PANORAMIC IMAGING

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CONTENTS

Introduction

- Panoramic imaging, also called pantomography and was earlier also called as the rotational radiography.

- It is a radiographic technique for producing a single tomographic image of facial structures that include both the maxillary and mandibular dental arches and their supporting structures.

- Body section radiography is a special X-ray technique that blurs out the shadows of superimposed structures to show more clearly the principal structures being examined.

INDICATIONS OF PANORAMIC RADIOGRAPHY

- Evaluation of trauma to dentofacial structures
- Location of impacted teeth
- Extensive disease
- Known or suspected large lesions
- Eruption sequence & stages of tooth development in mixed dentition
- Retained teeth or root tip
- Developmental anomalies
- Diagnostic imaging of Temporomandibular Joint
- To evaluate supernumerary teeth
- To visualize an elongated styloid process

- Alignment of teeth pre- and post-orthodontic treatment
- Used as an initial evaluation image that can provide the required insight or assist in determining the need for other projections
- Localization of impacted canine
- Calcified carotid artery atheroma
- Can be useful in general medical radiography
- Preoperative assessment of jaw bones prior to implant placement
- For patient education
- To evaluate the presence & extent of pathological fractures of the jaws.

ADVANTAGES AND DISADVANTAGES OF PANORAMIC RADIOGRAPHY

- Advantages
  - Broad coverage of facial bones and teeth
  - Low patient radiation dose
  - Convenience for examination of the patient
  - Ability to be used in patients unable to open the mouth
  - Short time required to make a panoramic image
  - Useful as a visual aid in patient education and case presentation

Disadvantages

- Images do not display fine anatomic detail
- Unequal magnification (especially in the premolar region)
- Geometric distortion across the image
- Presence of overlapping structures can hide odontogenic lesions
- Clinically important objects may be situated outside the plane of focus and may appear distorted or absent

- Numata of Japan in 1933
- Paatero in 1946

- 2 adjacent disks rotate at same speed in opposite directions as the x ray beam passes through their centers of rotation.
- Lead collimators
- Radiopaque objects A, B, C, and D stand upright on disk 1 and rotate past the slit.
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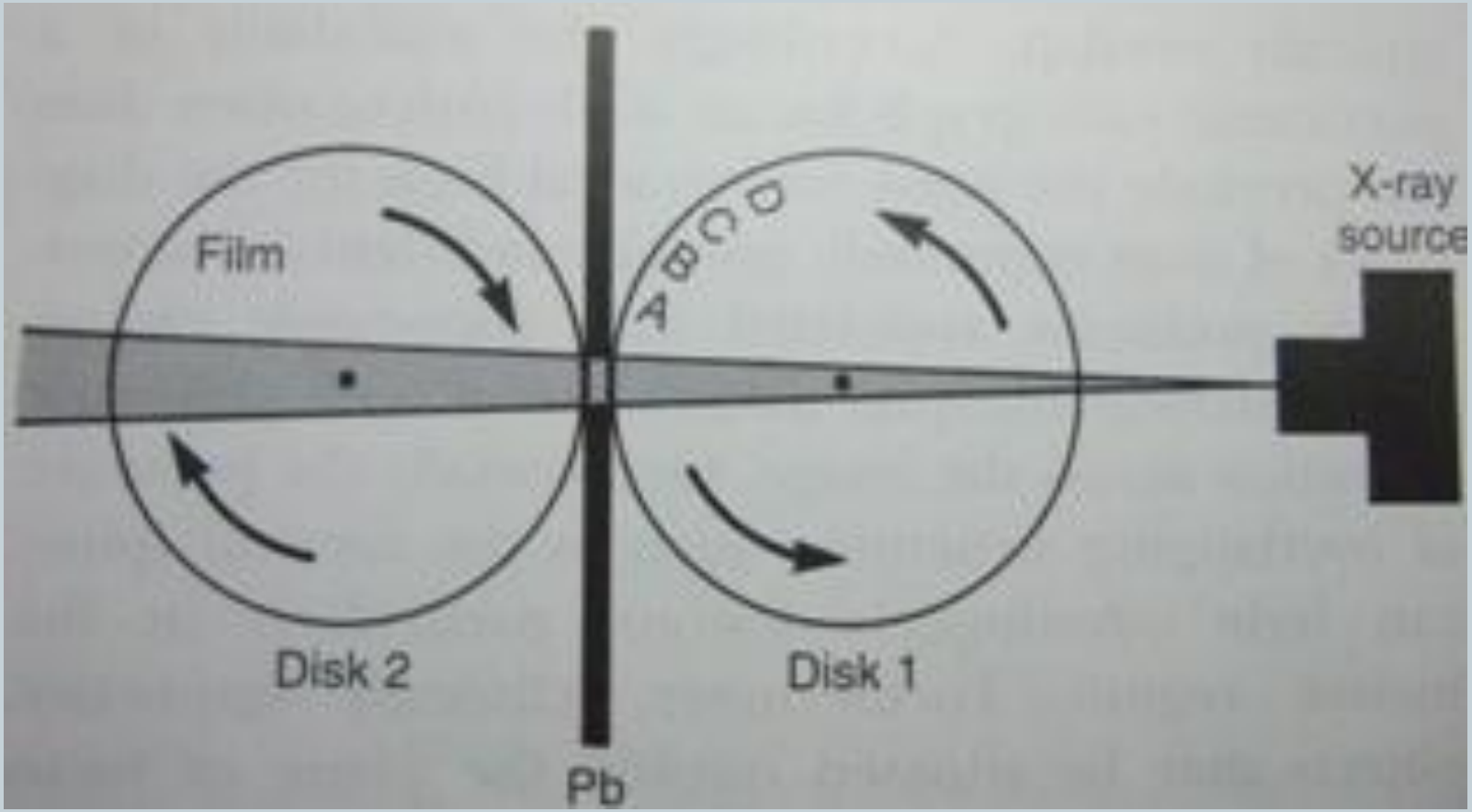
PRINCIPLES OF PANORAMIC IMAGE FORMATION



- Their images are recorded on the receptor, which also moves past the slit at the same time.
- The objects are displayed sharply on the receptor because they are moving past the slit at the same rate and in the same direction as the receptor.
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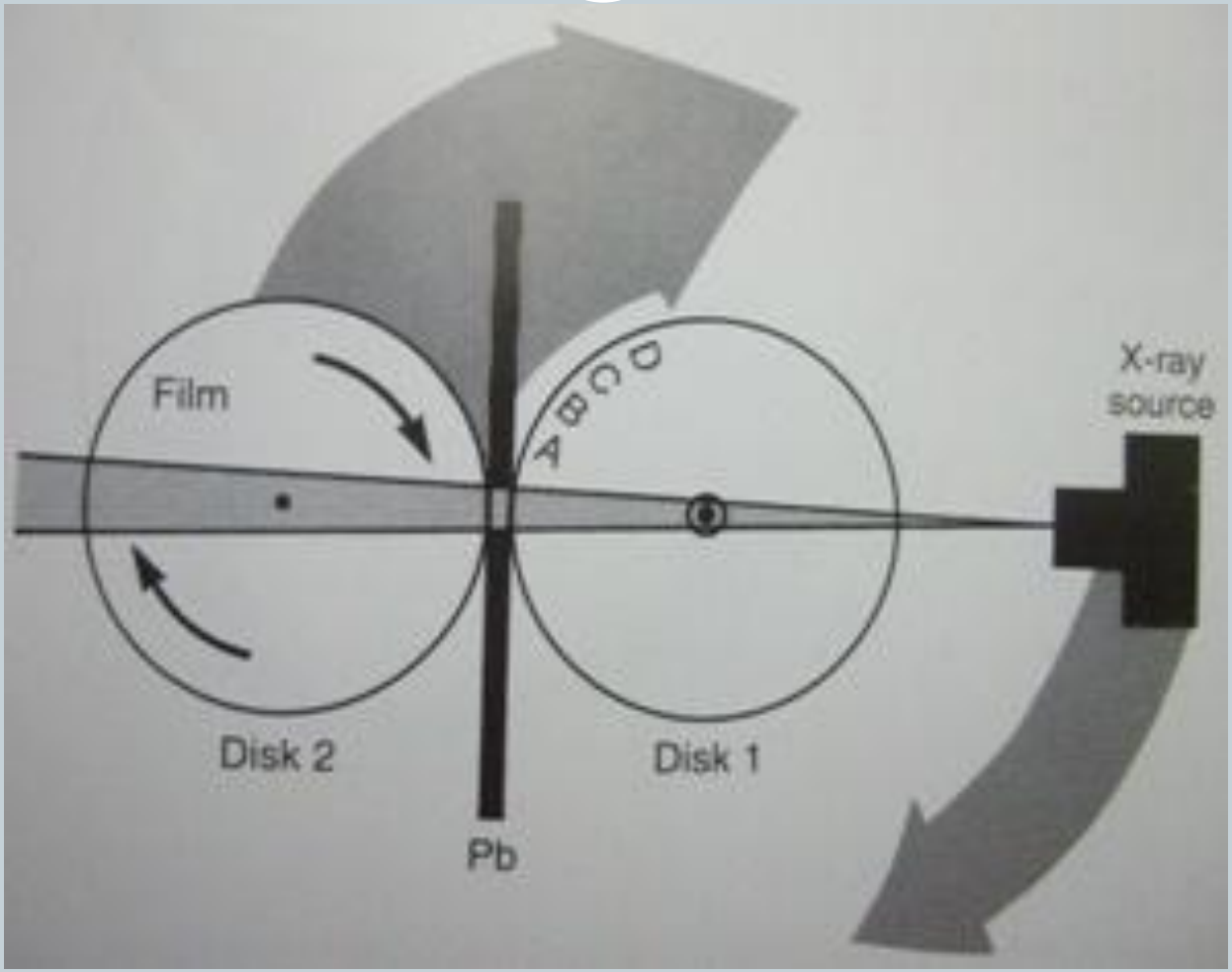
- This causes their moving shadows to appear stationary in relation to the moving receptor.

- Other objects between the letters and the center of rotation of disk 1 rotate with a slower velocity and are blurred on the receptor.

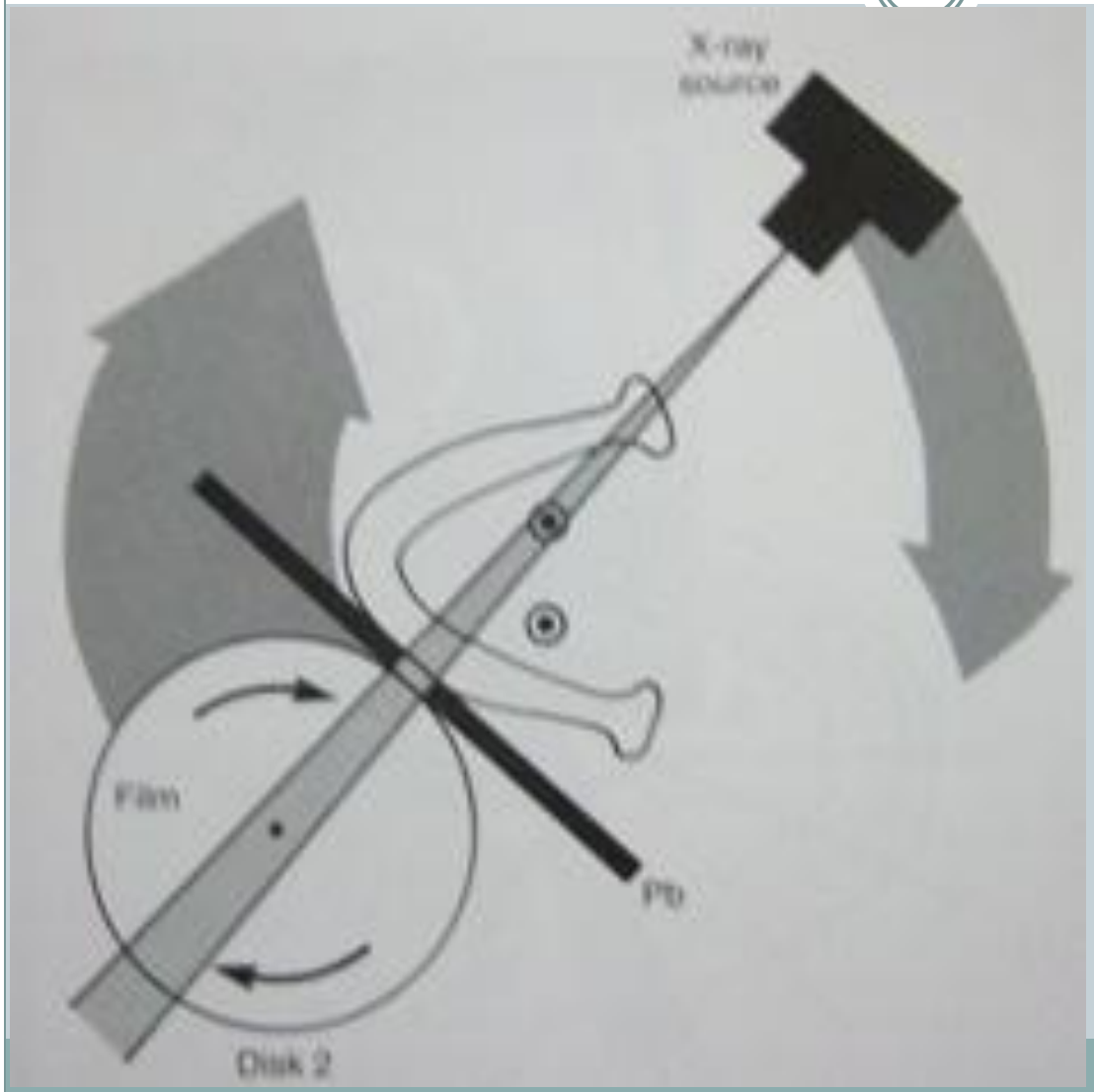
- Any objects between the x-ray source and the center of rotation of disk 1 move in the opposite direction of the receptor, and their shadows are also blurred on the receptor.


Film
A B C D
X-ray source
Disk 2
Disk 1
Pb

- The same relationship of moving film to image is achieved if disk I is held stationary and the x-ray source is rotated so that the central ray constantly passes through the center of rotation of disk 1 and, simultaneously, both disk 2 and the lead collimator(Pb) rotate around the center of disk 1.

- Although disk 2 moves, the receptor on this disk also rotates past the slit. In this situation, as before, the objects A through D move through the x-ray beam in the same direction and at the same rate as the receptor.

- This holds true for geometric distortions such as magnification and elongation, the pregence of ghost images, superimposition of the c-spine over midline structures, overlap of teeth, and left-right size variations from lack of proper positioning of the patient sagittal plane in the instrument.



Shows a patient - disk 1

Objects A through D -teeth and surrounding bone

- In practice, the center of rotation is located off to the side, away from the objects being imaged. During the exposure cycle, the machine automatically shifts to one or more additional rotation centers.

- The rate of movement of the receptor behind the slit is regulated to be the same as that of the central ray sweeping through the dental structures on the side of the patient nearest the receptor.

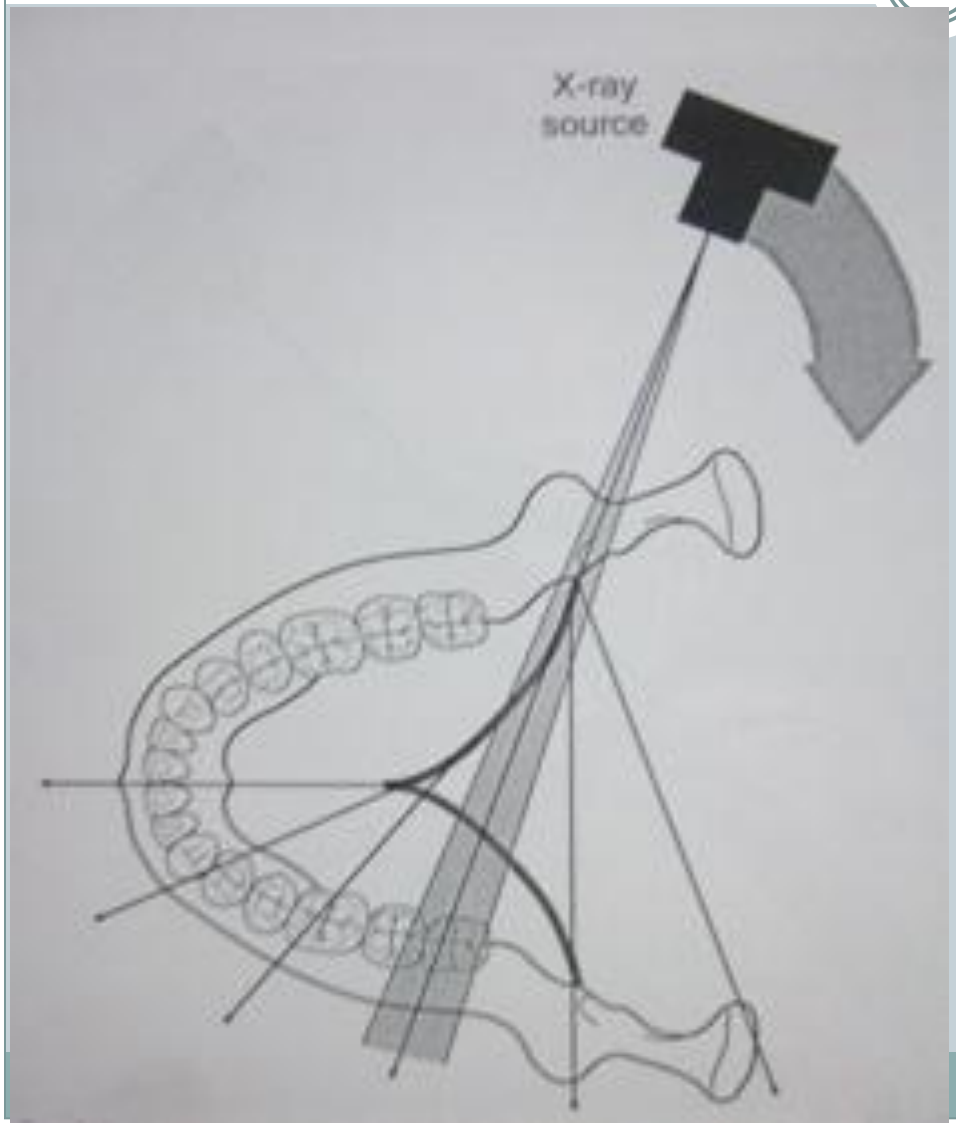


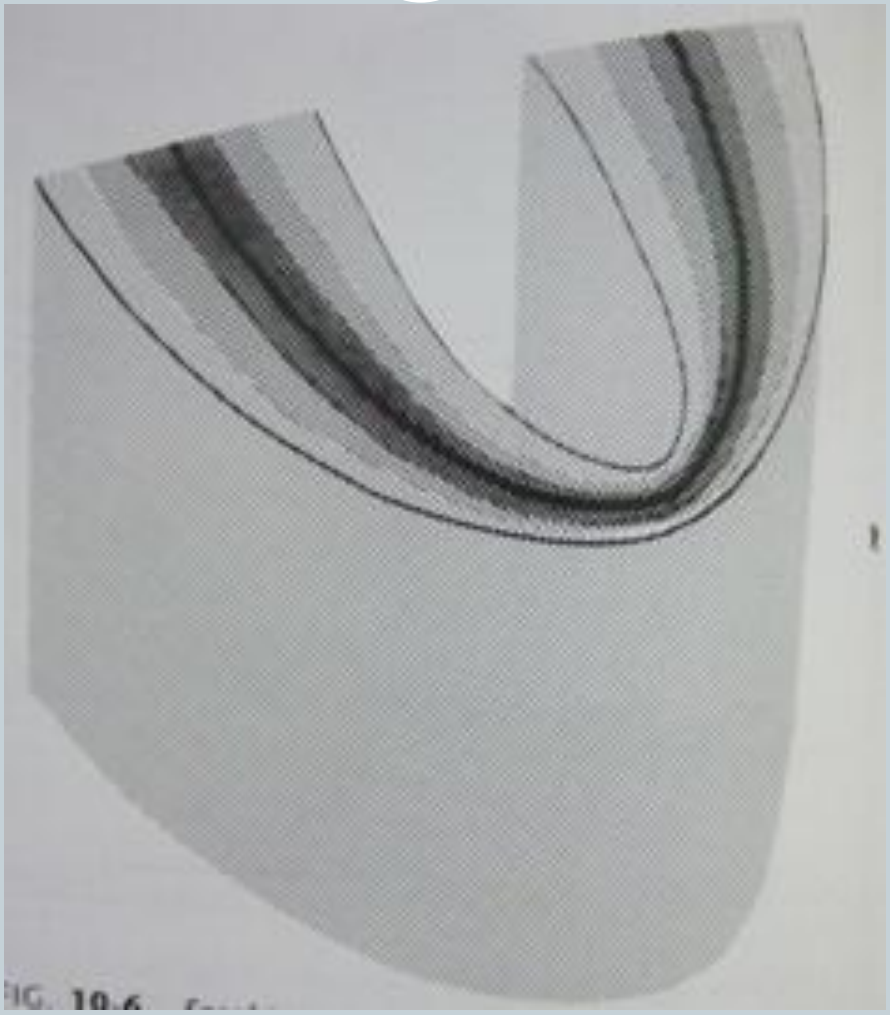
FIG. **10-5** *Movement of the x-ray source and beam.* The dark line shows a continuously moving center of rotation. As the source moves behind the patient's neck and the anterior teeth are imaged, the center of rotation moves forward along the arc *(dark line)* toward the sagittal plane. The x-ray source continues to move around the patient to image the opposite side.

- This feature optimizes the shape of the image layer to reveal the teeth and supporting bone.
- This center of rotation is initially near the lingual surface of the right body of the mandible when the left temporo-mandibular joint (TMJ) is imaged.

Focal Trough

- Three dimensional curved zone in which structures are clearly demonstrated in a panoramic radiograph.
- The shape of the focal trough varies with brand of equipment used.
- The focal trough is the region in which structures will be revealed most sharply.
- Objects in front or behind the focal trough are blurred , magnified or reduced in size or distorted

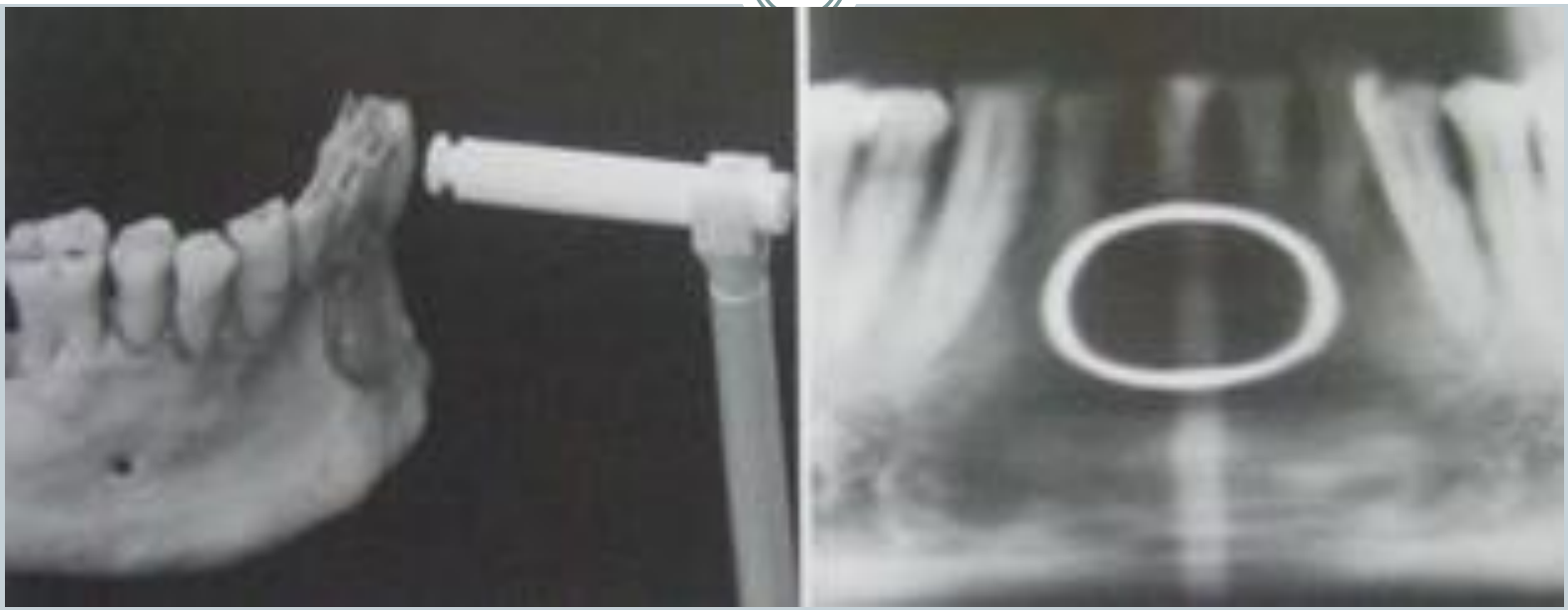
IMAGE LAYER



- The factors that affect its size are variable that influence image definition
- Arc path
- Velocity of the receptor
- X-ray tube head

Shows a mandible supporting a brass ring properly aligned in the middle of the image layer.
The even magnification of the ring and the images of the anterior teeth in proper proportion.

The same mandible positioned 5 mm anterior
This position causes distortion of the ring in the horizontal dimension, with the ring appearing thinner, and a commensurate decreased width of the image of the teeth.



mandible positioned 5 mm posterior to the middle of the focal trough. Now the horizontal distortion results in the ring appearing wider and a commensurate increased width of the projected teeth.
On these images the vertical dimension, in contrast to the horizontal dimension, is little altered, even though it appears to be.

PANORAMIC MACHINES

- Remove
  - Dental appliances
  - Ear rings
  - Necklaces and hair pins
  - Other metallic objects in the H&N region
- Demonstrate machine cycling to patient
- Leaded apron to the patient

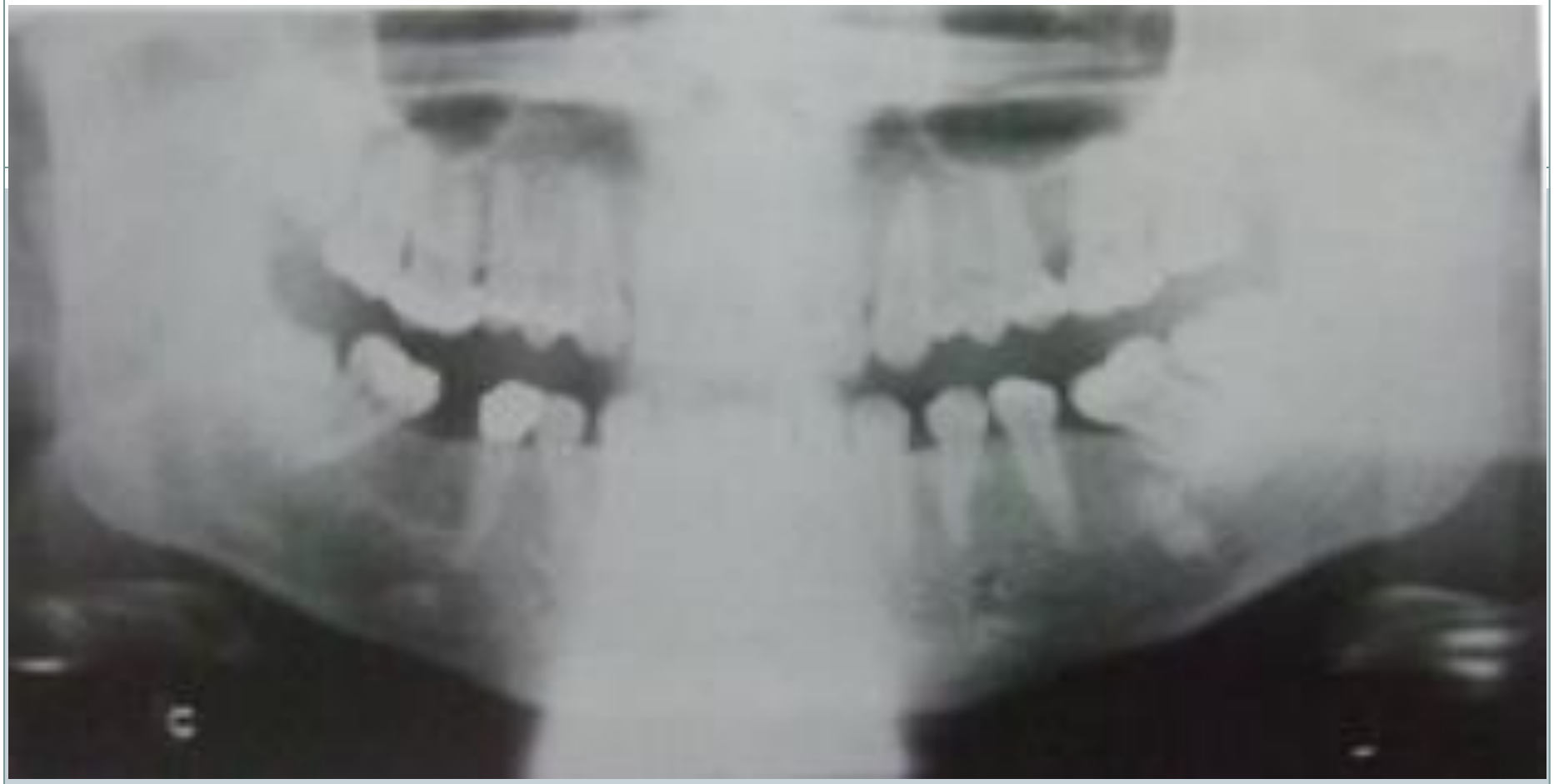
- Dental arches should be at the middle of the focal trough
- Chin and occlusal plane should be properly positioned
- Incisal edges of upper and lower teeth should be notched in the positioning device

- mid-saggital plane must be centered within the image layer
- Patients' back and spine should be erect as possible and their neck should be extended
- Line from tragus of ear to outer canthus of eyeshould be parallel to the floor(Frankfort Plane)

- Instruct patient to swallow and hold tongue on the roof of mouth.
- Fast films to be combined with high speed
- R or L lead markers to indicate the side
- Name , Age, Sex, Date should be indicated
- KVp should not be less than 65

Contraindications for panoramic imaging

- Patients with cervical spondylosis
- Patients with thyroid carcinomas – as the panoramic exposes a large amount of the gland.
- Patients who are contraindicated for any form of radiation exposure.



Panoramic radiograph of an improperly positioned patient. Note the large radiopaque region in the middle. This artifact (“ spine-shadow ghost ”) could have been eliminated by having the patient sit straight and align or stretch the neck.

Artifact caused due to the truft of the pantomographic machine

CONCLUSION

- Panoramic imaging (pantomography) - technique for producing a single tomographic image of the facial structures that includes both the maxillary and mandibular dental arches and their supporting structures.
- This is a curvilinear variant of conventional tomography and is also based on the principle of the reciprocal movement of an x-ray source and an image receptor around a central point or plane, called the image layer, in which the object of interest is located.

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