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**X – Ray films**

**Radiograph: -**

Is a photographic image of an object made with use of X- ray instead of light.

**Dental x- ray film: -**

Is a recording media on which image of the object was made by exposing this film to X-ray.

There are 2types of x- ray film:-

a- Intra oral X- ray film.

b- Extra oral X- ray film.

a- Intra oral X- ray film:-

 **Chemical composition of X- ray film:-**

It consist of a sensitized emulsion present on both sides of transparent base. This base made from cellulose acetate while the emulsion made from crystals of silver halides (mainly silver bromides) suspended in gelatin,

the silver bromide crystals are sensitive to both light and X- ray photons



X- ray photons interact with electrons of the atoms of the chemical emulsion in the X-ray film so the result is analog image, analog means the image appears identical to the original.

 Intra oral film are wrapped by opaque material to prevent light from reaching the film because light photons can activate the silver halides crystals. We found also a thin sheet of (Lead foil) is usually placed behind the film to prevent most of secondary radiation that originated in the tissue of the patient behind the film from reaching it.

Therefore this lead foil reduce secondary radiation and minimize film fog. In addition the lead foil absorbs x- ray that have passed through the object and the film so it reduce the exposure of the tissue behind the film. This foil has a design of (herring bone pattern) which appear on the radiograph when exposed from opposite side.



**The contents of a film packet. A The outer wrapper. B The film.**

**C The sheet of lead foil. D The protective black paper.**

 **X- Ray film type, size and speed:-**

 **Intra oral film types:-**

 Type I:-

 Called per apical film used to examine the apical area of the tooth and the surrounding structures these size of this type include (1.00, 1.0, 1.1 and 1.2).

 Type II:-

 Is called bitewing film it used to detect the inter proximal caries and the height of alveolar bone between 2 adjacent teeth.

 The size include: - (2.00, 2.0, 2.1, 2.2 and 2.3)

 Type III:-

 Is called occlusal film that used to demonstrate area larger in dimension than area appear in per apical film.

 The size include:- is only (3.4).

 **Speed of intra oral film:-**

Speed mans the sensitivity of X-ray film silver bromide crystals (Ag, Br) to X- ray radiation.

 We have direct relation between the speed of the film and the size of the crystals, the larger size the faster the film speed.

 The classification of film speed based on alphabetical basis so from **A** to **F**.

 Film speed A is the slowest with speed F is the faster one. We should know that the faster mean it need less amount of radiation to produce radiographic image.

**Extra oral film:-**

The purpose of using such film is to make a radiographic image able to examine an area in and around the jaw that can't be seen by intra oral film.

**Types of extra oral film:-**

1. Screen

2. Non screen

Non screen film:-

than to light 1. Film emulsion is more sensitive to X- ray

 2. The film has double emulsion like intra oral

 film but the emulsion is thicker.

3. Increase thickness of emulsion make the non-screen film need less amount of radiation so it need less exposure time

 4. The size of the film used include: 5×7 and

 8×10 inches.

**Screen film:-**

Film emulsion is more sensitive to visible

light and more specifically to blue light in

the visible light spectrum.

2. The size include: - 5×7, 8×10 and 10×12 inches.

3. Screen film has 3types:- slow or detail screen,

 medium or par – speed screen and fast or high – speed screen.

4. The screen film placed between 2 fluorescent made from screen in cassette. These 2 fluorescent screen made from (tiny calcium tungestate crystals).

**Film properties:**

These include density, contrast and details or definition.

**Density:-**

Is the degree of blackness present in the processed film it measures interns of light transmission on a percentage or logarithmic scale.

Film density used in diagnostic radiograph is ranged from 0.25 to 2.

Film density best shown by sensitometric or H & D curve. This curved is obtained by plotting the density against the exposure time, the more the film is exposed to X- ray the blacker it becomes when processed.

**Factors affects film density:-**

1. Exposure time, increase exposure time increase the film density.

2. Milliampere, increase milliampere value (mA) which is usually ranged from 10 – 15mA cause increasing film density.

3. Kilovoltage, increase Kilovoltage, value (kV) cause increasing film density.

4. Developing time, developing time usually range from 4 – 5 minutes. Increase developing time cause increasing film density.

5. Distance, increase the distance between X-ray tube and the film during exposure cause decrease film density.

**Contrast:-**

 It means the graduation of differences in film density at different areas of a radiograph.

The term film contrast describes the capacity of radiographic films to display differences in subject contrast, that is, variations in the intensity of the remnant beam. A high-contrast film reveals areas of small difference in subject contrast more clearly than does a low-contrast

film.

Long – scale or low contrast:-

 It means when many different film densities can be seen between totally clear and totally black areas of the radiograph.

Short – scale or high contrast:-

 It means when few different film densities can be seen.

**The stepwedge or penetrometer:-**

 Is an object used to show the radiographic contrast its usually made of aluminum and is constructed so that there is a constant increase in thickness of aluminum between the X- ray tube and the film.

**Factors affect contrast:-**

Kilovoltage:- increase kiolovoltage cause increase the (contrast scale)

Processing solution temperature since increase the temperature cause decrease of (contrast scale).

**Details or definition**:-

 Is the ability to reproduce sharp outlines of the object.

**Factors affect details**:-

1. Focal spot size:- size of focal spot must be as small as possible in order to produce sharp image.

2. Size of film crystals which called (film grain):- increase the size of film grain produce less sharp image.

3. Movement of patient head or X- ray tube or the film during exposure cause un sharp.

4. Target object distance: - which should be as great as possible, other wise the image will be un sharp.

5. Object film distance:- should be as small as possible to produce sharp image.

6. Screen – film contacts:- poor contact between then cause also un sharp image

 **Latent image formation:-**

The Ag Br crystals in the film emulsion are changed whenever they absorb X- ray photons, the result of absorption is precipitation of speck of silver in each exposed Ag Br crystal to X- ray, collectively these specks are called Latent image which is invisible and in order to convert to visible image X- ray film must be processed.

 **Film processing**:-

Processing cycle include:-

 Developing, rising, fixing, washing and drying.

**Developing: -**

 X- ray film is placed in developer for 4 – 5 minutes the action of developing agents are on exposed Ag Br crystals to continue the process of precipitating the specks of silver until all silver is deposit at the site of crystal and the bromine is released into the developing solution this solution is alkaline in its action its temperature is 20C˚. Other action of developing solution is soften the emulsion of the X- ray film.

**Fixing:-**

We put the film in fixer solution for 10 – 15 minutes its action is:-

Re harden the film emulsion.

Removed all the unexposed or undeveloped crystals.

After fixing washed the film in running water for 20 – 30 minutes.