

CHEST REPORTS

■ Item to be evaluated:

- Lung parenchyma
- Costophrenic sinuses
- Cardiac size and shape
- Chest wall including ribs, scapulae, clavicles and spine
- Extra thoracic soft tissues specially
 - * Shoulder joints
 - * Lower neck
 - * Breast shadows [females]

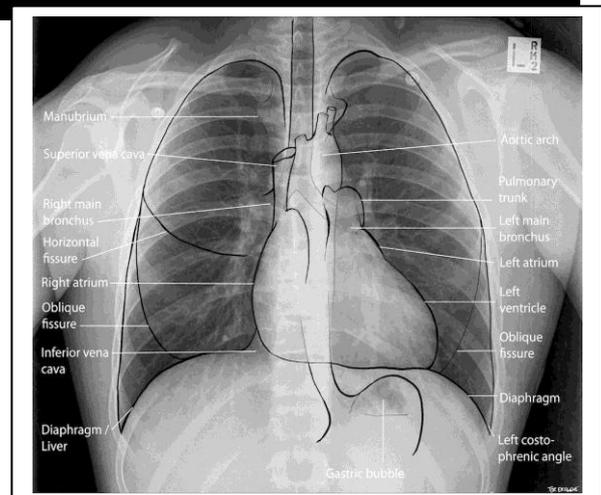
Chest X ray

■ Normal Findings

- ① Clear both lung fields and costophrenic angles
- ② Normal Cardiac size and shape

■ Normal [looking for lymph nodes]

- ① Clear both lung fields and costophrenic angles
- ② Normal Cardiac size and shape
- ③ No radiological evidence of enlarged hilar or mediastinal lymph nodes



■ Normal [Senile changes]

- ① Senile pulmonary changes with exaggerated hilar bronchovascular marking
± crowdening of the ribs.
- ② Clear both lung fields and costophrenic angles
- ③ Normal Cardiac size and shape

NB The cardiac shadow in these patients may be enlarged, usually with left ventricular dilatation, then you can say :

Increased cardiac transverse diameter with left ventricular preponderance ± dilated unfolded aorta



■ **Emphysematous chest**



- ✓ **Hyperinflated lungs** with exaggerated central bronchovascular markings and peripheral attenuation of the vascular shadows.
- ✓ Low flat diaphragm
- ✓ Exaggerated retrosternal and retrocardiac spaces with increased AP diameter of the chest (burrle chest). --> in Lateral Film

NB If **emphysematous bulla** is present : mention its **site** and **size**

If **multiple bullae** are present then you say:

Multiple variable sized emphysematous bullae are seen ____ (mention their sites), the largest is located in ____ and measures about _____ cm in maximal diameters



Emphysematous bullae: thin wall cavities that are peripherally located near the chest wall

- ✓ No evidence of pulmonary parenchymal masses or infiltrations
- ✓ Clear both costophernic angles
- ✓ Normal Cardiac size and shape



Chest Pathology

FOCAL LUNG LESIONS

X rays

■ **PULMONARY NODULE** [well defined lesion measuring less than 3cm in diameters]

① A well defined ____ shape [oval, rounded,..] pulmonary nodule is seen in ____ [mention to site of the lesion by lung zone if only PA film is present and by lung lobe if lateral view is present]

② The lesion measures X cm in maximal diameters with smooth [or speculated] edge ±



Rt lower lobe pulmonary nodule

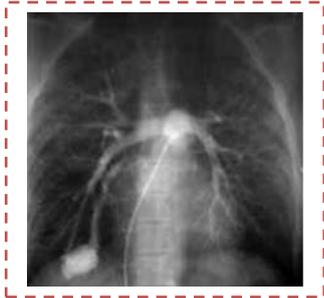
Example: The lesion measures 2X3 cm in maximal diameters with smooth margin and multiple foci of matrix calcifications seen

③ The surrounding lung parenchyma & the rest of both lung fields are clear.

④ Costophernic angles are free

⑤ Normal cardiac size and shape

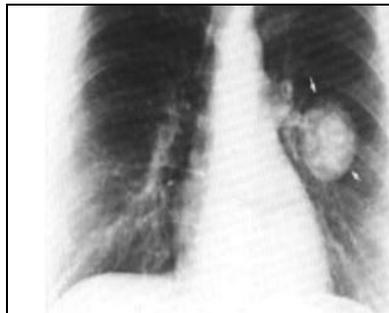
NB If the nodule has a **speculated margin**, you should assess the hilum and mediastinum for the presence of **enlarged lymph nodes** [lateral film should be present]



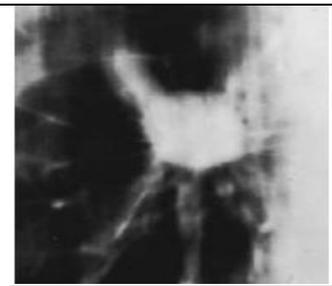
NB if the nodule is **connected to the hilum** by a vascular pedicle in the form of one or two linear opacities passing between the lesion and hilum, if present the diagnosis of **pulmonary AVM** is suggested.

NODULES 3cm or less **COMMON**

- ◆ Tuberculoma } Benign - Coarse calcification - well defined
- ◆ Hamartoma } Benign - Coarse calcification - well defined
- ◆ Bronchogenic ca. } Malignant - speculated edge
- ◆ Metastases } Malignant - speculated edge
- ◆ AVM + afferent & efferent vessels
- ◆ Hydatid cyst Homogeneous - sharply defined



Benign nodule
[smooth margin + matrix calcifications]



Malignant nodule
[speculated margin with no calcifications]

NB Nodules which are not classic for **Tuberculoma** or **Hamartoma** are recommended for further evaluation by CT

NB **CT examination of the chest should be the next step if you can not accurately diagnose any pulmonary lesion**

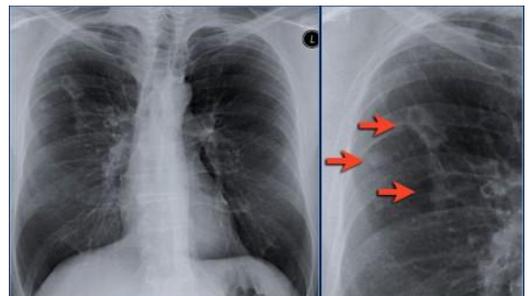
= A well defined pulmonary nodule may contain **air bronchogram** then you describe the lesion as before & you mention that the lesion contains air bronchogram.

⇒ The differential diagnosis of this lesion includes:

***Round pneumonia * Pulmonary lymphoma * Alveolar cell carcinoma**

= A well defined **cavitating pulmonary nodule** may contain a central cavity filled with air and may be multiple in many cases. Then you described the lesion as mentioned before and you mention that the lesion contains a central area of cavitation with thin [or thick] margin. The differential diagnosis of these lesions include

- * Wegener's granulomatosis [thick margin]
- * Septic emboli [thin margin]



Lesion that can be diagnosed by plain X ray & needs no further evaluation by CT include :

- *Tuberculoma, *Hamartoma, *Pneumonia, *Abscess Lung,
- *Fungal ball, *Pulmonary infarct,..
- *Deposits specially with known primary malignancy,

■ MULTIPLE PULMONARY NODULES

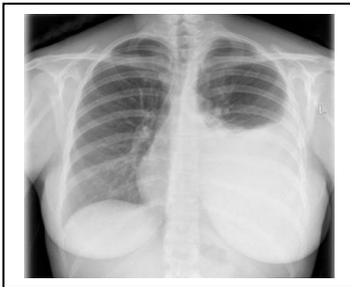
X rays

- ① Multiple pulmonary nodules are seen scattered in both lung fields, the largest measures ___X___ cm in maximal transverse diameters and is located in ___ [mention the site of the largest nodule, upper lobe, middle lobe, lower lobe, left, right,...]
- ② The lesions showed homogenous density with no evidence of areas of breakdown \pm calcifications.
- ③ Costophrenic angles are free. ④ Normal cardiac size and shape

NB In these cases you should check for pleural or chest wall lesions

Examples: ● **Osteolytic lesions** in ribs, spine [lateral view], shoulders,..

- Pleural thickening or effusion



NB If **pleural effusion** is present you write: **obliterated** [right, left or both] costophrenic angle(s) by pleural effusion seen extending along the lateral chest wall or raising to the axilla.

NB If the heart is enlarged you write:

Increased cardiac transverse diameter with evidence of [left ventricle, left sided, right ventricle and left arterial, all chamber] enlargement / Also mention if the aorta is dilated and unfolded.

NB **Multiple pulmonary nodules** are commonly representing metastatic deposits in the presence or absence of a known primary malignancy.

NB Multiple less common nodules include hydatid cysts and AVMs

NB Tuberculomas and Hamartomas are *rarely multiple*.

NB A nodule with **Speculated Margin** usually represents a **Bronchogenic carcinoma**.

The margin is better assessed by CT

A bronchogenic carcinoma may have multiple metastatic deposits in the same lung, opposite lung or both lungs. [deposits will have smooth margins]

■ PULMONARY MASS

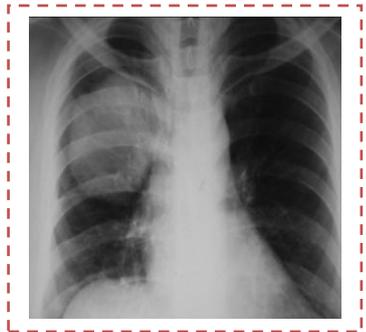
[well defined lesion > 3cm in diameters]

① A well defined ___ shape [mention if it is oval, rounded,..] pulmonary mass lesion is seen in ___ [mention to site of the lesion by **lung zone** if only PA film is present and by **lung lobe** if lateral view is present]

② The lesion measures __ X __ cm in maximal diameters with smooth [or speculated] edge \pm matrix calcifications

Example: The lesion measures 4X5 cm in maximal diameters with lobulated margin and multiple foci of matrix calcifications seen inside.

- ③ The surrounding lung parenchyma as well as the rest of both lung fields are clear.
- ④ Costophrenic angles are free
- ⑤ Normal cardiac size and shape



NB Pulmonary masses in adults include:

[Bronchogenic carcinoma, Hydatid cyst, and large Metastatic deposits]

- * **Hydatid cyst:** water density, thin sharp margin, no enhancement
- * **Metastatic deposit:** solid density, known primary, smooth margin and can contain calcium

NB A Solid mass in adult lung
 Considered as **Bronchogenic carcinoma** until proved otherwise

■ MULTIPLE PULMONARY MASSES



- ① Multiple pulmonary mass lesions are seen scattered in both lung fields, the largest measures X cm in maximal transverse diameters and is located in ____ [mention the site of the largest mass lesions, upper lobe, middle lobe, lower lobe, left, right,...]
- ② The lesions showed homogenous density with no evidence of areas of breakdown \pm calcifications.
- ③ Costophrenic angles are free.

Masses, more than 3cm

- ◆ Bronchogenic Carcinoma
- ◆ Hydatid Cyst
- ◆ Metastatic deposit

NB In these cases you should check for **pleural** or **chest wall lesions**
 Examples: ●Osteolytic lesions in ribs, spine [lateral view], shoulders,..
 ●Pleural thickening or effusion

NB If **pleural effusion** is present you write:
Obliterated [right, left or both] costophrenic angle(s) by pleural effusion seen extending along the lateral chest wall or / rasing to the axilla.

- ④ Normal cardiac size and shape

NB If the heart is enlarged you write:

Increased cardiac transverse diameter with evidence of [left ventricle, left sided, right ventricle and left arterial, all chamber] enlargement / Also mention if the aorta is dilated and unfolded.

NB = **Multiple pulmonary mass lesions** are commonly representing **Metastatic deposits** in the presence or absence of a known primary malignancy.
= Less common due to hydatid disease

NB "Lesion Margin"

- Mass lesion with **speculated** or **smooth lobulated** margin usually represents **Bronchogenic carcinoma** and may contain **Calcium**.
- The margin is better assessed by CT
- A bronchogenic carcinoma may have multiple metastatic deposits in the same lung, opposite lung or both lungs. [metastatic lesions will have smooth margins]

■ PATCHY OPACITY [Ill- defined lesion showing air bronchogram]

① An ill- defined patchy opacity is seen in the [mention the site of the lesion including right, or left, which lobe?!]

NB In cases of multiple opacities you mention the site of the lesions

- ② The lesion showed **air bronchogram** with no evidence of areas of breaking down [no measurements needed for these lesions]
- ③ Costophrenic angles are free.
- ④ Normal cardiac size and shape

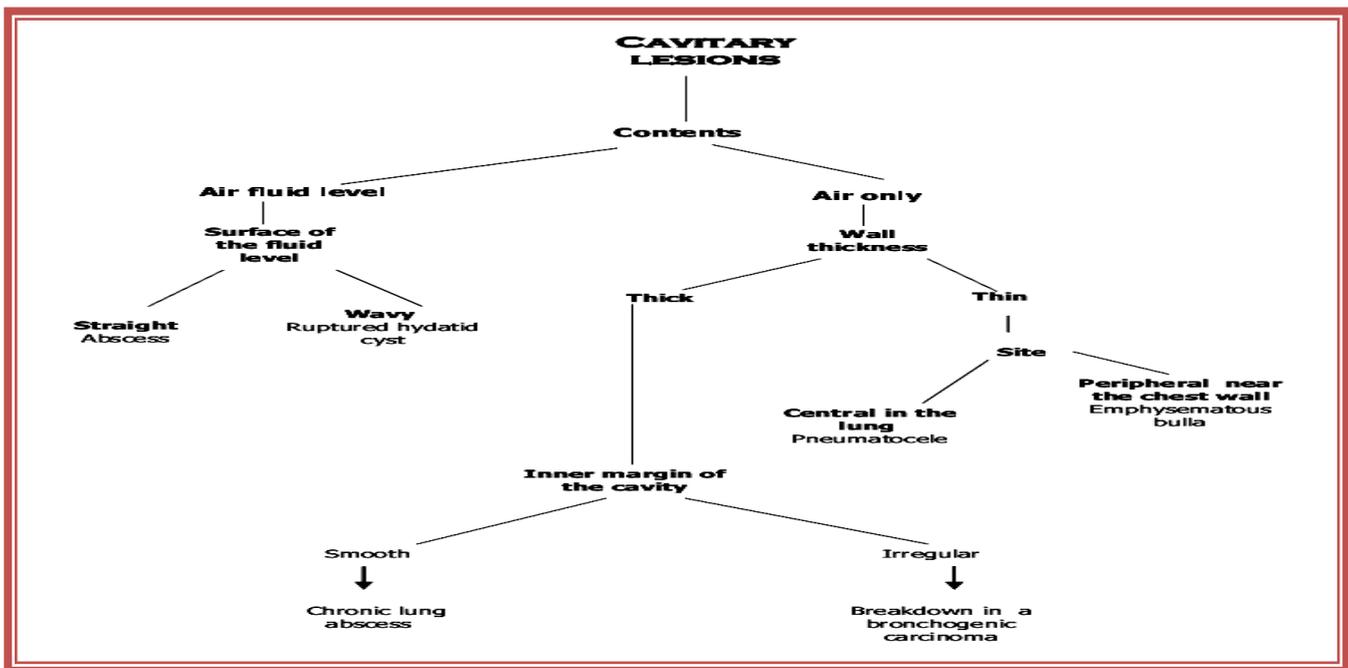


X- ray of consolidation with air bronchogram

Example: Multiple variable sized pulmonary parenchymal patchy opacities [or areas of alveolar consolidations] are seen in the right upper and left lower lobes showing air bronchogram with no areas of breaking down seen inside.

NB Focal pulmonary consolidation (s) are usually due to **pneumonia** & less commonly due to **infarcts** in cases of pulmonary embolism.

NB If pleural effusion is present you write: obliterated [right, left or both] costophrenic angle(s) by pleural effusion seen extending along the lateral chest wall or rasing to the axilla.



■ **CAVITARY LESION** [A well defined lesion that is totally or partially containing air] / X-Ray

NB The diagnosis of a cavity is applied for a lesion containing:

*Totally **air** OR ***Air -fluid** level OR * with a Mass or a **ball inside**

- ① A well defined cavitory lesion is seen _____ [mention the site of the lesion including right or left, which lobe?]
- ② The lesion measures X in maximal transverse diameters and showed an internal air-fluid level. **The surface** of the fluid is straight [usually seen in **lung abscess**] [or may be wavy giving the water- lily sign diagnostic of a **ruptured hydatid cyst**]

NB If the lesion contains air only then you write in item no. ② :

The lesion has a **thin** [or **thick**] margin with **no air fluid levels** or soft tissue masses seen inside. It measures _____ X _____ in maximal transverse diameters

NB **Multiple cavitory lesions** containing air only with thin margins are:

↳ Usually due to **pneumatoceles**.

↳ May be associated with areas of pneumonic consolidations [due to staph. Pneumonia]

↳ May be associated with **pneumothorax**

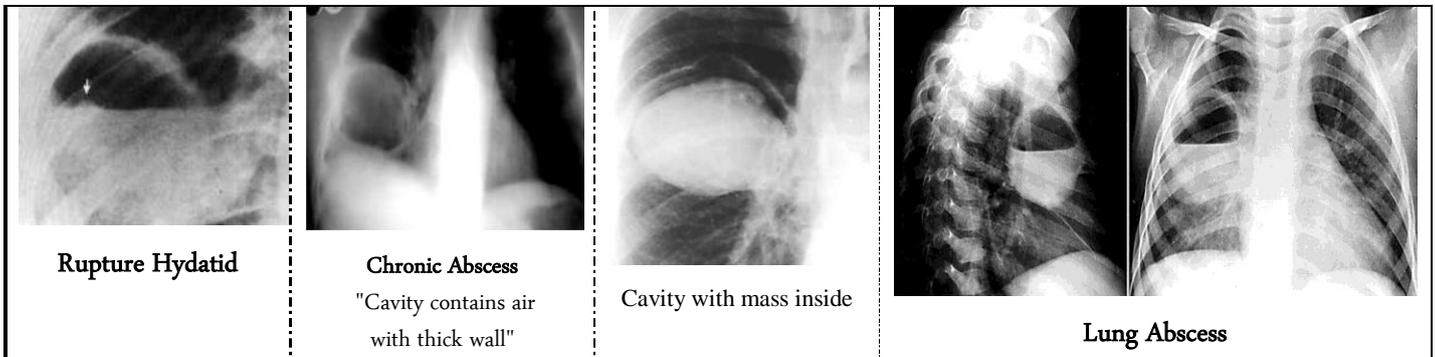
[due to rupture of one of the lesions into the pleural cavity]

③ **The surrounding lung parenchyma** is clear [or may show **strandy opacities** in cases of TB, or patchy areas of subsegmental consolidation in cases of pneumonia with breakdown forming an abscess]

④ Normal cardiac size and shape

NB If **pleural effusion** is large and is not associated with shift of the heart and mediastinum to the opposite side **then you write**: A large [right or left] pleural effusion is seen obliterating the costophrenic angle and rising to the axilla with no evidence of associated shift of the heart and mediastinum to the contralateral side denoting an **underlying lung collapse**.

⑤ Normal cardiac size and shape



■ Cavitory lesions with special features X rays

☒ Cavitory neoplasm

- ① A well defined cavitory lesion is seen ____ [mention the site of the lesion including right or left, which lobe?1]
- ② The lesion measures ___ X ___ in maximal transverse diameters and showed a thick enhancing margin with irregular inner wall.
 - ☒ The cavity has a thick margin with irregular inner wall
 - ☒ Soft tissue density or fluid may be seen inside this cavity due to tumor breakdown and necrosis
 - ☒ **The mediastinum** should be assessed for the presence of metastatic lymph nodes [seen as lobulated soft tissue shadows at the hilar region or in the paratracheal area. Confirmation of the presence of mediastinal lymph nodes can be reached by CT scan]
- ③ The surrounding lung parenchyma is **clear** [or may show multiple rounded pulmonary nodules suggestive of metastatic deposits]
- ④ Look for the presence of pleural effusion
- ⑤ Normal cardiac size and shape.

☒ Cavity with a soft tissue mass inside

- ① A well defined cavitory lesion is seen ____ [mention the site of the lesion including right or left, which lobe?]
- ② The lesion has a thick [or may be thin] margin with an internal soft tissue nodule [if below 3cm] or mass lesion [if > 3cm] measuring _____ X _____ in maximal diameters.
- ③ **The surrounding lung parenchyma** showed multiple reticulo nodular opacities [± patchy areas of parenchymal consolidations] [*This is a common finding because most of these lesions represent a fungal ball on top of a preexisting TB cavity and the changes in the lung around the cavity are usually the residual sequelae of this TB infection* / or it may be clear.

NB In cases of TB lesions bilateral cavities may be present and a fungal ball may occur only in one of the cavities. Multiple fungal balls may be seen

NB If the inner wall of the cavity is irregular, then consider the possibility of a breakdown in a neoplasm [bronchogenic carcinoma] whatever the contents of the cavity [air only, air- fluid level, or air and mass]

NB The differential diagnosis of a cavity with an internal mass lesion include:

- Fungal ball [The most common]
- Tumor breakdown
- Rupture hydatid cyst:
 - Acute rupture → air- fluid level
 - Chronic rupture → a mass inside the cavity [rarely seen]

CT SCAN OF THE CHEST

■ Normal findings

- ① Clear both lung fields and costophrenic sinuses. No evidence of pulmonary nodules or bronchiectatic changes.
- ② No CT evidence of enlarged hilar or mediastinal lymph nodes
- ③ No pleural or pericardial sac collections seen
- ④ Normal CT appearance of the heart and great vessels
- ⑤ Upper abdominal scans are free

■ Normal [looking for lymph nodes] The same as above

■ Normal [Senile changes]

- ① Senile pulmonary changes with exaggerated hilar bronchovascular markings and bilateral basal peribronchial thickening
- ② No CT evidence of enlarged hilar or mediastinal lymph nodes
- ③ No pleural or pericardial sac collections seen
- ④ Normal CT appearance of the heart and great vessels
- ⑤ Upper abdominal scans are free

NB In elderly patients with senile pulmonary changes, the heart is usually enlarged due to hypertension, also the aorta and coronary vessels may show atheromatous calcifications, **then write:**

The cardiac shadow is enlarged with left ventricular predominance.

Atheromatous calcifications are seen in the aorta and coronary vessels

■ Emphysematous chest

- Hyperinflated lungs with exaggerated central bronchovascular markings and peripheral attenuation of the vascular shadows.
- Exaggerated retrosternal and retrocardiac spaces with increased AP diameter (burrle chest).



NB If **emphysematous bulla** is present mention its site and size
If multiple bullae are present then you say: Multiple variable sized emphysematous bullae are seen ____ (mention their sites), the largest is located in ____ and measures about ____ cm in maximal diameters

Blebs = small bullae measuring < 1cm

- No evidence of pulmonary parenchymal masses or infiltrations
- Clear both costophernic angles
- Normal Cardiac size and shape
- No pleural or pericardial sac collections seen
- Normal CT appearance of the heart and great vessels

NB If you **see emphysematous bullae** you can discriminate between:

↪ **Centrilobular emphysema** [bullae or blebs are seen in the **lung parenchyma**] and

↪ **paraseptal emphysema** [the lesions are **subpleural in location**].

However both types can be seen in cases of panacinar emphysema

NB The chest may be emphysematous without detectable bullae or blebs, in this case the main finding in CT scan is the increased antroposterior diameter of the chest.

NB The chest may be enlarged due to **COPD** then write:

The cardiac shadow is enlarged with right sided predominance. Look also for atheromatous changes in the aorta and coronary vessels.

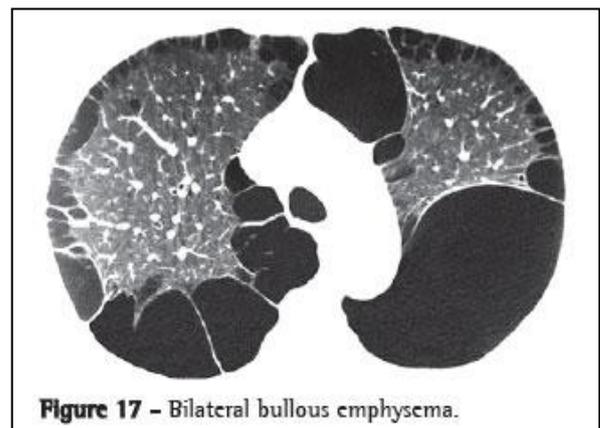
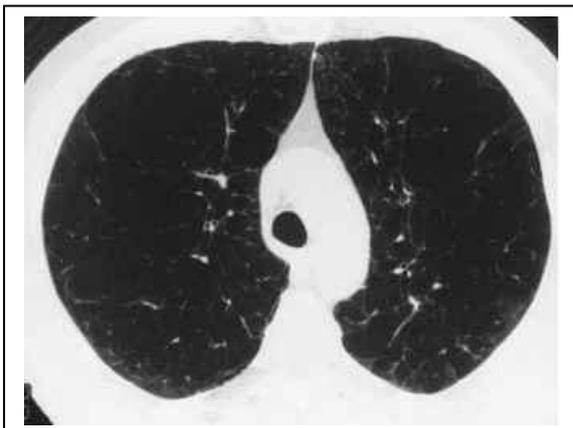


Figure 17 - Bilateral bullous emphysema.

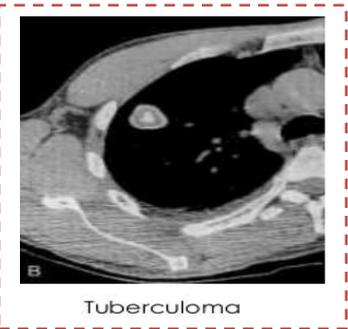
■ Pulmonary nodule

Focal lesions CT

- ① A well defined ____ shaped [mention if the nodule is oval, rounded,..] is seen in ____ [mention the site of the lesion including left, right and the segment where the lesion is located]
- ② The lesion measures ___ X ___ cm in maximal transverse diameters with ____ margin [mention if the margin is smooth, speculated, lobulated,...] ± matrix calcifications

Example: A well defined rounded pulmonary nodule is seen in the anterior segment of the right upper lobe measuring 2.5X1.7cm in maximal transverse diameters. It has a speculated margin with no evidence of matrix calcification

- ③ The surrounding lung parenchyma as well as the rest of both lung fields are clear.
- ④ Costophernic angles are free
- ⑤ Normal cardiac size and shape

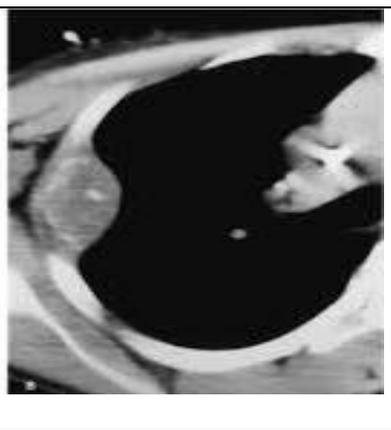
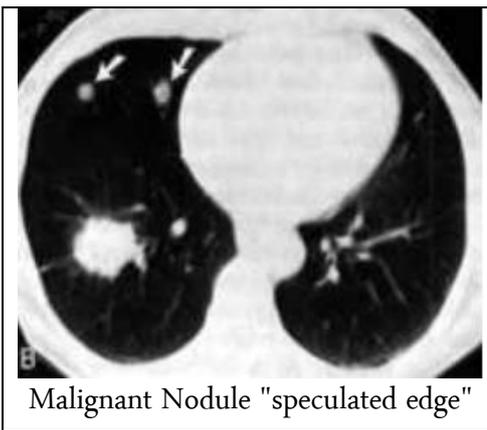


NB **Pleural thickening** and/or effusion may be present, then write:

A ____ [mention right or left] sided pleural effusion is seen filling the costophernic sinus ± underlying compression atelectasis of the adjacent lower lobe lung parenchyma.

NB = If the nodule is:

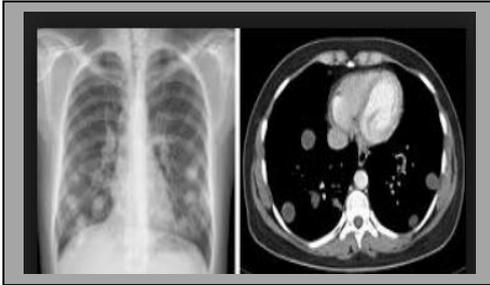
- ↪ **Adjacent to a rib**, mention if there is **bone erosion** or not.
- ↪ **Has a speculated margin**, → assess the hilum and mediastinum for enlarged lymph nodes
- ↪ **Connected to Hilum by vascular pedicle** → **AVM**



■ Multiple pulmonary nodules

CT

- ① Multiple pulmonary nodules are seen scattered in both lung fields, the largest measuresX.... cm in maximal transverse diameters and is located in ____ [*mention the site of the largest nodule, considering, left, right, and the segmental location*]
- ② The lesions showed homogenous soft tissue density with smooth [or lobulated] outlines \pm areas of breakdown [usually seen in larger nodules] with no evidence of matrix calcification



NB in Cases of multiple hydatid cysts the nodules will show water density, then write: The lesions showed homogenous density with clear water contents. No evidence of internal septations, mural calcification or enhancement.

- ③ No CT evidence of enlarged hilar or mediastinal lymph nodes
- ④ No evidence of pleural or pericardial sac collections

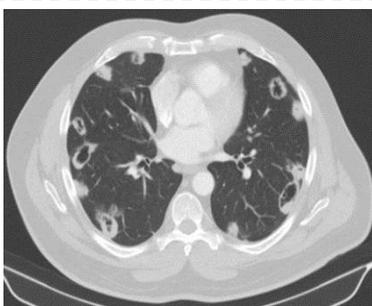
NB Pleural thickening and/or effusion may be present, then write:

A ____ [mention right or left] sided pleural effusion is seen filling the costophrenic sinus \pm underlying compression atelectasis of the adjacent lower lobe lung parenchyma.

- ⑤ Normal CT appearance of the heart and great vessels

NB If the heart is enlarged you can write: Enlarged cardiac shadow with evidence of [mention the chambers that are enlarged, or if the heart is globally enlarged you write: with evidence of all chamber dilatation]

Also mention if there are atheromatous calcification of the aorta and coronary vessels.



Multiple cavitating pulmonary nodules usually contain a **central cavity** filled with **air**. Then you described the lesions as mentioned before and you mention that they contain central areas of cavitation with **thin [or thick] margin**. The differential diagnosis of these lesions include

- **Wegener's granulomatosis** [thick margin]
- **Septic emboli** [thin margin]

■ Pulmonary mass CT

① A well defined _____ shaped [*mention the shape of the lesion, rounded, oval, lobulated, irregular,..*] pulmonary mass lesion is seen in _____ [*mention the site of the lesion including left, right, lobe and segment,..*]

NB • The lesion is considered **well defined** if you can see all of its borders,

↳ if part of the lesion is merging with the mediastinum or chest wall, → it is considered **ill- defined**

↳ A **relatively well defined** lesion= part of the lesion is well defined and part is not defined

② The lesion measures _____X_____ cm in maximal transverse diameters with a smooth margin [or lobulated, irregular,...]. It showed homogenous [or heterogenous] CT density and enhancement ± multiple areas of break down seen inside the lesion ± foci of matrix **calcifications** are also noted [if no calcium is seen in the lesion then write: No matrix calcification detected.]

NB Pulmonary masses in adults include:

[***Bronchogenic carcinoma**, ***Hydatid cyst**, and ***Large metastatic deposits**]

↳ **Hydatid cyst**: water density, sharply defined, thin margin, no enhancement

↳ **Metastatic deposit**: solid density, known primary, smooth margin and can contain calcium

NB A **SOLID MASS** in the lung in an adult should be considered as **Bronchogenic carcinoma** until proved otherwise

In cases of a mass diagnosed as **bronchogenic carcinoma** then you should assess the followings:

* **If the lesion is adjacent to the chest wall,**

→ assess for bone or chest wall invasion, if present, then write the following :

Associated CT evidence of chest wall invasion in the form of destruction of the adjacent rib or vertebra ± tumors mass seen infiltrating the chest wall muscles

OR if not, then write: *No CT evidence of associated chest wall invasion*

* **If the lesion is central and related to the mediastinum,** → assess :

- The distance of the lesion from the carina and
- Presence of mediastinal invasion in the form of :
 - encasement of the main bronchus or pulmonary artery
 - or SVC occlusion
 - or invasion of the heart,..... if positive then write:

The lesion is seen invading the mediastinum totally encasing the [bronchus, pulmonary artery or both] or invading into the SVC or one of the cardiac chambers.

NB In cases with **mediastinal invasion**, no need to measure the distance of the tumor from the carina

If the lesion did not invade the mediastinum, then write :

No CT evidence of mediastinal invasion

↪ In all cases you should assess for the presence of mediastinal lymph nodes

If **+ve** then write Associated enlargement of the mediastinal lymph nodes in the _ [*mention the site: retrosternal, prevascular, retrocaval, carinal, subcarinal, aortic window, hilar, zygoesophageal, pericardial,...*]

If **-ve** then write No CT evidence of enlarged hilar or mediastinal lymph nodes

* **Upper abdominal sections** should be assessed for the presence of hepatic deposits \pm suprarenal masses

If **+ve** then write Upper abdominal sections showed multiple variable sized focal hepatic lesions in the _____ [left lobe, right lobe, both hepatic lobes]. The largest measures _____ X _____ cm and is present in the _____ [mention the site]

* Unilateral or bilateral suprarenal mass lesion (s) are seen measuring _____X_____ cm on the left side and _____X_____ cm on the right side with homogenous [or heterogenous enhancement]

Diffuse lung lesions

1. Interstitial lung disease

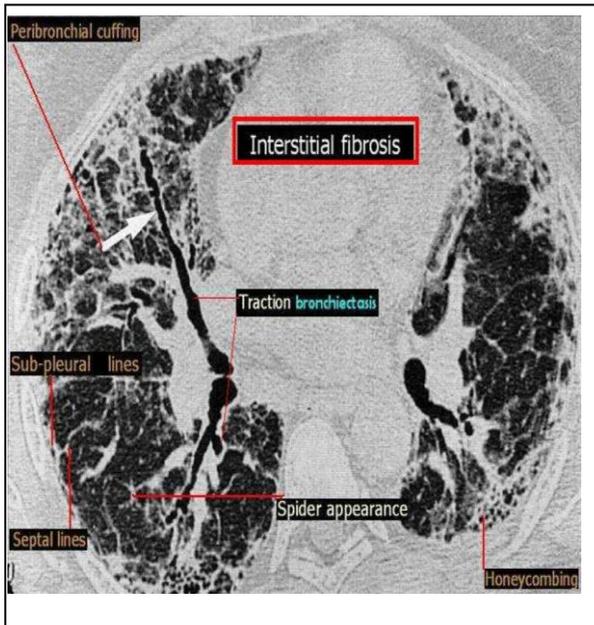
X-ray and CT

↪ **Common causes of interstitial lung opacities include:**

*Interstitial pneumonia, *Interstitial edema,

*Drug induced, *Radiation induced, *Collagen diseases

*Idiopathic pulmonary fibrosis



① **Bilateral widespread interstitial opacities** are seen affecting both lung fields being more pronounced in ____ [*mention the site of severe affection ex. lower lobes, middle zones,..*]

② The lesions are associated with **peribronchial thickening** ± **traction bronchiectasis** [best seen in HRCT images]. **Septal lines** are also noted near the costodiaphragmatic recesses ± in the perihilar regions.

③ Multiple variable sized cystic air spaces are seen mainly in ____ [*mention the site including the lower lobes, periphery of the lung field,..*] giving the characteristic **honeycombing** [best seen in HRCT images]

④ Assess for the presence of pleural effusion, if present mention its site (Rt or left or bilateral) and amount (mild, moderate,...)

In CT scans also mention if pericardial effusion is present or not

⑤ Assess for the presence of **mediastinal lymph nodes** [**best evaluated by CT**]. If present mention their anatomic sites [*retrosternal, retrocaval, prevascular, aortic window, carinal, hilar, zygoesophageal, circum cardiac*] also mention the texture [*homogenous, heterogenous, areas of breakdown, matrix calcifications*]

NB **Interstitial lung disease** associated with **mediastinal lymphadenopathy** is usually seen in cases of sarcoidosis, lymphangitis carcinomatosa and some cases of interstitial pneumonias of viral origin.

⑥ Assess the upper abdomen for the presence of focal hepatic lesions, lymph nodes, ascites,..

Diffuse lung lesions

2. Alveolar lung pathology

X ray and CT

**Common cases of alveolar lung opacities include:**

*Alveolar edema, *pneumonia, *Alveolar hemorrhage,

*Alveolar cell carcinoma and

*Alveolar protienosis

① Bilateral widespread pulmonary patchy opacities showing **air bronchogram** are seen affecting both lung field being more pronounced in ____ [*mention the site of severe affection*]:

* **Perihilar regions** [**Bat's wing appearance**] in cases of **pulmonary edema**

* **Periplural subplural** in cases of pneumonias

② Look for the **crazy-paving sign** [seen only by HRCT] which is characteristic of alveolar protienosis. If present you will see **patchy areas of opacified lung showing multiple hexagonal small frame like lesions representing the involved pulmonary lobules.**

Areas of normally aerated lung are seen also inbetween the opaque patches.

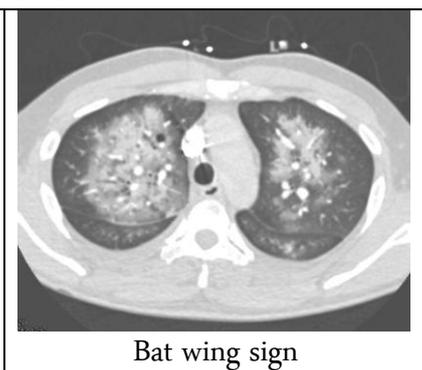
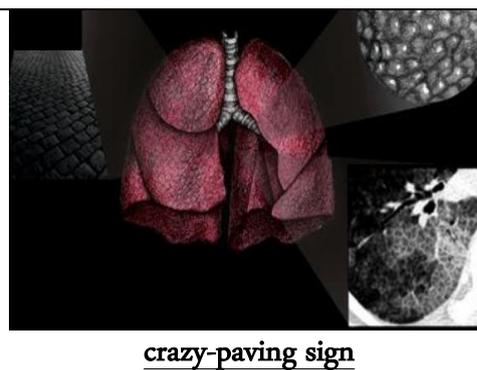
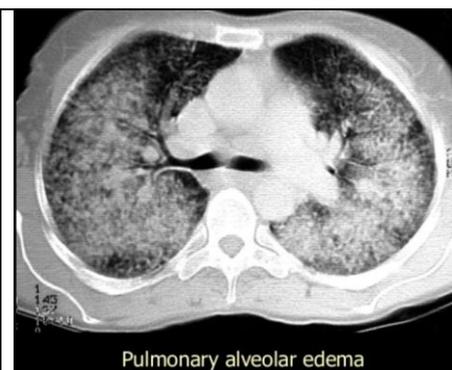
③ Assess for the presence of **pleural effusion**, *if present mention its site (Rt or left or bilateral) and amount (mild, moderate,...)* In CT scans also mention if **pericardial effusion** is present or not

④ Assess for the presence of mediastinal lymph nodes [best evaluated by CT]. If present mention their anatomic sites also mention the texture [*homogenous, heterogenous, areas of breakdown, matrix calcifications*]

NB Lymph nodes are usually seen in cases of **alveolar cell carcinoma** and can support the diagnosis.

NB In cases of **alveolars cell carcinomas** one lung can show patchy areas of consolidations frequently away from the costal pleural, while the other lung may show numerous pulmonary nodules which will coalse to form consolidative patches.

⑤ Assess the upper abdomen for the presence of focal hepatic lesions, lymph nodes, ascites,..



Diffuse lung lesions

3. Nodular pattern

X ray and CT

↪ **Common cases of miliary nodules in the lungs include:**

*Miliary TB, *Pneumoconiosis, *Miliary deposits,

*Alveolar cell carcinoma, and *Sarcoidosis

① There are miliary nodular opacities seen scattered in both lung fields being more pronounced in ____ [*mention the site of severe affection*] ± some of the nodules may be calcified

NB Some miliary nodules like those of TB are usually diffusely scattered in both lung fields

② Assess for the presence of **pleural effusion**, if present mention its site (Rt or left or bilateral) and amount (mild, moderate,...)

In CT scans also mention if **pericardial effusion** present or not

③ Assess for the presence of mediastinal lymph nodes [best evaluated by CT]. If present mention their anatomic sites also mention the texture [*homogenous, heterogenous, areas of breakdown, matrix calcifications*]

NB **Lymph nodes** can be seen in almost all cases of miliary shadows , more common in cases of sarcoidosis where the nodes are discrete, moderately enlarged, usually of homogenous density and may show matrix calcifications.

■ In cases of **pneumoconiosis** the nodes are small, usually hilar and densely Calcified

■ **Metastatic nodes** show malignant characters with:

- ✓ **central necrosis**,
- ✓ heterogenous enhancement,
- ✓ usually with no matrix calcifications.
- ✓ These nodes may be also seen in cases of alveolar cell carcinoma.

NB In cases of **pneumoconiosis** a known complication is the development of progressive massive fibrosis. In this case you will see:

Bilateral relatively well defined, almost symmetrical masses seen on either side of the superior mediastinum. The masses usually show irregular margins and may show central cavitation as well as matrix calcifications. Few nodules of pneumoconiosis may be identified in the rest of both lung fields.

④ Assess the upper abdomen for the presence of focal hepatic lesions, lymph nodes, ascites,..



Diffuse lung lesions

4. Cystic pattern

↳ **Common cause of cystic lesions filled with air in the lungs include:**

*Histiocytosis X, *Tuberous sclerosis,

*Lymphangioleiomyomatosis [LAM], *Lymphocytic pneumonia,

*Emphysema and *Cystic bronchiectasis.

① Multiple variable sized cystic air filled lesions are seen widely scattered in both lung fields being more pronounced in ____ [mention the sites of severe affection]

NB

■ **Sizable cysts** in the range of **1-2 cm** are seen in cases of **histiocytosis X**, **emphysema** and **cystic bronchiectasis**

■ Small cysts < 1cm are seen in LAM and tuberous sclerosis. In these cases the cysts are of **uniform size** with **very thin wall**.

↳ Thin walls are also seen in cases of emphysema,

↳ while relatively thick margins are seen in cases of histiocytosis and bronchiectasis

② Other diagnostic criteria in the history and films can help you to reach the Diagnosis:

✓ **Mural nodules** are usually seen in cases of **histiocytosis X**

✓ **LAM** occurs **only in females**

✓ Patients with **tuberous sclerosis** may have **mental retardation** and **cutaneous tubers**.
If brain scans are available. Look for the presence of intracranial **calcifications**.

✓ **Emphysematous bullae** are usually located **subpleural**

✓ In cases of **cystic bronchiectasis**, the lesions are usually **central** near the hilum and the presence of tubular bronchiectasis help in the differential diagnosis.

③ Assess for the presence of **pleural effusion**, if present mention its site (Rt or left or bilateral) and amount (mild, moderate,...)

In CT scans also mention if pericardial effusion is present or not

NB Most of the cases of **cystic diffuse lung disease** can have **unilateral** or **bilateral pneumothorax** due to rupture of one or more of the cystic lesions in the pleural cavity except for bronchiectasis.

In such case you can write: *There is ____ [mild, moderate, severe] amount of pneumothorax on the ____ [left, right, both] side seen compressing the underling lung parenchyma ± shift of the mediastinal structures to the contralateral side.*



NB In cases of **marked mediastinal shift** with compression of the contralateral lung, → the diagnosis of **Tension pneumothorax** can be made [a **surgical emergency**]

④ Assess for the presence of mediastinal lymph nodes [best evaluated by CT]. If present mention their anatomic sites also mention the texture [homogenous, heterogenous, areas of breakdown, matrix calcifications]

NB Mediastinal lymph nodes can only be seen in cases of LAM and some cases of lymphocytic pneumonia.

⑤ Assess the upper abdomen for the presence of focal hepatic lesions, lymph nodes, ascites,...

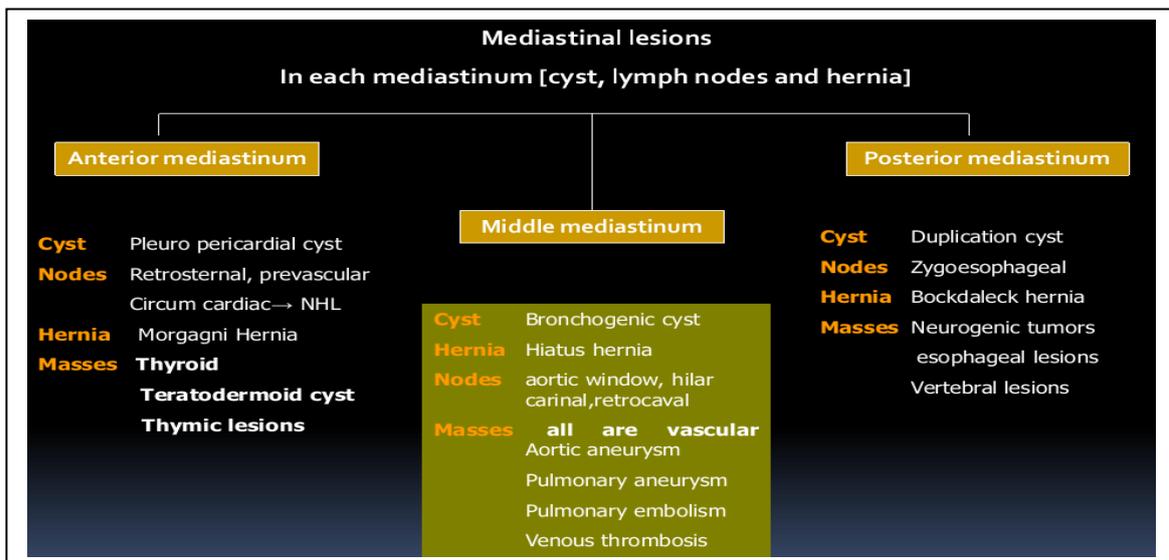


Mediastinal Pathology

Chest X- rays have a limited role in assessment of mediastinal masses

& the diagnosis is usually reached by **CT** and confirmed by **Biopsy**.

- In each mediastinum [anterior, middle and posterior], there is a cyst, lymph nodes and one type of herniae.

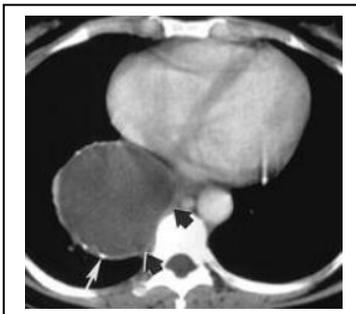


[A] Mediastinal cyst

- ↪ Pleuropericardial cyst [anterior mediastinum],
- ↪ Bronchogenic cyst [middle mediastinum] and
- ↪ Esophageal duplication cyst [posterior mediastinum]

- ① A well defined cystic lesion is seen in ____ [mention the anatomic site, which mediastinum] measuring ____ X ____ cm in maximal diameters.
- ② The cyst contain clear fluid of water density with thin non enhancing margin. No internal septations or mural calcifications could be seen.

NB The cyst may show **internal septations** and may show **mural calcification**, then mention that.



- ③ Assess for the presence of pleural / Pericardial effusion,
- ④ Assess for the presence of mediastinal lymph nodes [best evaluated by CT]. If present mention their anatomic sites

NB No mediastinal lymph nodes usually seen in cases of mediastinal cysts.

- ⑤ Assess the upper abdomen for the presence of focal hepatic lesions, lymph nodes, ascites,...

[B] Mediastinal hernia

↪ **Hernia of Morgagni** [anterior mediastinum],

↪ **Hiatus hernia** [middle mediastinum],

↪ **Hernia of Bochdaleck** [posterior m.]

① A **sizable** [or **small**] diaphragmatic hernia is seen in ____ mention the site, (which mediastinum) containing ____ [mention the contents, part of the stomach, bowel loops, liver, spleen, omentum, vessels,...]

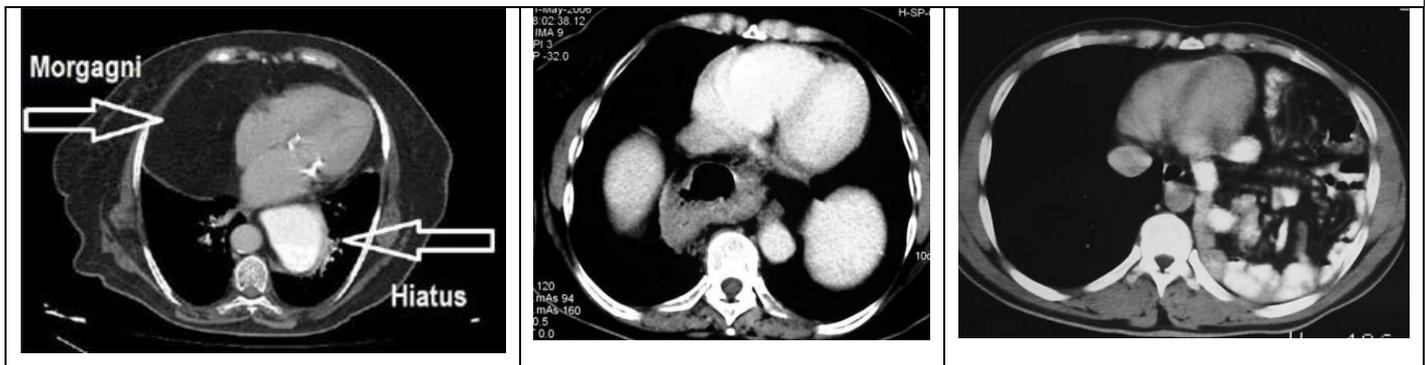
② ***Except for the hiatus hernia***, the lesion usually compresses the adjacent lung parenchyma with variable degree of atelectasis or consolidation collapse \pm mediastinal shift to the contralateral side.

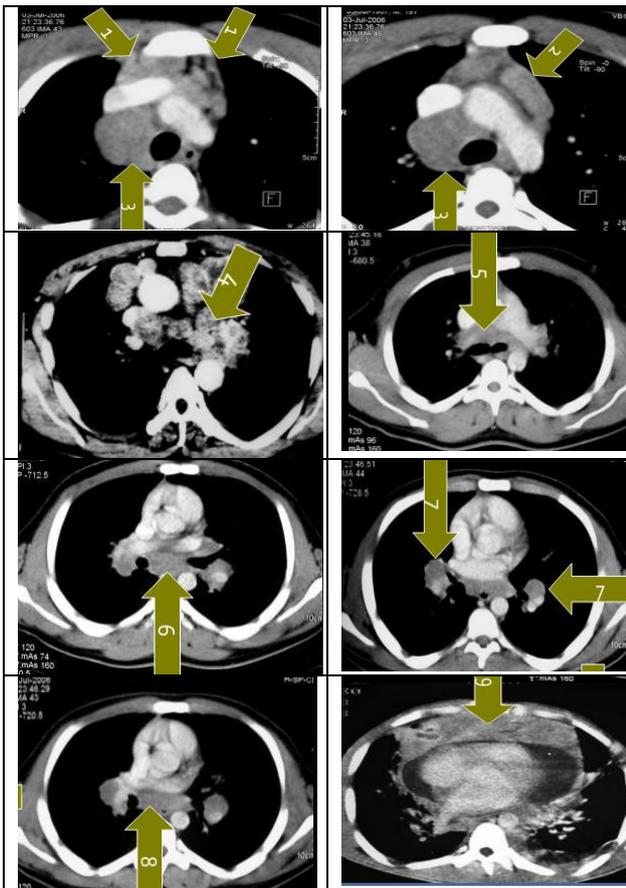
③ Assess for the presence of pleural effusion, if present mention its site (Rt or left or bilateral) and amount (mild, moderate,...)

In CT scans also mention if pericardial effusion is present or not

④ No CT evidence of enlarged hilar or mediastinal lymph nodes

⑤ Assess the upper abdomen for the presence of focal hepatic lesions, lymph nodes, ascites,..



[C] Mediastinal lymphadenopathy

9 sites for mediastinal lymph nodes

- 1-Retrosternal: behind the edges of the manubrium sterni
- 2-Prevascular : Along the lateral border of the aortic arch
- 3-Retrocaval: Posterior to the superior vena cava
- 4-Aortic window: between the ascending and descending aorta and above the pulmonary artery
- 5-Precarinal: anterior to the tracheal bifurcation
- 6-Subcarinal: below the tracheal bifurcation in the midline
- 7- Bronchopulmonary "Hilar" : At the hilar region
- 8- Zygo- esophageal: between the heart and esophagus
- 9- Circum cardiac: Around the heart specially anteriorly

① Evidences of enlarged mediastinal lymph nodes in the _____, _____, _____
 [mention the sites of enlarged nodes according the above mentioned data].

The affected nodes appear as soft tissue masses of variable sizes at their anatomic locations. They showed homogenous enhancement with no areas of breakdown or matrix calcifications.

NB Some nodes may show areas of **breakdown** (inflammatory and metastatic nodes), others may show **calcifications** (TB, sarcoidosis, pneumoconiosis,..)

NB **Lymphomatous nodes** are usually bulky and show homogenous enhancement with no areas of breakdown or calcifications. They usually encase the mediastinal vessels with evident vascular compromise.

NB **Circum cardiac** lymph nodes are almost always seen in **NHL**

- ② Clear both lung fields with no evidence or pulmonary parenchymal lesions
- ③ Assess for the presence of pleural / Pericardial effusion,
- ④ Assess the upper abdomen for the presence of focal hepatic lesions, lymph nodes, ascites,..

Mediastinal lesions [CT only]

[A] Thymic mass

① A relatively well defined **soft tissue mass** lesion is seen in the anterior mediastinum behind the sternum.

② The lesion measures ____ X ____ cm in maximal transverse diameters.

It showed homogenous [or heterogenous] CT density and enhancement \pm hypodense areas of breakdown seen inside the lesion.

NB Matrix calcifications are not usually seen in thymic masses ,if present, then mention that.

③ The lesion is seen compressing the superior mediastinal vessels (aortic arch, SVC, innominate veins) which are displaced posteriorly

NB **Thymic tumors** may invade the **SVC** or **aortic arch**, then the tumor is known to be **invasive**.

↳ The word "**invasive**" is more commonly used than the word "**malignant**" to express the aggressive nature of the lesion.

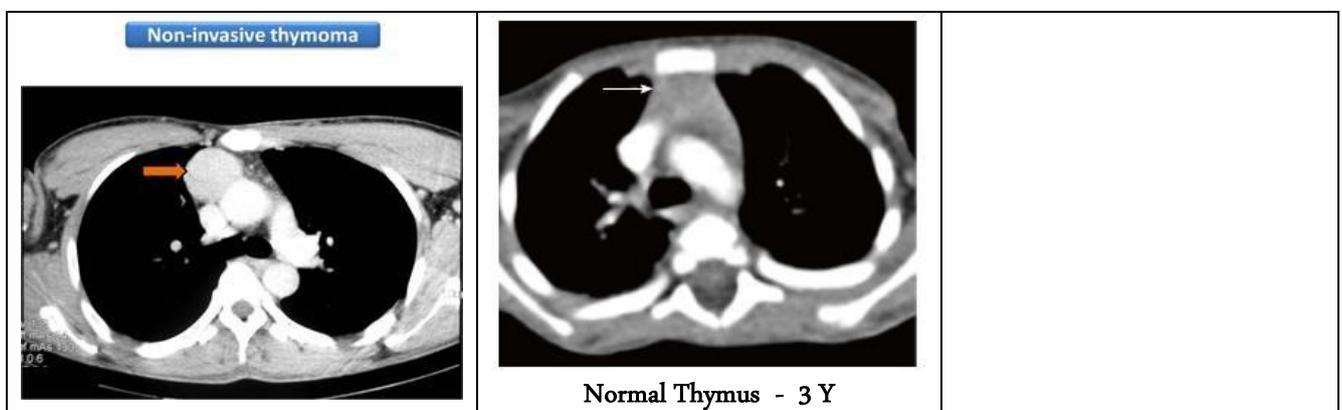
↳ **Vascular invasion** of the mediastinal vessels by mediastinal tumors is suspected whenever there is a **tumor tissue inside the vessel lumen**. →

This possibility is better evaluated by MRI than CT

④ Assess for the presence of mediastinal lymph nodes, if present mention their anatomic sites also mention the texture [homogenous, heterogenous, areas of breakdown, matrix calcifications]

⑤ Assess for the presence of pleural effusion, if present mention its site (Rt or left or bilateral) and amount (mild, moderate,...)

⑥ Assess the upper abdominal section for the presence of focal hepatic lesions, lymph nodes, ascites,..



[B] Teratodermoid cyst

- ① A relatively well defined soft tissue mass lesion is seen in the anterior mediastinum behind the sternum.
- ② The lesion measures ____ X ____ cm in maximal transverse diameters. It showed **heterogenous** CT density with hypodense areas of fat density and hyperdense foci of calcifications.

NB **Teratodermoid cysts** usually extend on both sides of the mediastinum, but more to one side than the other

↳ Cystic areas of fluid density may be also seen within the lesion.

↳ The lesion usually displaces the vessels without compression

- ③ Assess for the presence of mediastinal lymph nodes, if present mention their anatomic sites also mention the texture [homogenous, heterogenous, areas of breakdown, matrix calcifications]
- ④ Assess for the presence of pleural effusion, if present mention its site (Rt or left or bilateral) and amount (mild, moderate,...)
- ⑤ Assess the upper abdominal section for the presence of focal hepatic lesions, lymph nodes, ascites,...

NB **Teratodermoid cysts** whenever malignant, they can invade the mediastinal vessels and may have metastatic mediastinal nodes.

[C] Thyroid mass with retrosternal extension [X ray and CT]

- ① Enlarged ____ (left, right or both) thyroid lobe (s) being the seat of a sizable soft tissue mass of heterogenous CT density and enhancement.
- ② The mass measures ____ X ____ in maximal transverse diameters and showed scattered foci of matrix calcifications

NB In cases of affection of both thyroid lobes measure the largest lesion

NB **Calcium** is usually present in cases of nodular goiter and some cases of thyroid cancer.

- ③ The enlarged thyroid is seen extending into the superior mediastinum compressing and displacing the trachea to the ____ (left or right) side.
The inferior extension of the lesion reaches the ____ (innominate vein, aortic arch, ...)

NB The thyroid gland may be enlarged with or without extension into the superior mediastinum, then you write: *that the enlarged thyroid lobe does not extend retrosternally*

NB The retrosternal extension of the thyroid mass is only diagnosed when you can identify a thyroid tissue behind the sternum

④ Assess for the presence of mediastinal lymph nodes, If present mention their anatomic sites also mention the texture [homogenous, heterogenous, areas of breakdown, matrix calcifications]

NB **Nodular goiter** is not associated with **mediastinal lymph nodes** then you can write: *No CT evidence of changed mediastinal lymph nodes.*

But **thyroid cancer** may be associated with **mediastinal lymph nodes** as well as **pulmonary deposits**

⑤ Assess for the presence of pleural effusion, if present mention its site (Rt or left or bilateral) and amount (mild, moderate,...)

⑥ Assess the upper abdominal section for the presence of focal hepatic lesions, lymph nodes, ascites,..

NB **Thyroid mass is the most common causes of trachea compression and displacement.**

[D] Aortic aneurysm

① There is considerable dilatation of the ____ [mention the effected part of the aorta, ascending, arch, descending,____] measuring ____ cm in maximal cross sectional diameters.

② The affected part of the aorta shows homogenous enhancement with no evidence of mural thrombosis or intimal dissection. No evidence of aneurysmal leakage

NB *The aneurysm may show internal thrombus then write:* The affected part of the aorta shows an intraluminal non enhancing lesion representing mural thrombosis.



NB **Leaking aortic aneurysm** is a surgical emergency, if present you will see the hemorrhage as a **soft tissue density surrounding the aorta and extending into the retroperitoneal space**

③ Normal appearance of the rest of the aorta as well as the pulmonary artery and its main branches.

④ Assess for the presence of mediastinal lymph nodes, if present mention their anatomic sites also mention the texture [homogenous, heterogenous, areas of breakdown, matrix calcifications]

NB **Aortic aneurysms are not associated with mediastinal lymphadenopathy then write:** No CT evidence of enlarged hilar or mediastinal lymph nodes.

However lymph nodes in the mediastinum may be present due to other associated pathology like lymphoma, sarcoidosis,...

- ⑤ Assess for the presence of pleural effusion, if present mention its site (Rt or left or bilateral) and amount (mild, moderate,...)
- ⑥ Assess the upper abdominal section for the presence of focal hepatic lesions, lymph nodes, ascites,...

[E] Aortic dissection

In cases of aortic dissection you should mention the **extent of the dissecting intimal flap** affecting which part of the aorta [ascending only, arch and descending aorta, whole aorta down to ____ mention the level of the end of dissection]

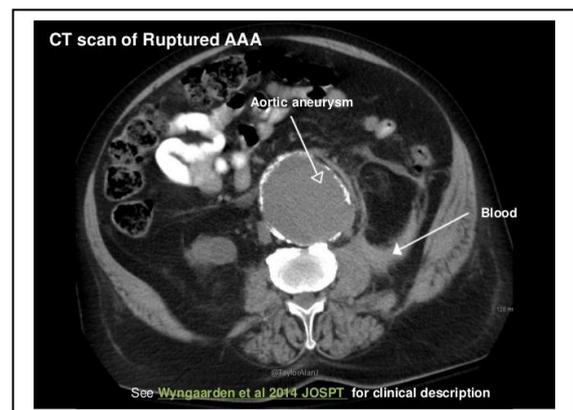
- ① A hypodense dissecting intimal flap is seen involving ____ [mention the part of the aorta that is affected by dissection]. The flap is seen extending along the aortic course down to ____ [mention the level of termination, above renal, infrarenal, aortic bifurcation,..]
- ② The intimal flap separates the true and false aortic lumens both are patent as evidenced by **homogenous contrast enhancement** of both lumens

NB The **false lumen** may be the thrombosed, then write: no contrast enhancement seen in the false lumen denoting its thrombosis

NB The **false lumen** is usually located along the posterolateral aspect of the true lumen.

NB The dissection may involve the origin of any of the aortic branches with or without ischemic changes of the organ supplied by the affected branch.

- ④ Normal appearance of the rest of the aorta as well as the pulmonary artery and its main branches.
- ⑤ Assess for the presence of pleural effusion, if present mention its site (Rt or left or bilateral) and amount (mild, moderate,...)
- ⑥ Assess the upper abdominal section for the presence of focal hepatic lesions, lymph nodes, ascites,...



Pleural effusion

① A ____ (Rt. or left) sided pleural effusion is seen obliterating the costophrenic recesses and rising towards the axilla

NB When the effusion is large, there will be compression of the underlying lung parenchyma and may be shift of the mediastinal structures to the opposite side.

② Clear both lung fields with no evidence of pulmonary parenchymal nodules or patches.

③ No evidence of pericardial effusion (in cases examined by CT) nor pleural effusion on the opposite side.

④ No radiological (or CT) evidence of enlarged mediastinal lymph nodes.

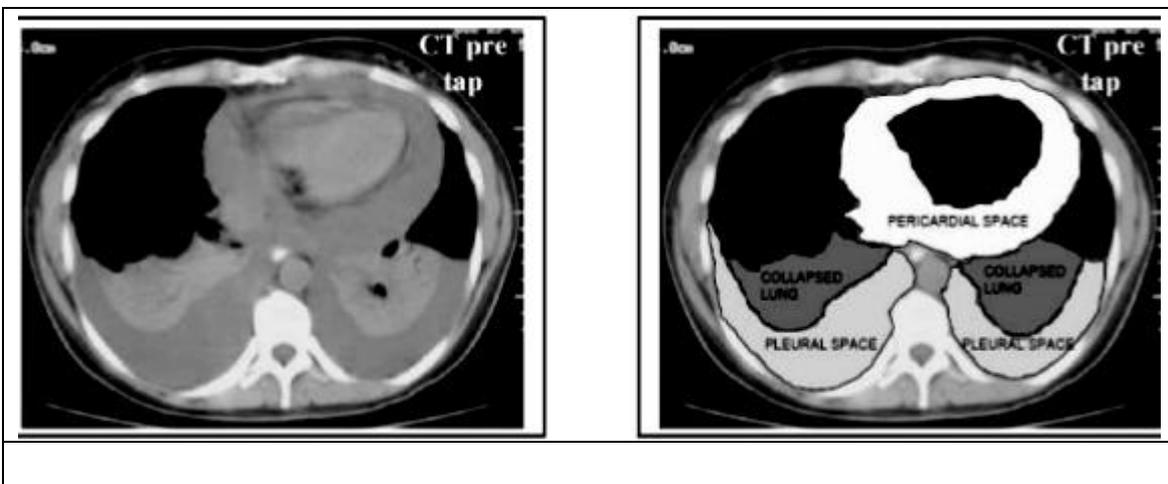
⑤ Upper abdominal sections are free.

NB **Encysted pleural effusion may occur in the fissure, along the chest wall or along the mediastinal border. Then write:** An elliptical (or oval) shaped encysted pleural collection is seen on the ____ (left or Rt.) side along the ____ (major or minor fissure, costal margin,...). No evidence of marginal enhancement or intracystic air loculi

NB Both free and encysted effusions may occur in the same case and on the same side.

NB In cases of **pleural empyema**, the fluid is usually **encysted** with **thick enhancing margin** and may contain **air loculi** usually due to bronchopleural fistula rather than infection with gas forming organisms.

NB Massive pleural effusion may totally obliterate the hemithorax and cause total collapse of the underlying lung. In this case no shift of the mediastinal structures seen.



Pleural mesothelioma

- ① Right (or left) sided diffuse (or focal) **non uniform pleural thickening** is seen affecting the ____ (costal, mediastinal, diaphragmatic, all) pleural surfaces being more pronounced near the costodiaphragmatic recesses.
- ② The lesion **encases the underlying lung** which showed partial volume loss.
- ③ **Pleural plaques of calcifications** are seen within the lesion (also may be seen on the opposite non involved side). Associated ____ (mild, moderate,..) ipsilateral pleural effusion is seen with consequent compression of the underlying lung parenchyma \pm patchy areas of consolidation.

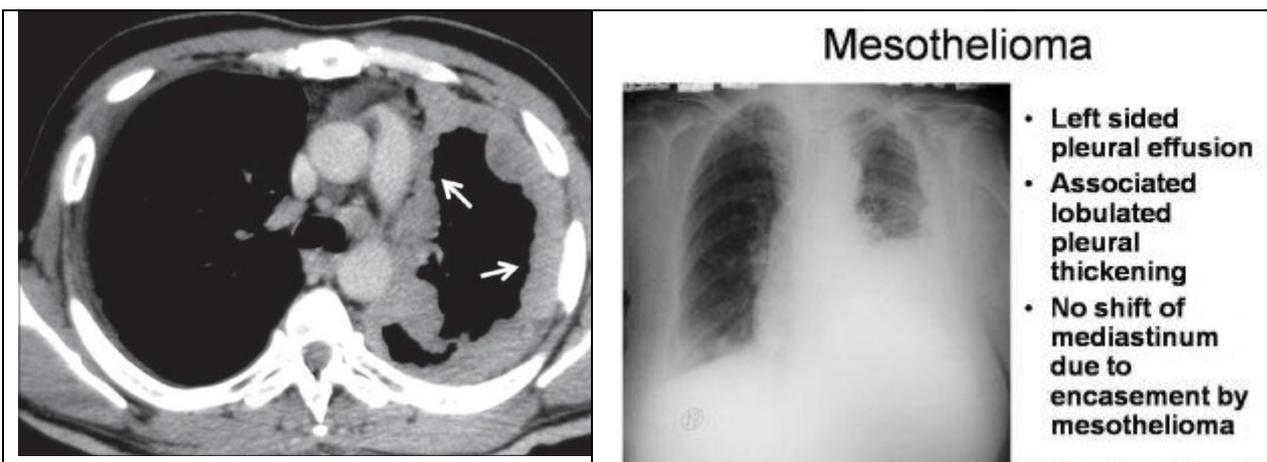
NB The pleural lesion may :

- ↳ **invade the mediastinum** and extends across the midline to the opposite side.
- ↳ invade the chest wall with **rib destruction**
- ↳ Extend into the upper abdomen around the liver through the pleuro-peritoneal recesses.

If these finding are present you should mention them in the report, if not also mention that.

- ④ Pleural mesothelioma may be associated with mediastinal lymphadenopathy then mention the sites of the enlarged nodes
- ⑤ If pericardial effusion is present, then mention it
- ⑥ Mesothelioma may have liver deposits and abdominal lymph nodes then mention that in the report, if not also mention that.

NB Pleural metastases and lymphoma are also described in a similar way to mesothelioma.



.....Thanks very much for our Prof. Mamdouh Mahfouz for the original file of this re-edit

A.M. Abodahab
8 Aug 2018