





Radiology of the respiratory/cardiac diseases (part 2)

Objectives

Done By


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Color Coding

Important | Notes | Extra

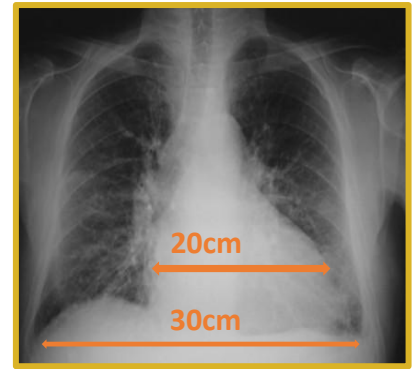
[Editing](#)
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Case

60 year old male presenting to emergency with chest pain.

Is the heart normal? The heart is abnormal (**Enlarged**) we compare the diameter of the heart (up) over diameter of the chest (down), the ratio should be less than 50% $20/30 * 100 = 66% > 50%$

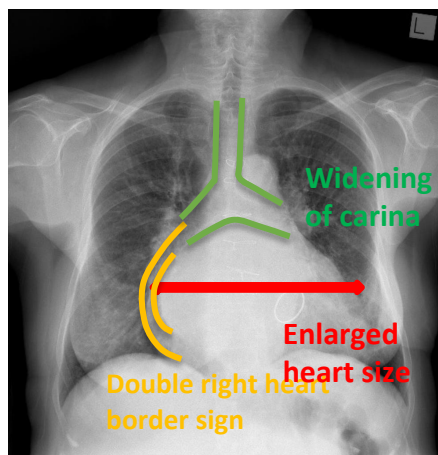
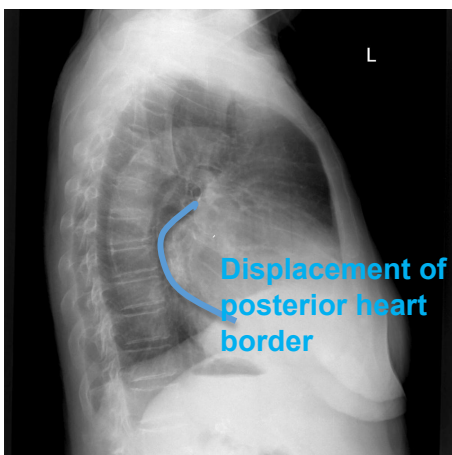


Are the lungs normal? Pulmonary edema (**Interstitial edema**) + left pleural effusion.

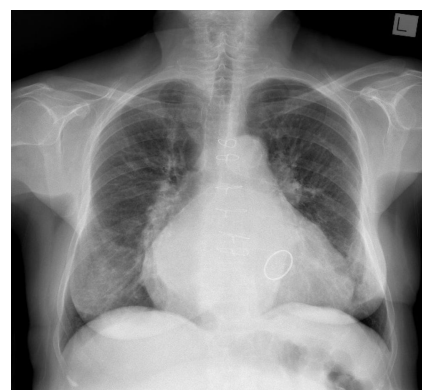
Causes of heart Enlargement on chest x-ray:

- Congestive heart failure.
- Ischaemic heart disease.
- Valvular disease.
- Myocarditis.
- Cardiomyopathy.
- Congenital heart disorders: e.g. ASD, VSD, PDA, coarctation of the aorta, Ebstein anomaly, tetralogy of Fallot.
- Pulmonary disease (leading to right-sided enlargement).
- Systemic disease: e.g. Hypertension (left ventricular hypertrophy), renal failure, anaemia
- Physiological: e.g. normal "athletic" heart, pregnancy.
- Pericardial effusion.

Which heart chamber is enlarged ? **Left atrium**



LA enlargement → widening of the carina
The left atrium pushes up against the carina and make it wider.



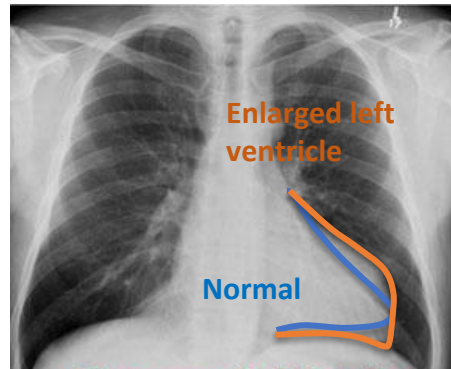
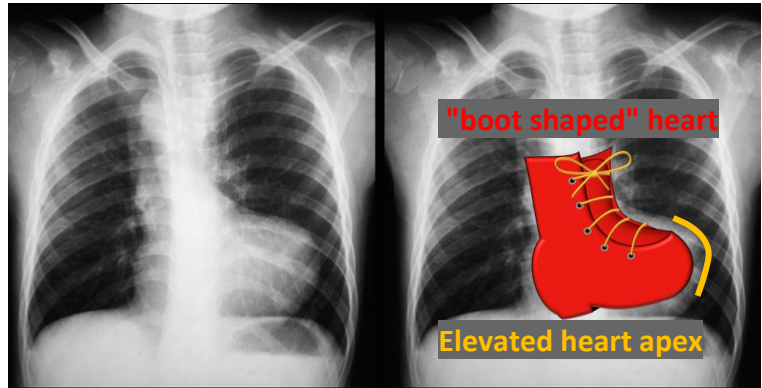
Double border sign

The left atrium lies slightly posterior to the right one, so when it is enlarged, it apposes from behind the right atrium, so the 2 borders represents:
1- the lateral (hypodense) represents the diseased left atrial border. 2- The medial (hyperdense) represents the normal right atrium.

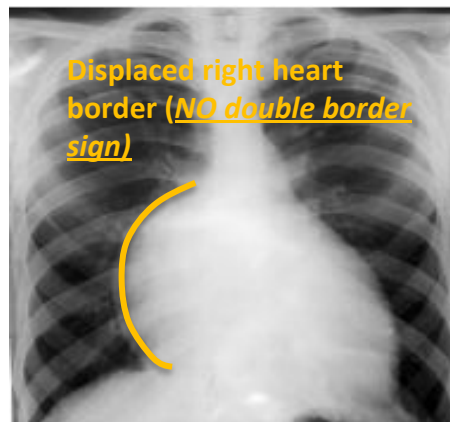
Which heart chamber is enlarged ?

Right ventricle

The right border (RA) of the Heart is normal, so either the LV or the RV is abnormal. Usually the apex pushed downwards, so the abnormality here in the RV which pushes the apex upwards.



Left ventricular enlargement



Right atrial enlargement

Case

The carina is not displaced, so it's not LA enlargement

From the X-ray image, **What is abnormal?**
Heart shadow is enlarged

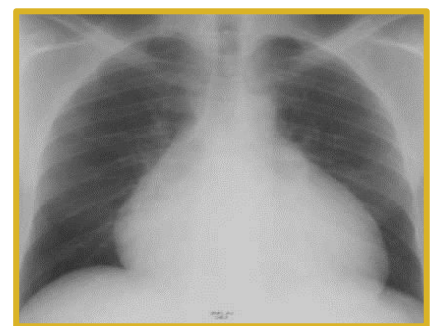
What could be the cause? And why?

Pericardial effusion. No lung changes (edema or pulmonary congestion).

If the all 4 chambers enlarged that will cause pulmonary Edema, if the effusion was large enough.

Who to confirmed the diagnosis?

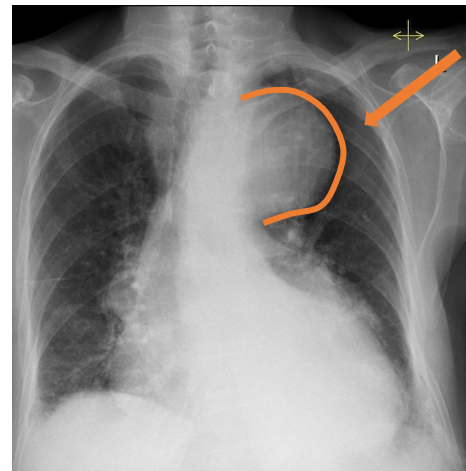
Echocardiograph or CT scan.



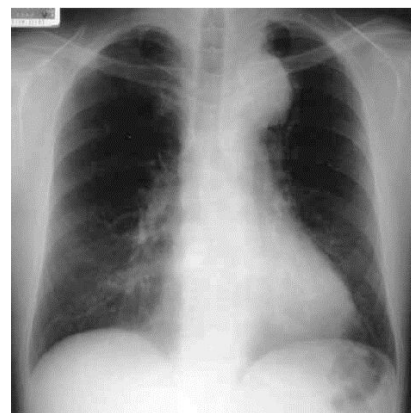
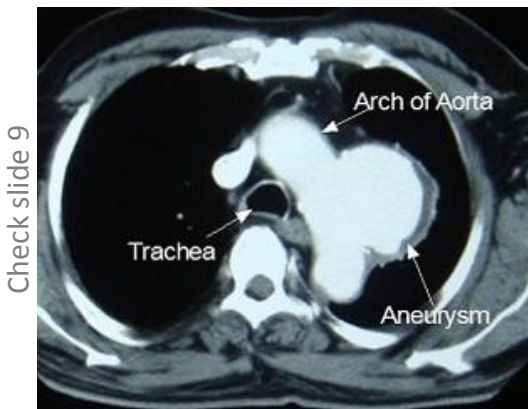
Known case of hypertension presenting with chest pain.

- **What is the arrow pointing at ?**
Aortic arch (aortic knob)
- **Is it normal ?**
No, dilated/enlarged.
- **What will you do next?**

CT Aortogram to make sure that's an aneurysm not a mass.
 *Ultrasound is good to assess the aorta but it's can't assess behind the bone (sternum).
 * Angiography is good if we're sure that it's an aneurysm not a mass and we want to treat it at the same time.



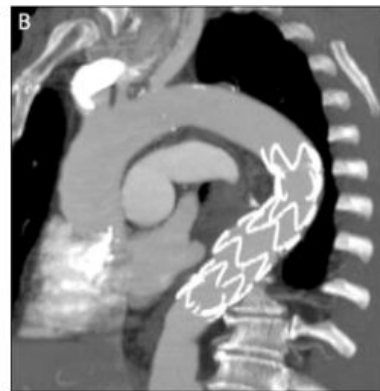
Aortic arch aneurysm



The contrast will go through the aneurysm. If it's a mass in the lung it will not.



Before stenting



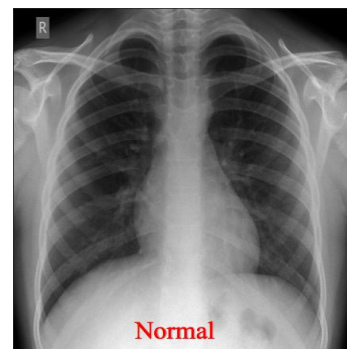
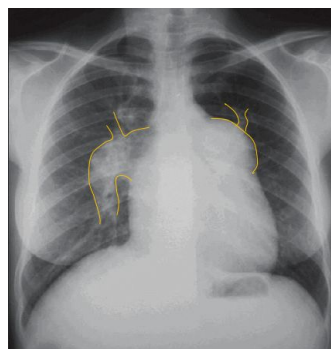
After stenting

No contrast in the aneurysm site, so it responded to the treatment.
 The stent actually covers the whole vessel wall but only a few wires absorb the radiation and appear on the image.

Case

What is abnormal in this x-ray ?
 Enlarged pulmonary arteries
 Normally the pulmonary arteries become smaller inside the lungs

what's the next step?
 CT scan.



pulmonary edema

CASE: 70 year-old female with orthopnea.

What is abnormal in the x-ray?

Pulmonary edema (cardiogenic).

Orthopnea: it's a dyspnea occurs when the patient is lying down, because the fluid will spread in all lungs areas.

Signs of pulmonary edema on chest x-ray:

- Upper lobe pulmonary venous diversion.

Fluid usually accumulate down due to: 1- gravity, 2- the lower lobes are bigger. So, when there's an edema in the lungs the vessels will go upward (away from the fluid) as a reaction mechanism, that's called diversion.

increase in left atrial pressure reflects on pulmonary veins pressure by increasing it, so unusual pressure engorges blood in pulmonary veins especially in upper lobe part, due to its much less blood supply than the lower lobe part which won't change that much.

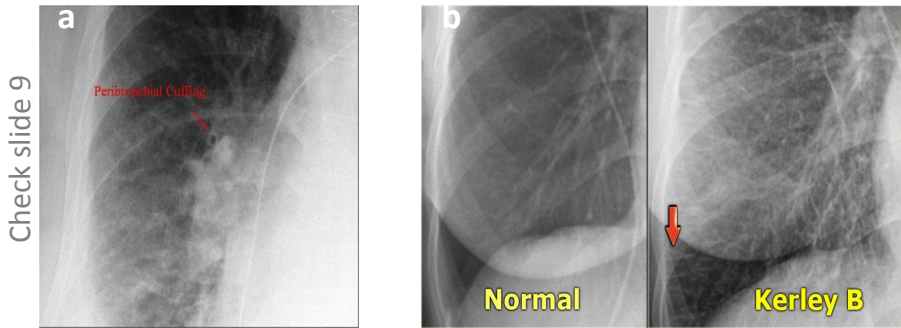
- Increased cardio-thoracic ratio (cardiogenic). (blue shape) It explained why we said it is cardiogenic pulmonary edema.

Features of pulmonary interstitial edema:

- a) Peri-bronchial cuffing.

Look at the black circle: this is a normal bronchiole which contains an air, the abnormality here is the white ring around it which represents fluids accumulation around the bronchioles.

- b) Septal lines/ thickening (Kerley lines, it has 3 types: A,B & C and the most common type is B). It's a small horizontal lines due to fluid accumulation in the interstitium (AND IT IS NOT AIRBROCHOGRAM SIGN)

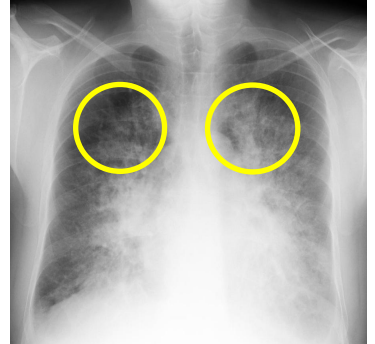
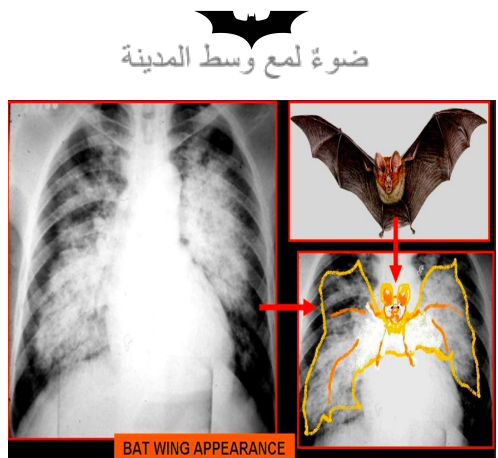


Features of pulmonary alveolar edema:

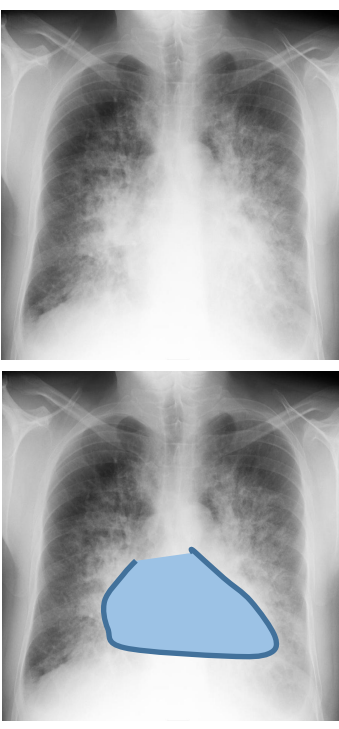
- Air space opacification (batwing distribution)

Usually in the center of the lungs, because the fluid escapes from the big vessels not the small one.

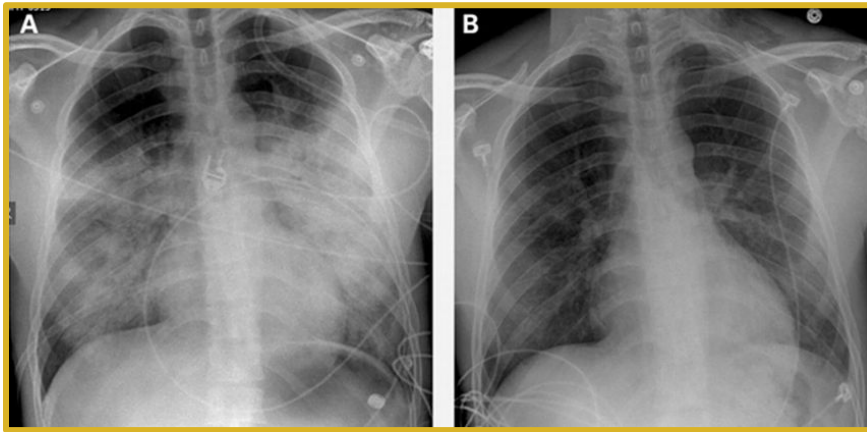
- Pleural effusions.



Upper lobe pulmonary venous diversion (yellow circles).



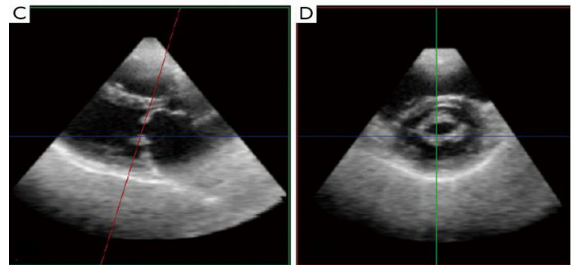
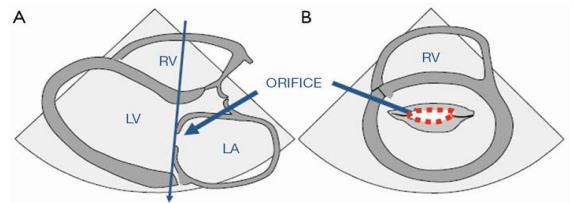
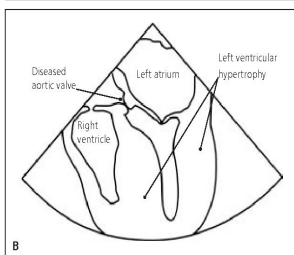
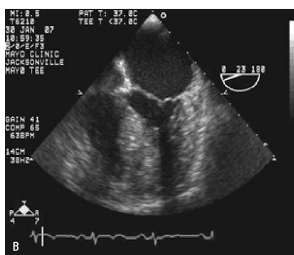
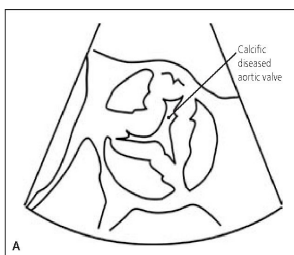
Pulmonary edema before and after treatment (diuretics)



Batwing sign

After diuretics

Heart valve assessment on echocardiography



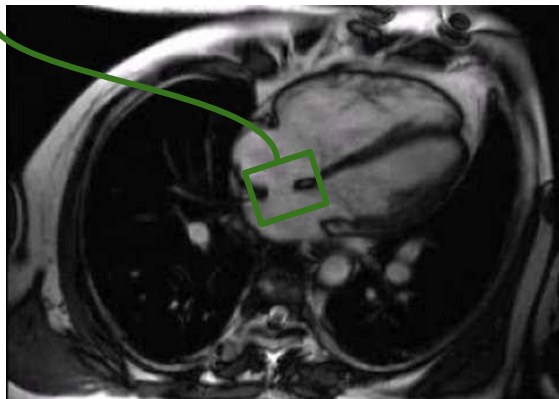
Aortic valve stenosis

Thickening of aortic valve (stenosis) during systole.

Mitral valve stenosis

Interatrial Septal defect

Opening between the 2 atria



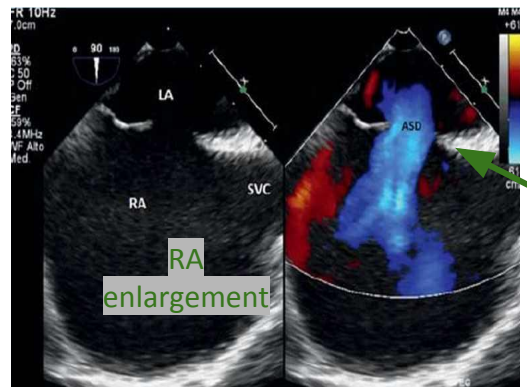
MRI

Check slide 9

It's important to know the direction of the blood

Red → going to

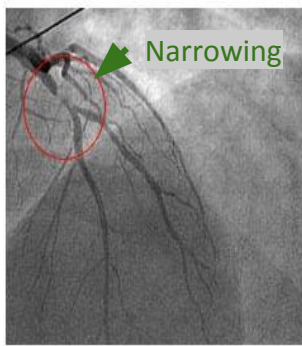
Blue → away from



Left to right shunt

Transesophageal Echo

Cardiac cath. (before and after stenting)



Narrowing

Before
99% proximal left anterior descending artery (LAD) stenosis



After
Status post stent of proximal left anterior descending artery (LAD)



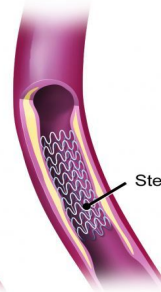
Look at the appearance of the stent on CT



A.

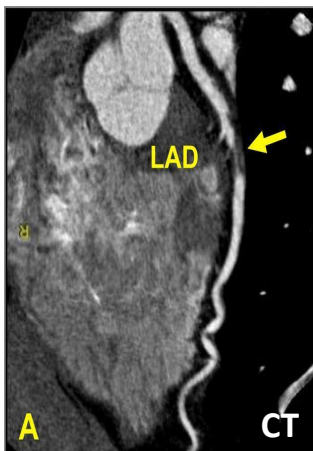


B.

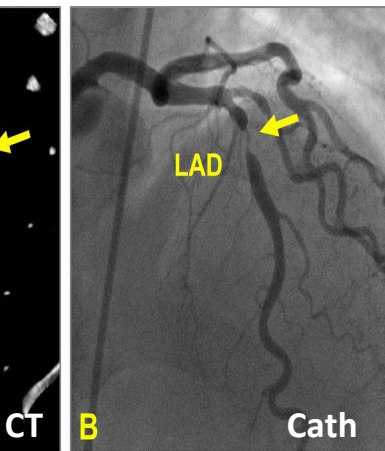


C.

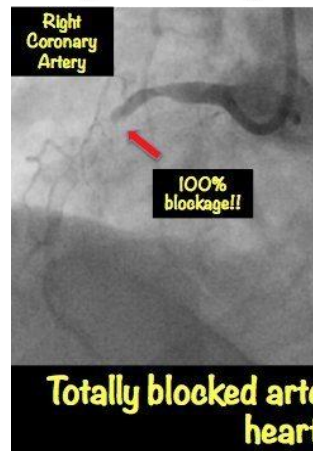
B. Daliator.
C. To keep the diameter normal.



A

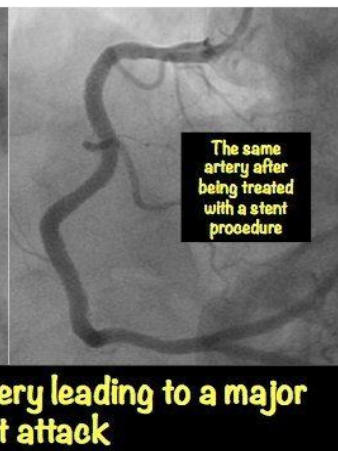


B



Right Coronary Artery

100% blockage!!



The same artery after being treated with a stent procedure

Totally blocked artery leading to a major heart attack

MRI myocardial enhancement

Contrast enhancement can refer to characteristics of abnormal lesions in the body. This term can be used in another way, [Read more here!](#)

HYPERENHANCEMENT PATTERNS

Ischemic

A. Subendocardial Infarct



B. Transmural Infarct



Nonischemic

A. Mid-wall HE



- Idiopathic Dilated Cardiomyopathy
- Myocarditis
- Hypertrophic Cardiomyopathy
- Right ventricular pressure overload (e.g. congenital heart disease, pulmonary HTN)
- Sarcoidosis
- Myocarditis
- Anderson-Fabry
- Chagas Disease

B. Epicardial HE

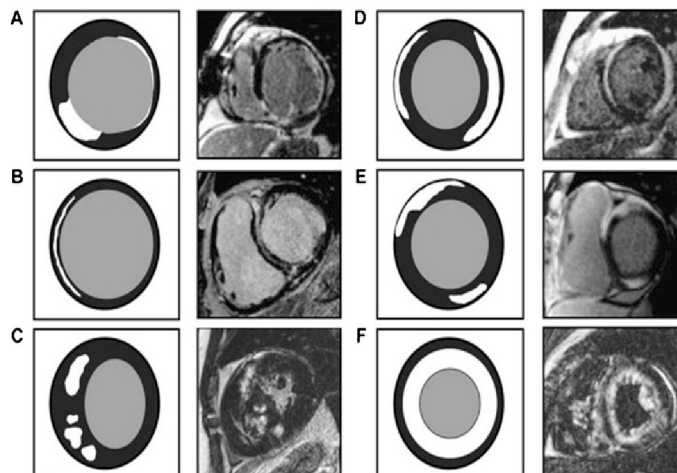


- Sarcoidosis, Myocarditis, Anderson-Fabry, Chagas Disease

C. Global Endocardial HE



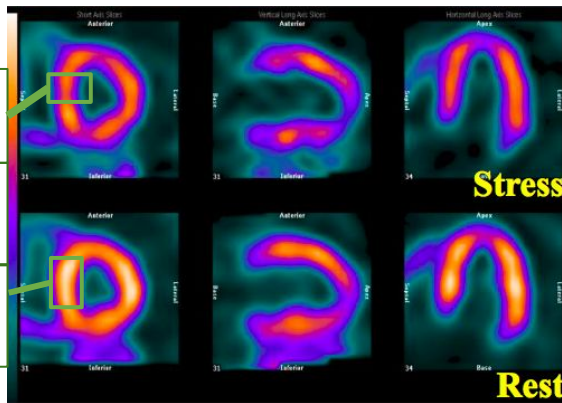
- Amyloidosis, Systemic Sclerosis, Post cardiac transplantation



What is the diagnosis?

Nuclear Imaging (stress and rest test/myocardial perfusion test)

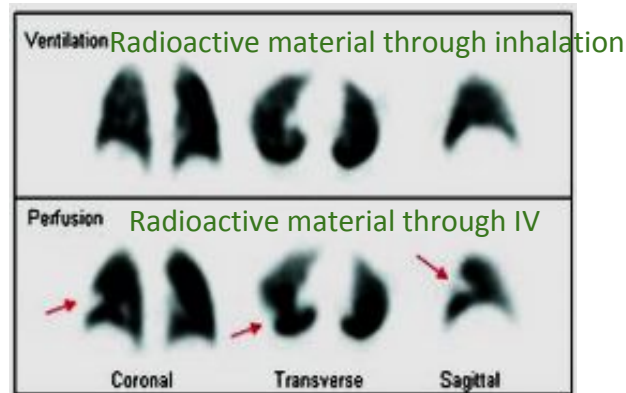
- 1- Reduced uptake in the LV
- 2- Ask the pt to take a rest and assess it again.
- 3- it's back to normal. so, it's ischemia.



Myocardial ischemia
Important!!

But in other cases if it doesn't return to normal, it is infarction.

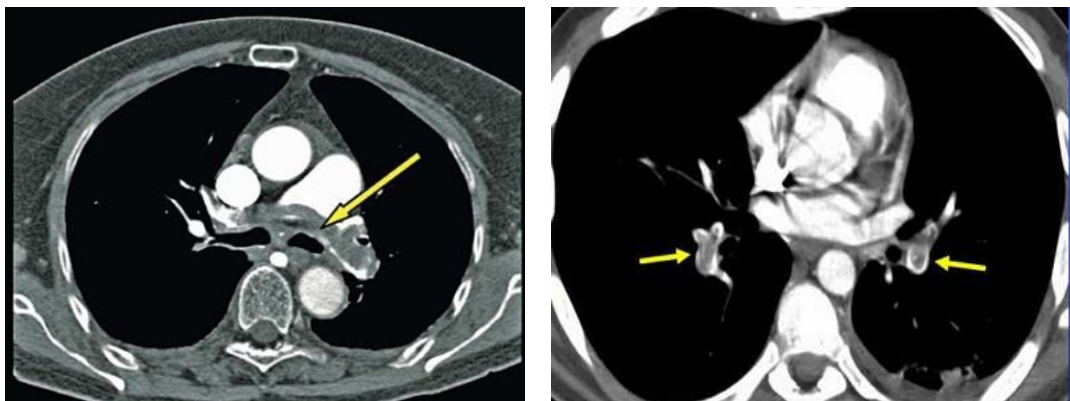
V/Q scan



Pulmonary Embolism
(mis-match between ventilation and perfusion scans)

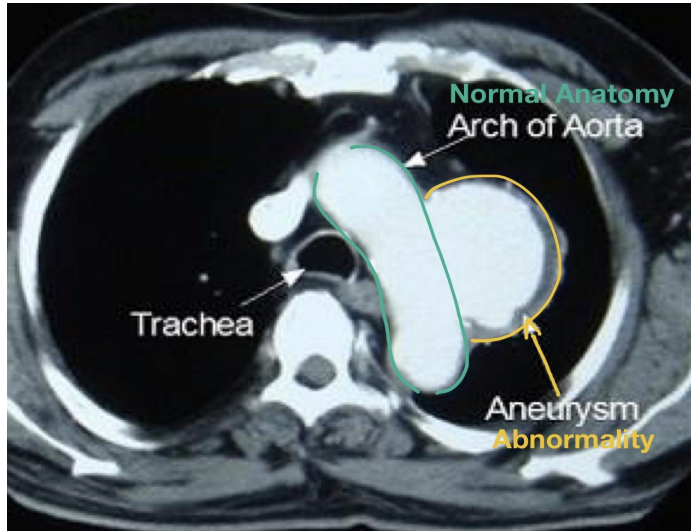
Normal pic during ventilation
Abnormal pic of perfusion, so the problem here in the blood supply
*if there an abnormality in the ventilation we will think about COPD disease.

CT pulmonary angiogram

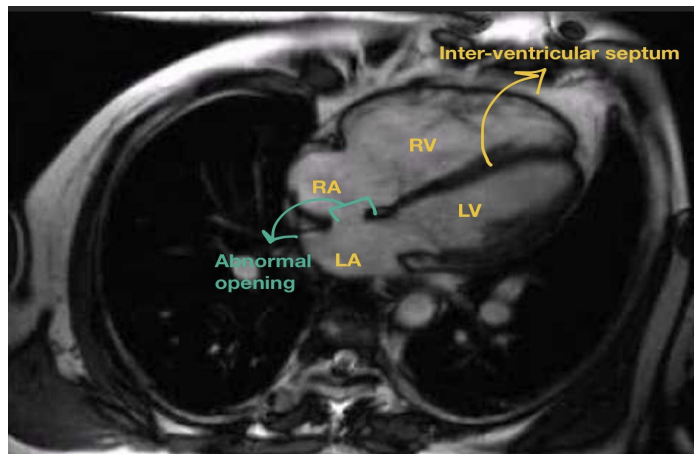


Pulmonary embolism

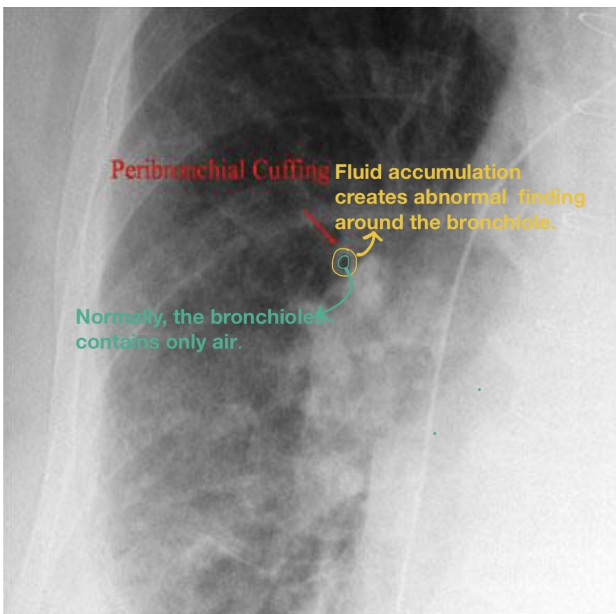
The vessel is white because of the contrast. And the clot appears dark grey. So, it's a thrombus NOT a mass.



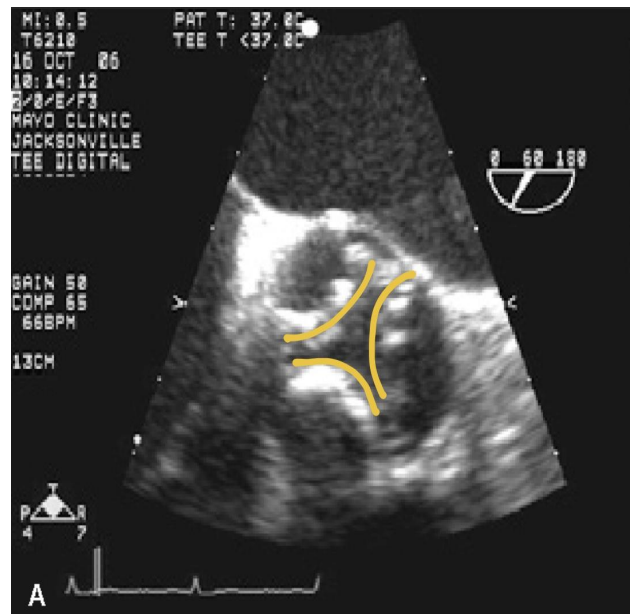
The aneurysm is thinning and bulging of the vessel wall, and the contrast will fill this extra space like the blood



Interatrial septal defect



Interstitial edema
(peribronchial cuffing)



Aortic valve leaflets

Summary

Sign	Indication
Boot shaped heart (The apex is pushed up)	Right ventricular enlargement
Widening of the carina, double border sign	Left atrial enlargement
Upper lobe pulmonary venous diversion.	Pulmonary edema. If > Increased cardio-thoracic ratio (cardiogenic).
Peri-bronchial cuffing. Septal lines (Kerley B)	Pulmonary interstitial edema
Batwing appearance	pulmonary alveolar edema

Questions

Q1: "Double border" sign is seen in which chamber enlargement?

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

Q2: The best way to confirm the diagnosis of Pericardial effusion is?

- A- CT.
- B- Ultrasound.
- C- Echocardiograph.
- D- A&C.
- E- B&C.

Q3: If a patient present with pulmonary alveolar edema which one of these sign you may see on x-ray?

- A- Peri-bronchial cuffing.
- B- Kerley lines.
- C- Batwing sign.
- D- A&B.

Q4: "Boot shaped heart" sign is seen in which chamber enlargement?

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

Q5: The best way to confirm the diagnosis of Interatrial Septal defect is?

- A- Ultrasound.
- B- MRI.
- C- Echocardiograph.
- D- B&C.

5-D
4-C
3-C
2-D
1-B

Answers :

WE NEED
YOUR
FEEDBACK

