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Textbook of Dental Radiology

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THIRD EDITION

JAYPEE

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CHAPTER

4 Films Used in Dental Radiography

- Film Composition
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- Extraoral Films
- Duplicating Films

We have but faith: we cannot know;
For knowledge is of things we see;
And yet we trust it comes from thee,
A beam in darkness: let it grow.

—Alfred Lord Tennyson

INTRODUCTION

The dental X-ray film serves as a recording medium or image receptor for recording the image after the X-rays pass through the structures to be radiographed and then strikes the film in order to bring about a chemical change. A latent image or invisible image is recorded in the X-ray film when it is exposed to information-carrying X-ray photons. This latent image can be viewed only after a step called processing. Processing brings about certain chemical changes in the exposed film.

FILM COMPOSITION

The X-ray film is composed of the various components as shown in **Figure 4.1**. An X-ray film is similar to a photographic film. The purpose of both the films is to act as an image receptor system. The photographic film also has to be chemically processed after exposing.

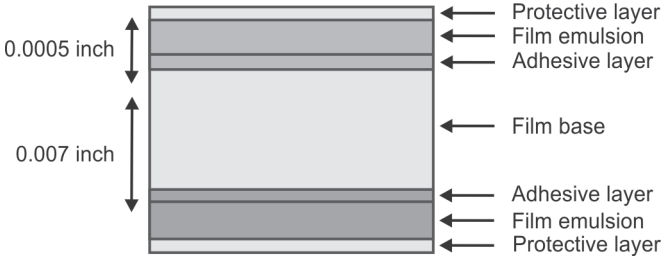

Fig. 4.1: Composition of X-ray film.

Film Base

The film base is a flexible piece of polyester, having a thickness of 0.2 mm. The film base is transparent and with slight blue tint to enhance the contrast and image quality and also to provide optimal viewing conditions. The base should be able to withstand heat, moisture, and chemical exposure. The purpose of the base is to provide stable support for the emulsion and to provide adequate strength to the film.

Adhesive Layer

The adhesive layer serves to attach the film emulsion to the film base.

Film Emulsion

The film emulsion is sensitive to the X-ray photons. The emulsion consists of gelatin matrix that suspends and evenly disperses millions of microscopic silver halide crystals over the film base. During the processing, gelatin absorbs water and swells, thereby facilitating close contact and the action of chemicals with the silver halide crystals. Gelatin is derived from cattle bone.

The silver halides used in X-ray films are silver bromide (AgBr) and silver iodide (AgI). An X-ray film contains 90–99% silver bromide and only 1–10% silver iodide. The silver halide crystals absorb radiation, and the information-carrying X-ray photons produce a latent image due to the presence of these X-ray-sensitive crystals that undergo certain chemical alterations. This latent image is made visible image by processing.

The sensitivity or the efficiency of the X-ray films can be increased by the following means:

- Coating the emulsion on both sides of the base (double emulsion coated film)

- By the addition of small amounts of silver iodide
- By adding sulfur-containing contaminants
- By using larger grains of silver halide.

Films used in dental radiography can be classified into:
- Intraoral films
- Extraoral films
- Duplicating films.

INTRAORAL FILMS

An intraoral film is one which is placed inside the mouth during X-ray exposure. An intraoral film is used for the visualization of the teeth and the supporting structures.

Contents of the Film Packet (Fig. 4.2)

The intraoral film is available in individual film packets. The film packet has an outer package wrapping which is made up of soft vinyl or paper. It protects the film from moisture, saliva, and light exposure. The film wrapper has two sides, i.e. tube side and label side. The tube side should always face the X-ray tube during exposure. The label side is the backside of the film packet. The tube side of the film wrapper is plane white in color with a raised embossed

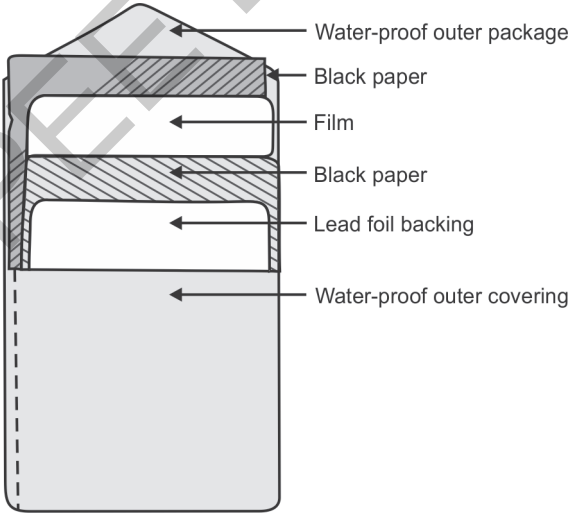

Fig. 4.2: Contents of the film packet.

dot in one corner, which serves in the identification of the side of the radiograph. During exposure, the embossed dot on the film must never get superimposed in the periapical region, it should be directed coronally (incisally in case of anterior teeth and occlusally in case of posterior teeth).

Within the film wrapper there is a paper film wrapper. This black paper protective sheet covers the film on either side and shields it from light exposure.

Lead foil is a single piece of thin lead foil present within the film packet and located behind the black paper between which the film is placed. This lead foil helps in preventing the back-scattered (secondary) radiation from causing film fog.

Types of Intraoral Films

Periapical Film

The periapical film is used for visualizing the entire tooth (crown and root) with an adequate area of the periapical region. Periapical films are available in three sizes.

1. *Size 0*: It has a size of 22 × 35 mm and is used for small children.
2. *Size 1*: It has a size of 24 × 40 mm and is used for radiographing the anterior teeth in adults.
3. *Size 2*: It is the standard film used for radiographic examination. It has a size of 32 × 41 mm.

Bitewing Film

Four sizes of bitewing film are available.

1. *Size 0*: It has a size of 22 × 35 mm and is used to examine the posterior teeth in small children.
2. *Size 1*: It has a size of 24 × 40 mm and is used to examine posterior teeth in children as well as anterior teeth in adults (when placed vertically).
3. *Size 2*: It has a size of 32 × 41 mm and is used to examine the posterior teeth in adults.
4. *Size 3*: It has a size of 27 × 54 mm and is narrower than size 2 film. This is exclusively used for bitewing projection. This film demonstrates all the posterior teeth of one side.

Occlusal Film

The occlusal film is larger in size compared to the other intraoral films. It has a size of 57 × 76 mm. An occlusal film is used to visualize the entire arch (either the maxillary or the mandibular) in one film.

This projection is also used in the localization technique to get the right angle view in conjunction with intraoral periapical radiograph. Detailed description about occlusal films is given in Chapter 9.

Classification of Films Based on Speed

Speed of an X-ray film refers to its sensitivity. A high-speed dental X-ray film requires only less amount of radiation for the image formation. Thus, use of high-speed films in the dental practice considerably reduces the exposure. Various factors responsible for increasing the sensitivity of films have already been discussed.

Based on the speed, the intraoral films are classified as A, B, C, D, and E-speed films. A-speed films are the slowest. B-speed and C-speed films are not used for routine intraoral radiography. D-speed (ultraspeed) and E-speed (ektaspeed) films are used for intraoral radiography. As the sensitivity of the film increases, there is a reduction in the contrast of the image. E-speed film requires only one-half the exposure time of D-speed film. Nowadays F-speed films are also being marketed which are highly sensitive and contributing in the reduction of radiation exposure to the patient. However, decrease in the contrast is a major disadvantage in using F-speed films. E-speed films have been found to be superior in the diagnostic point of view.

EXTRAORAL FILMS

The extraoral film is one that is placed outside the mouth during exposure. These films are used when visualization of a larger area is desired.

Extraoral films used in dental radiography are available in the following sizes based on the need for visualizing the required area:

- 5 × 7 inches
- 8 × 10 inches
- 5 × 12 inches or 6 × 12 inches for panoramic radiography.

Extraoral films are usually used with intensifying screens to minimize the radiation exposure. The use of X-ray films in conjunction with the intensifying screens is referred to as screen-film combination. Nonscreen films are rarely used for extraoral radiography. Such films are called direct exposure films. A nonscreen extraoral film requires more exposure time than a screen-film combination and is not recommended for routine radiography. See also Chapter 11.

DUPLICATING FILMS

In dental radiography, duplicating film is a type of photographic film that is used to make an identical copy of an intraoral or extraoral radiograph. Duplicating film does not require exposure to X-rays. Special equipment and duplicating films are necessary for the duplication process.

Textbook of
Dental Radiology

Salient Features

- A fully revised and updated textbook
- Rewritten and edited as per the requirements of the students
- Many photographs are added
- Simple and lucid style for easy grasping of the subject
- Easy to understand
- Provides essential knowledge on the subject, including recent advances
- Useful for students and teachers of radiology, dentistry and medicine as well as dental and medical practitioners.

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ISBN 978-93-5270-605-1