RADIOLOGIC SCIENCE 2

Prof. Stelmark

Course:

XRA 121

Title:

Scatter radiation

Name >>>>>>>

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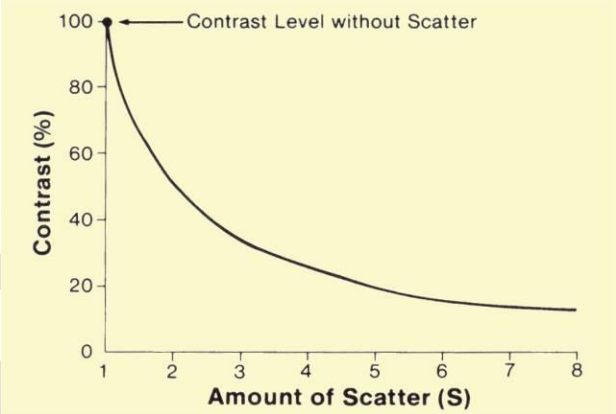
Team Room D

Lab Experiment # 1

Scatter Radiation

Purpose:

The purpose of this lab experiment is to demonstrate how scatter radiation affects a radiologic image, its contrast and visibility of details. Scatter radiation is a secondary radiation produced when the x-ray beam interacts with the body, causing the photons to change direction. This type of radiation produces an unwanted reduction of contrast and sharpness of the radiologic image. We can state that the level of contrast is inversely proportional to the amount of scatter produced that reaches the image receptor. As the graphic shows, the level of contrast gradually decreases when the amount of scatter increases.



The use of a grid is the most practical method to compensate this loss of contrast. This type of device reduces the scatter radiation that reaches the image receptor. The degree of scatter removing is determined by the Grid Ratio which is the ratio between the heights of the lead strips that make up the grid and their distance.

Equipment used:

- Various size CR image receptors;
- Whole body phantoms;
- Set of radiopaque markers.

Method:

1. Place a CR image receptors in the bucky lengthwise for the first 5 projections and on top of the radiologic table for the last 5. Set the SID to 40 inches.
2. Place the Whole Body Phantom on the tabletop positioned for various projections as indicated on the worksheet
3. Set the control console to the manual mode.
4. Make exposures using the settings indicated on the worksheet and derived from the charts.

Experiment analysis:

With the purpose of evaluating the effect of scatter radiation we x-ray 5 different body parts of the phantom twice: first using the bucky and after using the image receptor tabletop. For the first 5 exposures we place the CR image receptor lengthwise in the bucky with an SID of 40 inches. We set the control console in manual mode, and we use techniques derived from the charts as follows:

	ANATOMY	**kV**	**mAs**	**lgm**
1	CHEST	86	12.5	2.38
2	KUB	80	16	2.33
3	L-SPINE	90	20	2.5
4	PELVIS	84	16	2.49
5	KNEE	84	8	2.37

For the next 5 exposures, we place the CR image receptor on top of the radiologic table under the anatomic part of interest, still using the manual mode on the control console and the same SID 40 inches. The bucky, which has a Grid Ratio of 10:1, requires a stronger technique than a radiographic image taken tabletop, therefore for this last 5 radiologic images we will cut down the mAs by a factor of 5 as follows:

	ANATOMY	**kV**	**mAs**	**lgm**
6	CHEST	86	2.5	2.4
7	KUB	80	3.2	2.37
8	L-SPINE	90	4	2.56
9	PELVIS	84	3.2	2.65
5	KNEE	84	1.6	2.34

As foretold, the radiologic images taken with grid appear with higher contrast and enhanced visibility of details compared to the ones taken tabletop where the scatter radiation causes a loss contrast that not even the postprocessing functions are able to adjust. Some projections show a bigger difference in visibility of details between tabletop and grid, despite the fact that the phantom is considered an average patient. The loss in visibility of details is more evident in projections such as L- spine and abdomen. The L- spine projection does not display the bony structures sharp enough to observe a possible fracture, while the projection of the abdomen does not show soft the characteristics of soft tissues clear enough. The chest projection is affected by scatter but not as much as for the abdomen and L-spine. Lungs contain mostly air, which allows the radiation to penetrate them avoiding an excessive production of scatter radiation.

Thickness and density of the body part that needs to be x-rayed play a crucial role in deciding whether we should use a grid or not. For asthenic body habitus, pediatric and elderly patients, projections of body parts thicker than 10 cm can be performed tabletop with the benefit of a much lower patient's dose and a diagnostically result still acceptable.

For average patient the use of a grid is necessary for body parts thicker than 10 cm, and for above average patient a harder technique is required in addition to the use of grid.