CHAPTER 1
ARTIFACTS

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LESSON OUTCOMES

- Define the meaning of radiographic artifact
- Discuss categories of artifact and their examples
- Explain causes of artifact
- Explain preventive measures/ corrective action towards the artifact
INTRODUCTION

What is an artifact? (Definition)

- Is any irregularity on an image that is not caused by the proper shadowing of tissue by the primary beam.
- Any undesirable optical densities, structures, or blemishes recorded on the radiograph
- Interfere with visualization of the radiographic image
- Can lead to misdiagnose
- Can be controlled if the causes can be identified
TYPES

1. Internal Artifacts
2. External Artifacts
3. Anatomical Structure Artifacts
INTERNAL ARTIFACTS

- Found within patient
- Cannot be removed and must be accepted
- Examples: protheses, surgical pins/clips, pacemaker, tubes/catheters etc.

If an artifact that is not normally seen within the body displayed on the radiograph, the radiographer need to discretely search and interview the patient or to consult the ordering physician to determine whether the artifact is locatable outside the patient’s body.
EXTERNAL ARTIFACTS

- Found outside the patient’s body
- Examples: earrings, rings, necklaces, bra hooks, hairpins, ECG lines, gown snaps

- Two external artifacts that are not as common but do occasionally appear are caused by pillows and by the imprinted designs on shirts and pants
ANATOMICAL STRUCTURE ARTIFACTS

- Caused by the inclusion of anatomical parts/structures of the body in the region of interest
- Most common anatomical artifact is the patient’s own hand or arm

This example stresses the importance of explaining examinations to the patients so they understand the need to remain in the position the radiographer places them in.
CATEGORIES

1. Exposure Artifacts
2. Processing Artifacts
3. Handling & Storage Artifacts
1. EXPOSURE ARTIFACTS

- Exposure artifacts usually occur when the radiographer conducts the examination.
- Causes the largest number of repeat examinations
- Easy to detect and correct

a) Motion

**Causes:** due to the improper preparation of patient, lack of communication skills, patient conditions.

**Appearances:** Blurring, Unsharpness, Underexposed

**Corrective Action:** Provide sufficient preparation of patient (immobilisation, sedation), Clear & concise instructions to achieve good cooperation, and Assess the patient condition properly, Reduce exposure time.
1. EXPOSURE ARTIFACTS

b) Improper patient position

**Causes:** Technical skills, Inadequate rotating or turning with optimum angulation, Patient conditions.

**Appearances:** Overlapping structures, Obscuring the ROI, Distortion, Magnification

**Corrective Action:** Identify the proper standard/modification techniques, Use accessories equipment (sponges, bottles etc.) for better positioning techniques
IMPROPER POSITIONING

CORRECT POSITIONING
c) Wrong screen-film match

**Causes:** Improper match of film and screen combination; e.g. speed, film base

**Appearances:** Underexposed, Overexposed, High contrast, Low contrast

**Corrective Action:** Properly selected the film and screen combination, Identify the film base (blue or green) and speed.
1. EXPOSURE ARTIFACTS

d) Poor screen contact

Causes: Due to the film and screen is not fit properly (not even surface)

Appearances: High density at poor area, Obscuring pathology (ROI)

Correction Action: Replace the screen, Quality control tests

e) Double exposure

Causes: Expose the same film twice

Appearances: Overexposed (High Density), Overlapping Image, Blurring

Corrective Action: Repeat with new film
Poor Film Screen Contact

Double Exposure
1. EXPOSURE ARTIFACTS

f) Warped cassette
Causes: Leaking of light, Poor cassette condition
Appearances: Focal fog, High Density
Corrective Action: Replace cassette, Check the cassette condition, QC Test

g) Improper grid position
**Causes:** Upside down,Wrongly selected grid ratio and types, Angulation
**Appearances:** Underexposed (Low Density)
**Corrective Action:** Check the label and ratio, Ensure the grid is positioned properly
h) Radiopaque Materials

**Causes:** Post-operation (ILN, Plating etc.), Jewelleries, Watches, Metallic objects

**Appearances:** Radiopacity, White (Bright), Obstructing ROI

**Corrective Action:** Remove all radiopaque materials, Double check
Radiopaque Materials
2. PROCESSING ARTIFACTS

- Occur during processing
- Most are pressure-type artifacts – caused by the transport system of the processor

a) **Emulsion pick-off**
   - **Causes:** Occurs when emulsion is "picked off" or removed from the emulsion of the film base. may be a result of two images stuck together before or during processing and pulled apart or glutaraldehyde failure.

b) **Gelatin build-up**
   - **Causes:** Emulsion removed from previous films that is either stuck on processor rollers or dissolved in the developer solution is deposited on subsequent images.
FILMS STUCK TO EACH OTHER DURING PROCESSING
2. PROCESSING ARTIFACTS

b) Guide-shoe marks

**Causes:** made by jagged edges of the guide shoes because they are bent, worn, damaged, incorrectly installed or incorrectly adjusted and run parallel to the direction the film travels. Also occurs with improperly seated transport racks or rollers. If caused by a crossover assembly it will occur on the top surface of the film. If from turn around assemblies it will appear on the bottom surface of the film.

**Appearances:** Scratches on the image
2. PROCESSING ARTIFACTS

c) Pi Lines

**Causes:** Occur at 3.1416-inches (π) intervals because of dirt or a chemical stain on a roller, since the rollers are 1 inch in diameter, 3.1415 inches represent one revolution of a roller.

**Appearances:** will appear and regular intervals perpendicular the direction of film travel.
2. PROCESSING ARTIFACTS

d) Dichroic Stain

**Causes:** 1) Improper or inadequate chemistry, term generally applied to all chemical stain, dichroic means TWO colours, chemical stains seen on a radiograph can appear yellow, green, blue or purple, 2) caused by continued development in the fixer, never occur in automatic processor.

**Appearances:** The presence of brown or green stains. Brown indicates oxidized developer or hyporetention from several years of storage. Green indicates presence of unexposed and undeveloped silver halide crystals reaming on film after processing and is caused by incomplete fixation.
2. PROCESSING ARTIFACTS

e) Curtain Effect

**Causes:** improper or inadequate chemistry, in slow processors the chemistry may not be properly squeezed from the film, and it either runs down the leading edge of the film or runs up the trailing edge.

**Appearances:** When solution drips on or "running down" a film forming pattern that resemble a lace curtain. Can also occur if wash water is dirty.
f) Wet-pressure sensitization

**Causes:** produced in the developer tank, irregular or dirty rollers will cause pressure during development and produce small circular patterns of increased density.

**Appearances:** When the entrance rollers (made of soft rubber) or the film become wet before the film is introduced, the combination of the pressure and the water marks forms a series of dark stripes that match the grooves on the rollers.
3. HANDLING & STORAGE ARTIFACTS

- Can be caused by improper handling or storage either before, during and after processing.

a) **Light fog** – white lights leaks and improper safelight filters or intensities

b) **Radiation fog** – x-ray exposed eg leaving cassette in the examination room

c) **Static** – caused by the build-up electrons in the emulsion and is the most noticeable during extremely low humidity; three distinct patterns of static: crown, tree and smudge

d) **Kink marks** – caused by fingernail, or abrupt bending of film

e) **Hypo retention stain** – caused by the residual thiosulfate which still remains during washing and the slowly build up of the silver sulphide

f) **Scratches** – rough handling before processing
HYPORETENTION

PI-LINE