Chest and Abdominal X-Rays

**Radiation Exposures** (time of normal background radiation):
- Chest X-Ray – 0.1mSv (2.5 days)
- Abdominal X-Ray – 1mSv
- CT Abdomen – 15mSv (4.5 years; chest-abdo-pelvis)
- CT Chest – 7mSv (3 years)
- CT Head – 2mSv (7.5 month)
- Ultrasound – 0mSv
- Magnetic Resonance Imaging – 0mSv
- Background Radiation – ~3mSv/year
- Flying – 0.003mSv/hour

X-rays are absorbed in proportion to cube of atomic number of what they pass through; the difference between absorption is called contrast. In simple black means they are passing through air & white means no air. In the context of CT scanning the absorption is measured in Hounsfield units (H) which range from -1000H in air which is white to +3000H in dense bone which is white. Contrast can often be used to enhance the image obtained during radiological investigation and carries its own radiation exposure and side effects. It is contraindicated in patients taking metformin, asthmatics, eGFR <60, congestive cardiac failure and use of nephrotoxic drugs.

**Chest X-Rays**

Interpreting a Chest X-Ray (ABCDE Approach)

1. **Technical Features** – Date taken and name, age & sex of patient, penetration, annotation
2. **View** – PA or AP (PA most common); AP views make the heart appear larger (so size cannot be commented on) and have scapular edges lying more medially, obscuring lung tissue. Lateral CXRs may also be taken. Patient rotation & completeness of breath can interfere with comments on size and position of structures (if median ends of clavicles aren’t equidistant from spinous processes this means the patient is rotated)
3. **Airway** – Trachea & main bronchus positioning
4. **Breathing** – Lungs (start at hila then work around lungs to ensure clear lung markings), costophrenic angles, hilum (concave shape; left hilum 1-1.5cm higher than right; can be pushed or pulled by fibrosis/mass). Describe in terms of left or right apical, upper, middle & lower zones, rather than lobes
5. **Circulation** – Heart (cardiothoracic ratio = cardiac width/thoracic width; <50% is normal), mediastinum, aortic knuckle (can’t be seen through posterior mediastinal lesions), pericardium (signs of calcification or pneumopericardium)
   - **Aorto-Pulmonary Window** – Potential space between arch of aorta & pulmonary vessels when lymph node enlargement can be seen
   - **Azygous Fissure** – Azygous vein surrounded by two layers of parietal & visceral pleura giving the appearance of a tadpole along the right mediastinum (1-2% of people)
6. **Disability** – Ribs (5-7 anterior & 10 posterior ribs should be visible, less indicates incomplete breath in, more indicates hyper-expansion), shoulder joint, hemidiaphragms, costal cartilage not visible unless calcified
7. **Everything Else** – Edges, breasts (denser in gynaecomastia), pneumoperitoneum, stomach gas, retrocardiac area, hair (can obscure apical areas, particularly with certain shampoos)

Consolidation – Liquid within the air space which may be due to infection, pulmonary oedema, pulmonary haemorrhage (blood) or malignancy (cells)

‘Cannon ball’ lung lesions are typically of renal metastases

Loss of contour indicating location of disease:
- **Right Cardiac Border** – RML
- **Right Hemidiaphragm** – RLL
- **Left Heart Border** – Lingula
- **Left Hemidiaphragm** – LLL