**Chest Radiology for Dummies:**

**QUALITY OF THE FILM:**

**Is the film centered?**
If it's not centered, you might think the mediastinum is displaced. Check by finding the midline (vertical along the spinous processes) and it should fall exactly between the heads of the clavicles.

**Is it an upright PA film?**
On an AP film, the heart is magnified and gives a false impression of cardiomegaly. If the patient is supine it becomes harder to appreciate the fluid menisci in the lung. **ON A SUPINE FILM the upper mediastinal vessels are the same width as the atria.**

**Is the film properly exposed?**
You should be ONLY BARELY able to see the intervertebral spaces behind the heart. IF YOU SEE THEM CLEARLY, the film is overexposed. If you can't see them at all, the film is underexposed.

**Did the patient do the breath hold properly?**
The diaphragm shadow should cover the 10th rib

**IS EVERYTHING ON THE FILM??**
Should be able to see from T1 down to costophrenic angles

**ORIENTATION ON THE FILM:**
- Localise the abnormalities:
  - Use posterior rib number for vertical position
  - Use midclavicular line for horizontal
The ANATOMY: Thorax

1. Manubrium
2. Sternum
3. Right atrium (RA)
4. Left atrium (LA)
5. Right ventricle (RV)
6. Left ventricle (LV)
7. Apex
8. Infrasternal angle
9. Costal arch
10. Clavicle
11. Scapula
12. Right diaphragm
13. Gastroesophageal reflux disease (GERD)
14. Left diaphragm
15. Thyroid cartilage
16. Thyroid gland
17. Trachea
18. Hemiplegia
19. Border of left ventricle
20. Dome of diaphragm
21. Xiphoid cartilage
22. Pleural reflection

Note breast shadow on female patients.
The ANATOMY: Mediastinum
The Steps to Take:

1st thing: QUALITY! Is this film worth looking at?
Look at both films simultaneously + COMPARE WITH PREVIOUS

**Airway:**

Is the trachea midline??… (tension pneumothorax, goitre etc.)
Normally it may lay a little to the left, anyway.

**Bones and soft tissues:**

Bones are fully mineralised? (adult vs. pediatric chest film)
Compare cortex to medulla thickness (lytic and blastic lesions)
Look for erosions or fractures.
Vertebral heights roughly equal? (vertebral collapse)
**Look for RIB NOTCHING** as a result of collateral circulation secondary to coarctation of aorta

… Are there breasts? Don’t mistake ducts for lung markings
Is there air between chest wall and ribs? (subcutaneous emphysema)

**Cardiac shadows:** work from the top.

**Mediastinum:**

Dilated? (aneurysm or just a supine film)
Shifted? (tension pneumothorax)
SVC should not bulge into the lung border
**Aortic Arch “Knob”** should be visible
**HEART SHOULD NOT BE LARGER THAN 50% OF CHEST WIDTH!**

**Diaphragms** (right should be above left by 1 - 3 cm)

Costophrenic angles should be sharp (pleural effusion, pulmonary oedema)
Diaphragm should be dome-shaped, not flat (emphysema)
Diaphragm inverted?? → **tension pneumothorax**
Diaphragm vs. lung contrast should be sharp

**Equal lung volume** (count the ribs, look for mediastinal shift)

**Fine detail of lung markings** (pleura, lung parenchyma)

Visible vessels in the upper zone? (LA dysfunction → pulm. congestion)

**Gastric bubble** (should be no more than 0.5cm below lung border)

IS THERE AIR OUTLING THE DIAPHRAGMS FROM BELOW??
→ its free peritoneal air! Means a viscus is perforated!!

**Hilum:** left above right by ~thumb width

Is it enlarged? (may be lymphadenopathy or pulmonary congestion)

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**WHATS THAT OPACITY??**

**Lung collapse**
Looks opaque and consolidated, and everything is shifted TOWARDS the collapsed area (i.e an implosion).
You get fissure displacement, crowding of vessels and bronchi, and hemidiaphragm elevation. Most often the best sign of this is the loss of a heart border.

**Consolidation**
Means air is replaced by something other. Not specific in the least, but suggests pneumonia.

**Mass lesions**
Know number, size, distribution, evolution from previous films, cavitation (round ring shapes, possibly with fluid levels as in lung abscess)

**Reticular opacity**
Linear shadows, like Kerley B lines and bronchiectasis (“tram-track” parallel lines)

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**Relationship to aetiology:**

**Alveolar disease**
Patchy consolidation (like fluff) segmental or lobar pattern, air bronchogram (can clearly see a major bronchus outlined as translucent on the background of consolidated alveoli)
PLUS: Silhouette signs: cant see normally expected borders eq. diaphragm shadows, costophrenic angles, retrocardiac shadow etc)

**Pleural space disease**
Should be in the costophrenic angle. Meniscus formation. If the meniscus is lost, its probably a hydropneumothorax. Might be a fluid blob in the interlobular septum
**Solitary Pulmonary Nodule**
defined as a lesion smaller than 3 cm; anything bigger is a MASS
the skill is to know WHEN to investigate

**DIFFERENTIALS:**

**Malignancy**
- Primary cancer
- Metastatic deposit
- irregular, lobulated, or spiculated borders
10% of malignant nodules demonstrate calcification
- calcification in cancer is STIPPLED or ECCENTRIC (i.e. one side more calcified than another)

**Benign neoplasm:**
- Hamartoma - popcorn calcifications
- Lipoma
- Fibroma
- well-circumscribed smooth borders
- calcification is more likely than with cancer!
- diffuse, central, laminar, concentric,
  and maybe with popcorn calcifications.
- **GENERAL RULE:**
  Order = benign
  Chaos = malignant

**Vascular Lesion**
- Arteriovenous malformation – usually has a visible vessel entering it

**Infection**
- Aspergilloma – round mass within a cavity, maybe with pleural inflammatory reaction
- Bacterial abscess – cavitating with a fluid level and regular thin walls

**Infectious Granuloma**
- calcification, when present, is mainly central
- Tuberculosis or Atypical mycobacteria – commonly calcified,
- Histoplasmosis – commonly calcified

**Non-infectious Granuloma**
- Rheumatoid nodule – peri-pleural nodules or pleural plaques; may caviate but never calcify
- Wegener’s granulomatosis: systemic vasculitis of medium and small arteries, venules, arterioles, and occasionally larger arteries – typically, opacities with walls and irregular shaped borders
- Sarcoidosis – soft fluffy lesion

**Congenital lesion**
- Bronchogenic cyst – sharply demarcated opacity without fluid level

**Other problem**
- Hematoma widening of the mediastinum, abnormal aortic contour, deviation of the trachea
- Bronchiolitis obliterans usually with atelectasis- just a very thick bronchial wall
- Mucoid impaction – a bronchus ending abruptly in a mucus plug
- Massive Pulmonary Embolus a pulmonary artery ending abruptly in an opacity, and no vascular markings in the lung which is supposed to be supplied by that artery
- Pulmonary infarction - wedge-shaped
- Pleural adhesion usually seen, duh- at the pleura

**CT** WITH CONTRAST is the next step if you think its cancer. THEN → tissue diagnosis
- If you're lucky, PET scan for increased uptake
- Possibly, FNA (unless emphysema, bullae, or nodule is very deep)
- Possibly, Bronchoscopy (if adjacent to major bronchus)
- Possibly, Thoracoscopy or Mediastinoscopy (if lesion is @ the pleura or mediastinum)

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**INTERPRETATION DEPENDS ON HISTORY!**
Risk of malignancy increases with age
- Risk of 3% at age 35-39 years
- Risk of 15% at age 40-49 years
- Risk of 43% at age 50-59 years
- Risk of greater than 50% in patients older than 60

**Smoking history**, - AND BEING MALE!

**Prior history of malignancy**

**Previous history of tuberculosis or pulmonary mycosis**

**Travel history** –
- Travel to areas with endemic mycosis (e.g., histoplasmosis, coccidioidomycosis, blastomycosis)
- Travel to areas with a high prevalence of tuberculosis

**Occupational risk factors for malignancy**
- Exposure to asbestos, radon, nickel, chromium, vinyl chloride, and polycyclic hydrocarbons

**HAVE TO LOOK AT PREVIOUS FILMS!!**
**ANY CHANGE IS ABNORMAL**

**GROWTH OF NODULE:** it’s a sphere, so…
26% increase in diameter = one doubling in volume

**BENIGN** lesions take the longest: 400 days or more
**CANCER:** doubling time of 20-400 days.
**INFECTION, INFARCTION, and METS** double in 20-30 days

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