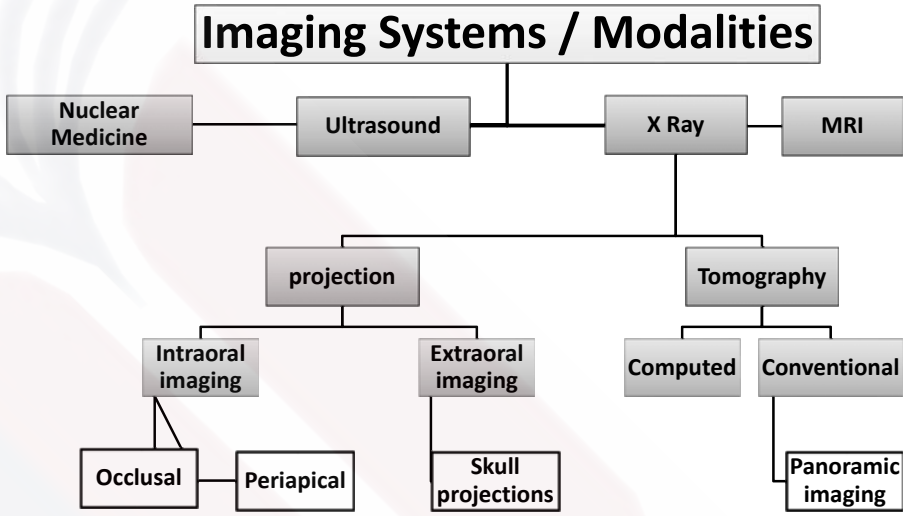
Syrian Private University
Faculty of Dentistry
Department of Oral Medicine

Introduction
Panoramic Radiography

Lecture 1

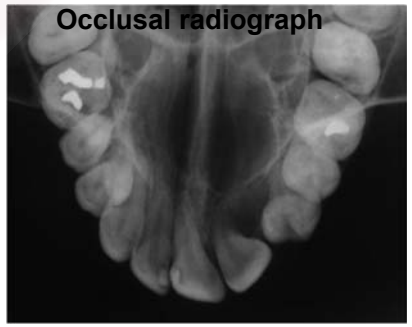
Imad Brinjikji

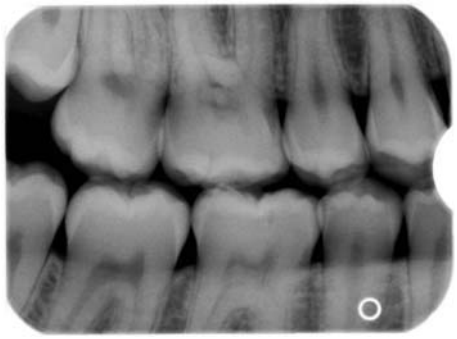


Imaging Systems / Modalities

- Tomography: Movement of X-rat source, patient, receptors or more than one of them. No overlapped structures.

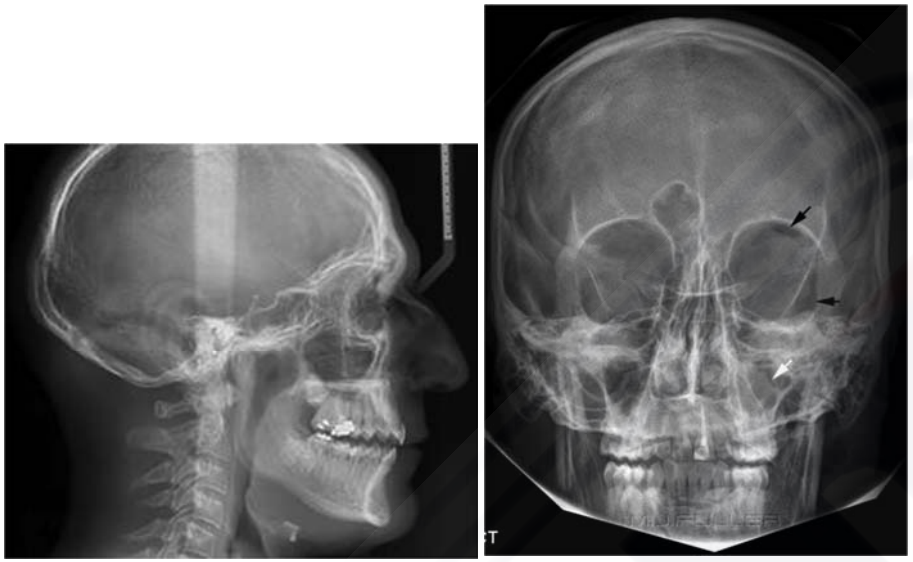
- Projection images: No movement in the X-ray source, receptors or the patient. Overlapped structures.



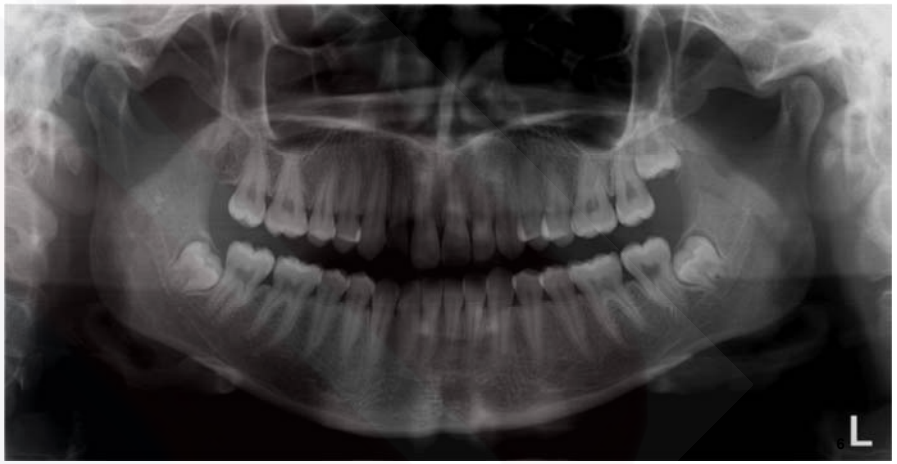


Bite-wing radiograph

Examples of extra-oral projections



Panoramic radiography



Panoramic radiography

- A type of **Conventional tomography (Pantomography)**.

INDICATIONS
ADVANTAGES/ DISADVANTAGES

INDICATIONS

- Overall evaluation of dentition
- Examine for intraosseous pathology, such as cysts, tumors, or infections
- Gross evaluation of temporomandibular joints
- Evaluation of position of impacted teeth
- Evaluation of eruption of permanent dentition
- Dentomaxillofacial trauma
- Developmental disturbances of maxillofacial skeleton

INDICATIONS
ADVANTAGES/ DISADVANTAGES

ADVANTAGES COMPARED WITH A FULL-MOUTH EXAMINATION

- Broad coverage of facial bones and teeth
- Low radiation dose
- Ease of panoramic radiographic technique
- Can be used in patients with trismus or in patients who cannot tolerate intraoral radiography
- Quick and convenient radiographic technique
- Useful visual aid in patient education and case presentation

INDICATIONS
ADVANTAGES/ DISADVANTAGES

DISADVANTAGES

- Lower resolution images that do not provide the fine details provided by intraoral radiographs
- Magnification across image is unequal, making linear measurements unreliable
- Image is superimposition of real, double, and ghost images and requires careful visualization to decipher anatomic and pathologic details
- Requires accurate patient positioning to avoid positioning errors and artifacts.
- Difficult to image both jaws when patient has severe maxillomandibular discrepancy

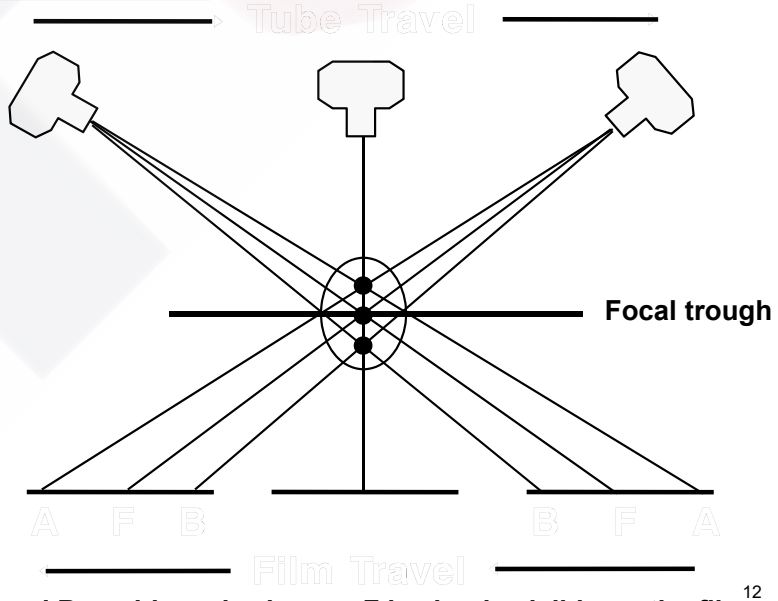
The proximal surfaces of premolars also typically overlap.

Principles of conventional tomographic imaging

With the synchronous movement of tube and film, the images of objects located within the focal trough are clearly imaged.

The images of objects located outside the focal plane are blurred.

Tomography principles



A and B are blurred, whereas F is clearly visible on the film.

Image formation

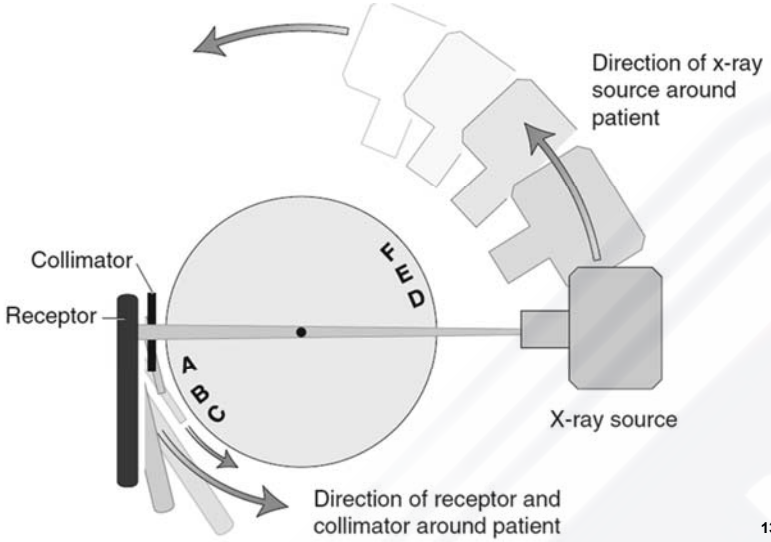
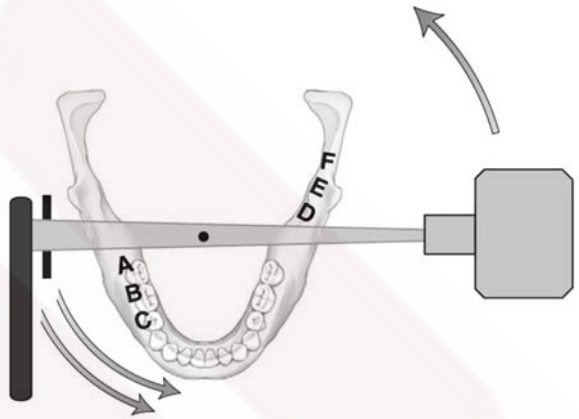


Image formation



Only the dentition in the mandible near the receptor (objects A-C) are imaged well. Structures on the opposite side of the mandible (objects D-F) are blurred beyond recognition.

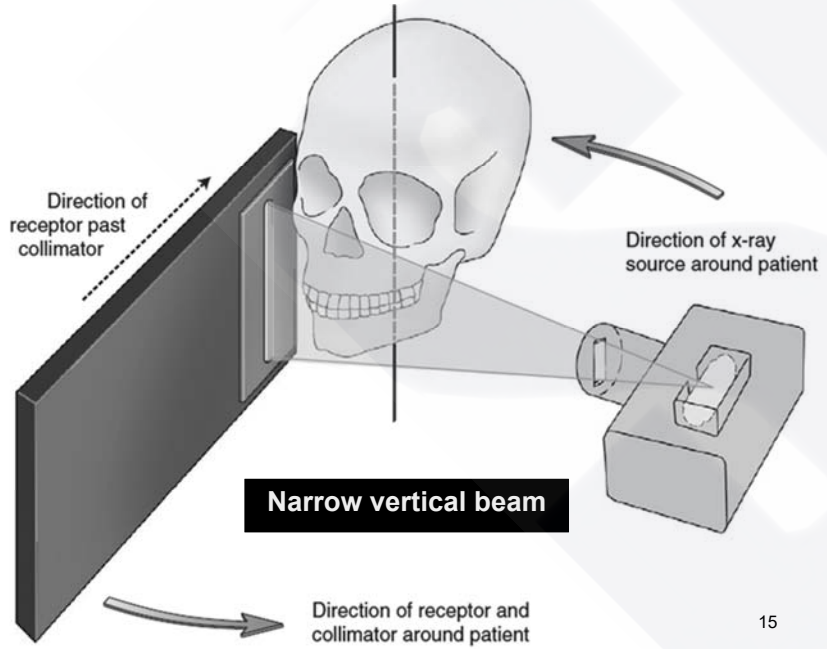
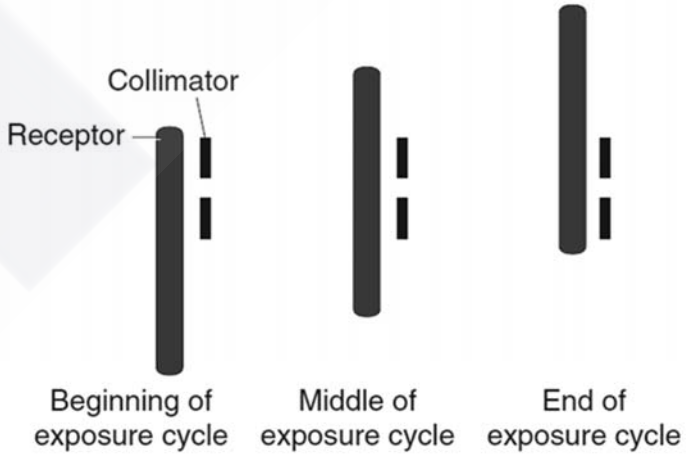
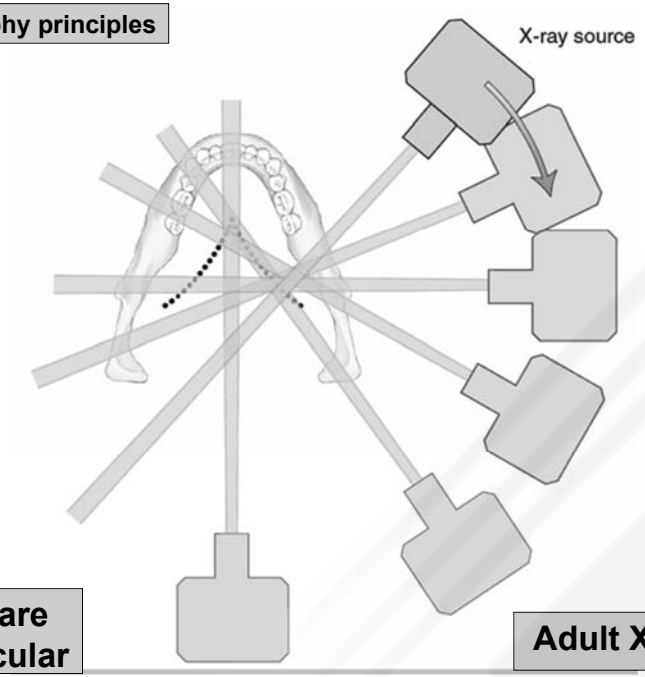


Image formation



Direction of receptor movement past collimator

Tomography principles



Jaws are not circular

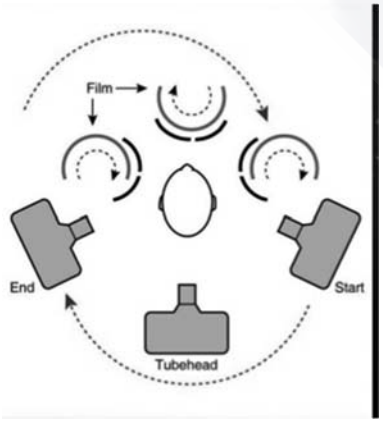
Adult X child

Focal trough (Image layer)

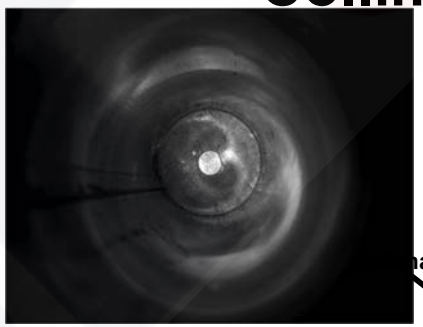
The focal trough is a three dimensional curved zone, where the structures lying within this zone are reasonably well defined on the final panoramic image.

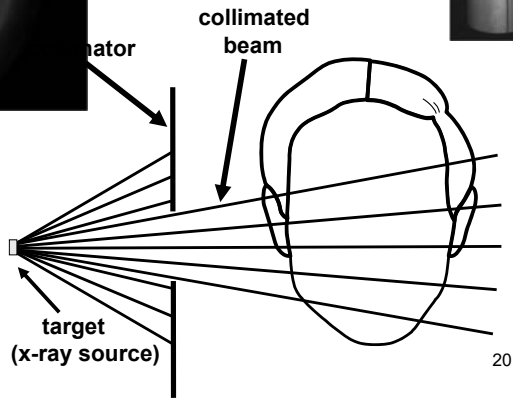
Tomography principles

Focal trough
Image layer



Collimator





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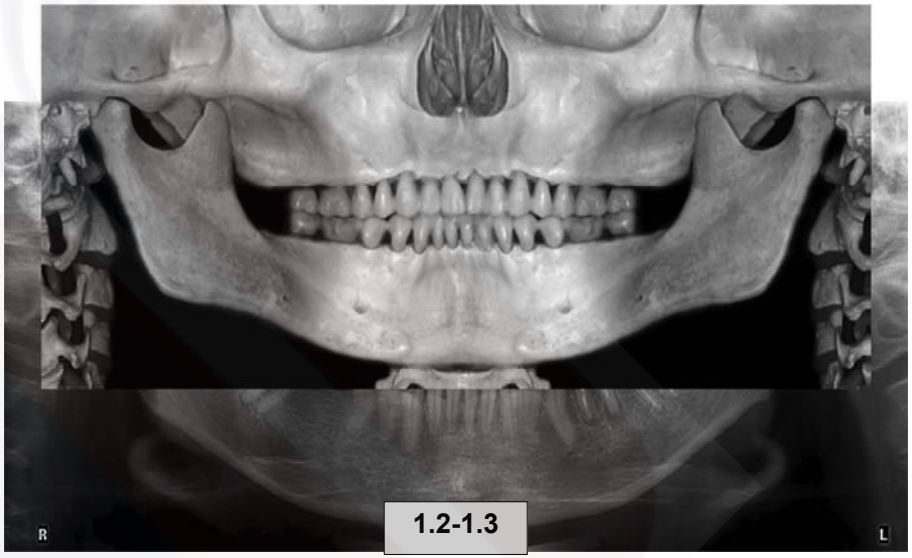
Tomography principles



1.2-1.3

Image distortion

- **The panoramic image necessarily produces distortion of the size and shape of the object.**
- **These distortions make the panoramic image highly unreliable for linear or angular measurements.**

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X-ray receptors

CCD CMOS | **PSPP** | **Films**

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X-ray films

Direct

No need to intensifying screens. X-ray photons hit the film directly.

Indirect

Intensifying screens/ film combination

Green

Blue

Ultra-violet

X-ray films

Intensifying screens

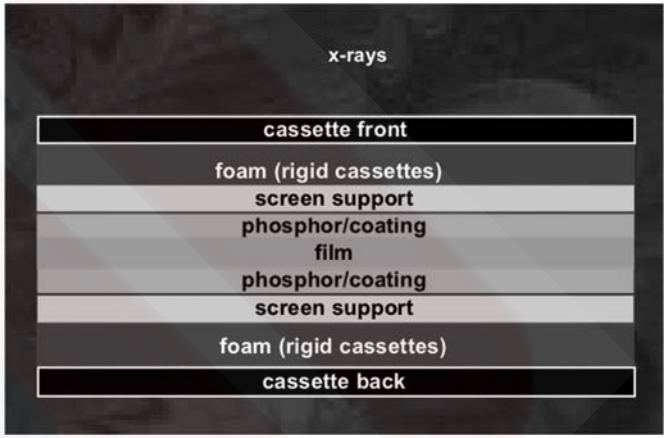
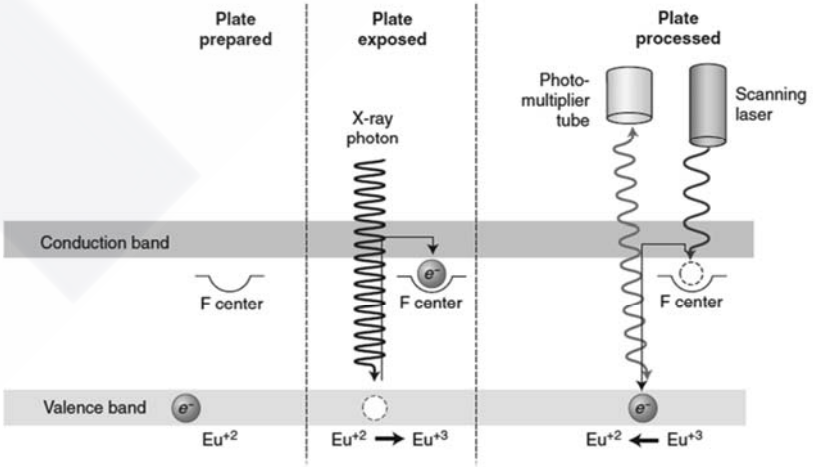


Photo-stimulable phosphor plates

Absorb and store energy from x rays and release this energy as light (phosphorescence) when stimulated by another light of an appropriate wavelength.

PSPP



PSPP

PSPP

Known as CR (Computed radiography) in medical radiology

CCD

Si

From analogue

CR
Digital radiography

Advantages???

panoramic imaging technique

Taking panoramic radiograph

1

Remove extraoral and intraoral items (?)

Load cassette into machine (for film/CR devices).

Adjust machine settings.

↑ KV: Large patient size.

↓ KV: Children.

Auto-adjustable.

Exposure time might be adjustable.

Taking panoramic radiograph

2

Bite in the groove in the bite block.

Check canine positioning light.

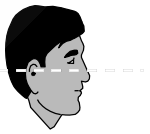
Taking panoramic radiograph

3

Position chin on chin rest, and adjust height of chin rest.

Make sure patient is standing upright with neck and back straight.

Check Frankfort plane positioning light.

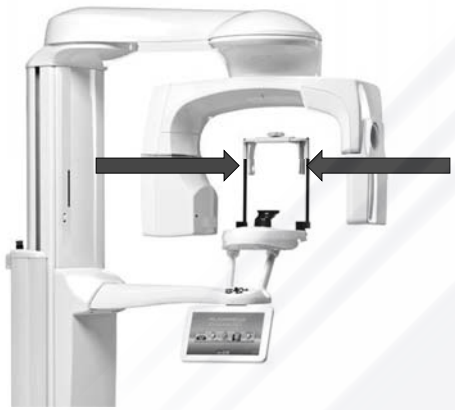


Frankfort Plane

Taking panoramic radiograph

4

Close the side guides.



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Taking panoramic radiograph

5

Close lips.

Place tongue against palate (**?**).

Hold still.

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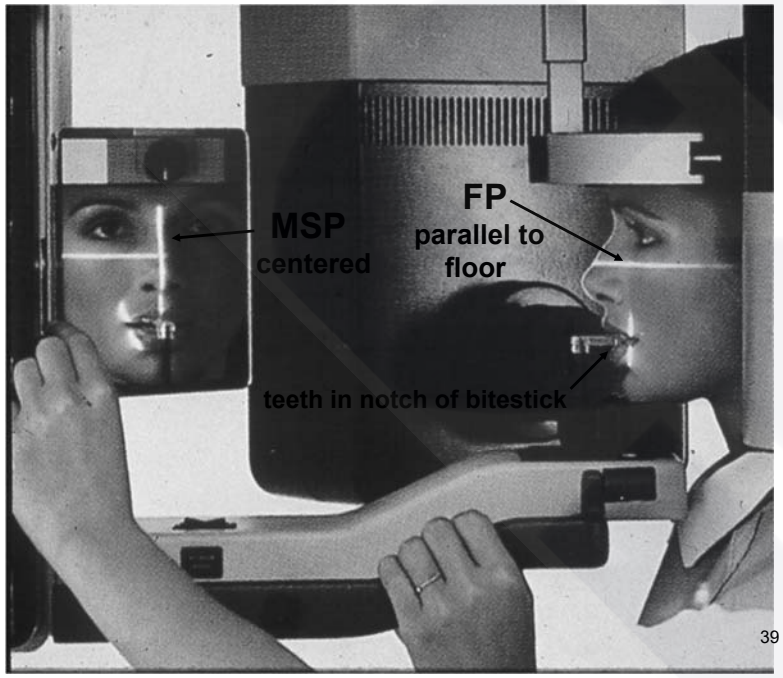

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Anatomical landmarks on panoramic radiograph

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Types of Panoramic Images

Single Real Image

Double Real Image

Ghost Images

Single Real Image

Only one image results from a given anatomical structure. Most images seen on a panoramic film are of this type.

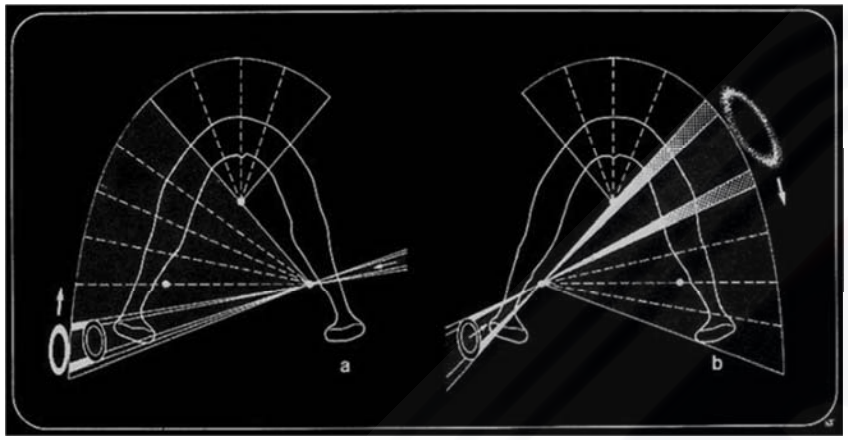
Double Real Image

Two images of a single object which is located in the midline. Structures that produce these double real images include the hard & soft palate, hyoid bone and cervical spine.

Ghost Image

Usually caused by external objects such as earrings but may be produced by dense anatomical structures such as the mandible

Ghost image



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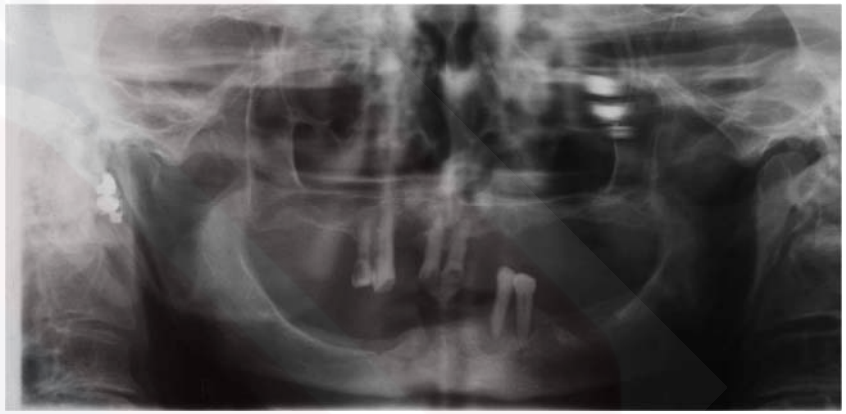
Opposite
Larger
upper



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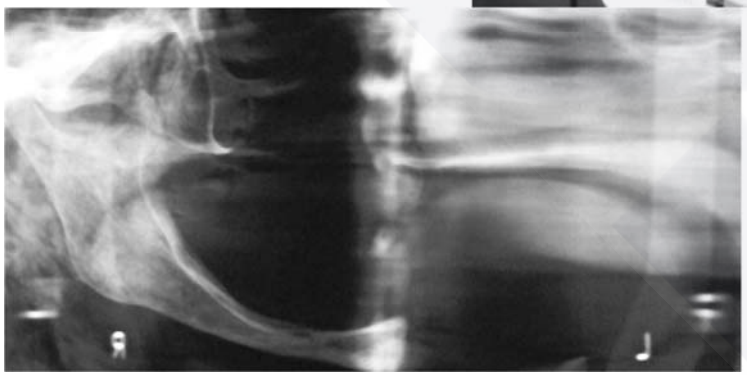

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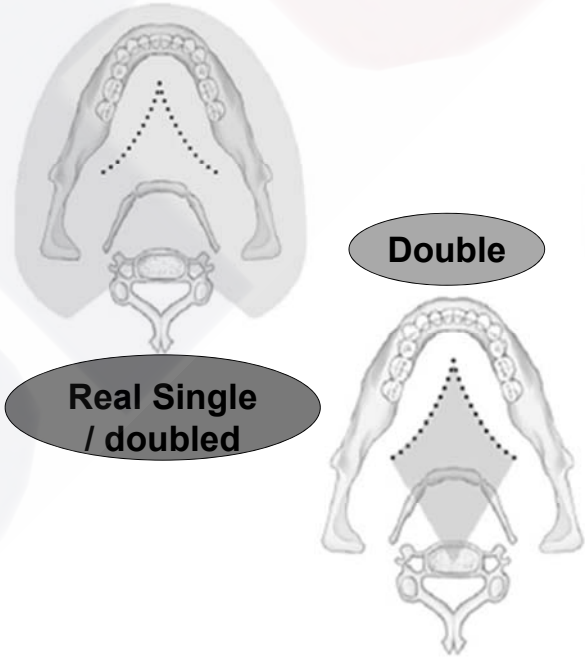

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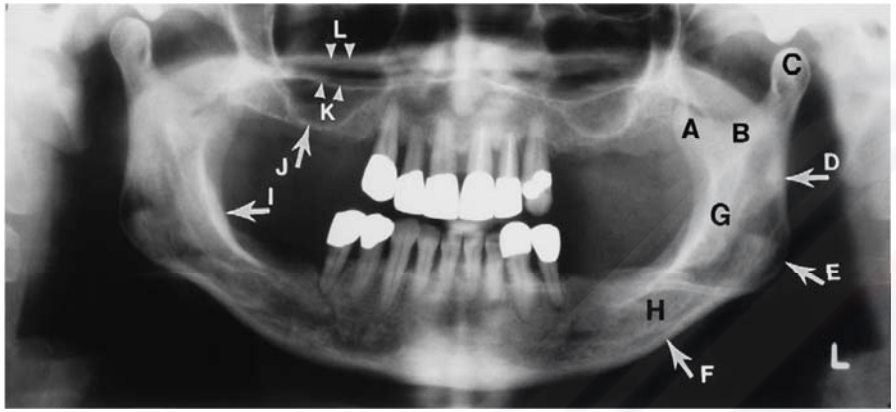
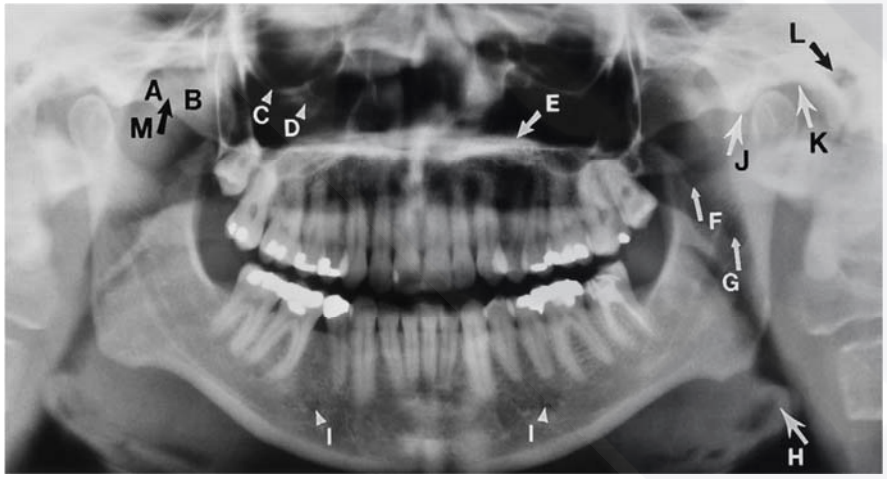
1



1

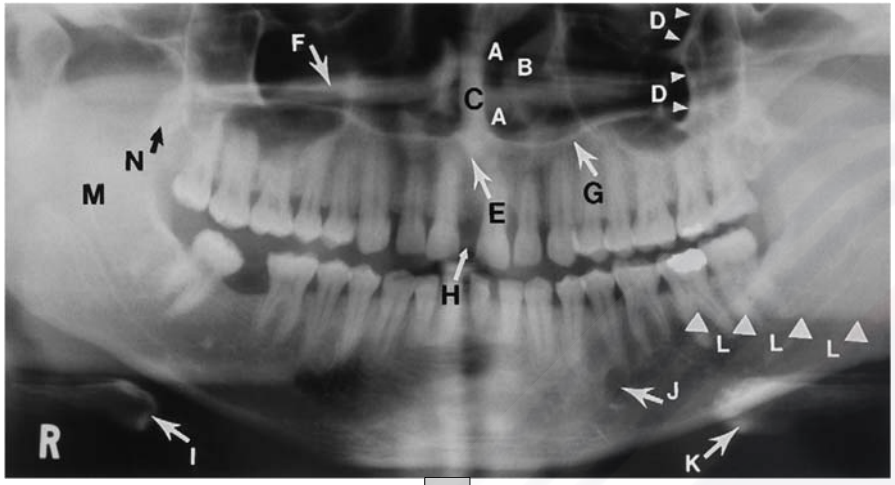
A: coronoid process of mandible
B: sigmoid notch
C: head of condyle
D: posterior border of ramus
E: angle of mandible
F: inferior border of mandible
G: ramus
H: body of mandible (note the shadow of the hyoid superimposed on this area)
I: external oblique ridge
J: floor of maxillary sinus (antrum of Highmore)
K: real double image of right palate
L: ghost image of left palate



2

2

A: zygomatic process of temporal bone
B: zygomatic process of zygomatic bone
C: inferior orbital rim
D: infraorbital canal
E: real double image of hard palate
F: medial sigmoid depression
G: mandibular foramen
H: real double image of epiglottis (the other side is blurred)
I: right and left mental foramina
J: articular eminence of TMJ
K: glenoid fossa of TMJ (condylar fossa)
L: external auditory meatus
M: zygomatico-temporal suture poorly seen

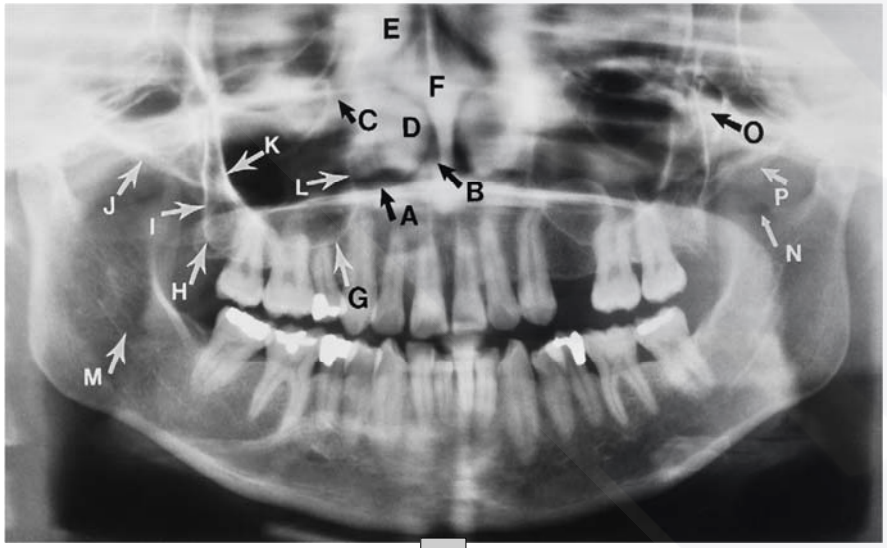


3

A: common meatus of nose
B: soft tissue of inferior turbinate
C: nasal septum
D: panoramic innominate line; lower half is zygomatic process of maxilla, and upper half is lateral wall of orbit. This line is often mistaken for the posterior wall of the maxillary sinus. The lower portion is destroyed or altered when disease affects the lateral wall of the sinus.
E: anterior nasal spine
F: ghost image of left real image of hard palate (*G*)
G: real double image of hard palate. Note the mirror image can be seen below *F*.
H: diastema
I: body of the hyoid; the two greater horns can also be seen. This is a real double image; *K* is its mirror image.
J: mental foramen

3

K: body of hyoid. This is the real double image of *I*. One is the mirror image of the other. *K* looks a little different because the patient is twisted in the machine.
L: inferior edge of the ghost image of the contralateral (right) ramus (*G*), which obscures most of the left ramus and makes it markedly more radiopaque above this line; note the same ghost image on the other side. These specific ghosts are the result of placing the patient too far back in the machine.
M: right ramus
N: medial pterygoid plate (somewhat obscure)



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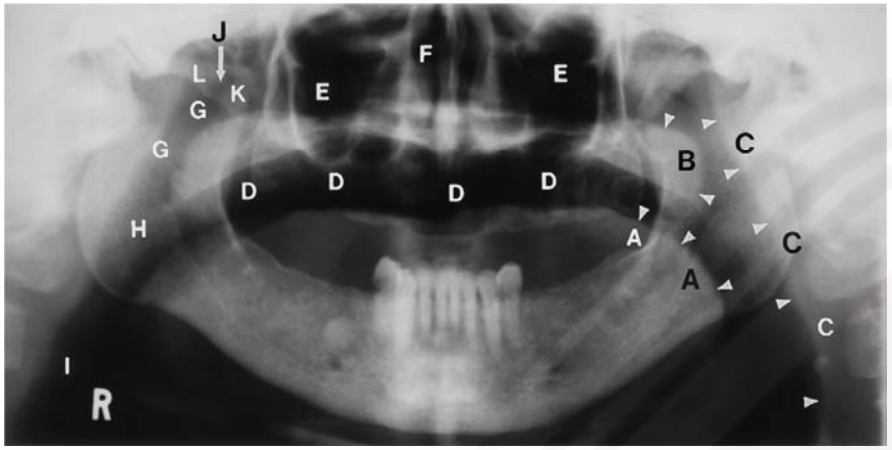
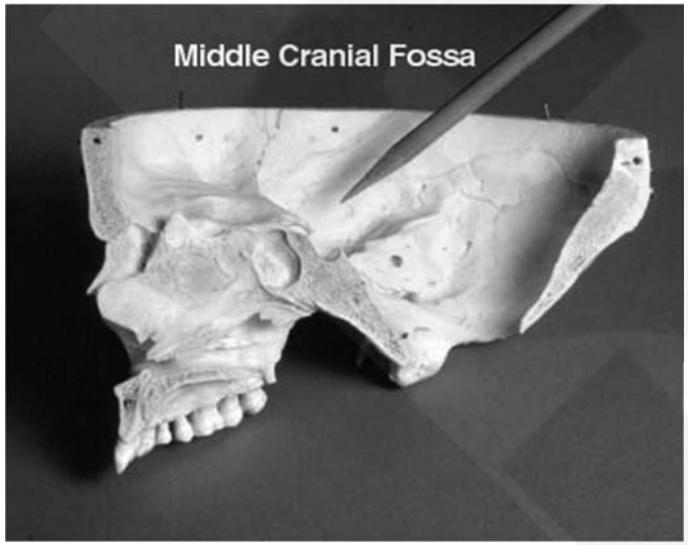
A: inferior meatus
B: common meatus
C: middle meatus
D: soft tissue of inferior turbinate
E: soft tissue of middle turbinate
F: nasal septum
G: floor of maxillary sinus
H: maxillary tuberosity
I: posterior wall of maxillary sinus
J: inferior border of zygomatic arch
K: zygomatic process of maxilla
L: anterior wall of maxillary sinus
M: inferior alveolar canal
N: medial sigmoid depression
O: pterygomaxillary fissure
P: lateral pterygoid plate

4



A: outline of base and dorsum of tongue
B: outline of posterosuperior aspect of soft palate; the letter *B* is on the soft palate image. Note the contralateral half-moon shape of the soft palate on the other side.
C: outline of posterior wall of pharynx (throat)
D: air space above tongue (palatoglossus air space) caused by a technique error whereby the patient did not place the tongue against the palate
E: sinus air space; letter indicates upper limit of sinus at the infraorbital margin
F: common meatus. Note the adjacent bony septum and soft tissue lining.
G: nasopharyngeal air space
H: oropharyngeal air space
I: hypopharyngeal air space
J: zygomaticotemporal suture
K: zygomatic process of zygomatic bone
L: zygomatic process of temporal bone



Thank you