# X – RAY DEPARTMENT

**Lecture 5.** **د. سناء القصاب**

## Factor effecting the production of radiograph

The x – ray output test used to monitor the reproducibility of radiation output by a particular x –ray machine. A dosimeter is used to read the output.

### Now factors effecting quality control.

**a. Factors related to x –ray beam (exposure technique factors) which include: -**

1. Kilovoltage peak (kVp): refers to the potential difference between anode and cathode of x –ray tube. The higher the KVP the greater is the energy of the photons produced lead to more penetrating power, kilovltage also change the number of produced photons.

kVp ↑ → Density ↑

kVp ↑ → Contrast ↓ → short scale because ↑ kVp → formation of more secondary radiation →↑ fog →↓ contrast

2. Filtration: filters remove the low energy radiation → ↓ contrast.

There are two types of filers 1. added (aluminum 2mm). 2. Inherent filter (cone, glass, oil).

3. Exposure time: can be checked electronically with a digital read out meter or mechanically with a spinning top.

4. Milliamperage (mA): Is responsible for the quantity and intensity of the x – ray beam and for the resultant density of the radiograph.

5. Focal spot size: It has a major effete on image sharpness, as an x –ray tube is used, the extreme temperature can cause the surface of the target to deteriorate as a result of pitting. This results in an increase in size of the effective focal spot to define small structures decreases, and focal spot size varies with changes in kVp and mA. Decrease size of focal spot →↑ sharpness.

6. Beam alignment and collimation: Work together to expose a precise area of the patient. Unproductive irradiation of the patient occurs if the beam or the collimator or both are not aligned. If the x –ray the tube within the machine housing is not aligned

with the aperture of the lead diaphragm where the x –rays exit the housing, significant cone – cutting will result. Collimation results in the final shape and size of the x –ray beam. The diameter of a beam at the end of a round collimator should not exceed 7cm (2.75inch). collimation $\rightarrow\downarrow$ secondary radiation.

7. Movement of the tube head: Caused by an unstable suspension arm can result in motion unsharpness of the radiographic image. Suspension arms most commonly are stabilized by hydraulic and coil spring dampeners. In most cases, there are easily adjustable after reference to the owner's manual.

The foregoing quality control tests are not difficult to perform. A degree of mechanical ability and an assortment of equipment are necessary to carry out the tests. Testing should be done yearly, and all procedures and results documented in log book.

8. Tube film distance: The distance from the x –ray tube to the film greatly affects the intensity of radiation at the film position. This relationship is stated in the inverse square law; the exposure time is proportional to the square of the distance measured from tube to film

$$\frac{\text{old exposure time}}{\text{new exposure time}} = \frac{(\text{old distance})^2}{(\text{new distance})^2}$$

and this formula is used when the kVp and mA must kept constant and exposure time and tube film distance need to be changed.

T.F.D. have no affect on kVp but when T.F.D. change we have to make change in the exposure time and the mA.

When there is greater distance between the tube and the object and smallest distance between the film and object it will give a proper density.

**b. Factors related to object (absorbing media)**

This include two factors

1. object thickness; that thicker the object the more radiation is required to get through the object to the film usually radiation is increased by increasing the mA and exposure time; also it is advisable to use higher kVp; higher kVp reduce the exposure time and minimize image blurring because of

movement; also reduction of exposure time can be accomplished by increasing mA and/or film speed; the secondary radiation increased with the increasing of the object thickness. For the teeth and jaws we need about 10 – 15mA and kVp about 60-65 KVA.

2. Objective Density: It is refereed to the weight per unit volume of the object. The density of the tissues being examined plays an important part in the creation of film fog due to secondary radiation. The soft tissues tend to produce more secondary radiation fog an a film then the hard tissue, this can compared by radiograph of a patients.

**c. Factor related to film processing**

1. Good darkroom.
2. Good equipment.
3. Good processing technique.
4. Good storage of the film.

The temperature shouldn't exceed $68F^0$ and the time is about 4 1/2 minutes. If we have a higher temperature more than $68F^0$, we will have a short scale of contrast. If we have decrease low degree; the contrast will be decreased (long scale). If the time of processing decrease (processing time is less than 4 minutes), we will have less density, and if the time of processing, is increased, we will have increased film fog. So any error in the steps of processing (developing, rising, fixing and washing) will give faulty film processing that effect the quality of radiograph.

and for good storage of the film

1. Film should stored in a dark cool place (like dark room).
2. It should stored in steel or lead lined boxes to protect the film stray radiation.
3. It should not exposed to chemicals or excessive humidity.
4. It should be used before expiray date record an the film.

Note: for increase sharpness about film should decrease secondary radiation by collimation, focal spot size, lead sheath, grid