

## Technical Adequacy

The technical adequacy of a film is assessed using the following factors:

- Penetration
- Inspiration
- Rotation
- Angulation

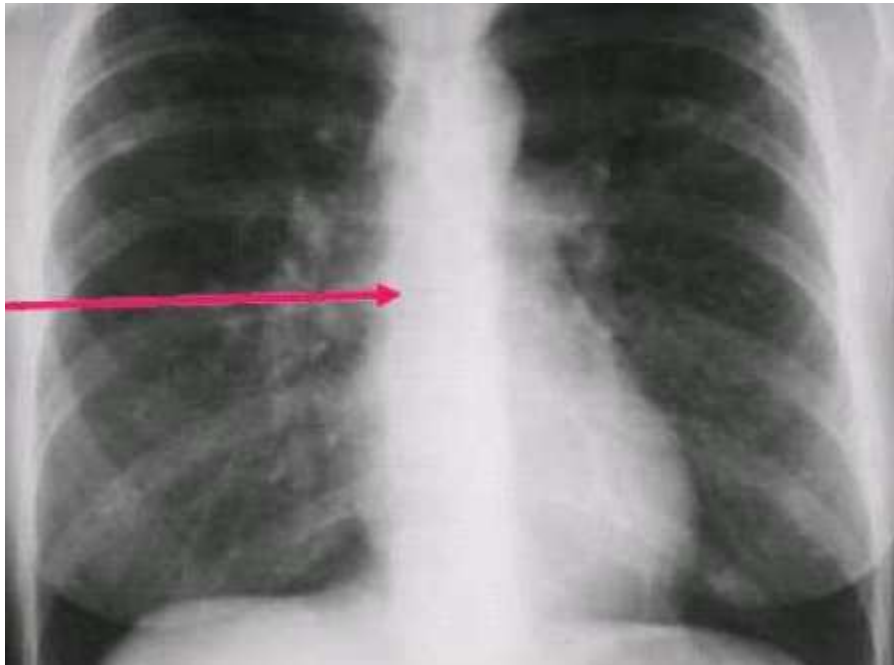
Technical errors bring lots of pitfalls, mainly in the form of suggesting pathology that isn't really there, or obscuring things that really are present.

**Beware.** Assess the technical adequacy before attempting to make radiologic diagnoses.

## Penetration

Thoracic vertebral bodies should just be visible through cardiac shadow.

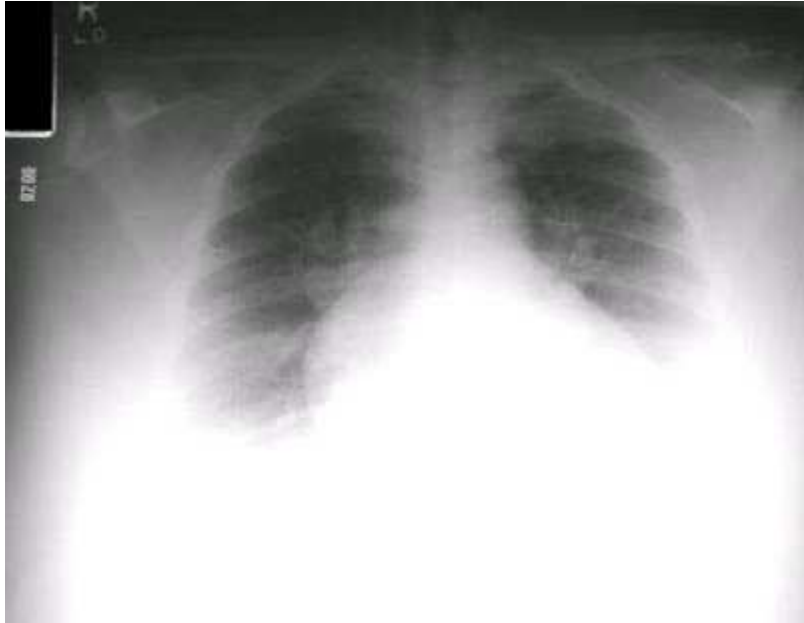
- If they are not visible, the film is underpenetrated.
- If they are too easily seen, the film is overpenetrated and detail will be "washed out".



## Underpenetration

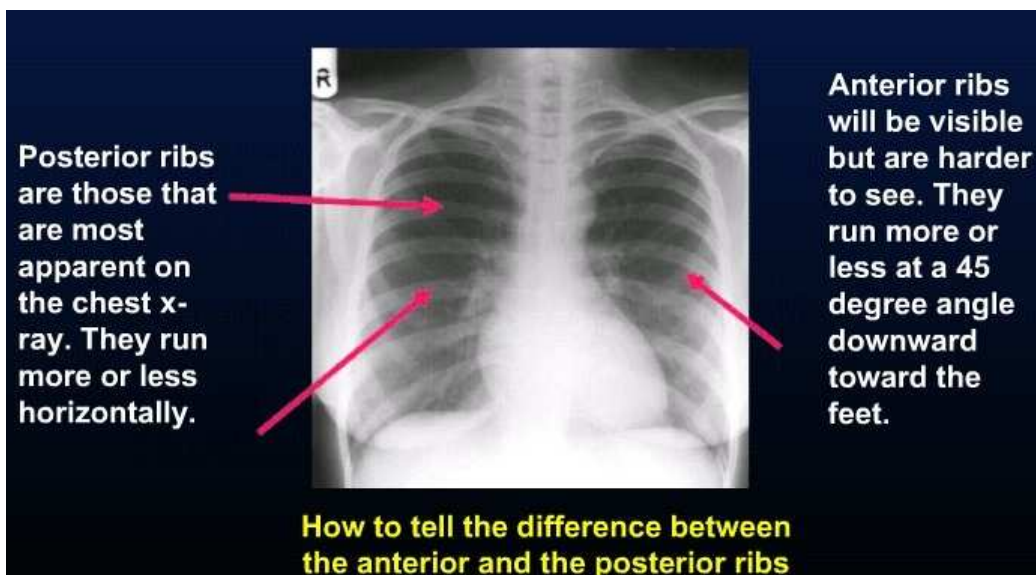
If the film is underpenetrated:

- left hemi-diaphragm will not be visible
- left lung base will not be visible.
- pulmonary markings will appear unusually prominent.



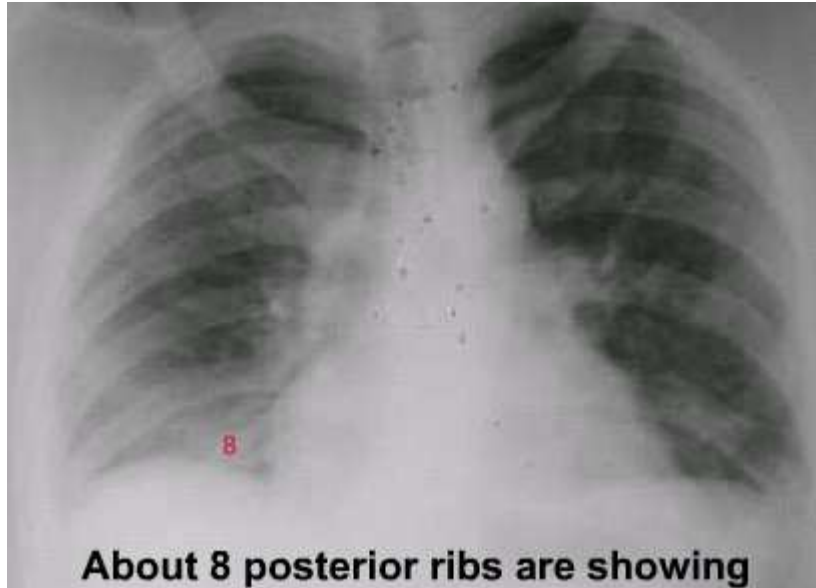
## Inspiration

- Visualizing 10 posterior ribs demonstrates excellent inspiratory effort.
- In many hospitalized patients, visualizing 9 ribs is adequate.

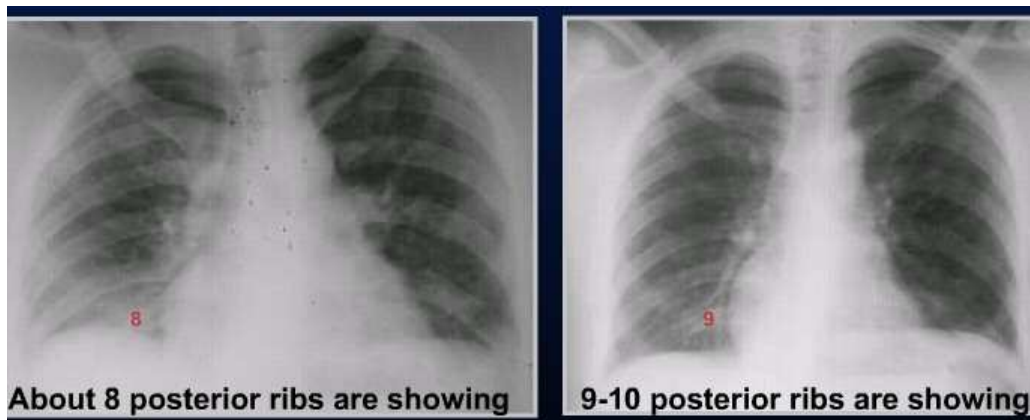


## Poor inspiration

Poor inspiration will crowd lung markings and simulate airspace disease.



## Same patient

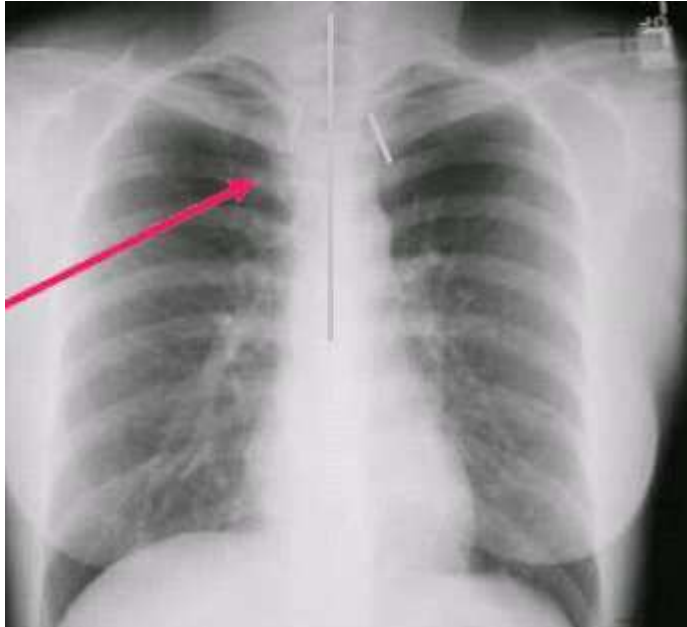


Better inspiration corrects the "apparent" disease at the left base.

## Rotation

Rotation is absent if:

- the spinous process of the vertebral body is equidistant from the medial end of each clavicle.

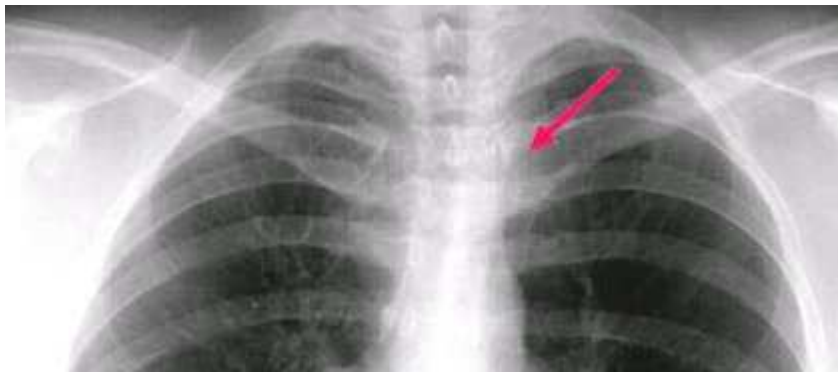


## Left and Right

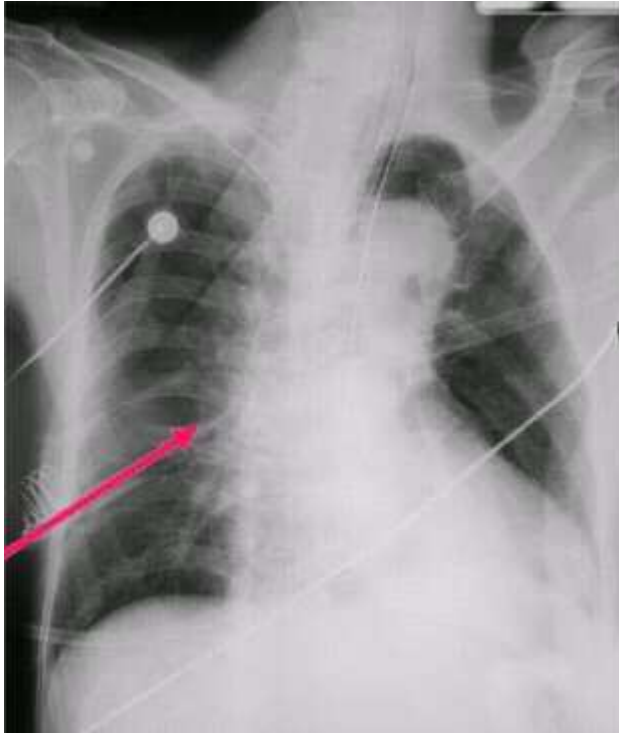
If spinous process is closer to medial end of right clavicle, then patient is rotated to their left.



If spinous process is closer to left clavicle, patient is rotated to own right.



## Pitfalls



Rotation will magnify the pulmonary arteries on the side furthest from the film.



## PA v. AP

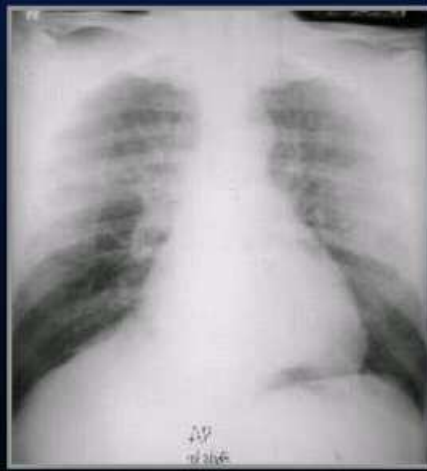
The standard chest x-ray is a PA. (postero-anterior) Basically, the patient's front is closer to the film.

- The heart is closer to the film and consequently less magnified.

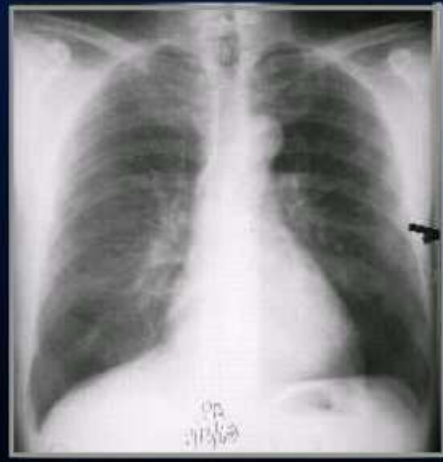
A portable x-ray is an AP. (antero-posterior). The cassette is slipped under the patient so that the patient's back is closer to the film.

- Since the heart is further from the film, it is magnified.

### Magnification effect



**AP portable film makes the heart look larger than it does...**



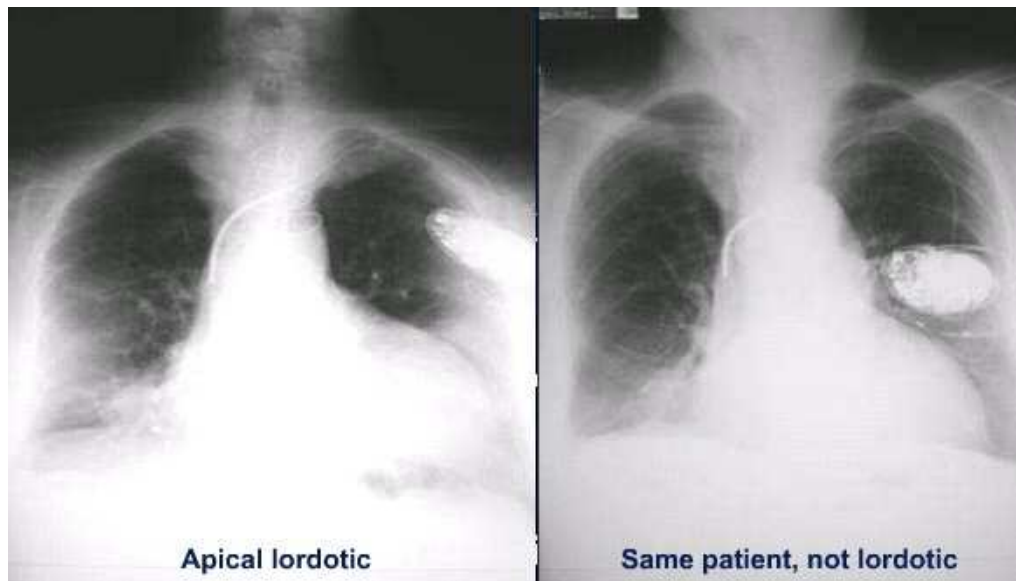
**On this PA film done on the same patient an hour later**

## Angulation

If the x-ray beam is angled toward the head, usually because the patient is semi-recumbent, the resulting film is called an "apical lordotic" view.

Anterior structures, such as the clavicles, will be projected higher on the film than the posterior structures.

## Pitfalls



An apical lordotic film will have an unusually shaped heart and the sharp border the left hemidiaphragm will be absent.

## **Summary**

The factors in evaluating the technique of the film are:

- Penetration - spine visible, but barely so, through the heart
- Inspiration - at least 8 to 9 ribs posteriorly, 10 is perfect
- Rotation - spinous processes between the clavicles
- Angulation - clavicle over the third rib, no higher