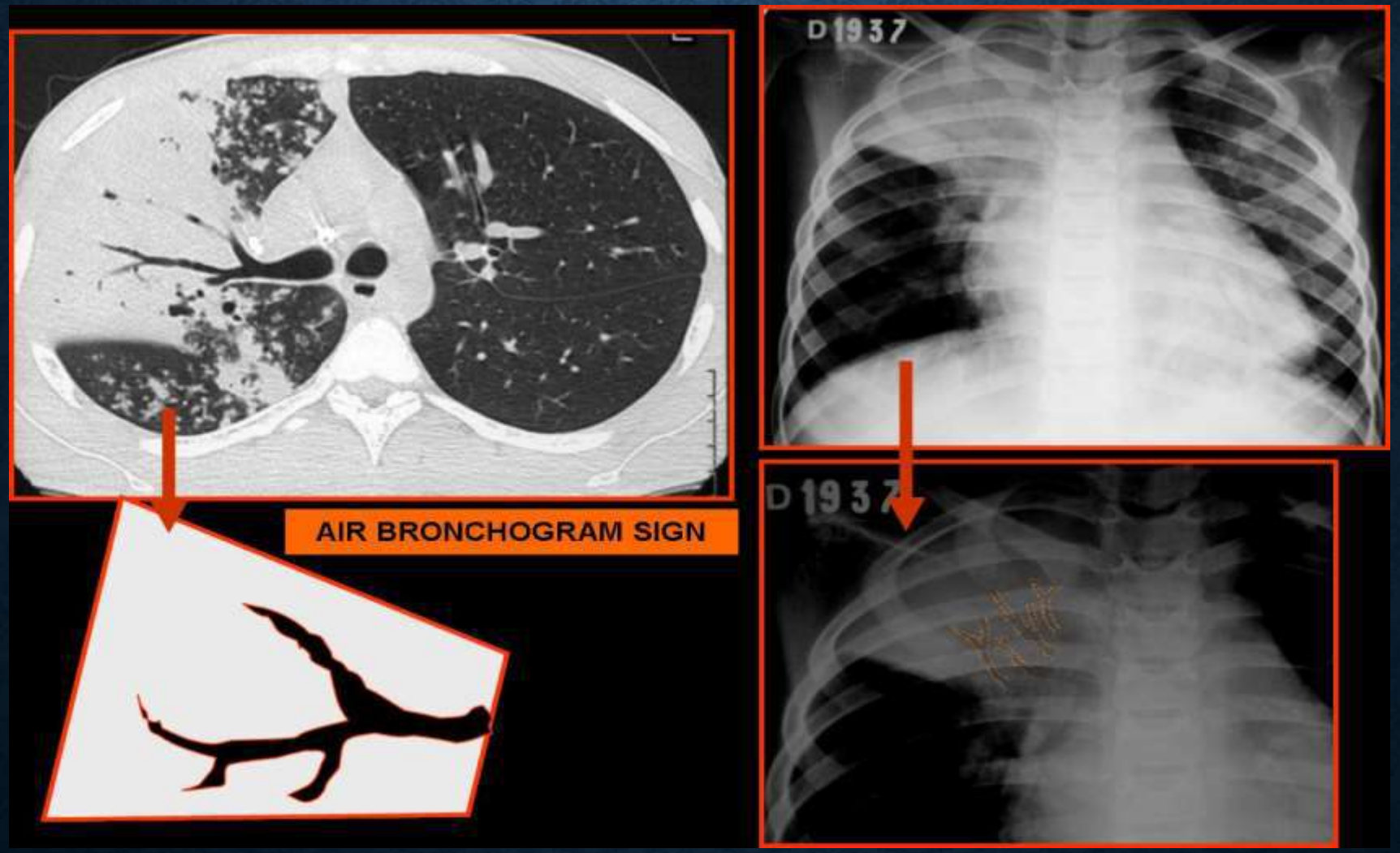
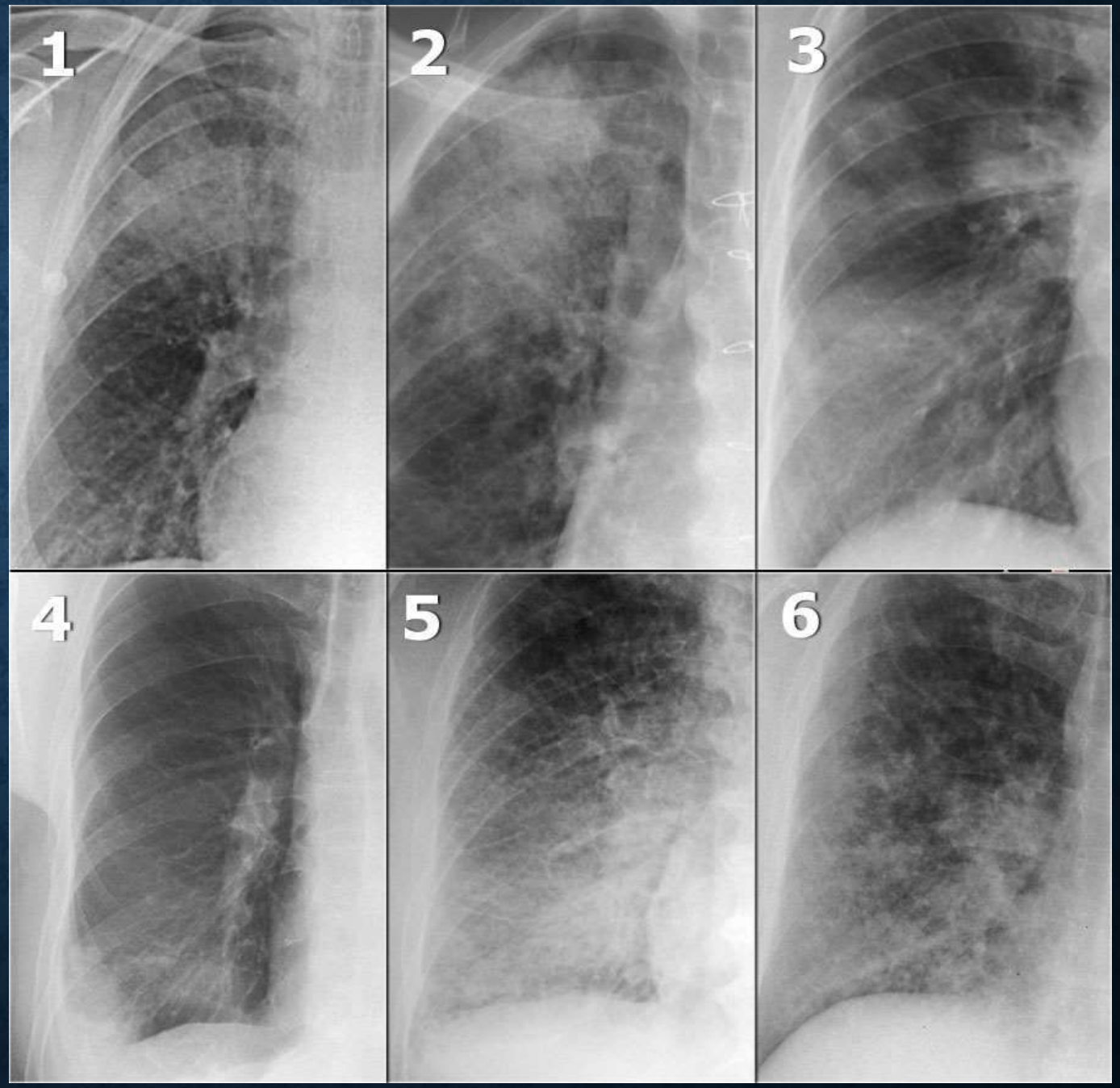
AIR BRONCHOGRAM SIGN



Air bronchograms in patients with RUL pneumonia

HERE WE HAVE A NUMBER OF X-RAYS WITH CONSOLIDATION.

NOTICE THE SIMILARITY BETWEEN THESE CHEST X-RAYS:



BASED ON THE IMAGES ALONE, IT IS USUALLY NOT POSSIBLE TO DETERMINE THE CAUSE OF THE CONSOLIDATION.

OTHER THINGS NEED TO BE CONSIDERED, LIKE ACUTE OR CHRONIC ILLNESS, CLINICAL DATA AND OTHER NON-PULMONARY FINDINGS.

-LOBAR PNEUMONIA - IN A PATIENT WITH COUGH AND FEVER.

-PULMONARY HEMORRHAGE - IN A PATIENT WITH HEMOPTESIS.

-ORGANIZING PNEUMONIA (OP) - MULTIPLE CHRONIC CONSOLIDATIONS.

-INFARCTION - PERIPHERAL CONSOLIDATION IN A PATIENT WITH ACUTE SHORTNESS OF BREATH WITH LOW OXYGEN LEVEL AND HIGH D-DIMER.

-PUMONARY CARDIOGENIC EDEMA - FILLING OF THE ALVEOLI WITH TRANSUDATE IN A

-PATIENT WITH CONGESTIVE HEART FAILURE. THIS WOULD BE MORE OBVIOUS IF YOU WERE SHOWN THE WHOLE IMAGE.

-SARCOIDOSIS - AT FIRST GLANSE THIS LOOKS LIKE CONSOLIDATION, BUT IN FACT THIS IS NODULAR INTERSTITIAL LUNG DISEASE, THAT IS SO WIDE-SPREAD THAT IT LOOKS LIKE CONSOLIDATION.

DIFFUSE CONSOLIDATION

THE MOST COMMON CAUSE OF DIFFUSE CONSOLIDATION IS PULMONARY EDEMA DUE TO HEART FAILURE.

CONGESTIVE HEART FAILURE:

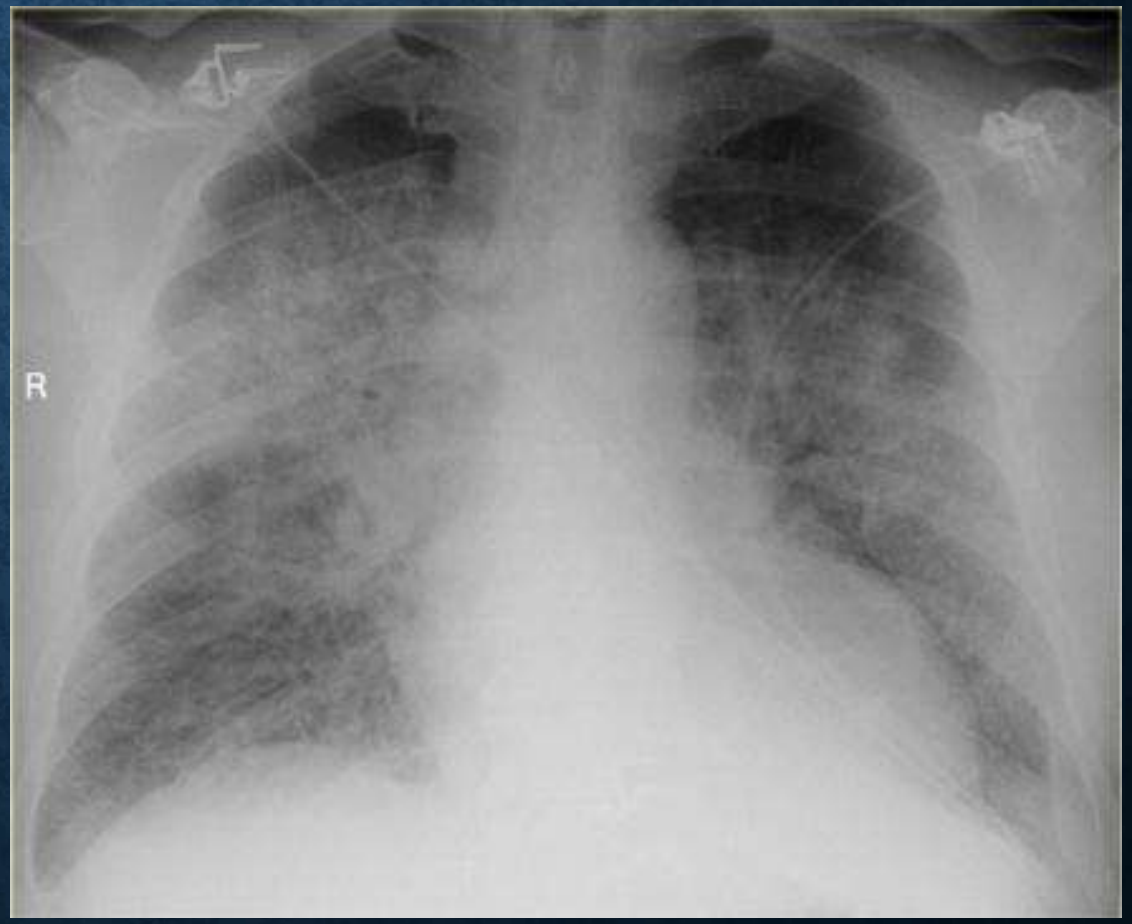
FIRST STUDY THE IMAGES, THEN CONTINUE READING. THE FINDINGS ARE:

BILATERAL PERIHILAR CONSOLIDATION WITH AIR BRONCHOGRAMS AND ILL-DEFINED BORDERS

1-AN INCREASED HEART SIZE
2-SUBTLE INTERSTITIAL MARKINGS

THESE FINDINGS INDICATE, THAT WE ARE DEALING **WITH PULMONARY EDEMA DUE TO HEART FAILURE.**

YOU PROBABLY WOULD LIKE TO LOOK AT OLD FILMS TO SEE IF THERE ARE ANY CHANGES.



DIFFUSE CONSOLIDATION IN BRONCHOPNEUMONIA

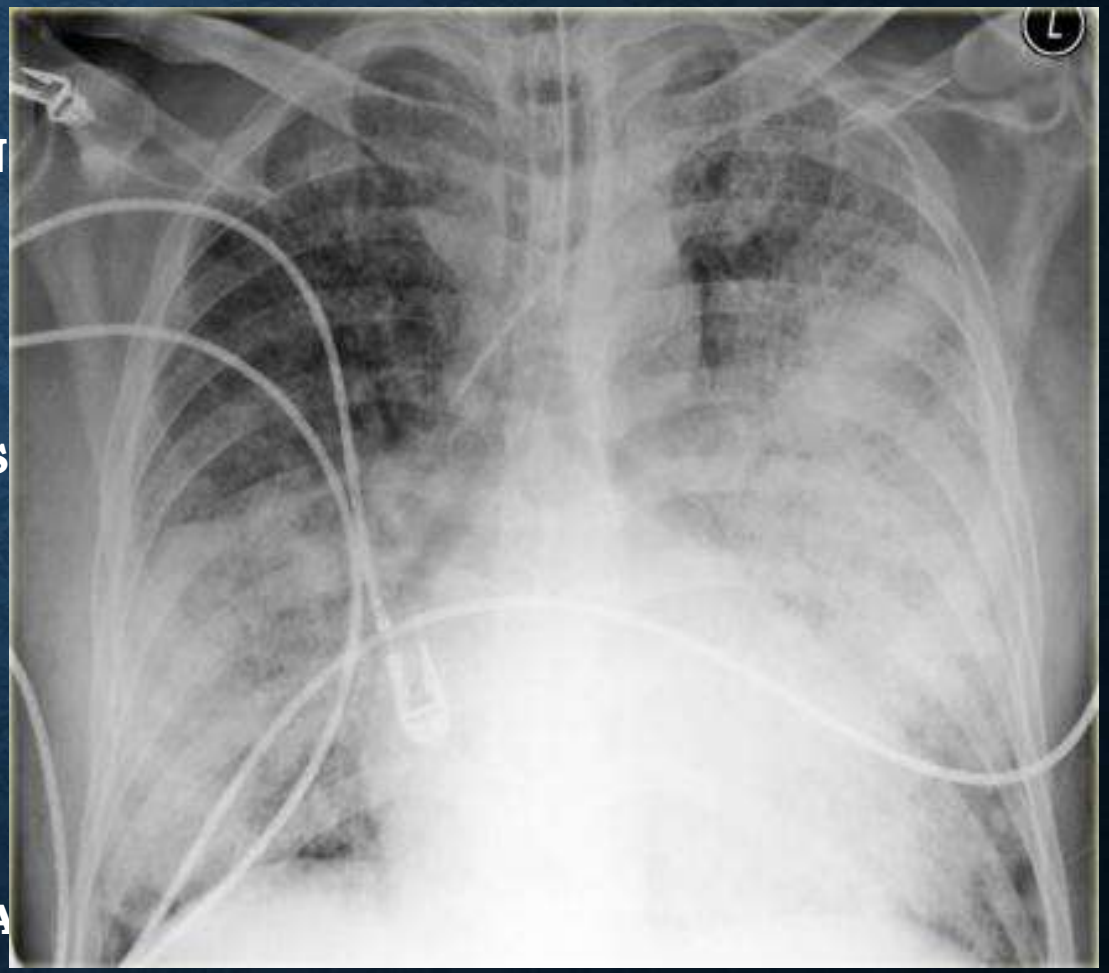
HERE ANOTHER CASE OF DIFFUSE CONSOLIDATION

THIS PATIENT HAD FEVER AND COUGH.

UNLIKE LOBAR PNEUMONIA, WHICH STARTS IN THE ALVEOLI, BRONCHOPNEUMONIA STARTS IN THE AIRWAYS AS ACUTE BRONCHITIS.

IT WILL LEAD TO MULTIFOCAL ILL-DEFINED DENSITIES. WHEN IT PROGRESSES IT CAN PRODUCE DIFFUSE CONSOLIDATION.
THE DISEASE DOES NOT CROSS THE FISSURES, BUT USUALLY STARTS IN MULTIPLE SEGMENTS.

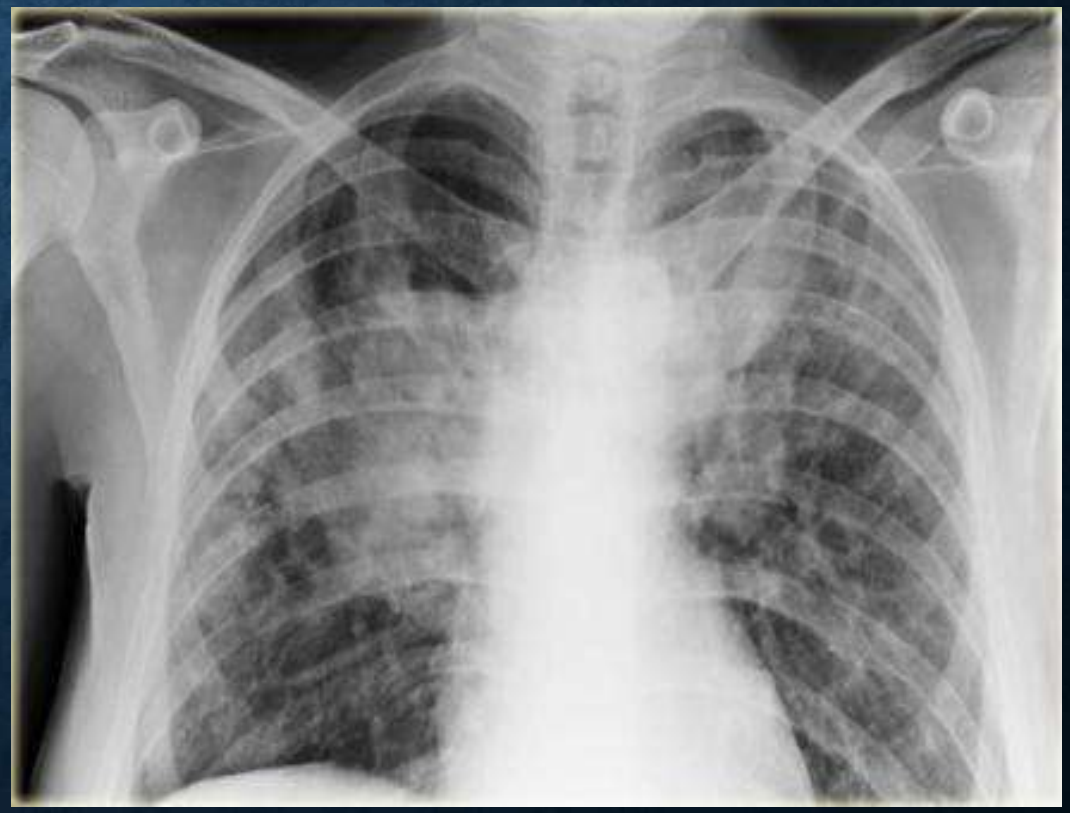
BRONCHOPNEUMONIA CAN BE CAUSED BY MANY MICRO-ORGANISMS. HIS PROVED TO BE LEGIONELLA PNEUMONIA



THIS IS A DIFFICULT CASE:

BASED ON THE X-RAY ALONE, IT IS NOT CERTAIN WHICH PATTERN WE ARE LOOKING AT.
ARE THESE DENSITIES MASSES OR CONSOLIDATION?

CONTINUE WITH THE CT.



INTERSTITIAL OPACITY: DDX

Differential diagnosis on HRCT

Most of our knowledge about imaging findings in interstitial lung disease comes from HRCT.

On HRCT there are four patterns: reticular, nodular, high and low attenuation (next table).

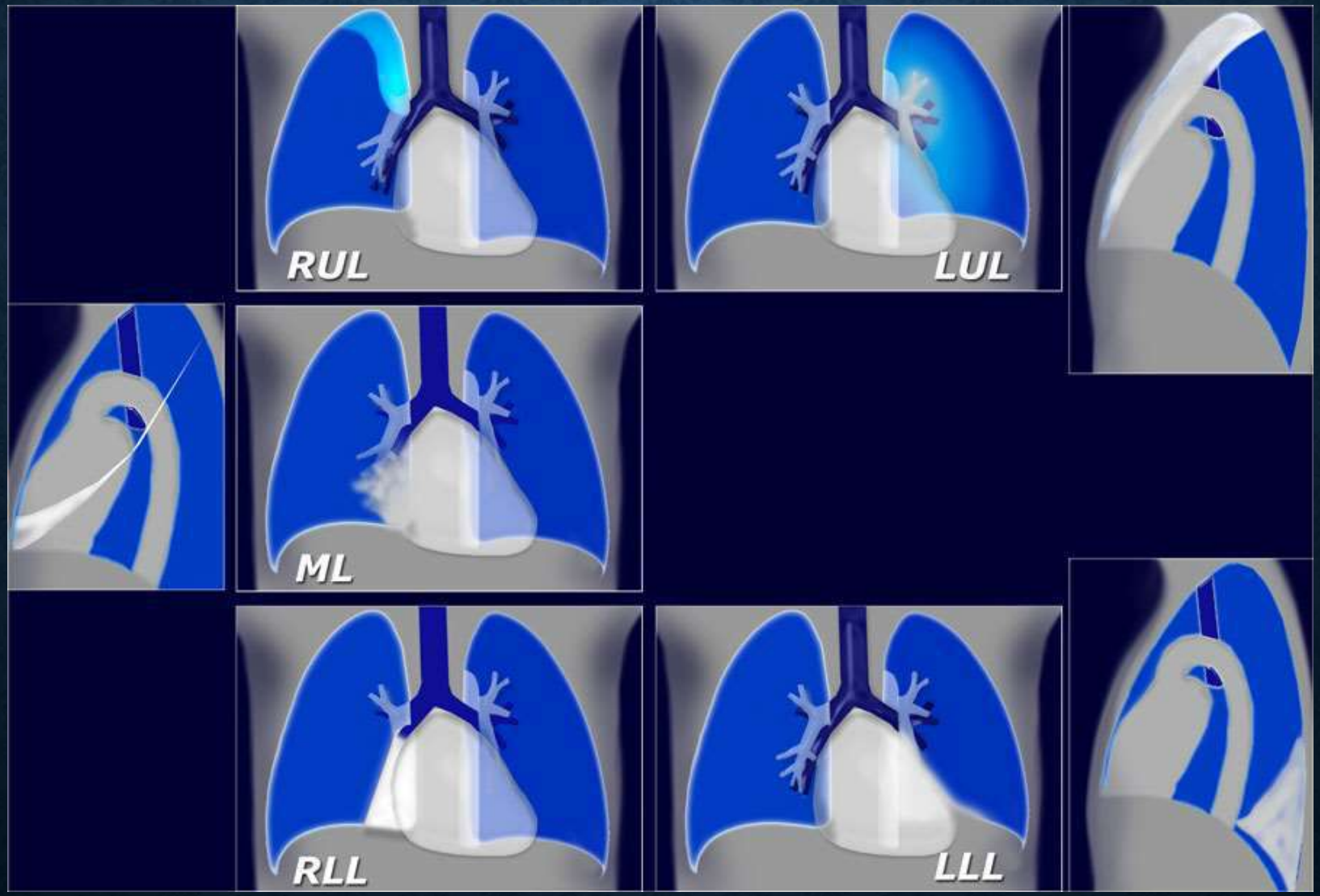
On a Chest X-Ray it can be very difficult to determine whether there is interstitial lung disease and what kind of pattern we are dealing with.
On a CXR the most common pattern is *reticular*.

The *ground-glass* pattern is frequently not detected on a chest x-ray.

HRCT basic interpretation

Dominant pattern	Reticular Nodular High attenuation (GG - consolidation) Low attenuation (cystic)
Distribution in secundary lobule	Centrilobular Perilymphatic Random
Distribution within lung	Upper versus Lower zone Central versus Peripheral

ATELECTASIS:



◈ ATELECTASIS

What do you see on this X-ray ?

Air is removed from the lung , the tissue collapses, resulting in Volume loss
The loss of volume causes nearby structures (fissures, hemidiaphragm, trachea) to shift toward the side loss.

Right upper lobe atelectasis
Upward shift of minor fissure (arrow)indicating volume loss in the right upper lobe.
Trachea is displaced towards this lesion

Courtesy of Dr Chantal Durand Head of Radiopediatric Department CHU Grenoble -France

RIGHT MIDDLE LOBE ATELECTASIS:

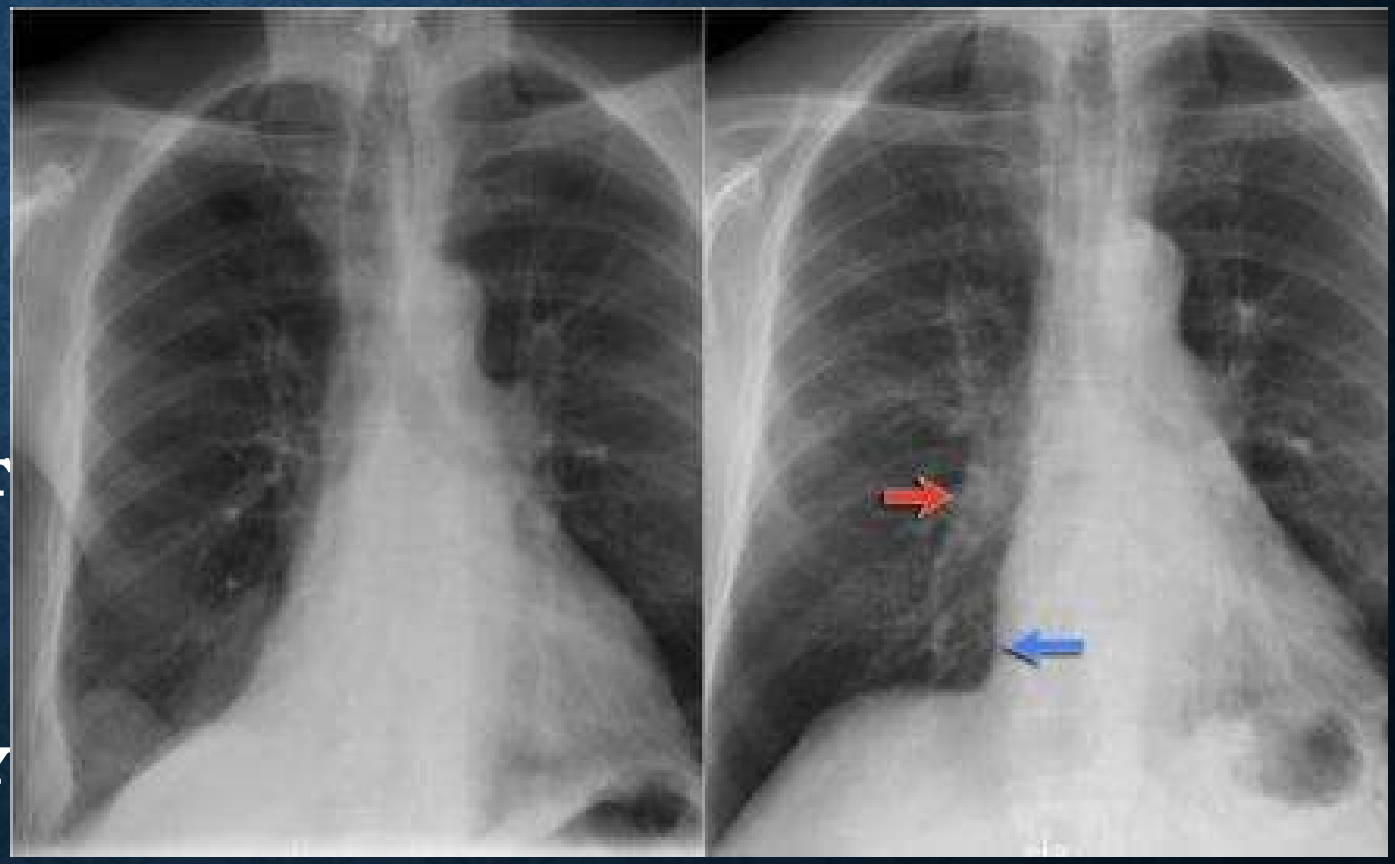
1- BLURRING OF THE RIGHT HEART BORDER (SILHOUETTE SIGN)

2- TRIANGULAR DENS

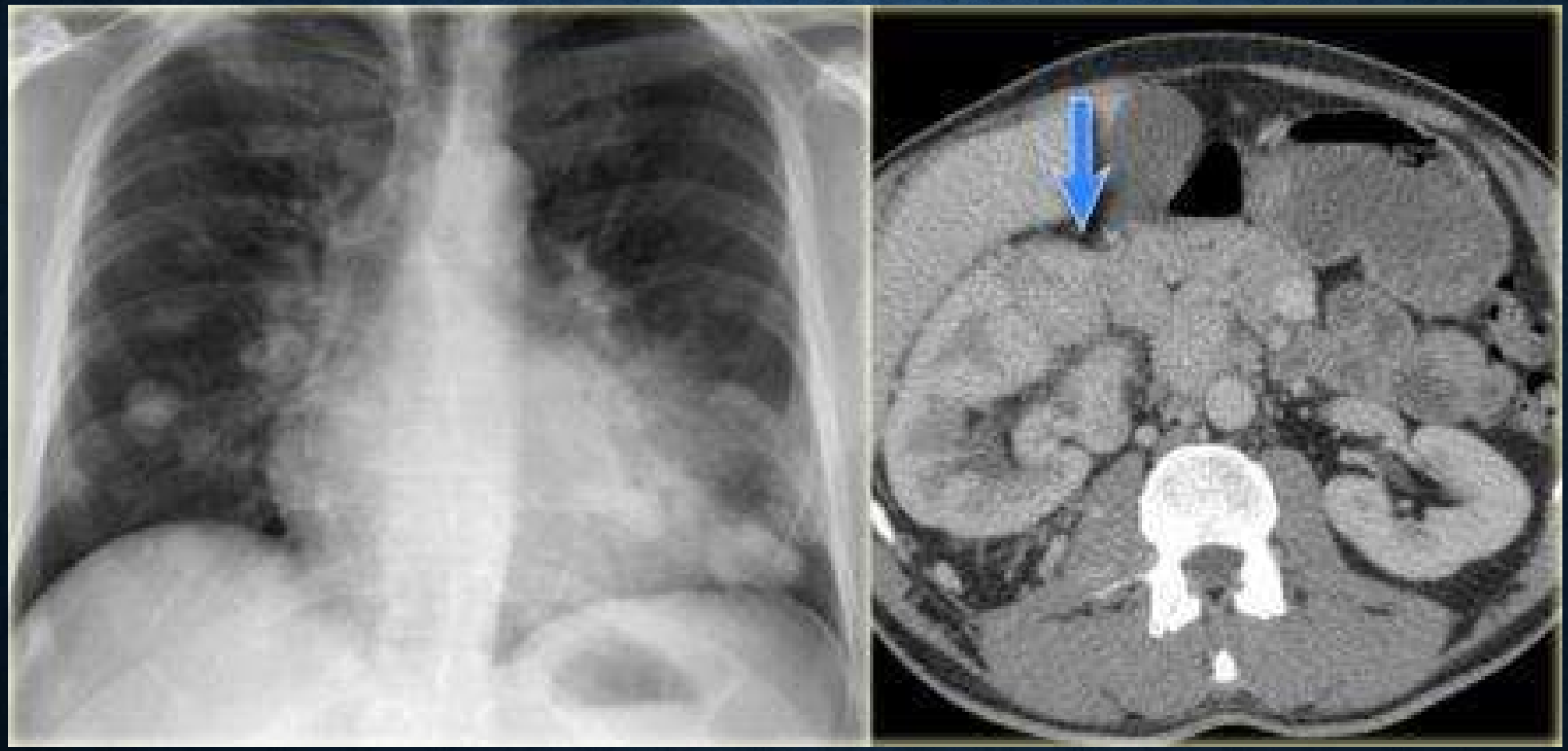
RLL ATELECTASIS:

NOTICE THE ABNORMAL RIGHT BORDER OF THE HEART.

ON A FOLLOW-UP: CHEST FILM THE ATELECTASIS HAS RESOLVED. WE ASSUME THAT THE ATELECTASIS WAS A RESULT OF POST-TRAUMATIC POOR VENTILATION WITH MUCUS PLUGGING.
NOTICE THE REAPPEARANCE OF THE RIGHT INTERLOBAR ARTERY (RED ARROW) AND THE NORMAL RIGHT HEART BORDER (BLUE ARROW).



Mass - Nodule:



SPN differential diagnosis

Most common

- Granuloma

Less common

- Bronchial carcinoma
- Metastasis
- Organizing pneumonia
- Hamartoma

Uncommon and rare

- Mucoid impaction
- Abscess
- Infected bulla
- Infarction
- Hematoma
- Rheumatoid nodule
- Wegener's granuloma
- Carcinoid
- Sarcoid granuloma
- AV-malformation
- Intrapulmonary lipoma or lymph node
- Hydatid cyst

Multiple Masses - diff. diagn

Neoplastic

- Metastases
  - Renal - GI - melanoma - uterus
  - testis - sarcoma
- Uncommon:
  - Bronchoalveolar cell ca
  - Lymphoma - Kaposi

Infection

- TB
- Fungal
  - Histoplasmosis
  - Coccidiodomycosis
  - Invasive aspergillosis
- Septic emboli

Inflammation

- Sarcoid
- RA-nodules
- Wegener's granulomas
- Organizing pneumonia

Vascular

- Rendu-Osler - AV-malform.
- Pulmonary infarcts

Inhalation

- Mucoid impaction (ABPA)
- Silicosis

Mediastinum Lines

Three of them are really important,
Especially for older children

◈Mediastinal Masses

Main specific aspects in child :

- Thymus

-Varies in size with age

- Adenopathy

-Often due to inflammatory or infectious causes

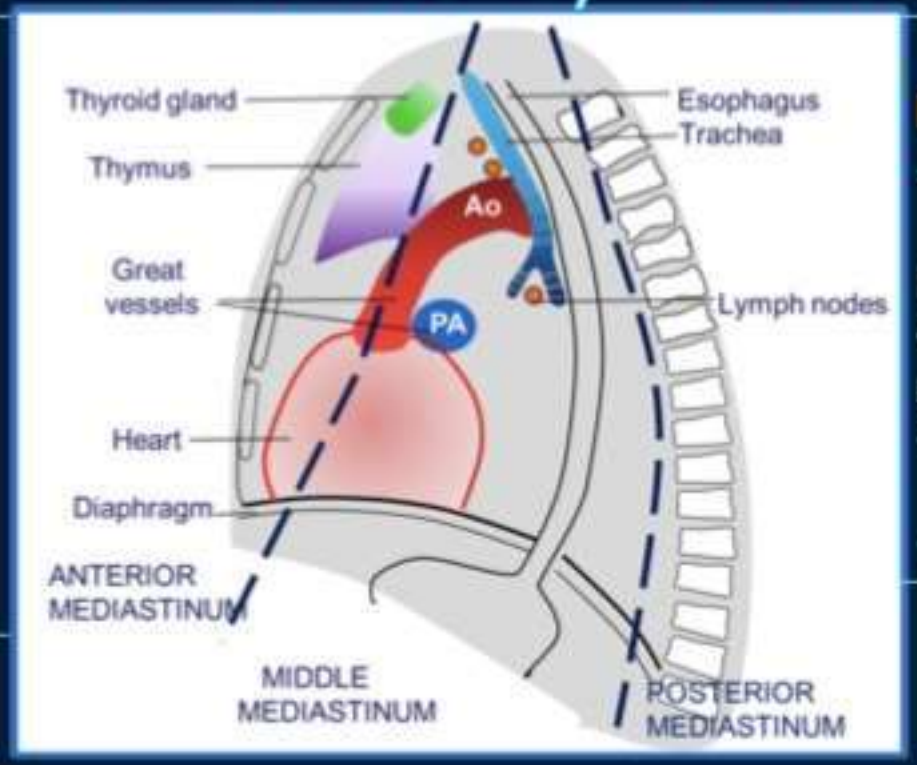
- Other mediastinal masses :

lymphoma, bronchogenic cyst,
neuroblastoma , neurofibroma

◈Mediastinal syndrom

ANTERIOR MEDIASTINUM

- Thymus
  - Hyperplasia +
  - Thymoma
- Thyroid
  Retrosternal goiter
- Lymphoma and Leukemia +
- Teratoma and Germinal tumors

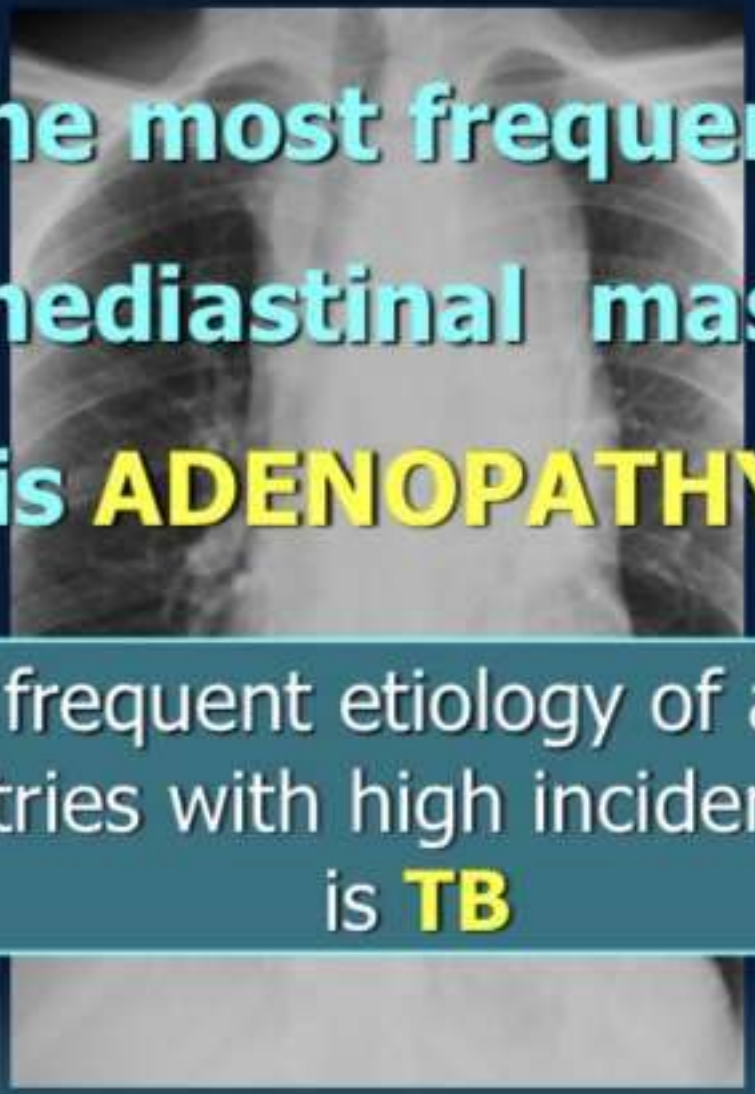


POSTERIOR MEDIASTINUM

- Neurogenic tumors
  Neuroblastoma
  Ganglioneuroma
  neurofibroma
- para spinal abscess
- Spinal tumor

MIDDLE MEDIASTINUM

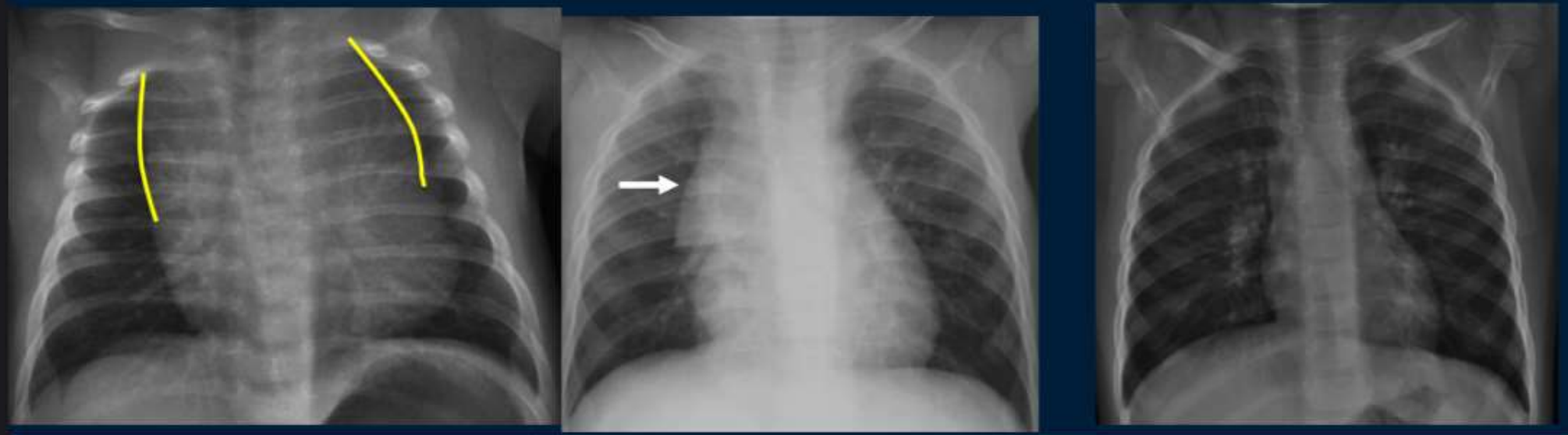
- Adenopathies ++
  - inflammatory
  - infectious
    Tuberculosis ++
- Lymphoma and Leukemia
- Bronchogenic Cyst



The most frequent mediastinal mass is ADENOPATHY

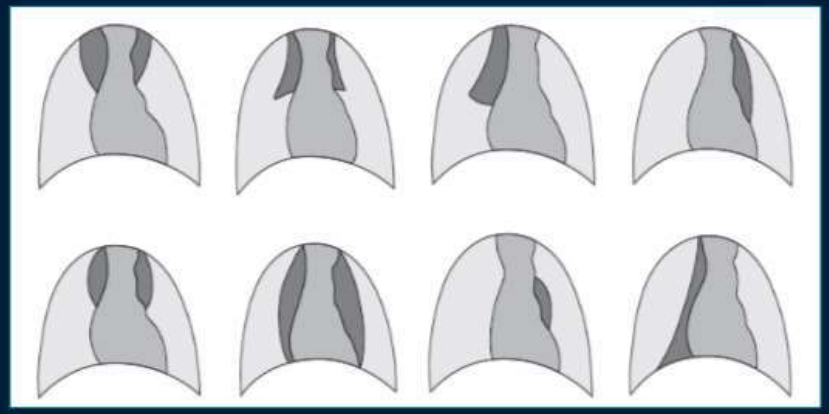
The most frequent etiology of adenopathy in countries with high incidence of TB is **TB**

Thymus : Image evolution with age

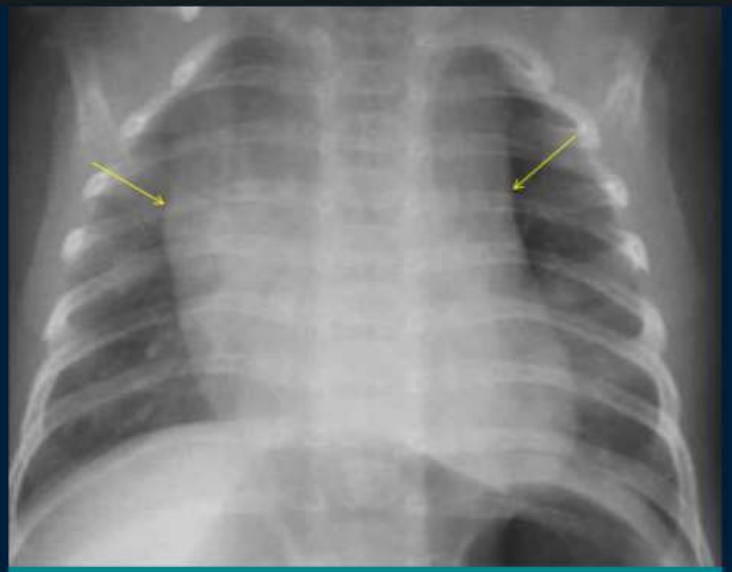


2 month old	7 month old	2 year old

Thymus: Various shapes and sizes



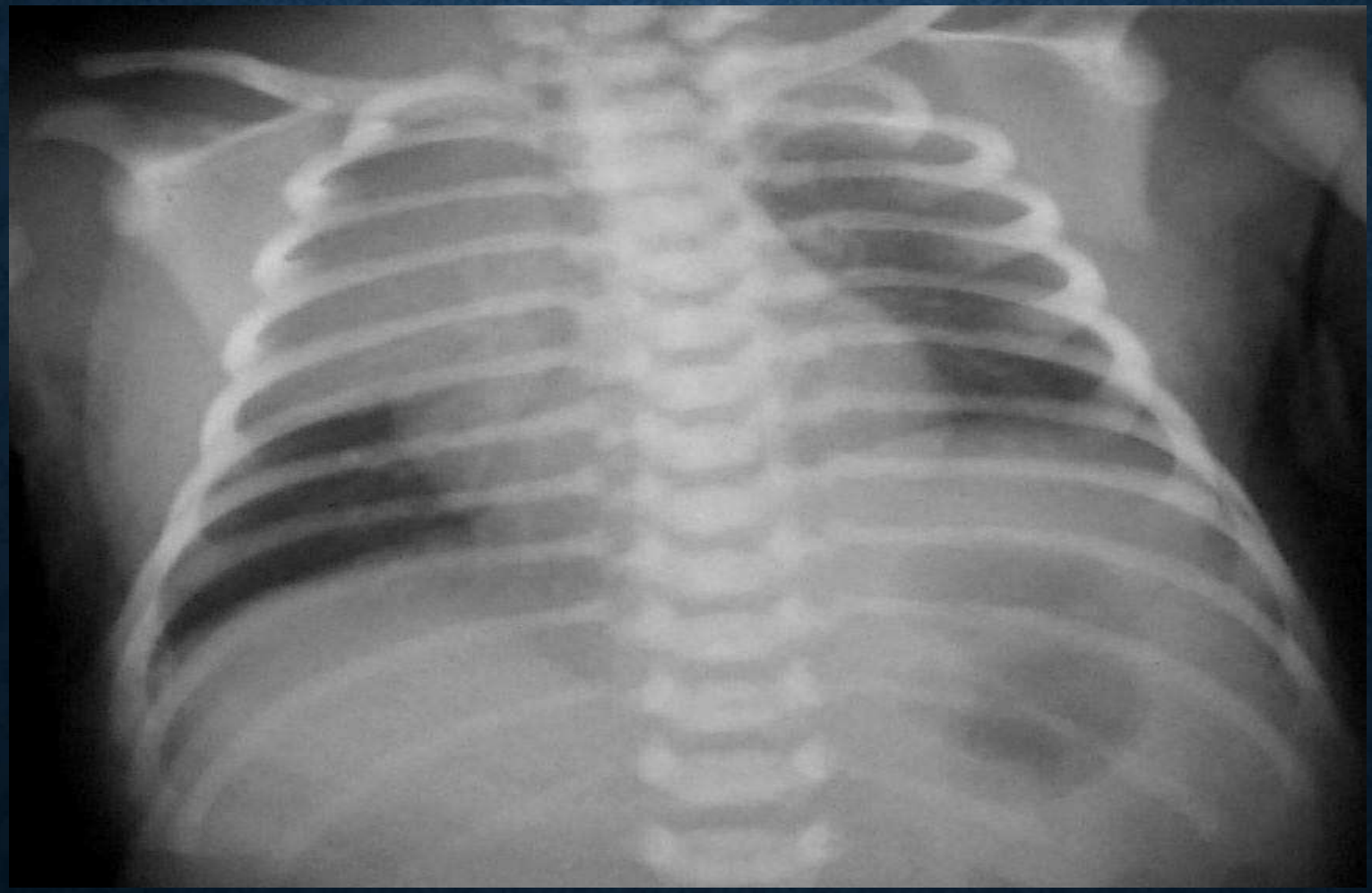
Chateil j-f. and coll EMC. 2005



Frontal view in an infant
A prominent thymus
gives an impression of widened mediastinum

Courtesy of Dr Chantal Durand Head of Radiopediatric Department CHU Grenoble -France

PROMINENT RIGHT THYMIC LOBE DUE TO ROTATION



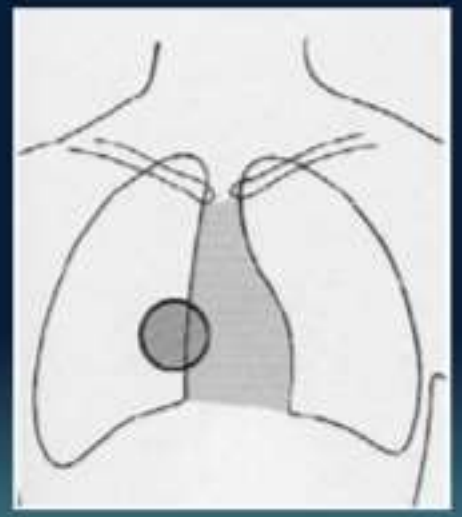
◈OPACITIES

Silhouette sign (Felson)

- A useful sign to localize opacities
- especially when a lateral view is not available

When 2 opacities of the same density are in contact with each other, their contours disappear.

► anterior opacity



When they are separated by any tissue of a different density (air), their respective contours are visible.

► posterior opacity

7 year old boy , what do you see on this X-ray ?

- mediastinal mass
- Where is it located?
- Posterior to the heart
- Why ?
- Right heart border not erased

What is your diagnosis ?

Bronchogenic cyst

16 year old girl with cough and fever

what do you see on this X-ray ?

perihilar widening with
convexe bilateral opacities

.Where is it located?

Anterior mass

.Why ?

erases the heart borders

What are most the likely diagnoses ?

A. Neuroblastoma
B. Hodgkin Lymphoma
C. Acute Lymphoblastic Leukemia
D. Thymic Hyperplasia

A. B. LYMPHOMA / LEUKEMIA

Anterior mediastinum

- Thymus
  - Hyperplasia +
  - Thymoma
- Thyroid

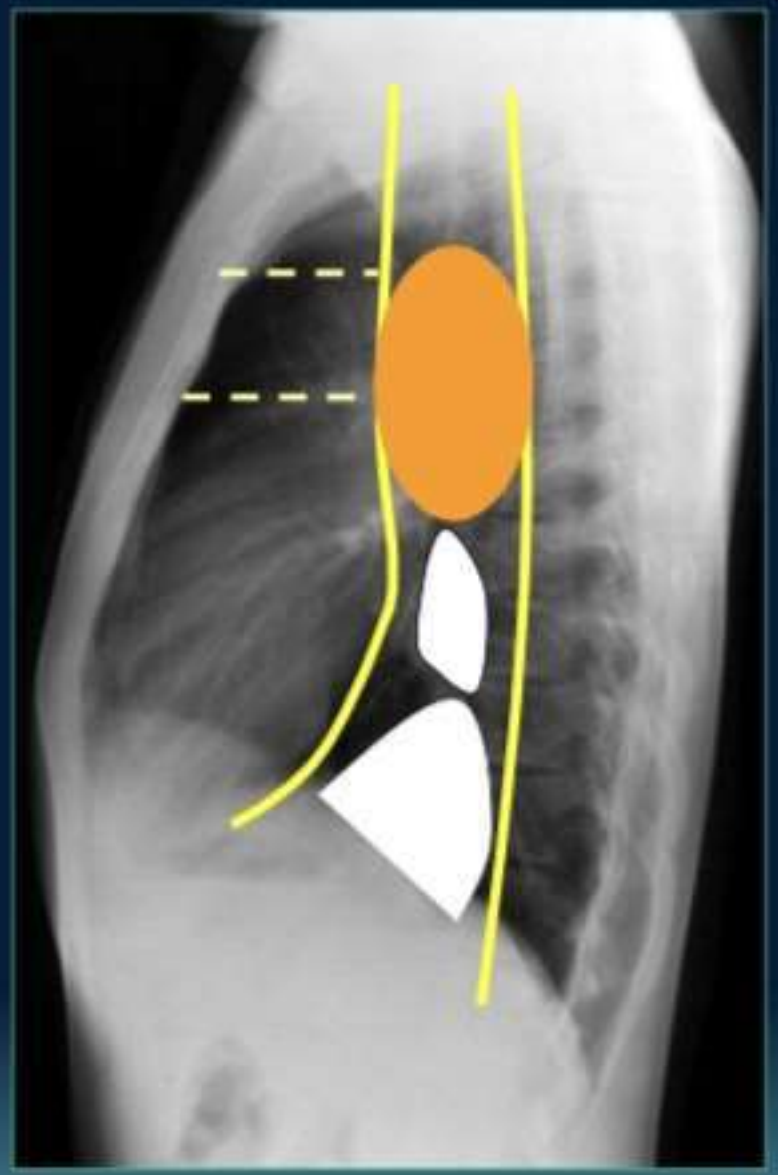
Retrosternal goiter

- Lymphoma and Leukemia +
- Teratoma

and Germinal tumors

Middle Mediastinum

- ADENOPATHIES +++
- TUBERCULOSIS >>
- Lymphoma, leukemia
- Bronchogenic cysts

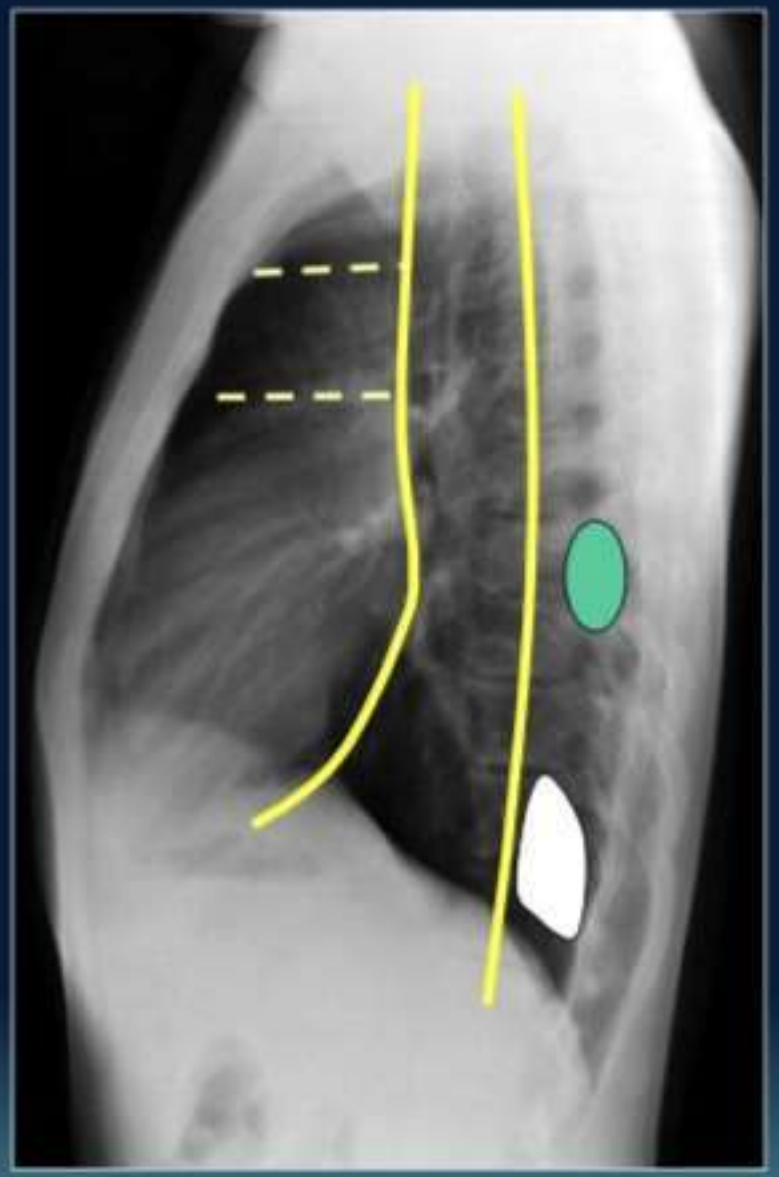


Posterior mediastinum

- Neurogenic tumours

and

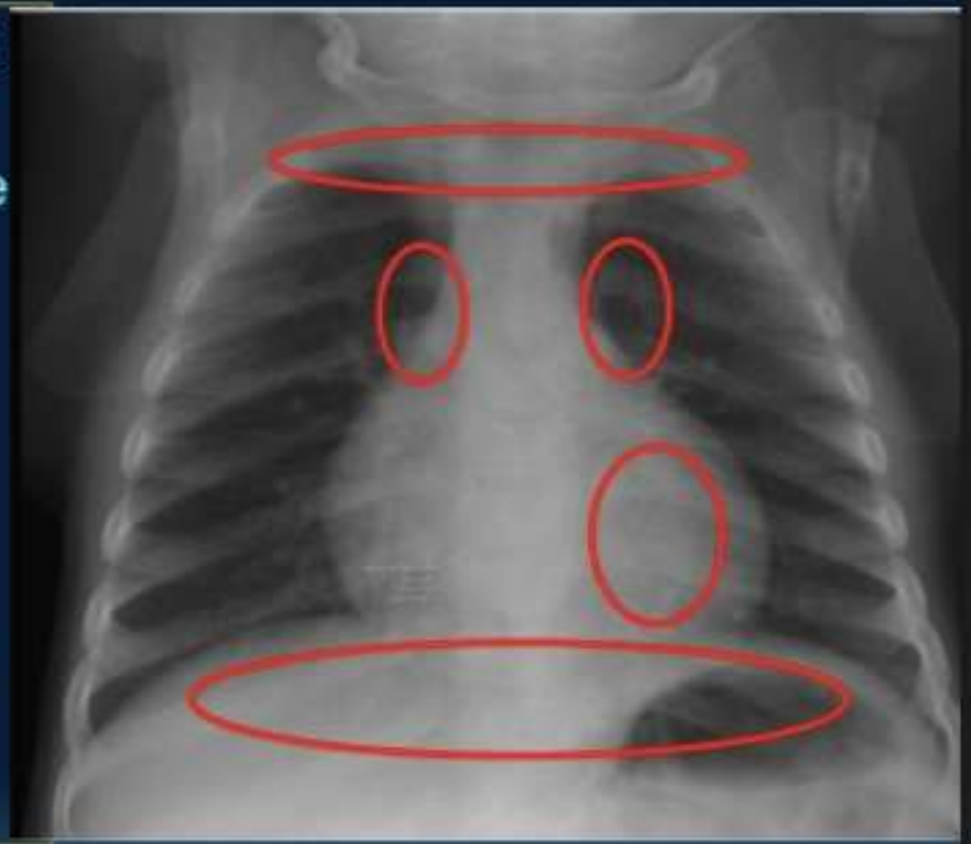
- Rachis pathology



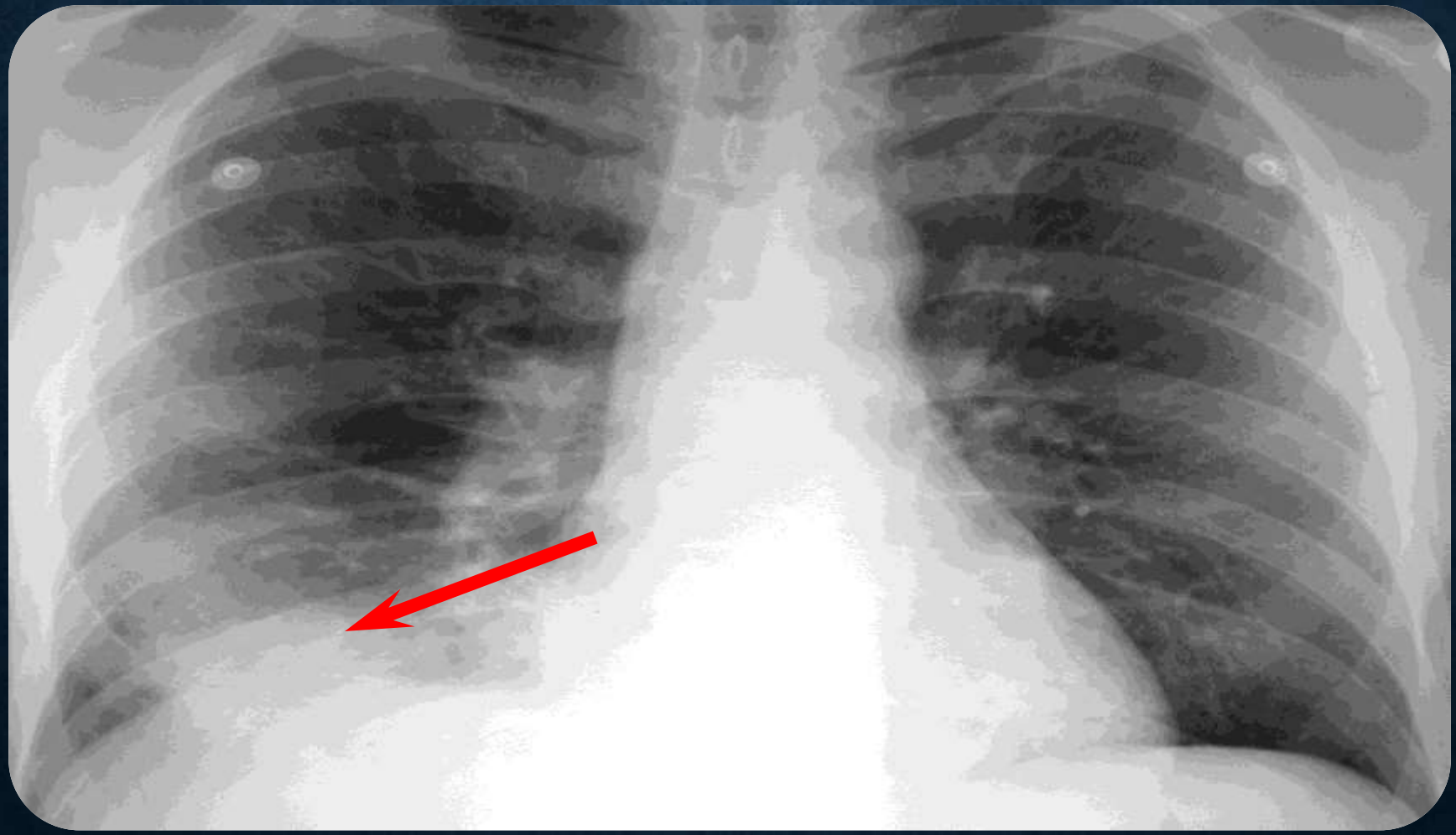
The hidden areas: worth a second look

There are some areas that need special attention, because pathology in these areas can easily be overlooked:

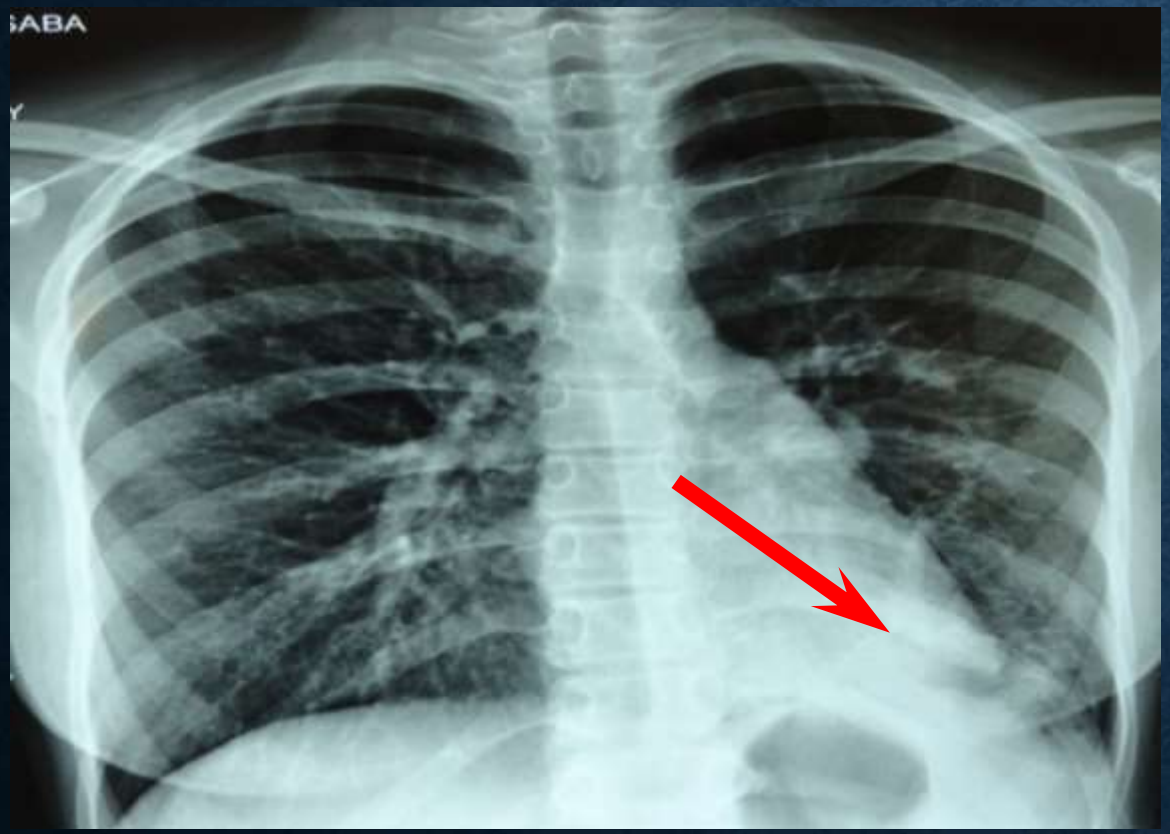
- Apical zones
- Hilar zones
- Retrocardial zone
- Zone below the dome of diaphragm



Right Lower Lobe Pneumonia



CASE 3: *Left Lower Lobe Pneumonia*



After treatment

LET'S REVIEW WHAT WE LEARNED

key points

When interpreting a child's CXR use the systematic approach

- Check the Good quality factors :
  inspiration, rotation, penetration
- Assess the 3 circles with an inward progression
  with a good knowledge of infant specificities

Ribs,clavicles : lesions in bones , accidental injuries , deformities

Diaphragms: check their shape , symmetry and elevation

Lungs : read from top to bottom , compare right and left

Look for assymmetry, areas of different lucencies, vascularisation

Unilateral hyperlucencies: foreign body aspiration, pneumothorax

Opacities : Pneumonia , atelectasis , pleural effusion…

key points

Airways :

- Normal Trachea buckle in expiration in infant
- look at size, position , displacement

Mediastinum:

- Normal Thymus varies in size with age
- Know the clues to localize different masses
- Adenopathy often due to inflammatory or infectious causes

TB is the main etiology in country with high incidence

- Other mediastinal masses : lymphoma,bronchogenic cyst, neuroblastoma , neurofibroma

Heart :

- Shape changes with age and position
- Make sure you look at the lung behind the heart (a favorite place for pneumonia)

1-MAKING INITIAL CHECKS :

NAME & HISTORY & DATE

2-ASSESSING THE FILM QUALITY :

UNDER FULL INSPIRATION & EXPOSURE & ROTATION

3-IDENTIFYING AND ALIGNING THE X-RAY :

LOOK FOR MARKERS & PATIENT POSITION & L OR R

4-ANALYZING THE IMAGE:

ABCDE METHOD: CHECK THE AIRWAY (A), BONES (B), CARDIAC SILHOUETTE (C), DIAPHRAGM (D) AND LUNG FIELDS AND EVERYTHING ELSE (E).

CHECK IF THERE ARE ANY INSTRUMENTS SUCH AS TUBES, IV LINES, EKG LEADS, PACEMAKER, SURGICAL CLIPS, OR DRAINS.

CHECK THE AIRWAY
CHECK THE BONES
LOOK FOR THE CARDIAC SILHOUETTE SIGN
CHECK THE DIAPHRAGM
CHECK THE HEART.
HECK THE LUNG FIELDS.
OBSERVE THE HILA.

THANK YOU