Experiment number(2)

Inverse square law and radiographic density

Objective:To apply the principles of the inverse square law to a practical situation.

To demonstrate that the radiographic density of an image can be maintained at different FFD by adjusting the mAs according to the principles of the inverse square law.

Procedure:

The inverse square law states that the intensity of an X-ray beam is inversely proportional to the square of the distance from its source to the film.

A practical formula based on the principles of the inverse square law has been developed, enabling us to accurately adjust our exposure factors to maintain the density at different FFD.

$$\text{NEW mAs} = \frac{\text{OLD mAs X (NEW DISTANCE)}^2}{\text{(OLD DISTANCE)}^2}$$

Part one:
Using 35x35 cm cassette ,elbow phantom and a lead apron.
 The cassette will be divided into 3 sections (using the lead apron) to record 3 images.
 the elbow phantom is centered to one section at a time, and the x-ray beam is collimated to the elbow phantom.
Three exposures are made as following:

section	KV	mAs	FFD
1st	45	2.5	100
2nd	45	2.5	120
3rd	45	2.5	80

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Part Two:
Using 35x35 cm cassette ,elbow phantom and a lead apron.
 The cassette will be divided into 3 sections (using the lead apron) to record 3 images.
 the elbow phantom is centered to one section at a time, and the x-ray beam is collimated to the elbow phantom.
Three exposures are made as following:

section	KV	mAs	FFD
1st	45	2.5	100
2nd	45	3.6 (we will use 4)	120
3rd	45	1.6 (we will use 2)	80

The mAs is changed with the change of the FFD according to the inverse square law.

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Conclusion:

Density is ***inversely proportional*** to the FFD.
As the distance is increased the Density will decrease.

In part one :

 Since the mAs was not changed with the change of the FFD:

The density in 1st section is ***optimum*** because the FFD is ***optimum*** (100).

The density in 2nd section is ***low*** because the FFD is ***long*** (120).

The density in 3rd section is ***high*** because the FFD is ***short*** (80).

In part two :

 Since the mAs was changed with the change of the FFD (according to the inverse square law):

 although the distance was changed, the density in 1st ,2nd and 3rd section are almost the same(density was maintained) because we applied the inverse square law.

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