LECTURE 4
SPECIAL PROCESSES
1) Duplicating Radiograph
2) Subtraction Technique

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DUPLICATING RADIOGRAPH
LESSON OBJECTIVES

At the end of the lesson, the student should be able to:-

• Define duplication of radiograph and explain the purposes
• Briefly explain how the process is done
• Briefly explain the characteristic of image produced
INTRODUCTION

• Process of making copies of x-rays!
• Purpose:
  – Allowed pt. to take films to many different locations, keeping original at hospital
    ➢ often checked out and lost forever
  – Extra set for teaching purposes
Cont’d..

• It is often necessary to send a copy of films to another general practitioner (GP), a specialist, or to obtain a preauthorization from the insurance company. In order to get this copy, the film needs to be duplicated.
Cont’d..

• A duplicate film is made by directing a light source through the original film onto special duplicating film. This is most effectively done using a commercial duplicator (see next slide). A red safelight is used (GBX-2, LED).
DUPLICATION MACHINE
1. Cover
2. Platen Glass
3. Timer set switch (+/-)
4. Mode switch
5. Timer start button
6. Power cord

DUPLICATION MACHINE
Cont’d..

• The original film must be in tight contact with the duplicating film. This is accomplished by closing the lid on the duplicator and locking it or pushing down on it.

• Duplicating film has a single emulsion layer. The emulsion side must be in contact with the original film.
• Duplicating film is a direct positive film, meaning that it gives a positive, or duplicate, image of the original film. If you increase the amount of time the light is on, the duplicate film will be lighter; less light exposure creates a darker duplicate film.
Cont’d..

• If done properly, a duplicate film will provide most of the diagnostic information needed (see next). However, duplicate films are never as good as the original.
EXAMPLE: DENTAL X-RAY

Original

Duplicate

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Cont’d..

• If not done properly, duplicate films will be of little value in trying to make a diagnosis. Films should always be removed from film mounts before duplicating in order to ensure tight contact between the original and duplicate films. Lack of tight contact produced the duplicate film (next slide).
EXAMPLE: DENTAL X-RAY

Original

Duplicate
Cont’d..

• Important to remember- duplication film does **not** reverse image blacks and whites (as does photography when print is made from negative)

Original X-ray + Copy film = Copy

**Quality never as good – Radiologist/Referring Specialist often keep original for own purposes.**
DUPLICATING PROCESS

• Equipment Needed:-
  – Duplication Machine
  – Film Processor and Darkroom
  – Original Film
  – Single emulsion Duplication Film (Usually notched in a corner)
1) Turn on power.
2) With mode switch on "view", position films to be duplicated on the platen.
3) Set the mode switch to "Duplicate".
4) Set the timer to the desired exposure time (20-35 seconds recommended).
Cont’d..

5) In approved safelight conditions, place duplicating film emulsion side down over the film(s) to be copied.

6) Close cover and latch securely. (Leave cover unlatched when not in use).

7) Press the duplicate start button.

8) When cycle is done, remove the exposed duplicating film and process as you would radiograph film.
PROBLEMS

• Films that appear:
  a) too light, decrease the exposure time.
  b) too dark, increase the exposure time.

• Films that appear hazy could be caused by:
  expired film,
  a) variable developing temperature,
  b) insufficient fixation, or
  c) inappropriate safe lighting.
Films that appear black could be caused by:

a) an inactive duplicating bulb, starter or timer;
b) using x-ray film instead of duplicating film;
c) placing duplicate accidentally in fixer before developer; or
d) expired duplicating film.
SUBTRACTION TECHNIQUE
INTRODUCTION

• The subtraction technique is a photographic method for eliminating certain unwanted images from a radiographic film.
Cont’d..

- **Purpose:**
  - To remove bony superimposition-leaving only contrasted vessels of interest!
  - Primarily used in Angiography
Equipment And Materials

- Duplication Machine
- Processor and Darkroom
- Illuminator – For registration of images
- Films:
  - Originals - taken before contrast
  - Series - taken with contrast
  - Subtraction Copy Film
  - Subtraction Mask Film created from zero film
Steps

• Ensure the safelight is ON.
• Place the Scout/Zero radiograph on the glass plate of the Subtraction Machine.
• Place Mask film with the emulsion side facing down.
• Close the lid of the Subtraction Machine.
• Expose them and remove to process the film in the automatic film processor.
Using Subtraction Film to create “Mask”

Original/Scout (zero) x-ray (Negative) + Subtraction Copy Film (reverses tone) = Mask (Positive)
If you combined Zero with Mask:

Original/Scout (zero) x-ray + Mask (Positive) = Black

Black + Subtraction film = White (Clear)
Creating Image Free of Background

Mask (Inverse of original)

Series (Like original but with Contrast)

Subtraction Copy Film (Reverses tones)

Finished product Vessels appear black, background clear

Mask-Series Combination

Vessels appear white on black background
All this tedious **Manual** Duplication/Subtraction process now **Unnecessary!!!!**

- Thanks to digital radiography and computers.
- Digital images can be reversed with the click of a mouse.
- Computer instantly can subtracted out of background.
~END OF LECTURE 4~