



MI 132: Unit 6

Part I

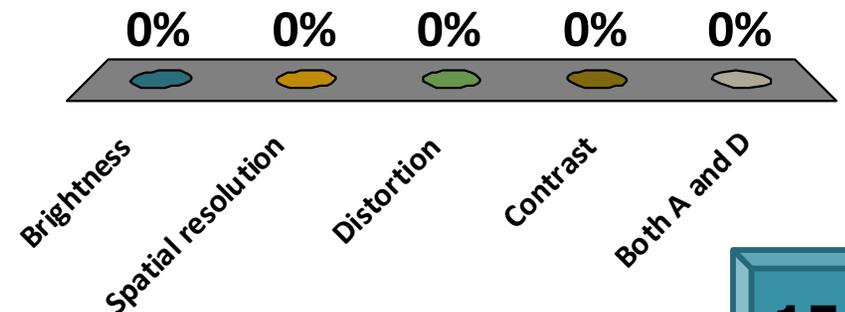
Image Quality and Characteristics

RHSHS Medical Imaging Program

2022-2023

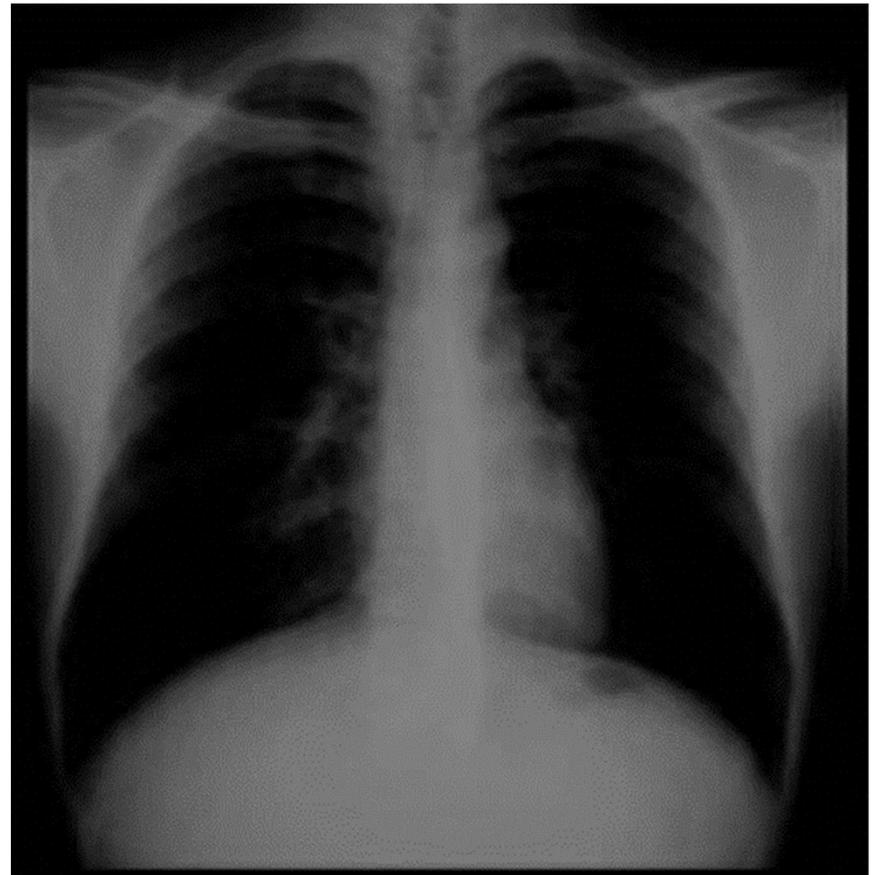
Visibility of the anatomic structures is accomplished by balancing:

- A. Brightness
- B. Spatial resolution
- C. Distortion
- D. Contrast
- ★ E. Both A and D



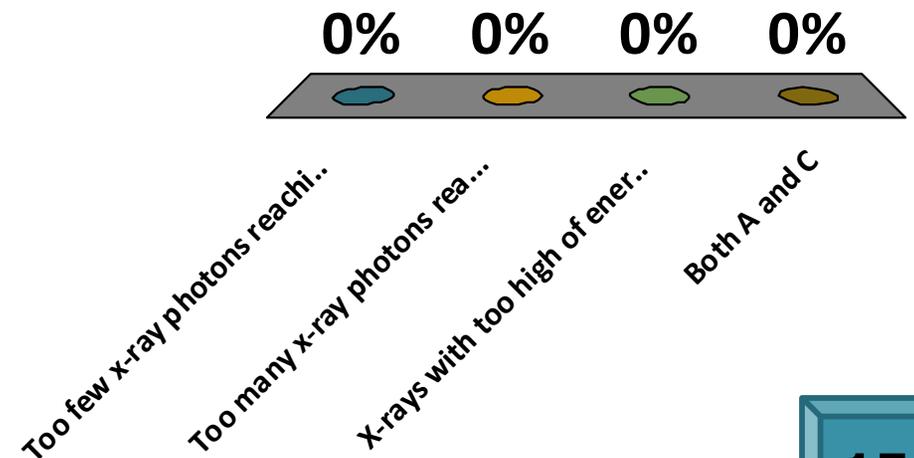
Brightness

#2 - Define brightness and describe its importance to image quality. Explain how image quality is affected by gross exposure errors (gross under- and gross over-exposure).



Quantum noise is a result of:

- A. Too few x-ray photons reaching the IR
- B. Too many x-ray photons reaching the IR
- C. X-rays with too high of energy reaching the IR
- D. Both A and C

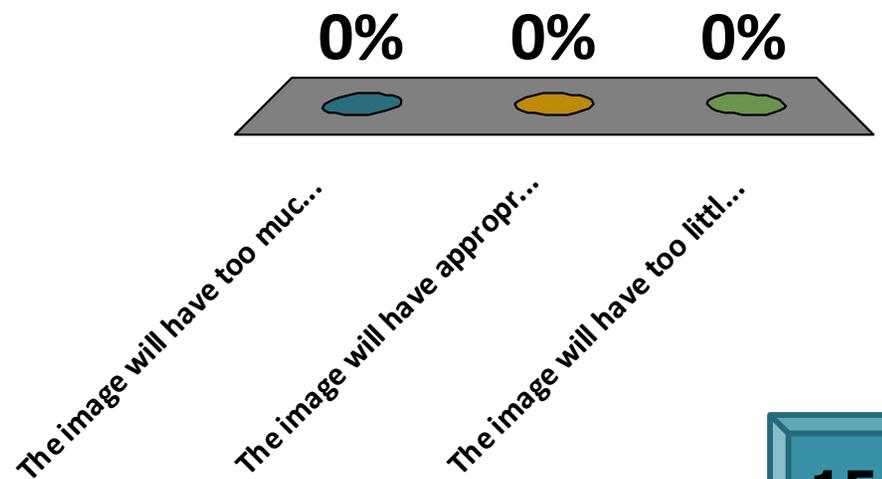






With digital imaging, how will brightness appear if the image was slightly over-exposed?

- A. The image will have excessive brightness which cannot be fixed by post-processing
- B. The image will have appropriate brightness after processing
- C. The image will have too insufficient brightness which cannot be fixed by post-processing



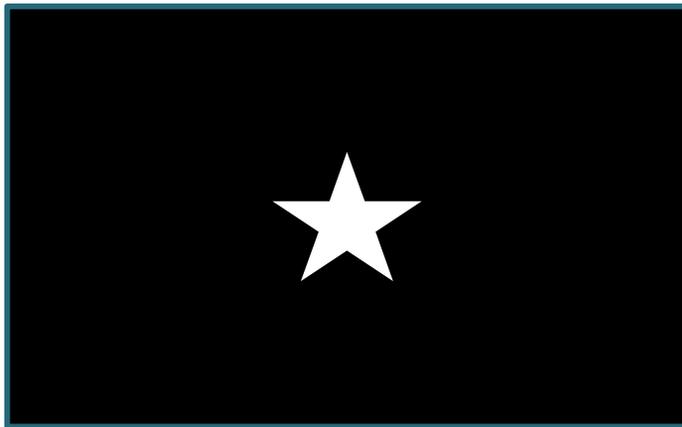
Exposure Indicator

#3 - Define exposure indicator and how it is used in radiology.



Contrast

#4 - Differentiate between contrast (**radiographic contrast**) and subject contrast. Explain how they relate to one another.

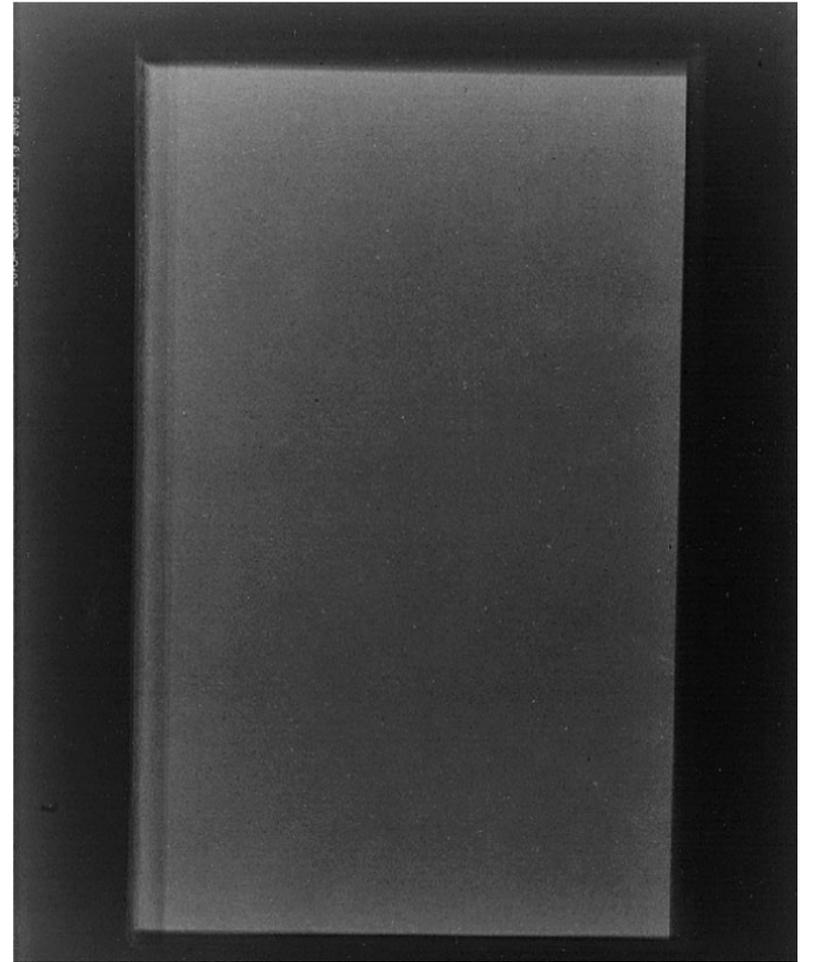
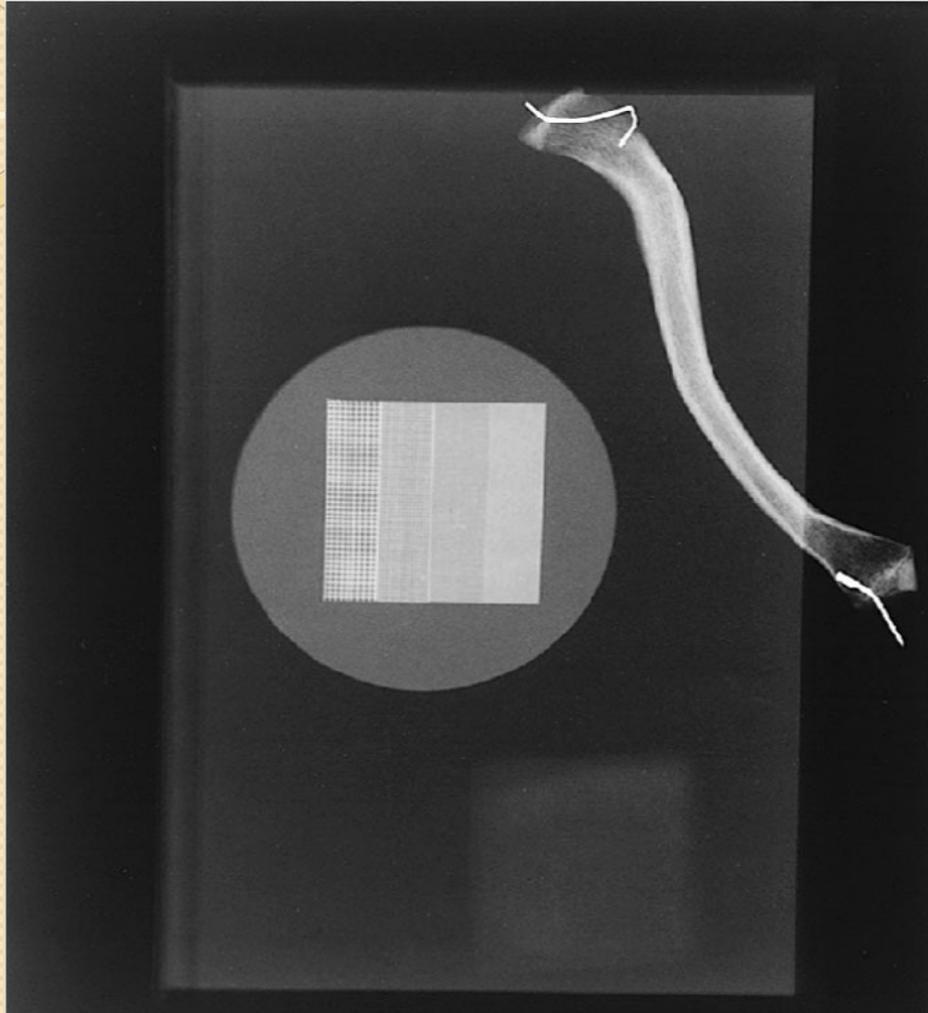


= High Contrast



= Low Contrast





Contrast and Grayscale

Grayscale - The *range* of all those different brightness levels on one image

High contrast
Short grayscale



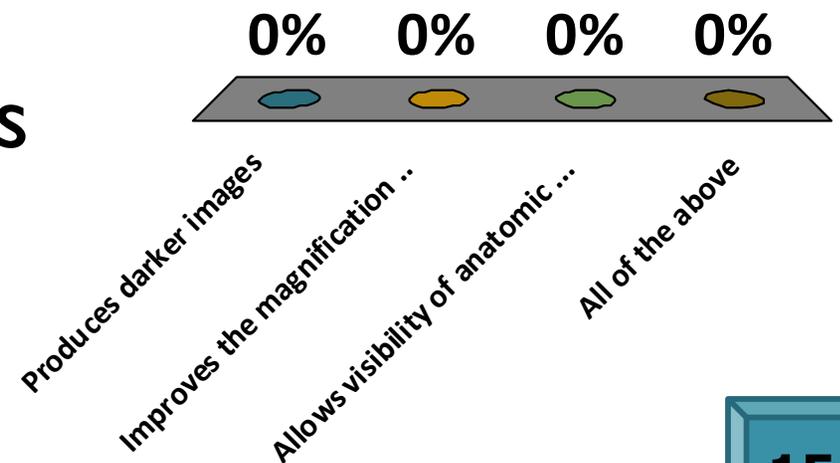
Low contrast
Long grayscale



The more shades of gray (differing brightnesses), the longer the grayscale.

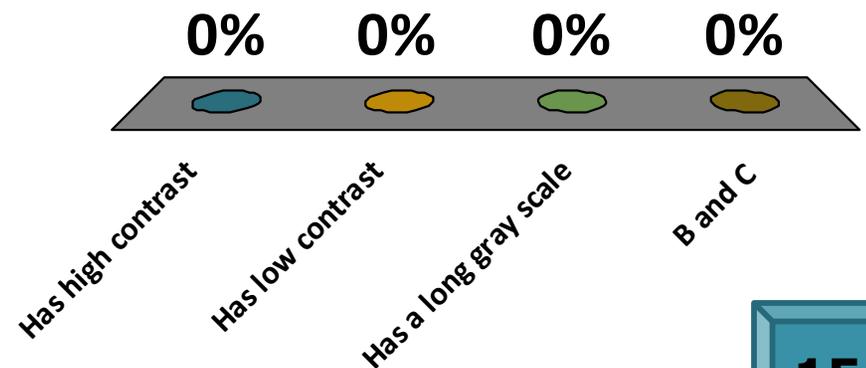
Radiographic contrast:

- A. Produces darker images
- B. Improves the magnification of the image
-  C. Allows visibility of anatomic structures
- D. All of the above



A radiograph that has brightness levels very similar to each other:

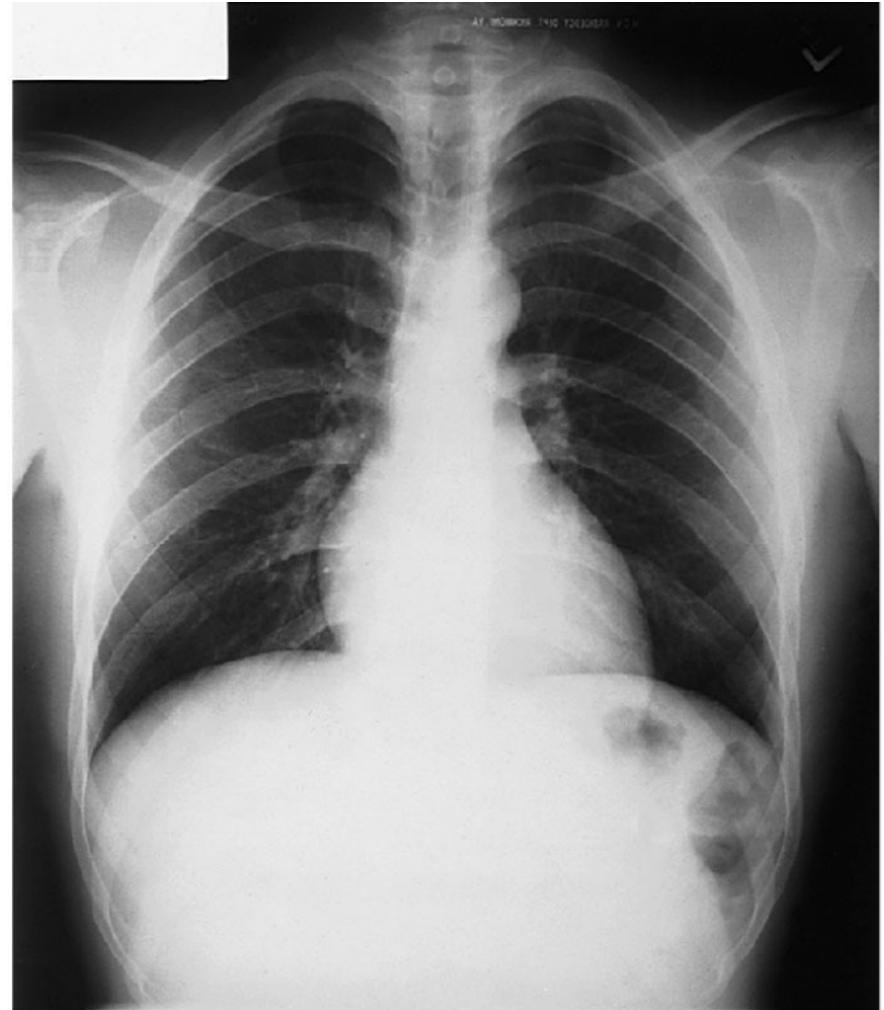
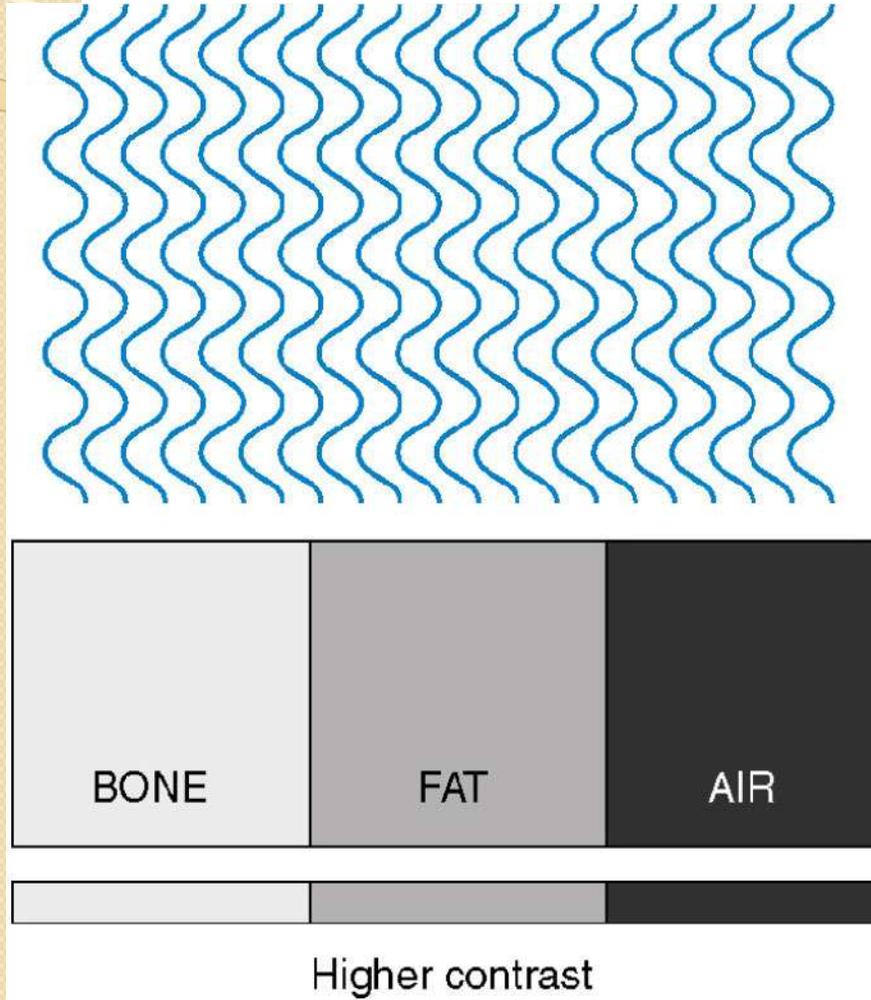
- A. Has high contrast
- B. Has low contrast
- C. Has a long gray scale
- ★ D. B and C



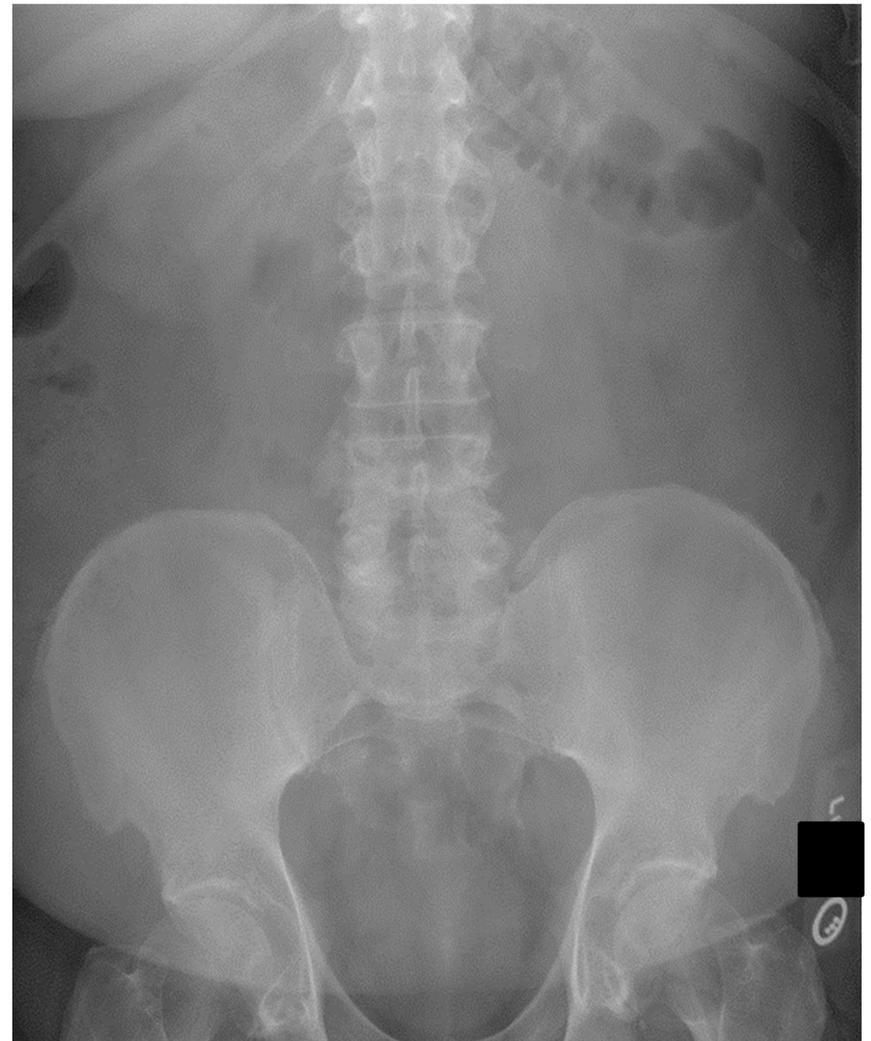
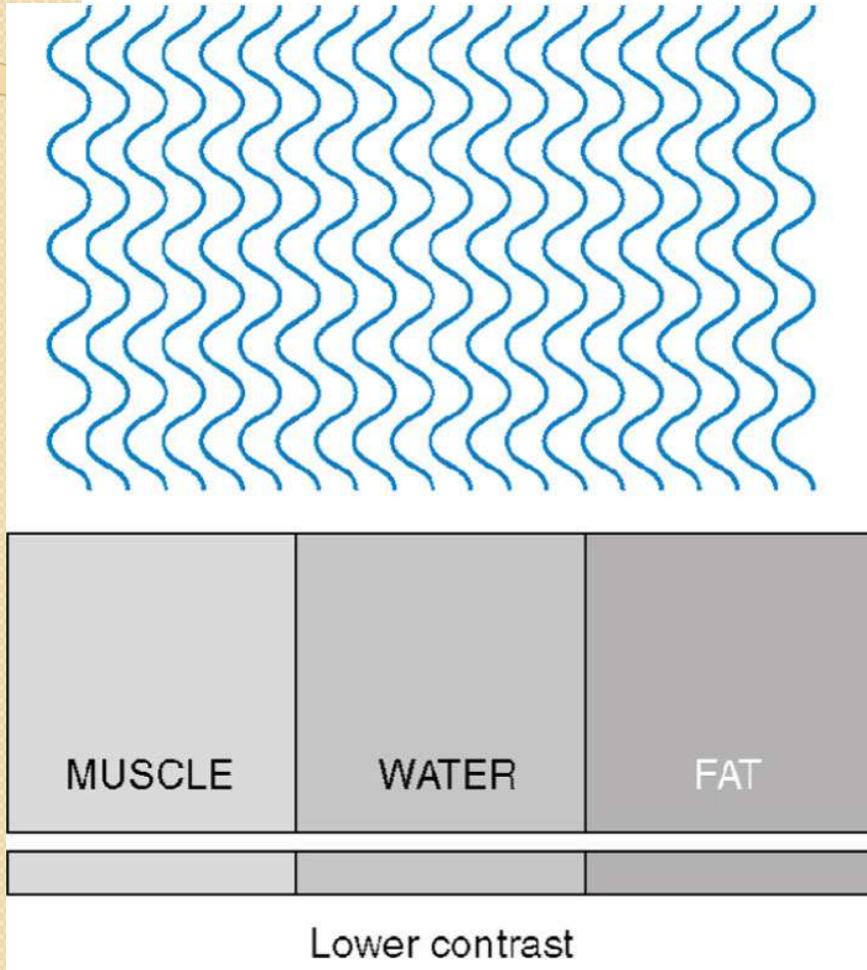
Subject Contrast

#4 (cont.) - Differentiate between contrast (radiographic contrast) and **subject contrast**. Explain how they relate to one another.

Absorption Characteristics of Tissue



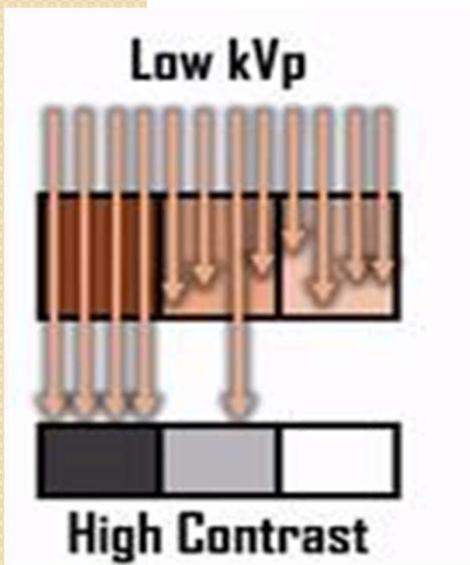
Absorption Characteristics of Tissue



Quality of Beam & Subject Contrast

#5 - Explain how the quality of the x-ray beam affects subject contrast.

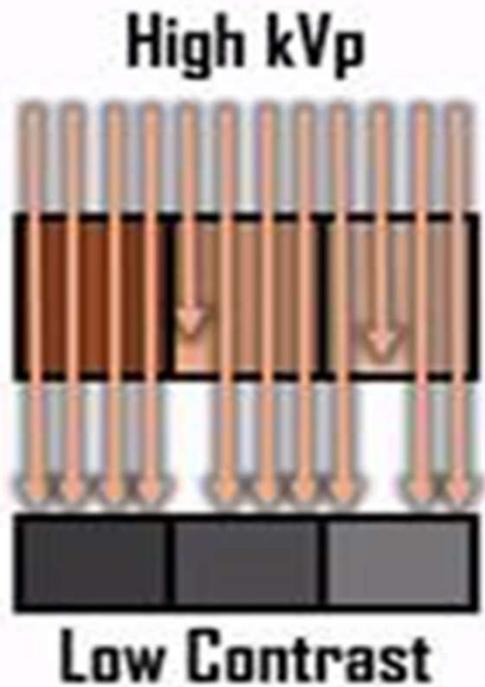
- Decreased kVp



INCREASE ABSORPTION
LESS TRANSMISSION
GREATER DIFF ABS
INC SUBJECT CONTRAST

Quality of Beam & Subject Contrast

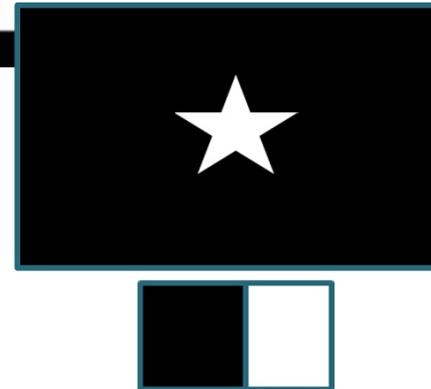
- Increased kVp





Low subject contrast
Less absorption; more transmission
Less differential absorption

Film/Screen
Low radiographic contrast image
Long gray scale



High subject contrast
More absorption; less transmission
More differential absorption

Film/Screen
High radiographic contrast
Short gray scale

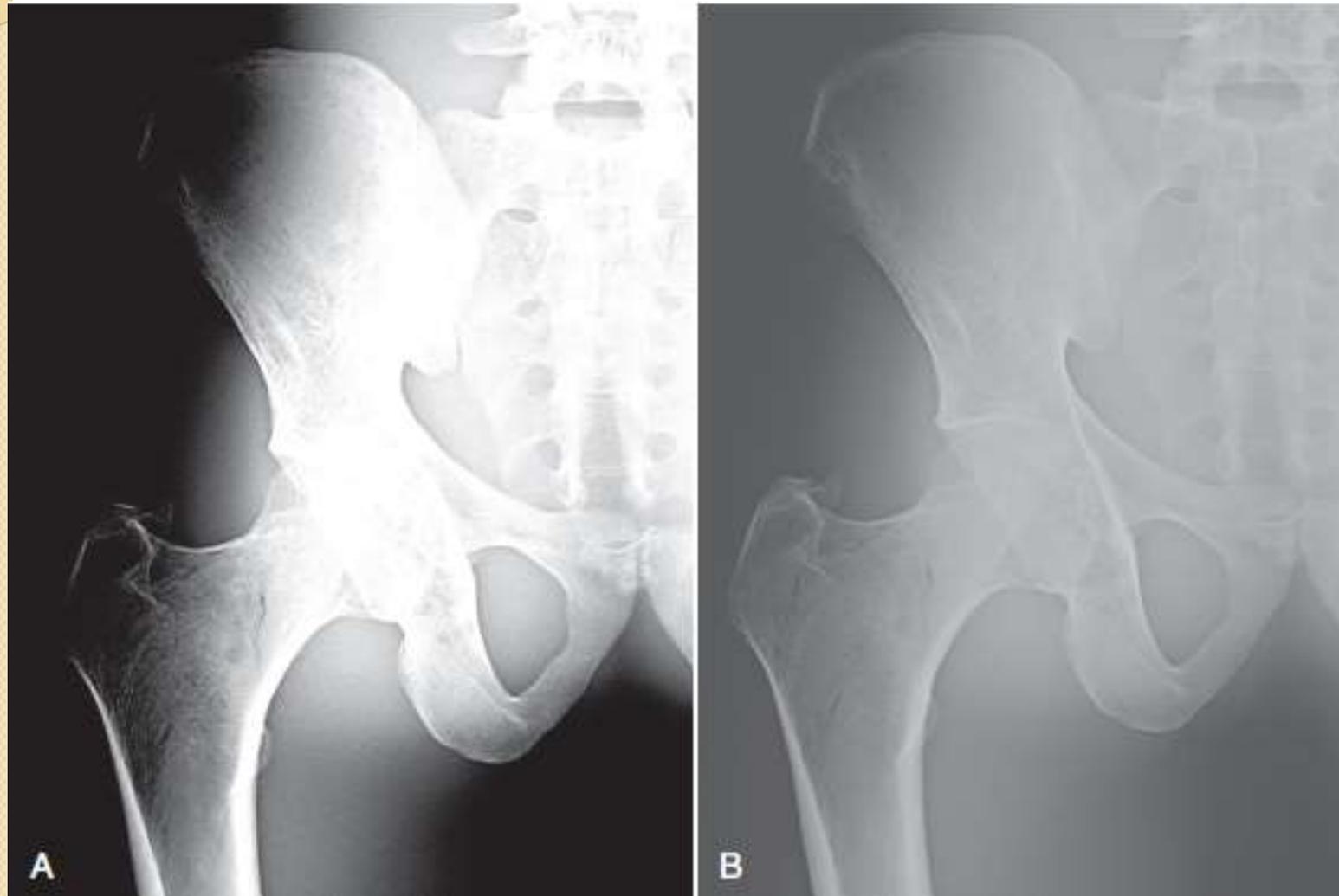
High/Low radiographic contrast image
Short/Long gray scale

High/Low subject contrast
More/Less absorption; more/less transmission
More/Less differential absorption



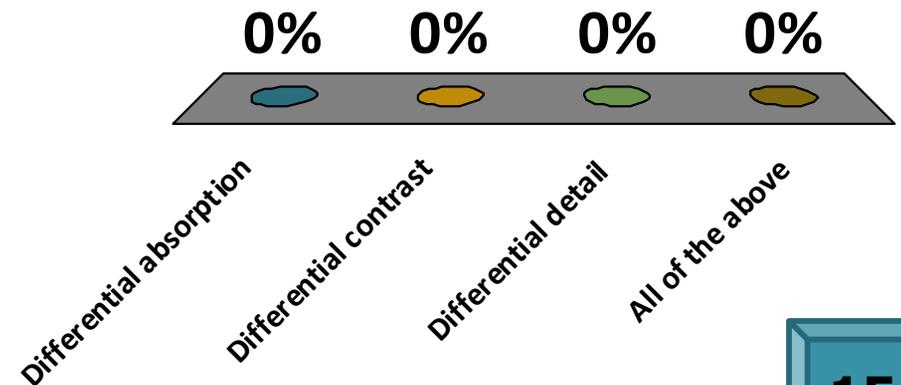
High/Low radiographic contrast image
Short/Long gray scale

High/Low subject contrast
More/Less absorption; more/less transmission
More/Less differential absorption



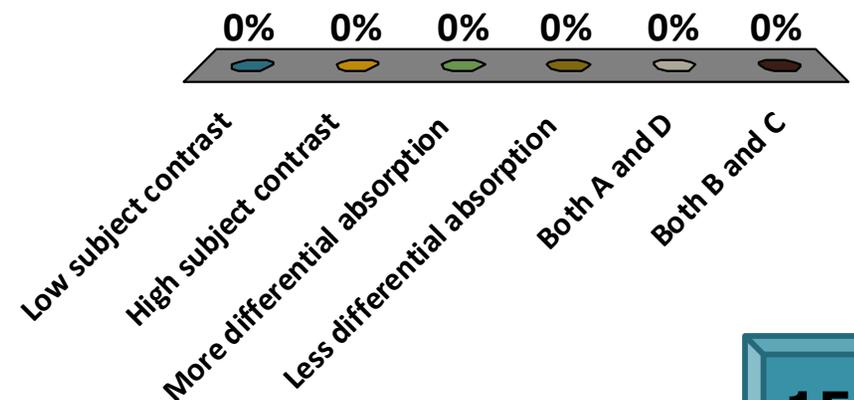
The range of brightness levels is a result of the tissue's:

-  A. Differential absorption
- B. Differential contrast
- C. Differential detail
- D. All of the above

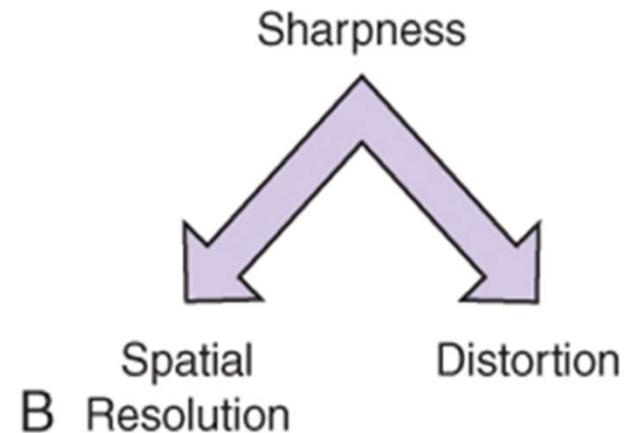


Increasing kVp will result in:

- A. Low subject contrast
- B. High subject contrast
- C. More differential absorption
- D. Less differential absorption
- E. Both A and D
- F. Both B and C



Sharpness



- Spatial Resolution
- Distortion

***Key is to minimize unsharpness by maximizing spatial resolution while minimizing distortion

Spatial Resolution

#6 - What is spatial resolution?

a. Identify how motion affects spatial resolution?
What can be done to reduce motion?

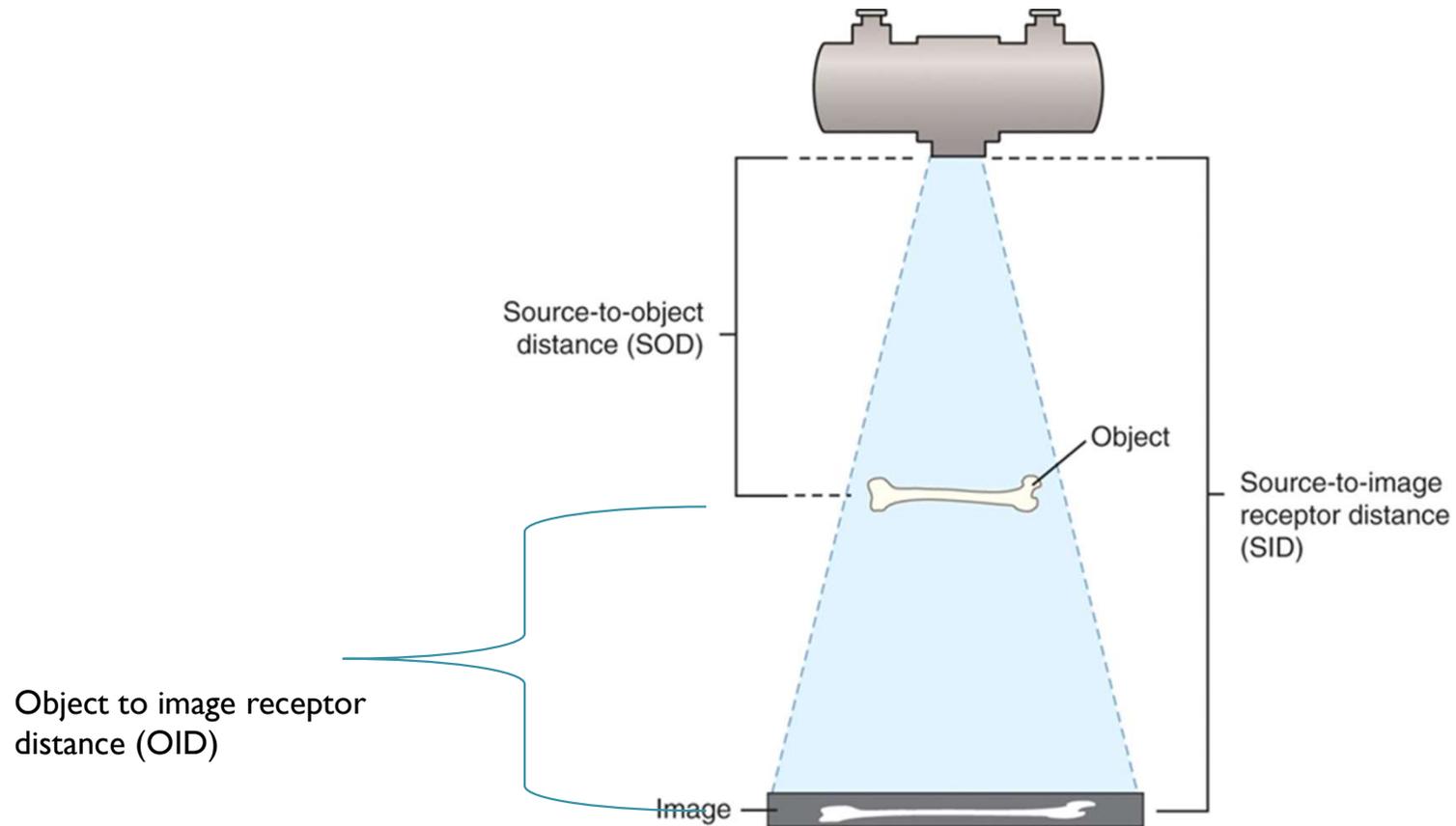


Distortion – Size vs Shape

#7 - Differentiate between size and shape distortion.

- a. Identify two factors that affect size distortion.

Distortion – Size

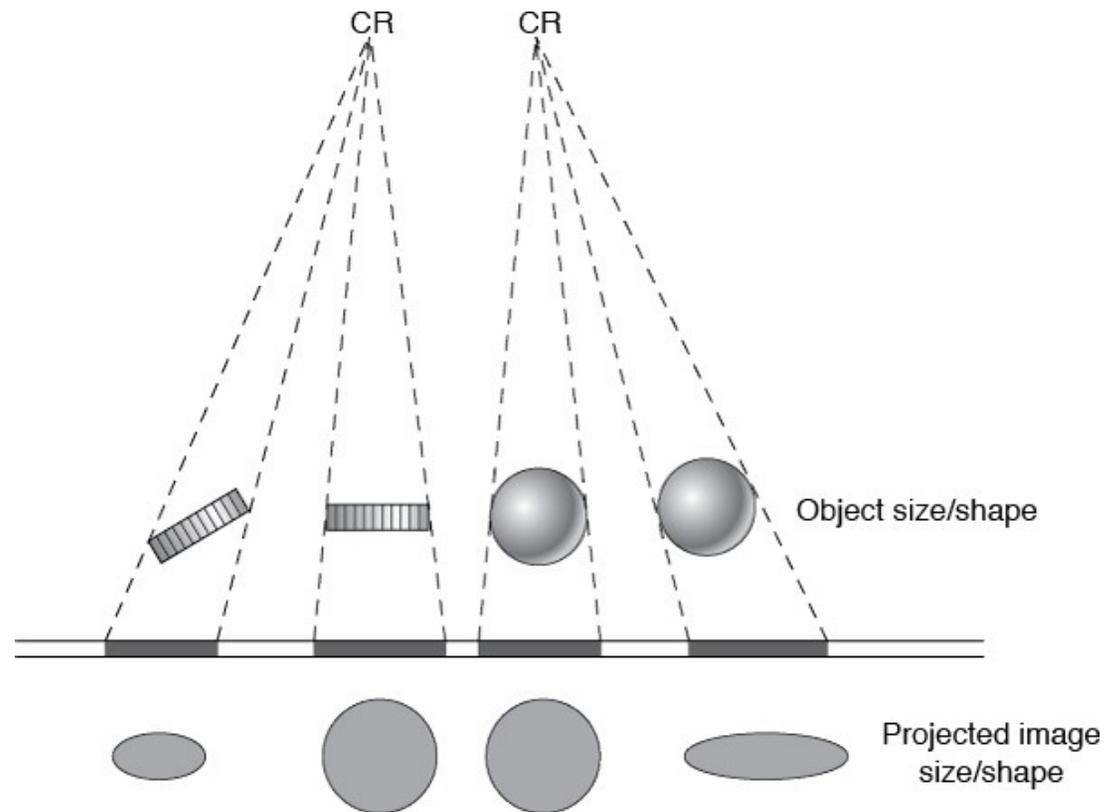


Distortion – Size vs Shape

#7 - Differentiate between size and shape distortion.

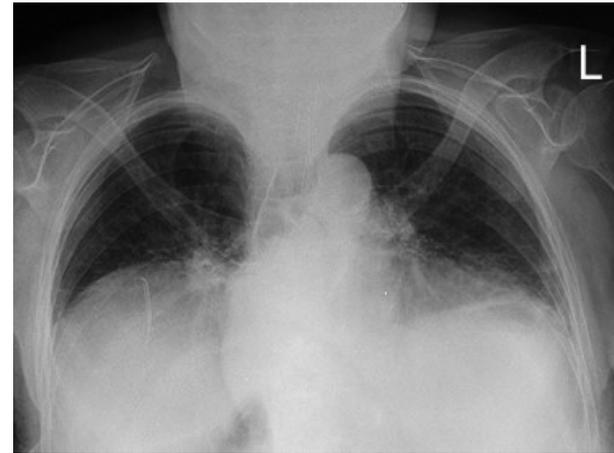
- b. Identify and define the two different ways shape distortion can appear radiographically.
- c. Identify what causes shape distortion to occur.

Shape Distortion

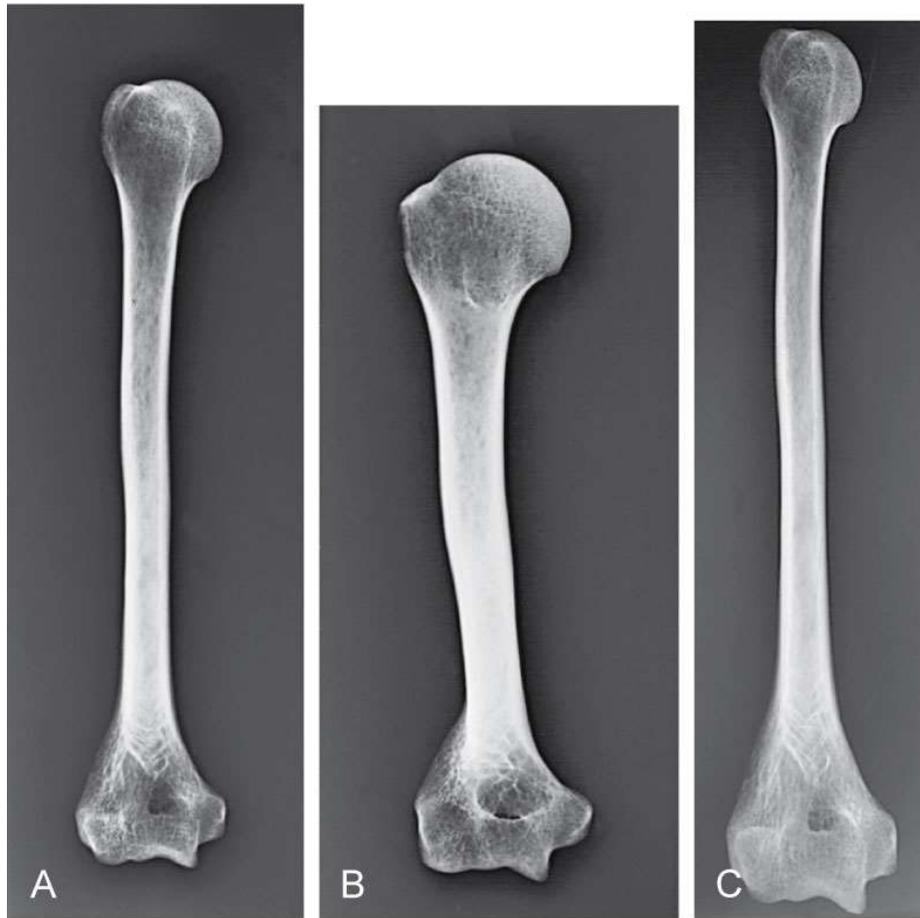


Source: Saia DA: *Lange Q&A™ Radiography Examination, 8th Edition*: www.radrevieweasy.com
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Shape Distortion



Shape Distortion

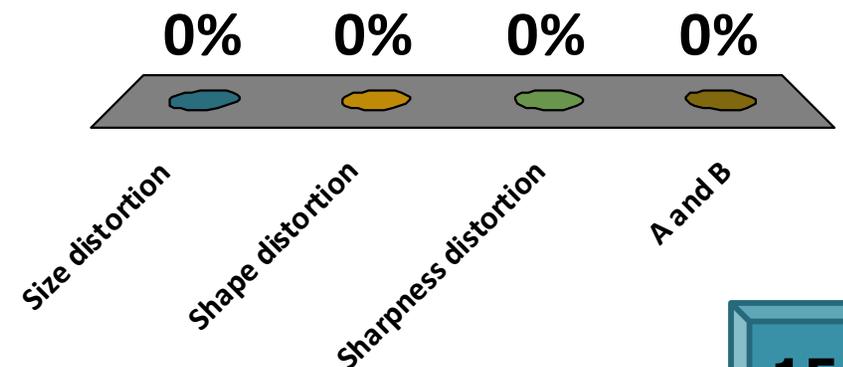


From Mosby's instructional radiographic series: radiographic imaging, St Louis, 1998, Mosby.

Fig. 9-35. Shape Distortion. A, No distortion. B, Foreshortened. C, Elongated.

An increase in the image size of an object compared with its true, or actual, size, is called:

- ★ A. Size distortion
- B. Shape distortion
- C. Sharpness distortion
- D. A and B



More Items Affecting Image Quality

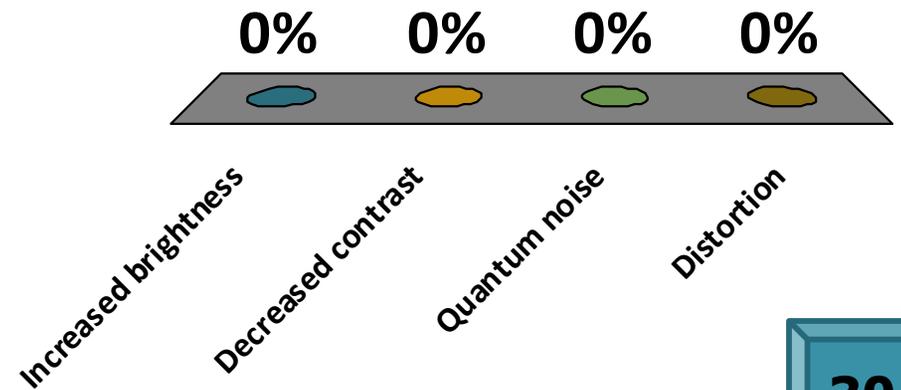
- Scatter
- Noise
- Artifacts
- SNR (*to be covered in Image Acquisition*)
- CNR (*to be covered in Image Acquisition*)

Scatter (Fog)

#8 - How does scatter affect image quality?

Increased scatter reaching the IR results in:

- A. Increased brightness
- ★ B. Decreased contrast
- C. Quantum noise
- D. Distortion



Scatter (Fog)



Quantum Noise

#9 - Explain what causes quantum noise and how quantum noise affects image quality.

Quantum Noise

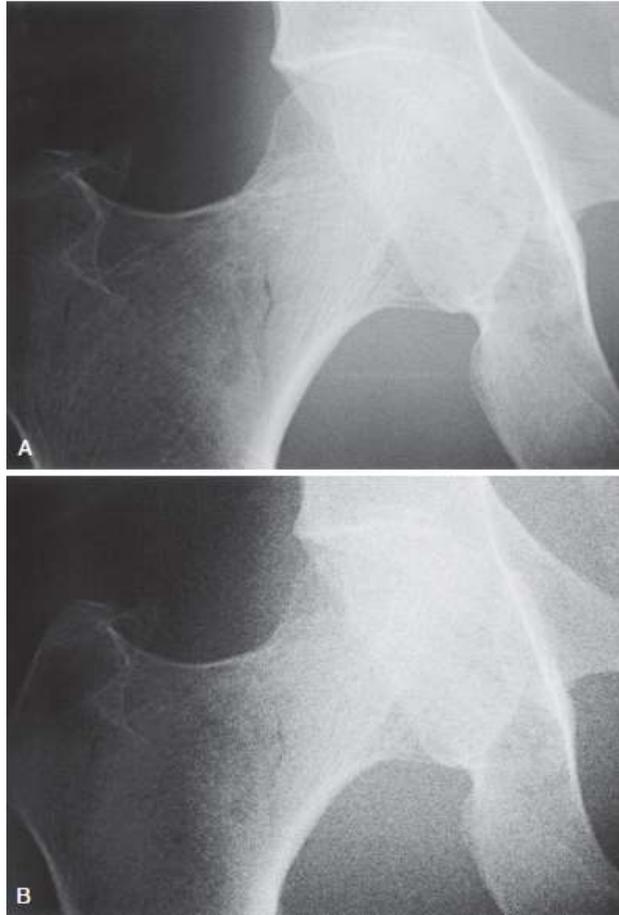
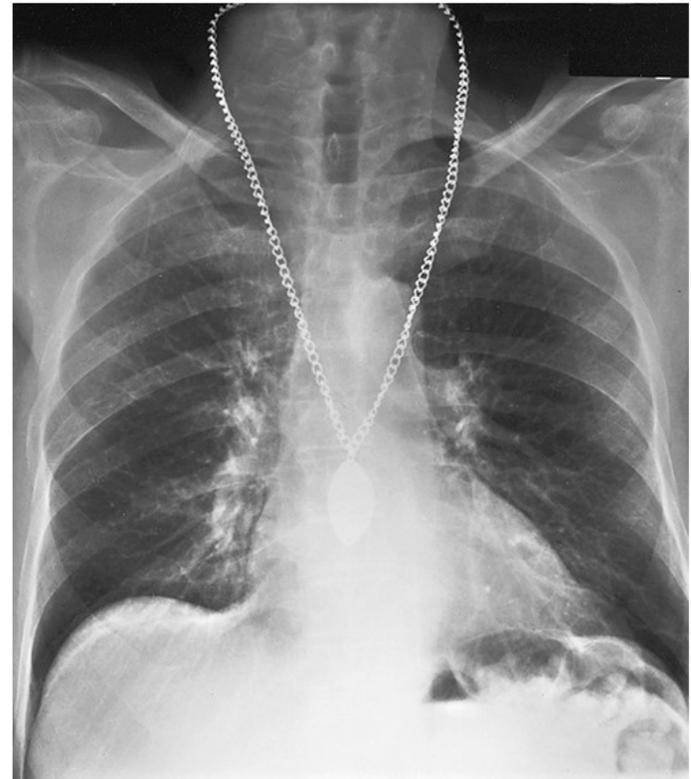


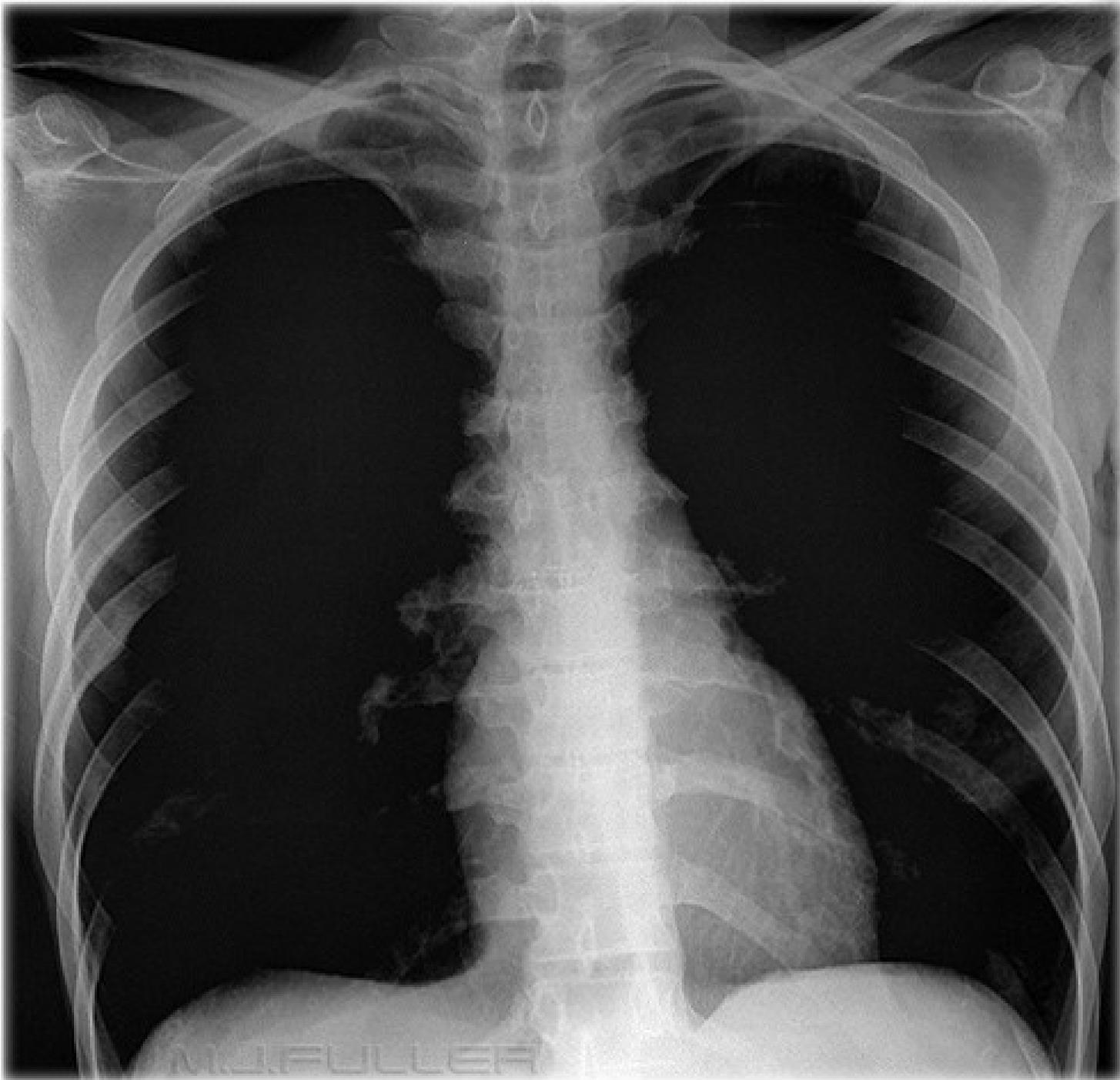
Image Artifacts

- An artifact is any unwanted item on an image
- Artifacts are detrimental because they make visibility of anatomic information difficult or impossible.

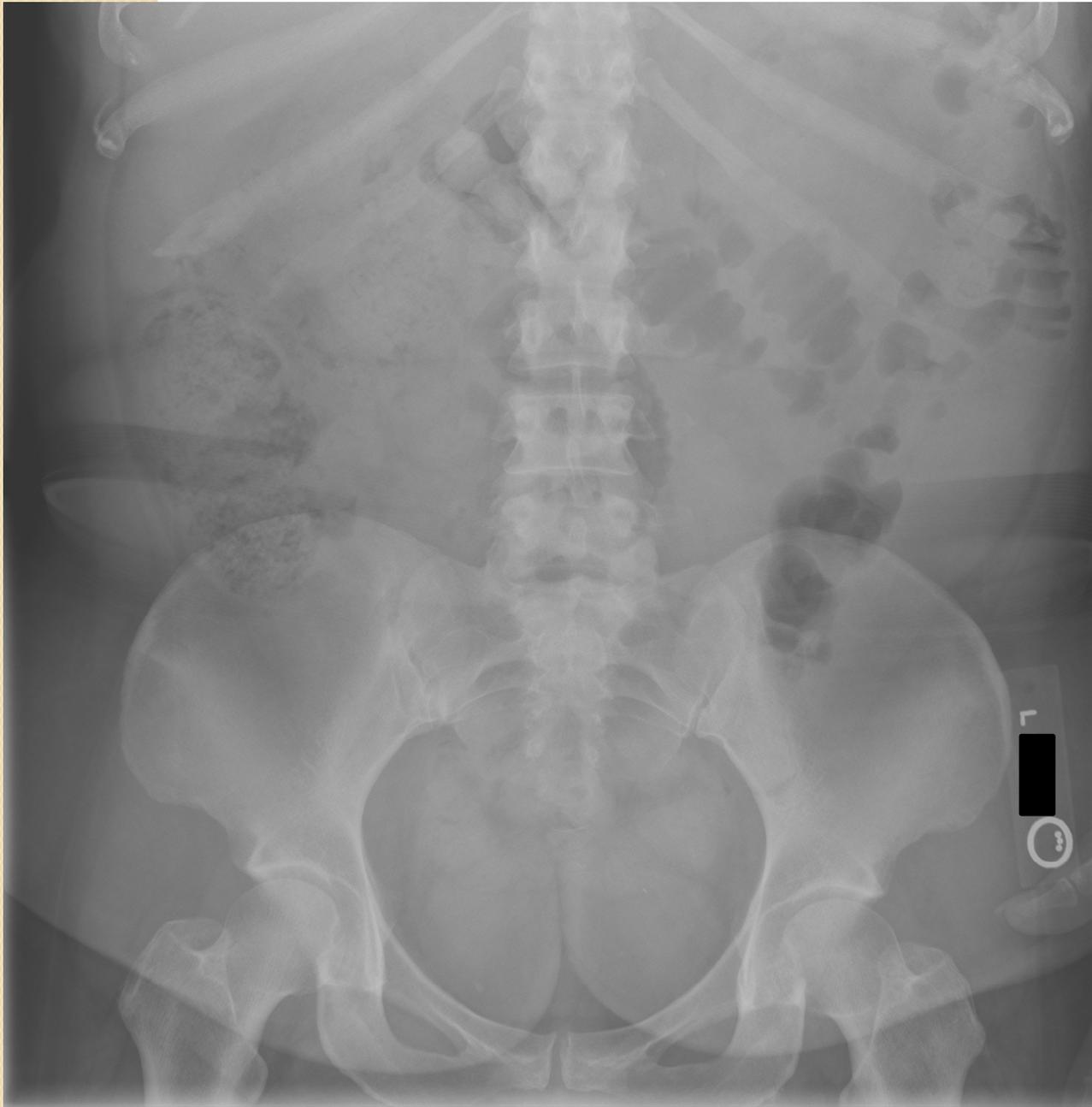




- What do you think about image quality?



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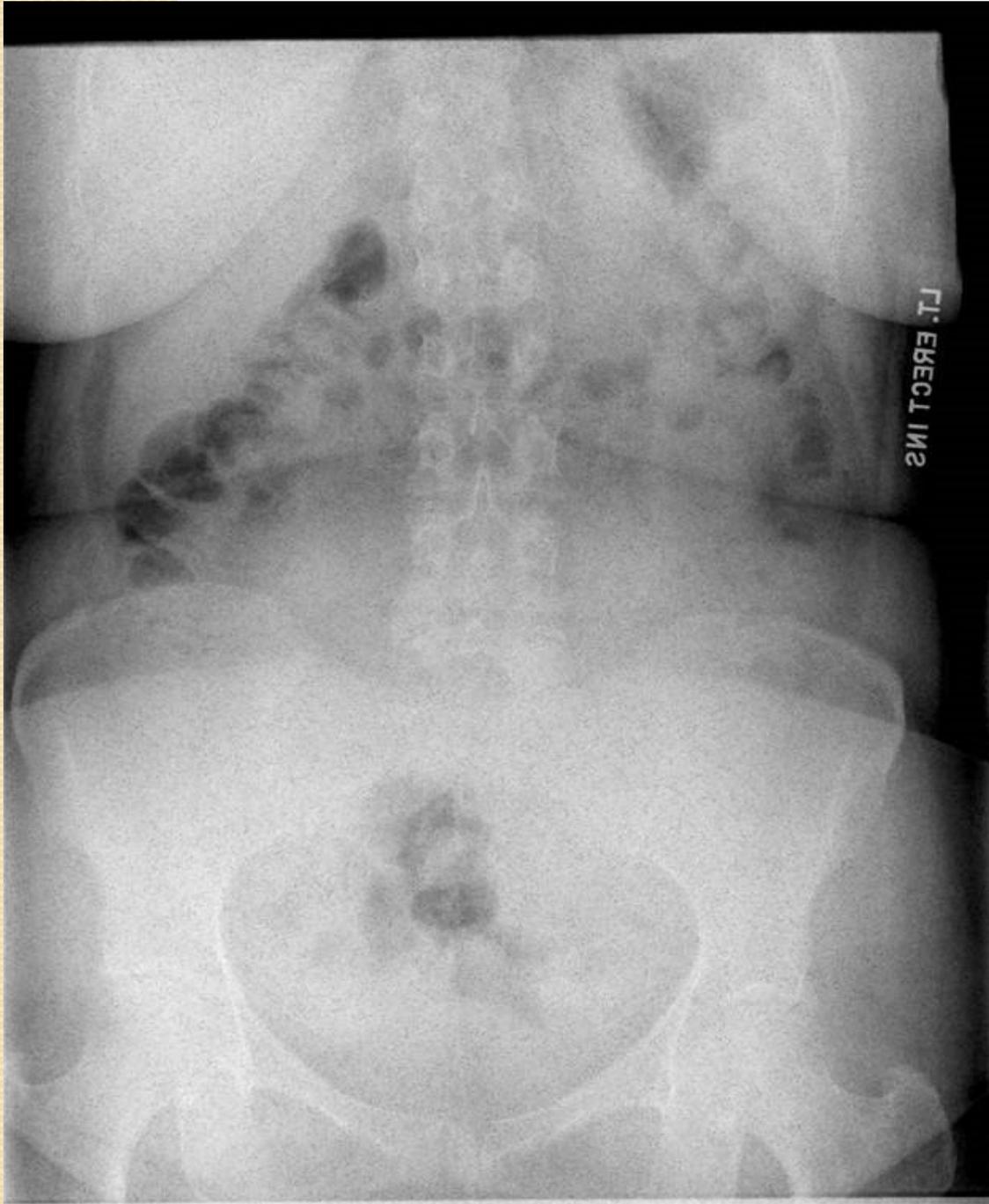
- What do you think about image quality?

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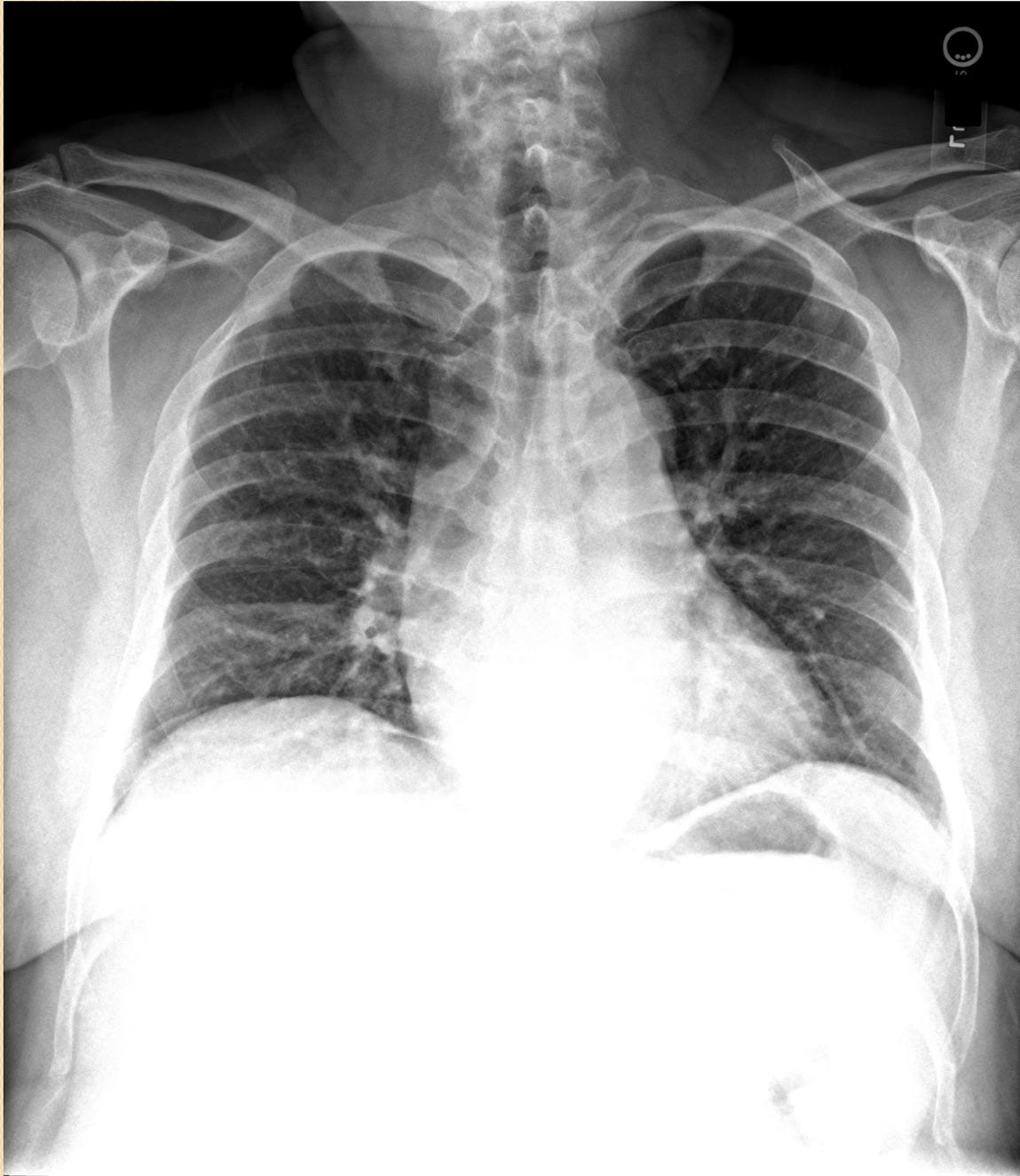




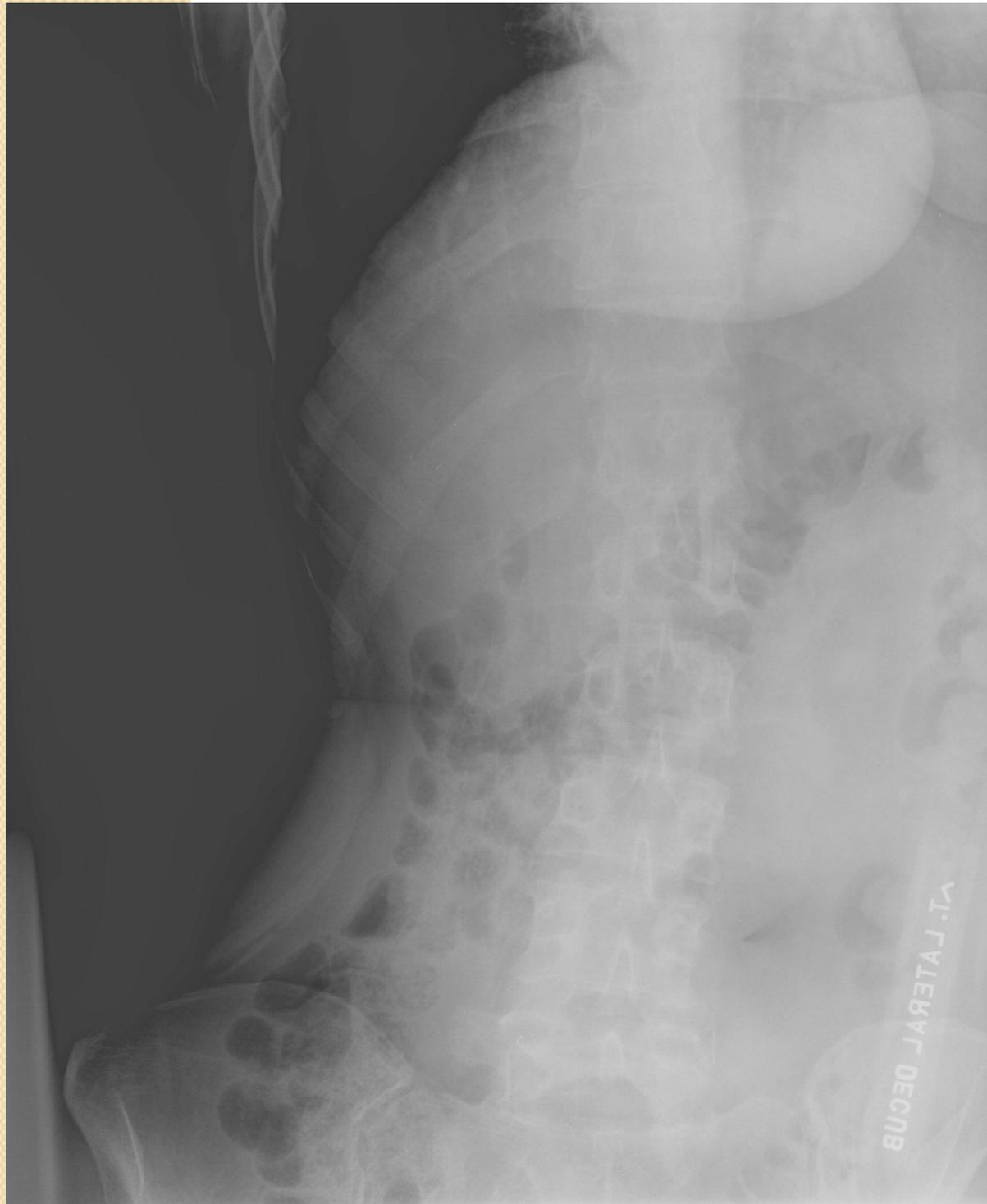
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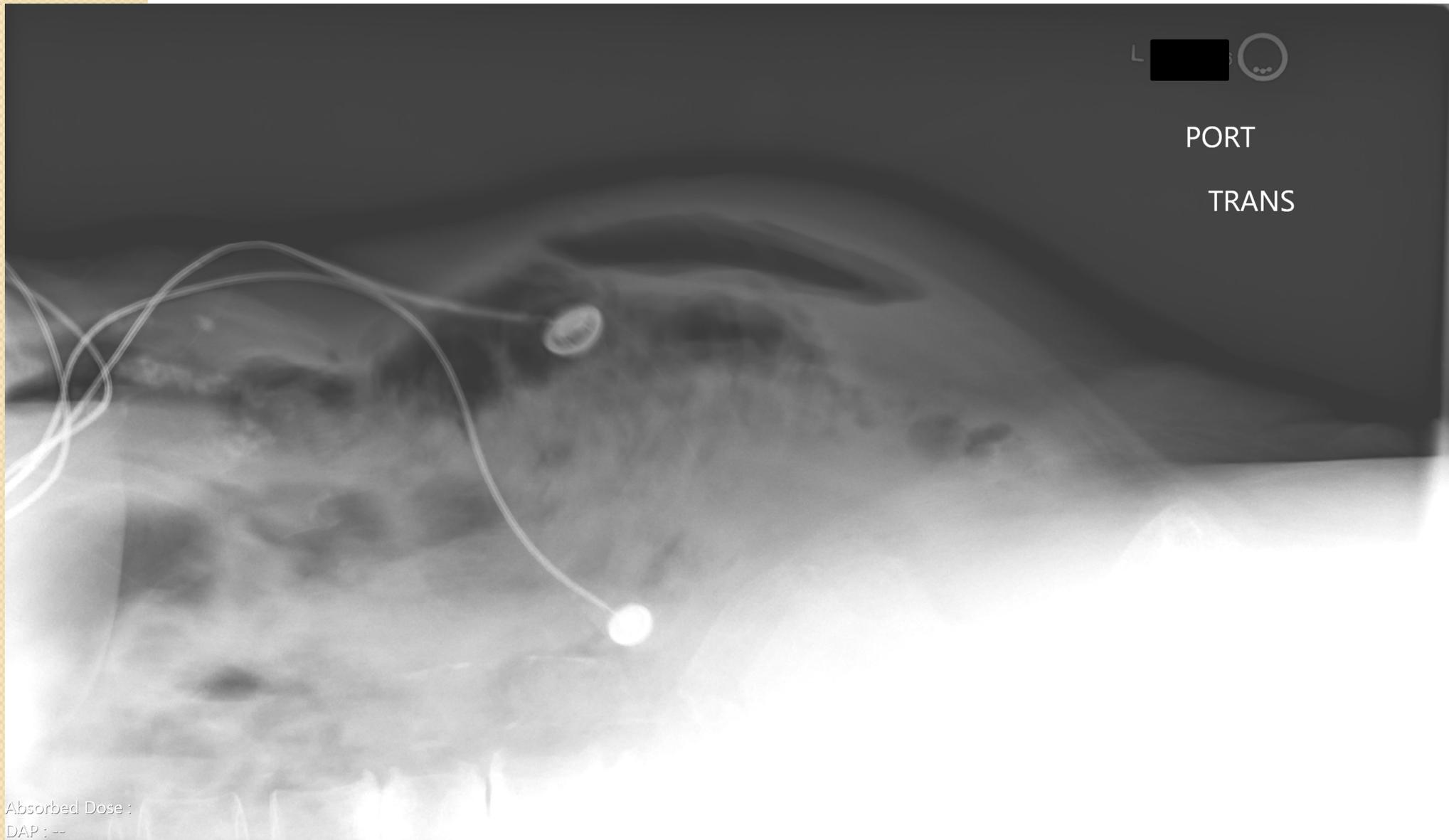


- What do you think about image quality?



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On to PART 2!!