Dental Radiology 1 (Final) - 202

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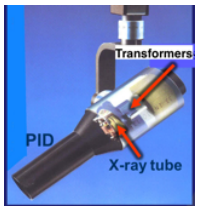
Lecture 1 (pt 1)

Production of Radiographs

Note that in these summaries, I'll be including the dr's slides, his explanation, and some important additional notes and clarifying images from the book. I'll also provide some questions at the end of each lecture. I hope you find them useful!!

LETS GET STARTED

Quick revision of the components of an X Ray machine; it's composed of:



- Tube head: contains the x-ray tube that produces dental x-rays.
  - Extending from the tubehead opening is the position-indicating device (PID), or cone. The PID may be round or rectangular in shape and it restricts the size of the x-ray beam.

- Extension arm: (1) suspends the x-ray tubehead (2) houses the electrical wires (3) allows for movement and positioning of the tubehead.
- Control panel: allows the dental radiographer to regulate the x-ray beam, is plugged into an electrical outlet and appears as a console or cabinet. It consists of:
  - Main parts:
    - On/off switch (with an indicator warning light and an audible signal when the equipment is turned on)
    - Timer
    - Exposure time selector

  - Other features may include:
    - Film speed selector
    - Patient size selector
    - Kvp selector
    - MA selector
    - Digital and film mode selector
  - It adjusts time exposure down to a fraction of a second using one of the three types of timers:
    1. Electronic (impulse)
    2. Digital timer
    3. Anatomical time selector (you pick the tooth you want to image and it automatically selects a time).

Types of dental X-Ray films

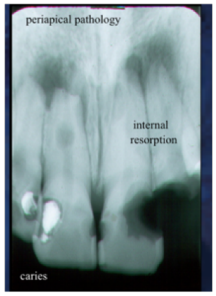
In dental radiography, the x-ray beam passes through teeth and adjacent structures and reaches the x-ray film. It serves as a recording medium, or image receptor. (Explained more in the next pages). Three types of x-ray films may be used in dental radiography:

(1) intraoral film (2) extraoral film (3) duplicating film (not included)

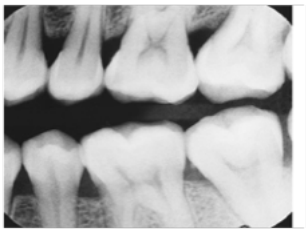
❖ Intraoral Film

An intraoral film is a film that is placed inside the mouth during x-ray exposure. It's used to examine teeth and supporting structures. Three types of intraoral films are available:

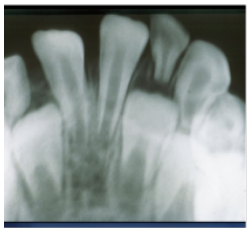
1. Periapical film: used to examine the entire tooth (crown and root) and supporting bone. It's useful in:
   - ✓ Apical pathology
   - ✓ Periodontal evaluation
   - ✓ Caries detection
   - ✓ Endodontic treatment

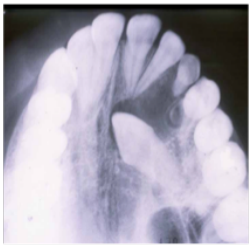


2. Bitewing film: used to examine the crowns of both maxillary and mandibular teeth on one film. It's useful in:
   - ✓ Interproximal Caries
   - ✓ Alveolar Bone Involvement



3. Occlusal film: used for examination of large areas of the maxilla or the mandible. It's named so because the patient "occludes," or bites on the entire film. It is larger than periapical or bite-wing films. It's useful in:
   - ✓ Identifying large lesions
   - ✓ Locating bucco-lingually
   - ✓ Developing anterior teeth
   - ✓ Imaging trismus patients (a condition of spasm of the jaw muscles causing the mouth to be tightly closed, typical in tetanus)



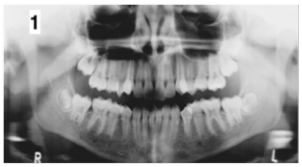


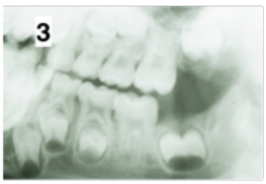
- Intra-oral film sizes:
  - # 0: Children (PA & BW); small mouths
  - # 1: Adult anterior (PA): paralleling
  - # 2 (also known as the standard film): Adult anterior PA (Bisecting); adult posterior PA & BW; pedo occlusal
  - # 3: Extra long BW
  - # 4: Adult Occlusal

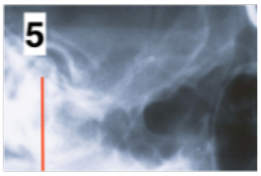
❖ Extraoral Film

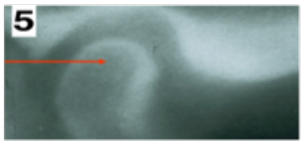
An extra-oral film is placed outside the mouth during x-ray exposure. It's used to examine large areas of the skull or jaws. Types include: (numbered as the pics)

1. Panoramic films: shows a panoramic (wide) view of the maxilla and the mandible and surrounding structures on a single image.
2. Cephalometric films: exhibits the bony and soft tissue areas of the face.
3. Lateral jaw films
4. Skull films
5. TMJ (temporomandibular joint) films





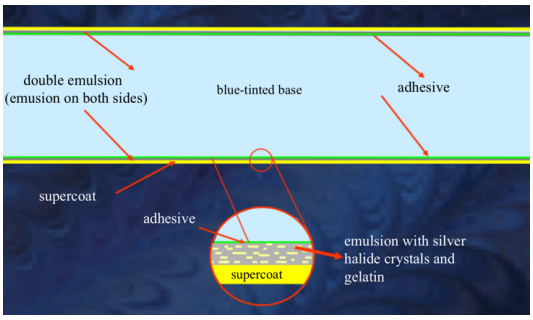




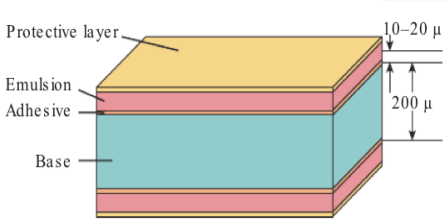
- Extra-oral film sizes
  - 5" x 12" – panoramic
  - 6" x 12" – panoramic
  - 5" x 7" – Transcranial
  - 8" x 10" – Skull, ceph, Tomogram

What's the composition of an x-ray film? It has four basic components:

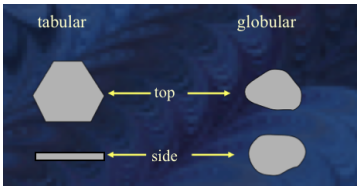
1. Film base: A flexible piece of polyester plastic that's instructed to withstand heat, moisture, and chemical exposure. It provides strength and a stable support for the delicate emulsion.
2. Adhesive layer: covers both sides of the film base and serves to attach the emulsion to the base.

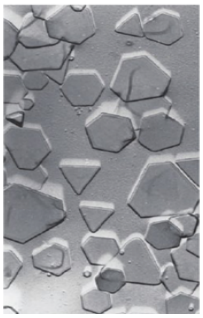


3. Film emulsion: A coating attached to both sides of the film by the adhesive layer <u>to make the film more sensitive to radiation.</u> It's a homogeneous mixture of:



   - Gelatin: It evenly disperses microscopic halide crystals over the film base, absorbs the processing solutions, and allows the chemicals to react with crystals
   - **Silver halide crystals**: Chemical compounds that are sensitive to radiation or light. They absorb radiation during x-ray exposure and store energy from that radiation. Types Include:
     - <u>Tabular</u> (flat) crystals with F- speed film (<u>insight</u>) (This type is more efficient)
     - <u>Globular</u> (rounded) crystals with D-speed film (<u>ultra speed</u>)



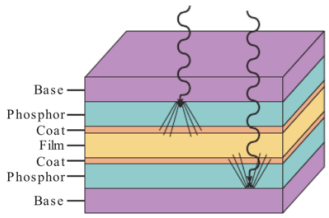


4. Protective layer: Thin transparent coating placed over the emulsion. It protects the emulsion surface.

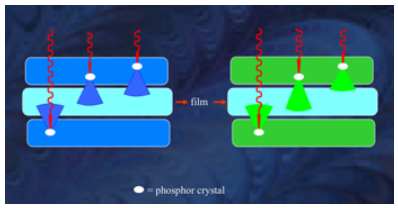
Film Types

- Direct Exposure film
  - Sensitive to x-rays
  - Used Intraorally
- Screen Film
  - Requires the use of an **intensifying screen**; a device that transfers x-ray energy into visible light (fluorescence), the visible light then exposes the screen film
  - Sensitive to fluorescent light (not direct exposure to x-rays)
  - Used extra-orally (most extra oral films are screen films)
  - Less radiation is required to expose a screen film, and the patient is exposed to less radiation. (30-60 times less radiation than direct exposure film)

❖ Intensifying screen composition



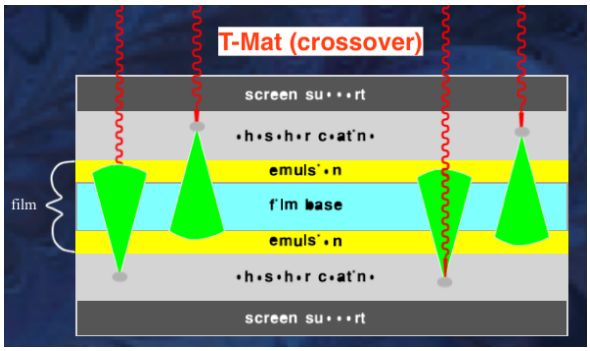
- ✓ Base (thick white line in upper pic) = plastic for support
- ✓ Reflecting layer (silver line) = reflects light back toward film
- ✓ Phosphor layer (green line) = rare earth (When exposed to x-rays, the phosphors fluorescent and emit visible light in the blue or green spectrum; the emitted light then exposes the film)
- ✓ Protective coat (thin white line) = plastic

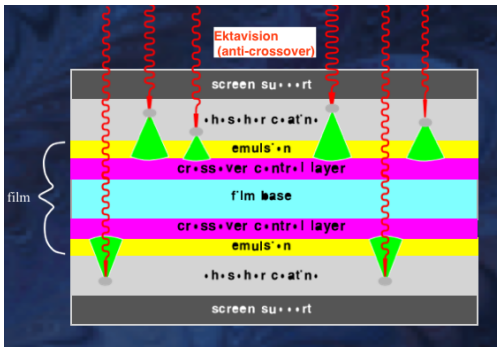


- ➢ Intensifying Screen Speed
  - Fast (Rapid): less exposure, less detail
  - Medium : compromise between detail and speed
  - Slow (Fine, Detail): more detail, more exposure
  - ❖ Screen speed is increased by:
    - Higher absorption phosphor (rare earth)
    - Higher conversion-efficiency phosphor (rare earth)
    - Thicker phosphor layer (all)

The newer rare earth screens have phosphors that are not commonly found in earth (thus "rare earth") and emit green light. (More efficient)

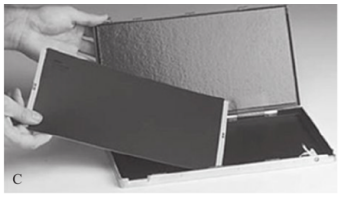
- ➢ Types of screen films:
  - T- Mat (crossover) : green-sensitive; used with rare earth screens. (Uses Flat crystals)
  - Ektavision (anti-crossover): green-sensitive; used with rare earth screens. Anti-crossover layer gives a sharper image. (Also uses flat crystals)

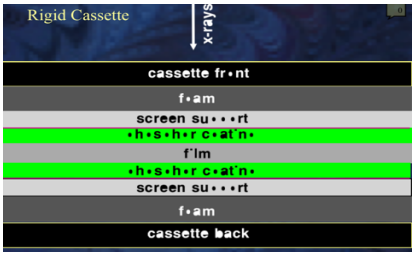


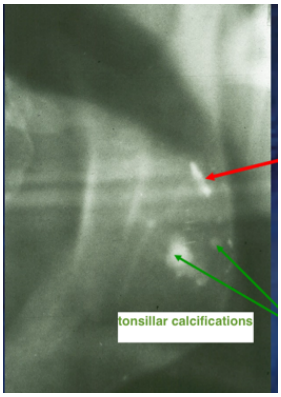


Cassettes

- Used to hold Intensifying screens in tight contact with film
- Available in a variety of sizes that correspond to film and screen sizes (additional)
- Could be soft (vinyl)
- Could be rigid (Metal): lasts longer, and better protects screens from damage than does a soft one (pic C)
- Any debris in the cassette (between screen and the film) will result in a white spot on the film (red arrow in 3rd pic)





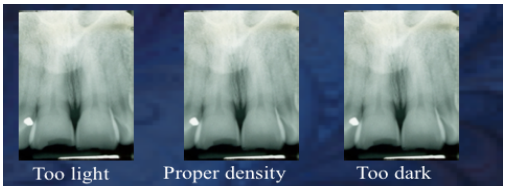


Extraoral Film Choices:

- G: used for best contrast
- L: most forgiving; normally used
- H: used for extra copy of film

Film Speed

- Represents the amount of radiation required to produce a radiograph of acceptable density
- Film speed increases with larger silver halide crystals
- A faster film requires less radiation exposure because the film responds more quickly

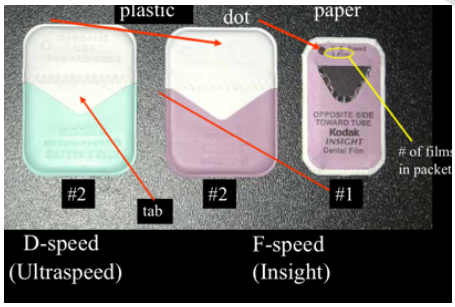


➢ Intra-oral film speeds:

- ✓ D-speed (**Ultraspeed**): Uses Globular crystals
- ✓ F-speed (**Insight**): faster
  - Uses the largest silver halide crystals
  - Uses Tabular crystals (flat)
  - 60% less exposure than D-speed

- Extraoral Film/Screen System (extra oral film speed)
  - Film speed + screen speed = system speed

Film cover



- It keeps out light and moisture, and protects the emulsion
- On the label side, It provides the following Information:
  - A circle or dot that corresponds with the raised identification dot on the film
  - The film speed (example: INSIGHT)
  - The number of films enclosed (example: one-Film or two-Film)

Contents of an intra-oral Film packet

- Inner and outer black papers: surround film, and protect the emulsion
- Film: one or two films
  - There's a raised dot in one corner that is used for film orientation (to know right from left) (red arrow)
- Lead foil:
  - Protects film from back scatter radiation that results in film fog.
  - Reduces patient exposure
  - Strengthens packet
  - Pattern on foil identifies if the film is placed backwards (if the film is accidentally positioned in the mouth where the back of the film is facing teeth and is gets exposed) (read the clarifying box)

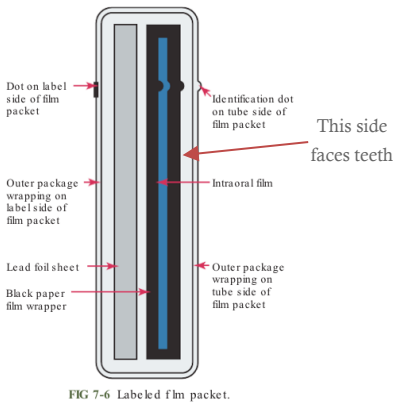


FIG 7-6 Labeled film packet.

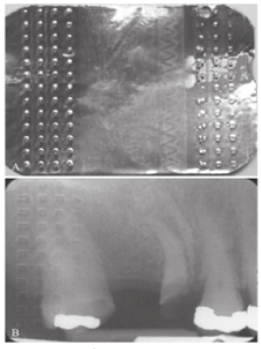
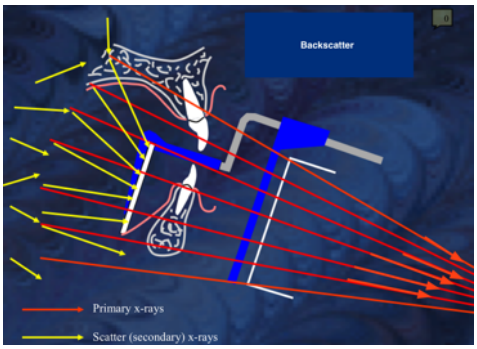


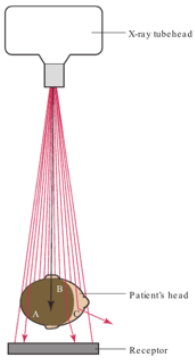
FIG 7-7 A, The lead foil insert in this packet has a raised diamond pattern across both ends. B, Radiograph showing the raised diamond pattern from the lead backing when the film is positioned backward in the mouth. (From Bird DL, Robinson DS: Modern dental assisting, ed 10, St Louis, 2012, Saunders.)

When a film is positioned backwards in the mouth (wrong side), the lead foil will be positioned between the teeth and the film. In this case, most of the radiation is absorbed by the lead foil. This results in a radiograph that's too light and non diagnostic, and the left and right sides are reversed when using the dot as the orientation guide. This Image will show the pattern on foil to Indicate that you must retake the radiograph (PIC B)

Backscatter:

- Scattered x-rays that go "back" towards the film
- (Additional) Scatter radiation is a form of secondary (useless) radiation that is the result of an X-ray that has been deflected from Its path by interacting with matter (patient's soft and hard tissues) (labeled C in the pic)





Film storage

- Store at 50 – 70 degrees F (refrigerated)
- Storage at high temperatures may result in film fogging.
- Opened boxes of screen (extraoral) film need to be kept in light-tight area (darkroom); need to be cool
- Use film before expiration date to avoid film fogging
- Do not store film in the room where radiographs are taken

TEST YOURSELF

1. Dental x-ray film that is placed inside the mouth and used to examine the teeth and supporting structures is termed:
a. duplicating
b. extraoral
c. intraoral
d. none of the above

2. The identification dot on the intraoral film is significant because it:
a. indicates the patient's right or left side
b. determines film orientation
c. is important in film mounting
d. all of the above

3. One advantage of a film with an emulsion coating on both sides (double-emulsion film) is that:
a. the film requires less radiation exposure to make an image
b. the image produced is less distorted
c. the film has less sensitivity to radiation
d. processing solutions are absorbed more easily

4.The purpose of a lead foil sheet in the film packet is to:
a. protect the film from primary radiation
b. protect the film from saliva
c. protect the film from backscattered radiation
d. distinguish between the patient's right and left sides

5.Which is not found on the label side of the film packet?
a. Film speed
b. expiration date
c. the phrase "opposite side toward tube"
d. number of films enclosed

6. Which film size is known as the standard film?
a. 0
b. 1
c. 2
d. 3

7. The speed of a film is determined by the size of the silver halide crystals in the emulsion. Identify the true statement:
a. The larger the crystals, the faster the film speed.
b. The larger the crystals, the slower the film speed.
c. The smaller the crystals, the faster the film speed.
d. None of the above are correct.

8. A film that is placed outside the mouth during x-ray exposure is termed:
a. extraoral
b. intraoral
c. duplicating
d. periapical

9. A screen film is more sensitive to fluorescent light than to direct exposure to x-rays.
a. True
b. False

10. The film characteristic that is "the amount of radiation needed to produce a radiograph of standard density" is:
a. contrast
b. speed
c. image resolution
d. size

11.Non screen extraoral film Is commonly used In extra oral radiography
A. True
B. False

12. The device that transfers x-ray energy into visible light is termed a(n):
a. cassette
b. nonscreen film
c. screen film
d. intensifying screen

13. The intensifying screen that emits green light and must be used with green-sensitive film is termed:
a. calcium tungstate
b. rare earth
c. phosphor
d. rare tungstate

14. The device used to hold the extraoral film and intensifying screens is termed a:
a. screen holder
b. Film holder
c. cassette
d. any of the above

15. Which statement is true?
a. Cassettes are available in sizes that correspond to film and screen sizes.
b. A flexible cassette is more expensive than is a rigid cassette
c. Film can be loaded incorrectly in the rigid cassette.
d. Film cannot be loaded incorrectly in the flexible cassette.

16. Which results if the intensifying screen is not in perfect contact with the screen film?
a. The screen may be damaged.
b. The film may be damaged
c. A loss of image sharpness occurs
d. None of the above.

17. Identify the ideal temperature and humidity levels for film storage:
a. 50° F to 70° F; 30% to 50%
b. 60° F to 80° F; 50% to 60%
c. 70° F to 90° F; 60% to 70%
d. below 50° F; 0% to 30%

18. Which is the largest intraoral film size?
a. 4
b. 3
c. 2
d. 1

1.c	4.c	7.a	10.b	13.b	16.c
2.d	5.b	8.a	11.b	14.c	17.a
3.a	6.c	9.a	12.d	15.a	18.a

For any questions, ask the prof or google ☺

Good luck <33