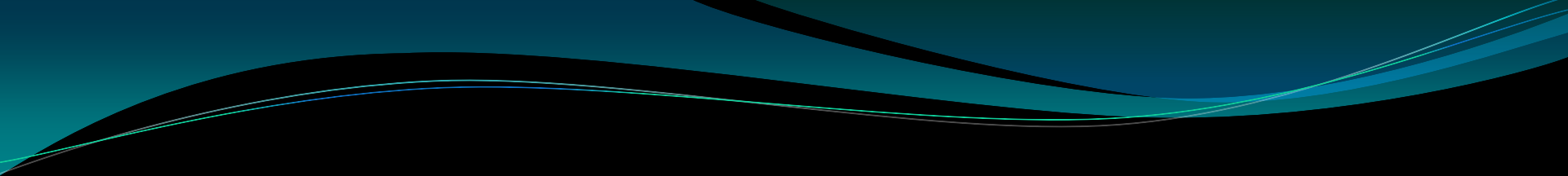
- Aortic isthmus 88-95% of aortic injuries
 - *Dahnert*
- Studies have shown that CT is sensitive for TAI (83-100%) with high negative predictive value (NPV) of 99-100%. Its specificity of 54-99.8%, and its related positive predictive value (PPV) of 9-89% are generally lower than those of angiography.
 - *Emedicine: Aortic Injury*
- A study by Lee et al concluded that no clinically relevant correlation exists between these injuries and acute traumatic aortic tears. The authors also concluded that upper rib fractures are not an indication for aortic angiography.
 - *emedicine: Rib fractures*

- **What is most likely cause of acute dyspnea in patient with lung adenocarcinoma?**
- A. SVC syndrome
- B. Atelectasis
- C. Malignant pleural effusion
- D. phrenic nerve paralysis
- E. obstructing main stem bronchus

E. obstructing main stem bronchus

- This seems to be the best cause of ACUTE dyspnea
- However adenocarcinoma is a peripheral lesion versus small cell and squamous which are central

- **In total anomalous pulmonary venous return, what structure contributes to the snowman's head?**
 - A. L vertical vein
 - B. Dilated aorta
 - C. Persistent L SVC
 - D. Pulmonary artery
 - E. Pulmonary vein



A. L vertical vein

- **A previously healthy young adult presents with an acute flu-like illness. The chest radiograph shows extensive mediastinal lymphadenopathy. What's the diagnosis?**
 - A. Inhalational anthrax
 - B. TB
 - C. Lymphoma
 - D. Mycoplasma pneumonia

A. Inhalational anthrax

- presents initially with nonspecific symptoms, including a low-grade fever and a nonproductive cough.
- Computed tomography (CT) of the chest: CT scan of the chest detects hemorrhagic mediastinal and hilar lymph nodes and edema, peribronchial thickening, and pleural effusions. It also may help differentiate from histoplasmosis, sarcoidosis, tuberculosis, and lymphoma.
 - emedicine

Medscape

- Chest X-ray (Case 7) showing mediastinal widening and a small left pleural effusion.



Medscape®

<http://www.medscape.com>

- Computed tomography of chest (Case 7) showing mediastinal



Medscape®

<http://www.medscape.com>

- **What is true about left ventricular aneurysms?**
 - A. They represent a contained leak (false aneurysms)
 - B. They most often occur at the ventricular apex (true aneurysm)

It depends on whether they are asking about false or true ventricular aneurysms; True aneurysms most often occur at the ventricular apex

- False Ventricular Aneurysm

- Contained left ventricular rupture
- High risk of delayed rupture
- Typically at posterolateral/diaphragmatic wall of LV
- left retrocardiac double density
- Diameter of mouth smaller than the largest diameter of the globular aneurysm

- True Ventricular Aneurysm

- Noncontractile outpouching of ventricle
- Wall thrombus with embolization;
- Rupture infrequent
- Apex; Left anterior and anteroapical or inferior and inferoposterior
- Broad mouth
- Localized paradoxical expansion during systole (CHARACTERISTIC)
 - Dahnert

- Which statement is true regarding coronary artery calcifications:
 - a. Calcium scoring is more sensitive for atherosclerotic disease than Tl-201 stress or EKG testing
 - b. Found in high grade stenosis
 - c. Is in equal frequencies in all coronary arteries
 - d. Is a contraindication for angioplasty

a. Calcium scoring is more sensitive for atherosclerotic disease than Tl-201 stress or EKG testing

- **All these have upper lobe predominance EXCEPT?**
 - A. Asbestosis
 - B. Silicosis
 - C. Langerhans Cell Histiocytosis (EG)
 - D. Centrilobular Emphysema
 - E. Cystic Fibrosis

A. Asbestosis

- Progression from bases to apices
- Silicosis predominantly affects upper lobes
 - Primer

- **What is the most sensitive sign for pneumothorax on a supine chest radiograph?**
 - A. Deep sulcus sign
 - B. Mediastinal shift
 - C. Continuous diaphragm sign

A. Deep sulcus sign

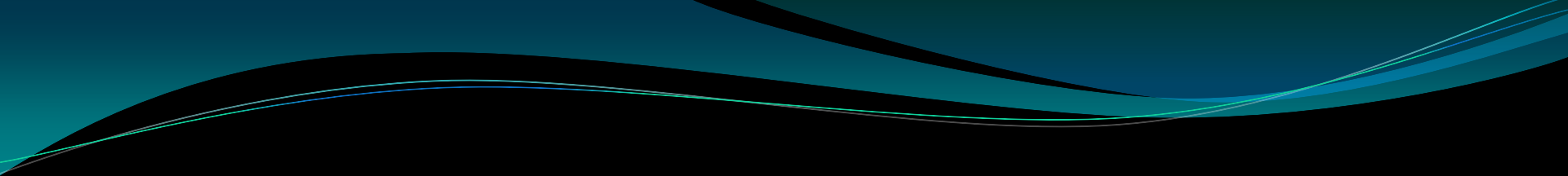
- *Radiology*

The Deep Sulcus Sign¹

Richard Gordon, M.D.²

On a supine chest radiograph, the only sign of pneumothorax may be a deep lateral costophrenic angle on the involved side. Seven cases where this finding was present are reviewed and the importance of this sign to radiologists and clinicians is stressed.

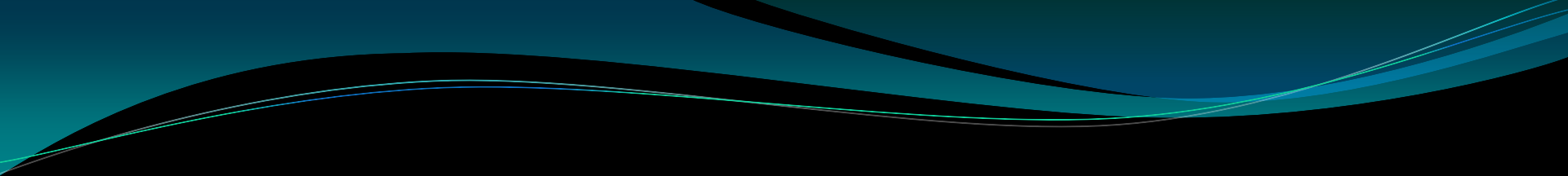
- **Man presents with swelling of the upper extremities and head and venous collaterals in neck and head. CXR shows widened upper mediastinum. What is the most likely cause?**
 - A. Bronchogenic carcinoma
 - B. Lymphoma
 - C. Germ cell tumor
 - D. Fibrosing mediastinitis
 - E. Thymoma



A. Bronchogenic carcinoma

- **What is used to decrease the heart rate in cardiac CTA?**
 - A) Atenolol
 - B) Atropine
 - C) Epinephrine

A) Atenolol

- 
- **What MR sequence is used to calculate the stroke volume?**
 - A. Spin echo
 - B. Phase contrast
 - C. Cine gradient echo

Phase Contrast

- Use phase contrast velocity mapping to measure forward flow through the aorta (as long as there is no mitral regurg or VSD so that all blood passes through aorta) to accurately determine stroke volume.
 - *Cardiac MRI, Lee*

Cardiac MRI

- *Short axis: assessment of regional ventricular function*
- *quantification of LV and RV volumes, ejection fractions and mass*
- *Three chamber view: assessment of anteroseptal and inferolateral walls of the LV*
- *(left ventricular assessment of mitral and aortic valves outflow tract)*
- *Two chamber view: evaluation of anterior and inferior wall motion*
- *(vertical long axis) assessment of LA appendage*
- *Four chamber view: evaluation of septal and lateral walls*
- *(horizontal long assessment of size and function of RV and tricuspid valve)*

- **What part of the heart is most susceptible to ischemia?**
 - A. subendocardium
 - B. septum
 - C. subpericardium

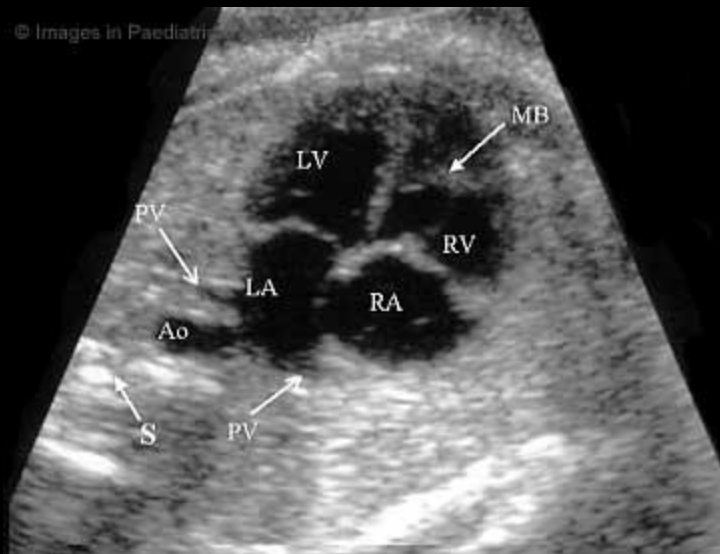
A. Subendocardium

- Chronic hypertension and LV hypertrophy narrow the range of autoregulation, especially in the subendocardium, where autoregulation is ordinarily more limited than in the subepicardium. LV hypertrophy amplifies the detrimental effects of coronary stenoses on myocardial perfusion, and patients with severe ventricular hypertrophy may have subendocardial ischemia even in the absence of coronary stenosis
 - Emecicine; myocardial ischemia

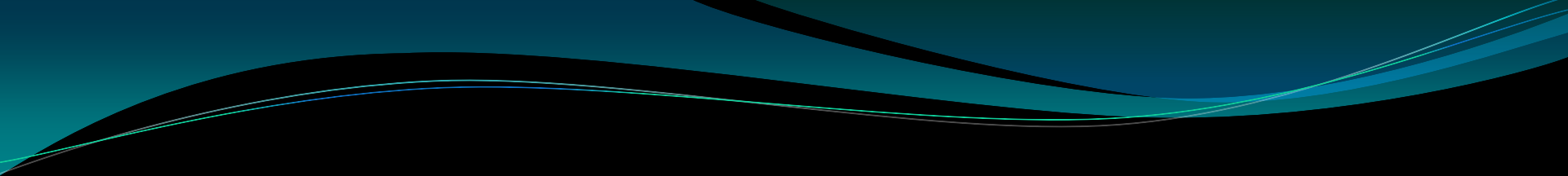
- **Where is the moderator band located?**

- A. Right atrium
- B. Right ventricle
- C. Left atrium
- D. Left ventricle

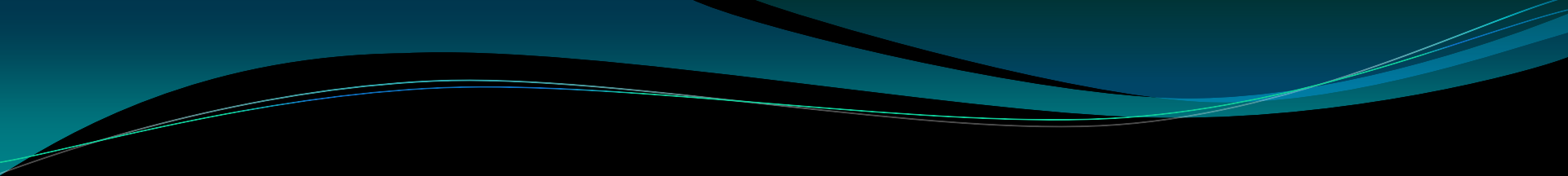
B. Right ventricle



- **A patient is to undergo lung resection for tumor. What is the purpose of a preoperative VQ scan?**
 - A. assess for resectability
 - B. predict FEV₁
 - C. assess perfusion defects
 - D. check for extent of ventilation abnormalities



B. predict FEV-1

- 
- Increased ejection fraction is a characteristic of:
 - A. Aortic stenosis
 - B. Aortic regurgitation
 - C. Idiopathic hypertrophic subaortic stenosis

C. Idiopathic hypertrophic subaortic stenosis

- If not a choice then aortic regurgitation could be the answer
- HCM results in impaired diastolic relaxation. This relaxation can produce symptoms of heart failure despite a normal and usually supernormal ejection fraction due to high filling pressures, which result in pulmonary congestion.
 - *medicine*

Variant Recall

- **Which entity is associated with an increased ejection fraction?**
 - A. Aortic insufficiency
 - B. Dilated cardiomyopathy
 - C. Aortic stenosis

A. Aortic insufficiency (note IHSS is not a choice)

- Left ventricular dysfunction is demonstrated by decreased cardiac output, decreased ejection fraction, and increased left ventricular end-diastolic pressure.
- In severe aortic regurgitation, the normally functioning ventricle is hyperdynamic (increased ejection fraction), and even a normal ejection fraction may indicate decreased systolic function.
 - <http://www.4yol.info/aortic-regurgitation/>

- An elderly woman has a chest x-ray showing lingular and right middle lobe bronchiectasis. Multiple 2-3 mm nodules are also present. What is the likely etiology?
 - A. Nocardia
 - B. Aspergillus
 - C. Mycobacterium avium-intracellulare

C. Mycobacterium avium- intracellulare

- **Which of the following is false regarding pulmonary embolism?**
 - A. Pulmonary infarcts are not common with PE
 - B. Distal emboli are more likely to cause infarcts
 - C. PE rarely arises from the upper extremity
 - D. The clinical triad of cough, chest pain, and hemoptysis is present in a majority of patients with angiographically proven emboli

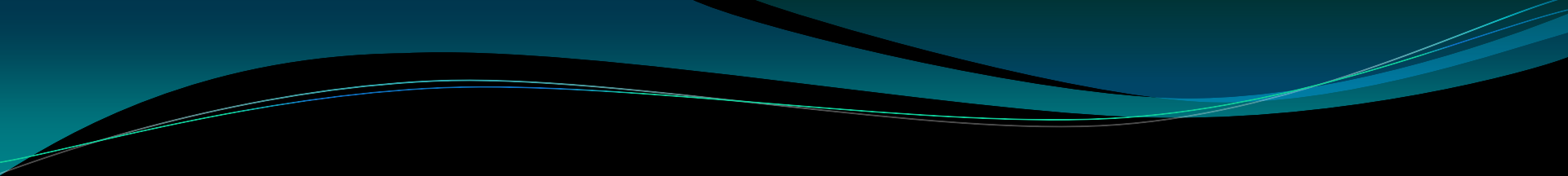
D. The clinical triad of cough, chest pain, and hemoptysis is present in a majority of patients with angiographically proven emboli

- Classic triad < 33%
 - Dahnert

- **Langerhan cell histiocytosis is not associated with:**
 - A. Thymic involvement
 - B. Renal failure
 - C. Diabetes insipidus
 - D. Lytic skull lesions

B. Renal failure

- Internet search reveals it involves thymus
- No evidence for renal failure - SFH

- 
- **What is the most common cause of isolated right upper lobe edema?**
 - A. Mitral stenosis
 - B. Mitral regurgitation
 - C. Tricuspid regurgitation
 - D. Aortic stenosis

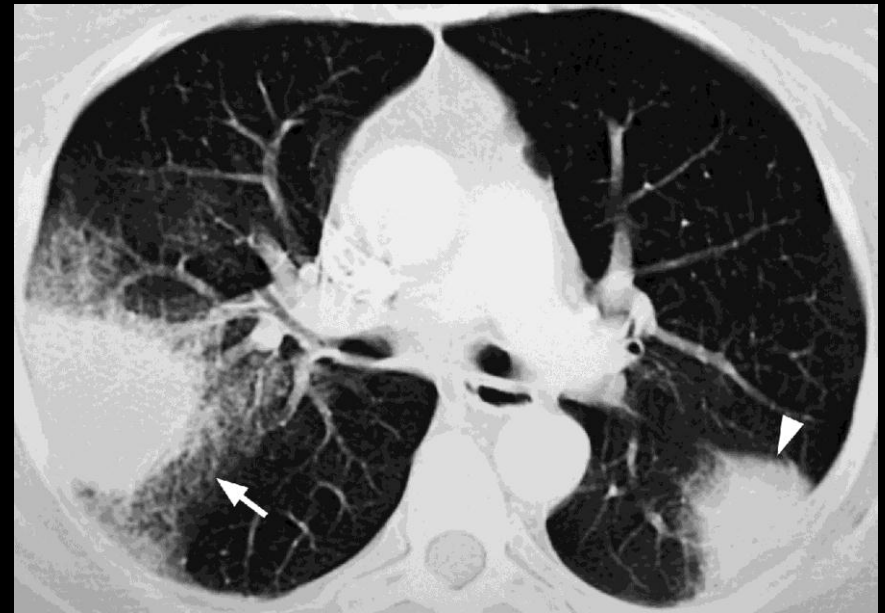
B. Mitral regurgitation

- *Isolated RUL edema; WJM*

- **A patient is status-post bone marrow transplant. Chest CT reveals several new pulmonary nodules with a halo sign. What is the likely etiology.**
 - A. Fungal
 - B. Bacterial
 - C. Viral
 - D. Mets

A. Fungal

- The sign refers to ground glass attenuation on CT that surrounds a more dense nodule or area of consolidation
- Although most hemorrhagic pulmonary nodules produce this sign, when seen in pts with acute leukemia (immunocompromised), the halo sign suggests early invasive pulmonary aspergillosis.
 - CE p 22-23



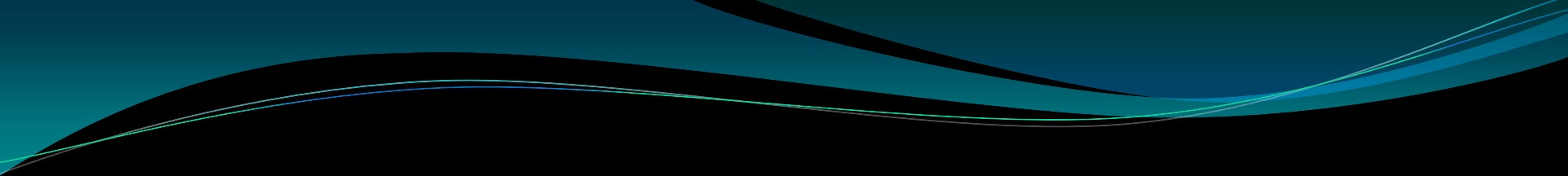
- **What is the most common cause of restrictive cardiomyopathy?**
 - A. IHSS
 - B. Sarcoid
 - C. Aluminum
 - D. Tuberculosis
 - E. Amyloid

E. Amyloid

- **Man who has severe SOB and occasional episodes of syncope while lying down on his left side? What should be the next test for evaluation?**
 - A. Echocardiogram
 - B. EKG
 - C. Stress perfusion test
 - D. CT

A. Echocardiogram

- Atrial myxoma, echo 2D is the study of choice
- Syncope and dyspnea are associated



- **What is the most common cause of a cavitary pneumonia (necrotizing pneumonia) in children?**

- A. *Strep pneumoniae*
- B. *Staph aureus*
- C. Tuberculosis
- D. *Mycoplasma*
- E. *Klebsiella*
- F. Influenza A
- G. *Pseudomonas*

B. Staph aureus

- Cavitating Pneumonia
 1. Staph Aureus
 2. H. influenzae
 3. S. pneumoniae

- **What is the mean arterial pressure needed to diagnose pulmonary arterial hypertension?**
This was the most recalled question. Unfortunately, everyone had different answers. All the recalled answers are provided.
 - A. 10
 - B. 14
 - C. 18
 - D. 21
 - E. 25

E. 25

- Pulmonary hypertension is present when mean pulmonary artery pressure exceeds 25 mm Hg (3300 Pa) at rest or 30 mm Hg (4000 Pa) with exercise.
 - *Wikipedia*

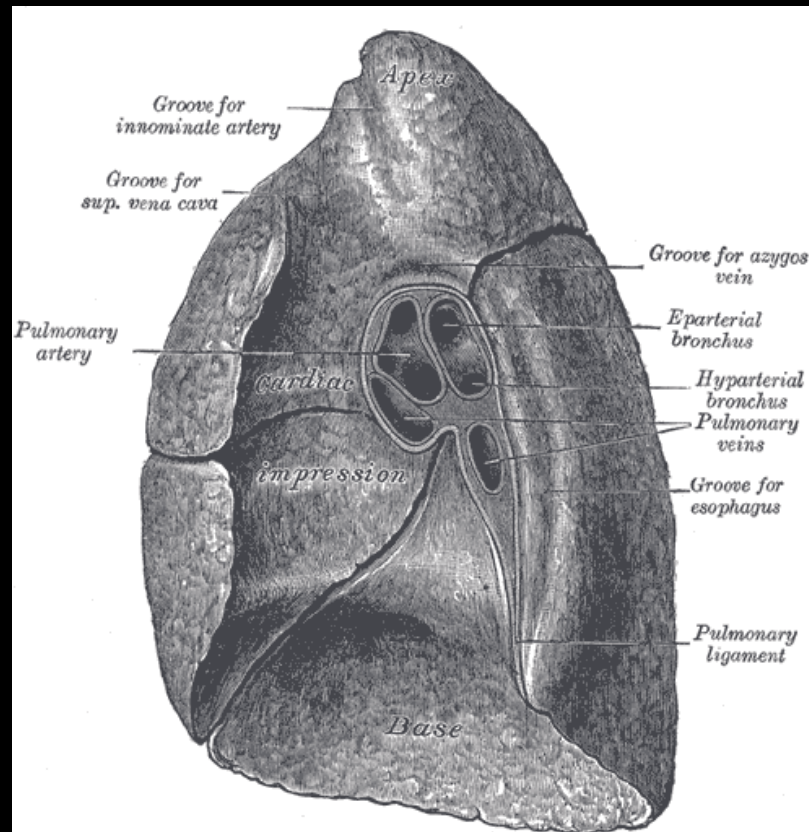
- **A patient has an end diastolic volume of 80 and an end systolic volume of 60. What is the ejection fraction?**
 - A. 25%
 - B. 33%
 - C. 66%
 - D. 75%

A. 25%

$$\text{LVEF} = \frac{\text{Volume at end of diastole} - \text{Volume at end of systole}}{\text{Volume of blood at end of diastole}}$$

- **The azygos vein enters the superior vena cava at which location?**
 - A. Anterior aspect, inferior to the right main bronchus
 - B. Posterior aspect, inferior to the right main bronchus
 - C. Anterior aspect, superior to the right main bronchus
 - D. Posterior aspect, superior to the right main bronchus
 - E. At the junction of innominate veins

D. Posterior aspect SVC, superior to the right main bronchus



- **What is the correct association regarding valvular heart disease?**
 - A. Systolic jet with aortic stenosis
 - B. Systolic jet with mitral stenosis
 - C. Diastolic jet with mitral regurgitation
 - D. Diastolic jet with tricuspid regurgitation
 - E. Systolic jet with aortic insufficiency

A. Systolic jet with aortic stenosis

- In patients in this situation, angiographic studies of the LV and the aortic valve are best performed by injecting contrast material into the pulmonary artery and by imaging in the 30° right anterior oblique and 60° left anterior oblique projections. These examinations often make it possible to ascertain the number of cusps of the stenotic valve and to demonstrate doming of a thickened valve and a systolic jet.
 - emedicine

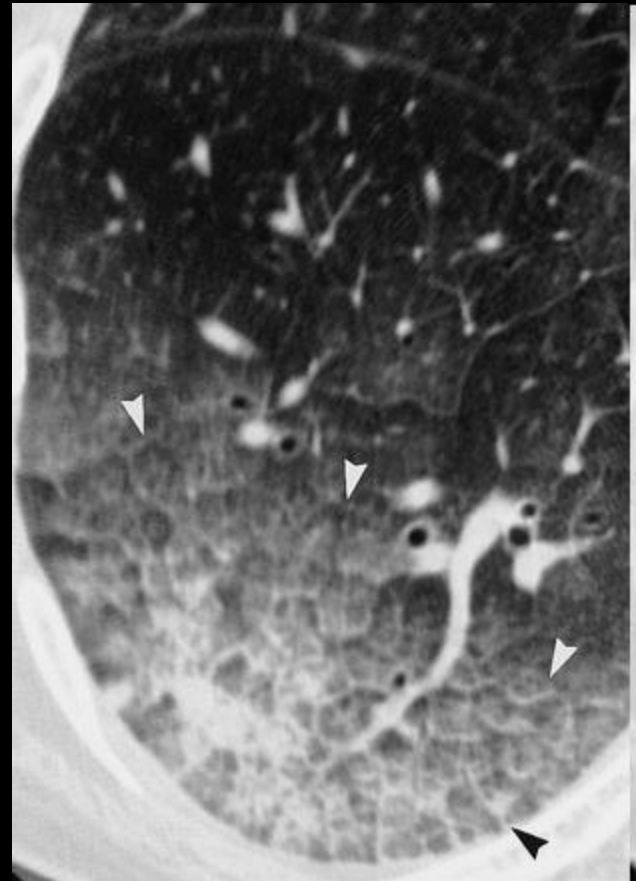
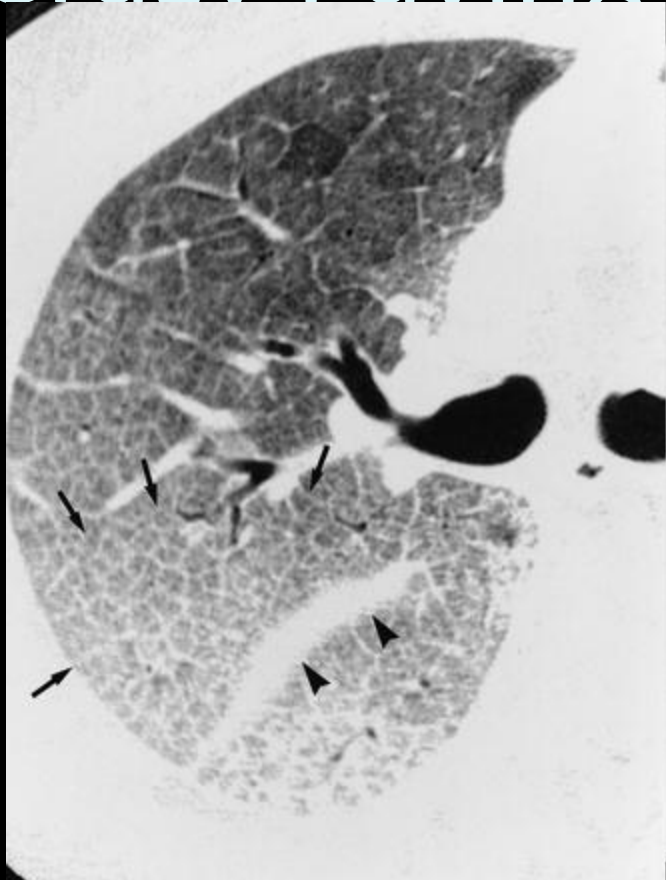
- **Which is not associated with crazy paving?**
 - A. Alveolar proteinosis
 - B. ARDS
 - C. Pulmonary edema
 - D. Multiple interstitial granulomas (also recalled as bronchocentric granulomatosis)
 - E. Lipoid pneumonia

D. Multiple interstitial granulomas (also recalled as bronchocentric granulomatosis)

- Crazy paving has been considered to be strongly suggestive of alveolar proteinosis
- Recently, it has been shown that mucinous bronchoalveolar carcinoma and lipoid pneumonia can produce this pattern
- Twenty of the lungs obtained at autopsy—seven with diffuse alveolar damage, six with pulmonary hemorrhage, three with cardiogenic edema, two with bacterial pneumonia, and two with postinfectious organizing pneumonia—showed the **crazy-paving** appearance at thin-section CT. The seven patients who had diffuse alveolar damage at autopsy had a clinical diagnosis of adult respiratory distress syndrome (ARDS).

- *Crazy-paving Appearance at Thin-Section CT: Spectrum of Disease and Pathologic Findings: Radiology*

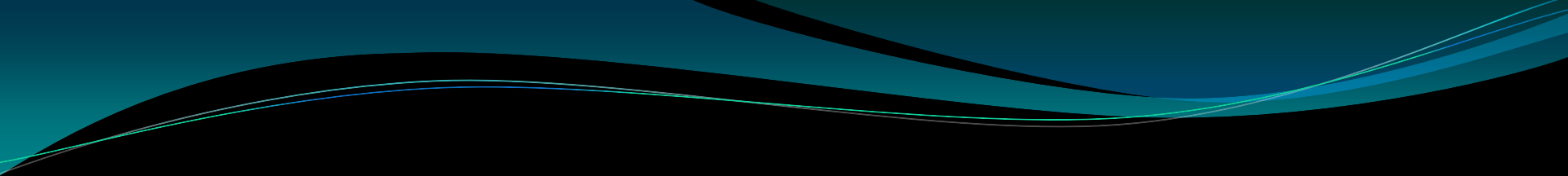
Crazy Paving



- **Which is most likely to recur after lung transplant?**
 - A. LAM
 - B. EG
 - C. Sarcoid
 - D. Alveolar proteinosis
 - E. Cystic fibrosis

C. Sarcoid

- Recurrence of sarcoidosis in the transplanted lung occurs in 50% of Caucasian patients
- The recurrence of pulmonary lymphangioleiomyomatosis (LAM) after lung transplantation has been rarely reported
 - Internet - SFH

- 
- **Miliary TB represents:**
 - A. Bacteremia
 - B. Endobronchial spread with cavity

A. Bacteremia

- Hematogenous Spread

- **Which lung disease is associated with increased compliance?**
 - A. Lymphangiomyomatosis
 - B. Asbestosis
 - C. Lymphangitic spread of tumor
 - D. UIP pattern of pulmonary fibrosis
 - E. Langerhan cell histiocytosis
 - F. radiation damage

A. Lymphangiomyomatosis

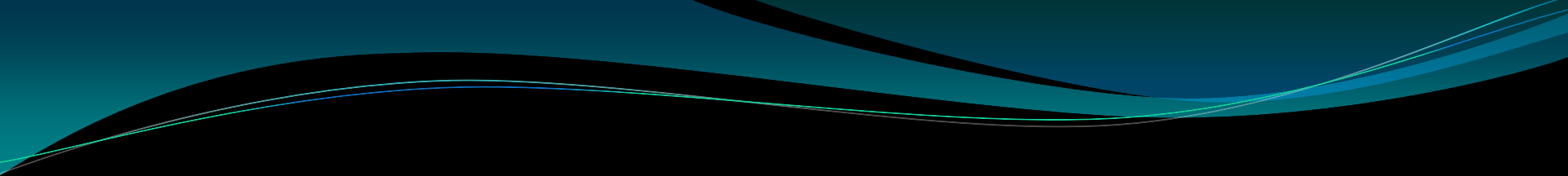
- LAM has normal / increased lung volum
- LCH 1/3 increased lung volumes
- All others have decreased lung volumes including lymphangitic carcinomatosis - SFH
 - Dahnert

- **Which lymph node group is not accessible via cervical mediastinoscopy?**
 - A. R superior paratracheal
 - B. L superior paratracheal
 - C. R inferior paratracheal
 - D. L inferior paratracheal
 - E. AP window
 - F. Anterior subcarinal

E. AP window

- The Chamberlain procedure is used to biopsy lymph nodes or masses in the aorto-pulmonary window on the left side of the chest, or nodes in the hilar areas of the lung. (In contrast, the cervical mediastinoscopy procedure is used to biopsy nodes or masses to the front or side of the trachea, or windpipe.) The aorto-pulmonary window is the area in the center of the chest bound by the aorta superiorly, and the pulmonary artery inferiorly. This area contains lymph nodes that filter lymph coming from the left lung, especially the left upper lobe. If a lung cancer is present in the left lung, the Chamberlain procedure is useful for staging the cancer (determining the extent of spread.)
 - Wikipedia

- **An old man is 3 years status-post myocardial infarction. He has an 80% stenosis of the LAD as well as anterolateral hypokinesis. On NH₃-PET, the anterolateral wall is cold while on FDG-PET, anterolateral wall is hot. What is the most likely diagnosis?**
 - A. Hibernating myocardium
 - B. Stunned
 - C. Infarct

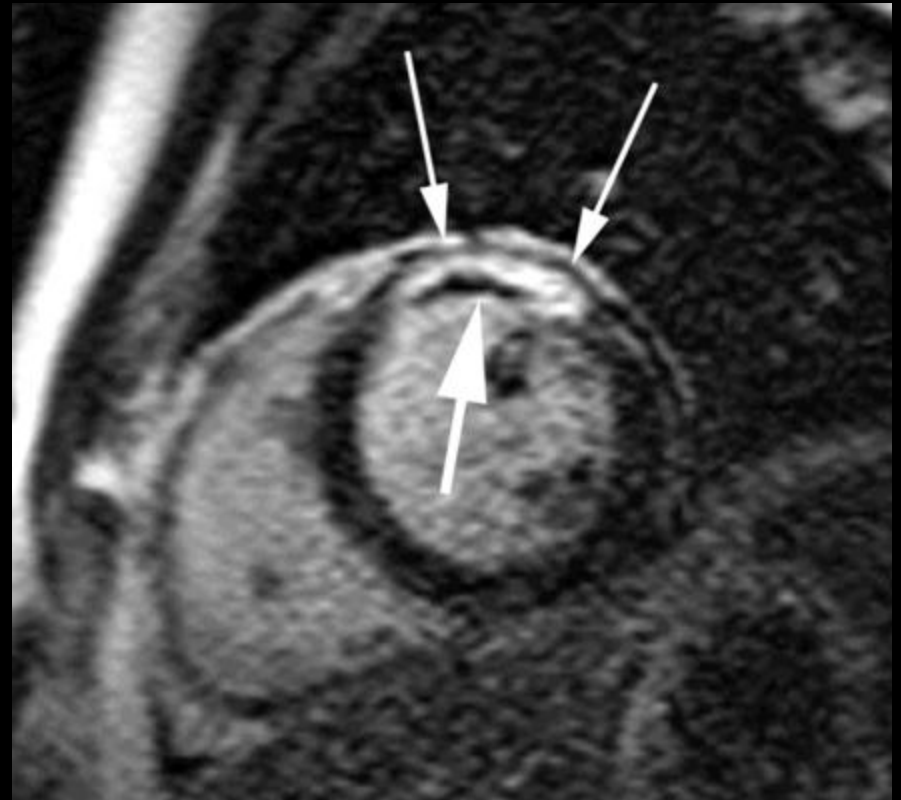


A. Hibernating myocardium

- **On cardiac MRI there is an abnormality with delayed peripheral enhancement and no central enhancement. What does this represent?**
 - A. Artifact related to very early timing
 - B. Small vessel disease related to DM
 - C. Hibernating myocardium
 - D. Stunned myocardium
 - E. Nonviable infarct
 - F. Viable myocardium

E. Nonviable infarct

- 36-year-old man with acute transmural myocardial infarction in midventricular part of anterior left ventricular wall caused by occlusion of first diagonal branch of left anterior descending coronary artery. Patient had clinical findings suggestive of perimyocarditis. Echocardiograms (not shown) did not reveal abnormalities. MRI was performed to exclude myocardial damage. Contrast-enhanced T1-weighted 3D fast field-echo image (4.3/1.3; inversion time, 250 msec) obtained 11 min after injection of 0.2 mmol/kg of gadopentetate dimeglumine in midventricular cardiac short axis shows transmural myocardial infarction (*small arrows*) with subendocardial no-reflow zone in anterior left ventricular wall (*large arrow*). Infarct was caused by occlusion of first diagonal of left anterior descending coronary artery, which was diagnosed at coronary catheterization (not shown).



- Within the **infarct** zone exhibiting delayed **hyperenhancement**, central areas of microvascular obstruction (the no-reflow or low-reflow region of an **infarct**) exhibit decreased first-pass perfusion. Thus, the **infarct** zone is not always histologically homogeneous and may contain "dead" and "more dead" myocardium. Furthermore, some investigators claim they can see the **peripheral** zone of potentially salvageable myocardium and others claim it does not exist
 - *Myocardial Viability Using MR Imaging*
 - *Use of Inversion Recovery Contrast-Enhanced MRI for Cardiac Imaging: Spectrum of Applications*
 - *AJR*

- **Which plane is best to evaluate the mitral and tricuspid valves on cardiac MRI?**
 - A. Short axis
 - B. Sagittal
 - C. Coronal
 - D. Horizontal long axis
 - E. Vertical long axis
 - F. Axial

C. Horizontal long axis – Duke recalls

- **C. Horizontal long axis, also known as the 4 chamber view**, is best to evaluate both the tricuspid and mitral valves. The short axis view (doughnut) is best to evaluate myocardial mass, chamber volume and aortic – mitral valves. The vertical long axis, also known as the right anterior oblique, best evaluates the interventricular septum.
- *Source: Evaluation of cardiac valvular disease with MR imaging; qualitative and quantitative techniques. Radiographics 2003; 23:e9-e9.*
- **Short axis:** assessment of regional ventricular function
- **quantification of LV and RV volumes, ejection fractions and mass**
- **Three chamber view:** assessment of anteroseptal and inferolateral walls of the LV
- (left ventricular assessment of mitral and aortic valves
- outflow tract)
- **Two chamber view:** evaluation of anterior and inferior wall motion
- (vertical long axis) assessment of LA appendage
- **Four chamber view:** evaluation of septal and lateral walls
- **(horizontal long axis)** assessment of size and function of RV and tricuspid valve
- *Cardiovascular magnetic resonance. 2003 1st Ed. Martin Dunitz*

- **What coronary vessel is diseased if patient has posterolateral wall hypokinesis?**
 - A. LAD
 - B. Left circumflex
 - C. Left main
 - D. RCA

B. Left circumflex

- the 8 sectors corresponding to the posterolateral free wall were used to assess function in the left circumflex artery distribution
 - *American Journal of Cardiology: Comparison of exercise radionuclide angiography with thallium SPECT imaging for detection of significant narrowing of the left circumflex coronary artery*

- **Man with atypical chest pain undergoes EBCT demonstrating no coronary calcium. What is the percentage chance of this patient having significant coronary artery disease?**
 - A. Less than 15%
 - B. 25-35%
 - C. 45-55%
 - D. 55-75%
 - E. Greater than 85%

A. Less than 15%

- The calcium score *directly* correlates with the risk of cardiac events. People with higher scores have greater plaque burden and a higher the risk for cardiac events regardless of whether symptoms are present. For asymptomatic individuals, a calcium score of 0 indicates absence of detected calcium and an extremely low likelihood (<1%) of any CAD (negative predictive value 95-100% for stenosis >50%).
 - **Advanced Body Scan of Newport's EBT Coronary Calcium Scoring Guide**

- **Regarding EKG gating in multidetector coronary CTA, which is true.**
 - A. Not necessary
 - B. Prospective
 - C. Retrospective
 - D. Only needed if atrial fibrillation present

C. Retrospective

- This is the best

- In MRI, if the true velocity in a vessel is 300cm/sec and the VENC upper limit set at 200cm/sec what phenomenon will you see?
 - A. Aliasing
 - B. Wrap around
 - C. Tiger striping
 - D. Chemical shift

A. Aliasing

- MRI (as Doppler ultrasound) samples discrete sections of vascular flow and, therefore, it is vulnerable to aliasing if flow velocities are excessively high. Velocity sensitivity with MRI may be adjusted so that such aliasing does not occur.
 - *Potential Sources of Error for Clinical PC Cine MRI: Medscape*

- **What is calculated in cine cardiac MR using the modified Bernoulli equation?**
 - A. Stroke volume
 - B. Cardiac output
 - C. Regurgitation fraction
 - D. Ejection fraction
 - E. Pressure gradient
 - F. Volume gradient

E. Pressure gradient

- Modified bernouilli: $P=4v^2$
- The modified Bernoulli equation states that the pressure gradient across a stenosis is approximately 4 times the square of the maximum velocity across the stenosis (pressure gradient = $4 \times v_{max}^2$),
 - Medscape: Cardiac MRI

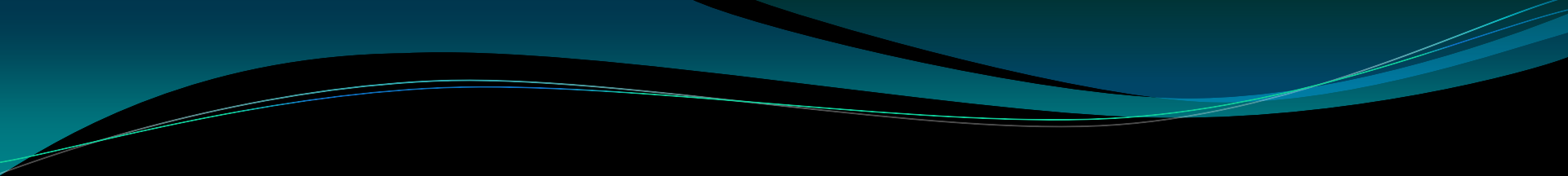
- A left sided superior vena cava drains into which structure?
 - Left vertical vein
 - Left atrium
 - Left innominate vein
 - Coronary sinus
 - Azygous vein

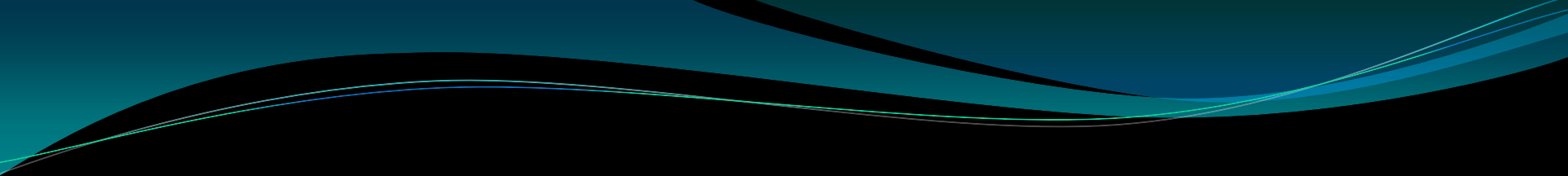
Coronary sinus

- In cardiac MRI for viability, when is the post contrast Inversion Recovery sequence performed?
 - Immediately following contrast administration
 - 5 minutes after
 - 10 minutes after (answer: b/w 5 and 15 minutes according to Duke review 2007; <5 minutes not enough washout from normal myocardium/ >30 minutes gad washes out of dead heart tissue, Radiographics, 2006;26:795-810 Vogel-Claussen, et al)
 - 30 minutes after
 - I realize that FLAIR is usually a brain sequence but I think this is what was asked.

10 minutes after

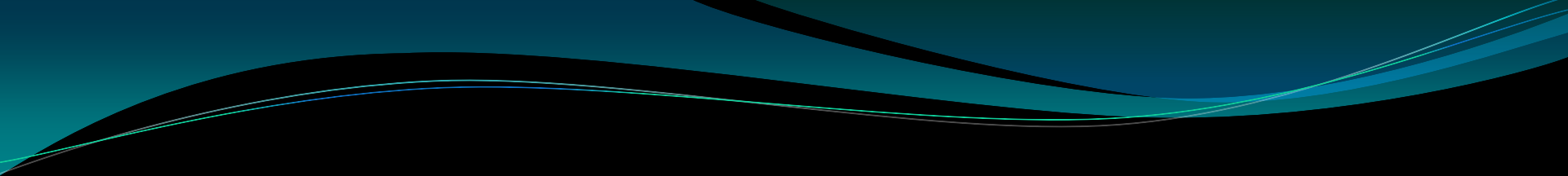
- (answer: b/w 5 and 15 minutes according to Duke review 2007; <5 minutes not enough washout from normal myocardium/ >30 minutes gad washes out of dead heart tissue, Radiographics, 2006;26:795-810 Vogel-Claussen, et al

- 
- What disease process can mimic restrictive cardiomyopathy? (Dahnert, p622)
 - Constrictive pericarditis



Constrictive pericarditis

- Which of the following lesions is associated with an increased LVEF?
 - Mitral stenosis (Dahnert, p 635, mitral regurg causes increase preload without increased afterload = increased LVEF)
 - Aortic Insufficiency (Dahnert, p611)
 - Amyloid infiltration
 - LAD infarction
 - VSD
 - An unladen swallow



?

- AI. This is the answer given on multiple old recalls
- However mitral stenosis may be a better answer

- What is the most likely pulmonary parenchymal presentation of aggressive B-cell lymphoma in HIV patients?
 - Interstitial opacities
 - Multifocal 1-3 cm mass-like opacities
 - Solitary pulmonary nodule
 - Lobar consolidation
 - Mediastinal adenopathy
 - Pleural effusion

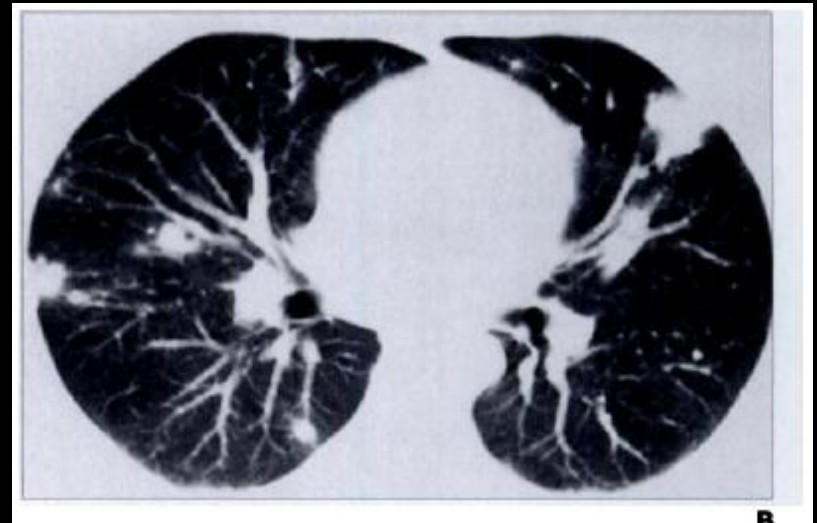
Multifocal 1-3 cm mass-like opacities

- AJR

Imaging of Pulmonary Lymphomas

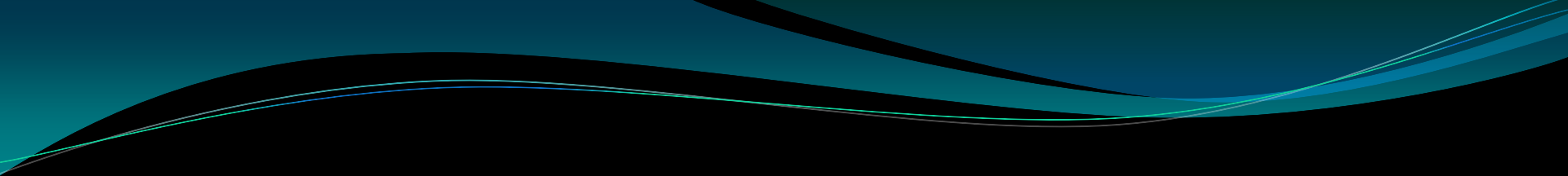
Kyung Soo Lee¹, Yookyung Kim¹, Steven L. Primack²

Pulmonary nodules are the most common radiographic or CT finding in ARL. The nodules are usually multiple and well circumscribed [40, 41] (Fig. 8). However, ARL occasionally appears as a solitary pulmonary nodule [42]. Pleural effusions and localized areas of consolidation are also common findings [40, 41, 43]. Mediastinal adenopathy is usually less extensive than in non-ARL. How-



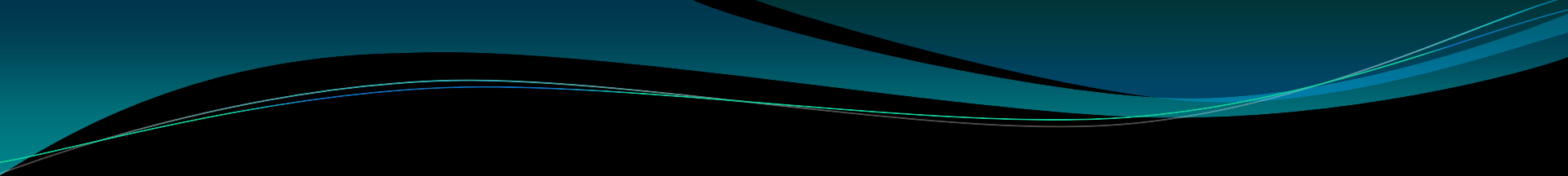
- Kaposi's and lymphoma which complicate about 30% of AIDS pts are often aggressive multicentric tumors producing nodular lung lesions, diffuse lung disease, or consolidation.
 - *Radiology of the chest and related conditions, Wright*
- Intrathoracic NHL in AIDS is most often extranodal.[4] The most common radiologic findings consist of multiple pulmonary nodules, areas of consolidation, and pleural effusions.[44,45] Reticular opacities and masses are also observed relatively frequently.[44] With regard to lung nodules, they are usually well circumscribed and range in size from 0.5 to 5 cm in diameter; air bronchograms are frequently present, and a halo of ground-glass attenuation may be observed around the nodules on thin-slice CT.[45] One distinctive form is primary pulmonary AIDS-related lymphoma, which is defined by exclusive lymphomatous parenchymal involvement with no other sites of involvement identified up to 3 months following diagnosis[40] (Figure 6). CT shows mediastinal and hilar lymph-adenopathy in approximately half of patients imaged.[44] AIDS-related NHL may occasionally present as a mediastinal mass in the absence of pulmonary parenchymal disease (Figure 7).
 - *Noninfectious Lung Diseases in AIDS , Medscape*

- A high resolution CT shows centrilobular V- and Y-shaped opacities 2-3mm from the pleural surface.
What is the most likely etiology?
 - Lymphangiitic carcinomatosis (thickened interlobular septa; thickened polygonal reticular network 10-25mm)
 - Bronchocentric granulomatosis (upper lobe, Dahnert p 467)
 - Acinar filling
 - Bronchiolitis (tree in bud Dahnert p 409-410)



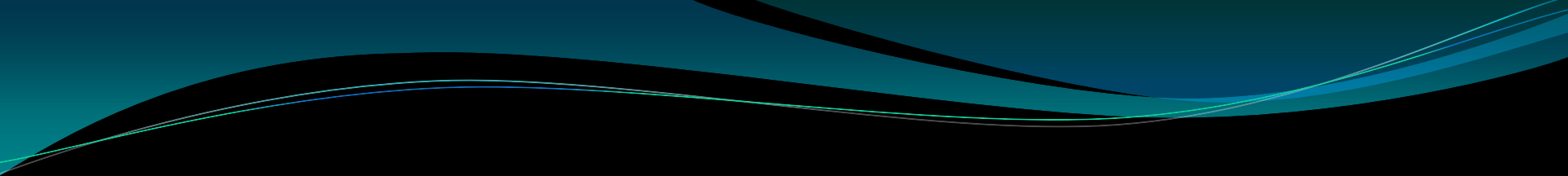
Bronchiolitis

- In which of the following disease processes would one expect to see increased lung volumes?
 - Bleomycin toxicity
 - UIP
 - Sarcoidosis
 - Eosinophilic granuloma (33%)
 - Asbestosis



Eosinophilic granuloma

- All of the following statements regarding true ventricular aneurysm are true EXCEPT?
 - Occurs after myocardial infarction
 - Frequently rupture
 - Frequently calcify
 - Wide communication with LV
 - Typically occurs at the left ventricular apex



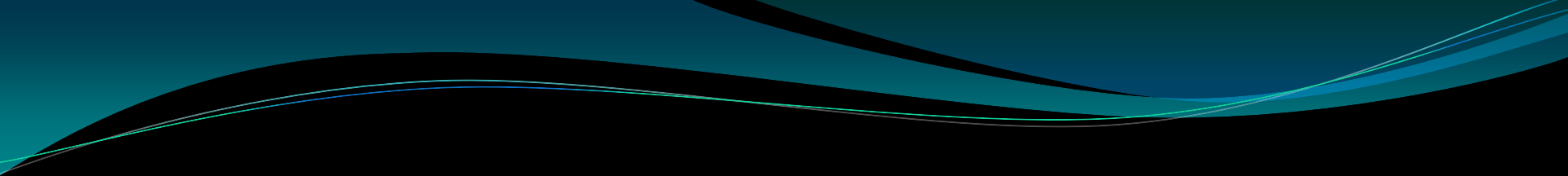
Frequently rupture

- What is the etiology of round atelectasis?
 - Pleural effusion
 - Pneumothorax
 - Pneumonia
 - Pulmonary embolism

Pleural effusion

- (Dahnert p424—any type of pleural inflammatory rx (asbestosis as leading cause))

- Which of the following statements is true regarding MRI of valvular heart disease?
 - AS jet in systole
 - AI jet in systole
 - MR jet in diastole
 - MI jet in systole



AS jet in systole

- Question regarding sudden cardiac death in a young person with a family history of the same. I cannot recall the exact demographic given, but BOTH IHSS AND ARVD were given as options!

ARVD

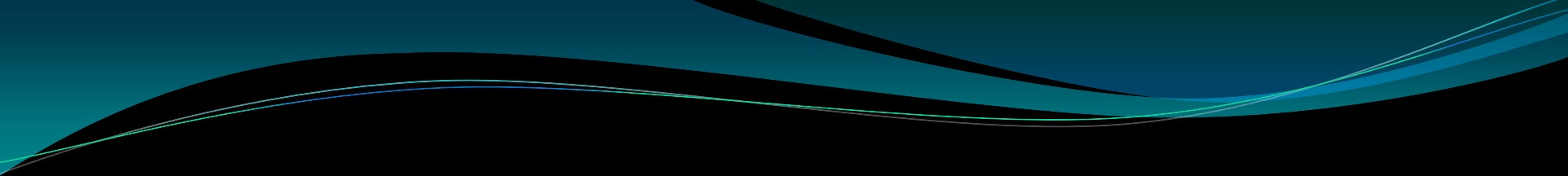
- This question has something about abnormal signal in the RV in other recalls

- What is the most likely etiology of valvular heart disease in a patient with both tricuspid and pulmonic disease?
 - Endocardial cushion defect
 - Carcinoid
 - Rheumatic fever
 - Fish and chips

Carcinoid

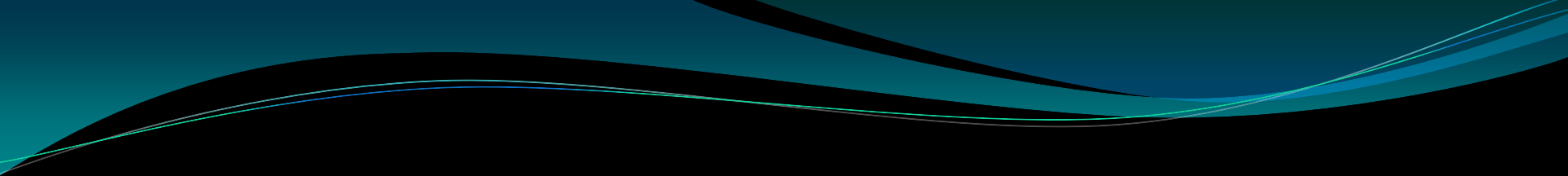
- Many recalls say carcinoid with liver mets as the answer

- What is the TNM classification for a patient with a 2 cm tumor with ipsilateral hilar nodes and no distant metastases? Dahnert p469
 - T₁N₁M₀
 - Just know the staging, there are 5X4X2 possible combinations!



T1N1M0

- Which of the following lung diseases increases the functional residual capacity?
 - UIP
 - Sarcoid
 - Emphysema
 - Asbestosis
 - Systemic lupus erythematosus



Emphysema -- all others restrictive

- What is the optimal position of an aortic balloon pump?
 - Just distal to the aortic knob
 - At the diaphragm
 - Mid-thoracic aorta
 - Between the brachiocephalic and left common carotid
 - In the arch just distal to the coronaries

Just distal to the aortic knob

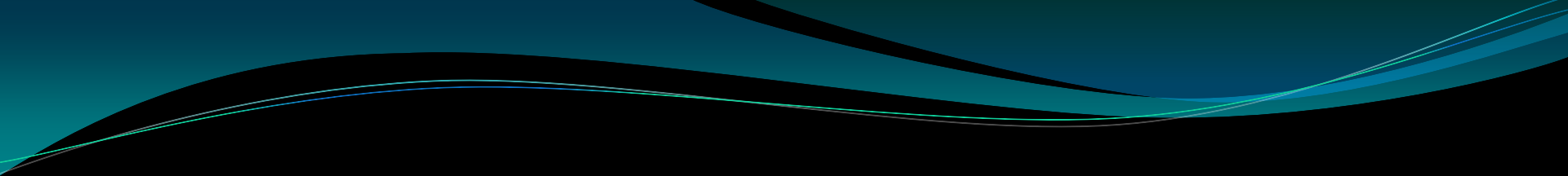
AJR

- Just distal to the L. subclavian (projecting at the level of the aortic arch on a frontal chest radiograph)

- A chest radiograph shows multiple left pleural masses not associated with rib fractures. What is the best modality for further evaluation?
 - CT thorax without contrast
 - Tc99RBC scan
 - Ultrasound
 - Gradient MRI

Tc99RBC scan

- I think this question was asking about masses associated with rib fractures and wanted a study to look for splenosis. The answer would be Tc99 RBC scan (damaged RBC's better).
- If just looking at chest masses, then CT is best.



2005

- 32. Interstitial edema begins at what PCWP
- a) 10-12
- b) 12-15
- c) 20-25
- d) 25-30
- (15-20 was not a choice)

c) 20-25

- Answer: C (Brandt and Helms, pg. 365)
- PCWP (mm Hg)Radiographic findings
- 8-12 Normal
- 12-18 Cephalization of flow
- 19-25 Interstitial edema
- > 25 Pulmonary edema

- 33. A 68-year-old female with right middle lobe and lingular bronchiectasis and chronic cough. Answers include:
 - Atypical mycobacterial infection
 - Legionella
 - Staph
 - Sarcoid

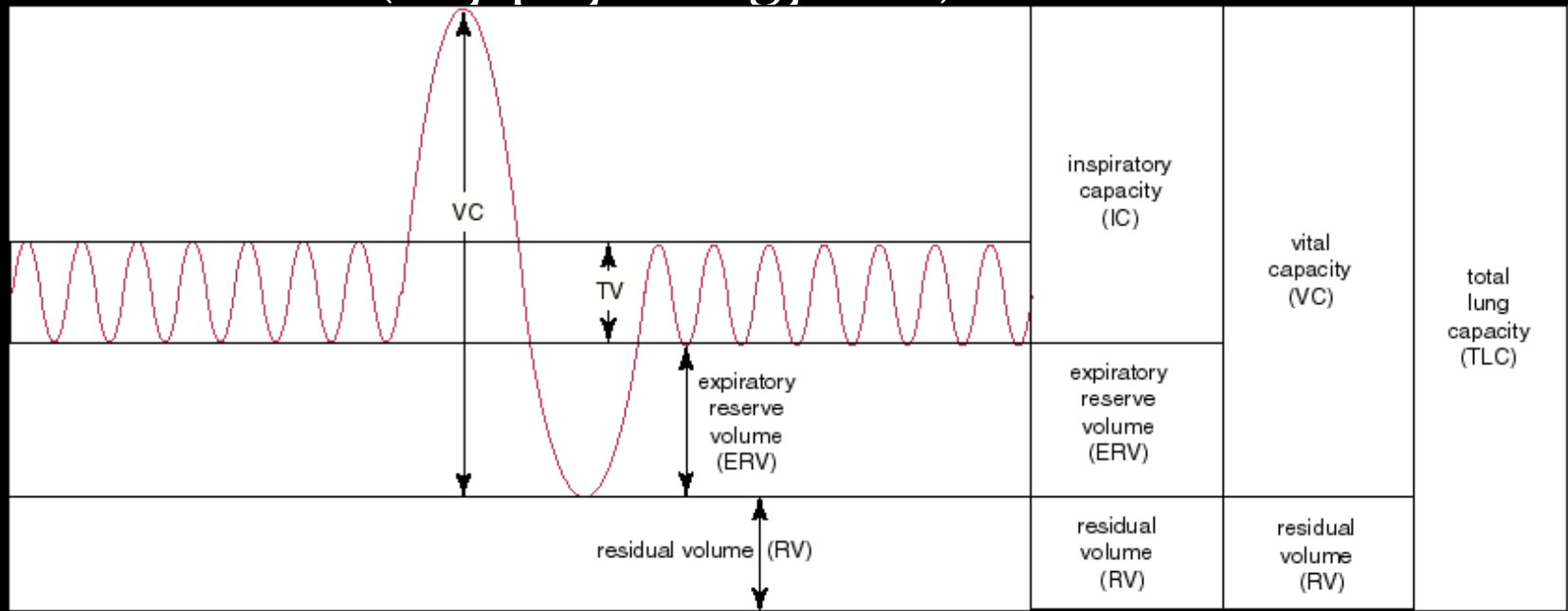
Atypical mycobacterial infection

- Answer: A (Brandt and Helms, pgs. 402-407)
- “Lady Windermere’s Syndrome” – *M. avium* intracellular infection often seen in middle-aged and elderly females with peribronchial nodularity and bronchiectasis in a middle lobe and lingular distribution.
- Legionella – Usually elderly men (often with underlying COPD/malignancy/immunocompromise). Radiographic findings include sub-lobar, peripheral air space disease which progresses to lobar/multi-lobar air space disease despite antibiotic therapy.
- Staph – Often in hospitalized/debilitated pts, hematogenous spread from endocarditis (IV drug use), indwelling catheters, etc. Also may superinfect with viral pneumonia. Radiographic findings include bronchopneumonia with patchy air space disease progressing to lobar pneumonia. Can be complicated by abscess/effusion/empyema. Hematogenous spread may look more like septic emboli.
- Sarcoid – Often in 20-40 year old African American females. Can look like anything. Classically, a reticulonodular pattern predominately within the middle and upper lobes with associated adenopathy. Can progress to nodular or mass-like air space disease. (B&H, 435-436)

- 34. Vital capacity is:
 - a. the exhaled volume after maximal inspiration followed by maximal expiration
 - b. gas remaining in the lungs after maximal exhalation.
 - c. volume of gas in the lungs after normal exhalation.
 - d. the exhaled volume after normal inspiration followed by normal exhalation

a. the exhaled volume after maximal inspiration followed by maximal expiration

- Answer: A (any physiology text)



- **Vital capacity** = amount of expired gas following maximal inspiration, without force
- **Tidal volume** = amount of gas moving in and out with each respiratory cycle
- **Residual volume** = amount of gas remaining in the lung after a maximal expiration
- **Total lung capacity** = gas in lung at end of maximal inspiration
- **Functional residual capacity** = volume of gas remaining in lungs at end of a *quiet* expiration
- **Forced expiratory volume (FEV)** = amount of air expired during a certain period (FEV₁, FEV₃, etc.)

- 35. Ipsilateral supraclavicular lymph node.
- a. N₁
- b. N₂
- c. N₃
- d. M₁
- e. N_x

C. N3

- Staging of NSCLC
- Primary tumor
 - T₀ is - Carcinoma in situ
 - T_X - Positive malignant cytologic findings, no lesion observed
 - T₁ - Diameter of 3 cm or smaller and surrounded by lung or visceral pleura (see [Image 1](#)) or endobronchial tumor distal to the lobar bronchus
 - T₂ - Diameter greater than 3 cm (see [Images 2-3](#)); extension to the visceral pleura, atelectasis, or obstructive pneumopathy involving less than 1 lung; lobar endobronchial tumor; or tumor of a main bronchus more than 2 cm from the carina
 - T₃ - Tumor at the apex (see [Image 5](#)); total atelectasis of 1 lung; endobronchial tumor of main bronchus within 2 cm of the carina but not invading it; or tumor of any size with direct extension to the adjacent structures such as the chest wall mediastinal pleura (see [Image 8](#)), diaphragm, pericardium parietal layer, or mediastinal fat of the phrenic nerve
 - T₄ - Invasion of the mediastinal organs, including the esophagus trachea, carina (see [Image 11](#)), great vessels (see [Image 13](#)), and/or heart; obstruction of the superior vena cava; involvement of a vertebral body; recurrent nerve involvement; malignant pleural or pericardial effusion; or satellite pulmonary nodules within the same lobe as the primary tumor
- Regional lymph node involvement
 - N₀ - No lymph nodes involved
 - N₁ - Ipsilateral bronchopulmonary or hilar nodes involved
 - N₂ - Ipsilateral mediastinal nodes or ligament involved
 - Upper paratracheal lower paratracheal nodes
 - Pretracheal (see [Image 4](#), [Image 7](#), [Image 10](#)) and retrotracheal nodes
 - Aortic and aortic window nodes
 - Para-aortic nodes
 - Para-esophageal nodes
 - Pulmonary ligament
 - Subcarinal nodes (see [Images 12-17](#))
 - N₃ - contralateral mediastinal or hilar nodes involved (see [Image 19](#)) or any scalene or supraclavicular nodes involved
- Metastatic involvement
 - M₀ - No metastases
 - M₁ - Metastases present (see [Images 20-27](#))
- Stage groupings are as follows:
 - IA - T₁N₀M₀
 - IB - T₂N₀M₀
 - IIA - T₁N₁M₀
 - IIB - T₂N₁M₀ or T₃N₀M₀
 - IIIA - T₁₋₃N₂M₀ or T₃N₁M₀
 - IIIB - Any T₄ or any N₃M₀
 - IV - Any M₁

- A defect in the conal septa is associated with which of the following?
- a. ASD
- b. Tetralogy of Falot (asso. With mem. VSD)
- c. Ebstein's anomaly
- d. Truncus arteriosus
- e. Tricuspid atresia

Truncus arteriosus

- TA is an uncommon congenital anomaly in which one great vessel serves as the outlet for both ventricles. It is always associated with a large supracristal VSD (conal septal defect).
 - *Manual of Clinical Problems in Cardiology by Hills*

- 36. Regarding endotracheal intubation, which of the following is true: **
- a. The ETT moves caudally with flexion of the head
- b. Inflation of the cuff prevents aspiration
- c. Granuloma formation secondary to intubation most often involves the posterior wall of the trachea
- d. An LPO CXR is the best way to evaluate for esophageal intubation

Answer: A. The ETT moves caudally with flexion of the head

- This has always seemed a bit counter intuitive to me, but the ETT moves caudally with flexion of the neck and cranially with extension of the neck.
- From all I can find, the cuff is designed to prevent an air leak and prevent aspiration. This statement may be too strong (ie. Don't guess the question that states ALWAYS/NEVER/etc.)
- Granuloma formation secondary to intubation most often involves the posterior glottis.
- Pathophysiology of tracheal stenosis progresses from ulceration/ischemia to inflammation to granulation to scar formation to contraction of scar to stenosis. This process can be seen from anywhere from days/weeks after intubation (more common) to months/years (less common). The typical radiographic findings include an "hour glass" configuration of the airway on frontal radiographs. Of note, the ulceration/ischemia most commonly results from the ETT cuff (not the distal tip), so there is circumferential contact. (B&H, pg. 441 and www.emedicine.com and a bunch of random web sites).

- 37. What is true of UIP
- a) primarily in lung apices
- b) should not be called w/o fibrosis
- c) GGA more common than honeycombing

Answer: b) should not be called w/o fibrosis

- Usual Interstitial Pneumonia (UIP) is the most common idiopathic interstitial pneumonia. Most common presentation is male>female, age 50-70, with dyspnea and cough. Can have associated collagen vascular disease (30%) PFTs show restrictive lung disease.
- Pathologic process involves inflammation followed by repair and fibrosis. Spectrum of radiographic findings based on disease extent and chronicity.
- Acutely there is non-specific ground glass attenuation. These areas progress to reticular opacities, honeycombing and traction bronchiectasis and bronchiolectasis. Different stages of the disease process can be seen in the same patient at the same time. There is a peripheral (subpleural) and basilar (middle and lower lobes) predominance.
- I assume this question refers to the importance in distinguishing UIP from NSIP or DIP. UIP carries a poor prognosis and does not respond well to therapy.
- Given all that I have read, I think that B is the correct answer. A is definitely incorrect. Given the range of pathologic and radiographic findings, it seems that fibrosis may not be present early in the disease process. However, the GG opacity is non-specific, so while early UIP may be in the differential, it cannot be called definitively as many other entities (both interstitial pneumonias and other oricesses) have GG opacities. In classic UIP, the fibrosis and honeycombing predominate over the GG opacities, while the opposite is true of NSIP.
- Lots of texts touch on the subject, but it is probably worth reading “Idiopathic Interstitial Pneumonias: CT Features” in *Radiology* 2005;236:10-21.). I know my knowledge in the area is still lacking, but this summed up the topic relatively well.

- 39. What med is associated with mediastinal adenopathy
 - a) phenobarb
 - b) versed
 - c) INH
 - d) bromocriptine
- **Phenytoin is on other recalls and is the best answer**

Answer: C. INH

- “Drug reactions: Adverse drug reactions can cause generalized lymphadenopathy. Within a couple of weeks of initiating phenytoin, some patients experience a syndrome of regional or generalized lymph node enlargement, followed by a severe maculopapular rash, fever, hepatosplenomegaly, jaundice, and anemia. These symptoms abate 2-3 months after discontinuation of the drug. Several other drugs are implicated in similar symptomatology, including mephenytoin, pyrimethamine, phenylbutazone, allopurinol, and isoniazid.”
- www.emedicine.com – Lymphadenopathy
- PRIMER SAYS PHENYTOIN , METHOTREXATE, AND CYCLOSPORINE CAN CAUSE ADENOPATHY

- 40. Male with LLL PNA and painful skin nodule over lower left chest
- a) Nocardia
- b) actinomyses
- c) Tb

b) **actinomycosis** <http://www.emedicine.com/PED/topic26.htm>

- Thoracic actinomycosis: Specific clinical or radiologic findings do not exist. Physical examination reveals diffuse rales and rhonchi. Decreased breath sounds can be appreciated if a pleural empyema is present. The patient appears chronically ill. Radiographic findings have the appearance of pneumonitis or a mass lesion, and, frequently, a pleural effusion is present. Hilar adenopathy often can be observed. Extension to adjacent tissues with involvement of chest wall muscles and soft tissues may lead to the formation of sinus tracts extending to the skin. This finding always should raise the possibility of actinomycosis.

- 41. What will not cause pulmonary arterial hypertension
- a) pulmonary AVM

a) pulmonary AVM

- Pulmonary Arterial Hypertension can be caused by an array of pulmonary vascular and pulmonary parenchyma disease processes. These include primary PAH, thromboembolic disease, vasculitis, collagen vasc disease, emphysema, ILD, bronchiectasis, Obesity. OSA, Heart Failure, PVOD, etc.) For an extensive list, see Core Curriculum pg 601.
- Pulmonary AVM is a low resistance path that does not elevate pulmonary arterial pressures.

- 42. During exercise, how does pulmonary blood flow go up while pressure stays the same
 - a) arterial recruitment
 - b) arterial dilatation
 - c) capillary dilatation
 - d) increased heart rate

c) capillary dilatation

- (Physiology, Bern and Levy, pg. 553)
- “ When humans exercise sub maximally, cardiac output may rise three fold. This increase in blood flow is accommodated by the pulmonary circulation without an equivalent rise in pulmonary vascular driving pressure. This accommodation occurs because of recruitment and distension of microvessels by the increasing transmural pressures in the very small vessels (arterioles, capillaries, and venules).”
- Thus, I assume arterial dilatation and recruitment are incorrect due to the size of the vessel.

- 44. How to differentiate between aspiration pneumonia and hyaline membrane disease.
- a. lung volumes.

a. lung volumes.

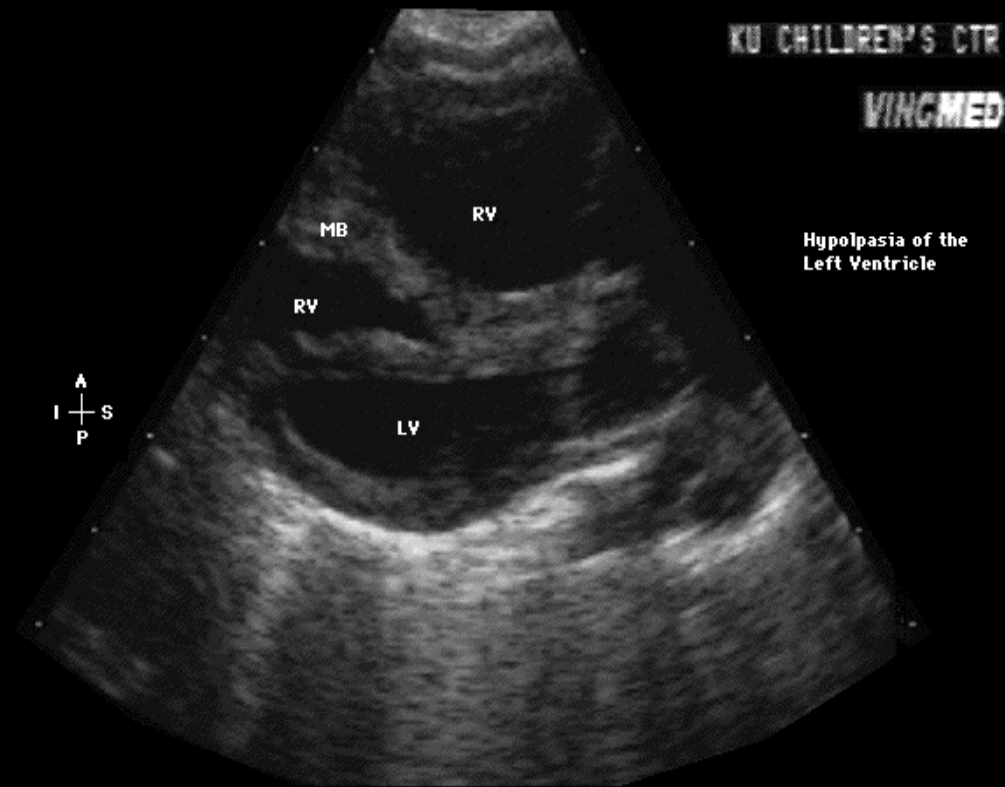
- (Brandt and Helms, pg. 1125)
- Hyaline membrane disease is secondary to insufficient surfactant from Type II alveolar cells. Thus, the alveoli are poorly distensible and remain collapsed. The clinical picture is one of respiratory distress in the first few hours after birth. The radiographic picture is characterized by low lung volumes with a granular pattern and air bronchograms extending to the periphery. The low lung volumes of RDS helps differentiate this entity from almost any other type of pathologic neonatal respiratory process.

- 45. Structure in RV (?LV) which could be mistaken for a mass.
 - papillary muscle.
 - Moderator band
 - Crista supraventricularis.

Moderator band

- In my experience with Cardiac echo...structures that can imitate a mass...
- Right Atria – thickening of tricuspid annulus, prominence of trabeculae along roof of atria, crista terminalis, prominent eustachian valve, compression of atrial wall by intrathoracic mass or aortic root aneurysm,
- Left Atria – Compression of atrial wall by intrathoracic mass or hiatal hernia
- Right Ventricle – Moderator band
- Left Ventricle – “False tendons”, papillary muscle
- (All taken from Cardiac Imaging: The Requisites, Chapters 1 and 2)

Enlarged Right Ventricle & Hypertrophic Moderator Band, LAO



- 46. On cardiac echo, what is most likely to appear as a mass in the right atrium
 - a) crista terminalis
 - b) crista supraventricularis
 - c) sinus venosus
 - (network of Chiari was not a choice)

A. crista terminalis

- The **sinus venosus** is the large quadrangular cavity located between the two venae cavae in the embryonic human heart. In the adult it is incorporated into the wall of the right atrium to form a smooth part called the **sinus venarum**, also know as the **venarum sinus**, which is separated from the rest of the atrium by a ridge of fibers called the crista terminalis.
 - wikipedia
- Crista Supraventricularis is in the RV
 - Emedicine: surgical anatomy heart

- 47. Which is associated with an enlarged left atrium.
 - Atrial fibrillation
 - ASD
 - Tricuspid pulmonic stenosis.

Atrial fibrillation

other recalls have mitral regurg or mitral stenosis which are better answers

- When atrial fibrillation occurs, the left atrial volume may increase by 20% (Cardiac Imaging, The Requisites – pg. 10)
- ASD typically has a left to right shunt and results in right atrial enlargement. Tricuspid or pulmonic stenosis also result in right atrial enlargement.

- 48. A 20 year female with history of the brother dying of sudden cardiac disease, has an MR of the heart showing increased signal on the T₁-weighted images of the right ventricle.
 - IHSS
 - Arrhythmogenic right ventricular dysplasia
 - Restrictive cardiomyopathy

Arrhythmogenic right ventricular dysplasia

(<http://www.clevelandclinic.org/heartcenter/pub/guide/disease/heartfailure/arvd.html>)

- **What Is Arrhythmogenic Right Ventricular Dysplasia (ARVD)?**
- ARVD is a rare form of cardiomyopathy in which the heart muscle of the right ventricle (RV) is replaced by fat and/or fibrous tissue. The right ventricle is dilated and contracts poorly. As a result, the ability of the heart to pump blood is usually weakened. Patients with ARVD often have arrhythmias (abnormal heart rhythms), which can increase the risk of sudden cardiac arrest or death.
- **What are the symptoms of ARVD?**
- ARVD is usually diagnosed at a young age (usually less than 40 years) and may cause of sudden cardiac death in athletes. Symptoms may include:
 - **Ventricular arrhythmias:** Irregular heart rhythms originating in the ventricles or lower chambers of the heart - The most common is ventricular tachycardia.
 - Palpitations: Fluttering in the chest due to abnormal heart rhythms
 - Dizziness, lightheadedness, or fainting caused by irregular heart rhythms
 - **Sudden cardiac death** - can be the first sign of ARVD
 - **Heart failure** - shortness of breath with activity, inability to carry out normal activities without fatigue, swelling in the legs, ankles and feet (edema)
- **What causes ARVD?**

The cause of ARVD is unknown. It occurs in about 1 in 5,000 people. ARVD can occur with no family history, although often it runs in families. A family history of ARVD is present in at least 30 to 50 percent of cases. Therefore, it is recommended that all first- and second-degree family members (parents, siblings, children, grandchildren, uncle, aunt, nephew, niece) be evaluated carefully for this form of cardiomyopathy, even in the absence of symptoms.
- Researchers have found two patterns of inheritance for ARVD:
- **Autosomal dominant** - When one parent has ARVD. Studies show that in these families, the family members have a 50 percent chance of inheriting the condition, although the symptoms and age of onset may be different between family members. ARVD is more prevalent in some geographic locations, such as Italy.
- **Autosomal recessive** (one form is called Naxos disease) - Characterized by the symptoms of ARVD listed above. Naxos disease is associated with a thickening of the outer layer of skin on the palms of the hands and soles of the feet (hyperkeratosis) and thick, "wool-like" hair.
- Not all the specific genes have been identified as a cause for ARVD. Researchers are attempting to identify the specific gene mutations and locations of chromosomes associated with ARVD.
- ARVD may also be related to non-genetic causes such as congenital abnormalities (affecting the right ventricle), viral or inflammatory myocarditis.

48. A 20 year female with history of the brother dying of sudden cardiac disease, has an MR of the heart showing increased signal on the T1-weighted images of the right ventricle.

- **How is ARVD Diagnosed?**

- ARVD is diagnosed based your on medical history, physical exam, and tests (echocardiogram, Holter monitor, electrophysiologic testing, cardiac MRI, and/or cardiac CT scan. [Click here to learn about these tests.](#)

- [Cardiac Magnetic Resonance Imaging](#) (MRI) is recommended for the diagnosis of ARVD, as it visualizes fibro-fatty infiltration of the right ventricular (RV) myocardium. It also can show increased RV dimensions as well as wall-motion abnormalities. Unfortunately, the image quality frequently is limited due to artifact from irregular heart rhythms. For this reason, the patient may also undergo a [cardiac CT scan](#) to confirm or rule out the diagnosis of ARVD. This imaging test can detect characteristic abnormalities of the RV myocardium or the RV cavity. Unlike MRI, a CT scan can be performed if the patient has an implanted device (e.g. pacemaker, defibrillator).

- The diagnosis of ARVD is confirmed if the patient has these characteristics:
- Abnormal function of the right ventricle (RV)
- Fatty or fibrous-fatty infiltrates of the right ventricle heart muscle (myocardium)
- Abnormal ECG
- Arrhythmias (supraventricular tachycardia, ventricular tachycardia or ventricular fibrillation, especially with exercise)

- Family history of ARVD

- **How is ARVD Treated?**

- There is no known curative treatment for ARVD. Treatment is usually directed at controlling the patient's ventricular arrhythmias and managing heart failure. The primary goal of treatment is preventing sustained ventricular arrhythmias and/or sudden death. Thus, antiarrhythmic drug therapy is the most frequently used therapy. Frequent ventricular arrhythmias that have not been successfully treated with medical therapy may be treated with [radiofrequency ablation](#). Patients who are thought to be at risk for sudden death are usually treated with an [implantable defibrillator](#) (ICD).

- 49. Ebstein's anomaly involves which valve.
 - tricuspid.
 - Mitral
 - Aortic
 - Pulmonary.

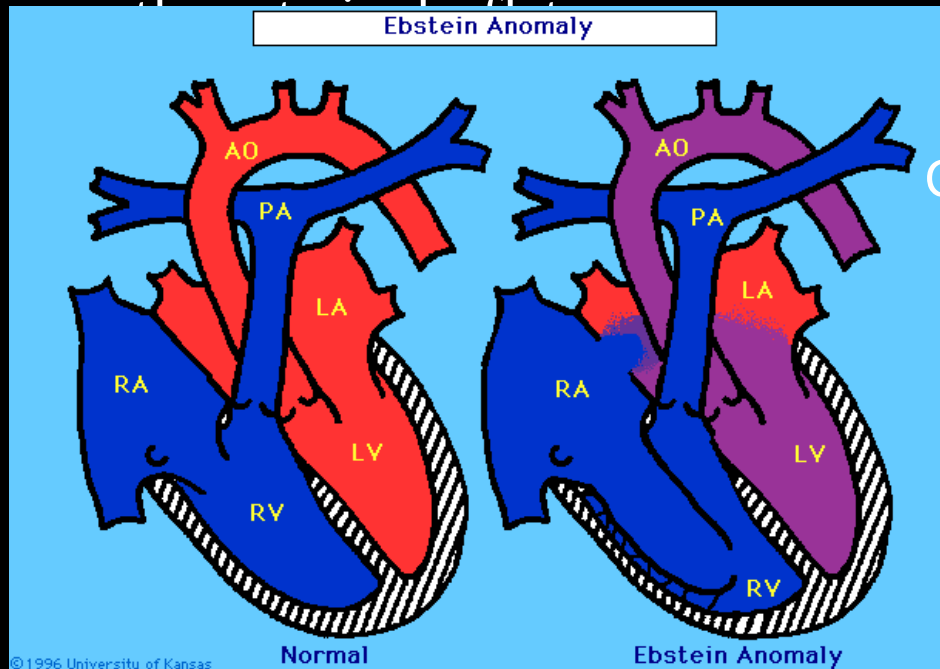
tricuspid

- Ebstein anomaly is a congenital malformation of the heart that is characterized by apical displacement of the septal and posterior tricuspid valve leaflets, leading to atrialization of the right ventricle with a variable degree of malformation and displacement of the tricuspid valve.

Infant CXR



Child CXR



- **What is Ebstein's Anomaly?**
- Ebstein's anomaly is an abnormality in the tricuspid valve. The tricuspid valve separates the right atrium (the chamber that receives blood from the body) from the right ventricle (the chamber that pumps blood to the lungs).
- In Ebstein's anomaly, two leaflets of the tricuspid valve are displaced downward into the pumping chamber and the third leaflet is elongated and may be adherent to the wall of the chamber. These abnormalities cause the tricuspid valve to leak blood backwards into the right atrium when the right ventricle contracts and as a result, the right atrium becomes enlarged and. If severe enough, congestive heart failure can result. More rarely, the valve is so deformed that it will not allow blood to flow easily in the normal direction (right atrium to right ventricle).
- If pressure within the right atrium becomes very high due to the excessive backflow into it, a communication between the right atrium and left atrium known as the foramen ovale (which is normally present in the fetus and usually closes after birth) will remain open. This connection allows unoxygenated ("blue") blood to flow from the right atrium, bypassing the lungs and going directly to the body. This will result in lower oxygen levels in the blood.
- Ebstein's anomaly may occur with other heart lesions, such as pulmonary valve stenosis or atresia, atrial septal defect or ventricular septal defect. In addition, many patients with Ebstein's anomaly have an accessory (extra) conduction pathway in the heart (Wolff-Parkinson-White syndrome) leading to episodes of abnormal fast heart rate (supraventricular tachycardia.)
- **What signs or symptoms are associated with Ebstein's anomaly?**
- Ebstein's anomaly can range from very mild, with little symptoms, to very severe. Many patients with milder forms of Ebstein's anomaly do not have symptoms are diagnosed due to the presence of a heart murmur. Abnormal or extra heart sounds may also be present on the physical examination.
- Some babies and children have bluish discoloration to their lips and nail beds (cyanosis), due to the flow of blood from the right atrium to the left atrium. Children may complain that their heart races, skips a beat, or "hiccoughs." They may tire more easily than other children or become short of breath, particularly during play. In adolescents and young adults, the sensation of "heart skipping" (palpitations) or fast heart rate, shortness of breath, and chest pain may be the first symptoms. Growth and development are usually normal in patients with Ebstein's anomaly.
- Severely affected babies are often critically ill at birth, with low oxygen saturations (cyanosis) and heart failure requiring intensive care.

- 50. Cardiac MRI demonstrates delayed transmural enhancement @ 7 minutes. What is the most appropriate management.
 - medical management.
 - CABG

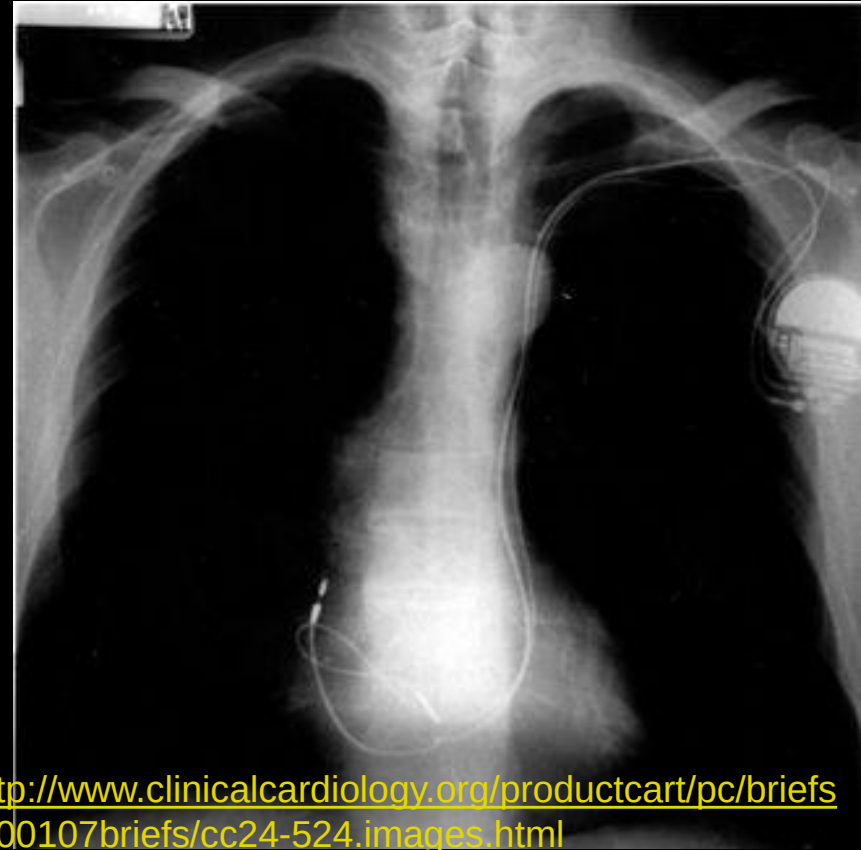
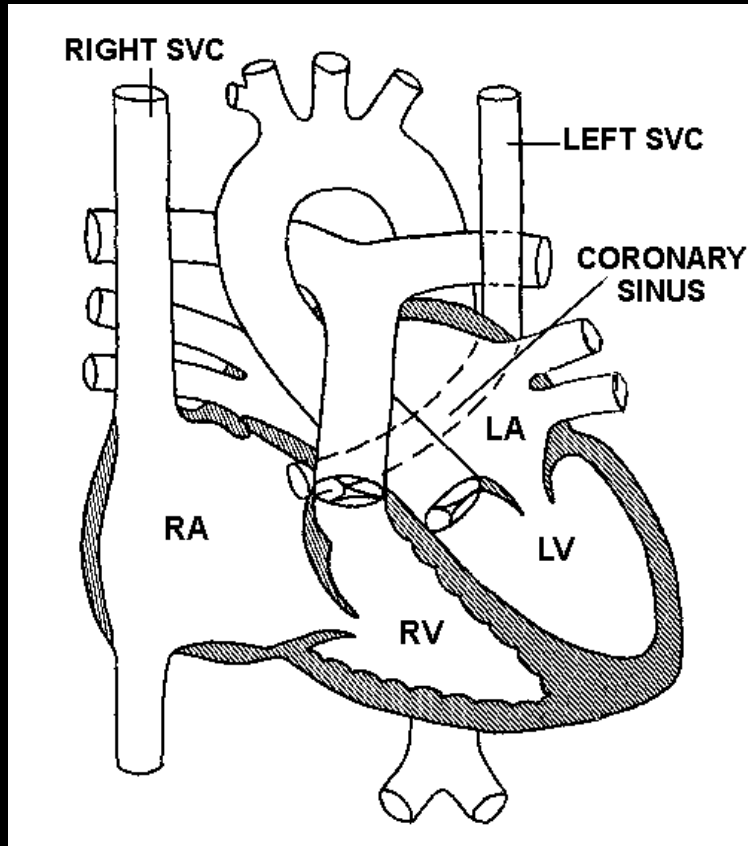
medical management

- A more reliable indicator of acute MI is contrast enhancement 5-20 minutes after the IV administration of gadolinium-based contrast material. Studies in patients after they had an MI have shown a good correlation between increased enhancement and infarcted tissue compared with healthy myocardium.
- After the contrast has washed out of other regions (5-10 min), it is retained in the altered cells of a myocardial infarction (10-20 min). Thus, T₁-sensitive inversion recovery imaging set to null (blacken) normal myocardium (typically 250 microseconds) produces a "scar map." The size and transmural depth are slightly larger shortly after a myocardial infarction, but, from 1 week onwards, they are stable indicators of scar extent. Delayed contrast enhancement can also be seen with inflammation and in sarcoid lesions. Scarring of less than one third of the wall thickness indicates viability, as determined by improved function with revascularization, whereas scarring of more than two thirds of the wall thickness indicates the opposite.

- 51. What structure does a persistent left superior vena cava most typically drain into?
 - Right atrium
 - Coronary sinus
 - Vertical vein
 - Left brachiocephalic vein
 - Right SVC

Coronary sinus

The answer is the coronary sinus.



<http://www.clinicalcardiology.org/productcart/pc/briefs/200107briefs/cc24-524.images.html>

• www.achd-online.com/diagrams/diagram3.htm

- 53. Which of the following is associated with complete tracheal rings? Options were:
 - Aberrant origin of the left pulmonary artery from the right pulmonary artery
 - Right and left aortic arch
 - Right arch with a left aberrant subclavian
 - Left arch with a right aberrant subclavian

Aberrent origin of the left pulmonary artery from the right pulmonary artery

- Pulmonary Sling
- The so called “Ring-Sling Complex”. The presence of a pulmonary sling (left pulmonary artery arising from the right pulmonary artery and coursing between the esophagus and trachea) is associated with tracheomalacia and stenosis secondary to complete cartilaginous rings in 55-60% of patients.

- 54. Which is associated with failure of normal development of sinus venosus.
- a. truncus arteriosus.
- b. tetralogy of Fallot.
- c. TAPVR
- d. VSD
- e. IVC occlusion

TAPVR

• Failure of the septum primum to normally form or abnormal septation of the sinus venosus can lead to direct connection of the pulmonary veins to the right atrium

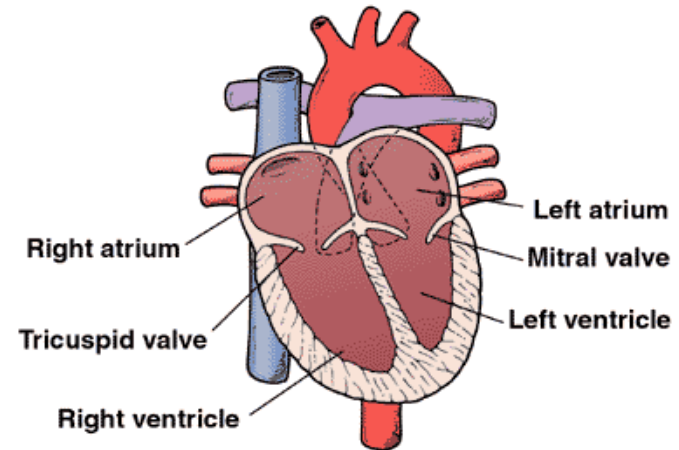
- Emecicine: TAPVR

- 56. Which is not associated with an endocardial cushion defect.
 - a. ostium primum defect.
 - b. mitral valve defect.
 - c. tricuspid valve defect.
 - d. ostium secundum defect.

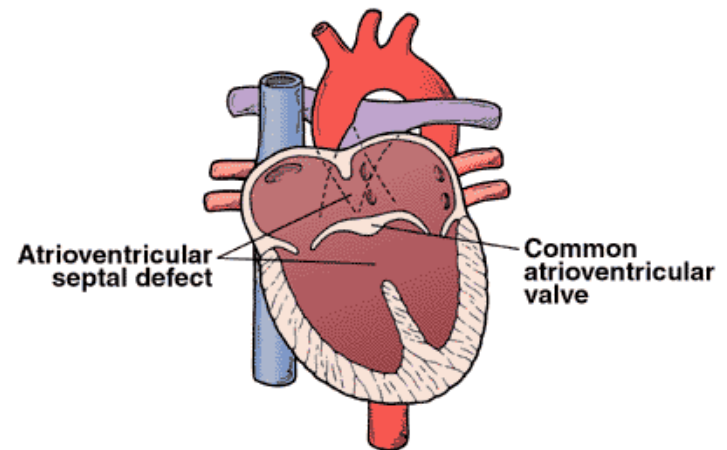
ostium secundum d

- A partial defect indicates atrial septal involvement with separate mitral and tricuspid valve orifices.
- AV canal defects arise from abnormal development of the endocardial cushions. In these patients, the superior and inferior cushions do not close completely. An interatrial communication is left at the lower portion of the atrial septum. This is called an ostium primum defect.
 - *Emedicine: Endocardial Cushion Defect*

Endocardial Cushion Defect



Normal Heart



Endocardial Cushion Defect

- 57. Cardiac tamponade results in which of the following?
 - a. LV diastolic dysfunction.
 - b. LV systolic dysfunction.
 - c. RV systolic dysfunction.
 - d. RV diastolic dysfunction.
 - e. LV diastolic and systolic dysfunction.

d. RV diastolic dysfunction

- PER DR. DIETHELM
- NEJM:
Volume 349:684-690 August 14, 2003 Number 7
- Acute Cardiac Tamponade
- *David H. Spodick, M.D., D.Sc.*
- “Among echocardiographic signs, the most characteristic, although they are not entirely specific, are chamber collapses, which are nearly always of the right atrium and ventricle. During early diastole, the right ventricular free wall invaginates, and at end diastole, the right atrial wall invaginates. Right ventricular collapse is a less sensitive but more specific finding for tamponade, whereas right atrial collapse is more specific if inward movement lasts for at least 30 percent of the cardiac cycle. **Right atrial collapse may be seen in patients with hypovolemia who do not have tamponade.** “

- 58. Cardiac MRI best view to determine ejection fraction?
 - a. FSE long axis.
 - b. FSE short axis.
 - c. cine short axis.
 - d. cine long axis.

cine short axis

- Based on the 2005 RSNA lecture outlining at the following link.

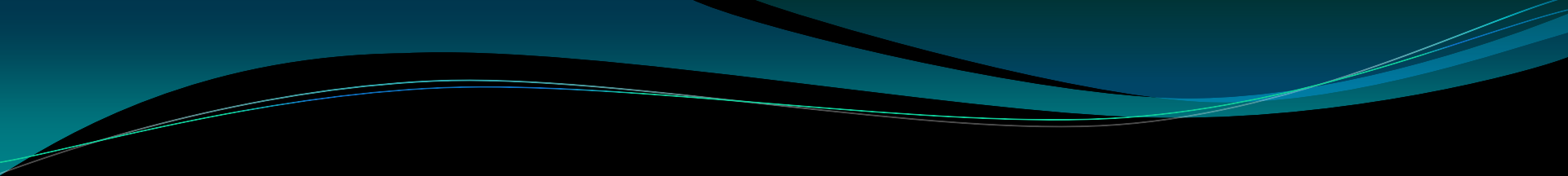
<http://tools.med.nyu.edu/RSNA05Handouts/RSNA2005Cardiac.pdf>

- (it's all about the modified Simpson's rule)

- The arterial supply to the SA node is from:
- a. left coronary artery
- b. branch of the LAD
- c. distal right circumflex coronary artery
- d. proximal right coronary artery
- e. conus branch of the right coronary artery

proximal right coronary artery

- The sinoatrial node artery (SANA) is the 2nd branch from the right coronary artery (in >50%)
- The conus artery is the 1st branch from the RCA (in 50% directly from the aorta) to supply the RVOT

- 
- What is the most common congenital heart disease?
 - a. ASD
 - b. Membranous VSD
 - c. Tetralogy of Fallot
 - d. Bicuspid aortic valve
 - e. PDA

Bicuspid aortic valve

- Bicuspid aortic valves may be present in up to 1-2% of the population. Because
- the bicuspid valve may be entirely silent during infancy, childhood, and
- adolescence, these incidence figures are not generally included in the overall
- incidence of congenital heart disease. "Most centers report VSD as the most
- common congenital cardiovascular anomaly if one excludes a bicuspid aortic
- valve from consideration." (Kirks 3rd p. 534) VSD has a frequency of 1.3 - 3.5
- per 1000 live births. "Ventricular septal defect (VSD) is the second most
- common cardiac malformation accounting for approximately 20% of all
- congenital
- cardiac anomalies."
- "VSD is the most common cardiac anomaly, accounting for 30% of heart
- defects in
- live-born infants and 9.7% of fetuses. It accounts for 50% of all
- cardiovascular lesions." Rumack 2nd p. 1140 Dr. Stein-Wexler would say VSD.
- While bicuspid aortic valve is technically more common, it is not commonly
- thought of as a congenital cardiac anomaly.
- Medline Encyclopedia "Bicuspid aortic valve is present at birth (congenital). An abnormal aortic valve develops during the early weeks of pregnancy, when the baby's heart develops. The cause of this problem is unclear, but it is the most common congenital heart disease. It often runs in families."

- 59. Which of the following have an increased EF:
 - AI
 - Dilated cardiomyopathy
 - Atrial fibrillation
 - Early mitral insufficiency
 - remote myocardial infarction

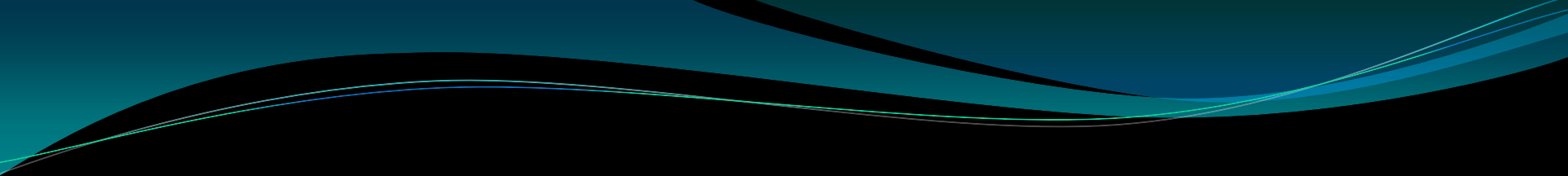
AI and early mitral insufficiency

- Reference pdf article from New England journal of medicine.
- <http://scalpel.stanford.edu/articles/Valvular%20heart%20DZ.pdf>

and therefore end-systolic volume (ESV) is reduced from 50 to 30 ml. The ejection fraction (EF) increases acutely, but because 50 percent of the total stroke volume is regurgitated into the left atrium, resulting in a regurgitant fraction (RF) of 0.50, forward stroke volume (FSV) is reduced from 100 to 70 ml. The increased volume in the left atrium raises pressure there from normal to 25 mm Hg.

- Severe aortic insufficiency also has increased EF

- 60. Diastolic reversal of flow in the internal carotid arteries.
- a. aortic insufficiency.
- b. aortic stenosis.



A. Aortic Insufficiency

- 61. Which of the following is the most common cause of a vascular ring
 - Aberrant left pulmonary artery
 - Right aortic arch with aberrant left subclavian
 - Left aortic arch with aberrant right subclavian
 - Right aortic arch with mirror image branching
 - NOTE: double aortic arch was not a choice (same deal in 2003/2005)- note that double aortic arch is the most common cause

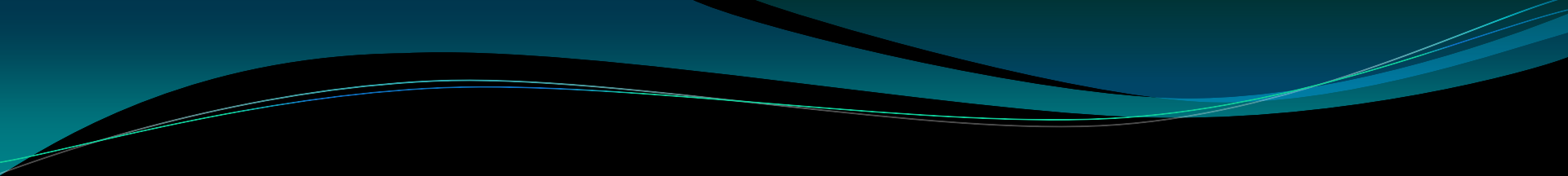
Right aortic arch with aberrant left subclavian

- In the most frequent form of vascular ring with a right aortic arch, an aberrant origin of the left subclavian artery from a retroesophageal diverticulum (diverticulum of Kommerell) is present, which originates as the last branch of the aortic arch (distal to the right subclavian artery). The ring is completed by a left-sided ductus arteriosus (or its remnant ligamentum arteriosum) passing from the aberrant left subclavian artery to the proximal left pulmonary artery (see Media file 2).
 - emedicine

- 62. The correct relationship of the pulmonic valve relative to the aortic valve: Please note that .
- b. Inferior, posterior, and right
- c. Superior, anterior, and left
- d. Inferior, anterior, and left
- e. Inferior, posterior, and left

Superior anterior and to the left

- SFH – check out anatomy site e-anatomy
- www.e-anatomy.org

- 
- 63. Following MI, a false ventricular aneurysm is worrisome because:
 - Rupture
 - Conduction abnormalities
 - Decreased diastolic volume
 - Diminished ventricular contractility

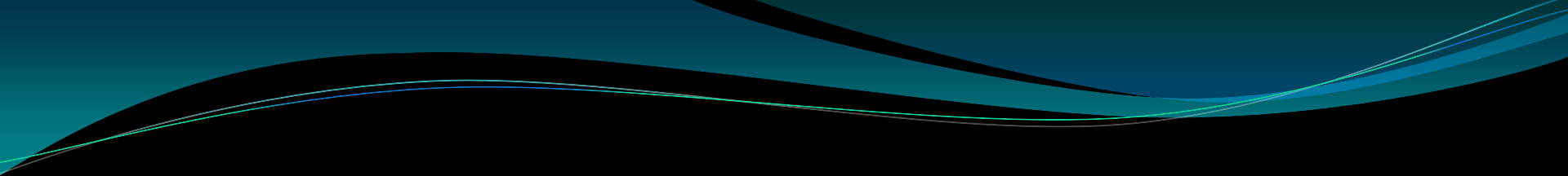
rupture.

- <http://www.learningradiology.com/notes/cardiacnotes/ventaneurysmpage.htm>

- **Ventricular Aneurysms**

- Congenital left ventricular aneurysms
 - Rare
 - Young black adults
 - Produce abnormal bulge in region of left atrium or
 - Cardiac enlargement from aortic insufficiency
- Acquired left ventricular aneurysms
 - Usually complication of myocardial infarction
 - May be associated with
 - Persistent congestive heart failure
 - Arrhythmias
 - Peripheral embolization
 - Usually are either true or false aneurysms
- True ventricular aneurysms
 - Localized outpouching of ventricular cavity
 - Associated with dyskinesia
 - Wide-mouthed in connection with the LV
 - Anterolateral or apical wall
 - Frequently not visible on chest x-ray but may produce localized bulge of left heart border
 - Paradoxical expansion during systole
 - May have rim of calcium in fibrotic wall
 - Ventriculography is diagnostic
 - Complications: Thrombus with embolization; Rarely rupture
- False or pseudoaneurysms
 - False aneurysm occurs when left ventricle ruptures into pericardial sac
 - Pericardial adhesions contain rupture
 - Usually occurs on posterolateral wall
 - Diameter of mouth is smaller
 - Causes
 - Myocardial infarction
 - Trauma
 - Increase in size over serial films suggests false aneurysm
 - This finding indicates the patient requires immediate attention
 - High risk of delayed rupture
 - Calcification of left ventricular wall takes several years after myocardial infarction

- 64. Which native structure is preserved during an orthotopic heart transplant?
 - Pulmonic valve
 - Posterior wall of left atrium
 - Right atrial appendage
 - Coronary sinus
 - Sinus of Valsalva



Posterior wall of the left atrium

- 65. Location of ablation to correct a-fib.
- a. SA node.
- b. AV node.
- c. Bundle of HIS.
- d. Bachmann? Bundle.
- e. Ostia of pulmonary veins.

the ostia of the pulmonary veins.

- **Pulmonary vein antrum isolation**: Research has shown that almost all atrial fibrillation signals come from the four pulmonary veins. During this procedure, special catheters are inserted into the heart. Two catheters are inserted into the right atrium and two into the left atrium. The left atrium is accessed through a transeptal puncture.
- Intracardiac echocardiogram is used to visualize the left atrium during the procedure. One catheter in the left atrium is used to map or locate the abnormal impulses coming from the pulmonary veins. The other catheter is used to deliver the radiofrequency energy to ablate, or create lesions outside the pulmonary veins. The procedure is repeated for all four pulmonary veins.
- The lesions heal and within 4 to 8 weeks, form a circular scar around the pulmonary veins. The scar blocks any impulses firing from within the pulmonary veins, thereby "disconnecting" the pathway of the abnormal rhythm and curing atrial fibrillation
 - Cleveland clinic

- 66. Patient s/p single vessel R CABG on non-dominant right system (remote) now presents with inferior wall ischemia on Thallium scan. This represents.
 - a. graft failure.
 - b. new right disease.
 - c. new left disease.

new left disease

- Answer is C. Dominance of the coronary arterial system is defined by which artery gives rise to the posterior interventricular artery (posterior descending artery), which supplies the diaphragmatic surface of the heart. Most people are right dominant, 10% are left dominant, and 15% are co-dominant [Moore, Clinically Oriented Anatomy]. In this case, patient is non right dominant, which means the diaphragmatic surface of the heart is largely supplied by the left coronary artery. Therefore new inferior wall MI is new left disease.

- 67. Long axis view is best to demonstrate.
- a. Tetralogy of Fallot.
- b. AV canal.
- c. Transposition.

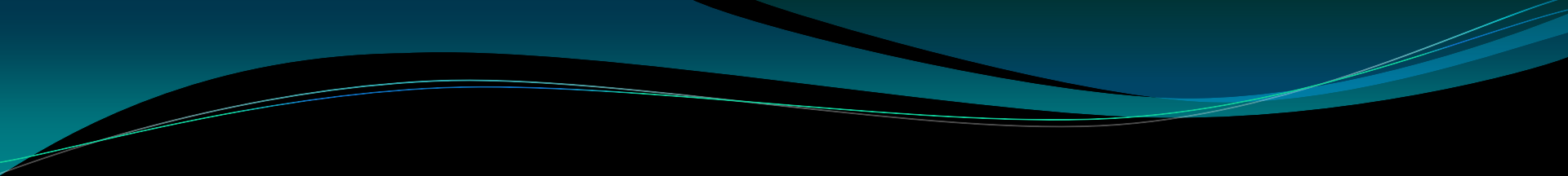
b. AV canal

- Discussed with various chest attendings. Nobody is really sure, but everybody's guess is b (AV canal). 2004 recall on acpacs had a similar question, where the question asked what's the best way to image AV canal, and the answer given was also horizontal long axis view.
- On echo the best view is long axis
 - <http://www.orpha.net/data/patho/GB/uk-PAVC.pdf> - SFH

- A patient status post bone marrow transplant 2 years presents with slowly increasing shortness of breath and normal plain film and routine chest CT. What should you do next?
 - conventional pulmonary angiogram.
 - CT pulmonary angiogram
 - Expiratory CT

Answer: c. exp CT

- Looking for BO
- www.auntminnie.com/index.asp?sec=ref&sub=thi&page=misc&itemid=53651&d=1

- 
- Which finding is most characteristic of acute pulmonary emboli?
 - filling defect
 - webs
 - Mural thrombus
 - Wall thickening

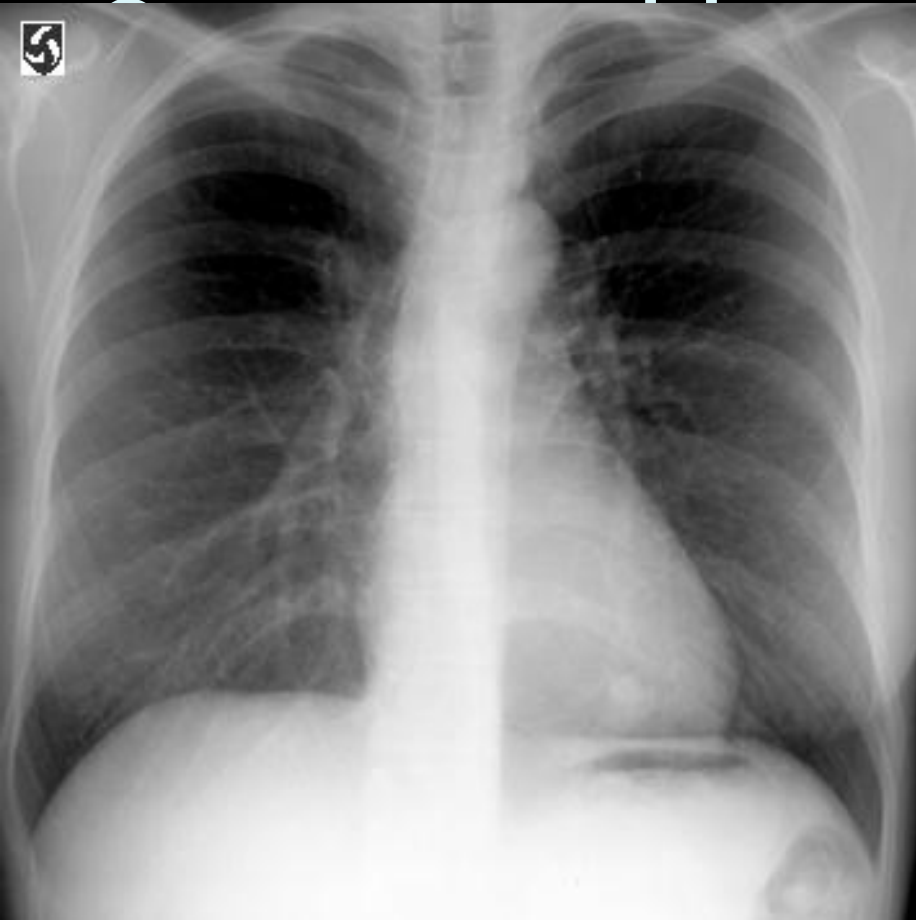
Answer: A. filling defect

- The others are associated with chronic PE
- http://www.ijri.org/articles/archives/2002-12-2/thoracic_207.htm

- What is the most likely cause for a 19 year old with LUL hyperlucency and suprahilar branching mass?
 - CLE
 - segmental bronchial atresia
 - Small cell lung cancer

Segmental bronchial atresia

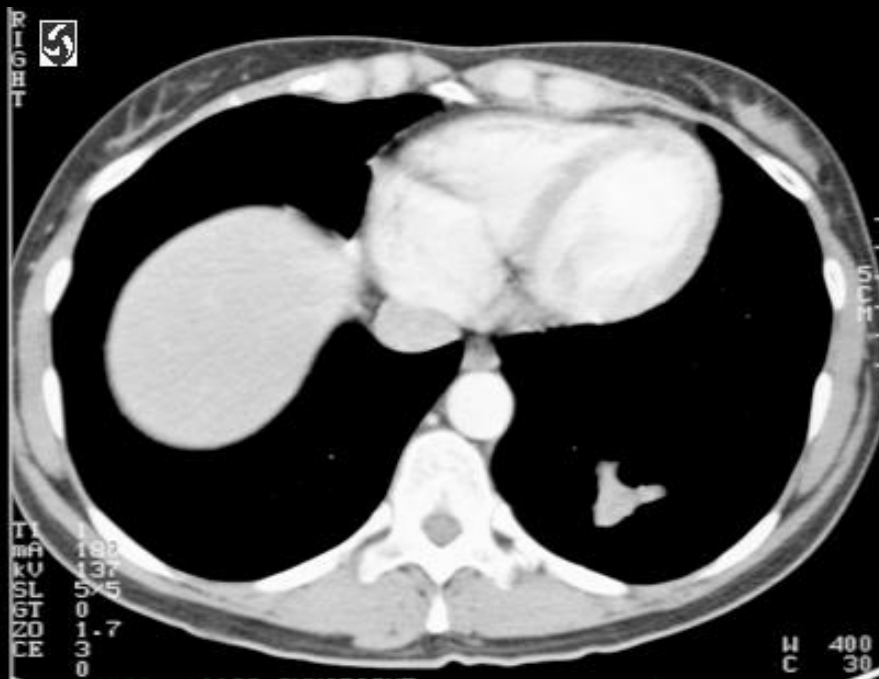
- Apicoposterior segment of LUL (>>RUL/ML)
- Decreased perfusion
- Overexpanded segment (collateral air drift with expiratory air trapping)
- Fingerlike opacity lateral to hilum (=mucinous plug distal atretic lumen) is CHARACTERISTIC
- DDx CLE has no mucous plug
 - Dahnert



nc



Segmental bronchial atresia



- What is the most common mediastinal germ cell tumor?
 - Seminoma
 - Immature Teratoma
 - Embryonal Cell
 - Endodermal Sinus Tumor
 - Choriocarcinoma
 - Yolk sac tumor

Answer: b Immature teratoma

- www.auntminnie.com/index.asp?sec=ref&sub=thi&page=med&itemid=55194
- Mature Teratoma 75-86%
- Immature Teratoma 14-20%
- Seminoma 2-6%
 - Dahnert

- Where is damage first seen in UIP?
 - alveolar wall
 - terminal bronchiole
 - interlobar septum

a. Alveolar walls

- <http://www.uhrad.com/ctarc/cto59.htm>
- A disruption in the homeostasis of alveolar epithelial cells caused by unknown endogenous or environmental stimuli is thought to occur
 - emedicine

- **Which is best to assess UIP (Pulmonary Fibrosis)**
 - High res. inspiratory/expiratory CT
 - CXR
 - CT thorax with contrast

Answer: a. High res.
inspiratory/expiratory CT

- **Which drug most characteristically causes hilar adenopathy?**
 - Bromocryptine
 - Diphenylhydantoin
 - Valium
 - INH
 - Phenobarbitol

Diphenylhydantoin

- diphenylhydantoin (aka phenytoin). Drug reactions: Adverse drug reactions can cause generalized lymphadenopathy. Within a couple of weeks of initiating phenytoin, some patients experience a syndrome of regional or generalized lymph node enlargement, followed by a severe maculopapular rash, fever, hepatosplenomegaly, jaundice, and anemia. These symptoms abate 2-3 months after discontinuation of the drug. Several other drugs are implicated in similar symptomatology, including mephenytoin, pyrimethamine, phenylbutazone, allopurinol, and isoniazid. From <http://www.emedicine.com/PED/topic1333.htm> and http://www.scorecard.org/chemical-profiles/summary.tcl?edf_substance_id=630-93-3

- **With exercise, the lungs are able to accommodate increased blood flow without increase in pulmonary pressure. What is underlying mechanism responsible for this?**
 - Decrease in pulmonary venule resistance
 - Decrease in pulmonary capillary resistance
 - Decrease in pulmonary arteriole resistance
 - Increased heart rate

Decrease in pulmonary capillary resistance

- In *systemic* circulation, *arterioles* are the site of the greatest pressure change.
- The pressure change occurs at the *capillaries* in the *pulmonary* circulation.
- At rest, over half of the pulmonary capillary bed is not open.
- As exercise increases cardiac output and PA blood flow, the pulmonary capillaries respond by:
 - Recruitment – closed capillaries open
 - Distention – open capillaries distend
- This results in a larger capillary bed and lower resistance. This allows pulmonary arterial pressure to remain constant.
- (Berne RM, Levy MN. Physiology, 4th edition. Pgs 523-525)

- In a hypoxic patient and normal PCO_2 , administration of 100% oxygen shows no improvement in PaO_2 . What is the most likely cause?
 - Left to right shunt
 - Right to left shunt
 - Hypoventilation
 - Diffusion abnormality
 - V/Q mismatch

Right to left shunt

- Prior recalls, common knowledge.
- For the unbelievers: Marples IL. Et Al. Acute right-to-left inter-atrial shunt; an important cause of profound hypoxia. British Journal of Anesthesia. Vol 85 no. 6, pp 921-925.

- **On a lateral view of the chest, which of the following is TRUE?**
 - Anterior portion of bronchus intermedius is well seen
 - Right upper lobe bronchus is better seen than left upper lobe bronchus
 - Pulmonary venous confluence is inferior to the right and left upper lobe bronchi
 - Left pulmonary artery is inferior to the left main stem bronchus
 - Confluence of pulmonary veins is inferior to the carina

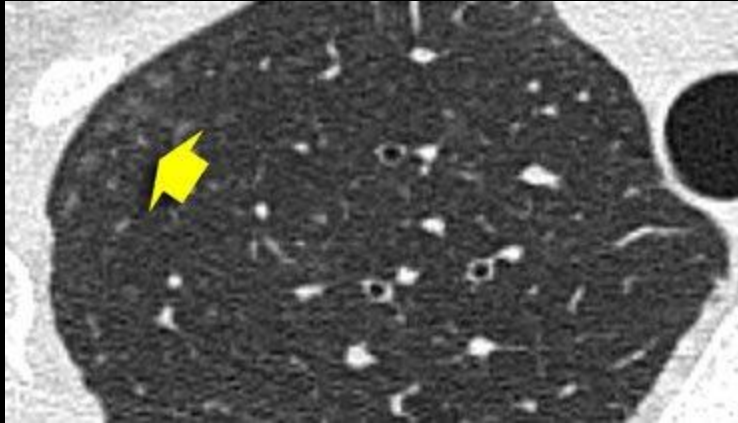
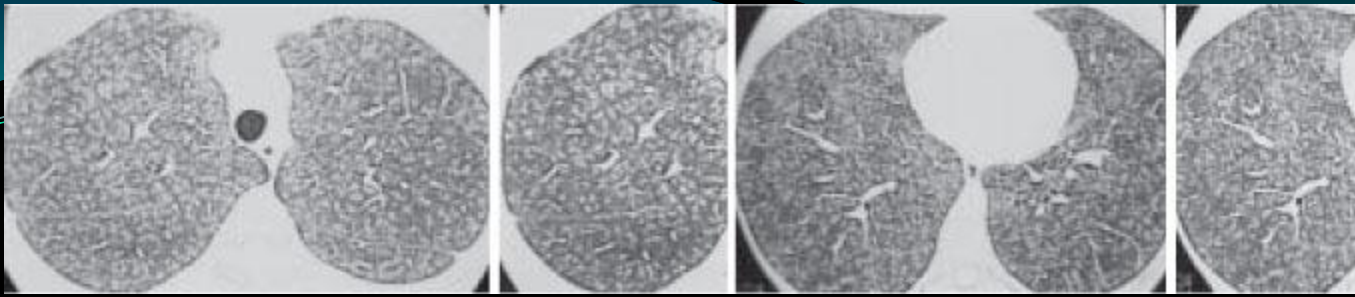
Answer C. Pulmonary venous confluence is inferior to the right and left upper lobe bronchi

- On a lateral chest radiograph, the tracheal air column is always visible. The left upper lobe bronchus is more often visible than the right (70% vs. 30%). The right upper lobe bronchus branches from the trachea more superiorly than the left. Between the right and left upper lobe bronchi the posterior wall of the right bronchus intermedius can be seen. The left pulmonary artery arches over the left mainstem bronchus (left main bronchus is hyparterial). The confluence of pulmonary veins are inferior and anterior to the right and left bronchi. (Previous recalls and Netter)

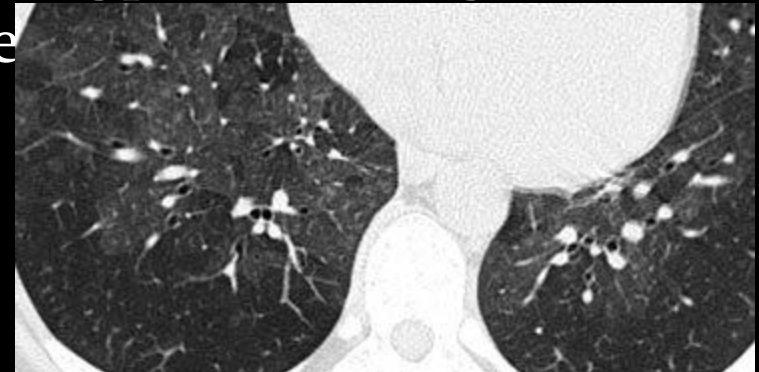
- **Which is NOT associated with smoking? (repeat)**
 - extrinsic allergic alveolitis
 - centrilobular emphysema
 - laryngeal ca
 - E.G.
 - RB-ILD

extrinsic allergic alveolitis

- **Extrinsic allergic alveolitis = hypersensitivity pneumonitis**
 - Inhaled antigens cause lymphocytic infiltration of alveolar walls
 - Acute: diffuse reticulonodular with superimposed airspace consolidation
 - Subacute: diffuse reticulonodular and ground glass opacities, mosaic attenuation
 - Chronic: Midzone predominance. Fibrosis/bronchiectasis/air trapping. (Dahnert)
- Smoking related interstitial lung disease spectrum:
 - Respiratory Bronchiolitis (RB)
 - Asymptomatic. Centrilobular nodules, bronchiolar thickening, air trapping, GGO in upper lobes
 - Respiratory bronchiolitis – Interstitial Lung disease (RB-ILD)
 - Symptomatic: restrictive PFTs. Radiologic appearance similar to RB
 - Desquamative Interstitial Pneumonia
 - Symptomatic. Symmetrical basilar ground glass opacities with reticulonodular changes and multiple air cysts, emphysema (Galvin AFIP Notes)
- Hypersensitivity Pneumonitis pic below



- **Hypersensitivity Pneumonitis**
- Ill defined centrilobular nodules of ground glass density in a patient with hypersensitivity pneumonitis
- Mosaic pattern in a patient with hypersensitivity pne



- 192. What is the correct N staging for a patient who presents with a NSCLC and ipsilateral supraclavicular lymph nodes?
 - N₁
 - N₂
 - N₃

Answer C. N3

- N₁ = ipsilateral hilar
- N₂ = ipsilateral mediastinal
- N₃ = contralateral mediastinal, or supraclavicular/scalene
- (eMedicine)

- Which of the following is NOT associated with pulmonary HTN?
 - Pulmonary AVM
 - Schistosomiasis
 - Mitral stenosis
 - Eisenmenger's syndrome

Answer: A. Pulmonary AVM

- Causes of PHTN can be grouped into 3 categories:
- Obliteration of the pulmonary vascular bed: emphysema, chronic PE, fibrosis, parasites. Need to obliterate >60% of vessels.
- Hypoxic vasoconstriction: COPD, High altitude, chronic hypoxic states (neuromuscular hypoventilation, sleep apnea)
- Volume/pressure overload: left-to-right shunts/Eisenmenger/cor pulmonale, left atrial hypertension from mitral/aortic valvular disease or LV dysfunction. (Dahnert)
- In the schistosomiasis life cycle, worms in the gut lay eggs that travel thru the portosystemic pathway/right heart to lodge in the pulmonary arterioles. They cause an obliterative endarteritis leading to PHTN. (eMedicine)
- And remember someone has to eat shit for the life cycle to be complete, so wash those hands...

- **.Which is true of pectus excavatum?**
 - Can mimic RML pneumonia .
 - Involves manubrium

can mimic RML pneumonia

- Regarding Pectus excavatum on lateral and PA views: The portion of the right chest wall adjacent to the sternum is seen tangentially, resulting in increased opacity, and the right heart border is obliterated. This may erroneously simulate right middle lobe disease. Recognition of the sternal depression on the lateral view is the clue to the diagnosis; the apparent “right middle lobe” opacity follows as a result of the pectus excavatum and should not be interpreted as right middle lobe pneumonia.

Pectus Excavatum



- A patient who had negative procedure (?bronchoscopy) presents with increased SOB. CT with contrast and PFT's are normal. Which of the following procedures is the next most appropriate step?
 - Inspiratory/expiratory HRCT
 - Transesophageal echo
 - Exploratory thoracotomy
 - pulmonary biopsy

Inspiratory/expiratory HRCT

- transesophageal echo. (d) and (e) don't make sense. Since PFTs and CT are both normal unlikely that (b) will be high yield. The question is likely recalled incorrectly.
- Probabaly should have read: **A patient status post bone marrow transplant 2 years presents with slowly increasing shortness of breath and normal plain film and routine chest CT. What should you do next? Answer is a**

- 1) **The arterial supply to the AV node is from:**
 - A) left coronary artery
 - B) branch of the LAD
 - C) distal right coronary artery
 - D) proximal right coronary artery
 - E) conus branch of the right coronary artery

C) distal right coronary artery

- The sinoatrial node artery (SANA) is the 2nd branch from the right coronary artery (in >50%)
- The conus artery is the 1st branch from the RCA (in 50% directly from the aorta) to supply the RVOT
 - *Dähnert 5th p. 596*
- *AV NODE = distal RCA branch*

- **Abnormality of which of the following is most responsible for the symptoms in pericardial tamponade?**
 - LV diastole
 - RV diastole
 - LV systole
 - RV systole

d. RV diastolic dysfunction.

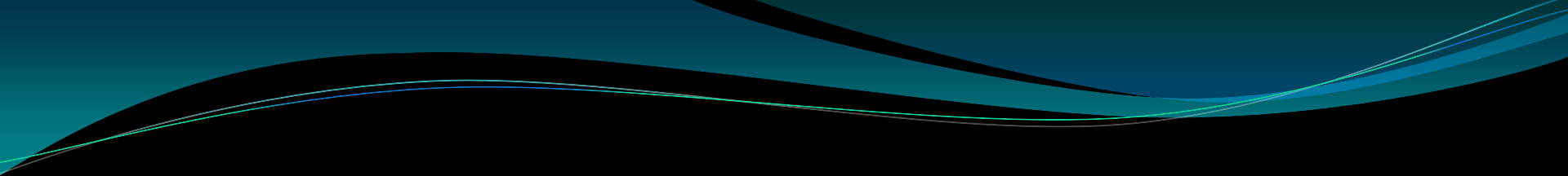
- PER DR. DIETHELM
- NEJM:
Volume 349:684-690 August 14, 2003 Number 7
- Acute Cardiac Tamponade
- *David H. Spodick, M.D., D.Sc.*
- “Among echocardiographic signs, the most characteristic, although they are not entirely specific, are chamber collapses, which are nearly always of the right atrium and ventricle. During early diastole, the right ventricular free wall invaginates, and at end diastole, the right atrial wall invaginates. Right ventricular collapse is a less sensitive but more specific finding for tamponade, whereas right atrial collapse is more specific if inward movement lasts for at least 30 percent of the cardiac cycle. Right atrial collapse may be seen in patients with hypovolemia who do not have tamponade.”

- **What is a normal structure that commonly simulates a right atrial mass?**
 - crista terminalis
 - crista supraventricularis
 - papillary muscle
 - chordae

CRISTA TERMINALIS

- The papillary muscles are in the ventricles.

- **A patient comes for cardiac CT with a heart rate of 90. What should you do?**
 - Do without contrast
 - Administer beta blocker
 - Don't use gating
 - Administer aminophylline



Administer beta blocker

- **MRI for velocity measurement is performed. Number of phase encoding steps is set at 200. Aliasing is seen. How many phase encoding steps will need to be set to prevent aliasing?**
 - -200
 - 0
 - 100
 - 200
 - 300

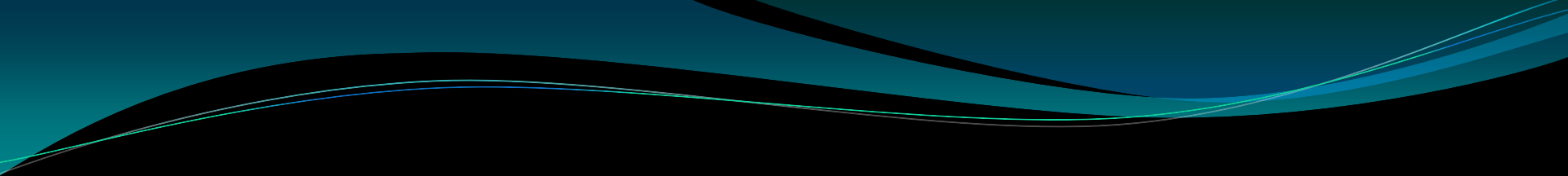
300cm/s

- Aliasing occurs when you exceed the scale similar to Doppler, so in this case the scale is 200cm/s, so a velocity of 300cm/s would probably appear erroneously as -100cm/s

- Left atrial enlargement repeat 2003
 - a. atrial fibrillation

****atrial enlargement is common in AF**

On other recalls, mitral regurg and mitral stenosis are answers and are better

- 
- **What is most associated with ascending aortic aneurysm?**
 - Aortic valvular disease
 - Atherosclerosis
 - Dissection
 - Cystic Medial necrosis

Cystic Medial Necrosis

- Ascending Thoracic Aneurysm
 - causes of thoracic cystic medial degeneration (necrosis) - breaking down of the tissue of the aortic wall. This is the most common cause of this type of thoracic aortic aneurysm.
 - genetic disorders which affect the connective tissue, such as Marfan syndrome and Ehlers-Danlos syndrome
 - aging
 - atherosclerosis - hardening of the arteries caused by a build-up of plaque in the inner lining of an artery. This is a rare cause of ascending thoracic aortic aneurysm.
 - infection, syphilis (rare aortic aneurysm)
 - Dahnert

- **A patient with a prior LAD infarct, status post CABG and known RCA dominance presents with chest pain and found to have ST segment depressions on ECG. What is the likely cause?**
 - new high grade stenosis in circumflex territory
 - occlusion of bypass graft
 - posterior wall infarct
 - acute infarct in LAD territory

new high grade stenosis in circumflex territory

- In short I think C. and D. are excluded because ST depression is a sign of ischemia not infarct. A. is more likely than B. because progression of disease in native vessels is more likely to result in recurrent symptoms than graft narrowing/occlusion. More info below if you want.

- **During radiofrequency ablation for atrial fibrillation which, of the following is being ablated?**
 - Posterior wall of left atrium/pulm vein ostia
 - S-A node
 - A-V node
 - Bachman's bundle
 - Purkinje's fibers

Posterior wall of left atrium/pulm vein ostia

- In the opinion of the author, the best technique currently available for curing paroxysmal AF (assuming it originates from the pulmonary veins) is segmental isolation of the pulmonary veins by discrete applications of radiofrequency energy at the ostia, guided by pulmonary vein potentials." Scheinman M. "Nonpharmacological Approaches to Atrial Fibrillation," *Circulation*. 2001;103: p. 2120

- **Most common cause of restrictive cardiomyopathy:**
 - Alcohol
 - Familial Amyloidosis
 - IHSS
 - Amyloid

Amyloid

- **Definition:** "Restrictive cardiomyopathy" refers to a group of disorders in which the heart chambers are unable to fill properly with blood because of stiffness of the heart. In restrictive cardiomyopathy, the heart is normal in size or only slightly enlarged, but it cannot relax normally during diastole (that is, the time between heartbeats in which the blood returns from the body to the heart). Later in the disease, the heart may not pump blood efficiently. The abnormal heart function can affect the lungs, liver, and other body systems. Restrictive cardiomyopathy may affect either or both ventricles and may or may not be associated with a disease of the heart muscle.
- **Causes, incidence, and risk factors:** The most common causes of restrictive cardiomyopathy are amyloidosis and idiopathic myocardial fibrosis (a scarring of the heart of unknown cause). Restrictive cardiomyopathy is frequently encountered after a heart transplantation. Other causes of restrictive cardiomyopathy include sarcoidosis, hemochromatosis, radiation fibrosis, and various tumor infiltrations of the heart. More rarely, restrictive cardiomyopathy is caused by diseases of the endocardium (the lining of the heart) such as endomyocardial fibrosis and Loeffler's syndrome.
- **Restrictive cardiomyopathy**
- **Etiology:**
 - (a) infiltrative disease: amyloid, glycogen, hemochromatosis

- **Regarding endotracheal intubation, which of the following is true?**
 - a. The ETT moves caudally with flexion of the head
 - b. Inflation of the cuff prevents aspiration
 - c. Granuloma formation secondary to intubation most often involves the posterior wall of the trachea
 - d. An LPO CXR is the best way to evaluate for esophageal intubation
 - e. Left main stem bronchus intubation is more common than right main stem bronchus

A. The ETT moves caudally with flexion of the head

- Flexing of the neck can move the tip 2 cm inferiorly. Extending the neck can move the tip superiorly by 2 cm.
- Posterior granulomas usually affect the larynx, not trachea.
- While the balloon decreases the chance for aspiration, it cannot completely prevent it.
- The right main stem is more often intubated.
 - *Source: Primer 3rd ed. p.108*
- Neutral neck: 4- 6 cm above carina
- Flexed neck: moves tip inferiorly (caudal) by 2 cm
- Extended neck: moves tip superiorly (cranial) by 2 cm
 - (Primer, Common repeat)

- 60-yo male has shortness of breath & syncope when lying on left. Best exam is:
 - Echocardiography
 - Cardiac cath
 - Doppler of the left carotid
 - Selective rt ventriculogram
 - Selective lt ventriculogram

Echocardiography

- A. Suspect left atrial myxoma with the history of positional symptoms. Study of choice per Dahnert (pg 531) is 2D echocardiography
- Syncope noted with specific positional changes may suggest a pedunculated (left) atrial myxoma intermittently causing obstruction to ventricular inflow. Myxoma may present with positional symptoms due to hemodynamic obstruction – arrhythmia (20%), heart murmur, congestive heart failure (valve obstruction), syncope. 2-D echocardiography is the study of choice.
- *Dähnert 5th p. 639*

- Which is the best view to estimate left ventricle volume?

- a. short axis
- b. sagittal
- c. coronal
- d. horizontal long axis
- e. vertical long axis

- **In MRI, which is the best plane to image the left ventricle for hypertrophy?**

- Axial
- Coronal
- Four chamber view
- Sagittal long axis

short axis.

- “Many methods of ventricular volume calculation are used. Rehr et al, as well as Pearlman et al, found excellent correlation between findings at volumetric analysis with MRI and findings with ventricular casts (0.99 correlation, 4.9 mL standard error). **Accuracy increases with the inclusion of long-axis measurements.**” Take your pick, I guess
- Ventricular analysis requires a true short-axis plane.
 - Emedicine.com; Radiology

- For evaluation of the aortic valve, which MRI view would you use?
 - short axis
 - long axis
 - Four chamber view
 - Oblique view

oblique view

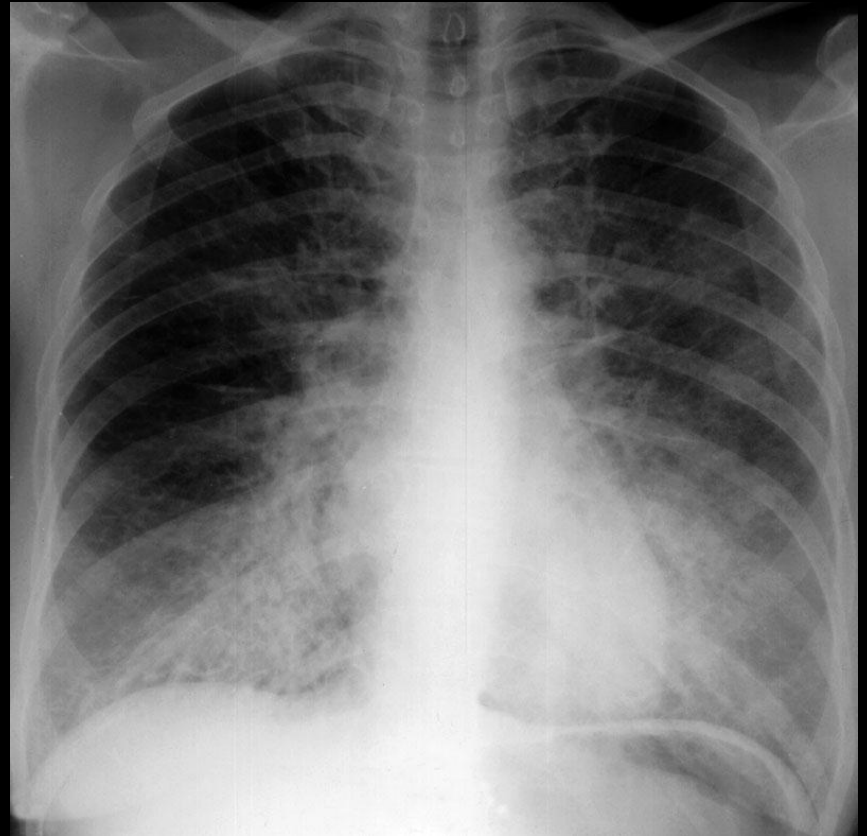
- * Dr. Goitein says that she uses the LVOT view to assess the aortic valve, so this is the answer that most closely fits.
- EMedicine.com says this: Ventricular analysis requires a true short-axis plane. This author's approach begins with the selection of an image from the coronal series that depicts both the cardiac apex and proximal ascending aorta. A few breath-hold GE or DIR sections are prescribed along an oblique axial plane parallel to a line from the cardiac apex through the middle of the aortic root (see [Image 7](#)). The result is a quasi 4-chamber view on which the interventricular septum can be localized. Cine imaging is performed from the apex to the base of the heart in a left parasagittal plane perpendicular to the interventricular septum (see [Image 8](#)). This provides short-axis images with excellent depiction of the aortic and pulmonary outflow tracts for ventricular analysis. The aortic and pulmonary valves can be evaluated in this fashion; image interpretation is limited with 8-mm sections but better with contiguous 5-mm sections.
 - ***Clinical cardiac MRI***
 - *By Jan Bogaert*

What is the CXR appearance of a L atrial myxoma?

- a. similar to mitral stenosis
- b. attached to septum but will not prolapse
- c. most commonly arises from anterior leaflet of mitral valve

similar to mitral stenosis

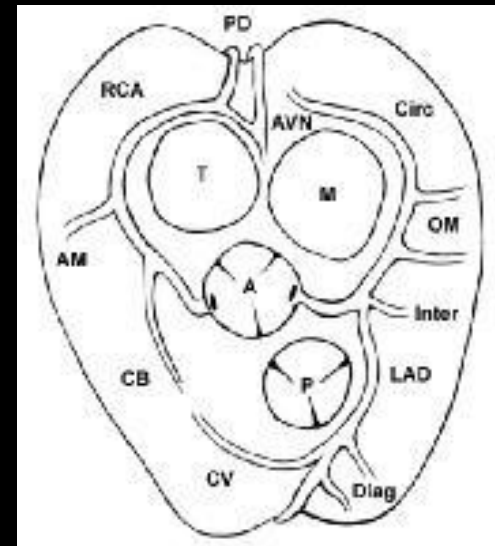
- Abnormal cardiac silhouette, mimicking mitral stenosis
 - emedicine



- **Stress MR Imaging demonstrates septal ischemia without any other ischemic regions. Which coronary artery is involved?**
 - Left main
 - Lad
 - Right Coronary
 - Left circumflex
 - Diagonal

ANS: A) LAD

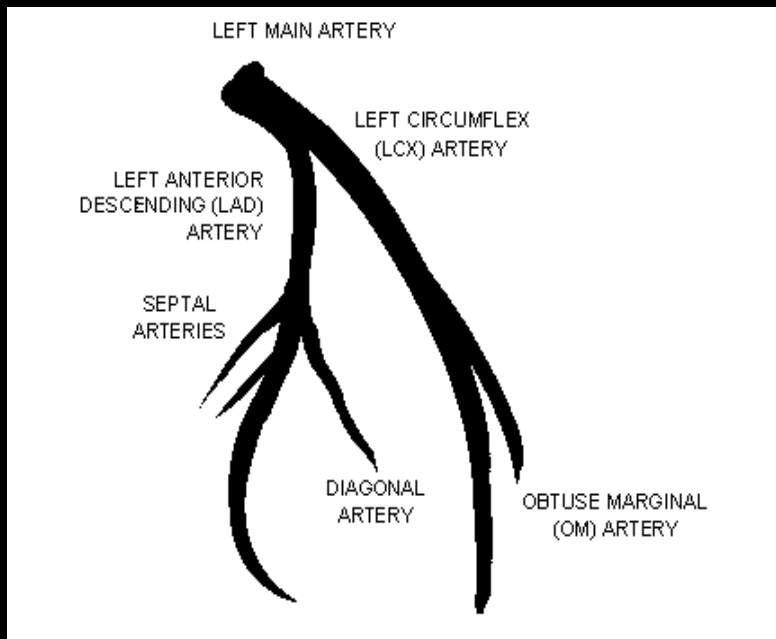
- The left coronary artery (LCA) arises from the aorta above the left cusp of the aortic valve as the left main (LM) artery. The left main artery typically runs for 1 to 25 mm and then bifurcates into the left anterior descending (LAD) artery and the left circumflex artery (LCX). If an artery arises from the left main between the LAD and LCX, it is known as the ramus intermedius. The ramus intermedius occurs in 37% of the general population, and is considered a normal variant.
- The LAD runs down the anterior interventricular groove. In 78% of cases, it reaches the apex of the heart. It supplies the anterolateral myocardium, apex, and interventricular septum. The LAD typically supplies 45-55% of the left ventricle (LV). The LAD gives off two types of branches: septals and diagonals. Septals originate from the LAD at 90 degrees to the surface of the heart, perforating and supplying the intraventricular septum. Diagonals run along the surface of the heart and supply the lateral wall of the LV and the anterolateral papillary muscle.
- Circumflex supplies posterolateral LV and anterolateral papillary muscle. Also supplies sinoatrial nodal artery in 35% of population. Supplies 15-25% of LV in R dominant systems. If L dominant, L circumflex supplies 40-50% of LV.
- The right coronary artery (RCA) originates above the right cusp of the aortic valve. It travels down the right atrioventricular groove, towards the crux of the heart. At the origin of the RCA is the conus artery. In addition to supplying blood to the right ventricle (RV), the RCA supplies 25% to 35% of the left ventricle (LV). In 85% of patients, the RCA gives off the posterior descending artery (PDA). In the other 15% of cases, the PDA is given off by the left circumflex artery. The PDA supplies the inferior wall, ventricular septum, and the posteromedial papillary muscle. The RCA also supplies the SA nodal artery in 60% of



• A higher incidence of coronary anomalies is observed in young victims of sudden death than in adults (4-15% vs 1%, respectively). Several large studies address the frequency of minor and major coronary anomalies in different subsets of patients by varying techniques and recording methods. Angelini's comprehensive review identified an incidence of coronary anomalies in 5.6% of consecutive patients undergoing angiographic study (see Image 1). The most common coronary variants were split RCA (1.23%) and ectopic origin of the RCA near the right aortic sinus (1.13%). Many coronary variations, such as intramural extension or myocardial bridging of the LAD, which occurs in 5-25% of patients, are so common, they are not considered an anomaly.

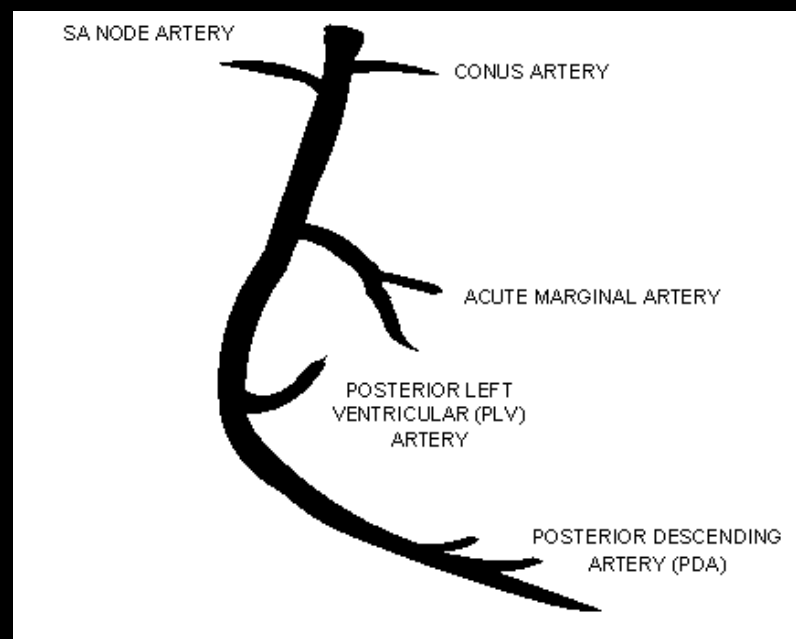
LEFT CORONARY ARTERY

LEFT ANTERIOR OBLIQUE (LAO) – CRANIAL VIEW



RIGHT CORONARY ARTERY

RIGHT ANTERIOR OBLIQUE (RAO) VIEW



- On a post-contrast TI delayed pulse sequence (which is the only sequence you are given), what is predicted?
 - a. functional recovery of an infarct following revascularization
 - b. risk of future myocardial infarction
 - c. future ischemic event
 - d. functional recovery after an ischemic event

ANS: D) functional recovery of an infarct following revascularization

- Delayed enhancement gives an assessment of stunned or hibernating myocardium
- Similar to the description in this [‘Net Reference](http://www.gemedicalsystems.com/auen/rad/mri/pdf/cardiac1.pdf) of cardiac perfusion imaging. (<http://www.gemedicalsystems.com/auen/rad/mri/pdf/cardiac1.pdf>)
- Myocardial viability imaging with MRI is performed after I.V. administration of gadolinium contrast (0.2 mmol/kg) injected over 20 seconds; imaging begins after 10-15 minutes). **Nonviable (infarcted) myocardium enhances on delayed contrast images. Stunned or hibernating myocardium is viable and will not enhance**, but will have abnormal contractility. Stunned myocardium is viable tissue that demonstrates abnormal function after an ischemic event and the abnormal function is reversible once reperfusion ensues. Hibernating myocardium is viable tissue that is in an altered hypo metabolic state due to chronic ischemia. It will demonstrate abnormal function, however, once adequate perfusion ensues normal function will return. http://www.proscan.com/fw/main/February_2004_to_print-258.html
- In right ventricular dysplasia, the right ventricular anterior wall is replaced by fatty fibrous tissue (bright on T₁)
 - Cardiac CRS p. 172

- Regarding vascular calcification of the coronary arteries?
 - a. can see in patients over 70 without atherosclerosis
 - b. don't need to use cardiac gating if the scanner is fast enough
 - c. absence of calcifications means a low likelihood of significant atherosclerosis

absence of calcifications means a low likelihood of significant atherosclerosis

- Thus, from emedicine.com....
- “Calcium scoring can be accomplished without cardiac gating, but most of the current work is devoted to either prospective or retrospective gating.”—so *B is false*.
- “Coronary segments with a luminal obstruction of greater than 50% are likely to have some calcification that is detectable with EBCT. In one trial, a 0 calcium score had a 100% predictive value in the exclusion of angiographic evidence of obstructive epicardial coronary lesions. The higher the calcium score, the more likely the presence of angiographic obstructive disease. In another study (Rumberger, 1999), a calcium score greater than 371 had a 90% specificity in the detection of a luminal obstruction of greater than 70%. Specificity tends to decrease with advanced patient age, but it increases with the number of calcified vessels as well as the total calcium score.
- When EBCT calcium scores became available, the prognostic value of coronary calcification was again affirmed. The higher the calcium score, the worse the prognosis. The degree of coronary calcium was a good predictor of the development of symptomatic cardiovascular disease. In a study by Agaston et al, the mean calcium score for patients with a cardiovascular event was 399, compared with a mean score of 76 in those without such an event

Table 5. Absence of Detectable Coronary Artery Calcification Using Electron Beam Computed Tomography (Negative Test)

Does *not* absolutely rule out the presence of atherosclerotic plaque, including unstable plaque.

Highly unlikely in the presence of significant luminal obstructive disease.

Observation made in the majority of patients who have had both angiographically normal coronary arteries and EBCT scanning.

Testing is gender independent.

May be consistent with a low risk of a cardiovascular event in the next 2-5 years.

Table 6. Presence of Detectable Coronary Artery Calcification Using Electron Beam Computed Tomography (Positive Test)

Confirms the presence of coronary atherosclerotic plaque.

The greater the amount of calcification (ie, calcium area or calcium score), the greater the likelihood of obstructive disease, but there is no one-to-one relation, and findings may not be site specific.

Total amount of calcification correlates best with total amount of atherosclerotic plaque, although the true "plaque burden" is underestimated.

A high calcium score may be consistent with moderate to high risk of a cardiovascular event within the next 2-5 years.

- Which is true regarding aortic disease?
 - a. elderly patients with dissection are hypertensive
 - b. type B dissection requires surgery
 - c. most penetrating ulcers are infrarenal
 - d. traumatic rupture appears as an amorphous mediastinal contrast collection on angio

elderly patients with dissection are hypertensive

- Patients w/ dissection are managed w/ aggressive beta blockade.
- Hypertension (60-90%)
- B—false→ Type A dissection or dissection involving ascending aorta requires surgery.
- C —false→ Penetrating atherosclerotic ulcers (PAU) of the aorta are defined as atherosclerotic lesions with ulceration of the aortic intima and media and rupture of the internal elastic lamina.^{1, 2 and 3} These lesions typically occur in elderly patients with systemic atherosclerosis. PAU were first described by Shennan in 1934,⁴ yet their natural history remains unclear and treatment remains controversial. **Occurring predominantly in the thoracic aorta, PAU is uncommon in the abdominal aorta.** The incidence of these life-threatening lesions, whose main risk is aortic rupture, is probably underestimated, and surgical resection or stent-graft placement, which have low morbidity and mortality, are recommended.
- D—trueish→ Traumatic rupture usually will appear as an irregular collection of contrast beyond the normal aortic lumen. However, the presence of any SHARP or irregular contour represents a transection until proven otherwise. Kind of contradictory sentences.
- SOURCE: Angio requisites.

- Concerning penetrating aortic ulcers, which is not associated
 - intimal flap extending from the brachiocephalic artery to the renals
 - diffuse atherosclerotic disease
 - there is mild enlargement of the aorta
 - focal subintimal contrast collection
 - a flap extends from the left SCA to the diaphragm
 - there is intramural hematoma

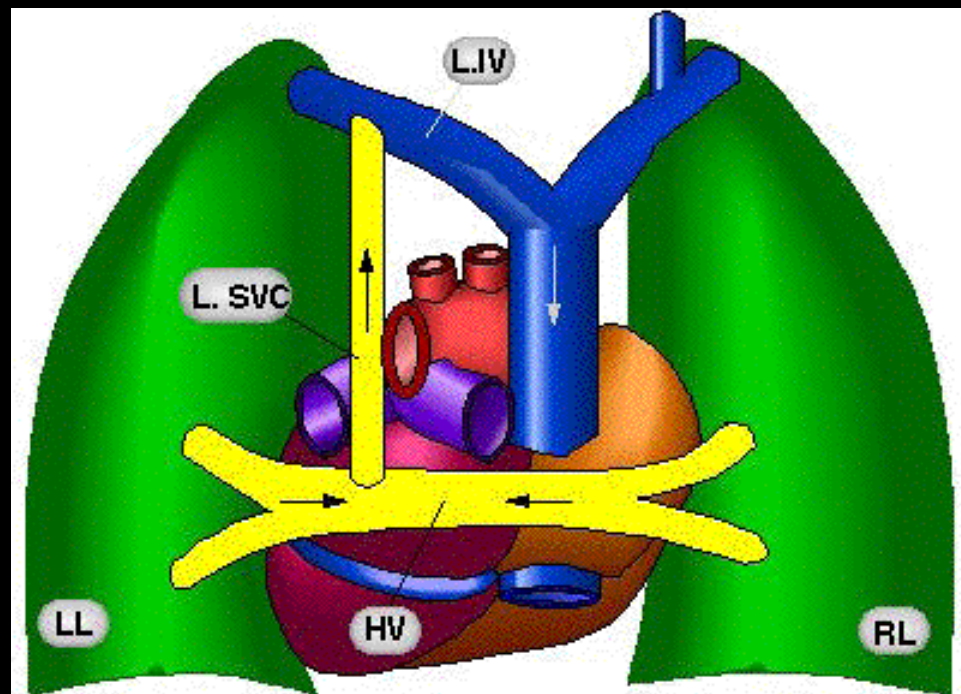
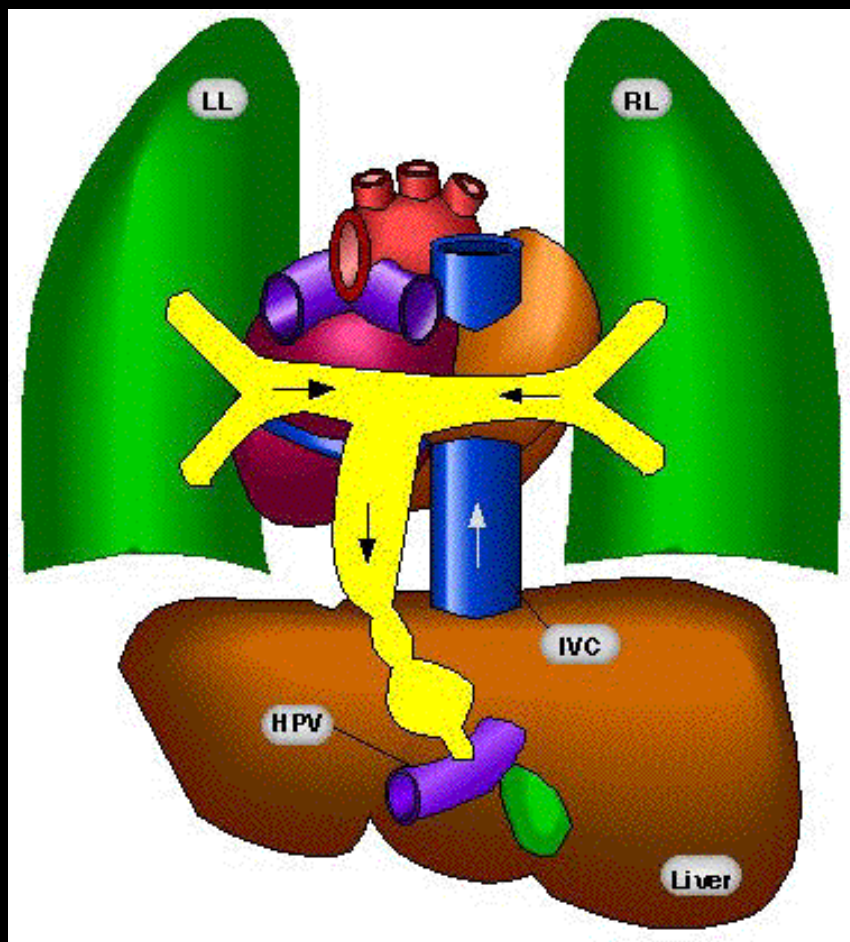
intimal flap extending from the brachiocephalic artery to the renals & a flap extends from the left SCA to the diaphragm

- This is seen in Type B dissections. (E is probably another remembered version)
- Penetrating Aortic Ulcers:
 - Ulceration of an atherosclerotic plaque which penetrates into the internal elastic lamina
 - ? Hematoma then forms within the media of the aortic wall
 - ? Occurs in the elderly who usually have a history of severe atherosclerosis, hypertension, and hyperlipidemia
 - ? Similar presentation to those with a descending thoracic aortic dissection i.e. acute chest or back pain
 - ? Plaque ulceration usually in the middle to distal third of the descending aorta
 - ? Intramural hematoma accompanies the penetrating ulcer 80% of the time
 - ? Associated with abdominal aortic aneurysm
 - ? Disease progresses from intimal plaque ulceration to media hematoma formation to adventitial saccular pseudoaneurysm formation and finally rupture if there is transmural penetration
- there is mild enlargement of the aorta - true
- a flap extends from the left SCA to the diaphragm - false
- there is diffuse atherosclerotic dz of the aorta - true
- there is intramural hematoma - true
- there is a small collection of contrast in the wall of the aorta – true
- I believe this is a reference to a penetrating atherosclerotic ulcer. Plaque ulcerates with subsequent intramural hematoma formation. Contrast may extend into the ulcer on CTA. Usually seen in elderly patients with diffuse atherosclerotic disease. Aortic rupture is a rare complication. Good article in Radiographics 2000; 20: 995- 1005.

- **In total anomalous pulmonary venous return, what forms the left/upper side of the “snowman”?**
 - a. pulmonary artery
 - b. pulmonary vein
 - c. right sided aorta
 - d. L. vertical vein

Lvertical vein

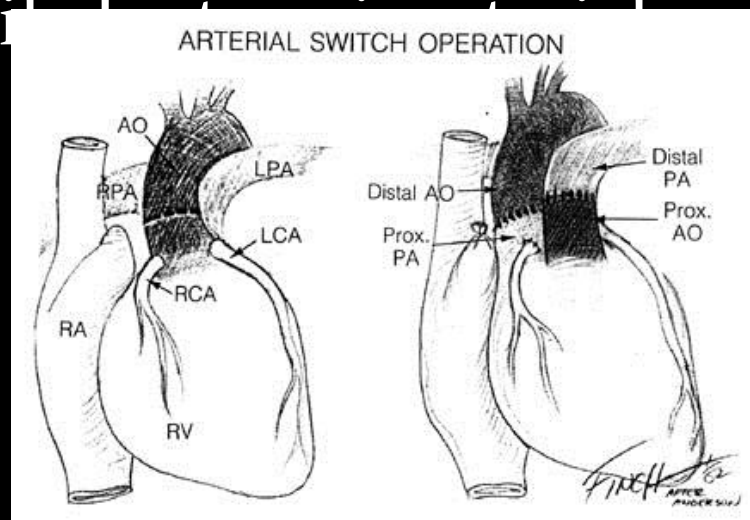
- The abnormal mediastinal contour is caused by the dilated right superior vena cava on the right side and by the anomalous vertical vein draining both lungs on the left side.
- Source: cardiac requisites and earlier recalls (with variations on the same question.)
- admixture lesion: cyanosis, increased pulmonary blood flow
- incidence 2%
- must have R->L shunt for survival (eg, ASD)
- Darling's classification
 - Type I = supracardiac (55%) - "Snowman heart"
 - Type II = cardiac (30%)
 - Type III = infracardiac (12%)
- associated with
 - ASD (needed for survival)
 - asplenia - 3/4 of cases have TAPVR
- Total anomalous pulmonary venous drainage is a cyanotic condition with intracardiac mixing in which the pulmonary veins collect in a confluence behind the heart but then fail to drain into the left atrium. Drainage occurs either directly or indirectly to the right side of the heart. This anomalous venous drainage may occur via a variety of routes:
 - supracardiac - drainage is to the innominate vein or the right superior vena cava.
 - cardiac - drainage is to the coronary sinus or the right atrium directly.
 - infracardiac - anomalous drainage is to the portal vein or the inferior vena cava.
 - (TAPVC), a congenital anomaly in which none of the pulmonary veins are connected to the left atrium but instead all drain by various routes into the right atrium. A 'snowman' sign or figure of 8 configuration is seen in the supracardiac type but rarely before 4 months of age. The snowman configuration is due to widening of the superior mediastinum and cardiac silhouette. A right to left shunt is necessary for survival. In type I TAPVR (supracardiac, 55% of all types) the pulmonary veins drain cephalad into a left SVC (aka left vertical vein), into left brachiocephalic vein, then into the SVC. The superior mediastinum is enlarged secondary to dilation of the right vena cava, innominate vein and ascending vertical vein. The vertical vein is to the left-upper aspect of the mediastinum.



- **Concerning cardiac surgery, which of the following are true:**
 - a. mitral annuloplasty reverses the effects of calcific mitral stenosis.
 - b. Coronary ostial markers are not necessary when the coronary ostia are occluded
 - c. In repairing VSD's, the patches are on the low pressure RV side
 - d. The Jantene or switch procedure for transposition involves switching of the venous inflow to the atria

C. In repairing VSD's, the patches are on the low pressure RV side

- A: False: used for M. Regurgitation.
- Treatment for mitral stenosis is commissurotomy or MVR.
- D: False: Mustard and Senning are the atrial switch operations while the arterial switch operation.



- What is the most clinically significant concern from a pseudoaneurysm that involves the left ventricle?
 - a. They cause bleeding elsewhere in the body secondary to hemolysis
 - b. rupture
 - c. clot formation and embolization
 - d. tamponade
 - e. myocardial infarction

Rupture.

- Ventricular aneurysms may be congenital or acquired. Acquired is generally due to an MI.
- An acquired true aneurysm is caused by a transmural infarct. You see paradoxical expansion during systole at the left heart border and a wide neck. Complications include thrombus within the true aneurysm or embolization.
- A pseudoaneurysm or false aneurysm is basically a contained rupture. It usually has a narrow neck and is usually found near the diaphragm. False aneurysms have a high risk of delayed rupture, unlike true aneurysms. (Danherth)
- Pseudoaneurysm
 - = FALSE ANEURYSM = left ventricular rupture contained by fused layers of visceral + parietal pericardium / extracardiac tissue
 - (a) cardiac rupture with localized hematoma contained by adherent pericardium; typically in the presence of pericarditis
 - (b) subacute rupture with gradual / episodic bleeding
 - Etiology: trauma, myocardial infarction
 - Location: typically at posterolateral / diaphragmatic wall of LV
 - left retrocardiac double density
 - diameter of mouth smaller than the largest diameter of the globular aneurysm
 - delayed filling
 - Cx: high risk of delayed rupture (infrequent in true aneurysms)

- Which of the following layers are not included in a false pseudoaneurysm in the ventricle?
 - Endocardium and myocardium
 - Endocardium, myocardium, and epicardium
 - Endocardium only
 - Epicardium only

Answer B. Endocardium, myocardium, and epicardium

- Pseudoaneuysm is left ventricular rupture contained by fused layers of visceral and parietal pericardium and extracardiac tissue. They are caused either by trauma or MI and carry a high risk for delayed rupture.
 - Dahnert

- Pseudoaneurysm
- = FALSE ANEURYSM = left ventricular rupture contained by fused layers of visceral + parietal pericardium / extracardiac tissue
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 - delayed filling
- Cx: high risk of delayed rupture (infrequent in true aneurysms)
 - Dahnert

- What will give a bp of 180/40 in a brachial artery?
 - coarctation
 - pseudocoarctation
 - aortic stenosis

- C. AS when long standing often leads to AI which can explain the low diastolic pressure. Coarct should increase pressure in arms and be NL in legs, and pseudocoarct shouldn't affect arm pressures.
- AI has a wide pulse pressure. This could be the answer and it was not recalled or the above explanation is possible - SFH

- **Aortic stenosis commonly assoc with**
 - Angina
 - Dilated Left ventricle
 - Sinus of Valsalva aneurysm
 - Aortic knob enlargement
 - **(this has been debated endlessly on old tests... would look it up for yourselves)**

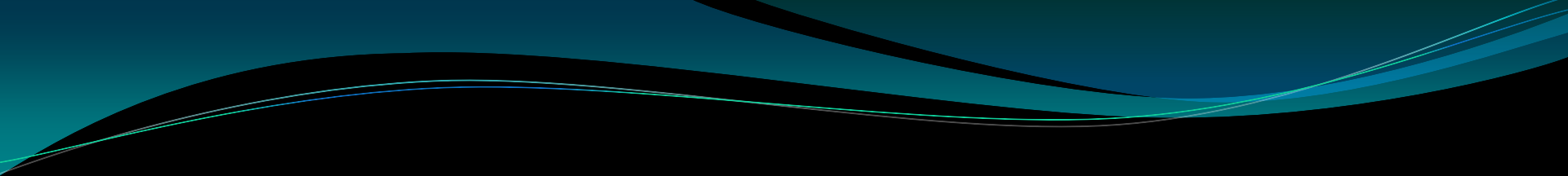
Angina

- seen in 30% - 40% AS asymptomatic latent period of 10-20 years, then see classic triad of chest pain, heart failure, and syncope.
- b) bounding pulse – no. Get carotid pulsus parvus et tardus (diminished and slowly rising carotid artery pulse).
- c) AO knob enlargement – no. Could see ascending aortic enlargement (post-stenotic dilation).
- d) Yes, possible since palpation can reveal a laterally displaced apex reflecting the presence of left ventricular hypertrophy, however, this is a less typical finding than angina.
- www.emedicine.com/EMERG/topic40.htm
- LVH is commonly associated with aortic stenosis. Poststenotic dilatation of the aorta is only present in valvular AS. Aortic valve calcification occurs in all types of AS after age 40 if severe. Types of AS: Subvalvular, Valvular (most common, bicuspid aortic valve most common congenital anomaly causing), Supravalvular. Cardiac Requisites, 149-162 Primer 123
- Clinical: Angina/Syncope/CHF
- ACQUIRED: RHEUMATIC VALVULITIS (with mitral); senile/degenerative
- **Poststenotic Dilation:** occurs in 90% Acquired; 70% Congenital
- **Valvular aortic stenosis** when mild to moderate is often due to two cusps with partial fusion of one or both commissures. Severe valvular stenosis is more often seen in unicusped or noncusped valves.
- **Supravalvular aortic stenosis** is due to a diffuse or localized narrowing immediately above the aortic sinuses and coronary artery. It may be associated with William's syndrome and may be sporadic or have Mendelian dominant inheritance.
- **Subvalvular aortic stenosis** may result from a simple diaphragm or from a long tunnel-like fibromuscular narrowing of the left ventricular outflow tract. This accounts for about 0.5% of all congenital heart disease.
- On a chest radiograph, **the heart size is usually normal** but there may be rounding of the apex due to **thickening of the left ventricle**. In severe obstruction, the left ventricle and atrium may be enlarged. The descending aorta usually demonstrates poststenotic dilatation in the valvular stenosis type. Significant cardiomegaly does not develop unless congestive heart failure occurs
- **AORTIC NIPPLE:** this is visualized in 5% of the normal population and is due to the course of the supreme intercostal vein. It appears as a small rounded density adjacent to the aortic knob.

- Which of the following is associated with a 'domed' aortic valve on MR examination?
 - a. bicuspid aortic valve
 - b. aortic insufficiency
 - c. IHSS
 - d. Supravalvular aortic stenosis

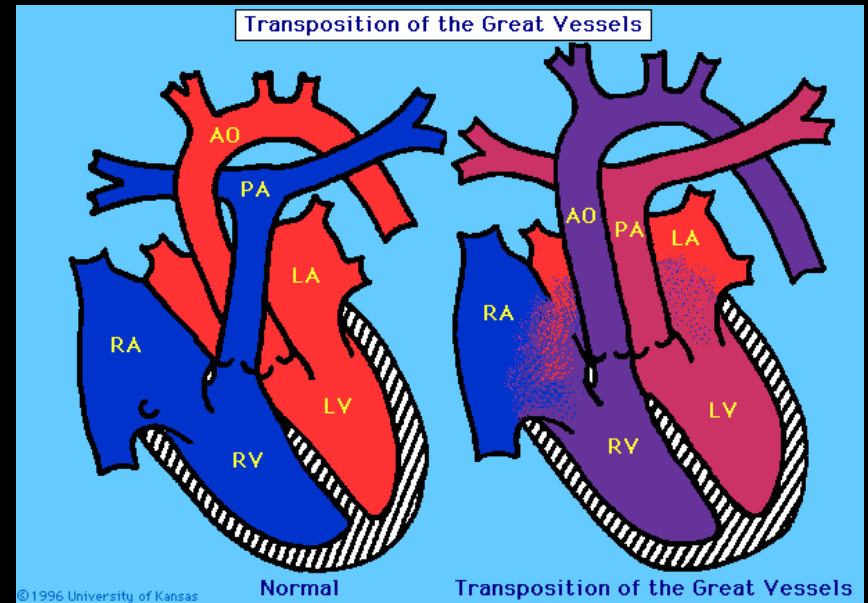
BICUSPID AORTIC VALVE.

- There are 3 types of congenital aortic stenosis: subvalvular, valvular, and supravalvular. The most common cause of valvular aortic stenosis is a bicuspid valve. A bicuspid valve created a domed or vaulted appearance to the valve in much the same way it does in architecture (think of domed ceilings in Washington, DC). (Danhert, Aunt Minnie)

- 
- D-transposition of the great vessels involves:
 - AtrioVentricular concordance
 - AtrioVentricular discordance

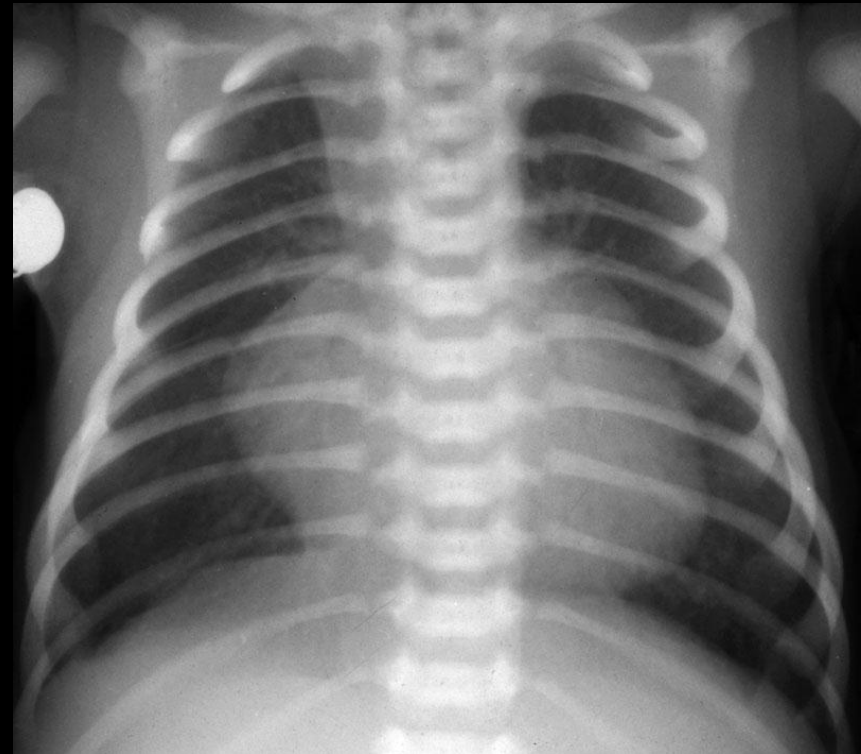
ANS: A) AV concordance

- D transposition is defined as a concordant connection at the atrioventricular level and a discordant one at the ventriculoarterial level.
 - emedicine



Transposition

- This causes separate and parallel systemic and pulmonary circulations. At birth a connection between the two circulations must exist. An interatrial communication exists in almost all patients and a patent ductus arteriosus occurs in two thirds and a ventricular septal defect in one third of patients.
- Other associated lesions include:
- valvular or subvalvular pulmonary artery stenosis,
- tricuspid atresia
- single ventricle.
- Chest X-ray typically shows increased pulmonary arterial flow and cardiomegaly although in the first days of life it may be normal. With regression of the thymus, a narrow vascular pedicle in the superior mediastinum produces the



- A parallel configuration of the aorta and pulmonary artery is seen with which congenital anomaly?
 - a. Truncus
 - b. Tetralogy of Fallot
 - c. TAPVR
 - d. Transposition of the great vessels

D. Transposition of the great vessels

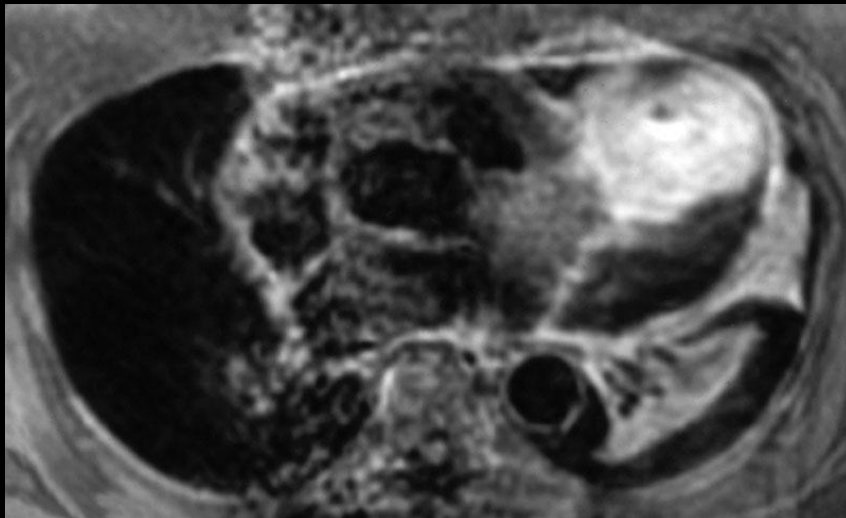
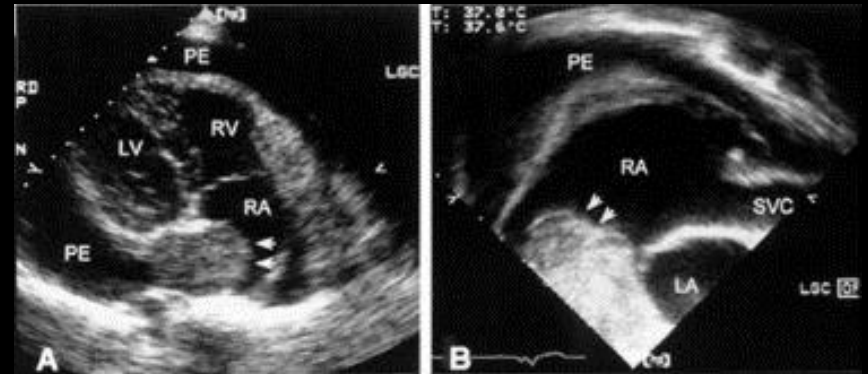
- In TGV, the aorta arises from the right ventricle and the PA arises from left ventricle, in a parallel fashion. *[Dähnert p.652]*
- Transposition of the great vessels can only be detected by seeing parallel cardiac outflow tracts. Truncus arteriosus dx is made with echo by demonstrating a large, single great vessel which overrides a large VSD. Tetralogy of Fallot shows a VSD beneath a large overriding aortic root, right ventricular hypertrophy, and often underdeveloped pulmonary artery (due to stenosis). Total anomalous pulmonary venous return has variable findings.
Cardiac Requisites 87-91 Primer 130-132

- What is the most common cardiac tumor in adults?
 1. hemangioma
 2. rhabdomyosarcoma
 3. myxoma
 4. rhabdomyoma

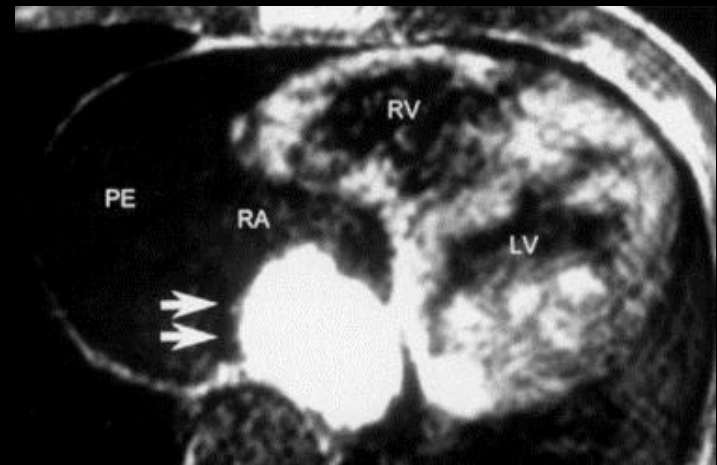
ANS: C) myxoma

- Benign cardiac tumors are more common than malignant cardiac tumors (76% vs. 24%) and Myxomas are the most common of the benign tumors (24% of benign tumors—18% overall.)
- **Myxoma**—usually arise in the atria (LA 4x more common than RA). Most arise from interatrial septum. “dumb-bell” myxoma extends thru fossa ovalis and is in both atria. Most are polypoid and will move during cardiac cycle. They can embolize into the coronary arteries and cause MI. The MR appearance is characteristic—iso-intense on T2, bright on T2 and enhance on post con.
- **Rhabdomyoma**—Most commonly associated with tuberous sclerosis. Accounts for 7% of benign cardiac tumors (4.2% overall.)
- **Hemangioma**—Accounts for 3% of benign cardiac tumors (1.8% overall.) Cardiac hemangiomas are composed of a benign proliferation of endothelial cells that are histologically identical to hemangiomas elsewhere in the body. May involve the endocardium, myocardium, or epicardium.
- The symptoms depend on the anatomic location of the tumor. The most common symptoms are dyspnea, palpitation, atypical chest pain and arrhythmia. When the tumor is situated on the right side of the interventricular septum, it may simulate an infundibular pulmonary stenosis. In
- Most reported hemangiomas are small, and range from 2 to 3.5 cm in diameter. The lesions are sessile or polypoid and usually single
- Surgical excision is the mainstay of treatment because of the benign nature of the tumor. Wide excision is not necessary while incomplete excision may cause tumor recurrence. Resectable cases usually have a good prognosis, in contrast to unresectable tumors cases which have a poor prognosis and may lead to ventricular arrhythmia, local progression and sudden death.
- **Rhabdomyosarcoma**—Accounts for 5% of malignant tumors (1.3% overall) primary malignant tumor of the myocardium. Diffusely infiltrates the myocardium and less often appears as a polypoid intracavitary mass. It is the most frequent primary malignant cardiac

Ultrasound shows an echogenic mass within the RA.



Invasive
rhabdomyosarcoma (from
amershamhealth.com)



Post contrast MR shows brisk
enhancement of the tumor

- What would be a contraindication for the use of adenosine?
 - third degree heart block
 - COPD/asthma
 - Yes, these were both choices

ANS: A. third degree heart block

- Absolute
 - **Patients with active bronchospasm or patients being treated for reactive airway disease should not be administered adenosine because this can lead to prolonged bronchospasm, which can be difficult to treat or can remain refractory.**
 - **Patients with more than first-degree heart block (without a ventricular-demand pacemaker) should not undergo adenosine infusion because this may lead to worsening of the heart block. While this is usually transient, due to the extremely short half-life of adenosine (approximately 6 s), cases of prolonged heart block (and asystole) have been reported.**
 - Patients with an SBP less than 90 mm Hg should not undergo adenosine stress testing because of the potential for further lowering of the blood pressure.
 - Patients using dipyridamole or methylxanthines (e.g., caffeine and aminophylline) should not undergo an adenosine stress test because these substances act as competitive inhibitors of adenosine at the receptor level, potentially decreasing or completely attenuating the vasodilatory effect of adenosine. In general, patients should refrain from ingesting caffeine for at least 24 hours prior to adenosine administration. Patients should avoid decaffeinated products, which typically contain some caffeine, as opposed to caffeine-free products, which do not.
- Relative
 - **Patients with a remote history of reactive airway disease (COPD/asthma) that has been quiescent for a long time (approximately 1 y) may be candidates for adenosine. However, if a question exists concerning the status of the patients' airway disease, a dobutamine stress test may be the safer choice.**
 - Patients with a history of sick sinus syndrome (without a ventricular-demand pacemaker) should undergo adenosine stress testing with caution. These patients are prone to significant bradycardia with adenosine; therefore, use caution if they are to undergo adenosine stress. Similarly, those patients with severe bradycardia (heart rate of 40 bpm) should undergo adenosine stress with caution.

- **Which of the following is NOT seen in the affected lung with Swyer James Syndrome?**
 - Hyperlucency
 - Small Pulmonary Artery
 - Enlarged Lung Volume
 - Bronchiectasis

Answer: increased lung volume in affected lung

- Swyer James syndrome is related decreased or normal (collateral air drift) lung volume.
(*Dahnert*)
- Swyer-James syndrome (SJS) is a manifestation of postinfectious obliterative bronchiolitis. The involved lung or portion of the lung does not grow normally and is slightly smaller than the opposite lung. Radiographically, pulmonary hyperlucency caused by overdistended alveoli combined with diminished arterial flow characterizes its imaging appearance.

- **Which of the following is the most likely etiology for swelling of the head and upper extremities and signs of SVC obstruction in a 50 year-old male?**
 - a. Bronchogenic carcinoma
 - b. Non-Hodgkin's lymphoma
 - c. Thymoma
 - d. Seminoma
 - e. Fibrosing mediastinitis
 - f. Sarcoid

Answer: A) bronchogenic carcinoma

- more than 50% of cases. SVC syndrome is more common with malignant lesions (bronchogenic carcinoma, lymphoma).
- Benign lesions: granulomatous mediastinitis (sarcoids, TB, histoplasmosis), substernal goiter, ascending aneurysm, iatrogenic catheter, constrictive pericarditis.
- Superior vena cava syndrome is obstruction of SVC with development of collateral pathways. Sxs: head and neck edema (70%), cutaneous enlarged venous collaterals, headache, dizziness, syncope, proptosis, tearing, dyspnea, cyanosis, chest pain, hematemesis. See superior mediastinal widening, SVC thrombus, occlusion, or compression, dilated cervical and superficial thoracic veins.
- Etiology: Malignant lesion (80-90%) – rapid progression
- Bronchogenic Ca (>50%) – Small cell is most common type
- Lymphoma
- Benign lesions – slower onset
- Granulomatous mediastinitis (histo, sarcoid, TB)
- Substernal goiter
- Ascending aortic aneurysm
- Pacer wires/CVC (23%)
- Constrictive pericarditis
- Bronchogenic Carcinoma:
 1. **Small cell undifferentiated ca (15%)**
 - Strong association with cigs
 - Centrally located, highly malignant
 2. **Most common cell type assoc. with superior vena cava obstruction**
 - Ectopic hormone production: SIADH, Cushing syndrome
 3. **Squamous cell ca (30-35%)**
 - Strong assoc. with cigs
 - Centrally located, lowest incidence of mets
 - Most common cell type to cavitate
 - Most common cell type that is radiologically occult
 - Most common cell type to cause Pancoast tumor
 - Ectopic hormone production: parathyroid hormone-like substance
 4. **Adenocarcinoma (50%)**
 - Most common cell type seen in women and nonsmokers
 - Peripheral, upper lobe distribution, intermediate malignant potential
 - Frequently found in scars (TB, infarct, scleroderma, bronchiectasis)
 - Also a frequent cause of Pancoast tumor
 - Bronchioloalveolar carcinoma is subtype (air bronchograms)
 5. **Undifferentiated large cell carcinoma (<5%)**
 - Strong assoc. with smoking
 - Large bulky usually peripheral mass with intermediate malignant potential
 - Giant cell carcinoma is subtype (very aggressive, poor prognosis)
- Dahnert p. 391-2,539

A. Bronchogenic carcinoma

- The SVC syndrome is characterized by edema of the face, neck, upper extremities, and thorax, often associated with prominent, dilated chest wall veins. It is caused by obstruction of the vena cava, by either external compression or intraluminal thrombosis or neoplastic infiltration. In most published series, the causative disorder is malignancy in 95% or more of cases. Pulmonary carcinoma is the cause in 80-85%, and lymphoma and metastatic carcinoma of non pulmonary origin in 5 to 10%. Of the pulmonary carcinomas, small-cell is the most common histologic type. [*Fraser and Pare, p. 2949*]
- 70% of thymoma occurs in the 5th to 6th decade. Rarely, the invasive variety can produce SVC syndrome. Fibrosing mediastinitis occurs in the 2nd to 5th decades.

- Pulmonary hypoplasia is most associated with what?
 - a) diaphragmatic hernia
 - b) pulmonary sequestration
 - c) bronchogenic cyst
 - d) congenital lobar emphysema
 - e) CCAM

a) diaphragmatic hernia

• Pulmonary Hypoplasia

• Cause:

- 1. Prolonged oligohydramnios (20-25%)
- 2. Skeletal dysplasia (small thorax)
- 3. Intrathoracic mass (lung compression)
- 4. Large hydrothorax (lung compression)
- 5. Neurologic condition (reduced breathing activity)
- 6. Chromosomal abnormality
- 7. CHD with R-sided cardiac obstructing lesion
- thoracic circumference (TC) < 5th percentile for EGA
- declining TC:AC ratio from > 0.80 (75% sensitive, 80-90% specific); not applicable for intrathoracic masses
 - (Danhert)

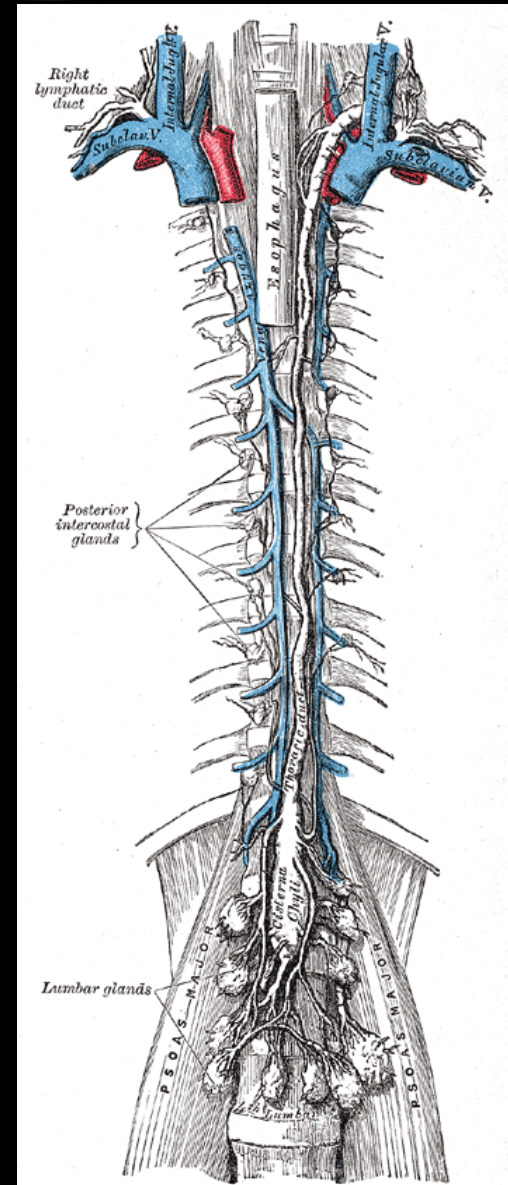
• Types of pulmonary underdevelopment:

- -agenesis: complete absence of bone or both lungs (airways, alveoli, vessels)
- -aplasia: absence of lung except for a rudimentary bronchus which ends in a blind pouch
- -hypoplasia: decrease in number and size of airways and alveoli: hypoplastic PA
- Pulmonary hypoplasia is common in CHD: incidence of CHD is 1 in 2-3000 births.
- Pulmonary hypoplasia is present in 25% of extralobar sequestration.

- At the inferior-most level of the thoracic mediastinum, the thoracic duct is in relation to what structure?
 - a) anterior to esophagus
 - b) adjacent to azygous vein
 - c) adjacent to hemiazygous vein
 - d) lateral to the esophagus
 - e) Left of to aorta

Answer: B: adjacent to azygous vein (gray's anatomy)

- The thoracic duct is the main lymphatic channel of the body that drains to the venous system from the whole of the body except the: right thorax, right arm, right head and neck
- It begins as a continuation of the cisterna chyli at the level of the T12 vertebra. It passes to the right of the aorta through the aortic hiatus. **It then ascends to the right of the esophagus with the azygous vein on its left.** Posteriorly are the right posterior intercostal arteries.
- At the level of the fifth thoracic vertebra the duct passes superiorly and to the left, posterior to the oesophagus. It then ascends on the left side of the esophagus into the superior mediastinum. At this point, the aorta lies anteriorly and posteriorly is the anterior longitudinal ligament of the vertebral bodies.
- Superiorly, within the neck the thoracic duct passes laterally to arch over the dome of the right pleura. It passes laterally and posterior to the carotid sheath and anterior to the vertebral arteries. During this final section:



- **The most common cause of pneumomediastinum is:**
 - a. Pneumothorax
 - b. Bleb rupture
 - c. Alveolar rupture
 - d. Extension from pneumoretroperitoneum

Answer: a) alveolar rupture

- Spontaneous Pneumomediastinum (common)
 - Age: neonates (0.05-1%), 2nd -3rd decade
 - Causes: 1) rupture of marginally situated alveoli from sudden rise in intraalveolar pressure (acute asthma, aspiration pneumonia, HMD, measles, giant cell pneumonia, coughing, vomiting, strenuous exercise, parturition, DM)
 - 2) tumor erosion of trachea/esophagus
 - 3) pneumoperitoneum/ retroperitoneum
- Traumatic pneumomediastinum (rare)
 - 1) pulmonary interstitial emphysema = disruption of marginal alveoli with gas traveling toward mediastinum due to positive pressure ventilation
 - 2) bronchial/ tracheal rupture (commonly associated pneumothorax)
 - 3) esophageal rupture (diabetic acidosis, alcoholic, boerhaave synd)
 - 4) iatrogenic
 - Danhert
- Spontaneous pneumomediastinum is more common than the traumatic type and is most commonly related to rupture of marginally situated alveoli from sudden / prolonged rise in intraalveolar pressure with subsequent dissection of air centrally along bronchovascular bundles to hila and rupture in the mediastinum.
- Source: Dähnert 5th ed. p.429-430

- Which does not affect the cardiothoracic ratio on CXR
 - Distance of the tube to film
 - Phase of respiration
 - Cardiac phase
 - Kilovolt peak
 - Oblique pt position

D. KvP

- relates to photon frequency and penetration, skin dose, contrast, and heat production (primer, 953). Distance changes should have an effect on magnification. Respiration and cardiac phase both affect cardiac size. Oblique patient position should also change the ratio.

- An intravenous drug abuser presents with a high fever and cough. A radiograph demonstrates patchy peripherally based infiltrates bilaterally. The most likely diagnosis is
 - *Staphylococcus pneumonia*
 - *Pseudomonous pneumonia*
 - acute bacterial endocarditis
 - Lemierre's disease
 - Talcosis

Answer: C) ABE

- IV drug abusers get endocarditis of the tricuspid valve (right-sided endocarditis), which causes multiple septic pulmonary emboli. Mortality rate is only 3%-9%, lower than left-sided [aortic valve] endocarditis. Dahnert 5th p. 616
- Septic emboli are trapped in the pulmonary circulation. Consequently, patients typically present with cough and pleuritic chest pain. Chest radiographs typically show multiple round pulmonary infiltrates that may cavitate. Systemic complications are uncommon unless the mitral valve or the aortic valve has become secondarily involved. MKSAP (medicine disk)
- *Lemierre's disease* is a rare complication of pharyngitis from a fusobacterium that eventually leads to thrombophlebitis of the internal jugular vein (Chirinos JA, Lichtstein DM, Garcia J, Tamariz LJ. The evolution of Lemierre syndrome: report of 2 cases and review of the literature. *Staph* can cause patchy and often confluent bronchopneumonia that is frequently bilateral (Dahnert 5th 525). *Pseudomonas* is generally a nosocomial infection that led to extensive bilateral consolidation with a predilection for lower lobes (Dahnert 5th 513).
- *Talcosis* resembles asbestosis, which may be characterized by "small irregular linear opacities . . . most severe in the lower subpleural zones" (Dahnert 5th 456). Pulmonary talcosis may be a complication of IV drug abuse.

- A middle-aged man has a lung bx for multiple foci of air-space consolidation. The histology report shows hemorrhage w/ small vessel vasculitis. What is likely cause?
 - a) Wegener's
 - b) Goodpasture's
 - c) pulmonary contusion
 - d) pulmonary infarct

Wegener's Granulomatosis

- WEGENER GRANULOMATOSIS
- =probable autoimmune disease characterized by systemic necrotizing granulomatous process with destructive angiitis
- Path: peribronchial necrotizing granulomas + vasculitis not intimately related to arteries
- Mean age of onset:40 years (range of all ages):



- CLASSIC TRIAD
- (1)respiratory tract granulomatous inflammation
- (2)systemic small-vessel vasculitis
- (3)necrotizing glomerulonephritis
- @Upper respiratory tract (100% involvement)
- (similar to midline granuloma)
- (a)nasal cavity:
 - epistaxis from nasal mucosal ulceration
 - necrosis of nasal septum
 - saddle nose deformity
 - progressive destruction of nasal cartilage + bone (DDx: relapsing polychondritis)
- granulomatous masses filling nasal cavities
- (b)sinuses (maxillary antra most frequently):
 - sinus pain, purulent sinus drainage, rhinorrhea
 - thickening of mucous membranes of paranasal sinuses

- Regarding aortic stenosis, which of the following is characteristic?
 - a) LV dilatation
 - b) enlargement of aortic knob
 - c) aortic valve calcification
 - d) pulmonary edema
 - e) Ascending aortic dilatation

Ascending aortic dilatation

- *LV hypertrophy, poststenotic dilatation of aorta is present only in valvular AS*

- Which structure lies immediately anterior to the right upper lobe bronchus?
 - a) right interlobar pulmonary artery
 - b) right superior pulmonary vein
 - c) SVC
 - d) right truncus anterior
- **What structure is immediately anterior to the left upper lobe pulmonary bronchus?**
 - a. Left pulmonary artery
 - b. Ascending aorta
 - c. Left atrial appendage
 - d. Main pulmonary artery
 - e. Superior pulmonary vein

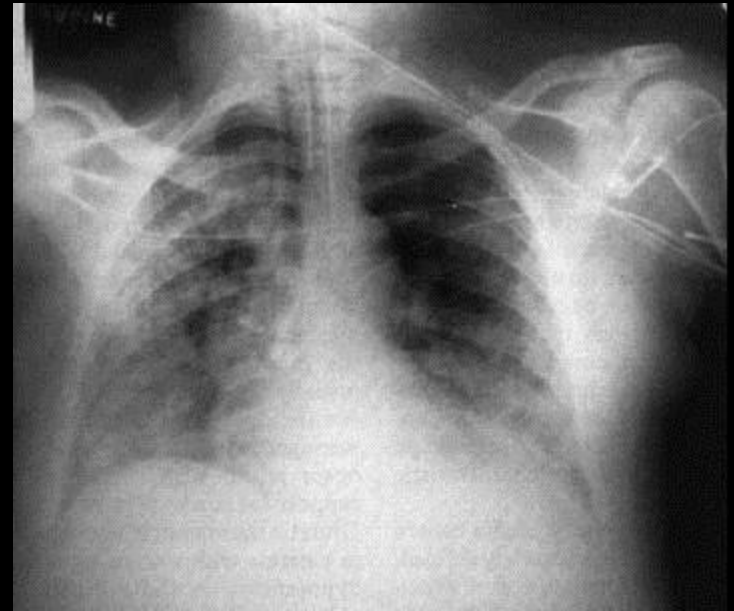
truncus anterior

- is directly anterior to RUL bronchus and anterior to truncus anterior lies SVC. P 14 figure 2-2 of Fundamentals of body CT.
 - E-anatomy
- C. Superior pulmonary vein
- *Source: Atlas of Human Anatomy, Netter plates 187,194*
 - E-anatomy

- A patient in the ER is found confused and disoriented w/ Cheynes-Stokes respiration. CXR shows bilateral symmetric upper-lobe air-space disease. What is the likely cause?
 - a) neurogenic edema
 - b) aspiration pneumonia
 - c) acute eosinophilic pneumonia

neurogenic edema

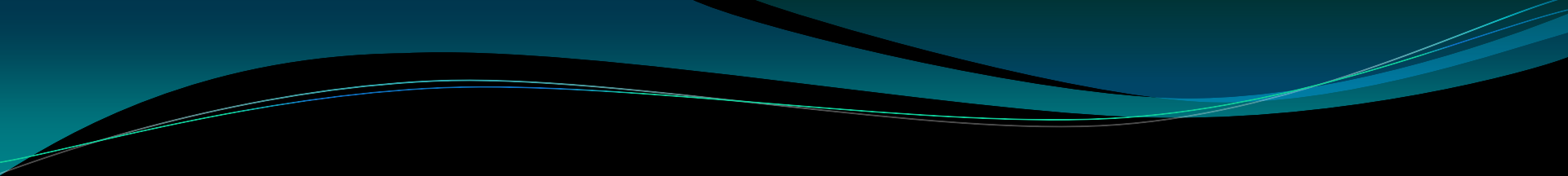
- The chest radiograph shows a bilateral alveolar filling process and a normal-sized heart (see [Media File 1](#)). This may mimic congestive heart failure with cephalization of blood flow, although other features of heart failure, such as septal lines, are usually not evident.
 - emedicine



- **What is the appropriate positioning for an aortic balloon pump?**
 - a. Descending aorta at the level of the diaphragm
 - b. Ascending aorta
 - c. Descending aorta just distal to the left subclavian artery takeoff
 - d. Aortic arch between the brachiocephalic artery and the left CCA

C. Descending aorta just distal to the left subclavian artery takeoff (just distal to the aortic knob)

- Intra-Aortic Balloon Counterpulsation (IABC) is instituted by insertion of a distensible polyurethane, nonthrombogenic balloon in the patients descending thoracic aorta. The balloon is passed retrograde to a position in situ just below the left subclavian artery, but above the renal arteries...
- Source: <http://mbob.tripod.com/iabp.htm>

- 
- Which of the following is most likely to metastasize to the heart?
 - Melanoma
 - Lymphoma
 - Bronchogenic CA
 - Renal cell CA

Melanoma

- -Mets to heart are most common MALIGNANT tumor (i.e. ahead of Primary malignant tumors). Answer is melanoma>lung> breast> lymphoma> leukemia.
- BLOOD = hemopericardium
 - (a) iatrogenic: cardiac surgery / catheterization, anticoagulants, chemotherapy
 - (b) trauma: penetrating / nonpenetrating
 - (c) acute myocardial infarction / rupture
 - (d) rupture of ascending aorta / pulmonary trunk
 - (e) coagulopathy
 - (f) neoplasm: mesothelioma, sarcoma, teratoma, fibroma, angioma, metastasis (lung, breast, lymphoma, leukemia, melanoma)

- What is the minimum stage for lung cancer that invades the parietal pleura?
 - a) Stage 1
 - b) Stage 2
 - c) Stage 3A
 - d) Stage 3B
 - e) Stage 4

Stage IIB – T3N0M0

- Parietal pleural invasion of non-small cell lung cancer (NSCLC) is a factor for poor prognosis, and a tumor of any size that invades the parietal pleura is classified as T₃.
 - *Classification of parietal pleural invasion at adhesion sites with surgical specimens of lung cancer and implications for prognosis; Virchows Archive*

- 45 y.o. female nodular thickening of right pleural space w/ proximal muscle weakness on physical examination. What is the most likely diagnosis?
 - a. mesothelioma
 - b. thymoma
 - c. metastatic adenocarcinoma
 - d. benign fibrous tumor of the pleura
 - e. pleural thickening

ANS: B: thymoma

- - unilateral nodular thickening, thymoma has no gender predilection. Metastasizing thymoma (benign appearing pleural or parenchymal seeding) or malignant thymoma (pleural thickening, often unilateral).
 - (*Danhert*)
- Myasthenia Gravis has proximal limb weakness
 - emedicine

- Cause of rounded atx
 - pneumonia
 - pleural effusion

ANS: B) pleural effusion

- Any type of pleural inflammatory reaction (asbestos leading cause), causes thickening of visceral pleura with progressive wrinkling + folding of subpleural lung. Radiographic findings: round mass in lung periphery, thickened pleura, mass most dense at periphery, mass never completely surrounded by lung, forming an acute angle with pleura, “comet sign” – bronchi and vessels curve toward mass, secondary signs of volume loss. ([Dahnert p.424, Primer])

- **Anterior mediastinal calcifications can be seen in untreated patients in each of the following condition except:**
 - Lymphoma
 - Thymoma
 - Teratoma
 - Aortic aneurysm
 - Thyroid goiter

Lymphomas almost never calc unless treated.

- Thymoma: calcification 5-25%
 - Dahnert

● In a 34 yo asymptomatic construction worker a routine CXR reveals unilateral pleural effusion which resolves on its own in 6 weeks. Six months later the patient presents with a focal upper lobe opacity. What is the most likely cause?

- a. lung cancer
- b. PE
- c. TB
- d. Lymphoma
- e. Viral infection
- f. Asbestosis
- g. Sarcoid
- h. PCP

Answer: A) TB

- A unilateral effusion and left upper lobe opacity are a common way for tuberculosis to present in an adult (adenopathy in kids); The effusion is low in glucose, just like in RA; mesothelioma can also present with a unilateral effusion though it is a bloody effusion.
 - (AFIP NOTES AND GALVIN)
- TB pleural effusions in 23-38% adults and 10% children; usually with mediastinal LAD and one or more homogenous area of ill defined airspace consolidation of 1-7cm; atelectasis is seen in 8-18% especially in right anterior segment of the upper lung.
 - Primer pgs 12-15; Dähnert pgs 444-445; Fraser 2nd p

- **Which of the following are branch of left circumflex**

- Acute marginal
- Obtuse Marginal
- Diagonal
- Conal
- Septal

ANS: D) obtuse marginal

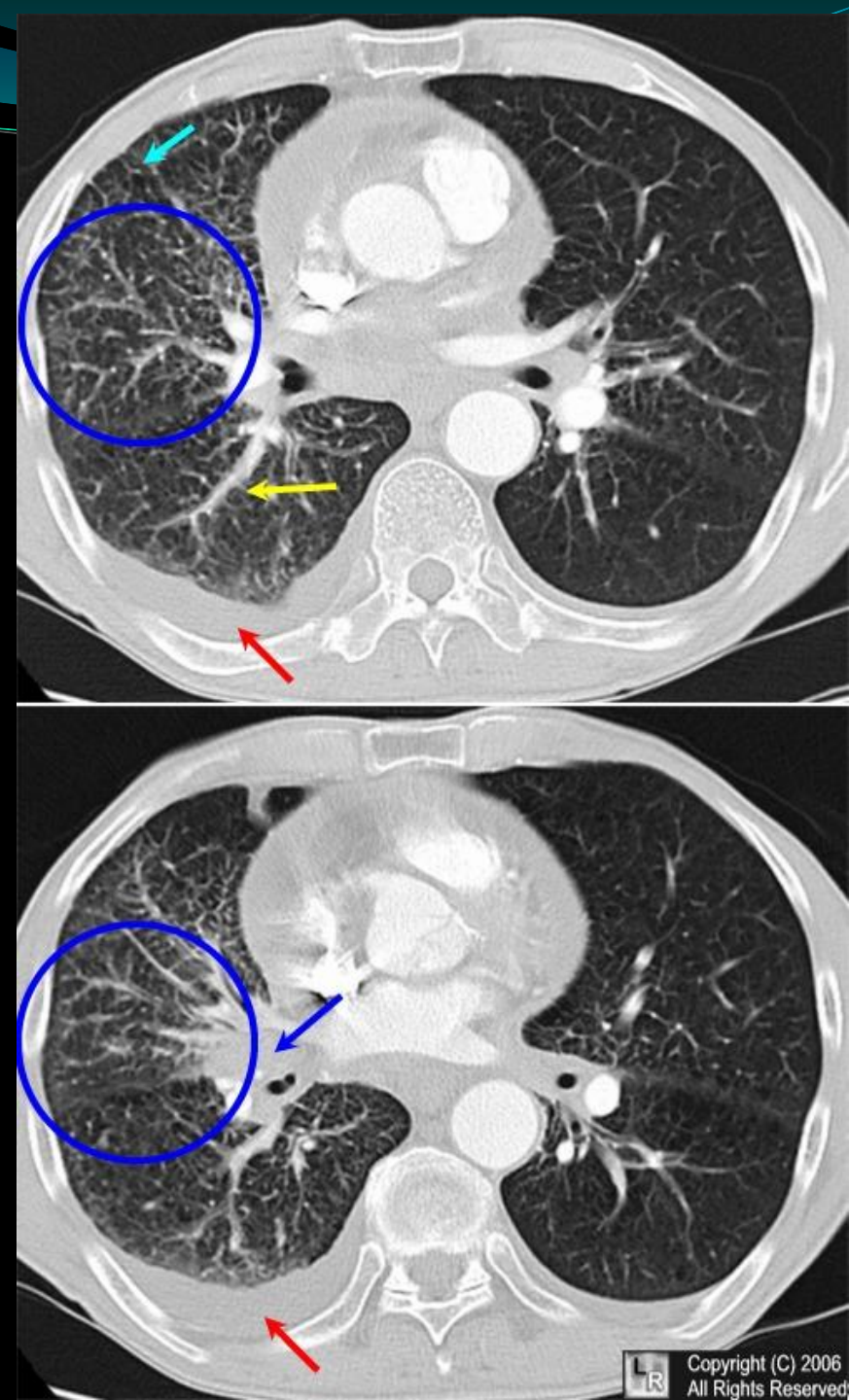
- -The LCX runs across the left atrioventricular groove. It gives off obtuse marginal (OM) branches. *Wikipedia*
- -Diagonal branches come off the LAD and run along surface of heart to supply lateral wall of LV and anterolateral papillary muscle.
- -Septal perforators also come off the LAD to perfuse the intraventricular septum.
- -The Right Conus branch is first branch off the R coronary artery and passes anterior to the RVOT. perfuses the SA node

- -“ What is the typical appearance of lymphangitic spread of tumor?”
 - a. nodular thickening of the interlobular septa with polyhedrals
 - b. smooth thickening of interlobular septa
 - c. ground glass opacity

polyhedrals

- **CT findings**
- Irregular, nodular, and/or smooth interlobular septal thickening
- Thickening of the fissures from infiltration of lymphatics in the subpleural space
- Peribronchovascular thickening which predominates over interlobular septal thickening in a minority of patients
- Polygonal arcades or polygons with prominence of the centrilobular bronchovascular bundle in association with interlobular septal thickening (50%)
- Mediastinal and/or hilar lymphadenopathy (30-50%)
- Pleural effusions (30-50%)
 - Laminar pleural effusions are common
- Nodular opacities₁
 - Learning Radiology

- **Lymphangitic carcinomatosis.**
- A central bronchogenic carcinoma (blue arrow) is producing unilateral interstitial edema (blue circles) characteristic of lymphangitic carcinomatosis with a pleural effusion (red arrow), thickening and irregularity of the bronchovascular bundles (yellow arrow) and thickening of the interlobular septa (light blue arrow)



- Sarcoidosis versus lymphangitic spread on HRCT.
 - a. peribronchial vascular bundles
 - b. subpleural nodules
 - c. ground glass opacities
 - d. nodular septal thickening

c. Ground glass opacities

- Sarcoid- Patterns on HRCT:

and septal thickening

Thickened bronchovascular bundles
Ground glass opacities
Consolidation and large nodules
fibrosis

Pleural, subpleural,

Lymphangitic carcinomatosis - HRCT patterns:

Smooth or nodular thickening of the peribronchovascular interstitium, fissures or interlobular septa. No mention of GG opacities

- Dahnert
- Sarcoid: Smooth or nodular peribronchovascular interstitial thickening; small well defined nodules in relation at the pleural surfaces, interlobular septa or centrilobular structures; large nodules with apparent air space consolidation; ground glass opacity (alveolitis); fibrosis; bronchiectasis; adenopathy (Webb HRCT)

- Association with eosinophilic granuloma include all EXCEPT
 - a. renal failure
 - b. lytic skull lesion
 - c. vertebral plana
 - d. something about the thymus

Answer: A) renal failure

- Eosinophilic granuloma is the most common manifestation of Langerhans-Cell Histiocytosis; the other two forms are Hand Schuller Christian disease and Letter-Siwe disease, albeit these are much less common manifestations. The disease is characterized by a defect in langerhans cells that simulate inflammation and involve the bones, lymph nodes, liver and spleen, GI tract and endocrine system.
- Lytic skull lesion and EG): most common to affect the skull though also can affect the spine and long bones and mastoids; will present with a lytic lesion in the skull. Because this affects kids usually the ddx for the skull lesion include neuroblastoma mets, leukemia and lymphoma.
- Vertebral plana: another manifestation of EG will spare the posterior elements.
- The ddx includes steroids, trauma, eg, tumor, hemangioma, steroids, infection
- Thymus: Dahnert
- Chest: EG will cause bizarre shaped cysts; strong association with smoking; presents in 20-40 year age group; 3 different phases: nodular, mixed nodular and cystic and cystic. Recurrent pneumothorax! (Dahnert)

- Which lesion results in pulmonary edema?
 - A. Tetralogy of Fallot
 - B. Aberrant L coronary artery
 - C. Absence of pulmonary valve
 - D. Intracardiac TAPVR

Answer: D) intracardiac TAPVR

- *Totally of Fallout: failure of the infundibulum to develop, tetrad includes obstruction of the right ventricle outflow tract; large vsd; rv hypertrophy; overriding aorta; Will present with cyanosis after the ductus has been closed; children will squat to increase pulmonary blood flow; in a neonate have a rt to left shunt via the pda. Other associated abnormalities are a bicuspid pul valve; left pul art stenosis; rt arch.*
- *Aberrant Left coronary Artery: listed cause of a right to left shunt; due to the left coronary artery originating from the pulmonary artery; when pul. Art. Resistance drops will siphon blood via collaterals from the rca to the left cor art and to lung; will present with chest pain and an mi! can have either nml pul vascularity or redistribution*
- *Absent pul. Valve: Really rare lesion with an atretic pul valve and. Associated with hypogenetic lung*
- *TAPVR: 3 types; disorder where venous return is the RA and causes a left to right shunt; all have an asd!*
- *I= supracardiac; blood flows via left vertical vein(left svc) to the left brachiocephalic vein and into svc; heart is snowman configured with cardiomegaly and increased flow; 50% can get venous obstruction due to compression by bronchus*
- *II=cardiac; pul veins drain into the coronary sinus or into the RA; non specific appearance with a large heart and increased vascularity*
- *III=infracardiac; pul vein descends thru the esophageal hiatus and drains into the PV or IVC or HV; venous return is obstructed; ht size is nml; pul edema*

- **Regarding Hepatocellular pleural fluid disease:**
 - Can occur without cirrhosis
 - Left more often than right
 - Associated with infection
 - Can occur with minimal ascites
 - Treated with pleurodesis

Can be seen with only minimal ascites

- Patients with advanced cirrhosis and portal hypertension have abnormal extracellular fluid volume regulation that in most cases results in accumulation of fluid, typically in the abdominal cavity (ascites) or lower extremities (edema). In approximately 5 to 10 percent of cirrhotic patients, fluid accumulates in the pleural space [1-3] . Hepatic hydrothorax is defined as a pleural effusion, usually greater than 500 mL, in patients with cirrhosis and without a primary cardiac, pulmonary, or pleural disease [1,4] .
 - uptodate
- Pts have a large effusion (rt=67%; left 17%; b/l=17%); fluid moves via diaphragmatic slips. (Dahnert)
- Hepatic hydrothorax is a recurrent transudative pleural effusion that occurs in patients with cirrhosis even in the absence of ascites or other manifestations of portal

- **Boerhaave's Syndrome of the esophagus is associated with:**
 - Bilateral pleural effusion more common than unilateral
 - Pneumomediastinum is early finding
 - Pain is a late finding
 - 1st test is Barium Esophagram

Pneumomediastinum is early finding

- Boerhaave's syndrome is a ruptured esophagus (transmural) due to increased pressure in the setting of vomiting (typically); the patient presents with severe substernal pain and an early finding on CXR is pneumomediastinum.
- Effusions are typically unilateral (L >> R) and an exam with water soluble contrast is usually performed. The leak is usually on the left about 2-3 cm above the GE junction (Dahnert)

- What is the location of the granuloma in sarcoidosis?
 - a. alveolar septum
 - b. perilymphatic distribution (bronchovascular)

perilymphatic distribution (bronchovascular)

- In sarcoidosis the granulomas are in a perilymphatic distribution with locations typically in the peribronchovascular spaces, perihilar regions, fissures, subpleural margins, interlobular septa or centrilobular; (Webb HRCT)

- **Regarding right ventricular failure in emphysema, it is most commonly related to**
 - pulmonary arterial hypertension
 - arteriosclerotic coronary artery disease
 - direct myocardial toxicity
 - chronic lung damage and hypoxia
- **In patient with COPD, what is the most common cause of heart failure?**
 - a. Pulmonary hypertension (Cor pulmonale)
 - b. atherosclerotic heart disease
 - c.
 - d.
 - e.

- **Answer: (A) – pulmonary arterial hypertension**
- *Pulmonary arterial hypertension* is a complication of emphysema and can lead to right-heart enlargement and eventually to cor pulmonale or right heart failure (Dahnert 5th 484, 573). Arteriosclerotic disease could be an answer if you assume that most patients with emphysema are smokers, who tend to have more CAD, and thus LV failure from MIs.
- **B. Atherosclerotic heart disease**
- Cardiac disease in patients with chronic pulmonary disease is usually caused by coronary artery disease, especially in older patients with a history of smoking. Coronary artery disease leads to CHF (LHF) superimposed on the chronic lung disease. Right heart failure is much less common than left heart failure (LHF) and is most commonly caused by LHF. Other causes include increased pulmonary arterial pressure – pulmonary stenosis, tricuspid regurgitation, right ventricular infarction, and volume overload from septal defect. Conclusion: The most common cause of heart failure in a patient with chronic lung disease is atherosclerotic disease (of coronary arteries). *Freundlich 2nd p. 354*
- Of 405 participating patients with a diagnosis of COPD, 83 (20.5%) had previously unrecognized heart failure (42 patients systolic, and 41 'isolated' diastolic, and none 'isolated' right sided heart failure).
 - *Heart failure in COPD*

- Which disease does NOT cause decreased lung compliance? (AKA, which causes increased lung compliance?)
 - a. Idiopathic pulmonary fibrosis
 - b. Alpha-1 antitrypsin deficiency
 - c. Eosinophilic granulomatosis
 - d. Rheumatoid lung
 - e. CHF
 - f. Lymphangitic carcinomatosis\

Answer: C) alpha 1 antitrypsin

- Increased Compliance: Emphysema
- Decreased Compliance: Edema; fibrosis; granulomatous infiltration (Dahnert)
- Alpha-1-antitrypsin deficiency allows alveolar inflammatory cells to destroy the lung parenchyma, which eventually reduces lung contractility (= increased compliance).
- Restrictive lung dz. – decreased compliance (chronic interstitial lung disease, fibrosis, edema)
- EG causes a combination of obstructive and restrictive lung disease. Dähnert p.498

- All of the following are causes of acquired bronchiectasis except?
 - a. cystic fibrosis
 - b. immotile cilia syndrome
 - c. aspiration pneumonia
 - d. immunodeficiency
 - e. idiopathic pulmonary hemosiderosis

idiopathic pulmonary hemosiderosis

- Immunodeficiency, aspiration and primary ciliary dyskinesia accounted for 67% of the cases of non-CF bronchiectasis.
 - Non-CF bronchiectasis: does knowing the aetiology lead to changes in management?; European Respiratory Journal
- Cystic Fibrosis: autosomal recessive disease where a defect on chromosome 7 leads to a defect in a membrane transporter; get abnml high amount of
- Na and Cl in the secretions; frequent pneumonia (pseudomonas); mucoid impaction; ul> ll changes; meconium ileus; pancreas with fibrofatty change; sinusitis; infertility
- Immotile Cilia syndrome (Kartagener's syndrome); disorder of abnormal mucociliary function due to deficiency of dynein arms of cilia; get situs inversus; nasal polyps and bronchiectasis
- Aspiration pneumonia: chronic aspiration either in the setting of ETOH abuse or Parkinson's or CVA can predispose you to bronchiectasis as well
- Immunodeficiency: either congenital or acquired predisposes you to bronchiectasis; if congenital consider chronic granulomatous disease as a cause.
- Idiopathic pulmonary hemosiderosis; autoimmune process that causes

- On a CT scan of the lungs, which of the following is most likely to be the cause of increased parenchymal density (measuring 125 HU)?
 - BOOP.
 - IPF.
 - Amiodarone.
 - BAC.
 - Pseudolymphoma.

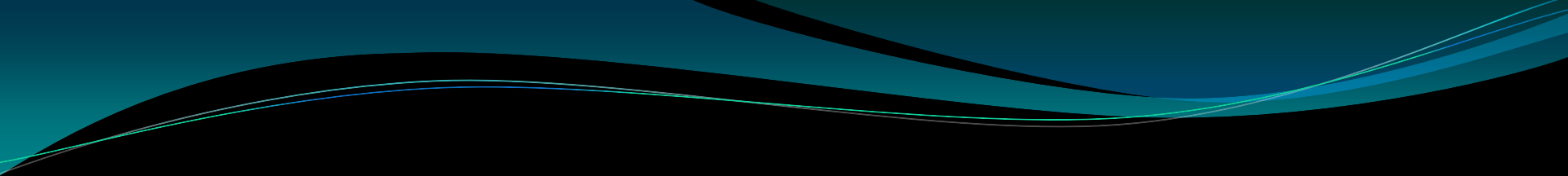
• Answer: Amiodarone

- Amiodarone is a drug used to treat arrhythmia with excellent results. Unfortunately, it can lead to complications. Its most common pulmonary cause is BOOP/COP pattern; similarly it can also present with high density nodules (due to iodine in drug); if recognized early is reversible! Also look for a hyperdense liver to help you in this diagnosis.
 - *Dahnert*
- Amiodarone contains 37% iodine by weight. 95 – 145 HU (range of normal for liver 30 – 70 HU). It leads to pulmonary insufficiency after 1 – 12 months in 14 – 18% on long term therapy. Alveolar and interstitial infiltrates, peripheral consolidations, pleural thickening adjacent to consolidations, consolidated lung parenchyma has attenuation values of iodine.

- **Nodular pleural density with proximal limb weakness, most likely diagnosis:**
 - **Mesothelioma**
 - **Metastatic Ewings**
 - **Diffuse AdenoCA**
 - **Thymoma**
 - **Fibrous Tumor of the pleura**

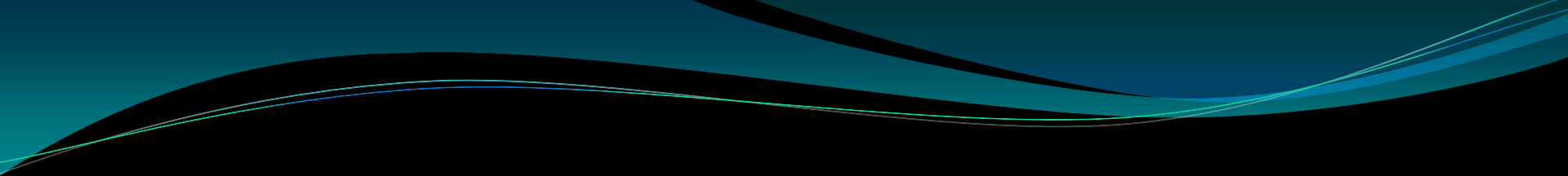
Answer: D. Thymoma

- *Mesothelioma: a long term manifestation of exposure to asbestos (amphibole); presents 30-40 yrs after exposure and can present with a bloody effusion; cause diffuse pleural thickening and will see pleural plaques as a sign of the disease. Is the most common primary pleural neoplasm; Poor prognosis*
- *Metastatic Adenoca: Mets is the most common pleural neoplasm and can be due to lung, breast, ovarian or stomach ca; less common causes are lymphoma or a thymoma; will be similar appearance to mesothelioma or other tumors and cause circumferential or nodular thickening.*
- *Benign Fibrous tumor of pleura: a very rare and AFIP award winning case if you have it (see matt heller for more info); Is a smooth, well rounded lobular mass that if pedunculated will be mobile (a finding that is supposedly diagnostic); will present with hypoglycemia or Hypertrophic pul osteoarthropathy; treat with resection and has a 90% cure rate.*
- *Thymoma: an asymptomatic (usually) neoplasm that presents as an ant mediastinal mass. If symptomatic will be due to size or to a paraneoplastic syndrome; the paraneoplastic syndromes include a pure red cell aplasia; myasthenia gravis; hypogammaglobulinemia; or cushing like syndrome*
- *If invasive the lesion will cause nodular pleural thickening.*
- *Myasthenia Gravis : if a patient has this; (Ab against the post nmj acetylcholine receptors) than routine workup is to check for thymic abnormalities; 85% will have thymic hyperplasia and 15% have a thymoma; similarly of patients with a thymoma about half have MG (Dahnert, AFIP and Brant and Helms)*

- 
- Which of the following is false regarding pulmonary embolism?
- a. infarcts not very common with PE
 - b. distal emboli are more likely to cause infarcts
 - c. rare from upper extremity
 - d. the clinical triad of cough, chest pain, and hemoptysis is present in a majority of patients with angiographically proven emboli

hemoptysis is present in a majority of patients with angiographically proven emboli

- -Pulmonary embolism is a difficult diagnosis with a highly varied form of presentation; only 1/3 present with the classic triad of hemoptysis, cough and chest pain;
 - --of those with a pul embolus 90% do not develop an infarct;
 - (*AFIP Notes, Dahnert, Brant and Helms, Armstrong*)
 - However, PE is not a rare complication in upper extremity DVT
 - *Upper-extremity deep venous thrombosis and pulmonary embolism. A prospective study; CHEST*
- Pulmonary Thromboembolism Symptoms: cough (53%), pleuritic chest pain (88%), hemoptysis (30%). So obviously, patients who have all three of these symptoms will be < 30% [14% if these are independent variables]. Other Symptoms -dyspnea (84%), apprehension (59%), ↑ RR (92%).
- Infarcts occur in 10-60%; source is DVT of lower extremity / pelvis in > 90%; distal emboli produce infarcts mainly due to the lack of collateral flow.



What is the most likely manifestation of thymic carcinoid?

- a. Carcinoid syndrome
- b. SIADH
- c. Conn's syndrome
- d. hyperinsulinism
- e. Cushing's syndrome

E. Cushing's syndrome

Adapted from:

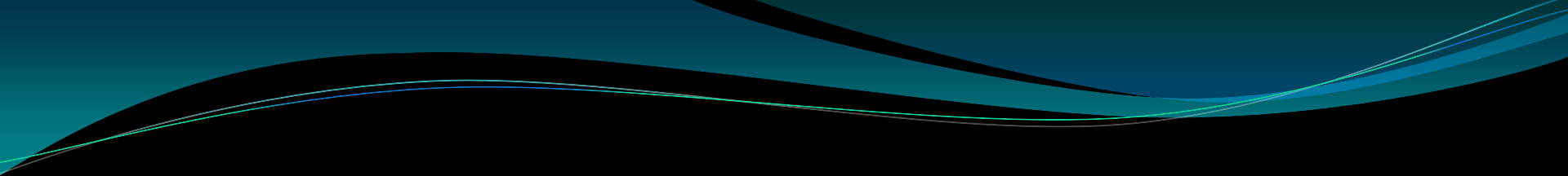
Radiographics. 1999;19:707-736.

CONTINUING EDUCATION

From the Archives of the AFIP

Thoracic Carcinoids: Radiologic-Pathologic Correlation

- Approximately one-half of thymic carcinoids are functionally active and manifest with clinical hormone syndromes.
 - Cushing syndrome: 33%–40% of affected individuals.
 - Type 1 MEN (Wermer syndrome): 19%–25% of patients with thymic carcinoids. Type 1 MEN syndrome is characterized by:
 - hyperparathyroidism (90% of cases), islet cell tumors of the pancreas (80%), and pituitary adenomas (65%). Carcinoids, adrenal adenomas or carcinomas, lipomas, or follicular thyroid adenomas are less frequently associated neoplasms .
 - Additional associated conditions found in patients with thymic carcinoids include type 2 MEN syndrome, inappropriate secretion of antidiuretic hormone, polymyositis, clubbing, polyarthropathy, and myocarditis.
 - There are no reports of the carcinoid syndrome in patients with thymic carcinoids.



On a chest X-Ray, what is the most specific/reliable CXR sign best of sternal dehiscence?

- a. new vertical lucency
- b. new broken wire
- c. lateral displacement of the sternal wire
- d. hematoma

Lateral displacement of the sternal wire

● Imaging findings

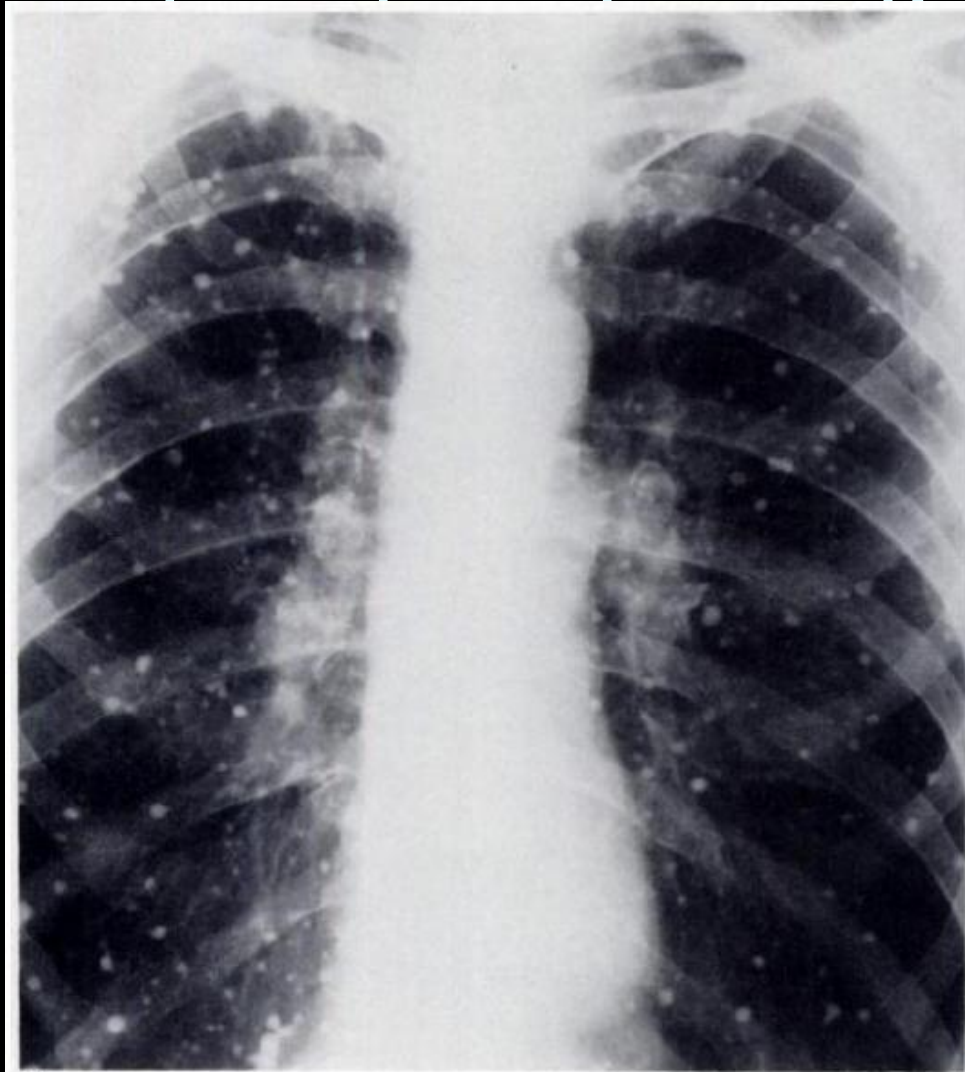
- Originally it was thought that a mid-sternal stripe of lucency seen on frontal chest radiographs was an indicator of sternal dehiscence but this is now felt to be of little diagnostic value
- **With dehiscence, sternal wires are displaced to one side or the other as they tend to pull through the sternum, rather than break**
 - **Most frequently 2 cm of displacement is seen in 2 or more wires**
- Sternal wire breaks alone are not an indicator of sternal dehiscence and single breaks are usually of no clinical significance
- CT findings of mediastinitis can include small air bubbles or an air-fluid level in a mediastinal collection
 - *Learning Radiology*

- Calcified hilar lymph nodes can be seen with all of the following EXCEPT:
 - a. EG
 - b. Silicosis
 - c. TB
 - d. Sarcoid
 - e. Lymphoma

EG True. Pulmonary nodules don't calcify.

- b. False. Central calcifications in 5-10% of cases of chronic silicosis. Also calcification (eggshell) of hilar/mediastinal adenopathy in 5%.
- c. False. Calcified granulomata and nodes.
- d. False. Granulomatous disease which may present like TB.
- e. False. Eggshell calcification of nodes when treated.
- DDx of calcified pulmonary nodules:
 - Histo, Hamartoma, Amyloid, **Alveolar microlithiasis**, Mitral stenosis, Mets (thyroid, osteosarcoma, mucinous carcinomas), TB, **Varicella**, Silicosis
 - *Dahnert 5th 423*

Histoplasmosis – eggshell calcifications



- The pulmonary valve is located where in relation to the aortic valve?
 - a. Anterior, Superior and Left
 - b. Anterior, Superior and Right
 - c. Posterior, Superior and Left

ANTERIOR, SUPERIOR, AND TO THE LEFT.

- **ANSWER: A.** The pulmonary valve is superior, anterior, and to the left of the aortic valve. On a lateral chest radiograph, the aortic valve is superior to the mitral valve. If a line is drawn between the left main bronchus and the sternodiaphragmatic junction, the aortic valve is above this line and the mitral valve is below this line. (Radiology Recall)

- Lung metastases are least associated with:
 - renal cancer
 - thyroid cancer
 - prostate cancer
 - testicular cancer
 - melanoma

C. Prostate

- Probability of pulmonary mets:
 - RCC, Osteosarcoma, Choriocarcinoma: 75%
 - Thyroid: 65%
 - Melanoma: 60%
 - Breast: 55%
 - Prostate: 40%
 - Head and Neck: 30%
 - Esophagus: 20%
- *Dahnert 5th 506*
- *It is unusual for prostate cancer (c) to metastasize to the lungs*

	Primary Tumor	Frequency at Presentation, %	Frequency at Autopsy, %
	Choriocarcinoma	60	70-100
	Melanoma	5	66-80
	Testis, germ cell	12	70-80
	Osteosarcoma	15	75
	Thyroid	7	65
	Kidney	20	50-75
	Head and neck	5	15-40
	Breast	4	60
	Bronchus	30	40
	Colorectal	<5	25-40
	Prostate	5	15-50
	Bladder	7	25-30
	Uterus	<1	30-40
	Cervix	<5	20-30
	Pancreas	<1	25-40
	Esophagus	<1	20-35
	Stomach	<1	20-35
	Ovary	5	10-25
	Hepatoma	<1	20-60

- MR similar to this with arrow pointing to structure in LV (TOP ARROWS)
 - a. papillary muscle
 - b. moderator band
 - c. thrombus
 - d. Myxoma



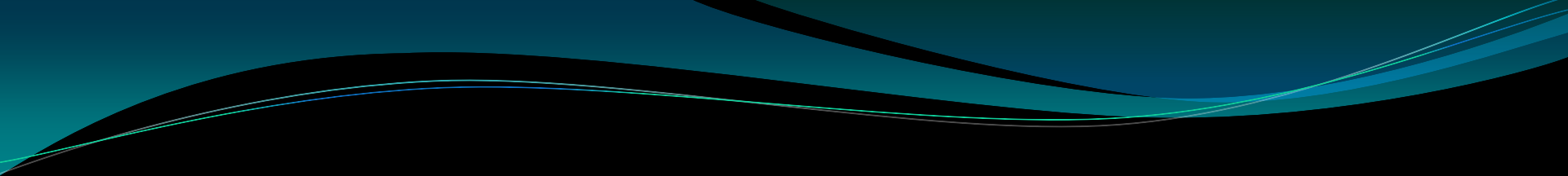
Papillary muscles

- Papillary muscles usually look like pimples in the left ventricle. The most common papillary muscle to rupture is the posteromedial from an inferior wall MI. It causes a sudden onset of mitral insufficiency and RUL pulmonary edema (see a trend???). There is a 70% mortality within 24 hours of a papillary muscle rupture.
- Moderator band is in the RV

- All of the following present as miliary nodules EXCEPT:
 - a. Langerhan's cell histiocytosis
 - b. Tuberculosis
 - c. Silicosis
 - d. Thyroid metastasis
 - e. Renal metastasis

Renal metastasis

- Mnemonic TEMPEST:
 - T = TB, fungal dz
 - E = EG
 - M = mets (thyroid, melanoma, adenocarcinoma)
 - P = pneumoconiosis
 - E = embolism of oily contrast
 - S = sarcoidosis
 - T = TS (Dahnert p. 417).

- 
- Alcoholic cardiomyopathy is associated with which of the following:
 - Systolic dysfunction only
 - Diastolic dysfunction only
 - Systolic and diastolic dysfunction.

LV Systolic and diastolic dysfunction

⑩ *Harrison's*

⑩ As the disease progresses, the left ventricular wall thickness may become normalized or reduced. Established alcoholic cardiomyopathy is characterised by pronounced LV dilatation, increased LV mass, thin (or normal) LV walls, diastolic dysfunction (asymptomatic phase) and systolic impairment (symptomatic phase) [7] .

⑩ *Uptodate*

- **Diastolic heart dysfunction**
 - a. in the elderly, as common as systolic dysfunction.
 - b. Dilated cardiomyopathy
 - c. IHSS
 - d. LV hypertrophy

DHF is seen in all of the answers - SFH
a. in the elderly, as common as systolic dysfunction.

Diastolic heart failure in the elderly.

Heart Fail Rev. 2002 Jan;7(1):17-27.

for expression of DHF. Recent reports from large population-based observational studies indicate that over 50% of persons 65 years and older who have heart failure have normal LV systolic function (presumed DHF). Among these, 45% have no other confounding variables (coronary, valvular, or pulmonary disease) and meet the criteria for isolated DHF. DHF is substantially more common in older women than men. A history of systemic hypertension and left ventricular hypertrophy are almost invariably present. Mortality rates are about 50% lower in

- **Chronic hypertension is the most common cause of diastolic dysfunction and failure. It leads to left ventricular hypertrophy and increased connective tissue content, both of which decrease cardiac compliance.¹⁰**
 - *AAFP: Diastolic Heart Failure: Challenges of Diagnosis and Treatment*

- Which lower lobe pulmonary artery branch is seen at the same level as the right mainstem bronchus on an axial CT:
 - Superior
 - Medial basal
 - Anterior basal
 - Lateral basal
 - Posterior basal
- The superior segment PA is the only lower lobe branch at the level of the RMS bronchus.
 - *e-anatomy.org*

What is the most common mediastinal mass in a 6-12 yo?

- a. neuroblastoma
- b. lymphoma
- c. rhabdomyosarcoma
- d. Ewing's sarcoma
- e. metastatic Wilm's

B. Lymphoma

- Peak age range for pediatric NHL is 7-11 years.
- Neuroblastoma occurs in younger children (79% <4yrs, 97% <10yrs).
 - *Dahnert 5th 431-433, 932-933; Kirks 3rd 779-792*
- Lymphomas were the most common tumors and represented 27% of our patients (10/37). They generally presented in the teen years and were located in the middle mediastinum.
 - *Childhood mediastinal masses in infants and children: Turkish Journal of Pediatrics*

Anterior Mediastinal Lymphoma in adolescent



Which of the following is a reason that digital radiography is superior to film for portable imaging?

- a. wider density latitude
- b. resolution
- c. lower patient radiation exposure
- d. ?

A. wider density latitude

- The wider the latitude, the less critical the exposure time. CR images can be digitally manipulated (windowed) at the workstation, while digitized screen-film cannot. Therefore, CR images probably have wider density latitude.
- Resolution of both CR and DR is less than that of film-screen.
- CR results in higher patient doses than does film-screen. I think DR results in less patient dose, but DR cannot be used portably.

- A patient has chronic eosinophilic pneumonia. Which of the following statements is false?
 - a. more common in females
 - b. peripheral blood eosinophilia
 - c. slowly responds to therapy
 - d. ?
- Which of the following statement is TRUE concerning chronic eosinophilic pneumonia:
 - a. tends to exacerbate after treatment stops
 - b. peripheral blood eosinophilia is uncommon
 - c. other choices not remembered

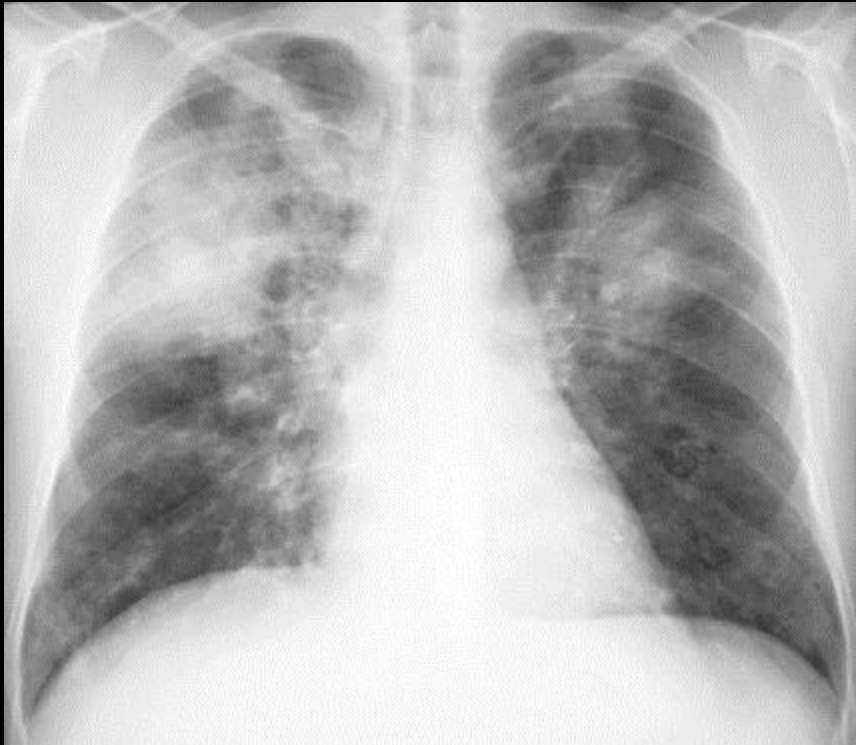
C. Slowly responds to therapy (false)

- Age:middle-age; M < F
- Numerous eosinophils, macrophages, histiocytes, lymphocytes, PMNs within lung interstitium + alveolar sacs
- Etiology:unknown
- Common history of atopia (may occur during therapeutic desensitization procedure)
- Adult onset asthma (wheezing)
- high fever, malaise, dyspnea (DDx to Löffler syndrome)
- peripheral blood eosinophilia (with rare exceptions)
- Homogeneous alveolar lung infiltrates with distribution at lung periphery = **"photographic negative" of pulmonary edema**
- Frequently bilateral nonsegmental
- Chronic-unchanged for many days / weeks (DDx to Löffler syndrome)
- Rx:dramatic response to steroid therapy (within 3-10 days) fast regression of infiltrates under steroids
 - *Dahnert 5th 475*

tends to exacerbate after treatment stops

- Peripheral eosinophilia is common, about 90%. Relapse is also common, and majority of pts require low-dose long term steroids (Armstrong p. 589-590).
- Radiographically, chronic eosinophilic pneumonia classically has peripheral opacities that usually persist for many days or weeks, unless steroid treatment is initiated.

Eosinophilic pneumonia



- Chest radiography
 - Patients with AEP exhibit bilateral, diffuse, peripheral infiltrates and pleural effusion. Early stages may show Kerley B lines. Late stages may show mixed interstitial and alveolar infiltrates.
 - Patients with CEP exhibit dense, bilateral, peripheral infiltrates, often described as the **negative image of pulmonary edema**, in the outer two thirds of the lung fields. The bilateral, diffuse, peripheral infiltrates are considered virtually diagnostic of CEP but occur in only 25% of patients. Unilateral pulmonary infiltrates and, rarely, consolidation, cavitation, and atelectasis are present. CEP can mimic pulmonary tuberculosis (PTB).
 - emedicine

A patient has a 4 cm mass in the periphery of the lungs with ipsilateral mediastinal lymphadenopathy. No distant mets. Stage?

- a. T₀N₁M₀
- b. T₁N₁M₀
- c. T₁N₂M₀
- d. T₂N₁M₀
- e. T₂N₂M₀

E. T2N2M0

• $>3\text{cm in lung} = T_2$

• ~~ipsilateral mediastinal nodes~~ = N2

• Contralateral mediastinal/hilar nodes = N3

• No distant mets = Mo

• *Dahnert 5th 469*

• $t_1 < 3\text{cm}$, limited to lung. $t_2 > 3\text{cm}$ size, $>2\text{cm}$ distal to carina.

• n_1 vs. n_2 = ipsilateral hilar or intrapulmonary vs. mediastinal/subcarinal.

• I think that since the question asks "single lymph node" then they imply hilar nodes, since these would occur before mediastinal/subcarinal nodes.

•

• Key points:

• All tumors are resectable until Stage IIIB: any T, N3 (contralateral nodes), Mo as well as T4, any N, Mo. basically T4 (mediastinal organs, invasion or malignant effusion, N3, or M1 (distant mets) are unresectable. M1 means stage IV, but stage IIIB could still have radiation since confined to chest.

• Mass General p. 27-28, and Armstrong 3rd edition p317.

- All of the following nodal groups are accessible to bx during transcervical mediastinoscopy EXCEPT?
 - a. Anterior subcarinal
 - b. Precarinal
 - c. Right paratracheal
 - d. Left paratracheal
 - e. Prevascular

Prevascular

- Cervical mediastinoscopy introduced by Carlens remains the gold standard surgical technique of the mediastinal nodal staging in lung cancer patients [1]. Visual inspection of the right and left paratracheal spaces and the anterior subcarinal space, and taking biopsies from the nodes of station 2R, 4R, 2L, 4L and 7 is possible during mediastinoscopy, while the other mediastinal stations are not accessible with this procedure
 - *Transcervical extended mediastinal lymphadenectomy; Multimedia cardiothoracic surgery journal*
- Lymph Node Map definition
 - 1. Highest mediastinal nodes
 - 2. Upper paratracheal nodes
 - 3. Prevascular and retrotracheal nodes
 - 4. Lower paratracheal nodes
 - 5. Subaortic (aortopulmonary window)
 - 6. Para-aortic nodes (ascending aorta or phrenic)
 - 7. Subcarinal nodes
 - 8. Paraesophageal nodes (below carina)
 - 9. Pulmonary ligament nodes

SFH

- **Computed Body Tomography with MRI Correlation**

- *By Joseph K. T. Lee, Stuart S. Sagel, Robert J. Stanley, Jay P. Heiken*
- This book says that mediastinoscopy is good for paratracheal and anterior subcarinal nodes. It is not good for prevascular and AP window nodes.
- Posterior subcarinal nodes can be sampled from a transbronchoscopic needle biopsy.

- Which of the following statements regarding subcarinal lymphadenopathy is true:
 - It is often difficult to distinguish from a bronchogenic cyst on CT.
 - It displaces the Left main bronchus posteriorly.
 - It is easily approachable by mediastinoscopy.
 - It can be biopsied by transthoracic needle approach.
 - Last answer which is what was believed to be the correct answer.????
- It is sometimes difficult to distinguish bronchogenic cyst from subcarinal LAD because ~ 40% are soft tissue density

- **The patient is status post RUL lobectomy now has RML gangrene, what is the cause?**
 - a. aspiration
 - b. RML torsion
 - c. thrombosis of right superior pulmonary vein
 - d. ligation of interlobar artery
 - e. Surgical interruption of PA
 - f. Surgical interruption of pulmonary vein
 - g. Ligation of bronchus intermedius

B. RML Torsion

Interactive Cardiovascular and Thoracic Surgery 3 (2004) 107–109

Pulmonary middle lobe fixation using TachoComb in patients undergoing right upper lobectomy with complete oblique fissure

Pulmonary lobar torsion is a rare, but serious complication after thoracotomy [1–6]. In particular, middle lobe torsion after right upper lobe sections is the most common event, and its cause is considered intraoperative and postoperative dislocation of the middle lobe with complete oblique fissure [1–6]. To prevent this complication, it is reasonable to fix the middle lobe to the lower lobe if the oblique fissure is complete [1–6].

- Most sensitive sign on CXR for traumatic aortic injury?
 - a. Widening of superior mediastinum
 - b. Upper rib fx
 - c. Rightward displacement of NG tube
 - d. Downward displacement of L main bronchus
 - e. Apical cap

A. Widening of the superior mediastinum

- Mediastinal width > 8cm at level of aortic knob (75%)
- Poorly defined irregular aortic contour (75%)
- Deviation of nasogastric tube to right of spinous process at T₄ (67%)
- Depression of left mainstem bronchus anteroinferiorly + toward right (53%)
- Leftward displacement of left mediastinal strip abnormally extending above the level of the aortic arch forming a left apical cap (37%), one of the earliest and most specific signs
- Fractures of the 1st and 2nd rib (17%)
 - Dahnert

- Which of the following is seen in RUL collapse?
 - a. Bronchus intermedius medially displaced
 - b. Posterior aspect of the middle lobe is hyperexpanded
 - c. Left upper lobe herniation
 - d. Elevation of the right hemidiaphragm
- Findings of right upper lobe collapse.
 - a. posterior herniation of left upper lobe
 - b. tenting of the right hemidiaphragm
 - c. posterior herniation of the right middle lobe

Elevation of the right hemidiaphragm

- B. Posterior aspect of the middle lobe is hyperexpanded is also true
- Compensatory hyperexpansion of the middle and right lower lobe leads to outward and upward displacement of the right lower lobe pulmonary artery.
- Upward angulation of the right mainstem and lower lobe bronchi may be difficult to appreciate on CXR.
- CE p. 170

B. tenting of the right hemidiaphragm

- Two radiologic signs are associated with RUL atelectasis. The golden S sign refers to RUL collapse around a central obstructing mass.
- The juxtaphrenic peak sign refers to a small triangular shadow based on the apex of the dome of the right hemidiaphragm with loss of silhouette of the adjacent hemidiaphragm.
- CE p. 171

- **Which of the following would be most helpful to determine the etiology of a mosaic pattern seen on high resolution CT?**
 - a. Lateral decubitus film
 - b. MRI
 - c. Routine chest CT
 - d. High resolution CT in expiration

D. High resolution CT in expiration

- Air trapping:
 - On expiratory scans from collateral air drift into postobstructive alveoli
- Vascular obstruction:
 - Attenuation differences similar on expiratory HRCT
 - *Dahnert 5th 410, 465*
- End-expiratory images help to determine whether mosaic perfusion is caused by air-trapping or primary vascular disease.
- Alterations that consist of patchy areas of decreased vascularity and attenuation associated with blood flow redistribution to uninvolved areas is a pattern known as mosaic attenuation or mosaic perfusion. Vascular mosaicism most commonly seen on CT with bronchiolitis obliterans, asthma, and chronic PE, pulmonary HTN or hypersens. Pneumonitis.

- **Alveoli develop fully by which age?**
 - a. Birth
 - b. 2 years
 - c. 4 years
 - d. 8 years

D. 8 years

- Approximately 60 million primitive alveoli exist at birth. When fully developed, the number of alveoli is about 375 million at age 8-12 years. (Pediatrics NMS p 313, 1992)
- Postnatal alveolarization of the lung is complete in humans within the first eight years of life.
 - *The Lung: Development, Aging and Environment by Harding*

- All these have upper lobe predominance EXCEPT?
 - a. Alpha-one Antitrypsin Deficiency
 - b. Silicosis
 - c. Langerhans Cell Histiocytosis (EG)
 - d. Centrilobular Emphysema
 - e. Cystic Fibrosis

B. Alpha-1-antitrypsin deficiency

- Affects whole lung, but more severe at lung bases
 - *Dahnert 5th 484-486*
- lower lobe predominant pan lobular emphysema. All others are upper lobe dz.

- A patient undergoes biopsy for a pulmonary mass.
Which of the following is the least likely complication?
 - a. pneumothorax
 - b. hemoptysis
 - c. air embolization
 - d. seeding of biopsy tract
 - e. infection (?)

D. Seeding of biopsy tract

- No mention of tract seeding in Valji, Primer or Chest Core Curriculum.

- Complications of percutaneous lung biopsy:
 - PTX 25% (5-10% require chest tube)
 - Hemoptysis 3%
 - Air embolism
 - Infection/empyema
 - Bronchopleural fistula
 - Lung torsion
 - Pericardial tamponade
- ***Primer 2nd 25; Chest Core Curric 626-629; Valji Vascular and Interventional Radiology 386***

- **lung perfusion scan shows a 70% left to right shunt**
 - a. BT shunt on right
 - b. Hypoplastic left pulm. Artery
 - c. Right lateral decubitus position
 - d. Left main pulm. Artery occlusion
 - e. Pleural eff.

- Unilateral lung perfusion mnemonic “SAFE POEM” -
Swyer-James syndrome, agenesis(pulmonary),
fibrosis(mediastinal), effusion(pleural), pneumonectomy
or PTX, obst. by tumor, embolus, mucus plug. Additional
etiologies include pulmonary artery atresia, pulm. artery
sarcoma, shunt procedures for CHD (like BT shunt) and
aortic dissection. Type A dissection results in unilateral
right lung hypoperfusion due to direct compression of the
right pulm. artery. Not sure about decubitus positioning.

- Atrial Septal Defect (ASD) is associated w/ enlargement of which one?
 - a. Pulmonary Artery
 - b. Left atrium
 - c. Left ventricle
 - d. Aorta

A. Pulmonary artery

- Hemodynamics:
 - Fetus: No hemodynamic perturbation
 - After birth: physiologic increase in LA pressure creates a L-to-R shunt (shunt volume may be 3-4 times that of systemic blood flow) with volume overload of RV leading to RV dilatation, right heart failure, pulmonary hypertension
 - Diastolic pressure differences in atria determine direction of shunt
 - Pulmonary pressure remains normal for decades before Eisenmenger syndrome sets in
 - Pulmonary hypertension in young adulthood (6%)
- *Dahnert 5th 614-615*
- They demonstrate increased pulmonary arterial vascularity with a prominent pulmonic trunk, right atrial enlargement, no evidence of left atrial enlargement, and right ventricular dilation.
 - emedicine.

- Endocardial cushion defects DO NOT include defects of the
 - a. Atrial septum
 - b. Ventricular septum
 - c. Mitral valve leaflet
 - d. Infundibular septum

B. Infundibular septum

- Endocardial cushion defects are caused by persistence of the common AV canal. So this means they involve the atrial septum, the ventricular septum, and one or both of the AV valves. That's the short version.
- The longer version is that there are multiple types of ECDs. A complete ECD involves an ostium primum ASD, a large posterior VSD, and one common AV valve with 5-6 leaflets. A partial ECD is the more common form. It involves an ostium primum ASD, NO VSD, 2 AV valves, and a classic trileaflet mitral valve with a cleft in the anterior leaflet.
- ECD associations to remember: Down's Syndrome, Asplenia/polysplenia.
- 40% of ECD pt have trisomy 21 (Down's syndrome).
 - (Danhert)

- Which of the following is most commonly associated with left atrial dilatation?
 - a. Left atrial myxoma
 - b. Mitral regurgitation
 - c. Mitral stenosis
 - d. Atrial fibrillation

B. Mitral Stenosis

- All of the choices are etiologies of LAE, mitral stenosis may be the most associated
- LAE DDX:
 - Mitral Stenosis
 - L->R Shunt
 - LV dysfunction
 - Mitral Regurgitation
- The differential diagnosis of left atrial enlargement includes Mitral stenosis (valve calcification, right ventricular enlargement, pulmonary vascular engorgement)
Mitral insufficiency (left ventricular enlargement, usually due to myocardial ischemia or rheumatic heart disease) Left-to-right Shunts (VSD, patent ductus arteriosus) and Left atrial myxoma (occasionally calcify).
 - medpix

- Which of the following is a characteristic of interstitial lung disease?
 - a. honeycombing
 - b. bronchiectasis
 - c. bat wing pulmonary edema
 - d. diffuse opacity

Honeycombing

- Honeycombing indicates end-stage lung dz. Central butterfly hilar pattern can be seen in pulmonary edema from renal causes.
 - Primer, 3rd ed., pp. 92, 64
 - Dahnert, 5th ed.
- Bat wing pulm edema is a air-space process. Diffuse opacity is a little vague, but I take that to be “air-space” process as well rather than diffuse “nodular” opacity or diffuse “reticular” opacity, which are interstitial processes.

- What is a sign of RUL collapse?

A. Posterior movement of the RML

B. Movement of the left mainstem bronchus

C. Tenting of the right hemidiaphragm

Tenting of the right hemidiaphragm

- Tenting or peaking of the diaphragm represents fat w/in the inferior aspect of a stretched inferior accessory fissure. Elevation of minor fissure, shift of trachea to rt, elevation of hilum, thickening of rt paratracheal stripe, anteromedial displacement of upper half of major fissure, S-sign of Golden, and LUL herniating across midline anteriorly toward the rt are also signs of RUL collapse.
 - *Primer, 3rd ed., P. 84*
 - *Brant and Helms, 2nd ed., pp. 346-7*

- A patient is 2 weeks s/p bone marrow transplant and has bilateral 2 cm pulmonary nodules which have surrounding areas of ground glass opacity on high resolution chest CT (crescent sign). What is the most likely etiology.
 - a. bacterial infection
 - b. graft vs host disease
 - c. fungal infection
 - d. acute rejection

Answer: A. Fungal

- Angioinvasive aspergillosis—nodule surrounded by halo of ground-glass = fungal infxn spreading into parenchyma and surrounding area of hemorrhage. Occurs during neutropenic phase (2-3 wks after transplant). High mortality. W/in 2 wks (during recovery phase) 50% of nodules undergo cavitation which results in the air-crescent sign.
- Dahnert, 5th ed., p. 462
- Primer, 3rd ed., p. 20
- Within the first 4 weeks of BMT is the neutropenic phase, and the most significant complications are infective in origin, bacterial or fungal. The most common fungal infection with predilection for the respiratory tract is *Aspergillus* with findings of
- diffuse bronchocentric infiltration or multiple segmental or nodular foci of consolidation. A halo of ground-glass density around these foci is characteristic, as is air crescent sign. (Armstrong p. 285-286).

- **Most specific sign of aortic injury on plain film?**
 - A. Depression of the left main bronchus
 - B. Displacement of the NG tube to the right
 - C. Widening of the superior mediastinum
 - D. Apical capping
 - E. Displacement of the trachea to the right
 - F. Upper rib fractures

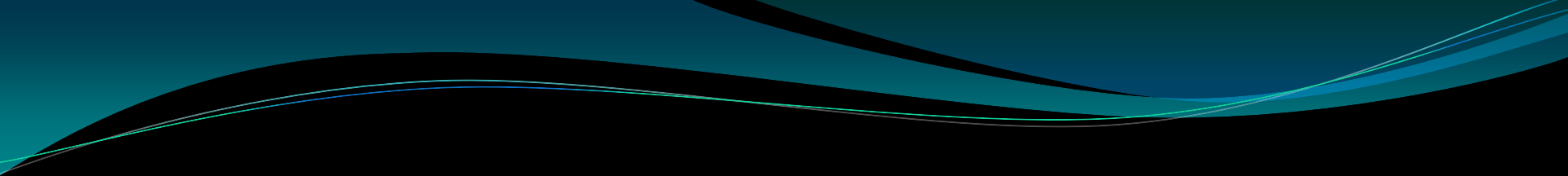
Displacement of the NG tube to the right

- Aortic injury is usually from shear forces from deceleration injury. 90-95% at the aortic isthmus: b/w left subclavian artery and ligamentum arteriosum.

- Dahnert, 5th ed., pp. 610-611; and deviation of the trachea, endotracheal tube, or nasogastric tube to the right of the T3 through T4 spinous process (sensitivity, 12%–100%; specificity, 80%–95%) (99,101). Although superior mediastinal widening (minimum total width, >8 cm) at the level of the origin of the left subclavian artery (sensitivity, 81%–100%; specificity, 34%–60%) is present in 92% of cases of ATAI, it is not reliable and has a specificity of only 10%

Imaging of Acute Thoracic Aortic Injury Due to Blunt Trauma: A Review¹

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- **What is the normal pressure in the main PA?**

A. 10/2

B. 20/8

C. 30/15

D. 5/1

B. 20/8

- Normal (mm Hg) = 20-25 / 8-12 with a mean of 14-15 and a capillary wedge pressure of 2-8. Pulm artery HTN is defined as >25 / 15 or mean >20. Pulm cap wedge pressure is a good estimate of lt atrial pressure.
 - Primer, 3rd ed., pp. 63, 689
 - Dahnert, 5th ed., p. 572

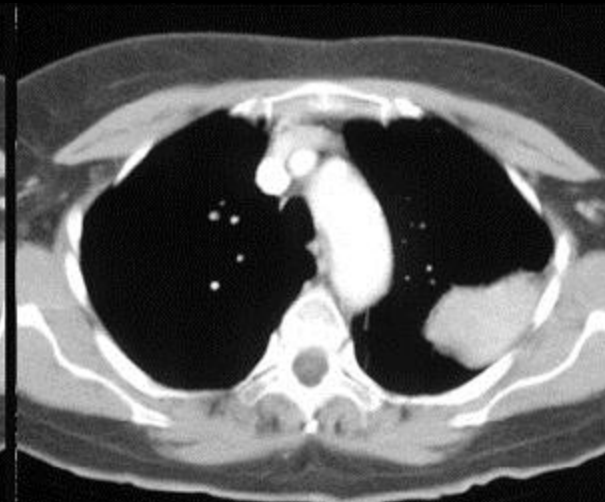
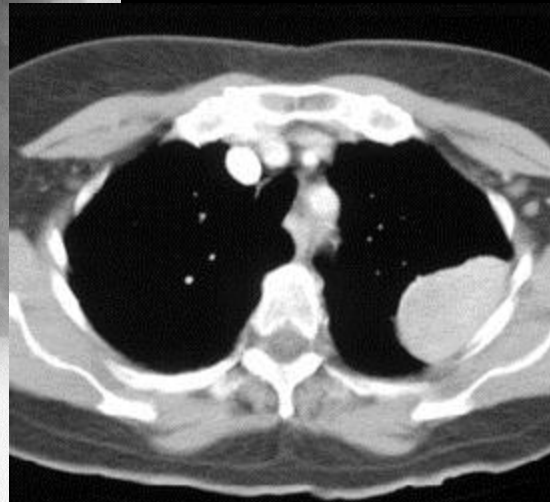
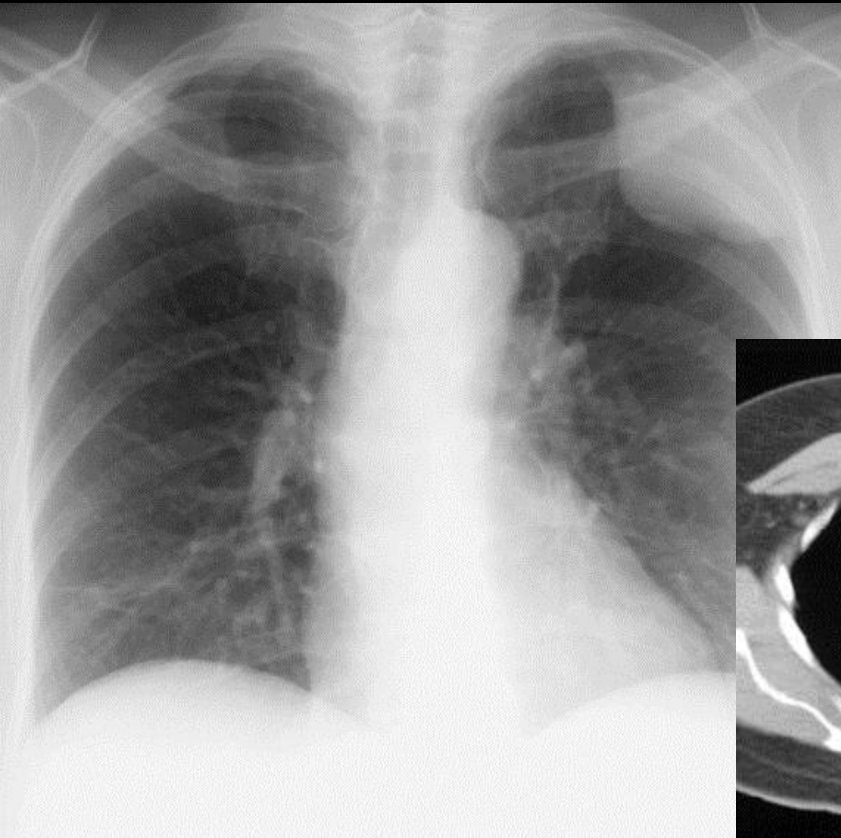
2002

- A female has leg pain, glucose of 20, fatigue and a well-defined chest mass. Most likely diagnosis:
 - a. bronchogenic carcinoma
 - b. lymphoma
 - c. localized fibrous tumor of pleura
 - d. Large cell lung CA
 - e. Pulmonary blastoma
- 35 y/o woman with bilateral lower extremity edema, 6cm mass on CXR, blood glucose level of 20mg/dL. Most likely diagnosis:
 - A. benign fibrous tumor of the pleura
 - B. metastatic disease

localized fibrous tumor of pleura.

- Localized fibrous tumor of the pleura (LFTP) is a *benign* mesothelioma (no association with asbestos exposure). It is largely resectable, even when the size is large, and has a favorable prognosis. Episodic hypoglycemia is seen in 4%; hypertrophic pulmonary osteoarthropathy [pain / swelling of limbs, especially tibia / fibula] in 20-35%. Other Sx include dyspnea and cough. *Dähnert 5th p. 504, 104*
- Bronchogenic CA is more common than LFTP, and causes 88% of cases of hypertrophic pulmonary osteoarthropathy. However, it typically does not cause hypoglycemia (other paraneoplastic syndromes, e.g. SIADH, however), and the well-defined chest mass favors a benign tumor. www.emedicine.com
- The preferred term is now localized fibrous tumor of the pleura since they are not always benign but rather on a spectrum of benign and malignant forms. Symptomatic hypoglycemia has been reported in 6% of patients. I'm not sure what the bilateral lower extremity edema has to do with it although older reports indicated that hypertrophic osteoarthropathy can occur with this entity. The most common clinical presentation is cough, chest pain, and dyspnea with a 7 cm

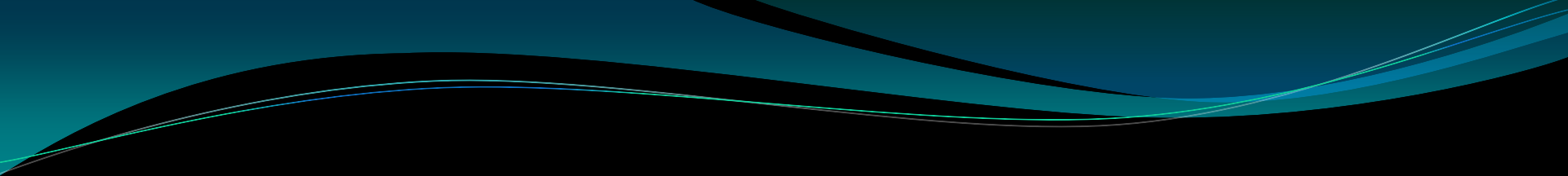
Localized fibrous tumor of pleura



- Which of the following requires a PDA for life?
 - a. D-transposition of the great vessels
 - b. Hypoplastic left ventricle
 - c. AP window
 - d. Tetralogy of Fallot
 - e. Truncus, Type II

Hypoplastic left ventricle or Transposition

- **Hypoplastic left heart** is a spectrum of cardiac anomalies characterized by underdevelopment of the LA, LV, MV, aortic valve, and aorta. Survival **requires a large ASD and PDA** with R-L and L-R shunting.
 - **Complete Transposition** of the Great Arteries (D-TGA) is when there are two independent circulations, from body to body via the RV and from lung to Lung via the LV. It is incompatible with life unless there are associated anomalies that permit mixing of the two circulations (eg, **ASD, VSD, PDA**).
 - Aorticopulmonary window have plain film findings identical to PDA; PDA associated 10-15%.
 - Tetralogy of Fallot and Truncus have a VSD.
- Primer of Diagnostic Imaging, 3rd Edition pg 125-129, 138

- 
- CT Hounsfield measurements are most useful in which of the following diagnoses?
 - Interstitial pneumonitis,
 - Bronchogenic CA,
 - Lipoid pneumonia,
 - hemochromatosis.

• **D. Lipoid pneumonia** may show a mass of low-attenuation approaching that of subcutaneous fat (-150 to -50 HU). When seen, this is very specific.

Acute Exogenous lipoid pneumonia – “fire-eater pneumonia”

- ingestion of liquid paraffin or petroleum [poisoning in children or accidental ingestion by “fire eaters”]

Chronic Exogenous lipoid pneumonia:

- aspiration or inhalation of fatlike material (vegetable oil, cod liver oil, mineral oil)
- in elderly, debilitated, those with neuromuscular disease
- predilection for RML and lower lobes

- *Thoracic Radiology the Requisites page 274-5; Dahnert 5th p. 400, 499*



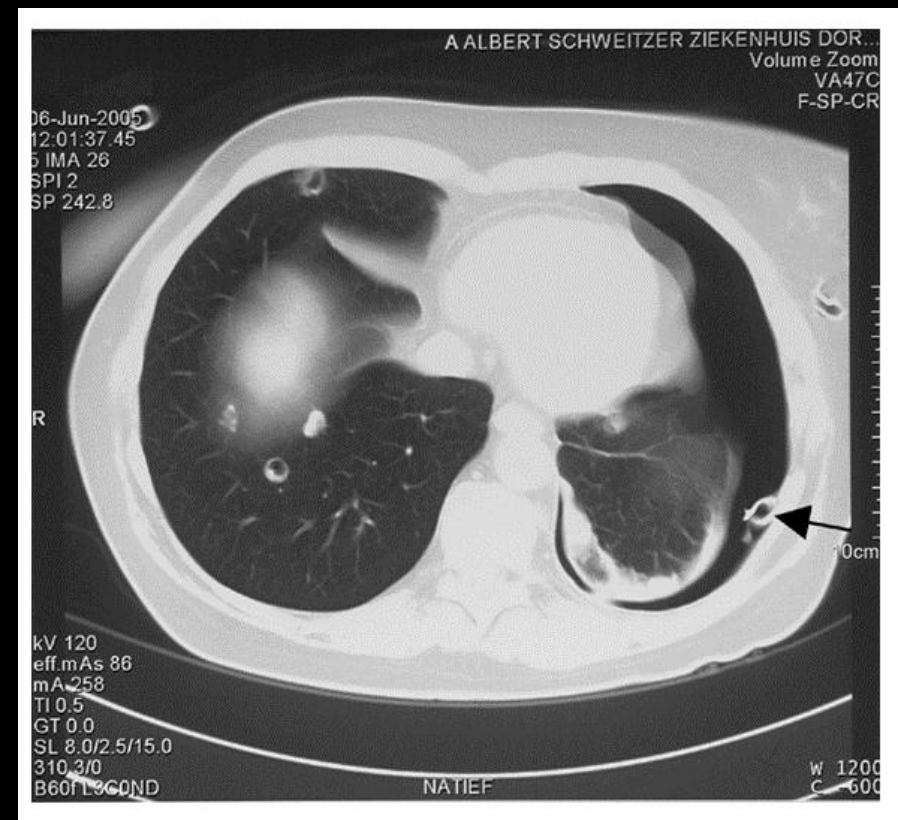
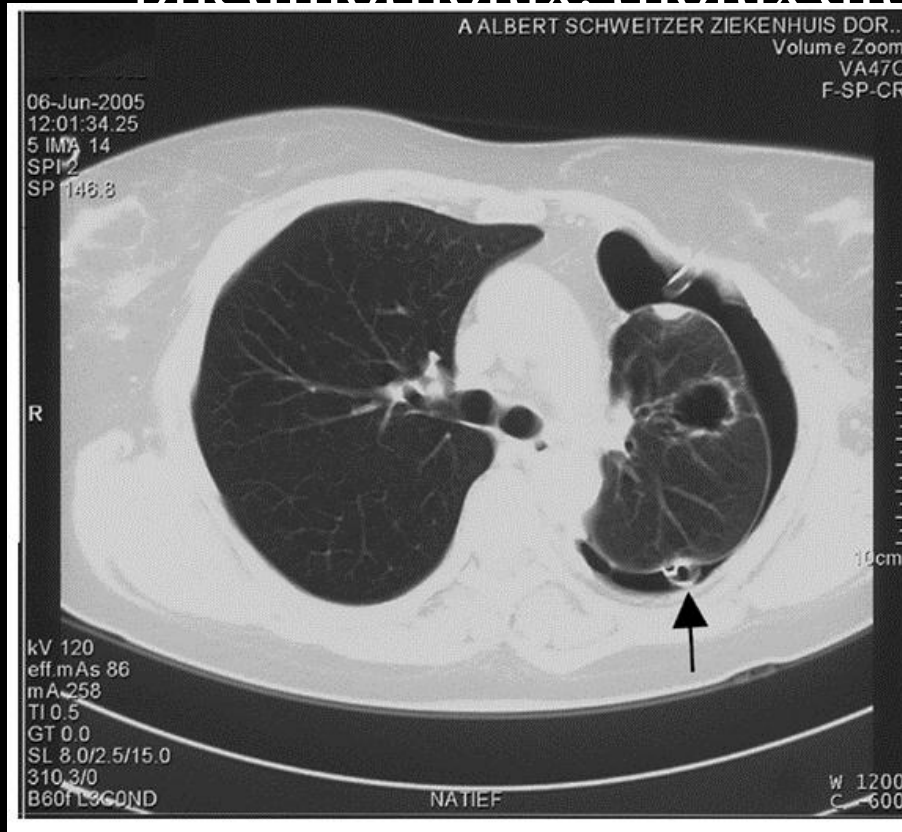
- Which of the following is not typical chest finding of Rheumatoid arthritis?
 - a. honeycombing
 - b. pleural effusion
 - c. lower lobe interstitial disease
 - d. nodules
 - e. hilar adenopathy

E. Hilar adenopathy

- There are five pleuropulmonary abnormalities associated with rheumatoid disease:
 1. pleurisy with or without effusion
 2. diffuse interstitial pneumonitis or fibrosis (lower lobe predominance)
 3. pulmonary (necrobiotic) nodules, often cavitate
 4. Caplan's syndrome (pneumoconiotic nodules)
 5. Pulmonary hypertension secondary to vasculitis
- *Thoracic Requisites 252; Dähnert 5th p. 521-522, 434.*

Rheumatoid Lung and Necrobiotic Nodule

- subpleural necrobiotic nodule in the left lung and pneumothorax: thorax drain 'in situ'



- Which of the following is false regarding subcarinal lymph nodes?
 - a. Can easily be differentiated from bronchogenic cyst on CT
 - b. Involvement does not preclude surgical resection of primary lung cancer
 - c. Easily accessible by mediastinoscopy
 - d. Can posteriorly displace the left mainstem bronchus
- Which of the following statements regarding subcarinal lymphadenopathy is true:
 - It is often difficult to distinguish from a bronchogenic cyst on CT.
 - It displaces the Left main bronchus posteriorly.
 - It is easily approachable by mediastinoscopy.
 - It can be biopsied by transthoracic needle approach.
 - Last answer which is what was believed to be the correct

- ** This question was recalled 3 different ways in 3 recall sets from 2002. Therefore, the following discussion is meant as a guide **
- Bronchogenic cysts typically arise in the mediastinum (80-90%), and in the vicinity of the carina (52%). If it is a thin-walled cyst of water density (0-10 HU), then CT is diagnostic. However, 40-50% are of higher density, making differentiation from a node or soft tissue mass difficult / impossible. Biopsy may then be necessary. *Dähnert 5th p. 470; Primer 3rd p. 80.*
- Anterior subcarinal nodes can be easily reached via mediastinoscopy (*B&H p. 394*); but, the other subcarinal nodes cannot.
<http://www.moffitt.usf.edu/pubs/ccj/v8n4/pdf/311.pdf>
- Involvement of subcarinal nodes would be N2 (= Stage IIIA), which could be resectable (depending on T and M). *Dähnert 5th p. 469*
- Subcarinal nodes extend inferior to the margins of the main bronchi, but may be present anterior and posterior to the carina; it is therefore plausible they could posteriorly displace the left mainstem bronchus. *Freundlich 2nd 142.*
- -ANSWER: Not any of a thru d. Bronchogenic cyst is of lower attenuation (although there is some debate about this as bronchogenic cysts have been reported to have higher HU ratings as patient gets very old.... Like 80's or so). Subcarinal nodes displace Left main bronchus superiorly and esophagus posteriorly. Cannot be approached by mediastinoscopy and transthoracic needle cuz heart and great vessels in the way.

- Which of the following avidly enhances in mediastinum?
 - a. Paraganglioma
 - b. lymphoma
 - c. thymoma
 - d.

A. Paraganglioma

- Paragangliomas are tumors of the paraganglionic cells and in the chest are chemodectomas or functioning paragangliomas. Chemodectomas are aortic body tumors and are seen as masses of the aortopulmonary window. Functioning paragangliomas occur rarely in the chest and mostly in the posterior mediastinum. These masses are usually extremely vascular and enhance brightly at enhanced CT. At MRI they may show high signal intensity on T2 weighted images.

www.galter.northwestern.edu “Exuberant enhancement”—

Dähnert 5th p. 529

- Masses that are known to possibly strongly enhance at CT are: goiters, vascular tumors (hemangiomas), parathyroid masses, castelman disease, medullary cancer of the thyroid, thymic carcinoid, and metastasis of sarcomas and melanomas.

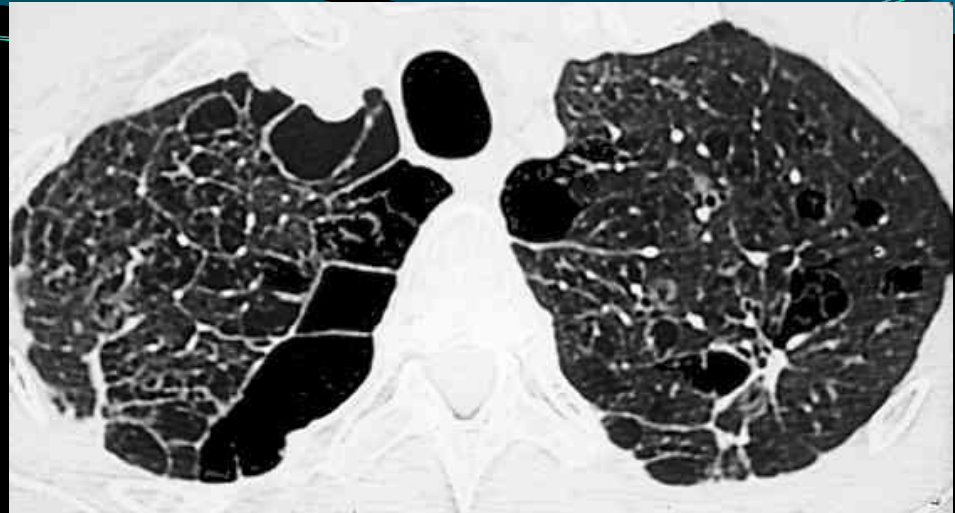
- **Which of the following is characteristic of smoking related emphysema?**
 - a. Basilar predominance
 - b. Centrilobular distribution
 - c. Panlobular distribution
 - d.

B. Centrilobular Distribution

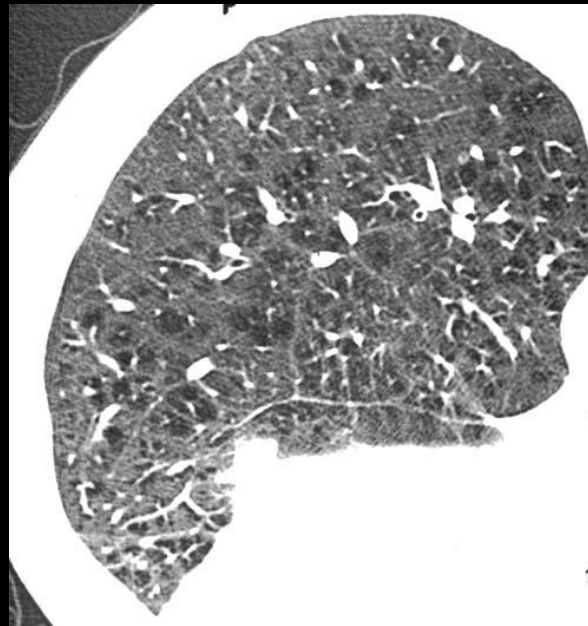
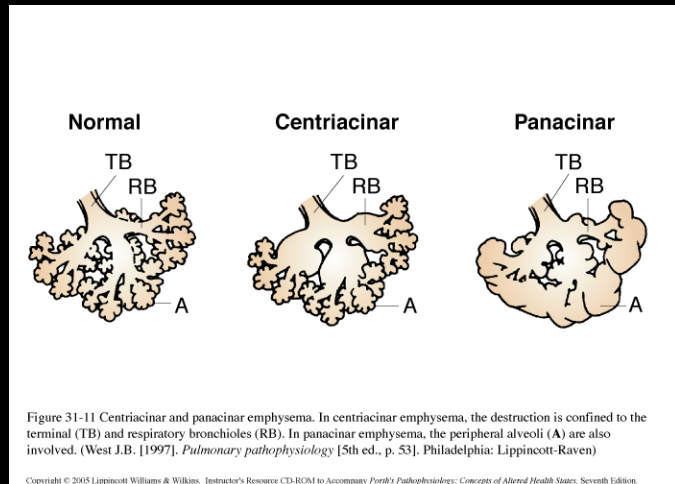
- There are four major types of emphysema defined anatomically. These are: 1. Centrilobular or centriacinar; 2. panlobular or panacinar; 3. paraseptal (distal acinar) emphysema; and 4. paracicatricial (irregular).
- Centrilobular emphysema affects the predominately the respiratory bronchioles in the central portion of the secondary pulmonary lobule. It usually identified in the upper-lung zones, and it is associated with cigarette smoking (causes up to 50%).
- Panlobular (panacinar) involves all the components of the acinus and therefore involves the entire lobule. It is classically associated with alpha-1 protease inhibitor (alpha-1-antitrypsin) deficiency (cause in 10-15%), although it may be seen without protease deficiency in smokers and elderly. Paraseptal involves the distal part of the secondary lobule (alveolar ducts and sacs). It can be an isolated phenomenon in young adults, and is associated with spontaneous pneumothorax. (*Thoracic Requisites 288, Dähnert 5th p. 485*)



panlobular



paraseptal



centrilobular

- Which of the following does not run with or contain lymphatics?
 - a. Bronchial artery
 - b. bronchial vein
 - c. alveolar wall
 - d. pulmonary artery
 - e. interlobular septa

C. Alveolar wall

- Pulmonary lymphatics are seen in all of the following locations except alveolar walls. There are two lymphatic plexuses that drain the lung: superficial and deep. The superficial lymphatic plexus lies deep to the visceral pleura and lymph vessels from it drain into the bronchopulmonary lymph nodes in the hilum. The deep plexus is located in the submucosa of the bronchi and in the peribronchial connective tissue. There are no lymph vessels in the walls of the alveoli. Lymph vessels from the deep plexus drain into the pulmonary lymph nodes, located along the large branches of the bronchi. Lymph vessels from these nodes follow the bronchi and pulmonary vessels to the hilum, where they drain into the bronchopulmonary lymph nodes.

Clinically Oriented Anatomy by Moore, Keith

- *Pulmonary Edema*
- *By Michael A. Matthay, David H. Ingbar*

- **On an axial CT image which takeoff to the RLL do you see at the same level as the bronchus to the RML?**
 - a. Superior
 - b. Medial Basal
 - c. Lateral Basal
 - d. Anterior Basal
 - e. Posterior Basal

A. Superior

- At the level of the right middle lobe bronchus many structures are seen. The superior segment of the right lower lobe, the right middle lobe lateral and medial branches, the right and left superior veins and the left lower lobe. *See Figure in Dähnert 5th p. 444, 446 or Freundlich 2nd Fig. 3-20.*
- The remainder of the answers are segments of the right lower lobe. The medial basal, posterior basal, and lateral basal arise clearly at the level of the lower lobe bronchi.
 - E-anatomy.org

- Which of the following has similar histology as UIP (usual interstitial pneumonia)?
 - a. LAM
 - b. Histiocytosis X
 - c. Sarcoid
 - d. lymphoma
 - e. Lupus

E. Systemic Lupus Erythmatosus

- Lupus and collagen-vascular diseases may have “UIP-like” areas of histology. *Colby Atlas Pulm. Surg. Path., 1991, p. 24., Dähnert 5th p. 495-496*
- “Usual interstitial pneumonia (UIP) is a distinct histological lesion that is observed in idiopathic pulmonary fibrosis (IPF), [1,2] but can also be observed in various etiologies (e.g., collagen vascular diseases...)”
<http://www.medscape.com/viewarticle/410887>

- **A child who has had a bone marrow transplant has a 3 cm upper lobe nodule. Most likely diagnosis:**
 - a. CMV
 - b. Invasive Aspergillus
 - c. TB
 - d. lymphoma
 - e. mycoplasma

B. Invasive Aspergillus

- Given the Hx of bone marrow transplant (BMT), the child is presumably immunocompromised. Invasive Aspergillosis is then a concern, and findings include single / multiple ill-defined peripheral opacities 1-3cm in size (possibly with a halo of ground glass on CT). Time course is 2-3 weeks (neutropenic phase)—high mortality (70-90%)
Dähnert 5th p. 458, 462.
- CMV pneumonia would certainly be a possibility, given the Hx, however it is characterized by multiple small nodules. Time course is 1st 100 days post transplantation.
- Late phase pulmonary complications include BOOP, chronic GVHD, and infections (in patients > 100 days post BMT).
- Mycoplasma favors the lower lobes and is typically not nodular.
- *Radiology Review Manual, 1999. p.385*

- Which of the following is false regarding traumatic rupture of a bronchus?
 - a. distal more involved than proximal
 - b. pneumomediastinum R/L pneumothorax
 - c. prompt / easy re-expansion with chest tube
 - d. commonly see pneumomediastinum and pneumothorax

c. prompt / easy re-expansion with chest tube

- The stronger proximal cartilage framework tends to fix the trachea and proximal bronchi in place, whereas the distal bronchi and lungs are more mobile. Consequently, deceleration injuries from blunt trauma typically occur at the transition zone between the fixed and mobile bronchus, within 2.5 cm of the carina. The left main bronchus is relatively protected by a longer mediastinal course
 - Emedicine
- Inadequate reexpansion of lung despite chest tube (due to large air leak)
- PTX (70%)
- Mediastinal +/- subcutaneous emphysema
- Collapsed lung falling to dependent position (loss of anchoring support in bronchial transection)
- Fracture of first three ribs, rare in children
 - Dahnert
- Bronchial cutoff

- **.Plain film findings of bronchial tear** include persistent pneumothorax despite adequate placement of one or more chest tubes; the fallen lung sign; increasing subcutaneous emphysema, pneumomediastinum and/or pneumothorax.(13) Transection of the trachea particularly in the setting of neck trauma may also show elevation of the hyoid bone on lateral c-spine films (hyoid bone above the level of the C3 vertebral body or greater cornu less than 2cm from the angle of the mandible). (14) Mechanism for elevation of the hyoid bone is rupture of the infrahyoid muscles with unopposed action of the suprahyoid muscles. (14)
- The fallen lung sign refers to the unusual appearance of a collapsed lung or lobe in the setting of bronchial injury and is thought to be due to disruption of the normal hilar attachments of the lung causing the collapsed lung to droop peripherally rather than centrally.(13)
- Another clue to tracheal tears on both plain films and CT is abnormality in the appearance or position of the endotracheal tube. These include overdistension of the ET cuff; protrusion of the ET tube wall beyond the expected margins of the tracheal lumen: and extraluminal position of the tip of the tube. (13) Associated fractures of the upper thorax occur in 40% of patients with tracheobronchial injuries including fractures of the first three ribs, the clavicle, the sternum, and the scapula.(13) Suspected tracheobronchial tears are confirmed with bronchoscopy.

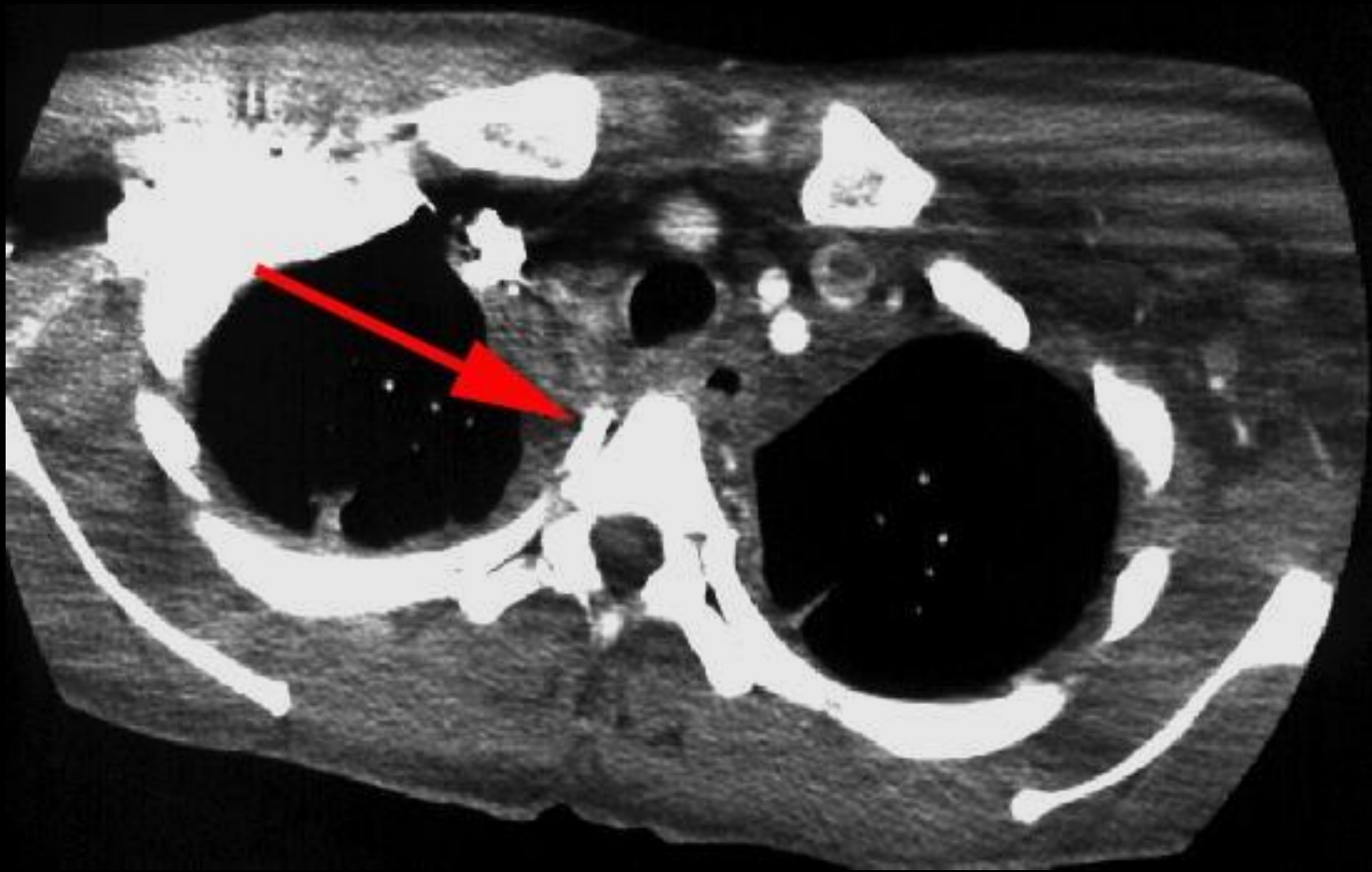
- Which of the following is most likely to cause an exudative pleural effusion?
 - a. cirrhosis
 - b. congestive heart failure
 - c. neoplasm
 - d. nephrotic syndrome
 - e. Uremia
- Know the causes of transudative vs. exudative pleural effusion

C. Neoplasm

- Exudative effusion = high-protein pleural fluid
 - Malignancy (e.g., pleural mets.): 60%
 - Uremic pleuritis: 20%
 - Infection: Empyema, TB, pneumonia
 - other: SLE, Wegeners (50%), trauma, Meigs, pancreatitis, etc.
- Transudative effusion = low-protein [1.5-2.5 g/dL] pleural fluid
 - CHF (increased hydrostatic pressure)
 - cirrhosis (low osmotic pressure)
 - nephrotic syndrome (low osmotic pressure)
 - hypothyroid, constrictive pericarditis, overhydration

Dähnert 5th p. 438-439

- **Diagram of axial CT slice through superior mediastinum above aortic arch. Tubular structure labeled on right/anterior aspect of vertebral body. What is it?**
 - a. azygous vein
 - b. hemiazygous vein
 - c. aberrant subclavian
 - d. paraspinal vessel
 - e. superior right intercostal vein



E. Superior right intercostal vein

- The right superior intercostal vein lies along the spine superior to and draining into the arch of the azygos vein. It is above the arch of the aorta.

Netter, old notes;

<http://www.uhrad.com/ctarc/ct116.htm>

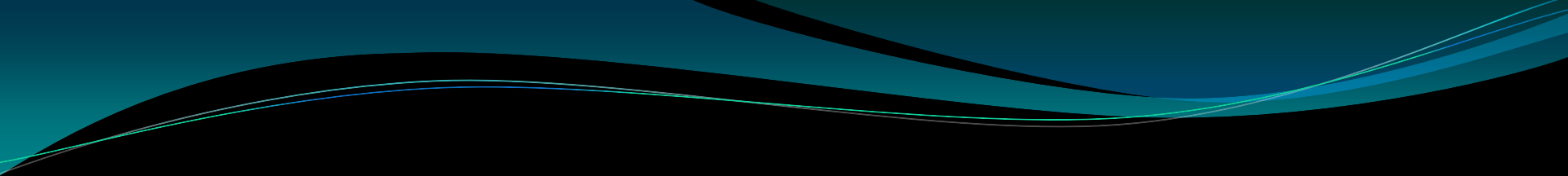
- The azygos vein arches under the right mainstem bronchus into the SVC. This is about the level of the inferior part of the aortic arch. * Be aware that there is a variant of this question that shows a CT cut at the level of the heart and great vessels; in this case (below intercostals), the correct answer would be azygous vein.

- **Best way to measure COPD emphysema:**

- a. FVC
- b. FEV₁
- c. FEV₁/FVC
- d. VC
- e. RV

B. FEV₁

- A simple staging system based on FEV₁ has been proposed for COPD ([American Thoracic Society](#))
 - Stage I is an FEV₁ 50% or more of the predicted value. The patients generally have mild exercise limitation because of COPD and are at low risk of serious exacerbations.
 - Stage II is an FEV₁ less than 50% but greater than 35% of the predicted value. Stage III is an FEV₁ 35% or less of the predicted value. The exercise capacity of patients with
 - Stage III COPD is severely limited. These patients tend to have frequent exacerbations and consume the greatest expenditure of health care dollars for care among persons with COPD. MKSAP (medicine disc)
- FEV₁ is a reproducible test and is the most common index of airflow obstruction
 - emedicine

- 
- **Most common lung infection in HIV:**
 - a. Aspergillus
 - b. Cryptococcus
 - c. PCP
 - d. TB
 - e. bacterial pneumonia

- **Opportunistic infection** accounts for the majority of pulmonary disease in HIV:
 - PCP (60-80%): bilateral interstitial disease (ground-glass opacities), 25% fatal; CD4 count usually < 200; frequently associated with pneumatoceles
 - Fungal Disease e.g., Cryptococcus or Aspergillus (2-15%)
 - Mycobacterial 20%
 - Bacterial (staph, strep, H. Flue, nocardia) 5-30%

Dähnert 5th p. 452

- Pneumocystis jiroveci pneumonia (PCP), formerly known as pneumocystic carinii pneumonia is the most common opportunistic respiratory infection in patients infected with HIV:
 - emedicine

2001

- **Which has a lower lobe predominance? (version 1)**
- **Which of the following does NOT usually involve the upper lobes (version 2)**
 - a. EG**
 - b. Silicosis**
 - c. Sarcoid**
 - d. Asbestosis**
 - e. Ankylosing spondylitis**

B. Asbestosis

- Most severe in lower posterior subpleural zones (concentration of asbestos fibers beneath visceral pleura)
Dähnert 5th p. 456.
- Upper lobes: mnemonic “CASSET”
 - CF, Ank Spon, Silicosis, Sarcoid, EG, TB
- Lower lobes: mnemonic “BADAS”
 - Bronchiectasis, Aspiration, Drugs/DIP, Asbestosis, Scleroderma/CVD
- *Dähnert 5th p. 456.*

- **Idiopathic pulmonary fibrosis: most common presentation?**
 - a. Dyspnea
 - b. Fever
 - c. Fatigue
 - d. Weight loss

A. Dyspnea

- UIP = IPF = mural type fibrosing alveolitis = cryptogenic fibrosing alveolitis
- IPF is a disease of unknown cause that is defined primarily by clinical, physiologic and radiologic criteria. *Fraser 2nd p. 852.*
- Disease of “middle age”: 4-6 decade. Male preponderance (2:1).
- Almost all patients present with breathlessness that is first noted with exercise. A dry cough is common and 50% of the patients have constitutional symptoms such as fatigue and weight loss.
- Pulmonary function tests demonstrate a restrictive pattern. Diffusing capacity is reduced as is the blood oxygen level at rest. The prognosis in IPF is poor, with most patients dying of respiratory failure. The mean survival is approximately 4 years.

- **The most common cause of pneumomediastinum is:**
 - a. Pneumothorax
 - b. Bleb rupture
 - c. Alveolar rupture
 - d. Extension from pneumoretroperitoneum

C. Alveolar rupture

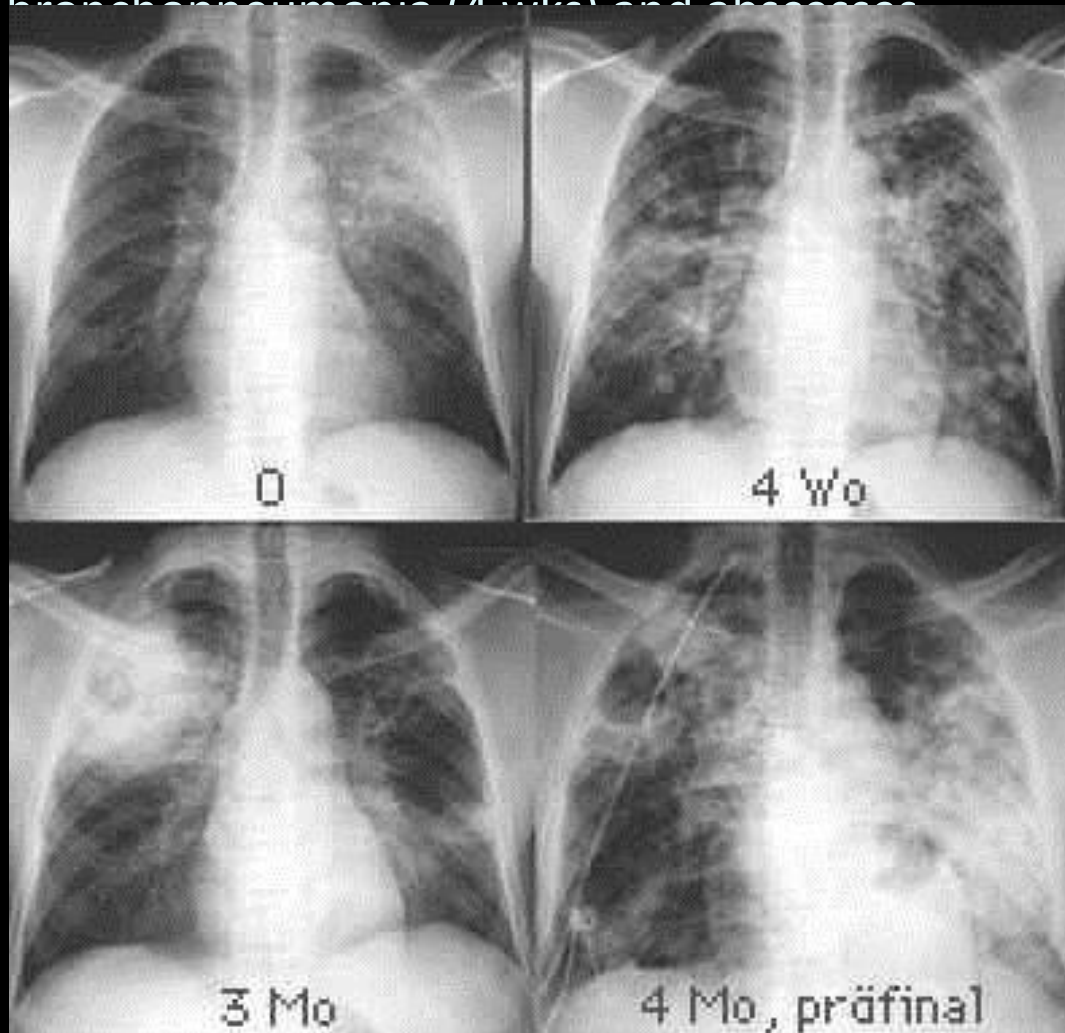
- Spontaneous pneumomediastinum is more common than the traumatic type and is most commonly related to rupture of marginally situated alveoli from sudden / prolonged rise in intraalveolar pressure with subsequent dissection of air centrally along bronchovascular bundles to hila and rupture in the mediastinum.
- *Source: Dähnert 5th ed. p.429-430*

- **What is the most common appearance of Legionella at the peak of the disease?**
 - a. Bilateral airspace consolidation
 - b. Unilateral airspace disease
 - c. Cavitory lesion
 - d.
- Most common appearance of Legionella pneumonia.
 - a. unilobar consolidation +/- cavitory components
 - b. variable lymphadenopathy

unilobar consolidation +/- cavitory components

- maybe bilateral is more common in “peak” ?
- Unilateral involvement is more common than bilateral involvement. Purely interstitial infiltrates are rare. Pleural effusion, present in at least one third of patients, may be the only abnormality. In adults, cavitation is more common in patients who are immunocompromised, but it has been described in children who were immunocompetent.
 - Emedicine

The consecutive investigations demonstrate the variable appearance with lobar pneumonia, bronchopneumonia (4 w/o) and changes



- A. Bilateral airspace consolidation

- Common radiographic features include bilateral severe disease, rapidly progressive, pleural effusions and lower lobe predilection. Associated hyponatremia. Seroconversion for dx takes 2 weeks. Starts as peripheral patchy consolidation. *Source: Primer 3rd ed. p.11*
- The characteristic roentgenographic pattern [of legionella] is one of airspace consolidation...in most cases, the pneumonia is unilateral and unilobar when first seen; however, there is a tendency to **bilateral involvement** particularly at the **peak of the disease**. There is a distinct lower lobe predilection. *Fraser 2nd p. 310.*
- *Dahnert 5th 498-499*
- This is a little controversial, both the AFIP notes and Armstrong say that pleural effusions occur 2/3rds of time, and bilateral consolidation 50% of time. But Mass General says pleural effusions occur <50%. So take your pick. Unilobar consolidation, cavitation, and adenopathy are much more rare. I'm going with 2 out of 3.
- Unilateral involvement is more common than bilateral involvement. Purely interstitial infiltrates are rare. Pleural effusion, present in at least one third of patients, may be the only abnormality. In adults, cavitation is more common in patients who are immunocompromised, but it has been described in children who were immunocompetent.

- **The chest radiograph in legionnaires' disease**
- **PA Dietrich, RD Johnson, JT Fairbank and JS Walke**

- The chest radiographs of 24 patients with documented Legionnaires' disease were evaluated. Twenty-two of the 24 patients had positive findings for the disease initially. There was unilateral involvement in 68% and the most common lung shadows were poorly marginated round opacities (46%), diffuse patchy (25%) and peripheral opacities (21%). At peak, 70% of patients had a lobar shadow. Pleural effusions were present in 39% of cases but could be explained by underlying congestive heart failure or renal failure in 7 of the 9. Although the findings are not specific, the radiologist should consider this diagnosis in a patient with compatible clinical history, a pneumonia of obscure etiology, and these radiographic manifestations.

- Clin Radiol. 1981 Jul;32(4):361-5.

Analysis of the chest radiograph in Legionnaires' disease.

Evans AF, Oakley RH, Whitehouse GH.

The serial chest radiographic findings of 10 patients with Legionnaires' disease seen in Liverpool during 1980 are described. A unilateral lobar pneumonia was the commonest initial finding. Every lobe was involved, with the lower lobes being the most common. Pleural effusion was present in 30% of the cases. A comparison is made with previously reported series both in the United States and in England. Though no single feature is pathognomonic, the radiographic pattern may aid in early diagnosis.

- Semin Respir Infect. 1998 Jun;13(2):109-15.

Radiological manifestations of Legionella/Legionella-like organisms.

Coletta FS, Fein AM.

Department of Medicine, Winthrop-University Hospital, Mineola, NY, USA.

The chest radiograph of Legionellosis has been described in many reports. Although some attempted to describe patterns which are specific for Legionella, in fact, the roentgenographic findings in Legionella infection vary widely and depend largely on when in the course of illness the radiograph is obtained. Certain temporal characteristics, however, can serve to enhance the likelihood of the diagnosis of Legionella pneumonitis. Initial focal infiltrates are most commonly poorly marginated with 10% presenting with concomitant pleural effusion. The infiltrates often spread to contiguous lobes eventually becoming bilateral, with incidence of pleural effusions reaching 35%. This progression often occurs despite appropriate antimicrobial therapy and often in the face of clinical improvement. A similar pattern of progression also occurs in immunocompromised individuals; in addition, a high rate of

- **Which of the following features can be used to differentiate sarcoid from lymphangitic spread on high resolution CT?**
 - a. Septal thickening
 - b. Subpleural nodules
 - c. Bronchovascular nodules
 - d. Ground glass opacification

D. Ground glass opacity

- Subpleural nodule – subpleural thickening seen in lymphangitic carcinomatosis and in sarcoid.
- Ground glass opacifications – seen in sarcoid alveolitis, not in lymphangitic carcinomatosis.
- Bronchovascular nodularity – in sarcoid, perilymphatic nodules = small nodules along bronchoarterial bundles and veins, in subpleural + interlobular septal lymphatics representing epithelioid cell granulomas; in lymphangitic carcinomatosis, central dot within bronchovascular bundle.
- Source: *Dähnert 5th ed. p.522-23, 502, 408-409; Primer 2nd*

34 <http://www.meddean.luc.edu/lumen/MedEd/Radio/sarc/xraylung.htm>

- **What TNM stage is a 4 cm mass in the lung parenchyma with ipsilateral mediastinal lymph nodes but no distant metastasis?**
 - a. T₁N₀M_X
 - b. T₁N₁M₁
 - c. T₂N₁M₀
 - d. T₂N₂M₀
 - e. T₂N₂M₁

D. T2N2M0

- TNM staging--

T1: <3 cm in diameter, surrounded by lung / visceral pleura

T2: >3 cm in diameter, invasion of visceral pleura / lobar atelectasis / obstructive pneumonitis / at least 2 cm from carina

T3: tumor of any size; less than 2 cm from carina / invasion of parietal pleura, chest wall, diaphragm, mediastinal pleura, pericardium; pleural effusion

T4: invasion of heart, great vessels, trachea, esophagus, vertebral body, carina / malignant effusion

No: no demonstrable metastasis to regional lymph nodes

N1: peribronchial / ipsilateral hilar nodes

N2: ipsilateral mediastinal or subcarinal nodes

N3: contralateral hilar / mediastinal nodes, ipsilateral or contralateral scalene, supraclavicular nodes.

M0: no known distant metastasis

M1: distant metastasis present with site specified (i.e. brain)

- *Source: Dähnert 5th ed. p.469*

- **Heart borders on AP CXR include all of the following except?**
 - a. Left ventricle outflow tract
 - b. Right ventricle outflow tract
 - c. Main PA
 - d. Right atrium
 - e. Left atrial appendage

B. Right ventricle outflow tract

- This is part of the lateral projection (the right ventricle is anterior on the PA film). *Source: Primer 3rd ed. p.106, Primer 2nd ed. p. 100*

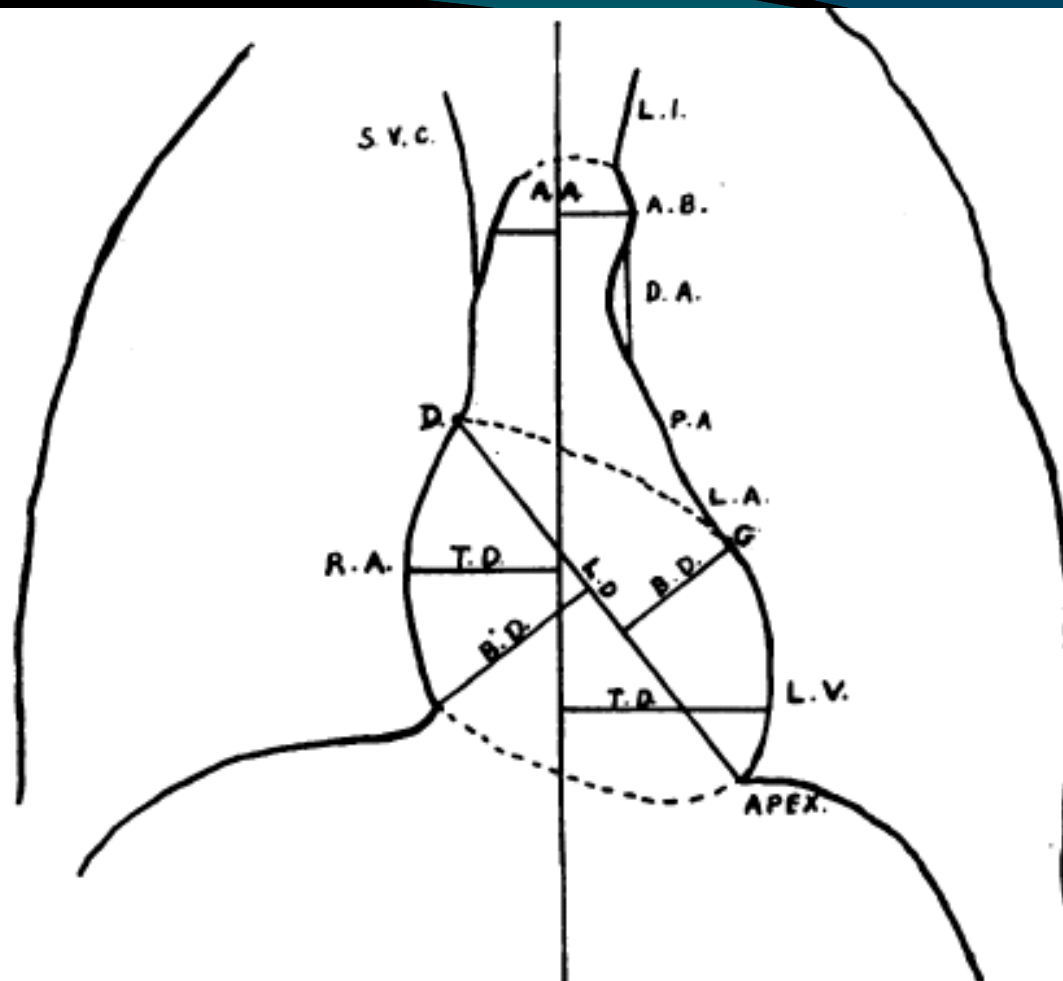


FIG. 4.—The radiographic outline of the heart.

A.A.—Aortic arch. A.B.—Aortic bulb. L.I.—Left innominate border. D.A.—Descending aorta. P.A.—Pulmonary arch. L.A.—Left auricular area. L.V.—Left ventricular border. R.A.—Right auricular border. S.V.C.—Superior vena cava. T.D.—Transverse diameter. B.D.—Basal diameter. L.D.—Longitudinal diameter which makes with the vertical the angle of the anatomical axis.

- Radiologist in reviewing a patient's films finds an abnormality that was missed by his colleague. The radiologist named is your chairman. Which of the following is NOT appropriate?
 - a. Inform your colleague so he can learn from his mistakes
 - b. Tell the chairperson so he can learn from the mistake
 - c. You as a radiologist tell the patient
 - d. Call the referring physician and tell him about it since this is a major cause of law suits
 - e. Let the radiologist decide whether to tell or not

- C or E
- This was recalled differently by various people.
Answer C was absent in one set; answer E was absent in another set.

- 30 year old woman presents with massive acute hemoptysis: CXR shows cavitary lesion in upper lobe.
 - a. TB
 - b. PE with infarct
 - c. RA
 - d. AVM
 - e. Aspergillosis
 - f. Bronchogenic ca
 - g. Bronchioaortic fistula

A. TB

- The most common cause of hemoptysis overall is bronchitis and carcinoma. In a patient this age and with a cavitory lesion TB is the best answer. Massive hemoptysis is caused by Rasmussen aneurysm.
 - *Source: Fraser 2nd ed. p.144*
 - *Dahnert 5th 532-534, 420, 399*
- Rasmussen's aneurysm is a pulmonary arteryaneurysm adjacent or within a tuberculous cavity. It occurs in up to 5% of patients with such lesions. It may lead to rupture and haemorrhage
 - wikipedia

- **What is the most common mycotic pneumonia in a patient with AIDS?**
 - a. Cryptococcus
 - b. Aspergillosis
 - c. Blastomycosis
 - d. Histoplasmosis
 - e. Coccidiomycosis
 - f. Candida

A. Cryptococcus

- While fungal infections in AIDS are uncommon (< 5% of patients) cryptococcus is the most common – of these, 90% have CNS involvement.
- Source: *Dahnert 5th 452, Primer 3rd ed. p.24*

- 45 year old woman with dyspnea and exercise intolerance has low glucose and chest xray reveals a 10cm mass in her left chest. The most likely etiology is:
 - a. Benign fibrous tumor of the pleura
 - b. Large cell tumor of the pleura
 - c. Bungholoma
 - d.

A. Benign fibrous tumor of the pleura

- This is more commonly known as benign mesothelioma. It has NO recognized association with asbestos exposure as in malignant mesothelioma. It is prevalent in the 3rd to 8th decade with a mean age of 50-60 years. It is asymptomatic in 50% but can present with cough, fever, dyspnea and chest pain. It is associated with episodic hypoglycemia in 4%.
- Radiologically, it is seen as a sharply circumscribed spherical / ovoid lobular mass of 2-30 cm in diameter located near lung periphery / adjacent to pleural surface / within fissure.
- Source: ***Dähnert 5th ed. p.504-505***

- In patients with AIDS, what is the most common cause of cavitory lesion in the chest?
 - a. Coccidiomycosis
 - b. Histoplasma capsulatum
 - c. TB
 - d.

C. TB

- Opportunistic infections account for the majority of pulmonary disease in AIDS patients. In fact, pulmonary infection is often the first AIDS-defining illness. This includes PCP (60-80%), fungal disease (<5%), mycobacterial infection (10% per year), bacterial pneumonia (5-30%), CMV pneumonia and Toxoplasmosis. Of these, Cryptococcus (15%, fungal), Coccidioycosis (only 10%,fungal), TB, nocardia (bacterial) and Rhodococcus equii (bacterial) can present with cavitary lesions.
- Per Primer, TB (20%) > fungal (< 5%).
- AIDS patients are 500 times more likely to become infected with TB then the general population. Radiological studies show postprimary TB pattern with upper-lobe cavitating infiltrate.
- Source: *Dähnert 5th ed p 652, 630, 631; Primer 6th ed*

- **Regarding asbestos-related pleural plaques: (T/F)**
 - a. They are commonly seen in the region of the costophrenic angle
 - b. They span less than 4 ribs
 - c. They arise on the visceral pleura
 - d. They spare the apices
 - e. All can be seen on CXR
 - f. Most occur above the 4th rib
 - g. Most occur below the 6th rib

- **False.** Pleural plaques usually spare the costophrenic angle and apices of the lung. The disease process is typically bilateral and involves the posterolateral aspect of the mid portions of the patient's thorax. NB: bilateral diaphragmatic *calcifications* sparing the CP angles is essentially pathognomonic for asbestos!
- **True.** Usually between 7th and 10th ribs (I assume that can be interpreted as not usually spanning more than 4 ribs)
- **False.** The pleural plaques typically involve the parietal pleura.
- **True.**
- **False.** Pleural plaques *may* be seen on chest radiograph, although they are only seen in approximately 15% of cases.
- **False.** Pleural plaques are seen most commonly on the domes of the diaphragm, on the posterolateral chest wall between the seventh and tenth ribs and on the lateral chest wall between the sixth and ninth ribs.
- **True.**
- Source: *Radiologic Diagnosis of DISEASES of the CHEST* (Muller, Frasier, Colman, Pare) 1st ed. p.537,538

<http://www.uhrad.com/ctarc/ct202.htm>

- Which of the following is NOT associated with pulmonary venous hypertension?
 - Pruning of the pulmonary arteries
 - Kerley B lines
 - Pleural effusions
 - Alveolar flooding
 - Redistribution

A. Pruning of the pulmonary arteries

- Three stages of cardiogenic pulmonary edema. 1)vascular redistribution 2)interstitial edema 3)alveolar edema
- Pruning is associated with Pulmonary Arterial Hypertension (PAH). Pruning is disproportionate increase in caliber of central fibrous arteries + decrease in caliber of smaller muscular arteries
 - *Source: Primer 3rd ed. p.65;Dähnert 5th ed. p.573*

- Which of the following would be most helpful to determine the etiology of a mosaic pattern seen on high resolution CT?
 - a. Lateral decubitus film
 - b. MRI
 - c. Routine chest CT
 - d. High resolution CT in expiration

D. High resolution CT in expiration

- A mosaic pattern of inhomogeneous attenuation consisting of light and dark patches on HRCT may result from air trapping, vascular obstruction, infiltrative lung disease, or some combination. An expiratory CT can help to decide which category is present. The degree of attenuation, the change in attenuation on expiration, and vessel sizes in areas of different attenuation are used in the assessment.
- *Source:*
<http://pathhsw5m54.ucsf.edu/case18/radiology18.ht> ,
confirmed by attending
- ***Dahnert 5th 410***

- An area of the lung is normally perfused and hyperventilated. PO_2 and pCO_2 will most likely be:
 - a. $pO_2=40$, $pCO_2=40$
 - b. $pO_2=80$, $pCO_2=40$
 - c. $pO_2=50$, $pCO_2=30$
 - d. $pO_2=98$, $pCO_2=30$
 - e. $pO_2=98$, $pCO_2=80$

D. $pO_2 = 98$, $pCO_2 = 30$

- Am I still in medical school? For general purposes, normal values are pO_2 100 mm Hg and pCO_2 40 mm Hg.
- Hyperventilation leads to decreased arterial pCO_2 (CO_2 blown off rapidly) and respiratory alkalosis. There is no respiratory compensation for respiratory alkalosis and the pO_2 is unaffected.
- *Source: Board Review Series: Physiology (Costanzo) 1st ed. p.166, 259 (question #48)*

- Which of the following is least likely to occur in a long-term smoker?
 - a. Centrilobular emphysema
 - b. Chronic bronchitis
 - c. Eosinophilic granuloma
 - d. Hypersensitivity alveolitis

D. Hypersensitivity alveolitis

- This is AKA extrinsic allergic alveolitis. It is due to exposure to organic dust $<5\mu\text{m}$ in size. It can present as recurrent episodes of fever, chills, dry cough and dyspnea following exposure after 6 hr interval (10-40% asymptomatic). Resolution may occur in days or weeks after exposures ceases. Chronic form may lead to honeycombing.
- Eosinophilic Granuloma – “It is interesting to note that 97% of those affected are either current smokers or have a previous history of smoking cigarettes.” Centrilobular emphysema and chronic bronchitis are associated with smoking.
- Source: *Dähnert 5th ed. p.485-487* <http://chorus.rad.mcw.edu/doc/00999.html> ; <http://www.uptodate.com/Providers/TeachingFiles/ITTP/Hist>

- On a HRCT what structure is most reliably seen in the secondary pulmonary lobule?
 - intralobular septa
 - intralobular pulmonary vein
 - centrilobular pulmonary artery
 - intralobular pulmonary lymphatics
 - bronchiole

B. Central pulmonary artery

Appearance of the Normal Secondary Lobule on HRCT

... The interlobular septa are seen only as rare fragments if the lung is normal. They are linear, nontapering structures that may be contiguous with the pleural surface. When the septa of numerous complete secondary lobules are visualized, this is an indication that the lung is abnormal. An average of three septa can be seen in a single lung slice when the collimation is 1.5 mm. An average of one septum can be seen in a single lung slice when the collimation is 3 mm.

- Since the interlobular septa are so rarely visualized, it is necessary to identify the peripheral pulmonary arteries in order to define the center of the pulmonary lobule. The smallest pulmonary arteriole that can be resolved by HRCT is approximately 0.2 mm and is a branching structure that does not reach the pleural surface. (There is usually a 5 mm clear space adjacent to the pleura.) The accompanying terminal bronchiole is too small to image as it enters the lobule. The last visible bronchus is located 2.5-3 cm from the pleural surface, unless the bronchial walls are thickened. Pulmonary veins are also branching structures that taper as they approach the pleural surface. It may be difficult to differentiate them from the pulmonary arteries, unless multiple contiguous slices are obtained. As noted previously, the pulmonary veins run separately, whereas the pulmonary arteries are accompanied by airways and lymphatics. The lymphatics are not normally visualized on HRCT sections.

- Source:

<http://www.vh.org/Providers/Textbooks/DiffuseLung/Text/NormAnat.html>

- Department of

- What structure is in close proximity to the vagus nerve as it passes through the diaphragm?
 - A. thoracic duct
 - B. aorta
 - C. azygous vein
 - D. esophagus

Esophagus

- The aorta and thoracic duct travel together separate from the esophagus through a different opening.
 - *Source: Atlas of Human Anatomy, Netter. Plates 180-181, 228*
- This is in Netter, plates 120 and 246.

- A patient with a pulmonary AVM has an increased risk for all of the following except:
 - a. Pulmonary hypertension
 - b. Stroke
 - c. Brain abscess
 - d. Hemoptysis

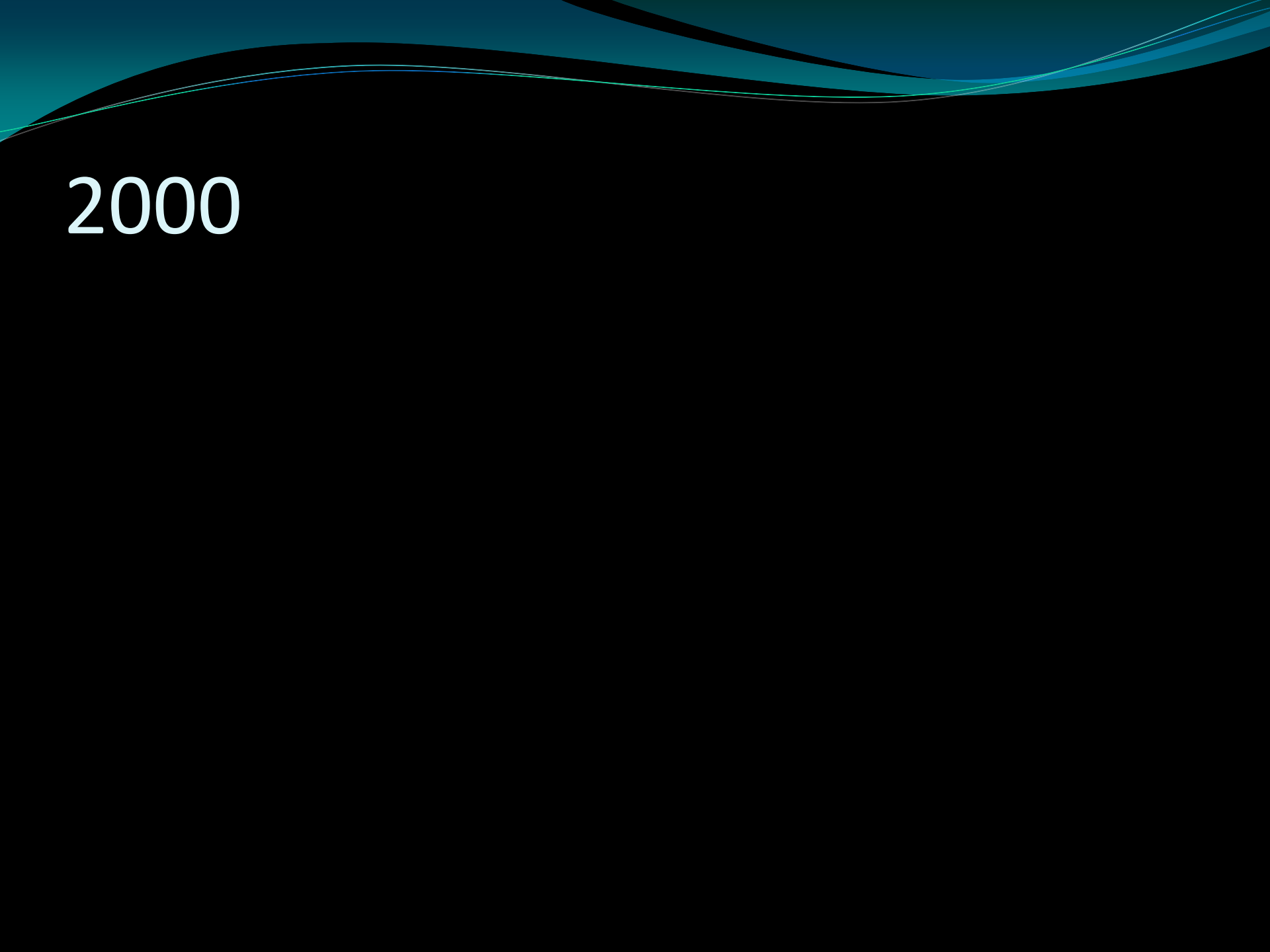
A. Pulmonary hypertension

- Pulmonary AVM is an abnormal vascular communication between a pulmonary artery and ven (95%) or systemic artery and pulmonary vein (5%).
- “The most common clinical manifestation is hemoptysis. Dyspnea is present in 60% of cases. Other findings include cyanosis and finger clubbing. Symptoms of central nervous system disease may be the result of metastatic abscess, hypoxemia, cerebral thromboemboli, cerebral vascular thrombosis from secondary polycythemia and cerebral hemorrhage from a concomitant intracerebral arteriovenous aneurysm.”
 - Source: ***Dähnert 5th ed. p.513,514***; *Radiologic Diagnosis of DISEASES of the CHEST* (Muller, Frasier, Colman, Pare) 1st ed. p.128,129

- **Most common radiologic finding for a bronchoalveolar cell carcinoma is?**
 - a. Solitary pulmonary nodule
 - b. Peripheral focal infiltrate
 - c.
 - d.

A. Solitary pulmonary nodule

- Bronchoalveolar cell carcinoma is a subtype of well-differentiated adenocarcinoma. It is associated with a history of heavy smoking (25-50%) and is often asymptomatic.
- The localized form (60-90%) is more common than the diffuse form (10-40%). Within the localized form, a single mass is the most common radiologic finding. This is seen as a well-circumscribed focal mass in peripheral / subpleural location arising beyond a recognizable bronchus.
 - Source: **Dähnert 5th ed. p.466**, Primer 2nd 30
- Radiologically, the most common presentation is as a solitary mass. It can also present as a unifocal or multifocal area of consolidation. If it presents as a solitary nodule, its prognosis is better than other types of



2000

- **Which structure passes under the aortic arch?**
 - a. Left recurrent laryngeal nerve
 - b. Right recurrent laryngeal nerve
 - c. Left vagus nv.
 - d. Right vagus nv.
 - e. Left phrenic nv.

A. Left recurrent laryngeal nerve

- This also loops under the ductus
 - *Netter, plate 220*
- The left branch loops under and around the arch of the aorta (ligamentum arteriosum) before ascending, whereas the right branch loops around the right subclavian artery.
 - Wikipedia

- **Which disease is NOT predominantly located at the lung apices?**
 - a. Silicosis
 - b. Alpha-1 antitrypsin deficiency
 - c. Lymphangioleiomyomatosis
 - d. Adult-onset cystic fibrosis
 - e. Centrilobular emphysema
 - f. Eosinophilic granuloma
 - g. Sarcoidosis
 - h. Ankylosing spondylitis
 - i. Asbestosis
 - j. TB
 - k. Idiopathic pulmonary fibrosis

B., C., I., K.

- Apices – **CASSETP**:
- CF, AS, Silicosis, Sarcoid, EG, TB, PCP/Post xrt pneumonitis
- Bases – **BADLASSRIF**
Brochiectasis, Aspiration, DIP/Drugs, Lymphangitic carcinomatosis, Asbestosis, Scleroderma and other CVD, Sarcoid, Rheumatoid, IPF(UIP), Furadantin ***Dähnert 5th ed p. 414***
- Centrilobular emphysema – areas of high V/Q - apices of upper and lower lobes.
- Alpha-1 antitrypsin def. – panacinar emphysema – uniform/diffuse. ***Dähnert p. 485***
- *Sarcoid is in both mnemonics, but Dahnert 5th 523 says “predominantly mid-zone involvement.”*

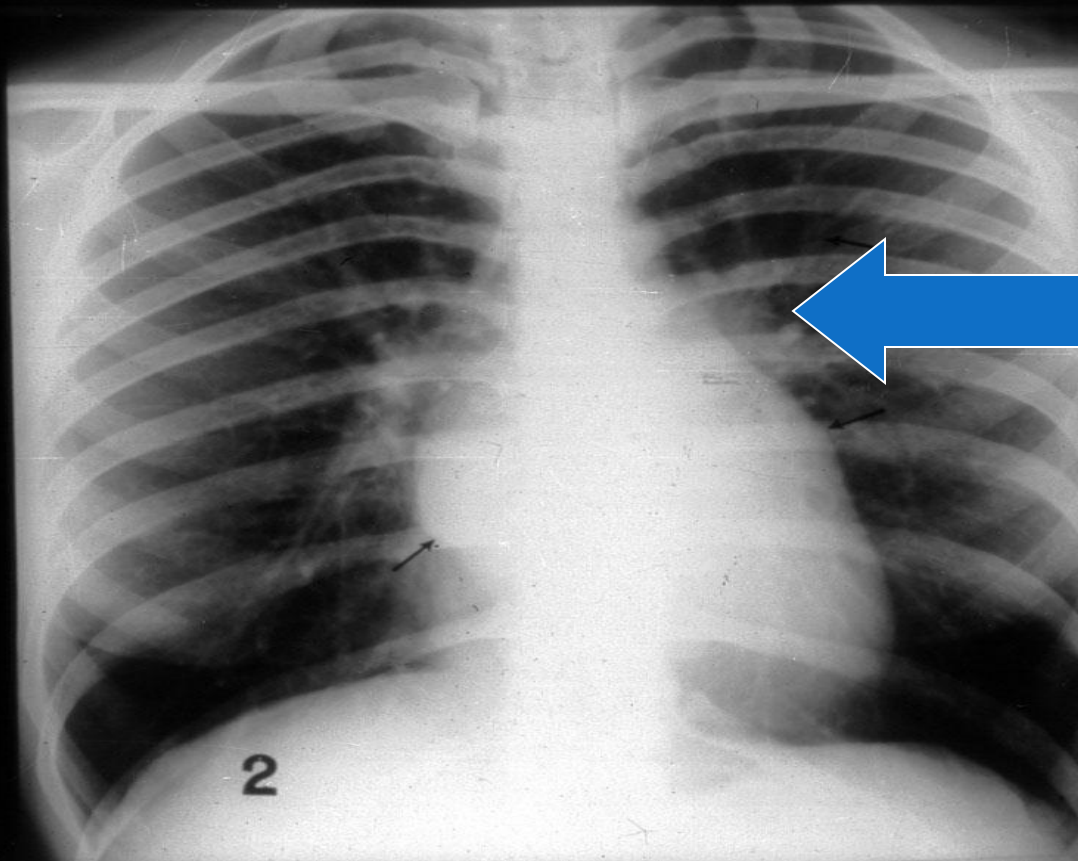
- The plain film finding most specific for left atrial enlargement is which the following?
 - a. Elevated left main bronchus
 - b. Double density of the left cardiac silhouette (AKA double contour sign)
 - c. Rounded contour of the left heart border
 - d. Bulging heart contour below hilum
 - e. Vascular redistribution
- The most sensitive sign of left atrial enlargement on CXR is:
 - a. Bumpy contour below the left pulmonary artery
 - b. elevation of the carina of the left main stem bronchus

B. Double density of the left cardiac silhouette

- One of the earliest signs of slight left atrial enlargement is the appearance of the double density, which is the right side of the left atrium as it pushes into the adjacent lung. The following indirect signs are visible only if the left atrium is dilated at least moderately:
- - Displacement of the left main bronchus posteriorly on the lateral view and superiorly on the frontal view - "walking man sign"
- - Spreading of the carina
- - Posterior displacement of the barium-filled esophagus
- - Double density on the left side at the left atrium extends into the left lower lobe
 - [Cardiac Radiology Requisites, p. 10-11]
 - *Dahnert 5th 575*

a. Bumpy contour below the left pulmonary artery

- All of the above are signs of LA enlargement. The question is asking what is the earliest sign, which is enlargement of the left atrial appendage; correct answer is a. Other signs of LAE are: double density within the cardiac silhouette behind RA on the PA view, elevation of left main stem bronchus, splaying of carina and anterior impression on esophagus on esophogram.
 - Sources: Radiology of the Heart by Spindola-Franco and Dr. Zelefsky



Left atrial
appendage

Dilated upper lobe
vein

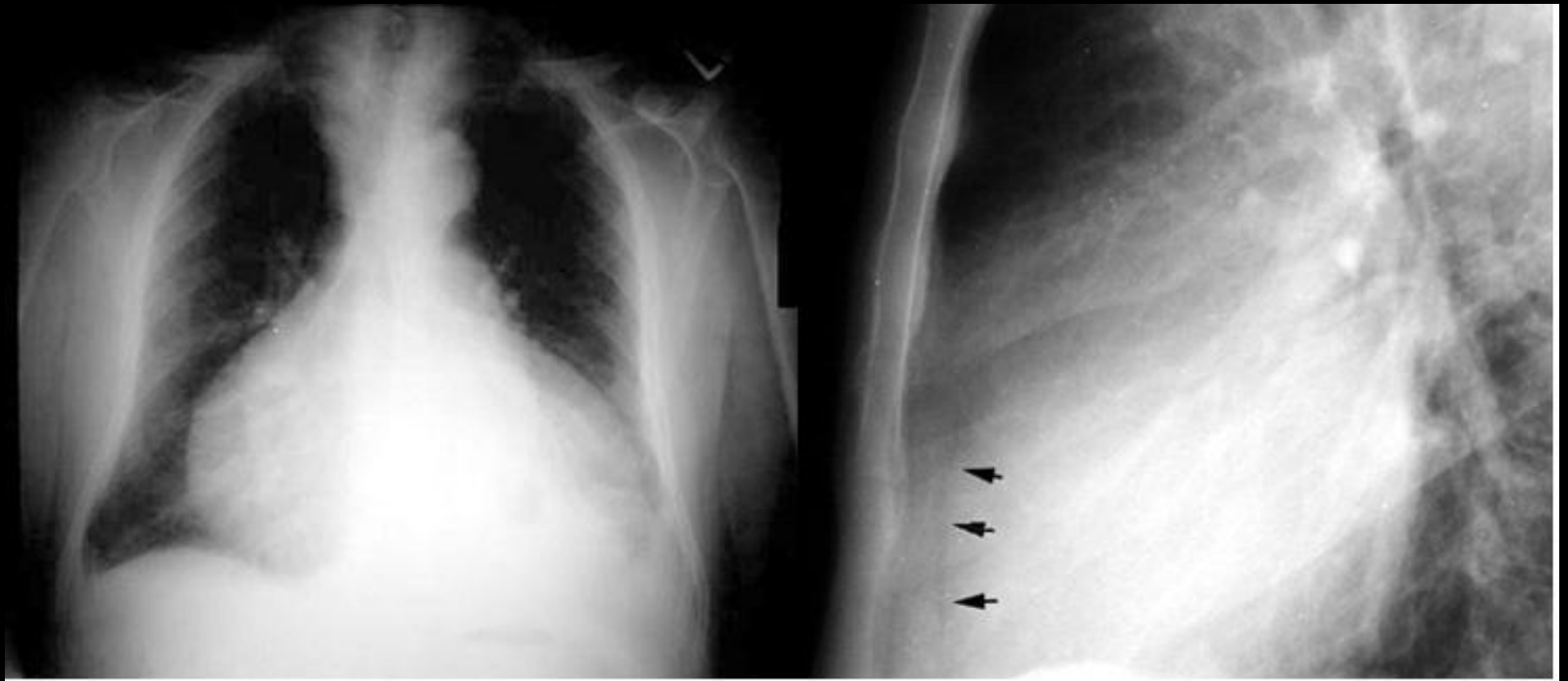


■ **Double Density Sign**

- Signs for pericardial effusion include:
 - a. No recognizable chamber enlargement.
 - b. Flask shaped heart on the erect film which becomes globular on the supine film.
 - c. Acute angle between right heart border and right hemidiaphragm.
 - d. Sharp cardiac outline
 - e. change in size on serial radiographs.

C. Flask-shaped heart (water-bottle heart)

- Multiple references indicate that the most specific finding for pericardial effusion is the epicardial fat pad sign (also double lucency sign). The EFPS refers to widening $>4\text{mm}$ of the soft tissue opacity of the pericardium between the lucent stripes that represent fat located anterior and posterior (epicardial) to the pericardium. This sign has low sensitivity but high specificity for pericardial effusion. A water flask heart is another common finding mentioned in multiple texts, but this is not specific. It is probably the answer because it is the classic description of pericardial effusion. Its presence on CXR, especially if acute in onset, should alert you to the possibility of pericardial effusion and prompt additional imaging if indicated (ECHO). Decreased cardiac contractions was also mentioned in multiple sources, but this may also be seen in ventricular failure, dilated cardiomyopathy, etc. Obscuration of hilar structures, IVC, dilated azygos are nonspecific. Ref. ACR Chest Syllabus (40), Fruendlich, Dahnert Brant&Helms see cardiac requisites pp265-270



Flask water bottle heart-pericardial
effusion, EFPS

- **The acinus begins where?**
 - a. Alveoli
 - b. Terminal bronchi
 - c. Bronchus
 - d. Distal to the respiratory bronchiole
- The pulmonary acini are defined as the tissue distal to:
 - Alveolar wall
 - Alveolar neck
 - Terminal bronchi
 - Respiratory bronchi
 - Subsegmental bronchi.

B. Terminal bronchiole

- Functionally the most important subunit of lung
 - all parenchymal tissue distal to one terminal bronchiole comprising 2-5 generations of respiratory bronchioles / ducts / sacs / alveoli. *Dähnert p. 446*
- **Acini and secondary pulmonary lobules are anatomic subdivisions of the gas-exchanging zone of the lung parenchyma and are of great practical importance to imaging. The acinus, that is, all of the lung subtended by a single terminal bronchiole, consists of about 400 alveoli of 200 μ m each, and measures approximately 7.5 mm in diameter. Consolidation of the acinus may account for recognizable "acinar" densities in bronchoalveolar cell carcinoma, bronchogenic tuberculosis, and varicella pneumonia. The secondary pulmonary lobule is that portion of lung that is supplied by a small bronchus just proximal to the bronchiolar level and bounded by a peripheral connective tissue septum. Taveras and Ferrucci**

- Which of the following is NOT associated with left atrial enlargement?
 - a. Mitral stenosis
 - b. Left atrial myxoma
 - c. Atrial fibrillation
 - d. Decreased compliance of the left ventricle
 - e. VSD
 - f. ASD
 - g. Aortic stenosis

F. ASD

(page numbers below refer to Dahnert 5th ed.)

- A. True. Pg 636
- B. True. Pg 639
- C. True. Inadequate contraction of left atrium leads to dilatation.
- D. True. LV can't fill normally, blood backs up and dilates LA.
- E. True. Pg 655
- F. False. Pg 615
- G. True. Pg 612
- ASD does not show left atrial enlargement because any additional blood in the left ventricle is "decompressed" into the RV through the defect. Primary pulmonary hypertension (if it were presented as a choice) would not cause LV enlargement.
- Common acquired causes of left atrial enlargement are mitral stenosis or regurgitation, left ventricular failure, and left atrial myxoma. Congenital causes include ventricular septal defects, patent ductus arteriosus, and the hypoplastic left heart complex. When atrial fibrillation occurs, the left atrial volumes may increase to 20%.
- Aortic stenosis can also cause left atrial enlargement. *Dahnert 5th p. 612.*
- Atrial fibrillation is most associated with left atrial enlargement. (That was the 1994 question.) In VSD, LA becomes enlarged b/c it receives an increased volume. The LV remains normal in size b/c the blood it receives is "decompressed into the RV. [*Cardiac Req p. 10*]
- [SD: Look up in Baxt/ AFIP]

- **Lymphatics are NOT associated with or adjacent to which of the following structures?**

- a. Alveoli
- b. Interlobular septa
- c. Pulmonary veins
- d. Bronchi
- e. Bronchial artery
- f. Bronchial vein
- g. Pulmonary artery

- **Pulmonary lymphatics run adjacent to all except (1998):**

- a) bronchial artery
- b) bronchial vein
- c) pulmonary artery
- d) pulmonary vein
- e) alveoli

A. Alveoli

- “The lymphatic vessels extend as far as the alveolar ducts but do not enter the alveolar walls.” see *Felson Chest Roentgenology* p. 241-250 for a discussion.
- The secondary pulmonary lobule contains the pulmonary arteriole, the bronchiole, the bronchial artery and vein, as well as lymphatic drainage. The pulmonary veins lie within the interlobular septa. The pulmonary veins and lymphatics are peripheral structures that lie within the interlobular septa. The alveoli lie too far peripheral for lymphatic drainage. [*Thoracic Radiology Requisites*, p. 16, 17. *Netter*, plates 193, 19].
- Note: Segmental bronchus - subsegmental bronchus - bronchiole - terminal bronchiole - respiratory bronchiole - alveolar sac and alveoli (resp to alveoli = acinus)
- **Dahnert 5th 448**
- Lymphatics are not found in alveolar walls, but start in the region of respiratory and terminal bronchioles.
- The lymphatics of the lung drain the pleural surface and the lung parenchyma. The former lymphatics drain the **most peripheral lobules of the lung and connect with a perivenous network by means of the interlobular septa to travel adjacent to pulmonary veins toward the hilar lymph nodes**. The latter drain the lung parenchyma as far **distally as the alveolar ducts and the respiratory bronchioles through lymphatic channels that extend along with the bronchoarterial bundles**. The multiple connections between the two networks (perivenous and bronchovascular) are occasionally seen as long interstitial lines when they are thickened (i.e., Kerley's A lines). Small nonencapsulated lymph nodes that often develop in subpleural locations must be considered in the differential diagnosis of small peripheral pulmonary nodules. The lymph nodes in the hilar regions tend to drain the lung distal to them. Although the extensive cross-connections between the lymph nodes of the anterior, middle, and posterior mediastinum make it difficult to establish rigid rules regarding specific drainage patterns, in general, the lung drains to the most adjacent regional lymph nodes. Lung lymphatics drain the lung parenchyma of fluid and large molecular size particles. Lymph flow is greatly increased in congestive heart failure, in which, thickened interlobar fissures and septal lines (i.e., Kerley's lines) are the result primarily of accumulated interstitial fluid, rather than from congested lymphatic vessels.

- **Alveoli develop fully by which age?**
 - a. Birth
 - b. 2 years
 - c. 4 years
 - d. 8 years

D. 8 years

- At about 28 weeks gestation, differentiation into Type I and Type II alveolar epithelial cells has clearly begun. At this time, a blood gas barrier exists that is capable of permitting gas exchange. A substantial number of alveoli are added after birth. The majority appear during early childhood, probably by two years of age. The age at which alveolar development is completed is also controversial, although it appears likely that some multiplication occurs until at least eight years of age. [*Fraser and Pare, p. 139*]
- Only 1/6 of the adult number of alveoli are present at birth. The remaining alveoli are formed during the first ten years of postnatal life. *Langman's Medical Embryology*.
- Notes from AFIP: Alveoli increase in size and # until 2 years; After 2 yo, alveoli only increase in size.
- ANS: B. development begins at 28 days post conception .
- Birth to 15 yrs diameter of airways increases, cartilage and muscles form. Lung parenchyma growth is principally due to new units in infancy and to increase in size in rest of child hood.

- **Which agent is NOT used in pleurodesis?**

- a. Talc
- b. Ethanol
- c. Bleomycin
- d. Tetracycline
- e. Doxycycline
- f. Minocycline

B. Ethanol

• Chemical Methods:

- Tetracycline (Not available anymore)
- Doxycycline
- Bleomycin. Expensive option.
- Nitrogen mustard, Atabrine,

• Surgical:

- Pleurectomy
- Thoracoscopic Talc pleurodesis (Current favoured method)

• Radiotherapy:

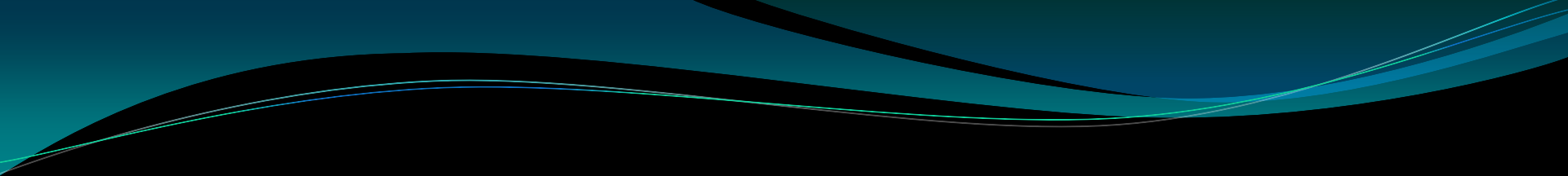
- Radioactive gold: (Used in the past. Requires special disposition of body because of radioactive material)
- External Radiation (Loose lung function, not used any more)

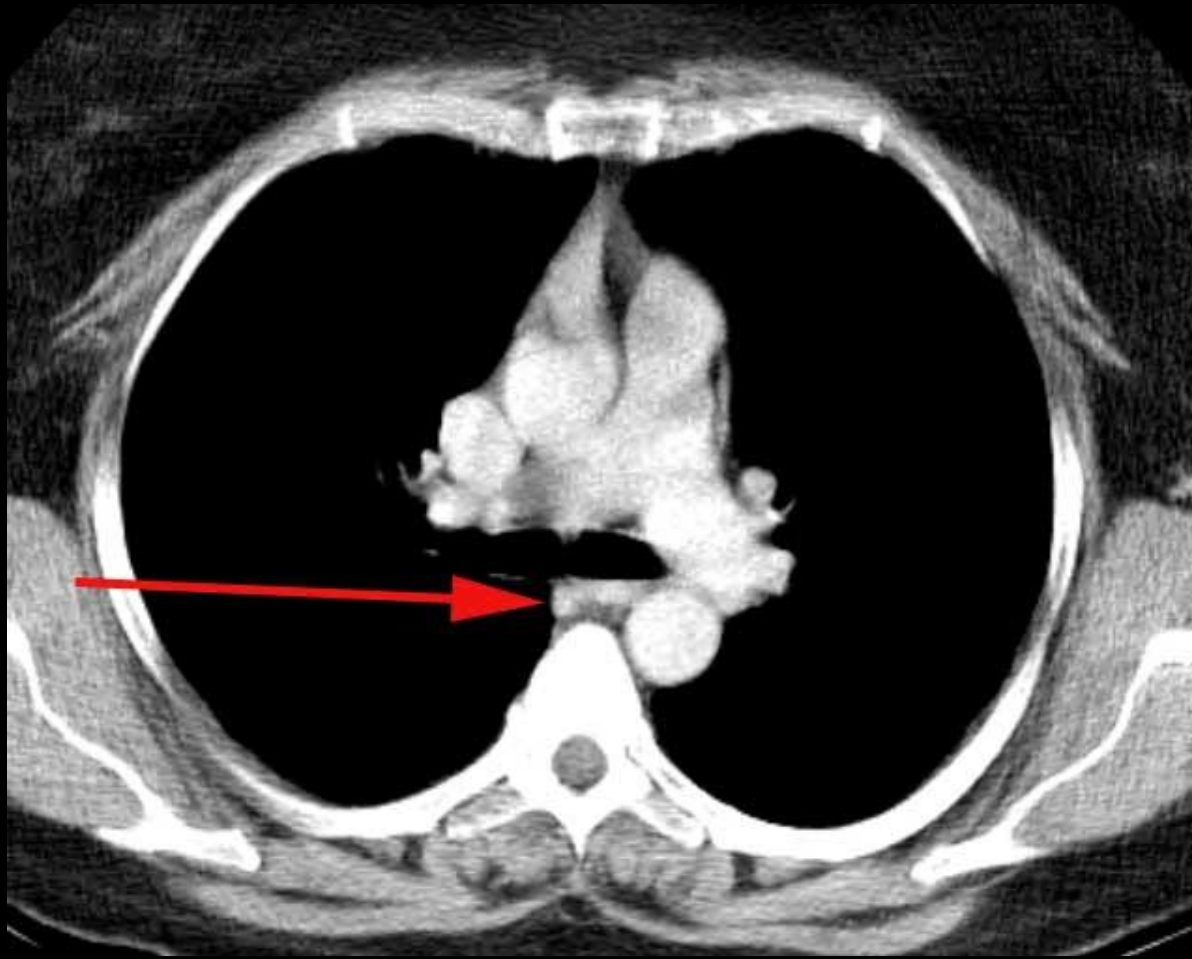
• http://www.meddean.luc.edu/lumen/MedEd/elective/pulmonary/pleurodesis/pleurod_f.htm

• Valji, Vascular and Interventional Radiology, p. 397

- “tetracycline, doxycycline, talc, dilute NaOH, bleomycin”

• Minocycline is one of the tetracyclines (as is doxycycline). Probably usable for pleurodesis.

- 
- **Which vessel does this represent? (see arrow)**
 - a. Azygos vein
 - b. Hemiazygos vein
 - c. Aberrant right subclavian artery
 - d. Pulmonic vein
 - e. Right superior intercostals vein
 - f. Pulmonary artery



A. Azygos vein

- The azygos vein is indicated in the image; the hemiazygos vein would be on the other (i.e., left) side.
- Note that the azygos vein joins the SVC at/slightly below the aortic arch. An image above the arch will not show the azygos vein [ref. 2002 written exam]. see *Netter plates 220, 226 for clarification*.

- **Phenytoin and cyclosporin can both result in which of the following?**
 - a. Noncardiogenic edema
 - b. Cardiogenic edema
 - c. Hypersensitivity reaction
 - d. Pleural effusion
 - e. Mediastinal lymphadenopathy
- **what do dilantin and cyclosporine both do to the lungs**
 - a. noncardiogenic pulmonary edema
 - b. cardiogenic pulmonary edema
 - c. effusions
 - d. adenopathy

e. Mediastinal lymphadenopathy

Pulmonary Complications of Chemotherapy and Other Medications

Nitin Bhatt, M.D.

Fellow, Division of Pulmonary and Critical Care Medicine

- Hypersensitivity pneumonitis
- Typical drugs - Methotrexate, chrysotherapy, cyclophosphamide, nitrofurantoin, antidepressants
 - Emedicine
- Cyclophosphamide
 - a) Pulmonary toxicity in malignant and non-malignant disease
 - b) Can be early onset (within wks) or late onset (6 mos-6yrs after tx) pneumonitis
 - c) Late-onset may have pleural thickening assoc with interstitial infiltrates
 - d) No association with dose, age, XRT, oxygen
 - e) Usually develop symptoms within weeks
 - f) DOE, fevers, crackles
 - g) CXR with bibasilar reticular pattern, can have diffuse pulmonary edema
 - h) Treat with steroids, mortality upto 50%
- Phenytoin
 - a) Hypersensitivity syndrome with fever, rash, leukocytosis with eos, hepatosplenomegaly, lymphadenopathy that may be focal or diffuse
 - a) Lymph node biopsy reveals hyperplasia, or a lymphoma-like appearance that can resolve with d/c drug...pseudolymphoma or resolve only to recur several mos later as a true lymphoma...pseudopseudolymphoma
 - a) Increased risk of lymphoma (4-10X) in pts on phenytoin
- Cyclosporin
 - a) Post-transplant lymphoproliferative disorder (3-5% of all cases)
 - b) Related to EBV

• Chest

Drug-induced Noncardiogenic Pulmonary Edema*

Carol R. Reed, M.D.; and Frederick L. Glauser, M.D.

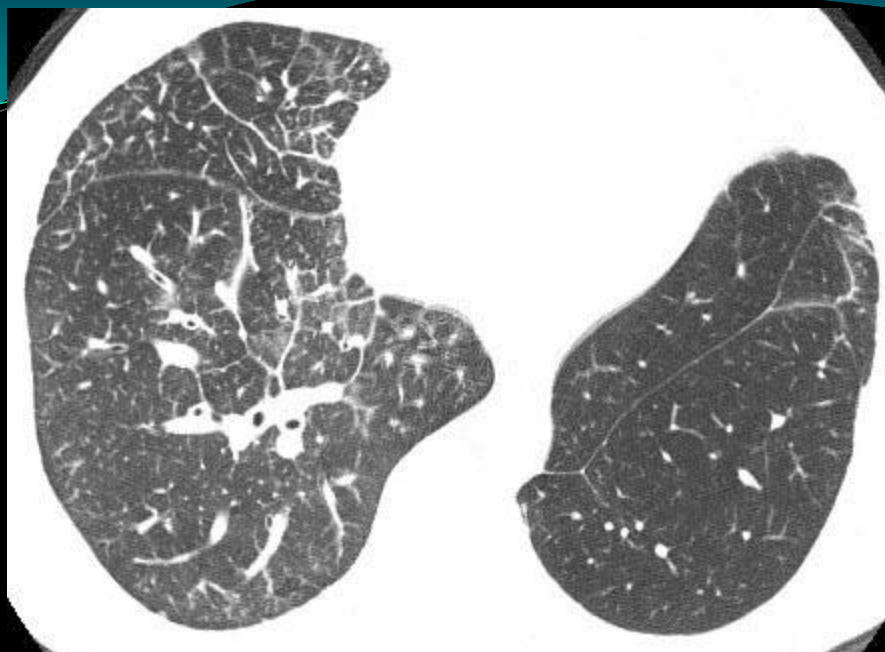
Table 1—Classification of Drug-Induced NCPE

Group 1 (>10 cases)
Ethchlorvynol
Narcotics
Heroin
Propoxyphene
Methadone
Naloxone
Tocolytics
Ritodrine
Isoxsuprine
Salbutamol
Terbutaline
Salicylate
Hydrochlorothiazide
Protamine
Recombinant interleukin 2
Group 2 (5-10 cases)
Cyclosporine
Tricyclic antidepressants
Amiodarone
Vinca alkaloids and mitomycin
Bleomycin
Cytarabine (cytosine arabinoside)
Group 3 (controversial areas)
Amphotericin and granulocyte infusions
Insulin and diabetic ketoacidosis
Group 4 (<5 cases)
Streptokinase
Trimethoprim-sulfamethoxazole
Flurazepam
Lidocaine
Sclerotherapy
Nitroprusside
Intrathecal methotrexate

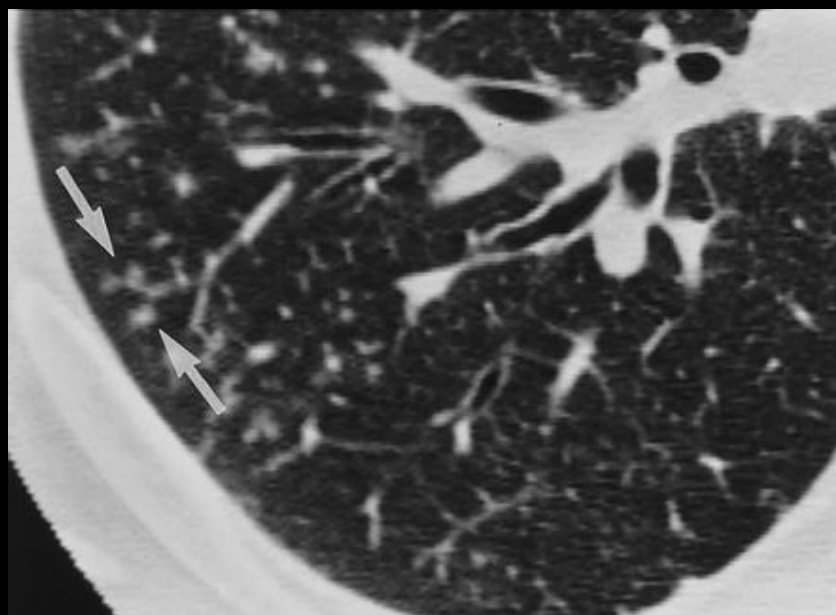
- **A high-resolution chest CT demonstrates 3 mm irregular Y and V-shaped thickening approximately 2 to 3 mm from the pleural surface. This imaging appearance is most consistent with which of the following:**
 - a. Lymphangitic carcinomatosis
 - b. Bronchiolitis
 - c. Bronchogenic ca.
 - d. PIE
 - e. Alveolitis
 - f. Microinfarcts
 - g. Pulmonary edema
 - h. Consolidation

B. Bronchiolitis.

- Sounds like centrilobular nodule not lymphatic spread.
(KMM)



Interlobular septal thickening (edema, lymphangitic spread of tumor, pulm hemorrhage,)



Tree-in-bud
(bronchiolar dz)

- **The most common mediastinal mass in a child between the ages of 6 and 12 years old is which disease?**
 - a. Teratoma
 - b. Neuroblastoma
 - c. Ganglioneuroma
 - d. Lymphoma
 - e. Bronchogenic cyst

D. Lymphoma

- According to Swischuck, mediastinal masses in young infants are within the posterior mediastinum 50-60% of the time, with neuroblastoma as the most common (*this age group is too old for neuroblastoma). In older children, mediastinal lymphadenopathy is most commonly due to lymphoma.
- Mediastinal masses in children are broken down as follows: anterior = 30%, middle = 30%, posterior = 40%. Greater than 90% of posterior mediastinal masses are neurogenic in origin, with neuroblastoma by far more common than ganglioneuroblastoma or ganglioneuroma. After leukemia and CNS tumors, lymphoma is the third most common neoplasm of childhood. It is the most common anterior mediastinal mass, accounting for 1/4 of all mediastinal masses. [*Pediatric Radiology Requisites. p. 44, 5*]

- In an older male patient with a left upper lobe opacity that parallels the hilar vessels, the next appropriate step in management of the patient would be which of the following?
 - a. Bronchoscopy
 - b. Thoracentesis
 - c. Percutaneous biopsy
 - d. Thoracotomy
 - e. Mediastinoscopy
 - f. Video assisted thoracoscopy
 - g. Tube thoracostomy

A. Bronchoscopy

- Parallel vessels in the HIL can be a sign of atelectasis, i.e. “vascular crowding” -> therefore bronchoscopy would be the procedure of choice to evaluate for intraluminal mass, mucus, etc. Any lesion/mass that parallels the hilar vessels is too central for percutaneous biopsy.
- “A major indication for bronchoscopy is suspected pulmonary carcinoma... Other situations include hemoptysis, selected interstitial lung disease cases, infection (esp. TB), and rejection of a lung transplant.” *Fraser 2nd p. 149.*
- This is likely just common sense stuff. There was a 1999 question regarding percutaneous lung biopsy which emphasized the following facts: biopsy may still be indicated even if bronchoscopy is negative; there is an increased risk of pneumothorax if the patient has emphysema; biopsy should not be performed if the platelet count is < 50 ; and bronchoscopy is (obviously) the best method for evaluation of an endobronchial lesion.

- **The most resistance to pulmonary blood flow is located at which site?**
 - a. Main pulmonary artery
 - b. Segmental arteries
 - c. Capillary bed
 - d. Mitral valve
 - e. Left or right pulmonary arteries
 - f. Muscular arteries and arterioles
 - g. Subsegmental arteries

C. Capillary bed

- In the pulmonary circulation, arteries are virtually absent; in the adult, this results in pulmonary blood flow being largely determined by the resistance of the alveolar capillaries. In fetuses it is different, the resistance is determined by small pulmonary arteries.
 - **Fetal medicine: Basic Science and Clinical Practice**
 - By Charles H. Rodeck, Martin J. Whittle

E. Turn patient prone and rescan

- This is the best way to negate dependent atelectasis

- A previously healthy child presents with new symptoms of SVC obstruction and diffuse mediastinal calcifications. Which of the following is the most likely etiology?
 - a. TB
 - b. Teratoma
 - c. Burkitt's lymphoma
 - d. Histoplasmosis
 - e. Thymoma

D. Histoplasmosis

- The cause of fibrosing mediastinitis is an abnormal immune response to Histoplasmosis. May cause SVC syndrome. Calcified nodes.
- The most common benign causes (only 10% to 20% collectively) of SVC syndrome are **granulomatous mediastinitis** and post-iatrogenic manipulation (long-dwelling lines, etc.). Between TB and Histoplasmosis, Histoplasmosis more classically results in mediastinal fibrosis and also results in more fulminant lymphadenopathy than TB. Histo is also not an opportunistic infection, and would therefore reasonably be seen more frequently. (*Dähnert, Radiology Review Manual, 5th p. 648.*)
- Lymphoma is probably more common overall, but the only lymphoma with calcifications would be *treated* – not good for a previously healthy child. The calcifications in TB, teratoma, and thymoma would be more focal than diffuse. Histo could cause SVC obstruction from fibrosing mediastinitis.
- SVC syndrome in adults: caused by malignant lesion in 80-90% - bronchogenic CA in > 50% and lymphoma; benign: granulomatous mediastinitis (usu histo, sarcoid, TB), substernal goiter, ascending aortic aneurysm, pacer wires, constrictive pericarditis

- *Dähnert 5th 475*

- **A 65 year-old male is two years status post single-vessel CABG. Pre operative catheterization at that time revealed a non right dominant system with severe RCA disease. He now presents with chest pain and EKG changes consistent with posterior wall reversible defect. What is the most likely etiology?**
 - a. Graft occlusion
 - b. Native RCA occlusion proximal to the graft
 - c. Native RCA occlusion distal to the graft
 - d. New left coronary disease/LAD ischemia
 - e. Circumflex ischemia

E. Circumflex ischemia

• Pure posterior wall infarcts are extremely rare. They are usually posteroinferior or posterolateral. In this patient whom we know has a small RCA (because of a non right dominant system) the presenting chest pain with posterior wall reversible defect is likely more posterolateral in distribution. This therefore likely represents new left circumflex disease.

- Coronary artery distributions:

- LCx – posterolateral

- RCA – posteroinferiorseptal

- LAD – anterior

- PDA - inferiorapical

- Dahnert 5th 596-598

- A - dominance refers to the coronary artery that supplies the posterior descending artery (PDA) and posterior inferior surface of the myocardium (left ventricle and interventricular septum). Approximately 85% of patients are right dominant, meaning that the RCA (right coronary artery) supplies the PDA and inferior, posterior left ventricle and posterior third of the interventricular septum. 10-12% of patients have left-sided dominance with the LCA being the supply for the PDA and inferior, posterior myocardium. 4-5% are co-dominant. Co-dominant patients may have two PDA vessels (one from the RCA and the other from the left circumflex artery). The RCA gives off the sinoatrial nodal branch, acute marginal branches, and atrioventricular nodal branch before terminating as the PDA in right-dominant patients. Since this patient's reversible lesion involves the posterior inferior wall only, there is ischemia involving the PDA, which in this patient is the most distal branch of the RCA. Therefore, a lesion distal to the RCA graft is present. Occlusion of the RCA graft would result in defects involving the anterior wall and conduction abnormalities.

- (Brant WE, Helms CA, Fundamentals of Diagnostic Radiology, 1st ed, Williams & Wilkins, 1994. pp. 577-580)

- **What is the most common cause of unilateral lymphangitic carcinomatosis of the lung?**
 - a. Bronchogenic carcinoma
 - b. Breast cancer
 - c. Colon cancer
 - d. Pancreatic cancer
 - e. Testicular cancer

A. Bronchogenic carcinoma

- Bronchogenic carcinoma goes from local dissemination via lymphatics to the unilateral lung. The other options are metastatic foci from extrathoracic sites. The tumor origin in lymphangitic carcinomatosis in order is bronchogenic cancer and breast cancer (56%), stomach (46%), then thyroid, pancreas, larynx, and cervix. The location is usually bilateral, or unilateral if the lung is the primary
- Source--pneumonic: Certain Cancers Spread By Plugging The Lymphatics
 - cervix, colon, stomach, breast, pancreas, thyroid, larynx
 - *Dähnert 5th, p. 502*

- Which of the following is NOT typically noted in the appearance of rheumatoid lung?
 - a. Hilar adenopathy
 - b. Pleural effusion
 - c. Lower lobe interstitial disease
 - d. Cavitory nodules
 - e. Honeycombing

A. Hilar adenopathy

- Pleural disease is the most frequent rheumatoid lung abnormality. It is usually unilateral with an exudative effusion which has increased protein, increased lymphocytes, and decreased glucose. Necrobiotic nodules are well-circumscribed, usually multiple and peripheral, commonly with cavitation. Honeycombing is a late, uncommon finding. [*Fraser and Pare, p. 1433-1452, 3046*]
- ***Dahnert 5th 521***
- There are five pleuropulmonary abnormalities associated with rheumatoid disease:
 1. pleurisy with or without effusion
 2. diffuse interstitial pneumonitis or fibrosis (lower lobe predominance)
 3. pulmonary (necrobiotic) nodules, often cavitate
 4. Caplan's syndrome (pneumoconiotic nodules)
 5. Pulmonary hypertension secondary to vasculitis

- Which of the following cells regenerate following alveolar damage?
 - a. Type I pneumocyte
 - b. Type II pneumocyte
 - c. Type III pneumocyte
 - d. Macrophage

B. Type II pneumocytes

• Type II pneumocytes produce surfactant, produce DNA, are bound by intracellular bridges, and increase in number with alveolar damage. In types I and II, the cells are joined by occluding or tight junctions. Intracellular bridges are the hallmark of tight junctions by light microscopy. Type I pneumocytes cover 95% of the alveolar surface while Type II cells represent only 8% of these cells.

- [Harrison's Principles of Internal Medicine, p. 1096]
- Type II pneumocytes replace injured pneumocytes. The alveolar epithelium comprises a continuous layer of two principal cell types: flattened, plate-like pavement type I pneumocytes (95%) and rounded type II pneumocytes. Type II pneumocytes are important for at least two reasons: 1) source of pulmonary surfactant and 2) main cells involved in repair of alveolar epithelium after destruction of type I pneumocytes.

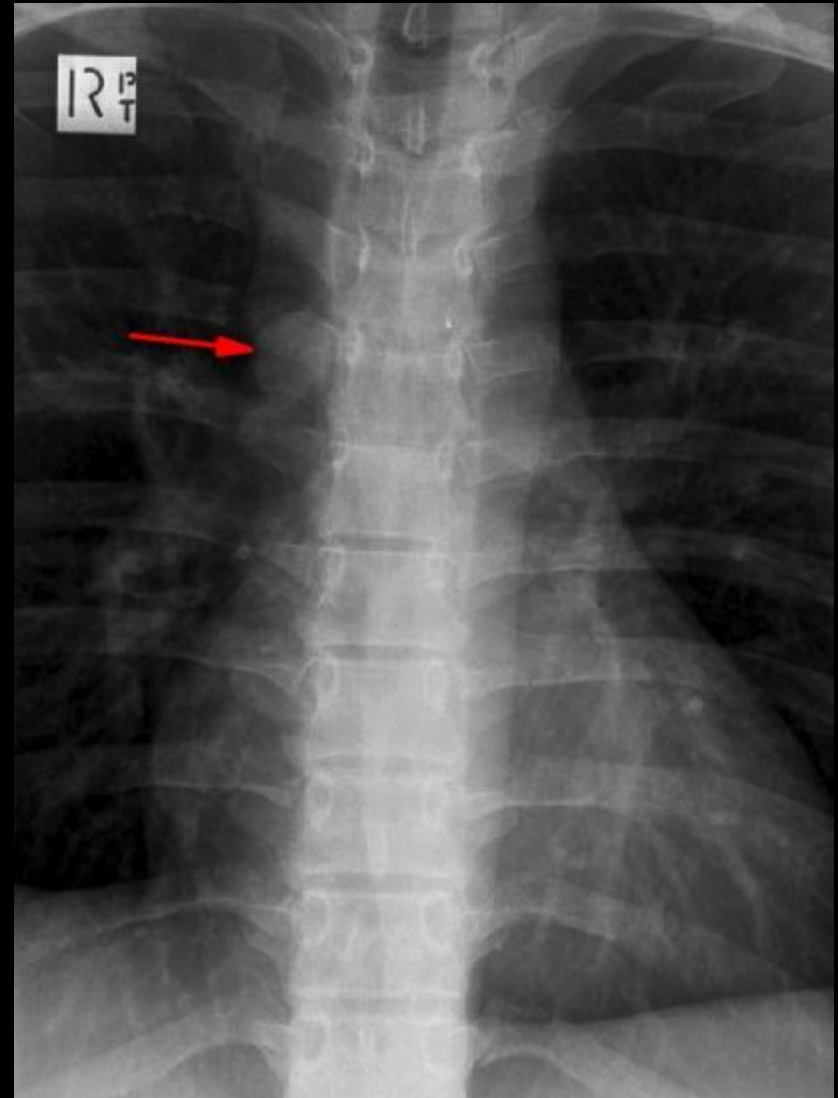
• Source: Pathologic Basis of Disease by Robbins

- **Which of the following maneuvers best distends the azygos vein?**
 - a. Upright position with Valsalva maneuver
 - b. Supine position with Valsalva maneuver
 - c. Supine position with Mueller maneuver
 - d. Upright position with Mueller maneuver

C. Supine position with Mueller maneuver

- Mueller maneuver = rapid forced inspiration against a closed glottis with decrease in intrathoracic pressure and increased venous return
- The Mueller manoeuvre – forced inspiration with closed glottis in supine position may be used to decrease intrathoracic pressure and increase size of thin walled vascular structures.
- Valsalva maneuver = increase in intrathoracic pressure and decrease in cardiac output mostly secondary to decrease in venous return to the heart
- The normal or abnormal azygos vein always shrinks dramatically when the patient assumes the upright position, takes a deep inspiration, or performs the Valsalva maneuver. [*Felson's Chest Roentgenology*, p. 236]

- This young patient was involved in a trauma. A supine thoracic spine film demonstrates a rounded opacity in the right mediastinum, just superior to the right main bronchus (click image for arrow). This opacity is a distended azygous vein, and it collapses when the patient is erect ([erect chest xray](#)).
- The azygous vein is a normal structure which may be distended in the supine position, right heart failure, inferior vena cava obstruction, and portosystemic shunting. The normal size of the azygous vein is <7mm (erect CXR).



- **Patients with tracheal laryngeal papillomatosis are at increased risk for which of the following?**
 - a. Squamous cell carcinoma
 - b. Adenocarcinoma
 - c. Carcinoid
 - d. Large cell undifferentiated carcinoma
 - e. Mucoepidermoid carcinoma

A. Squamous cell carcinoma

- Tracheal laryngeal papillomatosis is caused by the human papilloma virus types 6 and 11. It rarely undergoes malignant transformation. Juvenile tracheal laryngeal papillomatosis starts in the trachea and spreads throughout the tracheobronchial tree. Repeated laser treatments and antiviral therapy make up the treatment. Rarely squamous cell carcinoma arises from a bed of recurrent respiratory papillomatosis.
 - *Lung Pathology text. Dähnert 5th, p. 382-383*

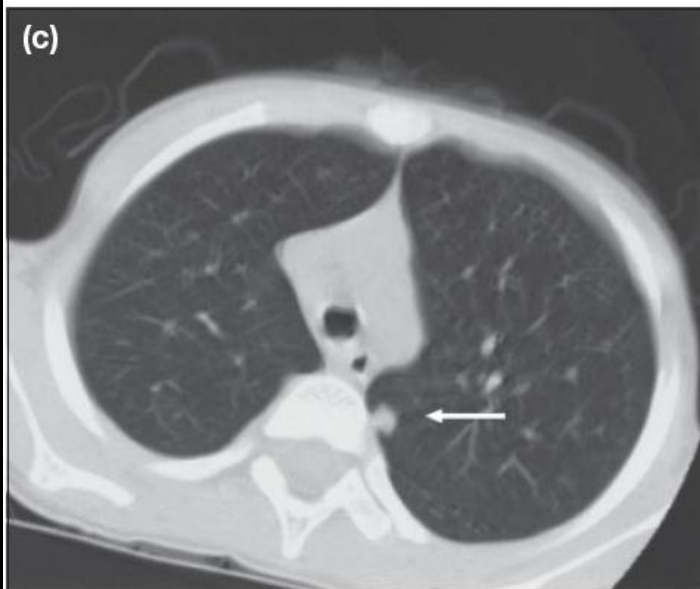
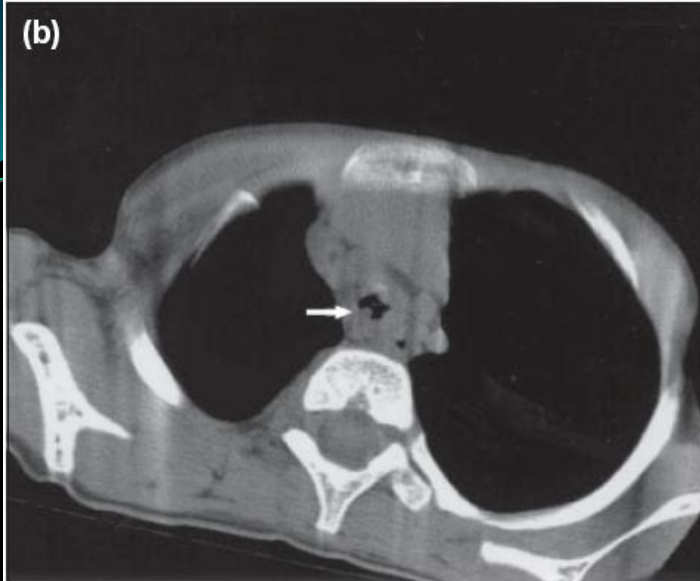


Figure 1. Radiological findings at age 3 years: (a) chest X-ray showing a few nodules (arrows) due to laryngeal papillomatosis in both lung fields (tracheostomy tube is also visible); (b) axial computed tomogram of the thorax (soft-tissue window) showing small soft-tissue nodular lesions and irregular wall thickening in the trachea (arrow); and (c) axial computed tomogram of the thorax (lung window) showing nodule in the left lung (arrow).

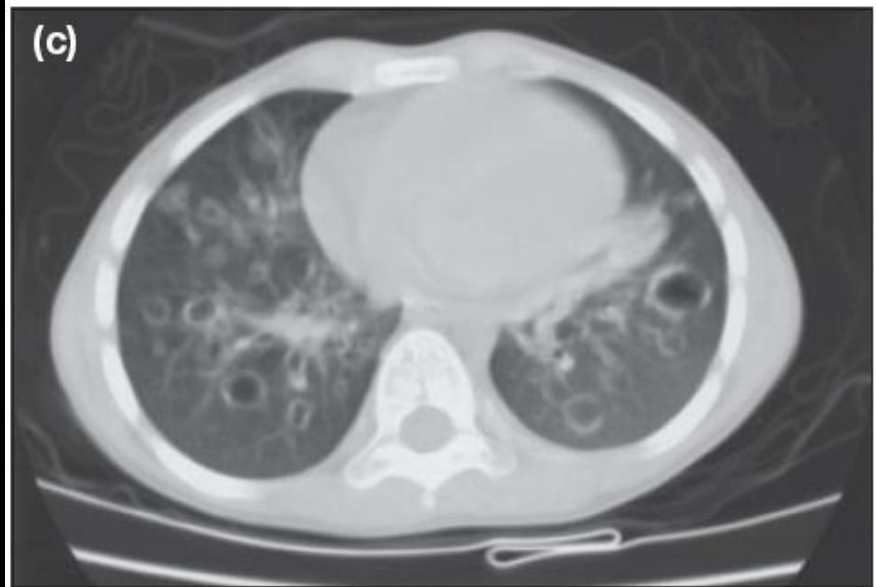
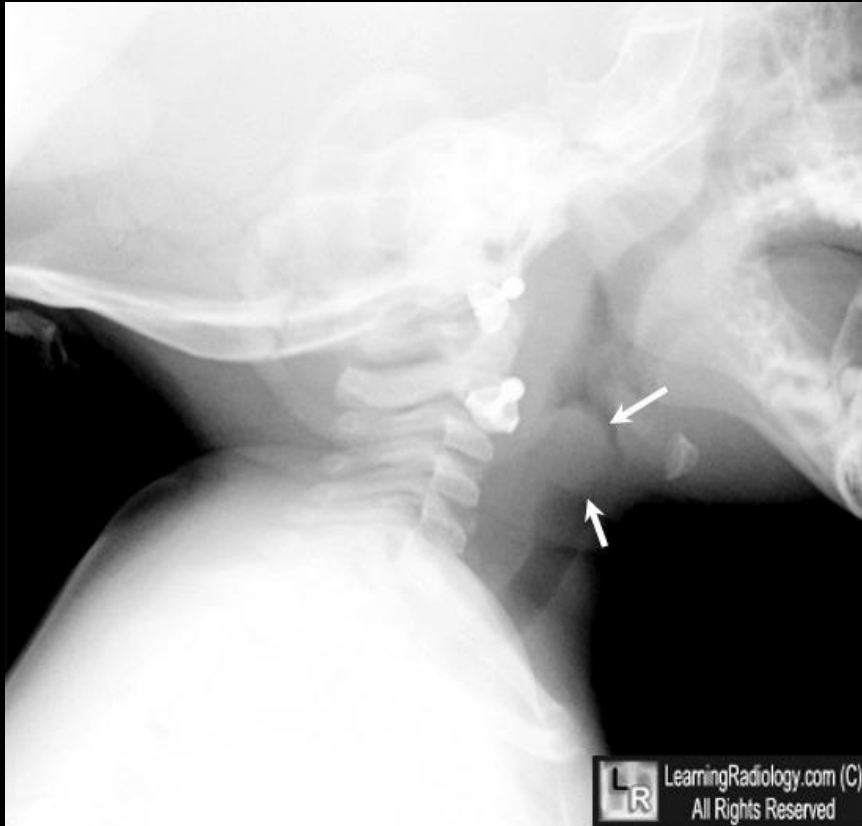


Figure 2. Radiological findings at age 8 years: (a) chest X-ray showing an increased number of nodules (arrows); and (b) and (c) computed tomograms showing more extensive disease, and solid and cavitated nodules with thin smooth walls in both lung fields.

Learning Radiology



- **Laryngeal Papilloma.** Soft tissue lateral view of the neck demonstrates a smooth, rounded soft tissue mass arising from the posterior wall of the trachea at the level of the larynx (white arrows).
- Most common benign tumor of the trachea in children (60% of all benign tumors)
- 2nd most common benign tumor of trachea in adults
- Majority of primary tracheal tumors are malignant
- In over 80% of cases, multiple papillomas occur in the trachea
- Chest radiographs are usually normal
- Papillomas can present as multiple nodules in the chest, some of which may cavitate
- CT scans of the neck and chest will demonstrate the extent of the lesions

- Which of the following is NOT part of the post-cardiac injury syndrome?
 - a. Fever
 - b. Pleural fluid
 - c. Pericardial effusion
 - d. PE
 - e. Transient focal pulmonary opacity

D. PE

- Dressler Syndrome (< 4%)
 - autoimmune reaction, 2-3 weeks post-MI
 - fever
 - pericarditis $\pm$ pericardial effusion
 - pleuritis $\pm$ pleural effusion
 - pneumonitis
 - *Dähnert 5th 638*
- PE is a well known complication of post MI state but not included in the syndromes which are thought to be autoimmune phenomena

- **The patient is status post RUL lobectomy now has RML gangrene, what is the cause?**
 - a. aspiration
 - b. RML torsion
 - c. thrombosis of right superior pulmonary vein
 - d. ligation of interlobar artery
 - e. Surgical interruption of PA
 - f. Surgical interruption of pulmonary vein
 - g. Ligation of bronchus intermedius

B. RML Torsion

- If you ligate the INTERLOBAR artery one would necrose not only the RML but the RLL as well.
- Masses, pl eff, PTX, PNA, surg resection of inf pulm ligament predispose to torsion.
RML is most common, rotates on bronchovasc pedicle, causes obstruction of venous flow, ischemia, necrosis. This happens less commonly cuz they tack down the RML during surgery. Inf pulm lig are reflections of the parietal pleura that extend from just below the inf margins of the pulm hila inferiorly and to the diaphragm posteriorly.
Ref: Weissleder, p. 58
- ***Dahnert 5th 531; Primer 2nd 58***

- **Malignant mesothelioma most closely resembles grossly and histologically what?**
 - a. Adenocarcinoma
 - b. Melanoma
 - c. TB
 - d. Uremia
 - e. Invasive thymoma

A. Adenocarcinoma

- Both, invasive thymoma and adenocarcinoma can invade the pleura and grow as pleural masses circumferentially around the lung. Histological appearances of adenoCA and mesothelioma are equally confusing requiring use of special immunohistochemical stains and electron microscopy. (*Fishman's Pulmonary Diseases and Disorders*)
- The task of the pathologist is to separate the mesothelioma from its many mimics including adenocarcinoma from the lung (in pleural cases) and soft tissue sarcomas such as malignant fibrous histiocytoma (in peritoneal cases).
- <http://www.thedoctorsdoctor.com/diseases/mesothelioma.htm>

- In a 34 yo asymptomatic construction worker a routine CXR reveals unilateral pleural effusion which resolves on its own in 6 weeks. Six months later the patient presents with a focal upper lobe opacity. What is the most likely cause?
 - a. lung cancer
 - b. PE
 - c. TB
 - d. Lymphoma
 - e. Viral infection
 - f. Asbestosis
 - g. Sarcoid
 - h. PCP

C. TB

- TB pleural effusions in 23-38% adults and 10% children; usually with mediastinal LAD and one or more homogenous area of ill defined airspace consolidation of 1-7cm; atelectasis is seen in 8-18% especially in right anterior segment of the upper lung.
- *Primer pgs. 12-15; Dähnert pgs. 532-534. Fraser 2nd p. 320.*

- **Which does not affect the cardiothoracic ratio?**
 - a. Inspiration
 - b. Expiration
 - c. Lordotic view
 - d. Posterior view
 - e. Increasing the kVp

E. Increasing the KVP

- *see Bushberg.*

- Regarding AIDS and TB, which one of the following is false?
 - May present with adenopathy alone
 - Military pattern is common
 - Resistant strains in institutionalized patients are common
 - There is a lack of inflammatory cells in pathologic specimens
 - Patients respond to antituberculous medications with the same level of efficacy as nonimmunocompromised patients

Miliary pattern common

- Of 408 patients with HIV and tuberculosis, 27 (6%) were diagnosed as miliary tuberculosis.
 - *Miliary tuberculosis in human immunodeficiency virus infected patients not on antiretroviral therapy: Clinical profile and response to shortcourse chemotherapy; JPGM*
- HIV and TB: AIDS pts are 500x more likely to become infected than genl pop. Findings include upper-lobe cavitating infiltrate (early in course of AIDS) and infiltrate, lung masses, hilar and mediastinal adenopathy, and pleural effusion (late in course). **Adenopathy is generally low attenuation with rim enhancement.** (Dahnert pp337-8) Response to anti-TB meds is as efficacious as in nonimmunocomp pts (Harrisons, 13th ed., p 1599)
 - **AIDS with TB**, Freundlich and Bragg, p 495
- MTB and MAC (avium complex) are commonest, but chelonii, gordonii, kansasii and xenopi occur relatively commonly. Most AIDS TB is due to reactivation with heterogeneous reticulonodular densities with or without cavitation in upper lobe apical and posterior segments and superior segments of lower lobes. In later stages of HIV, disseminated TB occurs as diffuse, symmetric coarse reticulonodular infiltrates. The pattern is only occasionally miliary and in this stage rarely cavitary. Hilar and mediastinal adenopathy is seen in approximately 80% of AIDS patients - unilateral or bilateral. Pleural fluid is seen in 10-20%. Responds well to antituberculous medications, ??? if it responds to the same degree as non-immunocompromised patients.

- Regarding branchial cleft cysts
 - a. most commonly present symptomatically
 - b. most commonly multilocular
 - c. most common at angle of mandible
 - d. most common are first branchial cleft cysts

B. At angle of mandible

- Type I: near EAC or parotid, middle-aged women, presents as enlarging mass near lower pole of parotid gland
- Type II (most common, 95%): from 2nd branchial cleft, anterior triangle, **angle of mandible**; young to middle-aged adult, presents as mult parotid abscesses unresponsive to drainage or abx or otorrhea; cystic oval or round mass; may insinuate bet ICA and ECA (PATHOGNOMONIC)
- ***Dähnert 5th ed p. 369-370***
- ***Cysts: entrapped remnants of either a cleft or pouch. May or may not communicate by sinus tract to pharynx, foregut, or skin. Second branchial anomalies are most common (90-99%). 75% present by age 20-40 years of age. Superficial to CCA and IJV, posterior to submandibular gland, along medial anterior margin of SCM near level of angle of mandible. Contain lymphoid tissue. Often noticed after URI, painless swelling, nontender mass.***

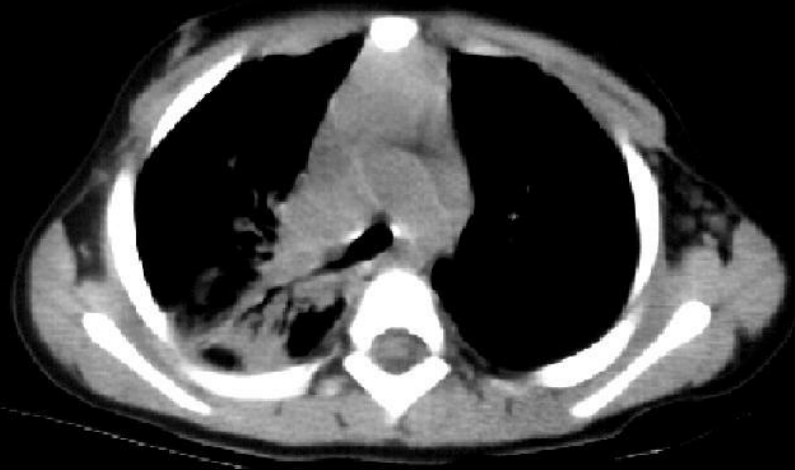
1999

- Which of the following is least likely to occur in the right upper lobe?
 - Tracheal bronchus
 - CCAM
 - Aspiration in supine position
 - Pulmonary sequestration
 - Congenital lobar emphysema

D. Pulmonary sequestration

- D. True: Occur mostly lower chest, especially left lung base.
 - *Dänhert 5th p 471-473*
- A. False: Tracheal Bronchus; see next slide.
- B. False: CCAM; Lesions occur with equal frequency in the lungs, but the lesions have a slight predilection for the upper lobes.
 - *emedicine*
- C. False: Aspiration in Supine position; Location: gravity-dependent portions of lung, posterior segments of upper lobes + lower lobes in bedridden patients, frequently bilateral, right middle + lower lobe with sparing of the left lung is common
 - *Dänhert 5th p459*
- E. False: CLE; LUL (40+%), RML (30+%), RUL (20%), 2 lobes (5%)
 - *Dänhert 5th p 478*

Tracheal bronchus



- Tracheal bronchus is a bronchial branch arising directly from the lateral wall of the trachea at any point above the carina
- The displaced type arises in an abnormal position and supplies one or more segments of the upper lobes. This type is more common and usually involves the apices. The supernumerary type is an accessory bronchus supplying the pulmonary parenchyma to an abnormal extent (Siegel). Tracheal bronchi are almost always found on the right, originating from the lateral wall of the trachea.
 - Uhrad.com

- **Regarding massive hemoptysis all of the following are true except:**
 - Can be due to a pulmonary artery lesion
 - Bleeding may occur from internal mammary and intrathoracic arteries
 - Cystic fibrosis is a common cause
 - Can be seen as sequelae of Pulmonary Embolus
 - Bronchial arteries may be embolized
 - spinal cord infarct is a complication of bronchial arterial embolization
 - Pulmonary AVM may be a cause

B. Bleeding may occur from internal mammary and intrathoracic arteries

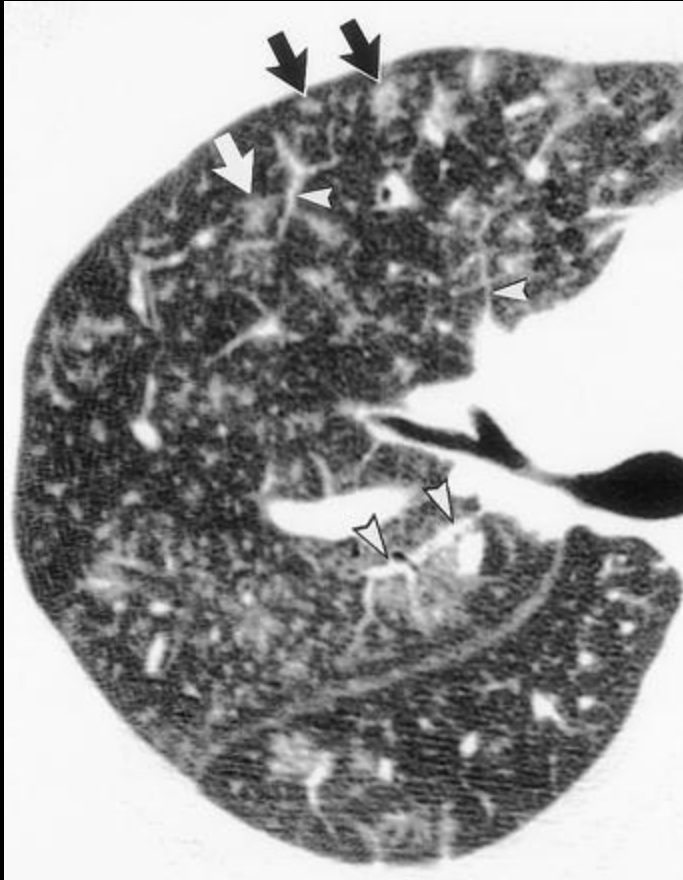
- B. False: not listed as source of hemoptysis *Dänherth 5th p399*
 - *ACR IR Disc- massive >300ml in 24 hours*
 - *If bronchial art source not seen, must search the internal mammary art, intercostals, and braches of subclavian arteries*
- A. True: Source of hemoptysis is bronchial artery—most common followed by pulmonary artery. (*Dänherth 4th 337*) Pulmonary artery pseudoaneurysms may be associated with lung abscesses, septic emboli, bronchiectasis, and lung neoplasms but have been reported most commonly after catheter trauma, especially with Swan-Ganz catheters [1] and in patients with chronic fibrocavitary tuberculosis when the aneurysms are termed Rasmussen's aneurysms
 - *Peripheral Pulmonary Artery Pseudoaneurysms and Massive Hemoptysis; AJR*
- C. True: Major hemoptysis occurs in approximately 1% of all patients with cystic fibrosis (CF) and is more frequent in those with more severe lung disease (1). Major hemoptysis is rarely seen in children younger than 10 years; however, it occurs in up to 1.5% of individuals aged 16–20 years (1). Minor hemoptysis—that is, blood streaking in sputum—such as that seen with bronchiectasis is relatively common and has been reported in up to 60% of adults with CF
 - *Bronchial Artery Embolization for Hemoptysis in Young Patients with Cystic Fibrosis; Radiology*
- D. True: PE may present with hemoptysis, thrombophlebitis and friction rub in less than 33%. Only 10–33% are symptomatic. (*Dänherth 431*)
- E. True: Bronchial artery embolization is a treatment of hemoptysis. Primer 638
- F. True: Complications of bronchial artery embolization include spinal artery injury and paralysis. (Primer 638, *Dänherth 5th p448*)
- G. True: abnormal vascular communication between pulmonary artery and vein and 10–15% can have hemoptysis *Dänherth 5th p514*

- In asymptomatic children with AIDS, a nodular infiltrate most likely represents
 - Miliary TB
 - PCP
 - Lymphoma
 - Lymphocytic interstitial pneumonitis

D. Lymphocytic interstitial pneumonitis

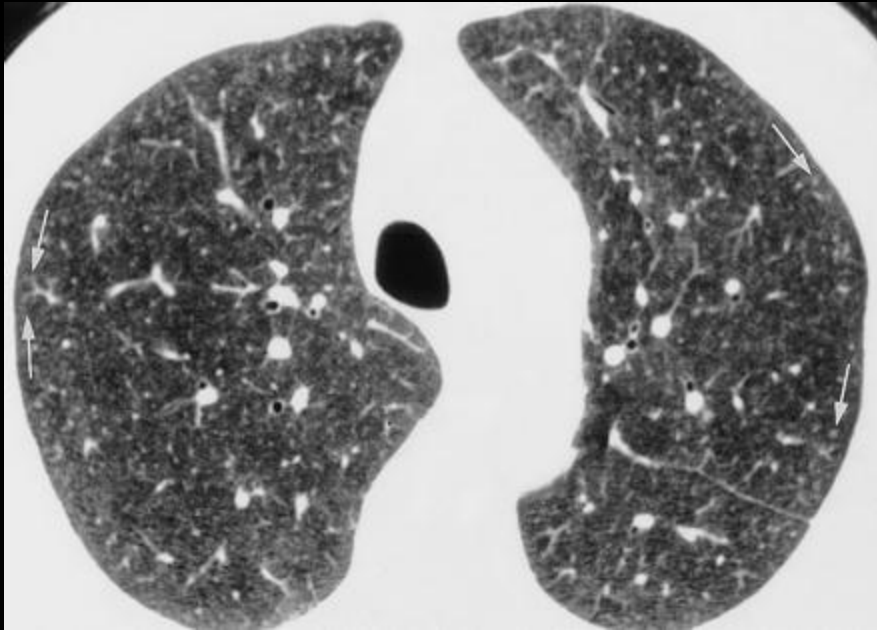
- In children with AIDS, the course of LIP is often indolent. (*Brandt and Helms, Fundamentals of Diagnostic Radiology, 2nd ed, p.398, 427*).
- Lymphocytic interstitial pneumonitis (LIP) is a lymphocytic infiltration of the interstitium consisting primarily of mature lymphocytes and other lymphoid cells, and thus it is generally regarded as benign.
- It is an AIDS defining illness in patients under 13 years old. (*Taveras and Ferrucci CDROM*). Dahnert 5th 502
- LIP is found in 22-75% of pediatric patients with HIV who have pulmonary disease. ;medicine
- In conclusion, lymphocytic interstitial pneumonia is characterized by the presence of ground-glass attenuation, poorly defined centrilobular nodules, and thickening of perilymphatic interstitium. Lymph node enlargement is more common than previously recognized.
- Lymphocytic interstitial pneumonia is a benign lymphoproliferative disorder characterized by a diffuse and exquisitely interstitial proliferation of small lymphocytes and plasma cells (1). Lymphocytic interstitial pneumonia occurs most commonly in patients who have Sjögren syndrome, autoimmune thyroid disease, acquired immunodeficiency syndrome (AIDS), or Castleman disease
 - *Lymphocytic Interstitial Pneumonia: Thin-Section CT Findings in 22 Patients; Radiology*

LIP

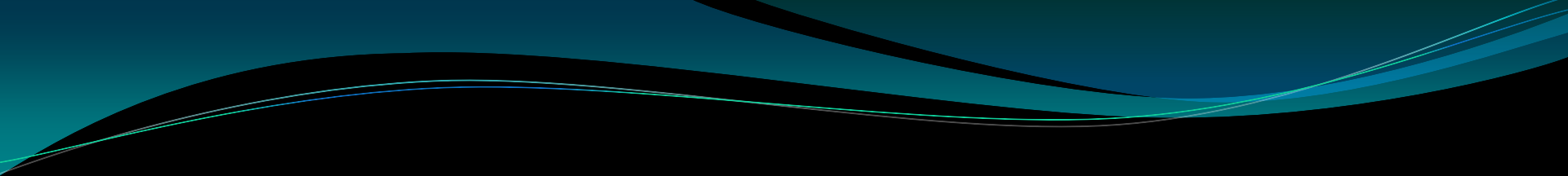


- CT scan obtained at the level of the carina demonstrates diffuse distribution of poorly defined centrilobular nodules (arrows) and areas of ground-glass attenuation and thickening of interlobular septa

LIP

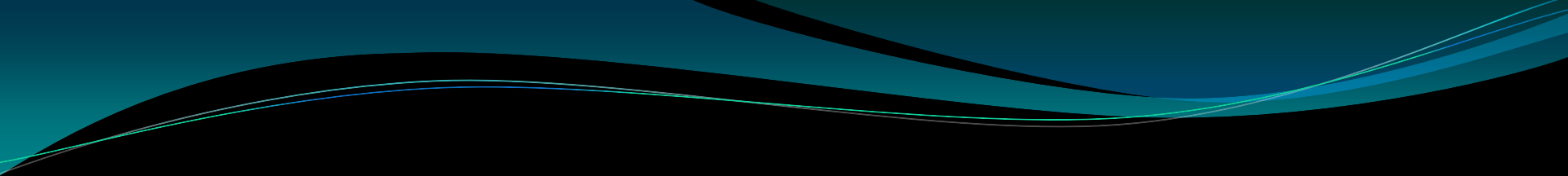


- Lymphocytic interstitial pneumonia in an 83-year-old man with AIDS. Thin-section (1-mm-collimation) CT scan obtained at the level of the aortic arch shows extensive bilateral areas of ground-glass attenuation and small, poorly defined centrilobular nodules

- 
- **Nonbacterial pneumonia in an adult is most likely caused by**
 - RSV
 - Histoplasmosis
 - Adenovirus
 - Mycobacteria
 - Coccidiomycosis

C. Mycobacteria

- Commonest cause of community-acquired nonbacterial pneumonia; most common in people aged 5-20 years.
- *Dahnert 5th 507*

- 
- The embryologic origin of the trachea is ...
 - Foregut
 - Thoracic somites
 - 6th branchial arch
 - 4-6th aortic arches
 - 6th branchial pouch

A. Foregut

- From *Pediatric Radiology: The Requisites 1st Edition* page 4-
----During the fourth week of gestation the trachea arise as a ventral diverticulum from the foregut. At fifth week of gestation, the lobar bronchi appear. At 6th week, all subsegmental bronchi are present.
- *Kirks Practical Pediatric Imaging 3rd ed. p.659*

- An inverted hemidiaphragm with a large effusion is most appropriately evaluated by
 - US
 - MRI
 - CT
 - Fluoroscopy
 - Right lateral decubitus x-ray
 - Left lateral decubitus x-ray
 - Repeat upright x-ray

A. US+ from old test

• See next slide

- Depends on the side of the effusion and diaphragmatic inversion. Diaphragmatic inversion is seen with moderate to large pleural effusions. It is more often seen on the left than right, likely secondary to liver support on the left. On the left it is most easily diagnosed by plain film (PA/LAT CXR?), where the colonic and gastric gas pattern are displaced inferiorly. On the right it is most easily diagnosed by ultrasound. On CT diaphragmatic inversion resembles a cystic lesion of the liver.
- Differential diagnosis of diaphragmatic inversion:
 - 1. Pleural effusion
 - 2. pneumothorax
 - 3. lobar emphysema
 - 4. diaphragmatic neoplasm
 - 5. myocardial aneurysm
 - 6. pericardial cyst
- Usually, it is asymptomatic. However, it can simulate an abdominal mass and can result in paradoxical diaphragm movement. Source: *Armstrong, Imaging Diseases of the Chest*, p. 661

- AJR

Sonography of the Inverted Right Hemidiaphragm

We conclude that inversion of the right hemidiaphragm does occur in association with right pleural effusion. Sonography in the sagittal plane provides an easy and effective access to the evaluation of the shape, position, and excursions of the diaphragm. Real time sonography is particularly helpful, especially to observe motion of the diaphragm. Sonography also allows evaluation of the base of the lungs, the subphrenic spaces, and the upper quadrants of the abdomen and may help clarify the etiology of the pleural effusion.

- Aspiration pneumonitis is mostly secondary to ...
 - pH < 2.5
 - enzymes
 - proteins
 - bacteria
 - lipid content

A. pH < 2.5 (acid)

- ~~The main factors determining~~ the extent of illness caused by gastric acid aspiration are as follows: 1. **The pH of the aspirate.** The acidity of the material is the single most important contributor to lung injury. A pH of 2.5 or less has been proposed as a critical value for inducing severe pneumonitis from acid aspiration. 2. The presence of food particles. Aspiration of gastric food substances causes a severe pneumonitis and peribronchial inflammatory reaction in the absence of acid. 3. Volume of the aspirate. Aspirating as little as 30 mL of gastric acid is sufficient to cause pneumonitis in the adult. 4. Distribution of the aspirate. *Goldman: Cecil Textbook of Medicine, 21st ed p. 428-429*

- *Dahnert 5th 459-460, Primer 2nd 752-753*

- **Unilateral rib notching is seen in the following EXCEPT?**
 - AVF
 - Brachial artery thrombosis
 - Blaylock-taussig shunt
 - Coarctation between the common carotid arteries
 - Coarctation with aberrant right subclavian artery

B Brachial artery thrombosis

~~Blaylock-Taussig shunt-anastomosis of subclavian artery to pulmonary artery for Tetralogy of Fallot, Aortic coarctation - proximal to left subclavian artery ==> RIGHT, anomalous right subclavian artery ==> LEFT, and chest wall/intercostal AVM are mentioned as causes for unilateral rib notching. However, Brachial artery thrombosis is not mentioned as a cause in any of the sources that I checked. In addition, rib notching is usually a sign of long standing/chronic shunting. Brachial artery thrombus, esp. acute, would be seen clinically and should be corrected prior to these changes. In addition, subclavian stenosis is mentioned as a cause for notching. However, in the cause of a Brachial artery occlusion/thrombus, collaterals would likely form from the subclavian artery proximally instead of the chest wall.~~

- ***See Dänhert 5th 19 p.14 for causes of rib notching***
- *Primer of Diagnostic Imaging p. 143; and the internet*
<http://chorus.rad.mcw.edu/doc/00408.html>

CHORUS

- **unilateral rib notching**
- aortic coarctation
 - proximal to left subclavian artery ==> RIGHT
 - anomalous right subclavian artery ==> LEFT
- subclavian artery stenosis / atresia
 - ==> IPSILATERAL
- Blalock-Taussig shunt
 - anastomosis of subclavian artery to pulmonary artery
 - for Tetralogy of Fallot
 - ==> IPSILATERAL

- **Pulmonary contusion:**
 - usually has massive hemoptysis
 - associated with osseous structures
 - resolves in weeks to months
 - universally present with blunt trauma

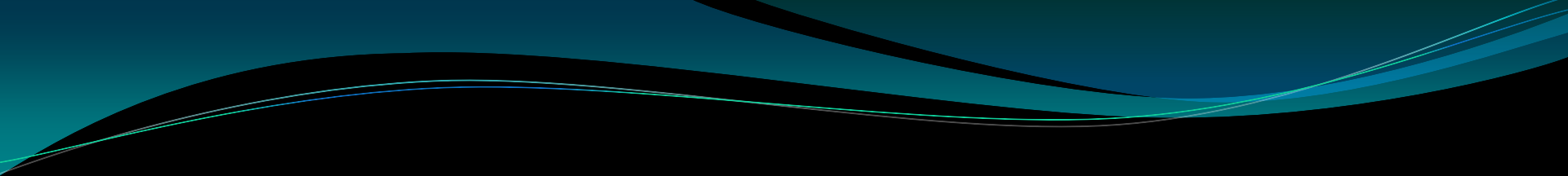
B. associated with osseous structures

- Per primer: occurs mainly in lung adjacent to solid structures appears 6 – 24 hours after injury, hemoptysis 50% mortality rate 15%-40%, resolve by 7 to 10 days
 - *Dänhert 5th 515; and Primer 2nd p. 55*
- Rapid resolution beginning 24-48 hrs, complete within 2-10 days
- Hemoptysis 50%
 - *Dahnert*

- **Man with multiple cavitary pulmonary nodules, hemoptysis and positive C-ANCA:**
 - Aspergillosis
 - Sarcoid
 - Wegeners granulomatosis
 - Churg Strauss

C. Wegener's granulomatosis

- Typical presentation of Wegener's Granulomatosis is Cough and hemoptysis with multiple nodules/masses with cavitation in the periperal aspects of the lungs. Pt is also C-ANCA positive.
 - Classic triad: resp. tract granulomatous inflammation, systemic small vessel vasculitis, necrotizing glomerulonephritis
 - Pulmonary nodules may cavitate when >2cm
 - *Dahnert 5th 534-535*
- In Churg Struass, the patients are P-ANCA positive and also may present with multiple nodules. However, the clinical history is of asthma and pronouced eosinophilia. The lung findings are variable but typically present with patchy areas of consolidation. *Thoracic Requistes pp.262-265*
 - Classic triad: allergic rhinitis or asthma, peripheral blood and tissue eosinophilia with Loffler syndrome, systemic small vessel granulomatous vasculitis
 - Pulmonary nodules may coalesce up to 2cm, but rarely; cavitation atypical

- 
- **Bacteria that most commonly affect lungs of patients with CF:**
 - staph aureus and pseudomonas
 - h flu and streptococcus
 - salmonella and klebsiella

A. staph aureus and pseudomonas

- Early in the disease, CF airways become colonized with bacteria, which are virtually impossible to eliminate. Staphylococcus aureus and Haemophilus influenzae are often found initially. However, with time Pseudomonas aeruginosa becomes very common, often as a mucoid species. Dänhert and the Thoracic Requistes also mention S. aureus and Pseudomonas as common infections in CF.
 - *Cecil Textbook of Medicine* pp. 401-405; *Dähnert* 5th 481; *Thoracic Requistes* p.391

- **Most common offending organism in community acquired pneumonia in adults:**

- Strep pneumonia
- Staph pneumonia
- Mycoplasma pneumonia
- Hemophilus pneumonia
- Klebsiella pneumonia
- TB
- Histoplasmosis
- CMV
- Coccidiomycosis

A. Strep. Pneumonia

- *Dahnert 5th 512*
- **Typical Bacterial Pathogens in CAP (approximately 85%):**
 - Streptococcus pneumoniae*
 - Penicillin-sensitive *S pneumoniae*
 - Penicillin-resistant *S pneumoniae*
 - H influenzae*
 - Ampicillin-sensitive *H influenzae*
 - Ampicillin-resistant *H influenzae*
 - Moraxella catarrhalis*
 - (all strains penicillin resistant)

- Which of the following is most commonly associated with Kawasaki's disease?
 - Myocarditis.
 - Gallbladder hydrops.
 - Pericardial effusion.
 - Pulmonary artery aneurysms.

A. Myocarditis

- Although Dähnert associates both myocarditis and transient GB hydrops with Kawasaki's, Kirks only mentions myocarditis of the options listed. According to Dähnert, myocarditis has a mortality of 0.4-3% that is related to myocardial infarction, myocarditis with congestive heart failure, or rupture of coronary artery aneurysm (pulmonary artery aneurysms are not associated with Kawasaki's). A pericardial effusion may occur, but I could not find any reference that included it in the findings associated with Kawasaki's disease.
 - Myocarditis in 25% of patients.
- Systemic vasculitis of unknown etiology that effects small to medium vessels and presents in children (<9), usually <2 y.o.
- Cardiac sequella often...coronary artery aneurysm
- Takayasu's Arteritis effects Aorta and large branch

- Patient with asymmetric pulmonary edema, the most likely etiology:
 - Cardiogenic pulmonary edema.
 - Noncardiogenic pulmonary edema.
 - Other answers not recalled.

A. Cardiogenic pulmonary edema (probably)

- Cardiogenic causes are the most common causes of pulmonary edema. Asymmetry caused by distortion by COPD, hemodynamics or patient position.
 - *Dähnert 5th 401-405*
- Asymmetric pulmonary edema:
 - 1) **Gravitational (most common);**
 - 2) underlying COPD (common);
 - 3) unilateral obstruction of pulmonary artery: PE;
 - 4) unilateral obstruction of lobar pulmonary vein: tumor.
- *Primer of Diagnostic Imaging, 2nd 62*
- **NB: Noncardiogenic edema would probably be the best answer if the question actually asked for causes**

- In chronic lung disease, what is the most likely cause of hypoxemia
 - L- $\rightarrow$ R shunt
 - VQ mismatch
 - R/L shunt
 - Tissue destruction

B. VQ mismatch

- “It is believed that the principal mechanism underlying arterial blood gas derangements in COPD is the mismatching of ventilation and perfusion in regional lung units.” *Textbook of Pulmonary Diseases, 6th Ed., Baum, et al. ed. 1998, p. 830.*
- Ventilation-perfusion mismatching is the most common cause of hypoxemia in patients with lung disease
 - *Chest Medicine: Essentials of Pulmonary and Critical Care Medicine*
 - *By Ronald B. George, Richard W Light, Michael A*

- The following radiographic findings commonly precede auscultation findings in pulmonary edema except:
 - Peribronchial cuffing
 - Alveolar edema
 - Upper zone redistribution
 - Kerley B lines

B. Alveolar edema

- Alveolar edema is the most advanced phase of pulmonary edema, and should be perceptible by auscultation by this point.
- Also, in interstitial pulmonary edema there is “NO abnormal physical finding.”
 - *Dähnert 5th 623*
 - *‘Dähnert 5th 401-402, 573-574, 623*

- **Concerning aortic transection:**
 - The majority rupture and exsanguinate if left untreated
 - ascending aortic dissection is most common
 - Mortality of the aortic root is most likely due to aortic insufficiency
 - Laceration of the coronary vessels

A. Rupture and exsanguination

- I suspect this wasn't recalled accurately, so let's go answer by answer.
- A. 85% of aortic lacerations are complete ruptures (=aortic transection), which almost always exsanguinate before receiving treatment. 15% of lacerations are incomplete ruptures, 50% of which go on to complete rupture.
- B. 65% are of the proximal descending
(http://www.adhb.govt.nz/trauma/injo6talks/nand/Aortic_dissection.htm)
- C. This is probably true, but few aortic transections occur at this site.
- D. This is a complication of laceration at the aortic root, an uncommon site of rupture.
- ***Dahnert 5th 616-618, 608***

- **No AP or superior-inferior pressure gradient in:**
 - pulmonary arterial pressure
 - pulmonary venous pressure
 - alveolar pressure
 - pleural pressure
 - pulmonary vascularity

C. Alveoli

- Alveoli are small units without pressure gradients. Gas exchange is purely diffusion on the alveolus level. OR The answer to this question depends on whether the patient is upright or not. If so, intraalveolar air pressure would be dependent on height with the alveoli in the apices at a lower pressure than the bases. The pleural pressure is not uniform throughout the pleural cavity, being more negative at the apex than the bases, with a vertical gradient of 0.2 cm water per centimeter of vertical height *Source: Fraser and Parre, pp. 128, 174.*
- I think the question and answer are trying to make the point that gas exchange within the alveolus does not depend upon a pressure gradient. Rather, gas exchange occurs strictly by diffusion. *SN*

- Requirements for HRCT include:
 - High spatial frequency algorithm
 - Helical scanner
 - Overlapping slices
 - Windowing from -600 to -800
 - IV contrast
 - Small field of view

A. High spatial frequency algorithm

The following is the typical protocol:

- 1-1.5 mm collimation
- high resolution algorithm
- 120 – 140 kVp and 140 – 240 mA
- 512 x 512 matrix
- lung windows: $L = -700\text{HU}$ and $W = 1000\text{HU}$
- Soft Tissue Window: $L = 45\text{ HU}$ and $W = 400\text{HU}$
- No IV Contrast
- Note: a small FOV can be used but is not required - some centers focus on one lung at a time.
- *Dahnert 5th 446; Primer 2nd 4*
- http://www.acr.org/SecondaryMainMenuCategories/quality_safety/guidelines/dx/Chest/hrct_lungs.aspx; ACR practice guidelines for HRCT

- True of type II pneumocytes, except:
 - capable of DNA synthesis
 - separated from other type II cells by intercellular bars (bonds)
 - can regenerate
 - synthesize surfactant
 - they comprise relatively small amount of the alveolar surface area

B. Separated from other type II cells by intercellular bars

- A. True: They can divide and regenerate both types of alveolar pneumocytes and contain mitochondria
- B. False: they are attached by tight junctions
- C. True: see A
- D. True Synthesize pulmonary surfactant which is stored in lamellar bodies
- *BRS Cell biology and histology 3rd p226*
- *Robbins Pathologic Basis of Disease 5th p 674; Junqueira Basic Histology 8th 335-342*
 - **Type I: 97% of alveolar surface**
 - Type II: repair and replacement of pneumocytes, surfactant production (requires DNA synthesis), desmosomes and occluding junctions

- Which of the following is the most common cause of alveolar filling in a patient with systemic lupus erythematosus?
 - Bacterial pneumonia
 - Lupus pneumonitis
 - Lymphoma
 - Alveolar hemorrhage
 - Lipoid pneumonia
- *NOTE: question also asked as: What is most common bilateral airspace disease which might change the answer*

A. Bacterial Pneumonia

- Parenchymal opacification:
 - Pneumonia (most common)
 - Hemorrhage
 - Edema
 - Lupus pneumonitis – due to infection and/or uremia (10%)
 - Cavitating nodules (vasculitis)
 - *Dähnert 5th ed. 526-527*
- Tachypnea, cough, and fever are common manifestations of lupus pneumonitis.
- Hemoptysis may signify pulmonary hemorrhage. However, infection is the most common cause of infiltrates seen on radiographs
 - *emedicine*

- Which of the following is most commonly associated with systemic lupus erythematosus in lung findings?
 - Pleural effusion
 - Pulmonary hemorrhage

A. Pleural Effusion

- Pleuritis, effusion, or both are the most common pleuropulmonary abnormalities in SLE. Thoracic Radiology-The Requisites pgs 257-259
- 70% get pleural effusions; ***Dahnert 5th 526-527***
- Pleural effusions (Fig 2) are the most common manifestation of SLE in the respiratory system and are bilateral in approximately 50% of patients (11). Pleural effusions in SLE are generally small and are exudative, containing lupus erythematosus cells, immune complexes, and anti-DNA antibodies, among other things. Pleuritis and pleural fibrosis are reported in 50%–83% of SLE patients in some autopsy series (11). Although an isolated pleural effusion is a nonspecific radiographic finding, its presence, particularly when chronic, may suggest SLE when clinical evaluation suggests an underlying autoimmune process.
- Over one-half of patients with SLE develop pulmonary disease, with pneumonia, pulmonary hemorrhage, and lupus pneumonitis being the most common manifestations (12–14). Acute pneumonitis (Fig 3), which occurs in up to 12% of patients (12), manifests as unilateral or bilateral patchy consolidation, typically in the lung bases, resulting from alveolar capillary injury leading to edema and hemorrhage. An accompanying pleural effusion is often present (11,12). Focal consolidation from acute pneumonitis may be difficult to differentiate from that due to pneumonia, and, given that infection is more common, it is imperative to exclude an infectious source with both clinical and laboratory evaluation before considering lupus pneumonitis.
- Pulmonary arterial hypertension is an increasingly recognized complication of SLE
- The risk of pulmonary infection is three times higher in patients with SLE than in the general population due to intrinsic immunologic abnormalities, including diminished phagocyte activity and decreased NK cell activity against pathogens, as well as immunosuppressive therapy (2,4,6,11). Atelectasis, underlying parenchymal disease, and respiratory muscle weakness also predispose SLE patients to respiratory tract infections due to poor clearance of secretions and stasis. Pneumonia can be atypical and advanced at the time of initial presentation. Aside from common organisms in community acquired pneumonia, *Staphylococcus aureus*, *Mycobacterium* species (Fig 6), and *Pneumocystis carinii* may cause pneumonia in patients with SLE. *Nocardia* species (Fig 7) deserve special mention because the prevalence of *Nocardia* infection is slightly higher in SLE patients than in the general population, and central nervous system (CNS) involvement by *Nocardia* species, which is not uncommon in immunocompromised patients, can be confused with lupus cerebritis (6,11). A high prevalence of pulmonary tuberculosis in patients with SLE has been documented (21). Recurrent pulmonary infections can lead to bronchiectasis and respiratory compromise (Fig 8)

- Which of the following is the most common cause of a community acquired pneumonia in an elderly patient
 - S. pneumonia
 - S. aureus
 - C. Klebsiella

A. S. pneumoniae

- A. S. pneumoniae – It is responsible for a third to a half of community acquired pneumonias in adults. These infections are more frequent in the winter and early spring. It is more common in alcoholic, debilitated, and other immunocompromised individuals.
- B. S. aureus – It rarely develops in healthy adults, but it is sometimes a complication of viral infections and is much more common in infants and children. In adults the disease is usually bilateral and preceded by an atypical pneumonia such as influenza.
- C. Klebsiella – Usually occurs in middle-aged or elderly patients, in those with underlying chronic lung disease, and in alcoholic individuals.
 - *Cecil Textbook of Medicine p. 436*
 - ***Dahnert 5th 405, 512***

- **Which of the following is characteristic of smoking related emphysema?**
 - a. Basilar predominance
 - b. Centrilobular distribution
 - c. Panlobular distribution
 - d. paraseptal emphysema

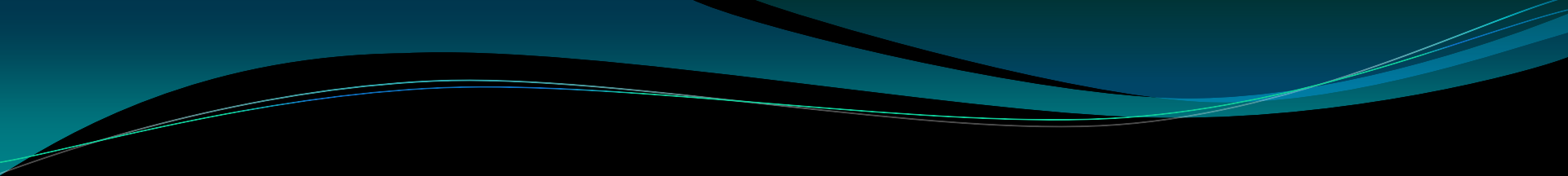
B. Centrilobular Distribution

- There are four major types of emphysema defined anatomically. These are: 1. Centrilobular or centriacinar; 2. panlobular or panacinar; 3. paraseptal (distal acinar) emphysema; and 4. paracicatricial (irregular). Centrilobular emphysema affects the predominately the respiratory bronchioles in the central portion of the secondary pulmonary lobule. It usually identified in the upper-lung zones, and it is associated with cigarette smoking (causes up to 50%). Panlobular involves all the components of the acinus and therefore involves the entire lobule. It is classically associated with alpha-1 protease inhibitor (alpha-1-antitrypsin) deficiency (cause in 10-15%), although it may be seen without protease deficiency in smokers and elderly. Paraseptal involves the distal part of the secondary lobule (alveolar ducts and sacs). It can be an isolated phenomenon in young adults, and is associated with spontaneous pneumothorax

- Patient with Left vocal cord paralysis. How low should you image.
 - thyroid
 - thoracic inlet
 - AP window

C. AP Window

- The vagus innervates the larynx through the superior laryngeal nerve, which supplies the cricothyroid muscle and does not cause significant hoarseness or vocal cord paralysis, and the recurrent laryngeal nerve, which courses from the medulla through the jugular foramen in the carotid sheath and loops under the aortic arch on the left and under the subclavian artery on the right
- *Neuro Requisites 2nd 678*

- 
- A pulmonary sling is associated with which of the following:
 - Tracheal cleft
 - Tracheal stenosis
 - Tracheal esophageal fistula
 - Tracheal web

B. Tracheal Stenosis

- *Aberrant Left Pulmonary Artery (Pulmonary Sling)* = failure of development of Lt 6th aortic arch with development of collateral branch of Rt PA to supply Lt lung. The Lt PA courses ABOVE the Rt main bronchus and BETWEEN the trachea and esophagus causing POSTERIOR indentation of the trachea and ANTERIOR indentation of the esophagus. Age at presentation neonate-child due to stridor (most common), wheezing, cyanosis, recurrent infections, feeding problems. Associations: “Napkin-Ring Trachea” = Tracheobronchomalacia due to absent pars membranacea (50%) “Carrot shaped Trachea” = caudal narrowing of tracheal diameter causing functional stenosis
- *Dähnert 5th 603, Primer 2nd 128*

A true vascular ring may be caused by a double aortic arch and?

- Aberrant right subclavian artery with a right aortic arch
- Aberrant left subclavian with a right aortic arch
- Left aortic arch with an aberrant right subclavian

B. Aberrant left subclavian with a right aortic arch

- Right AA with Aberrant Left Subclavian Artery 2nd most common vascular ring. (**Double AA is most common - 55%**)
- Most common right arch anomaly, 35-72%
- Aberrant LSCA passes BEHIND esophagus as opposed to pulm sling. Associated with CHD 5-12% Tet (70%) > ASD/VSD > Coarctation
- May become symptomatic in childhood due to tracheal edema from bronchitis or in adulthood due to aortic tortuosity
- May also have Diverticulum of Kommerell which is remnant of Lt arch at origin of Aberrant LSCA
- Rt arch with aberrant RSCA – Not a ring. Not in the books. I don't know if this even really exists.
- Lt arch with aberrant RSCA NOT a complete true ring, usually asymptomatic
 - *Dähnert 580-581, Primer 2nd 127*

- Regarding bronchial artery embolization all are true except:
 - it is successful for treatment of bleeding in patient with cystic fibrosis
 - one complication is spinal cord infarct
 - gelfoam or small particles are the method of choice

D. often cause pulm infarct

- Bronchiectasis may result in life-threatening hemoptysis in CF. Bronchial arteries may be markedly enlarged. Bronchial artery embolization may successfully treat such episodes of hemoptysis but may be complicated by spinal cord infarct, as spinal arteries may arise from the intercostals. Particles or gelfoam should be employed, as larger and/or more permanent agents such as coils may preclude future access to bleeding vessels and hemoptysis tends to be a recurrent problem in CF. Alcohol is contraindicated because of resultant cell necrosis. Bronchial artery embolization only rarely results in pulmonary infarct (e.g., concurrent pulmonary artery occlusion). *References: Kadir, pp. 197-200; baby Fraser and Pare p. 278*
 - *Valji, Vascular and Interventional Radiology 272-273*

- Regarding pulmonary Kaposi sarcoma:
 - Usually asymptomatic
 - Often precedes cutaneous Kaposi's
 - Cutaneous form is often a presenting problem with HIV pt's

C. Cutaneous form presenting problem in HIV

- A. False. "Kaposi's sarcoma in the lungs often leads to extensive interstitial disease with severe impairment of diffusing capacity and may result in massive pulmonary hemorrhage. Pulmonary Kaposi's sarcoma must be differentiated from *P. carinii* pneumonia, since both can present with fever and interstitial patterns on CXR. Pleural effusions and bilateral lower lobe infiltrates are much more common in Kaposi's sarcoma." *Harrison's Principles of Internal Medicine, 12th Edition.*
- B. False. "Kaposi's sarcoma, however, is the most common malignancy in AIDS patients, and cutaneous Kaposi's sarcoma is frequently the initial manifestation of the disease." *Imaging of Diseases of the Chest, 2nd Edition, Armstrong.*
- C. True See B

Dahnert 5th 452, 839

The acquired immunodeficiency syndrome (AIDS) epidemic has had a profound impact on our understanding of Kaposi's sarcoma (KS). Epidemiologic features suggest a sexually transmitted cofactor in the pathogenesis of AIDS-associated KS (AIDS-KS), and several putative agents have received intense scrutiny. Cell culture studies suggest that the angiogenesis of AIDS-KS is stimulated by both human immunodeficiency virus proteins and growth factors that may be involved in the development and progression of AIDS-KS, thereby providing a rationale for new therapeutic interventions. The dermatologist is uniquely qualified to provide care for the majority of patients with KS, as many patients have cutaneous lesions amenable to local therapy (cryotherapy, intralesional therapy, simple excision). Patients requiring more aggressive local therapy (radiation therapy) or systemic therapies (interferon, chemotherapy) can be easily recognized. Standardized staging criteria provide assistance for determining appropriate local or systemic therapy

- All are true regarding pulmonary bleomycin toxicity EXCEPT:
 - Is synergistic with 100% oxygen therapy
 - Is synergistic with radiation therapy
 - Occurs immediately
 - Is dose dependent

C. occurs immediately

- A. True. Bleomycin toxicity is augmented by oxygen toxicity
- B. True. Bleomycin toxicity is augmented by rad tx.
- C. False: Occur 1-3 months following therapy initiation.
- D. True: occurs at doses >300mg
 - *Dähnert 5th p400*
- Often, BIP starts gradually during treatment, but the development of BIP up to 6 months after discontinuation of bleomycin therapy has also been reported.²⁰ The clinical diagnosis of BIP is rather hampered by its resemblance to other conditions often encountered in cancer patients, such as pneumonia, pulmonary metastases, or lymphangitic carcinoma.
- Typical chest radiographic findings are bilateral, bibasilar infiltrates, sometimes followed by diffuse interstitial and alveolar infiltrates, and lobar consolidation ultimately. However, BIP can also present with unilateral abnormalities and focal infiltrates.¹⁷²¹
- On CT scanning, bleomycin-induced alterations may appear earlier than on chest radiographs. In most patients, small linear and subpleural nodular lesions in the lung bases are noticed.²²
- Pulmonary toxicity is both dose and age related, being more common in patients over 70 years of age and in those receiving over 400 units total dose
 - *FDA site on Bleomycin*

1998

- **True/False: What structures accompany the bronchus?**
 1. Bronchial artery
 2. Bronchial vein
 3. Pulmonary artery
 4. Pulmonary vein
 5. Lymphatics

1=T 2=T 3=T 4=F 5=T

- Pulmonary arteries travel along lobar and segmental bronchi to subsegmental level.
- Pulmonary veins course through interlobular fibrous septa, NOT along bronchi.
- Bronchial arteries and veins follow a tortuous path along peribronchial sheath of mainstem airway to terminal bronchioles.
- Lymphatics travel with bronchi.
 - *Dahnert 5th 448; Netter 194-197*

- **Concerning the cardiac size on PA chest film (T/F):**
 1. The cardiac width is proportional to thoracic width
 2. Is larger with slower heart rate
 3. It is less prominent in size when compared with apical lordotic view
 4. Is proportional to cardiac volume

1=T 2=T 3=T 4=F

- 1. T. Cardiac width is proportional to thoracic width. Hence the development of the Danzer cardiothoracic ratio, with the normal in adults < 0.5 . Because it measures the transverse heart diameter, the cardiothoracic ratio usually is normal when either the left atrium or the right ventricle is quite enlarged because neither of these two chambers is reflected in the transverse measurement. LV enlargement up to 66% above normal is often needed for the cardiothoracic ratio to reliably detect enlargement of the left ventricle.
- 2. T Marathon runners with heart rates in the range of 30 to 40 beats/minute occasionally have a cardiothoracic ratio between 0.5 and 0.55 (normal < 0.5). This reflects normal physiologic dilatation of the heart rather than any overall hypertrophy. Slow rate = larger end diastolic volume, so probably a larger overall cardiac size.
- 3. T. Apical lordotic views are obtained AP.
- 4. F. As mentioned in 1 above, LVH can be significant before enlargement even detected using the Danzer ratio. *Cardiac Requisites, 4-15*

- Which can be seen with a small pneumothorax on supine CXR?
 1. Deep lateral costophrenic sulcus
 2. Lucency over the lung base.
 3. Elevation of the hemidiaphragm

1=T 2=T 3=F

- Radiographic appearance (upright): air in pleural space radiolucent, white line of the visceral pleura distinctly visible, volume loss of underlying lung; (supine) deep sulcus sign, medial recess-juxtacaradiac outline, can accumulate in a subpulmonic location producing a sharply outlined hemidiaphragm. Elevation of the hemidiaphragm would come from atelectasis. *Thoracic Requisites* 498 and *Primer*, 3rd, 57-58
- ***Dahnert 5th 438***
- I'm not sure about choice #2. Is this a sensitive sign (i.e. seen in the case of a small PTX)? *SN*

- **Regarding use of high kVp technique for chest X-ray (T/F)?**
 - better bone detail
 - lower patient dose
 - better visualization of epicardial fat pad
 - greater latitude
 - lower contrast

1=F, 2=T, 3=F, 4=T?, 5=T

- High kVp x-ray beams have high mean energies and are more penetrating. Increasing kVp generally reduces subject contrast (a and c) and allows the X-ray output values (mAs) to be reduced and produce the same film density with reduced skin entry exposures. (b) Latitude and contrast are inversely proportional.
- *Huda, Ch. 13.*

- A 31 y/o female has a 1cm cavitary left upper lobe mass. She presented with hemoptysis.
- TB
- Pulmonary AVM
- Lung cancer
- No collagen vascular disorder listed

A. TB

- AVMs do not cavitate. Wegener's tends to be lower lobe predominant and multiple, in older pts (5th decade), and M:F ratio is 2:1. Lung cancer age at diagnosis is usually 55-60 yrs (range is 40-80yrs), M=F. Most common to cavitate is squamous cell CA which is central (2/3) rather than peripheral (1/3). Cavitation is the hallmark of reactivation TB. Usually the patient was infected as a child which was contained by hypersensitivity response and granuloma formation in 1-3 weeks. Other options after initial infection are progressive primary TB (inadequate immune mechanism with local progression) or miliary TB (uncontrolled massive hematogenous dissemination overwhelming host defense system). In reactivation TB (which this case probably is) infection is under the influence of acquired hypersensitivity and immunity secondary to longevity of the bacillus and impairment of cellular immunity. Predominant occur in the upper lobes (85%). Apical and posterior segments most common. *Primer*, 3rd 12-14
- ***Dahnert 5th 420, 399, 532, 514***

- **MRI is superior to CT for the evaluation of:**
 - a. tumor invasion into mediastinal lymph nodes
 - b. rib invasion
 - c. superior sulcus tumor with invasion into brachial plexus
 - d. small cell lung carcinoma

C. superior sulcus tumor with invasion into brachial plexus.

- It is a critical observation to evaluate chest wall invasion in superior sulcus tumor. The chest wall invasion alone does not preclude surgical resection, but it does adversely affect prognosis. CT cannot reliably show chest wall involvement unless there is bone destruction or a large soft tissue mass adjacent to the chest wall. MR has the similar problem to CT in diagnosis chest wall invasion. In some series MR was better than the CT in demonstrating chest wall invasion. There are three basic reasons why MR might provide more information than CT:
 - 1). Multiple plane scanning.
 - 2). MRI provides excellent tissue contrast
 - 3). The thin layer of extrapleural fat may be better shown on MRI than on CT. MRI does not offer any advantages over the CT for routine assessment of mediastinal invasion. MRI can, however, provide unique information in involvement of major mediastinal blood vessels, pericardium and the tracheal carina (T4 lesion). (*Imaging of Diseases of the Chest, 2nd edition, pp 298-293, 1995*).

- **CD4 count at which the incidence of PCP dramatically increases:**
 - a. 1000
 - b. 500
 - c. 200
 - d. 100
 - e. 50

C. 200.

- PCP tends to occur when the CD4 count is $<200/\text{mm}^3$ and MAI occurs when CD4 count <50 *Primer, 3rd, 22*
- *Dahnert 5th 451*

- **Match the following obstructive bronchial pathologies:**

1. obstructive pneumonitis
2. lipoid pneumonia
3. drowned lung
4. mucous plugging

- a. atelectasis
- b. lobar expansion
- c. bronchiectasis
- d. fluid in the alveoli and interstitium
- e. inflammatory cells in the alveoli and interstitium

SFH – who cares its from 1998

1. A. obstructive pneumonitis: atelectasis
2. E. lipoid pneumonia: inflammatory cells in the alveoli and interstitium
3. D. drowned lung: fluid in the interstitium and alveoli
4. C. mucous plugging: bronchiectasis

- 1 = E (A): Dahnert 5th 424
- 2 = E: Dahnert 5th 499
- 3 = B (D): D seems intuitive to me, but no source to back it up
- 4 = C: Dahnert 5th 436, 481
- All these questions are about pathological changes in obstructive bronchogenic carcinoma. (?)
- *Thoracic Requisites 44, 280 (Imaging of Diseases of the Chest, 2nd edition, p 279, 1995. Fundamentals of Diagnostic Radiology p 403, 1994).*
- *I'm not so sure about all of these questions pertaining to obstructing lung cancer, and I think the answers given for 1 and 3 aren't necessarily correct. My best guesses are in parentheses. References to Dahnert are from me. SN*

- **Matching:**

1. Sickle cell

2. Sarcoid

3. Cystic fibrosis

4. Silicosis

- a. Pseudomonas

- b. Tuberculosis

- c. Pneumococcus

- d. Saprophytic aspergillus

- 1 = C: Patients with functional asplenia (as in sickle cell disease) are predisposed to pneumococcal pneumonia.
 - *Dahnert 5th 512, 158-160*
- 2 = D: Noninvasive colonization of preexisting cavity by *Aspergillus*.
 - *Dahnert 5th 458, 523*
- 3 = A: Reduced mucociliary clearance encourages *Pseudomonas* colonization.
 - *Dahnert 5th 481*
- 4 = B: Silicosis predisposes to TB.
 - *Dahnert 5th 525, 532*

- **An enlarged pulmonary artery in an adult is usually due to:**
 - ASD
 - Emphysema
 - VSD

B. emphysema

- Enlarged pulmonary arteries are seen in PAH. Causes include Pulmonary causes: COPD, interstitial lung disease (CF, idiopathic fibrosis, sarcoid), Pulmonary embolic disease, idiopathic pulmonary hypertension. Cardiac causes includes left-sided failure with mitral stenosis, CHD (ASD, VSD, PDA). Dahnert pg. 361. According to Anderson 382 VSD will have upper limits of normal or mild central pulmonary artery enlargement. ASD will have very large central vessels (Must be seen in Eisenmenger ASD or VSD). Mitral stenosis will also result in PAH, but will have manifestations of PVH. *Primer, 3rd, 51-52*

- **CXR signs of pneumothorax (T/F)**
 - tongue-like contour of the CP angle
 - elevated right hemidiaphragm
 - hilum overlay sign
 - lucency at lung base
 - rounded pericardial fat pad contour

1=T, 2=F, 3=F, 4=T, 5=T

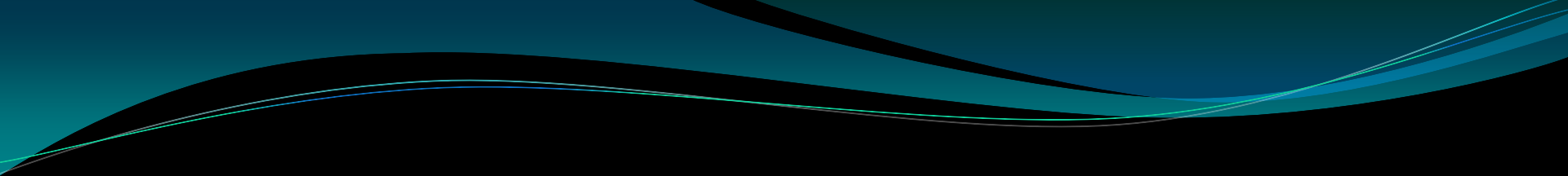
- The hilar overlay sign (Figure 3) is another sign described by Felson [6] that is especially useful in distinguishing an anterior mediastinal mass from a prominent cardiac silhouette. If the bifurcation of the main pulmonary artery is >1 cm medial to the lateral border of the cardiac silhouette, it is strongly suggestive of a mediastinal mass. If the pulmonary artery arises from the lateral heart border, this favors an enlarged heart. In other words, because the pulmonary arteries arise from the heart, when the heart enlarges, then pulmonary arteries must move laterally with the heart border. An anterior mediastinal mass that appears as an enlarged cardiac silhouette will not cause displacement of the pulmonary arteries.
 - *Medscape*
- The radiological signs of a supine pneumothorax, the factors modifying these signs and useful confirmatory views are presented. Common signs include lower zone lucency, a deep lateral sulcus, a visible anterior costophrenic sulcus and paramediastinal or paradiaphragmatic air. Specific but uncommon signs are interlobar air and a change in appearance of epicardial fat pads
 - *Australasian Radiology*

- When patients must be examined supine, gas rises to the highest point in the hemithorax, in the vicinity of the diaphragm. Depending on the size, the result can be an exceptionally deep radiolucent costophrenic sulcus (“deep sulcus sign”), a lucency over R or L upper quadrant, or a much sharper than normal appearance of the hemidiaphragm, with or without visible visceral pleural line above the hemidiaphragm. (2nd edition Frasier and Pare). tongue-like contour is analogous to deep sulcus sign. elevated hemidiaphragm is seen in subpulmonic pleural effusion, altered pulmonary volume (ATX, hypoplasia, etc), phrenic nerve paralysis, abdominal disease, diaphragmatic hernia, eventration of diaphragm, traumatic rupture of diaphragm, or diaphragmatic tumor (Dahnert p.1 281). hilum overlay refers to a hilar mass being anterior or posterior to the hilum on plain film, thus preserving the interface of the hilum. On supine view a juxtacardiac air collection can be seen. *Thoracic Requisites 496-501*

- A young patient with a calcified anterior mediastinal mass (T/F):
 - Untreated lymphoma
 - Teratoma
 - bronchogenic cyst

1=F, 2=T, 3=T

- Hodgkins lymphoma has two peaks, one at 30 and one at 70. Range for bronchogenic CA is 40-80 years. Non-Hodgkins occurs in all age groups with a mean of 50 years. Thymoma is most common between the 4th and 6th decades, and is rare in childhood. Lymphoma may calcify AFTER treatment, but doesn't calcify before treatment. Bronchogenic cysts occasionally have peripheral linear calcification. Germ cell tumors, of which teratoma comprises 21%, calcify 25%-40% of the time. *Thoracic Requisites* 330-334, 436, 441-443
- ***Dahnert 5th 431, 470, 502-503, 527-528***



1997

- A six-month-old with failure to thrive, diarrhea, weight loss and dehydration has interstitial opacities on chest x-ray. Least likely to be seen in this disease is (single best answer):
 - meconium ileus equivalent
 - Sterility
 - Polyposis
 - sinusitis

C. Polyposis

- Assuming cystic fibrosis. Option b (sterility) would be quite common in males and a somewhat smaller number of females are sterile. Sinusitis is a very common findings with hypoplastic frontals. Meconium ileus equivalent (aka distal intestinal obstruction syndrome): intestinal obstruction due to inspissation of viscid intestinal contents in the distal small bowel. Plain films may demonstrate large amounts of feces in distal small bowel, cecum, and right colon, and evidence of obstruction. Treatment is conservative with NG suction, oral N-acetylcystein, Golytely, gastrograffin enemas.?? Polyposis. No association found, except nasal polyps
 - *Dähnert 5th 481-482*

- In a patient with HIV, bilateral infiltrates and a negative gallium scan, the most likely disease is (single best answer):
 - a. PCP
 - b. MAI
 - c. Kaposi's
 - d. Lymphoma

C. Kaposi's sarcoma (it is, however Thallium avid.)

- PCP demonstrates diffuse uniform or non-uniform bilateral uptake with intensity greater than liver, usually no uptake in lymph nodes.
- MAI classically demonstrates patchy lung uptake with hilar and nonhilar (i.e. axillary and inguinal) nodal uptake.
- Lymphoma rarely has pulmonary uptake, but will demonstrate uptake in involved lymph nodes. *Nuc Req 207 Primer 926-927.*
 - ***Dahnert 5th 1076-1077***
 - Diffuse lung uptake (including PCP, TB, CMV)
 - Lymph node involvement (TB, MAI, Lymphoma)
 - “Not seen in Kaposi sarcoma, a useful distinction in AIDS patients with hilar nodes.”

- **Terminal bronchiole defines:**
 - Segment
 - primary pulmonary lobule
 - secondary pulmonary lobule
 - Acinus
 - alveolus

D. pulmonary acinus.

- Primary pulmonary lobule: consists of all alveolar ducts, alveolar sacs, and alveoli, together with blood vessels, nerves, and connective tissues distal to the last respiratory bronchiole. Approximately 23 million—not seen on X-ray or CT.
- Secondary pulmonary lobule: the smallest discrete portion of the lung that is surrounded by Connective tissue septa. It is composed of 3-5 terminal bronchioles And their transitional airways and parenchyma and has approximately Between 30 and 50 primary lobules.
- Pulmonary acinus: **defined as the portion of lung distal to a terminal bronchiole** comprising the respiratory bronchioles, alveolar ducts, alveolar sacs and alveoli. This is seen radiographically and proposed by some as the roentgenologic unit instead of the secondary pulmonary lobule. Pulmonary alveolus: small cup shaped out-pouching of respiratory bronchioles, alveolar ducts, And alveolar sacs. Region of air exchange. Contain pneumocytes;
 - *Dähnert 445-446*

- The pattern of pulmonary edema seen with upper airway obstruction is:
 - Perihilar
 - Generalized
 - Basilar
 - upper lobe
 - peripheral

D. Upper Lobe.

- Pulmonary edema that follows upper airway obstruction may occur in a variety of clinical situations. The predominant mechanism is forced inspiration against a closed or occluded glottis, inducing large intrapleural and transpulmonary pressure gradients favoring the transudation of fluid from the pulmonary capillaries into the interstitium. Postanesthetic laryngospasm has been implicated as the most frequent cause of this syndrome in adults. Risk factors for development of postlaryngospasm pulmonary edema include difficult intubation; nasal, oral, or pharyngeal surgical site; and obesity with obstructive apnea. The syndrome is recognized by development of hypoxia shortly (1-90 min) after a laryngospasm. **A chest radiograph will reveal a symmetric bilateral infiltrate in an UPPER lobe distribution with normal heart size.** Cardiogenic pulmonary edema and aspiration must be ruled out. Treatment is directed at correction of hypoxia with supplemental oxygen and use of diuretics (furosemide). Occasionally patients may require intubation.
- (*Anesthesia Progress*. 44(3):110-6, 1997 Summer).
- http://www.nv-med.com/rm/pdf/2005_23_2/139.pdf