

***Surgery department/Radiology***

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***Learning objectives:***

1. To describe and identify on chest radiography the normal heart size, positon, and pulmonary complications related to cardiac disorders as well as the effect on pleural cavities.

2. To study the value of echocardiography in providing information's related to cardiac morphology and function.

3. The indications of cardiac CT scan and MRI in specific conditions providing both functional and anatomical information's.

**Plain chest radiography (PA view):**

is of value to show

1. Heart size ,shape and position
2. Presence of calcification.
3. Main pulmonary artery and pulmonary vasculature (the size of the vessels within the lung, reflect pulmonary flow, there is no accepted measurements of normality, normal flow demonstrate smaller upper pulmonary vessels ,than the lower ones which supply the lung bases **but with congestive heart failure there will be redistribution of pulmonary blood flow equal in upper and lower lobes , and subsequently flow from the lower to the upper lobe vessels).**
4. Increase pulmonary blood flow due to LT to RT shunts (pulmonary plethora).
5. Pulmonary arterial hypertension (has to be severe before it is diagnosed on plain films it present large main pulmonary and hilar arteries with small peripheral arteries, it could be associated with lung disease ex. cor pulmonale, mitral valve disease,) .
6. Pulmonary venous hypertension.( mitral valve disease and left ventricular failure are common causes, the upper zone vessels are enlarged )
7. Pulmonary odema..



CT ratio measurements, the transverse diameter of the heart is normally less than half of the internal diameter of the chest on PA view

Increase in size of the heart may be due to

1. Dilatation or hypertrophy of one or more of the cardiac chambers
2. Pericardial effusion.
3. Apparent enlargement related to AP projection, or film taken at expiratory phase, supine and in semi erect position.

Diagnosis of specific chamber enlargement is not always possible on plain chest radiograph, and it is difficult to distinguish cardiac dilatation from hypertrophy.

**Left Atrial enlargement** is visible as double contour rt heart border.,

**Dilated Lt. atrial appendage** is seen as bulge below the main pulmonary artery

**Right atrial enlargement** cause increase in the radius of curvature of the Rt heart border often with enlarged SVC.

It is not easy to diagnose pericardial effusion on plain film but marked increase in the transverse diameter of the heart within a week or two without pulmonary edema is diagnostic.

Extensive pericardial calcification is a feature of constrictive pericarditis.

**Pulmonary odema and congestive heart failure**

1. Vascular redistribution and upper lobe blood diversion.( pulmonary plethora ),which represent a. prominent pulmonary vessels and increase caliber .

b. reaching lung apex

c. reaching the outer third of the pulmonary space.

1. Fluid leak from the loaded vessels to adjacent interstetium forming septal lines (interstitial odema)
2. Fluid leak from interstetium to alveoli ( alveolar odema )
3. Fluid leak to pleural space (pleural effusion).

**Echocardiography**

Using sound waves to visualize the heart and pericardium. Uses:

1. Visualize individual cardiac chambers and valves in motion.
2. Measure the dimensions of each chamber
3. Estimate wall thickness
4. Pericardial space.

**Radionuclide studies**

Non- invasive readily repeated and give information on cardiac metabolism and function (myocardial perfusion scintigraphy).

The tracer is taken up by the myocardium in relation to proportion of blood flow, so, regions of low blood flow reflect reduced uptake it is used in patients with suspected ischemic chest pain, and can differentiate between ischemic pain induced by exercise and infarcted region.

**Computed tomography**

1. Non contrast scan – cardiac coronary calcifications
2. With I.v contrast, it provide a non- invasive method to measure the extant of coronary artery stenosis in patients with suspected ischemic chest pain.
3. Evaluation of intra-cardiac disorders, pleural effusion, and cardiac tumors (but these are equally seen or better evaluated by cardiac ultrasound).

**Magnetic resonance imaging**

Anatomy of complex congenital heart disease

• Details of myocardial thickness, morphology and function

• Myocardial perfusion

• Tissue characterization

• Myocardial odema

• Valve disease

• Pericardial disease

• Intra-cardiac tumors, which can be shown with great

Precision, better in many cases than with ultrasound.

**Pulmonary embolism**

**Refers to embolic occlusion of the pulmonary arterial system**

Symptoms are nonspecific but the classical traid of dyspnea, chest pain and hemoptysis, has been described ….

Imaging evaluation

1. Plain chest film (frontal) is non – specific but used to differentiate from other similar clinical presentation ex , pneumonia , pneumothorax.
2. Pulmonary CT angiography will show filling defect.
3. Nuclear medicine

Ventilation / perfusion scan

Aortic aneurysm

Computed tomography with i.v contrast mandatory, to show

1. Non –enhancing atheromatous plaques

2. Dissecting aneurysm (when the layers of the wall of the aorta separate allowing blood to flow between those layers, causing them to separate further)…filling enhancement of true lumen

Native CT scan showing mural calcifications