# projection jeometry

**Dr. Ahmed Jamal**

**collage of dentistry / University of Al-Maarif**

---

# Ideal radiographic projection

The term image quality describes the subjective judgment by the clinician of the overall appearance of a radiograph. It depends on density, contrast, latitude, sharpness, resolution and other factors.

Ideal radiograph demonstrates certain image qualities include:

A – Radiographic image that is sharp.

B – Radiographic image that is shaped like the object.

C – Radiographic image that is the same size as the object.

**Image Size Distortion (magnification)** is the increase in size of the image on the radiograph compared with the actual size of the object.

**Penumbra:** Is the amount of un sharpness of the image so penumbra is the area of partial shadow.

**Umbra**: Is the area of total shadow and it exist only when the object absorb all of X – rays.

Penumbra is created by the size of focal spot (source of radiation), the larger the spot size the greater is the penumbra (the amount of un sharpness). penumbra not only affected by focal spot size but also affected by tube – object distance and object – film distance so the closer tube – object distance the greater is the penumbra while the closer object – film distance the lesser is the size of penumbra.
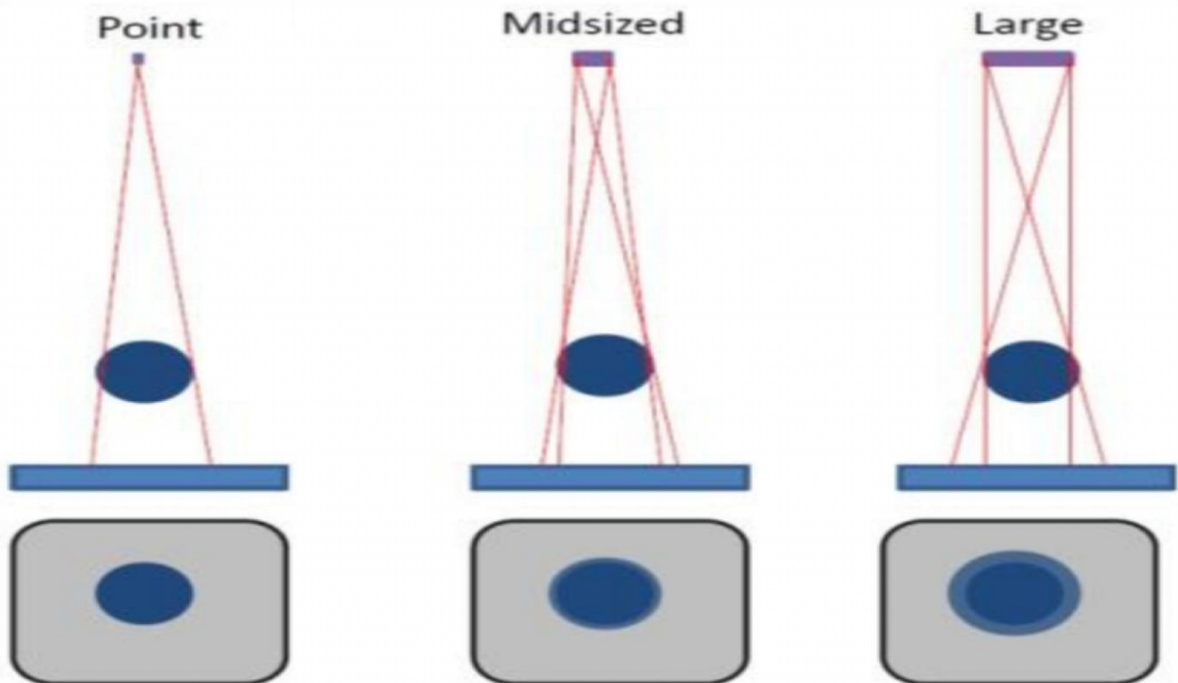


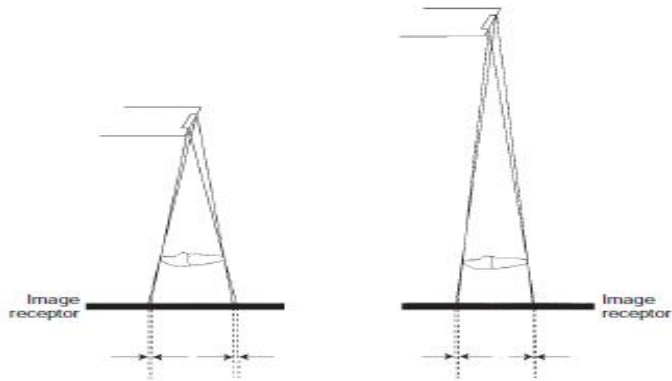effect of focal spot size on penumbra and umbra

FIG. **4-3** Increasing the distance between the focal spot and the object results in an image with increased sharpness and less magnification of the object.
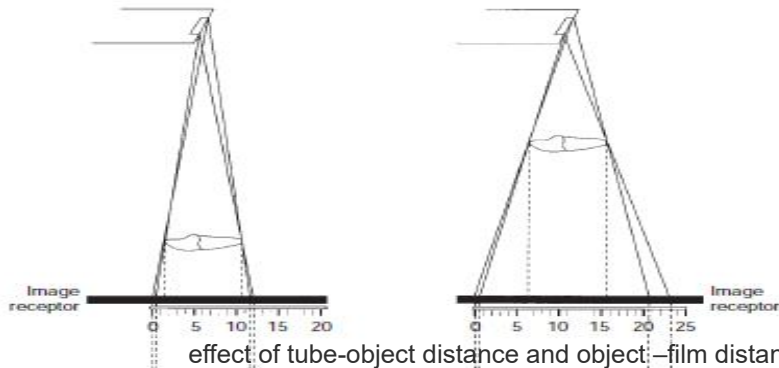
FIG. **4-4** Decreasing the distance between the object and the film increases the sharpness and results in less magnification of the object.

effect of tube-object distance and object –film distance on umbra and penumbra.

# Basic Principles of Projection Geometry for Radiography

1. Source of radiation should as small as possible.

2. Tube – object distance should be as great as possible.

3. Object – film distance should be as small as possible.

4. Film should be parallel to an easily identifiable plane of the object.

5. Central ray of the beam should be perpendicular to the film.

The first 3 principles deal with the image sharpness while the last 2 principles required

during exposure as a technique.

## Radiographic errors and Artifacts:
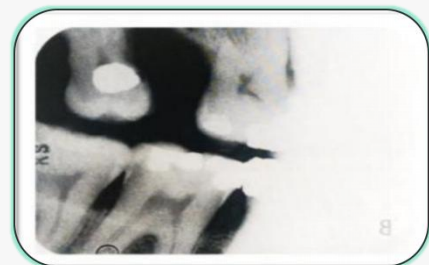
1 Technique and projection errors

2 Exposure errors

3 processing errors

---

**1. Cone cut:** is clear unexposed area result from positioning fault when the X- ray beam not completely cover the film during exposure.



**2. Back side exposure:** when the film placed in wrong position making the nonexposure side facing the beam, the result is the image with the pattern of the lead foil is evident.

**3. Double exposure:** when same film used and exposed twice to X- ray this result in excessive dense and blurred image .



**4. Elongated image:** vertical angulation of X- ray tube was too shallow.



**5. Shortened image:** vertical angulation was too steep.

**6. Over lapping of adjacent structures:** when horizontal angulation was incorrect.

**7. Blurred film:** due to excessive bending of the film during placement for exposure.

**8. Pale X- ray film:** this due to either under exposure, or under developing.



**9. Dark X- ray film:** this is due to either over exposure or over development .

**10. Completely clear film:** when put the film in fixer before developer. or when the film didn't receive radiation

**11. Undeveloped area:** this appear as clear area caused by incomplete immersion of the film in developer (sometimes called developer cut-off) or sticking the film in the developer to the side of the tank.



**12. Scratched film:** when the film is processed in manual processor, the soft emulsion is easily scratched due to rough handling of the film , ex. scratched by holder, tank or nails.



**13. Developer spot:** black dots or dark spots on the film caused by drops of developer solution that was accidently spilled on the film before it was developed.



**14. Fixer drop:** white dots or light spots on the film caused by drops of fixer solution that was accidently spilled on the film before it was developed.

**15. Yellow or brown stain:** stain or discoloration of film due to contaminated solution or insufficient rinsing.