

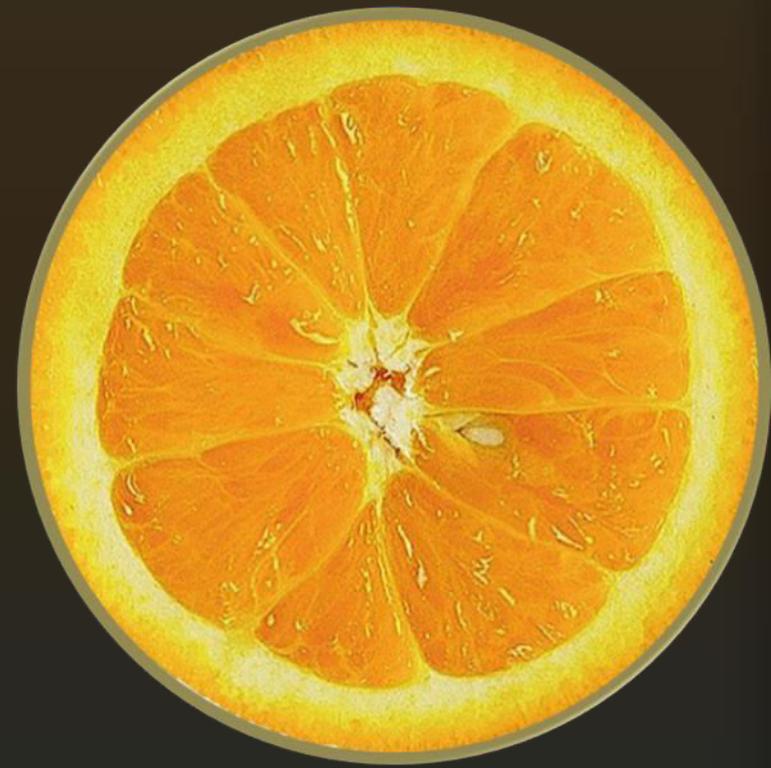
TOMOGRAPHY & PANORAMIC RADIOGRAPHY

Introduction :



Tomography...

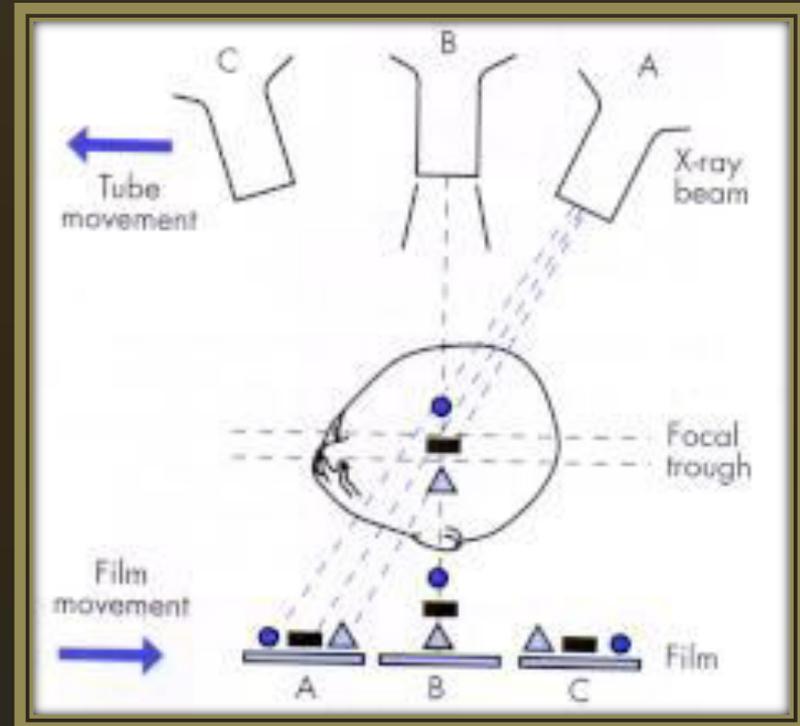
- ❖ Shows only a section/slice of the patient.
- ❖ Each tomograph shows the tissues within that section sharply defined and in focus-Focal plane or focal trough.
- ❖ Structures outside the section are blurred and out of focus.



Tomography cont...

Tomography requires controlled, accurate movement of both the X-ray tubehead and the film.

During exposure, the tubehead moves in one direction whereas the film moves in the opposite direction.



Tomography cont...

1.

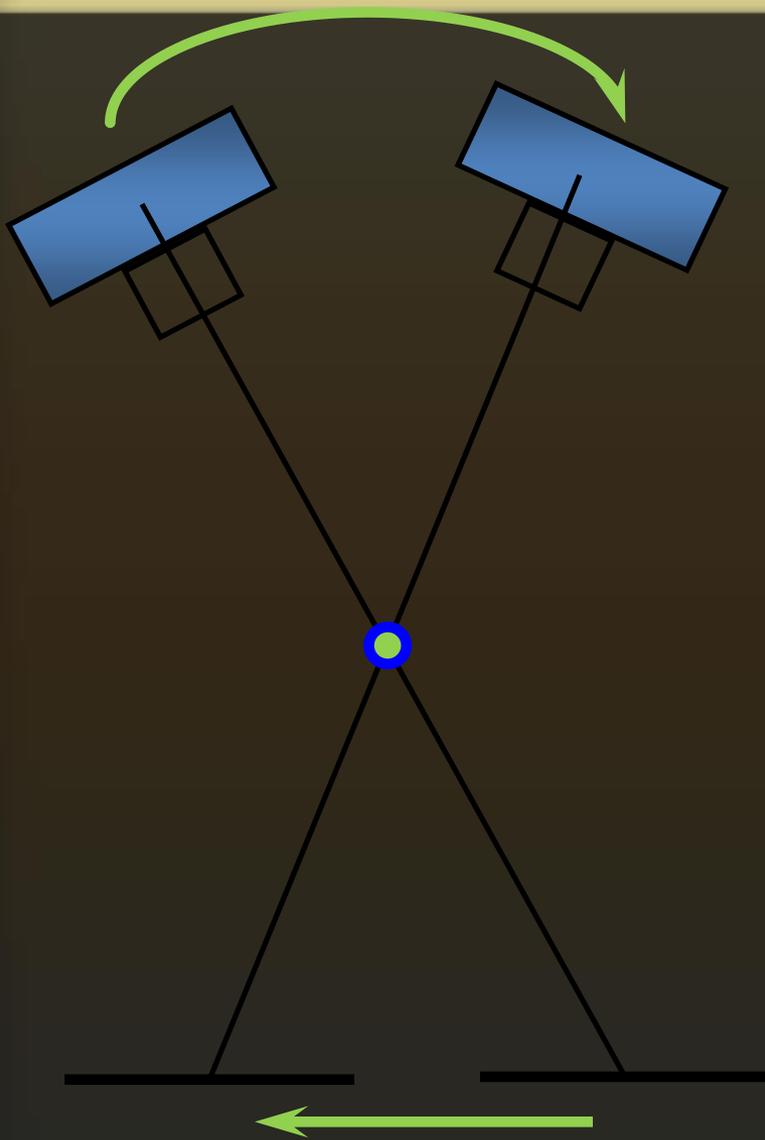
- **Conventional tomography**

2.

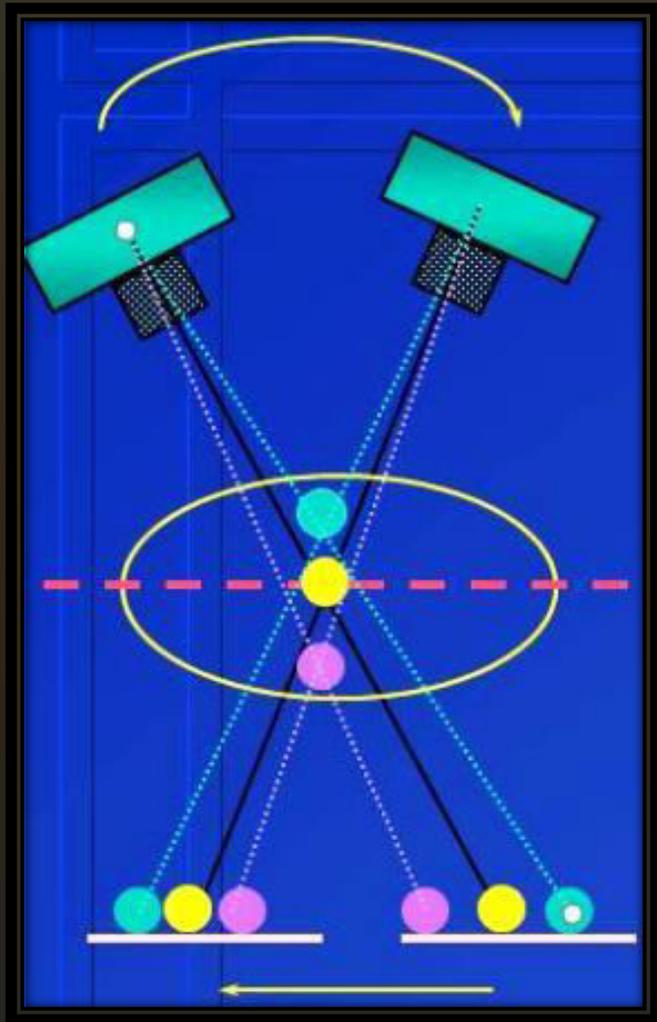
- **Computed Tomography**

The concept of blurring :



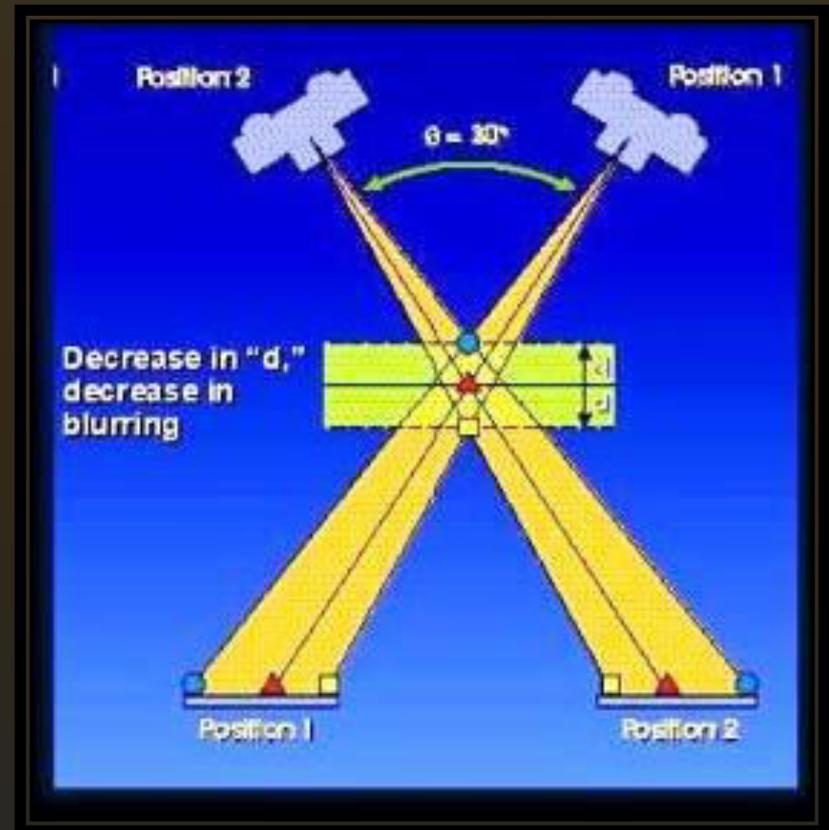
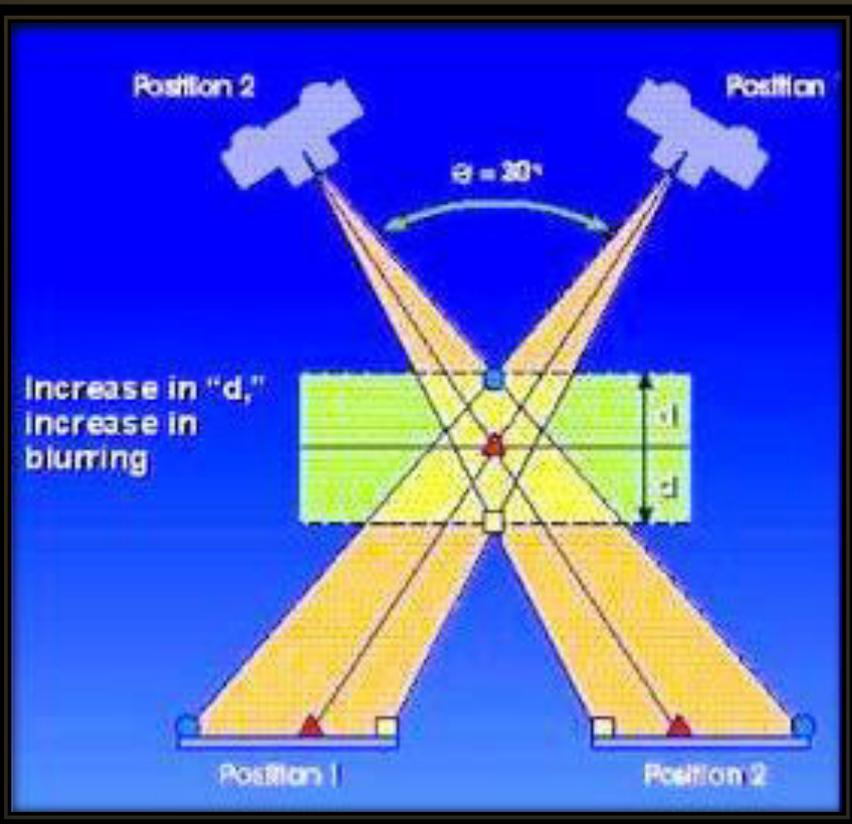


- ❖ Blurring is accomplished by synchronous movement of the tube and the film.
- ❖ Both are connected by a rod to rotate around a common pivot.
- ❖ Tube moves in one direction while the film in the opposite.



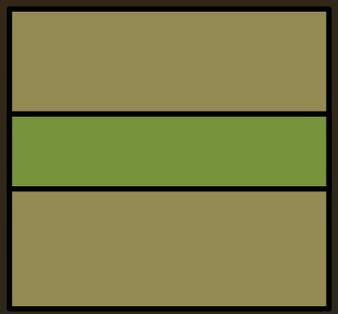
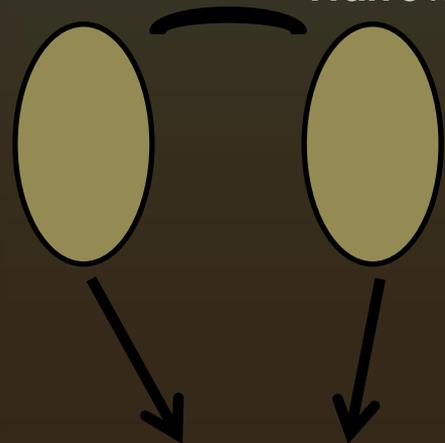
❖ Objects above or below the fulcrum plane change position on the film and thus blur.

Distance from objective plane:



Exposure angle:

Narrow angle



Film

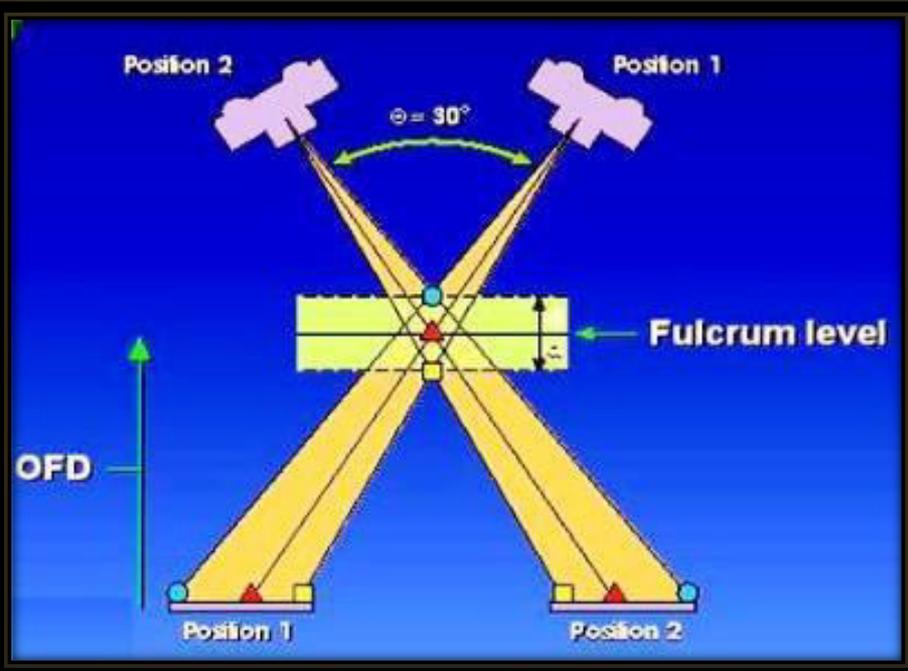
Image layer

Wide angle



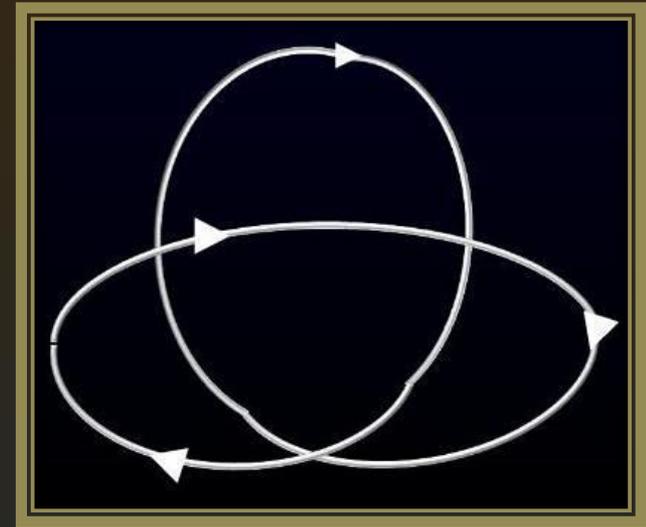
Film

Object-film distance :



Increase in object-film distance , increase in the blur.

Types of trajectories:



Tomography basic technique principles :

- ❖ The equipment has an X-ray tube, film and a rigid connecting bar rotating around a fixed fulcrum.
- ❖ According to the type of tube motion:

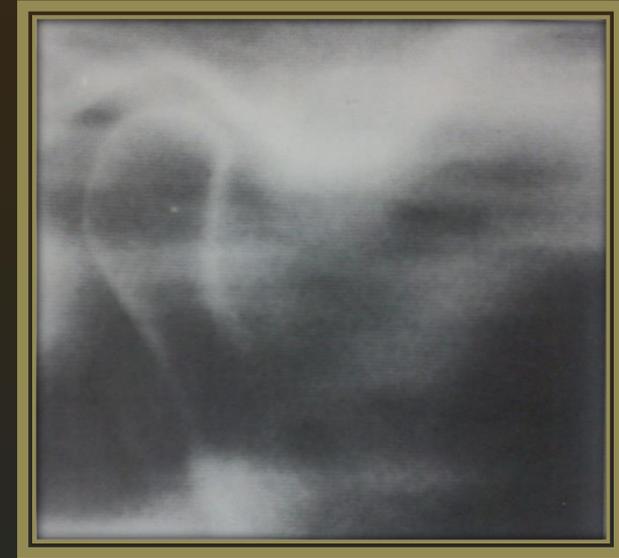
Linear tomography

Pluridirectional tomography

Tomography basic technique principles :

❖ **Linear tomography**-Simplest where in the tube moves in one direction and the film moves in the opposite direction with the fulcrum remaining stationary.

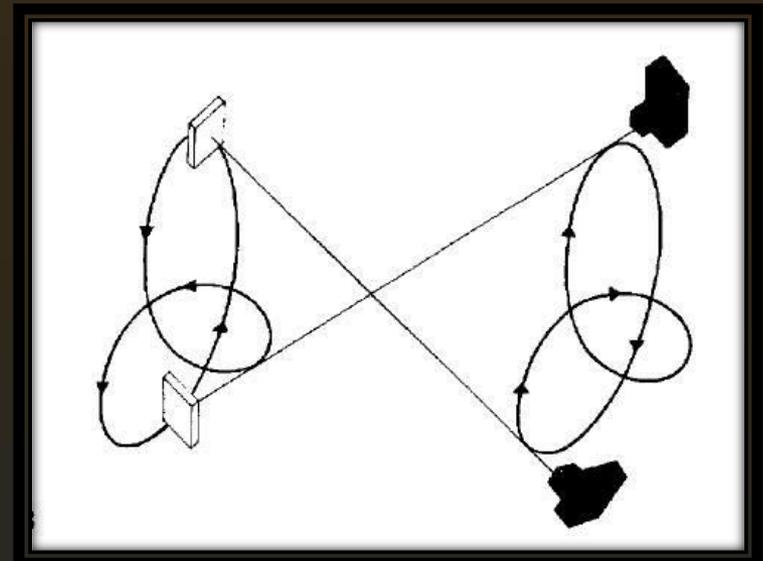
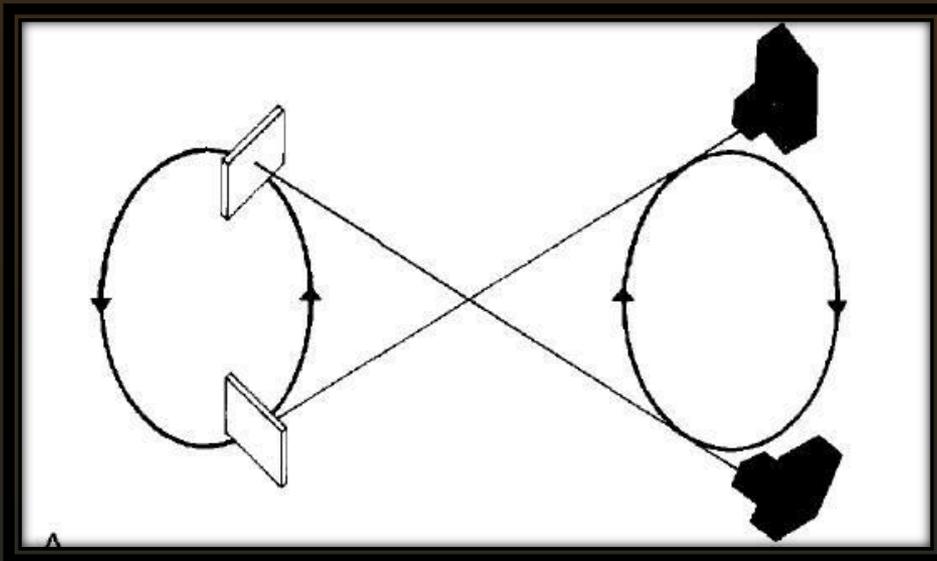
❖ **Disadvantage** :Streaking lines representing the edges of linear objects oriented along the path of tube motion.



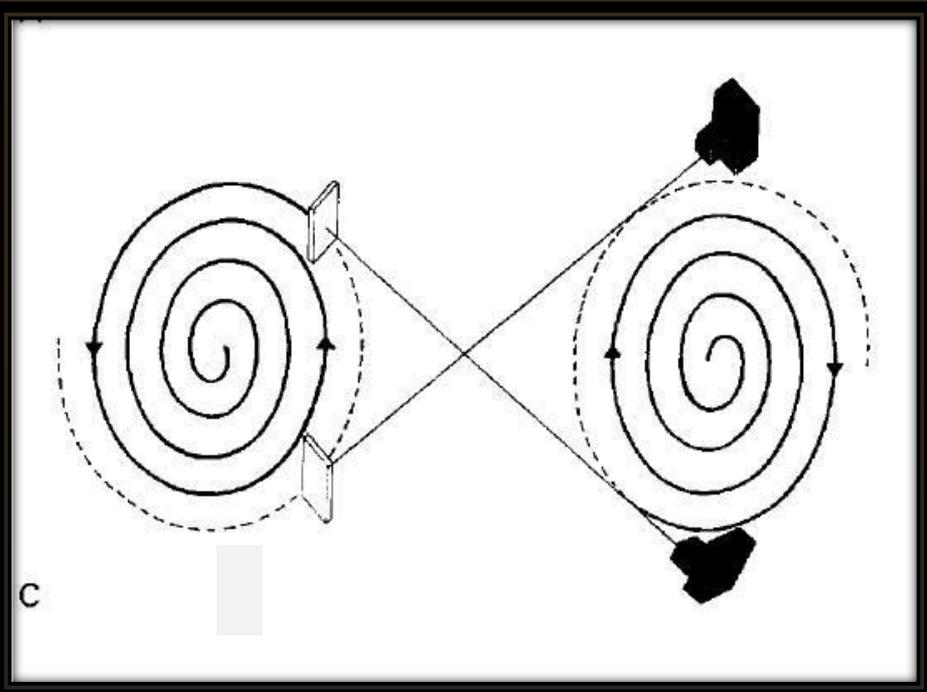
Tomography basic technique principles :

Pluridirectional tomography : The more complex, the tube motion is, more will be the uniform blurring of objects .

Resultant images had no streaks and overall contrast image was improved.

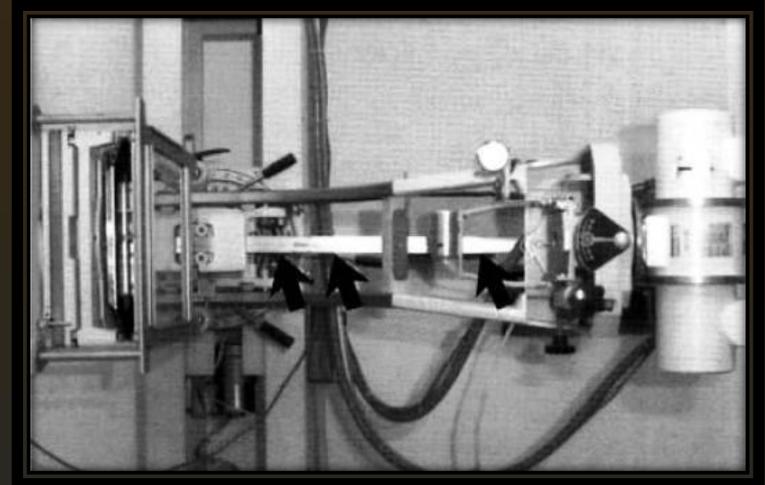
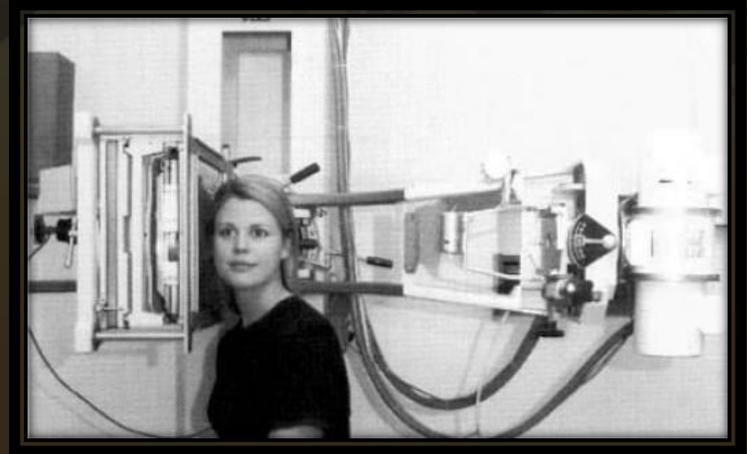


Tomography basic tehniqye principles :



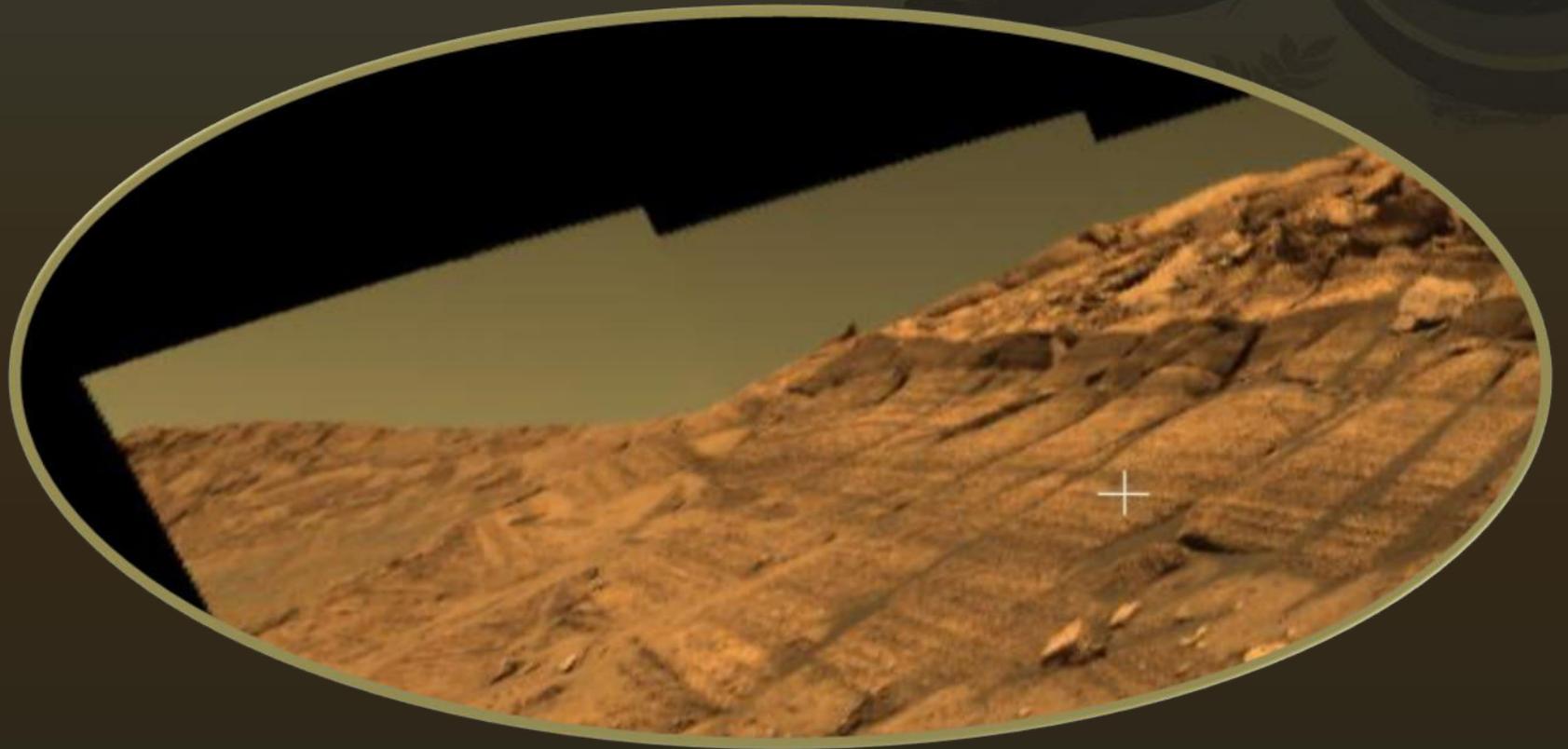
Equipment-Craniotome with modifications:

- ❖ A rigid connecting bar between tube head and cassette holder.
- ❖ Brake on the film-tube head assembly is released.
- ❖ Position of the fulcrum or pivot of the connecting bar can be adjusted accurately.
- ❖ Patient position : Within the skull unit on coronal or sagittal planes.



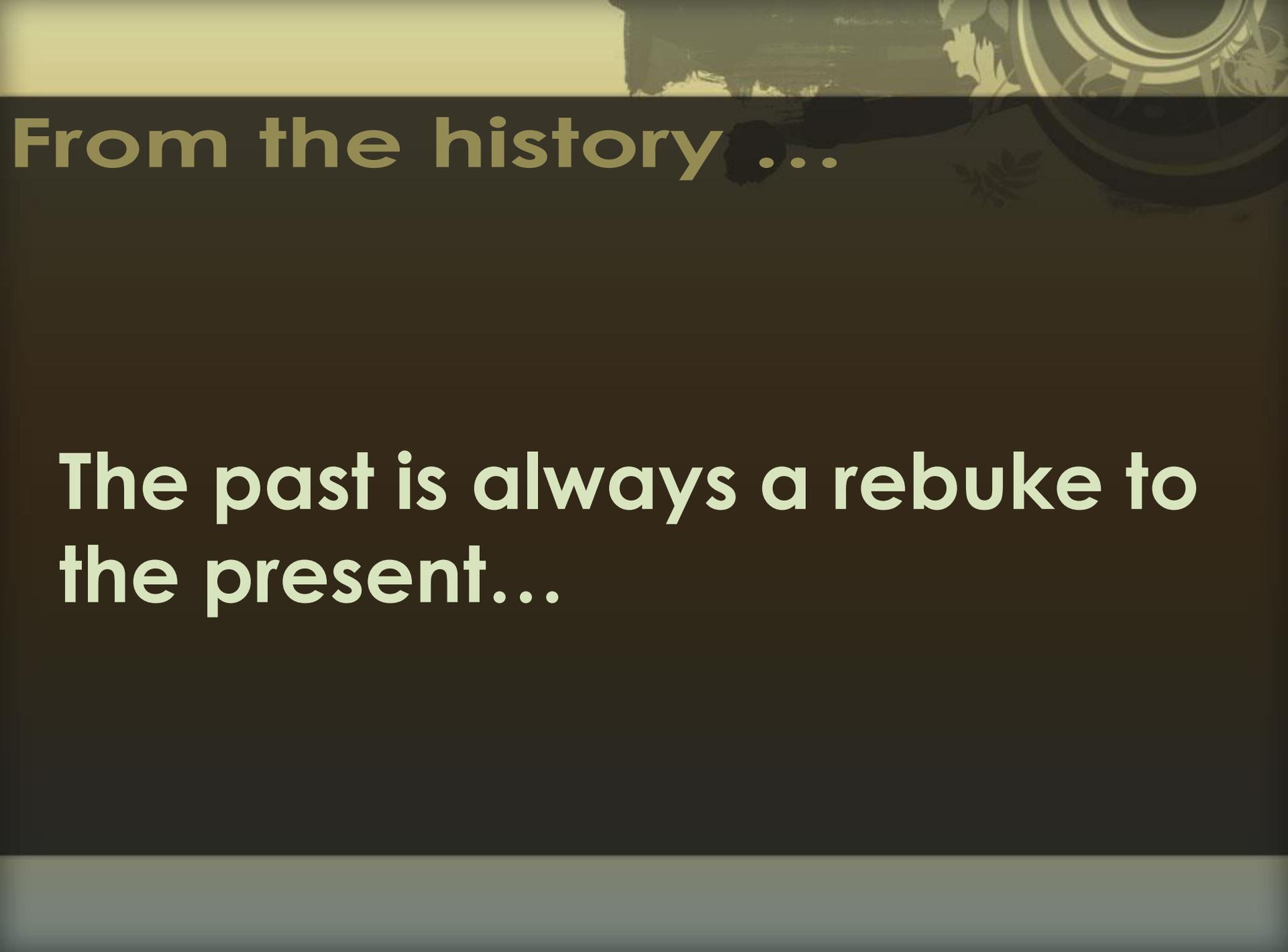
Indications:

- ❖ Assess jaw height, thickness and texture before inserting implants and its post operative evaluation.
- ❖ Assessment of antrum.
- ❖ Evaluate fractures.
- ❖ Diagnostic imaging of TMJ complex-Studies in the lateral, coronal planes and arthotomographic examination.
- ❖ Assess impacted teeth.



Panorama!!!

Introduction to panoramic radiography :



From the history ...

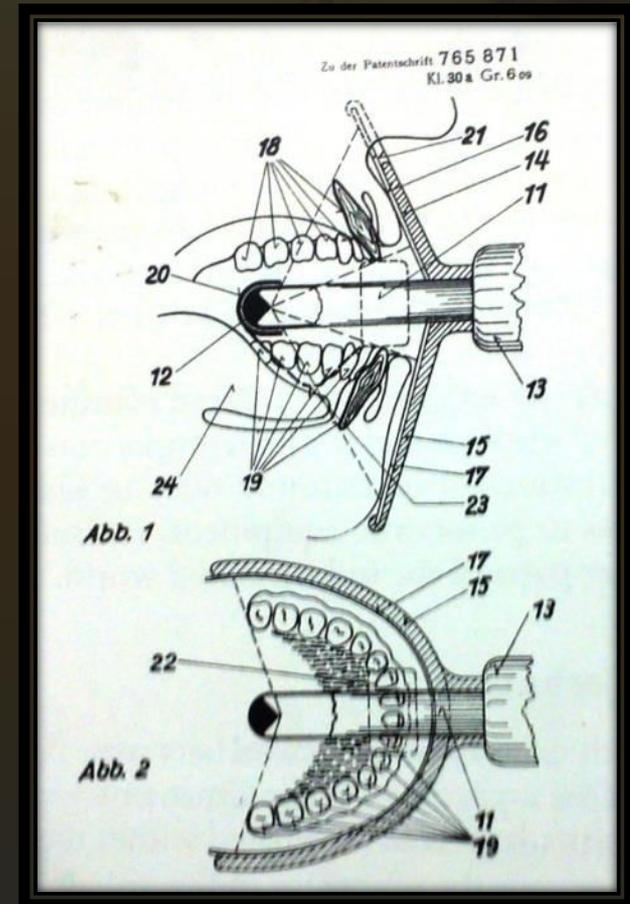
**The past is always a rebuke to
the present...**

Development of the technique :

- ❖ In early 20th century ,X-ray tube and film were used to identify foreign bodies.
- ❖ Andre Bocage-Principles of body section imaging in 1922 and imaging for curved surfaces like the jaws.
- ❖ Resulted in development of X-ray equipment using different radiographic techniques .

Panoramic Equipment using an intra oral source of radiation :

- ❖ Bouchaourt in 1898-used an intra oral source of radiation to image the jaws.
- ❖ Two set of researchers-in 1943 by German company of Koch and Sterzel and in 1951 by Dr.Walter Ott-wanted to develop an intra oral panoramic equipment.

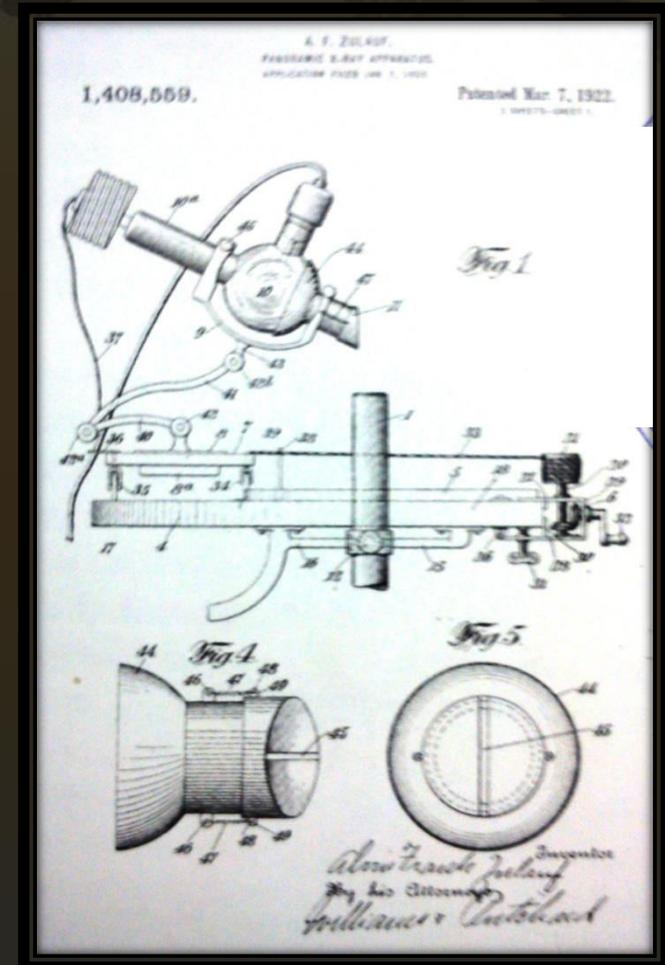


- ❖ **Dr. Sydney Blakman modified Dr. Ott's-developed PANOGRAPH by Watson and Sons Ltd.**
- ❖ **Through the bottlenecks, research still continued-Developed an intra oral panoramic unit that relied upon a radioactive isotope.**
- ❖ **Further development was emphasized on reducing the risk and image distortion.**



Panoramic equipment using an extra oral source of radiation :

- ❖ The patent was issued to A.F.Zulauf in 1922-used a rotational narrow X-ray technique.
- ❖ The X-ray generator was moved manually .
- ❖ Disadvantage : Exact speed of movement was unknown.



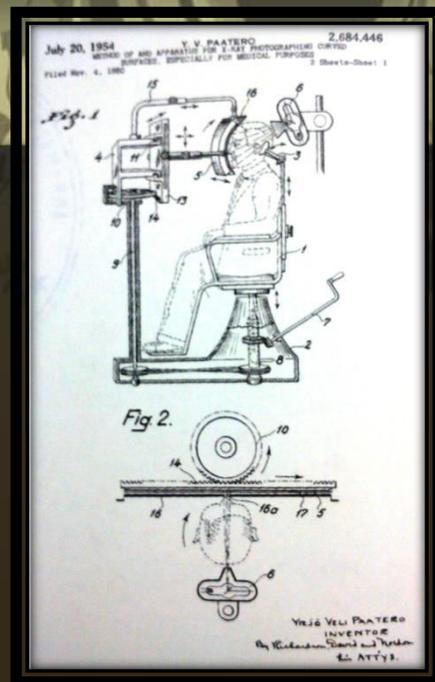
- ❖ In 1930's- methods of imaging curved surface.
- ❖ 1933-Numata-used narrow collimation-referred as slit beam x-ray equipment rotated around the patient's head with the film positioned intra orally in the lingual sulcus.
- ❖ 1946-PAATERO-first working prototype of an extra rotational panoramic unit. Used collimated X-ray beam rotating it manually as the patient sat on the dental chair.

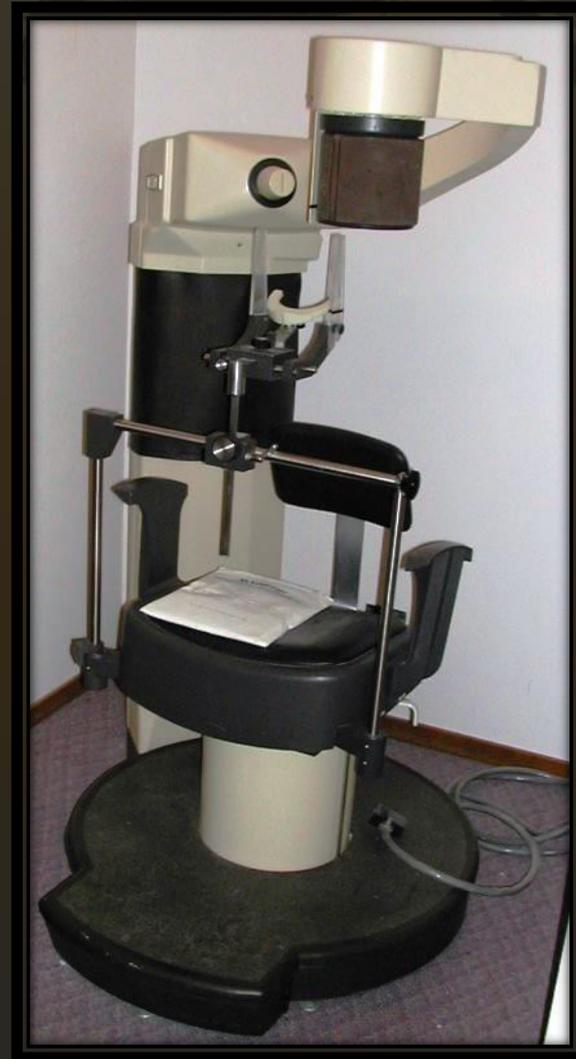
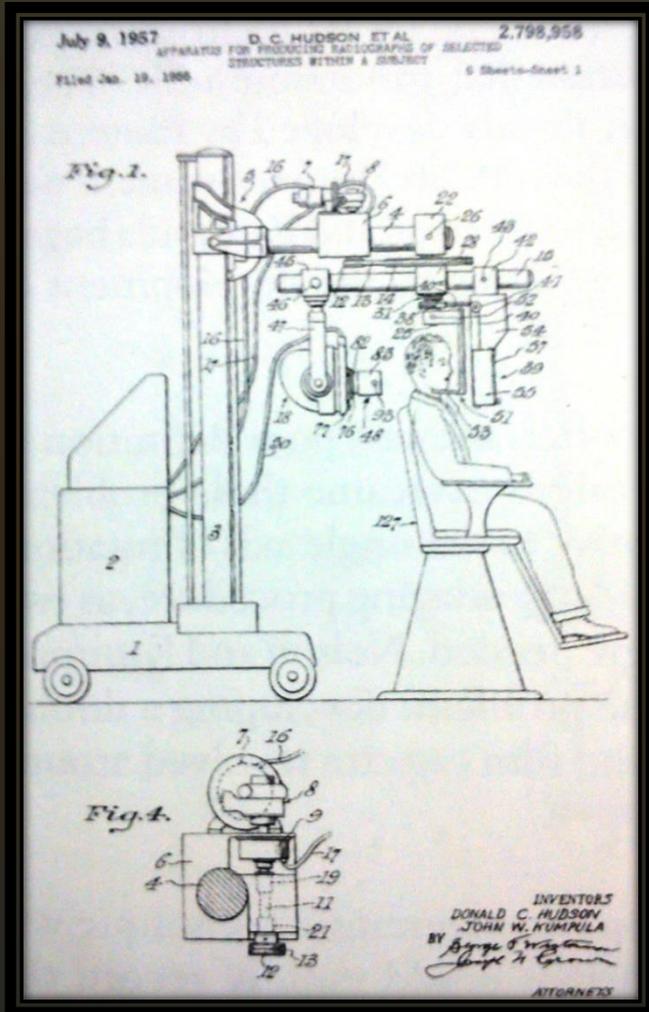
❖ Modification in 1949 -
Development of single axis of rotation-with the patient and film rotating around a stationary x-ray source.

❖ 1950-Dr.Nelson and Dr.Kumpula developed an unit similar to that by the Paatero's with double eccentric axes-

PANOREX

Panoramic Radiology-Rushton and Rout



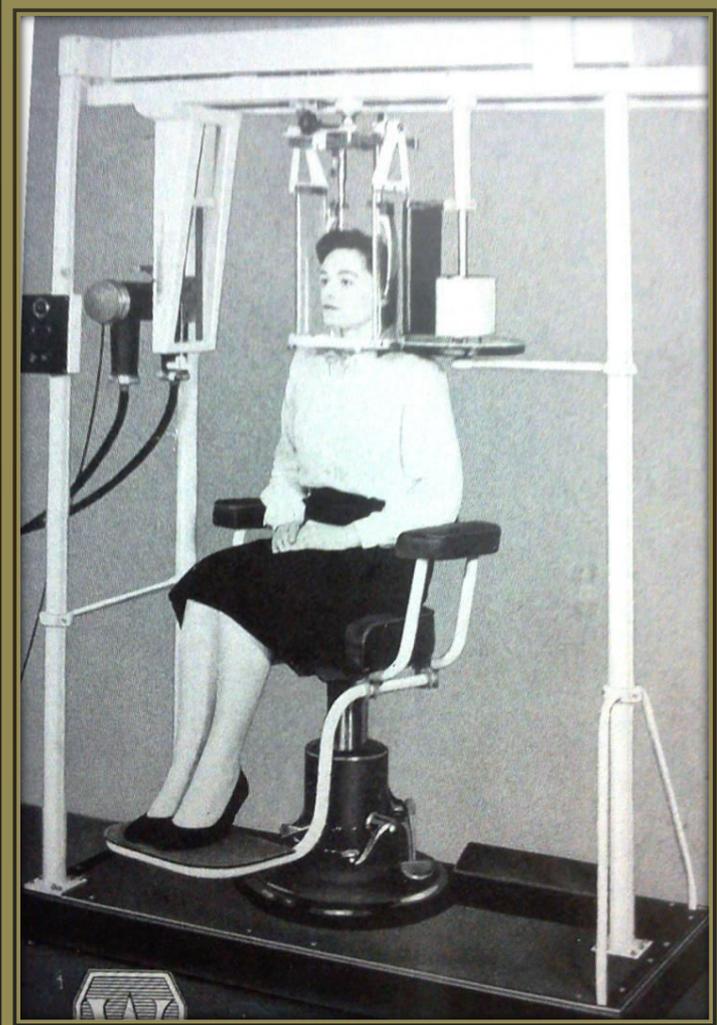


Panoramic Radiology-Rushton and Rout

- ❖ Paatero in collaboration with Dr. Sydney Blackman and Watson and Sons-ROTOGRAPH.
- ❖ This had three rotational axes.
- ❖ . ROTOGRAPH-A stationary X-ray source with the patient and film moving synchronously ,the film anti clockwise and head clockwise at the same speed.
- ❖ Paatero started with further refinement by keeping the patient stationary and moving the tube and film with two pivots.This principle is still used in S.S.White Panorex that was first available in 1959.



ROTOGRAPH



Radiographs taken with Rotograph :



❖ Paatero experimented with three rotational pivots so that approximal spaces would coincide with the radii from the various centers of rotation- Ortho radial panoramic tomography. This was the basis for siemen's orthopantomography in 1960.

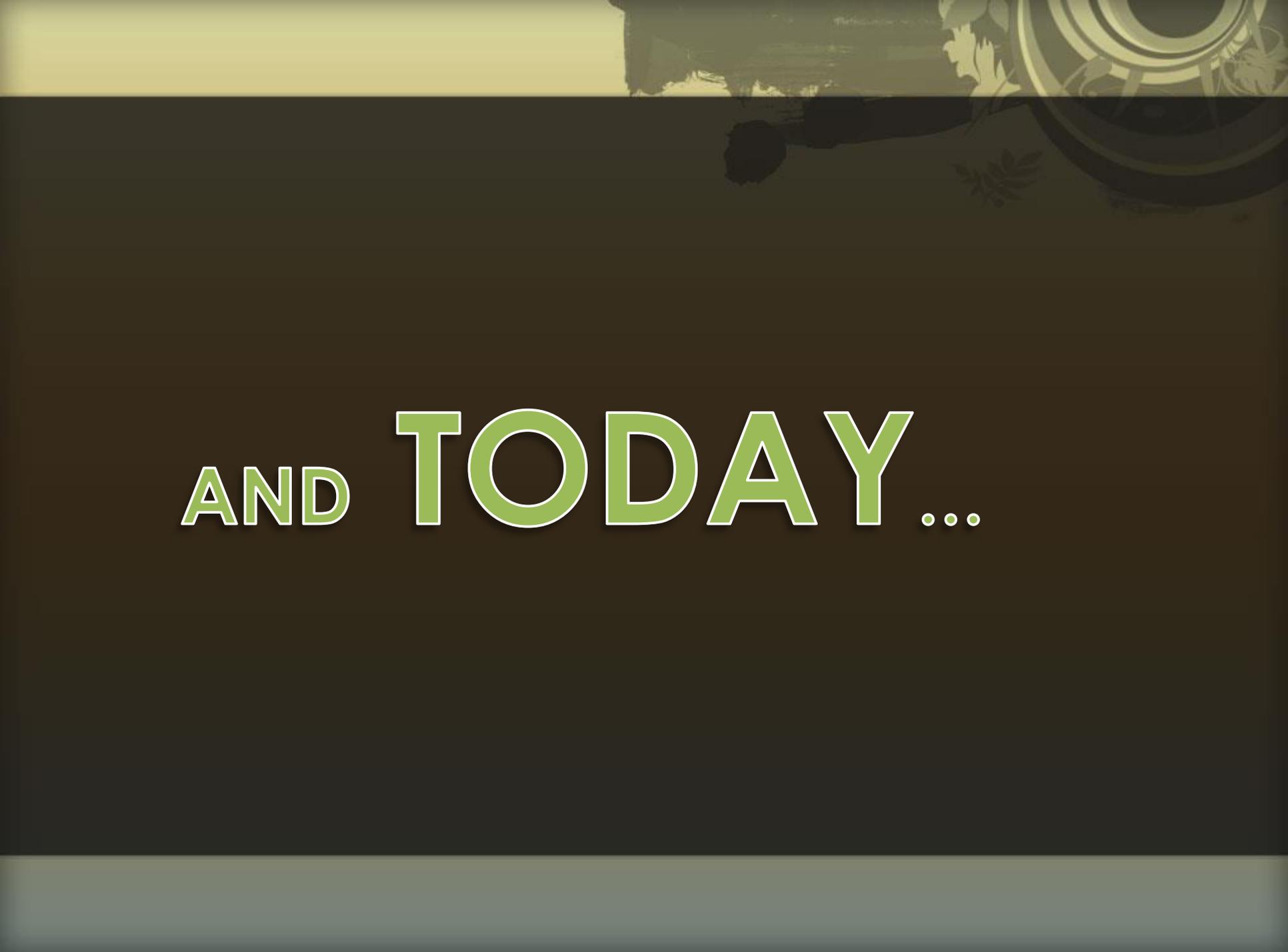


Dr. Sydney Blackman



❖ **Dr. Paatero-Father of orthopantomography.**

❖ **Dr. Sydney Blackman-Pioneer of pantomography.**



AND TODAY...



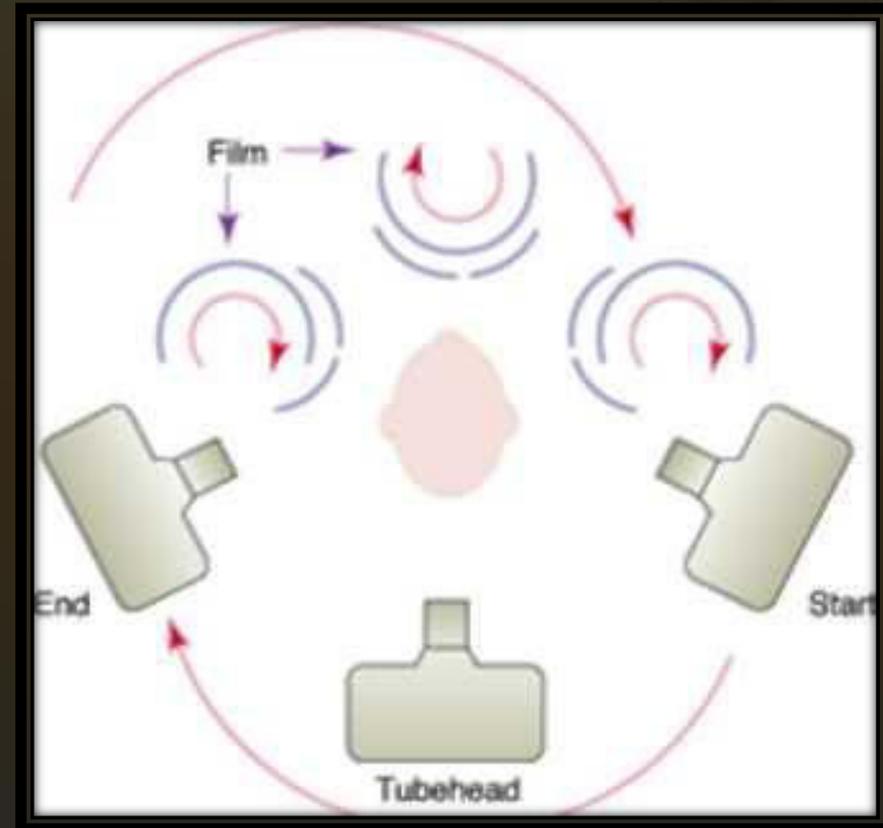
The center of rotation is continuously changed between three main pivots, so that the arc of rotation takes an elliptical shape of the dental arches.

The fundamentals...

- ❖ Extra-oral-U/L arch in a single film.
- ❖ Rotational panoramic radiography-both film and tube head rotate around the patient, producing a series of individual images - image conforms to the shape of the dental arches.



- ❖ Patient may sit or stand.
- ❖ When such images are combined on a single film, an overall view of maxilla and mandible is created.



Purpose???

- ❖ **Impacted teeth**
- ❖ **Eruption patterns, growth and development**
- ❖ **Large lesions of the jaws like cysts and tumors**
- ❖ **Fractures**

Rotation center :

❖ The pivotal point or axis around which the cassette and X-ray tube rotate is called **Rotational Center**.

❖ Three basic rotation centers:

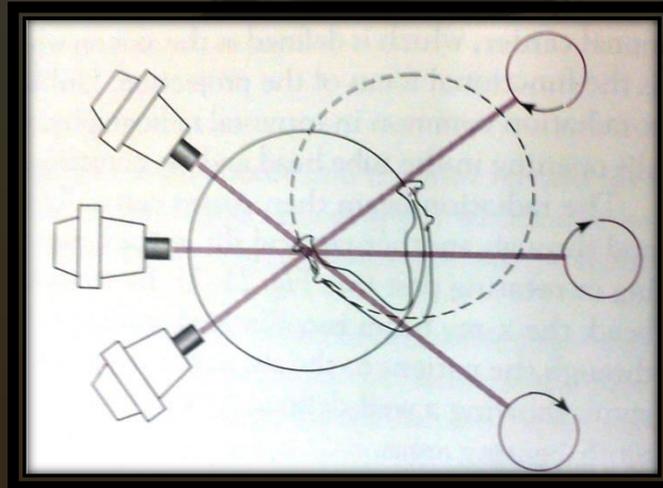
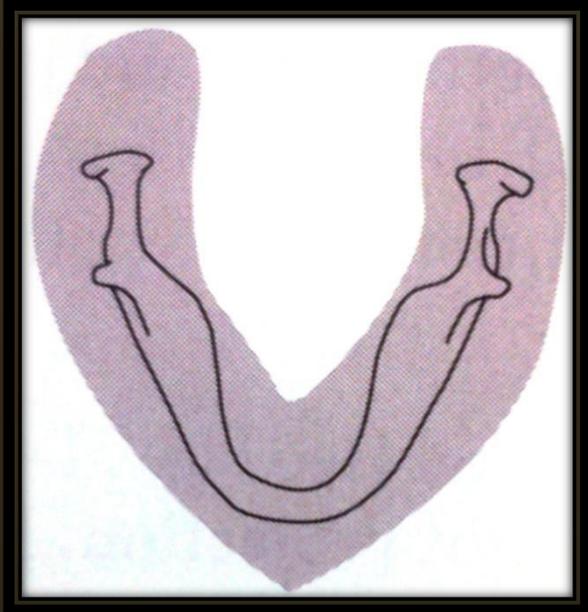
-Double

-Triple

-Moving

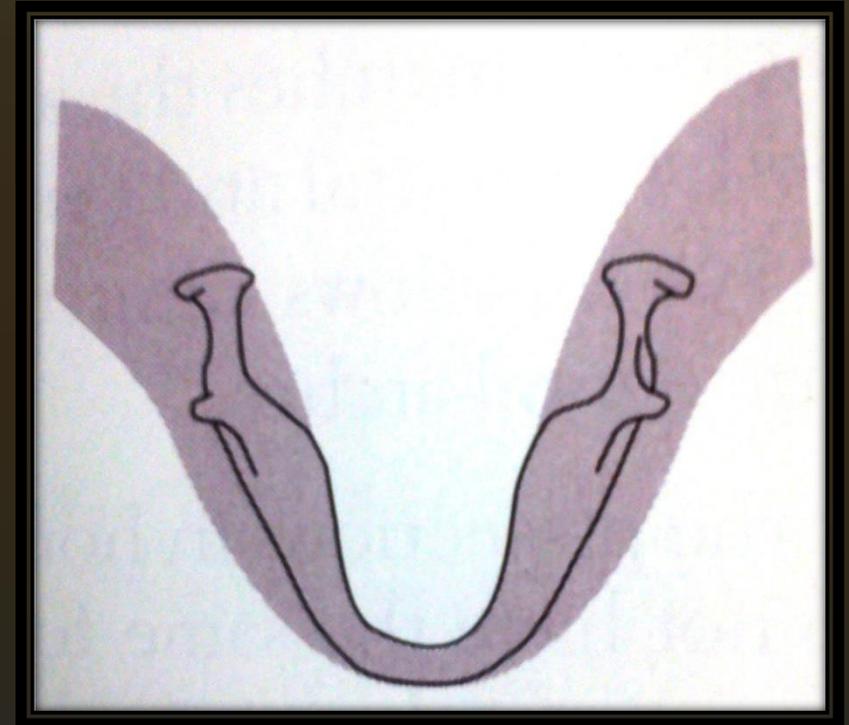
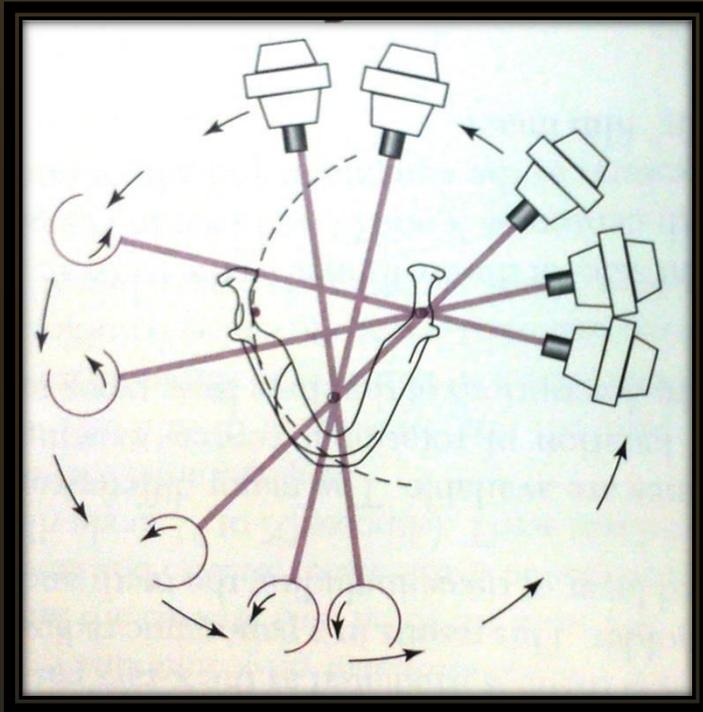
Rotation center :

1. Double center rotation :



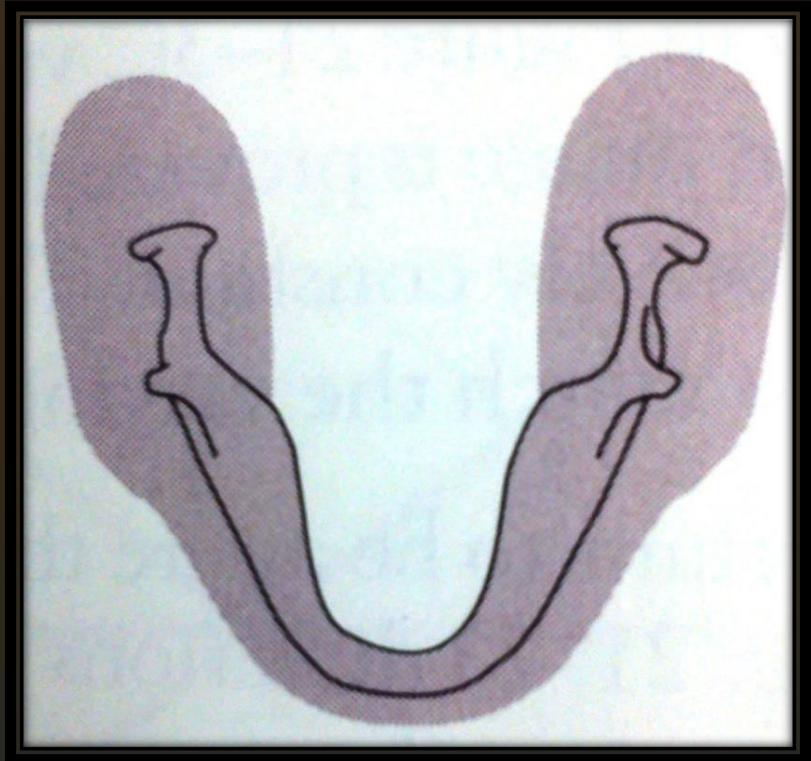
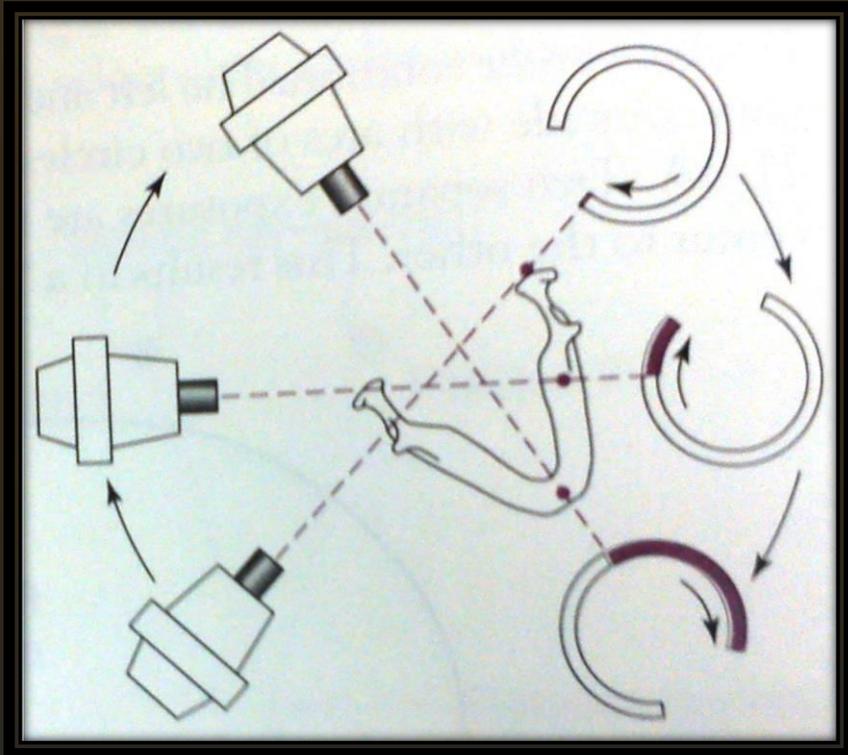
Rotation center :

2. Triple center rotation :



Rotation center :

3.Moving center rotation :



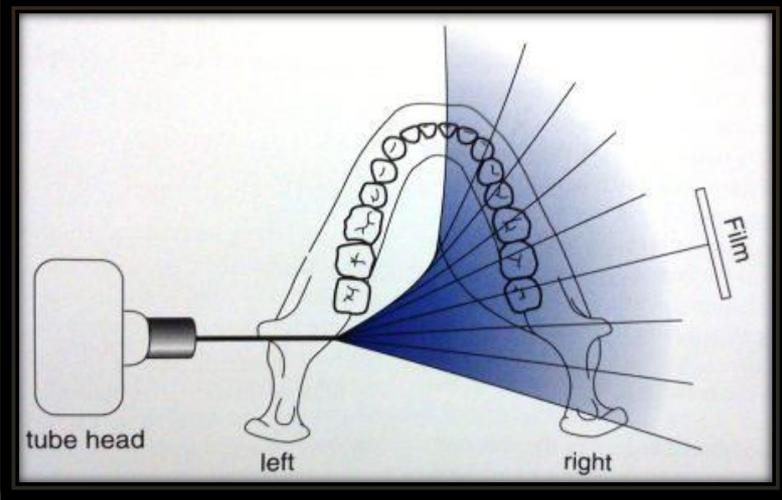
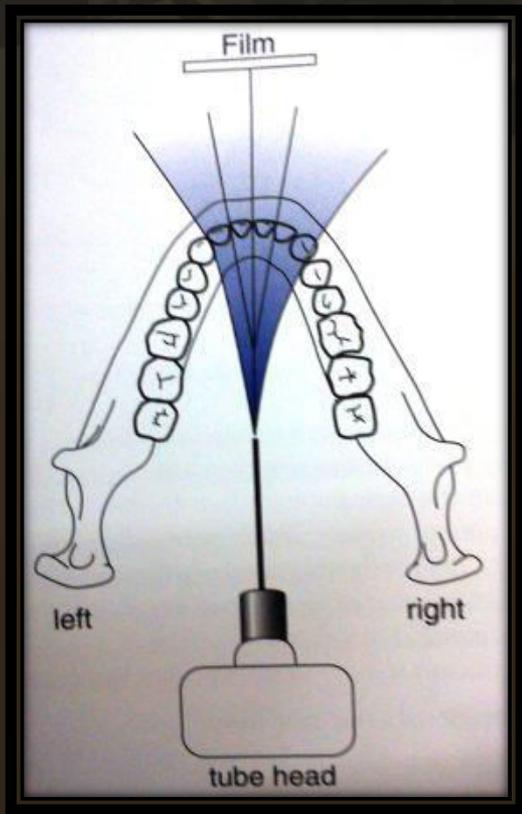
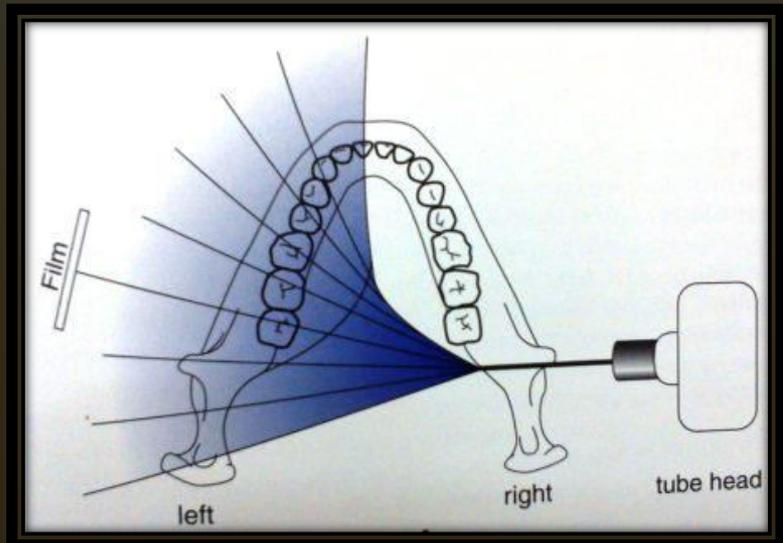


Focal trough :

- ❖ A three dimensional curved zone in which structures are clearly demonstrated on a panoramic radiograph.
- ❖ Also called **Image layer** or **focal plane**
- ❖ Structures positioned inside or outside the focal trough appear blurred or indistinct.



Plane of focus within the focal trough:



Interpretation of panoramic radiograph :

- ❖ Foci of projection in the vertical and horizontal direction are not the same.
- ❖ Horizontal-it is the rotational center of the beam that constitutes the functional focus.
- ❖ Vertical-it is the x-ray source.
- ❖ The moving film changes the horizontal magnification of the image but not the vertical projection of the object.

- ❖ The structures seen are actually flattened out.
- ❖ The real image is formed when the object is closer to the focal trough.
- ❖ Ghost images are formed when the object is located between the x-ray source and the center of rotation.
- ❖ Panoramic beams are to a certain extent affected by the soft tissue structures to make it visible on the radiograph.
- ❖ Air spaces are visualized.
- ❖ Separation of radiolucencies of the patient and machine is important.
- ❖ Extradental view of OPG is excellent especially of the TMJ.

The equipment :

❖ Panoramic X-ray unit

-X-ray tube head

-Head positioner

-Exposure controls

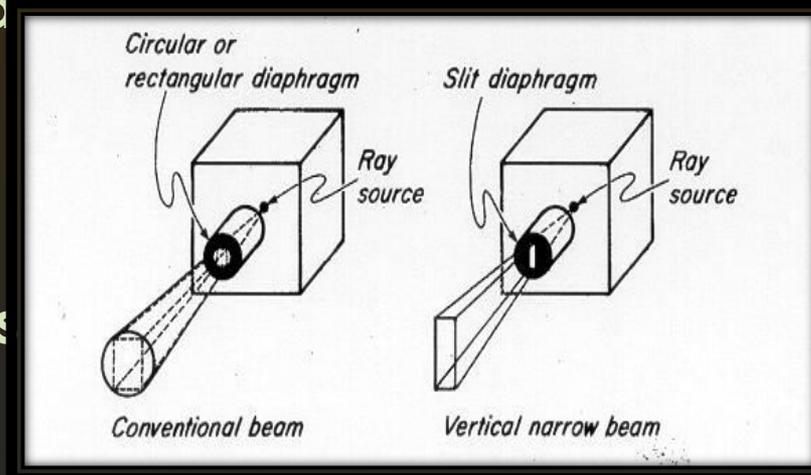
❖ Screen film

❖ Intensifying screens

❖ Cassette

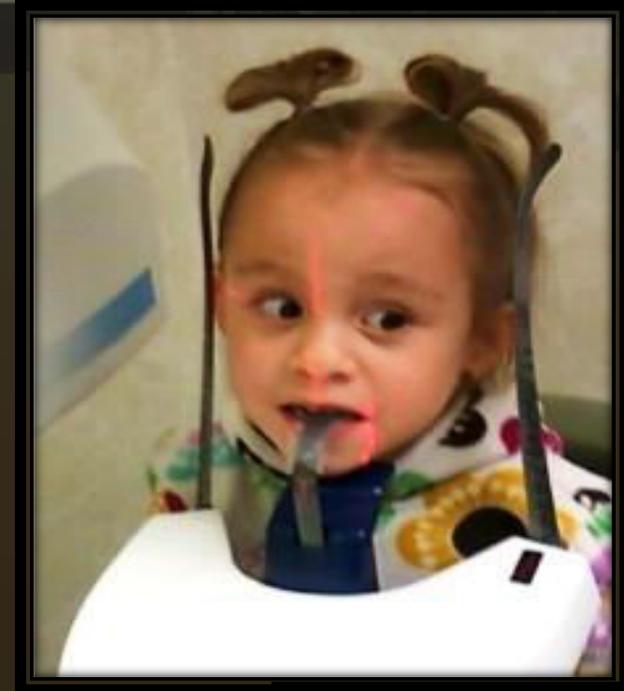
Tubehead:

- ❖ Has a filament used to produce electrons and a target used to produce x-rays.
- ❖ **Collimator** :Lead plate with an opening in the shape of a narrow vertical slit.
- ❖ Tube head is fixed in position and it always rotates behind the patient.



Head positioner :

❖ Chin rest, Notched bite pin, forehead rest and lateral head supports.



Exposure factors :

- ❖ mA and Kvp settings are adjustable.
- ❖ Exposure time is fixed and cannot be changed.



Intensifying screen :

❖Types

- Calcium tungstate
- Rare earth

❖Calcium tungstate:Emit blue light-faster

❖Rare earth :Emit green light-Less exposure.



Film :

- ❖ Screen film is used and the film is sensitive to light emitted from intensifying screens.
- ❖ Some are sensitive to green light while others to blue light.
- ❖ Appropriate pairing of screen and film is required.
- ❖ Sizes: 5x12 inches and 6x12 inches.

Cassette :

❖ Holds film and the screen.

❖ Types :
- Rigid/Flexible
- Curved/Straight

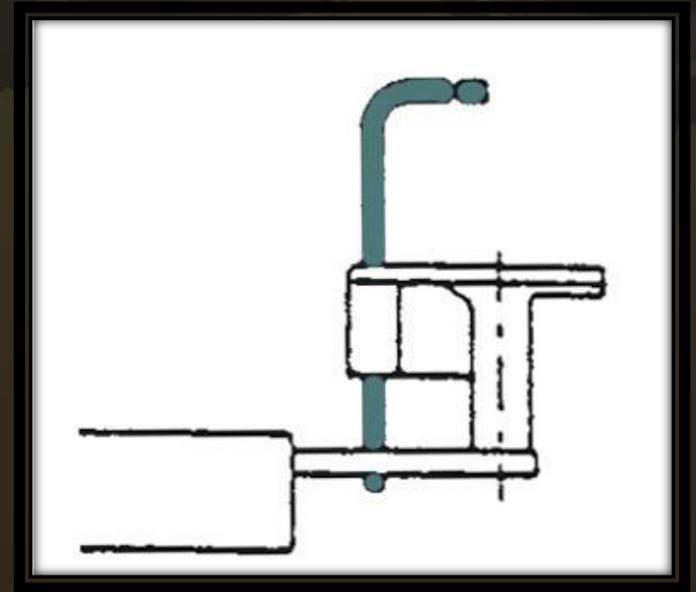
❖ Labeling on the cassette.



Step by Step procedure :

1. Equipment preparation :

- ❖ Load the cassette with intensifying screens.
- ❖ Cover bite block with disposable plastic coverslip -If made of impervious material then autoclave.



Step by Step procedure :

1. Equipment preparation cont...

- ❖ **Set exposure factors**

- ❖ **Adjust the machine to accommodate the height of the patient.**

- ❖ **Cassette to be loaded in the carrier of panoramic unit.**

2. Patient preparation :

- ❖ Explain radiographic procedure.
- ❖ Place lead apron without thyroid collar-Double sided lead apron is recommended.
- ❖ Remove all objects that would obstruct the information.



3. Patient positioning :

❖ Instruct the patient to stand erect .

Else, obscures diagnostic information

❖ Instruct the patient to bite on bite

block-U/L front teeth in end to end

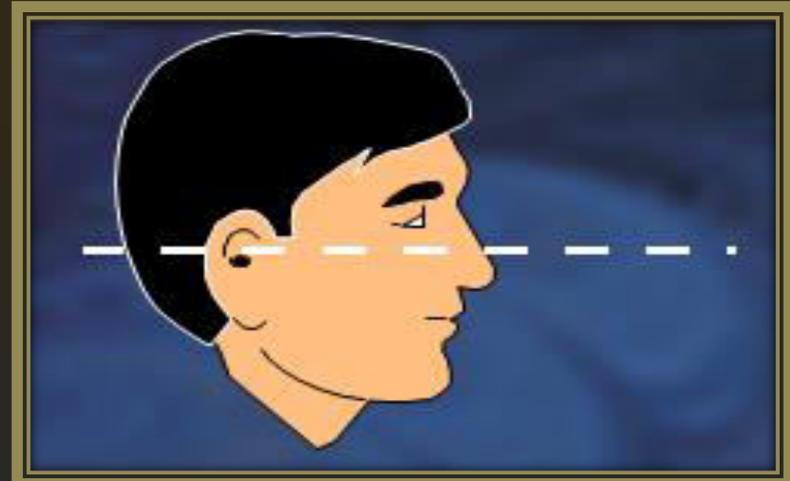
position-Cotton rolls for stabilization.



3. Patient positioning cont...

❖ Position mid-sagittal plane perpendicular to floor-Patient's head should not be tipped or tilted, else, distortion.

❖ Position FH plane parallel with floor.



3. Patient positioning cont...

- ❖ Instruct patient to position the tongue on the roof of mouth.
- ❖ Instruct to close the lip around the bite block.
- ❖ After positioning, instruct patient to remain still during exposure.
- ❖ Proceed with processing.

Going Digital...!!!

- ❖ **1985-Kashima et al** reported the implementation of computed panoramic radiography by means of a laser stimulated scanning luminescence of storage phosphor plates.
- ❖ **McDavid et al**-introduced direct digital panoramic imaging using a linear array of silicon photodiodes.
- ❖ **Recently, Arai et al**-devised an image intensifier, CCD as an alternative means of capturing digital panoramic radiographs.

Going Digital..!!!

❖ Consists of series of numbers that are created electronically and stored in the computer. Then, the image is fed into the computer, reconstructed as shades of grey and is displayed on the monitor.

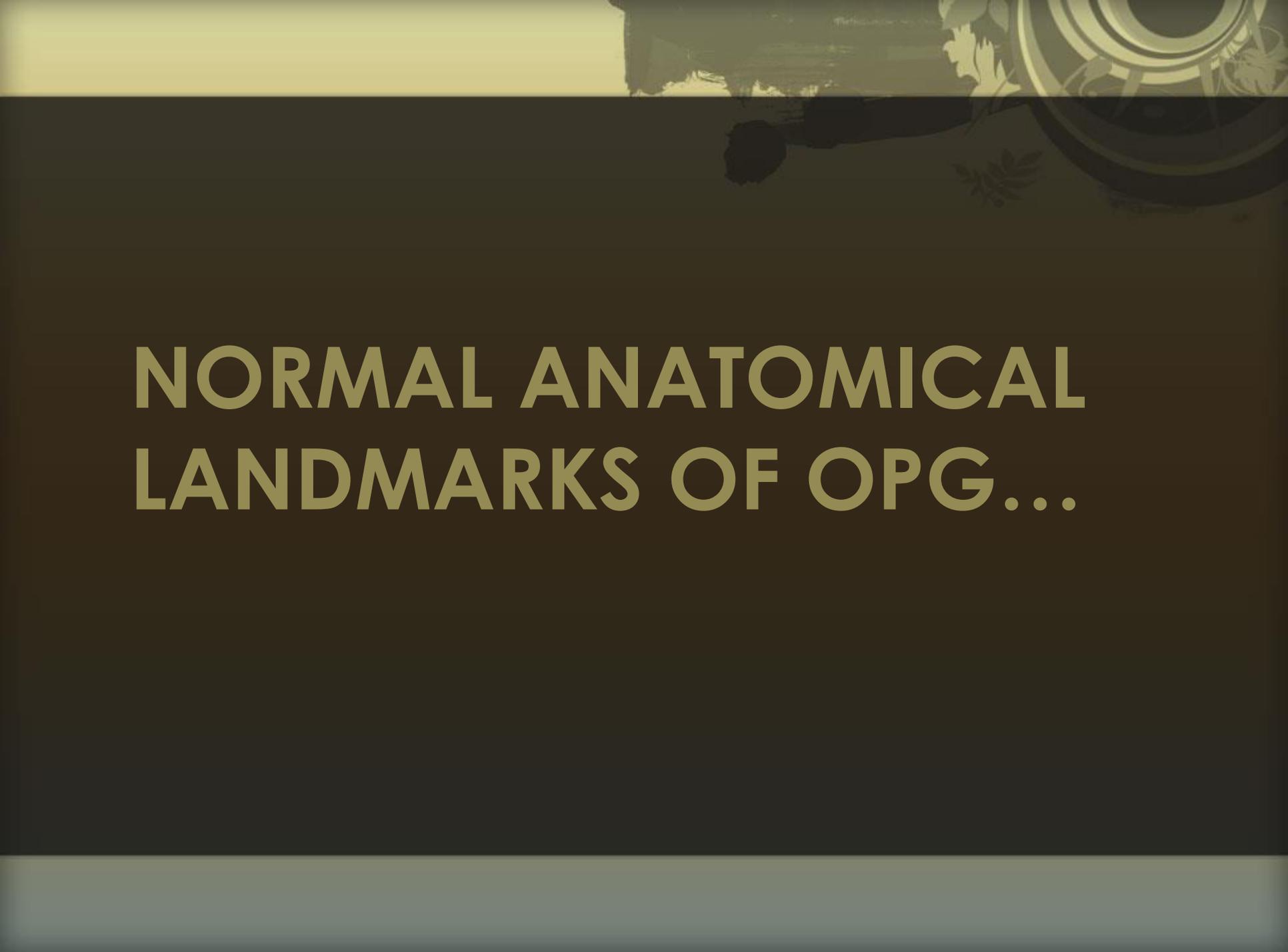
❖ Is based on either:

- SPP(Storage phosphor plate technique)
- CCD(Charge coupled devices)



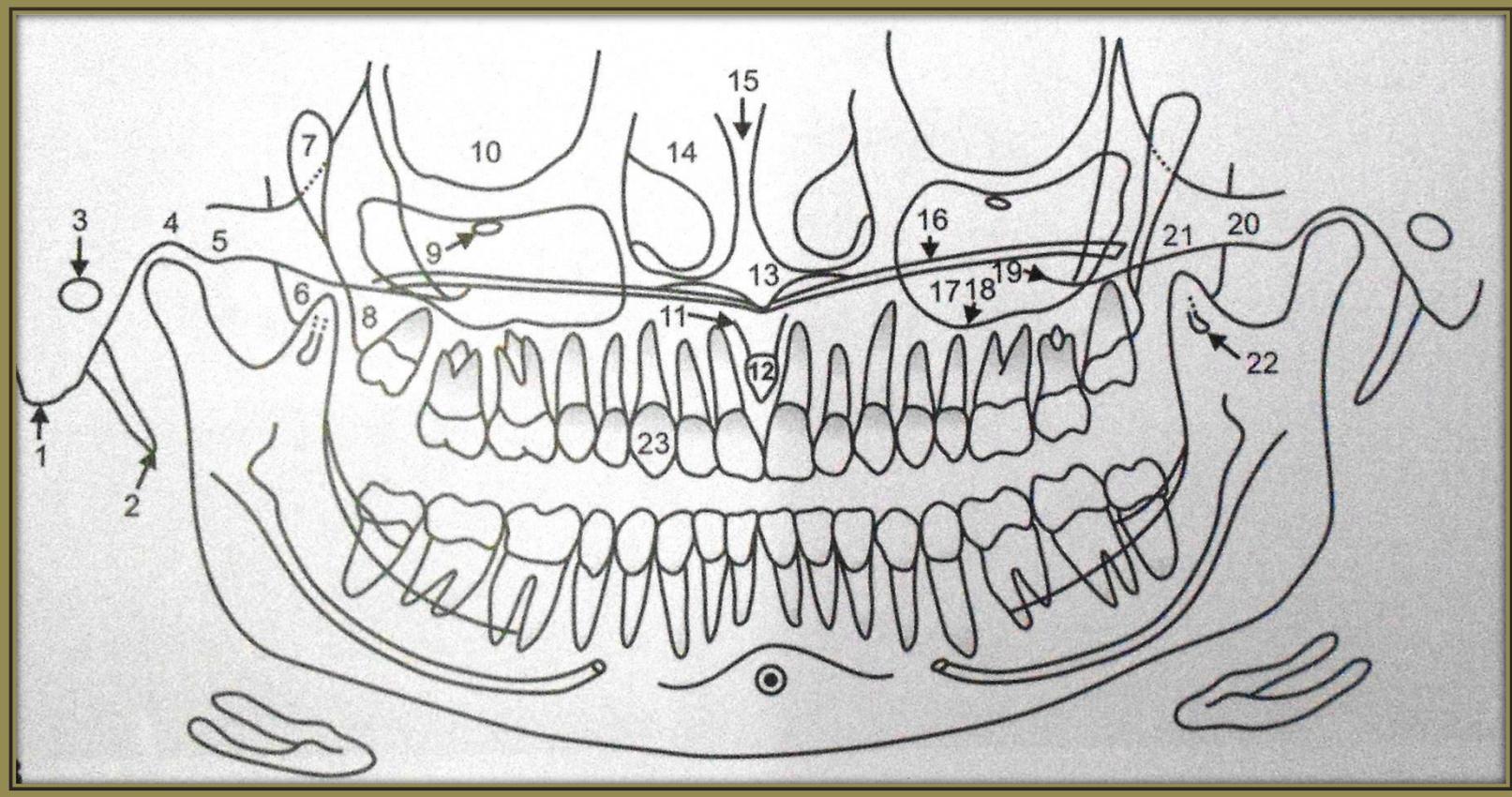
Going Digital...!!!

- ❖ **CCD** : Uses a narrow two dimensional detector in place of a moving cassette.
- ❖ **SPP** : Utilizes a phosphor imaging plate that captures x-ray energy.
- ❖ **Advantage** :
 - Less radiation dose
 - Less time required
 - Good diagnostic results
 - Image enhancement possible.

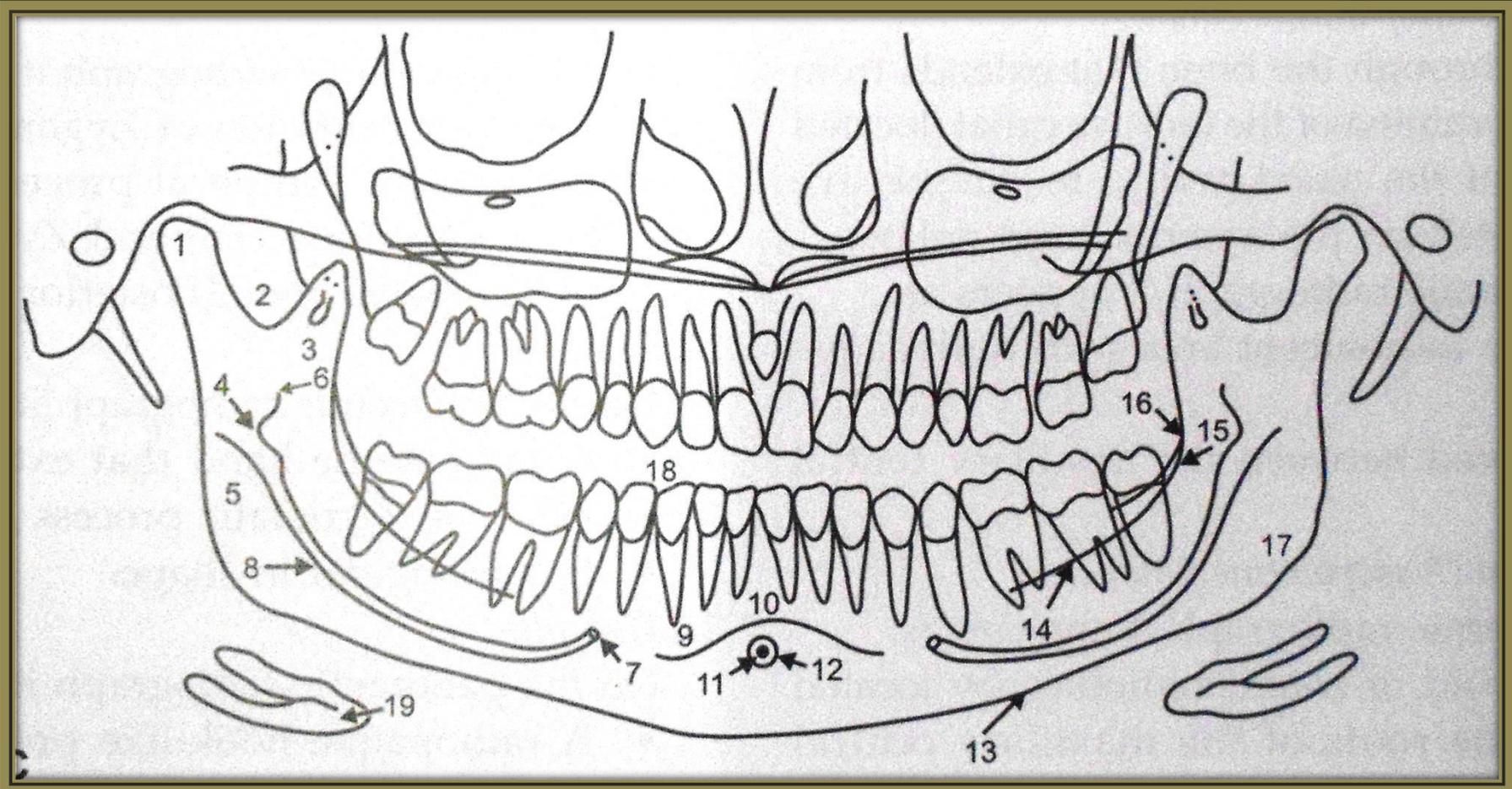
The background features a dark, textured surface. In the upper right corner, there is a faint, stylized illustration of a hand holding a pen, positioned as if writing. To the right of the hand is a circular graphic element with concentric rings and some internal patterns, resembling a seal or a logo. The overall color palette is muted, with shades of grey, black, and a light beige or cream color.

NORMAL ANATOMICAL LANDMARKS OF OPG...

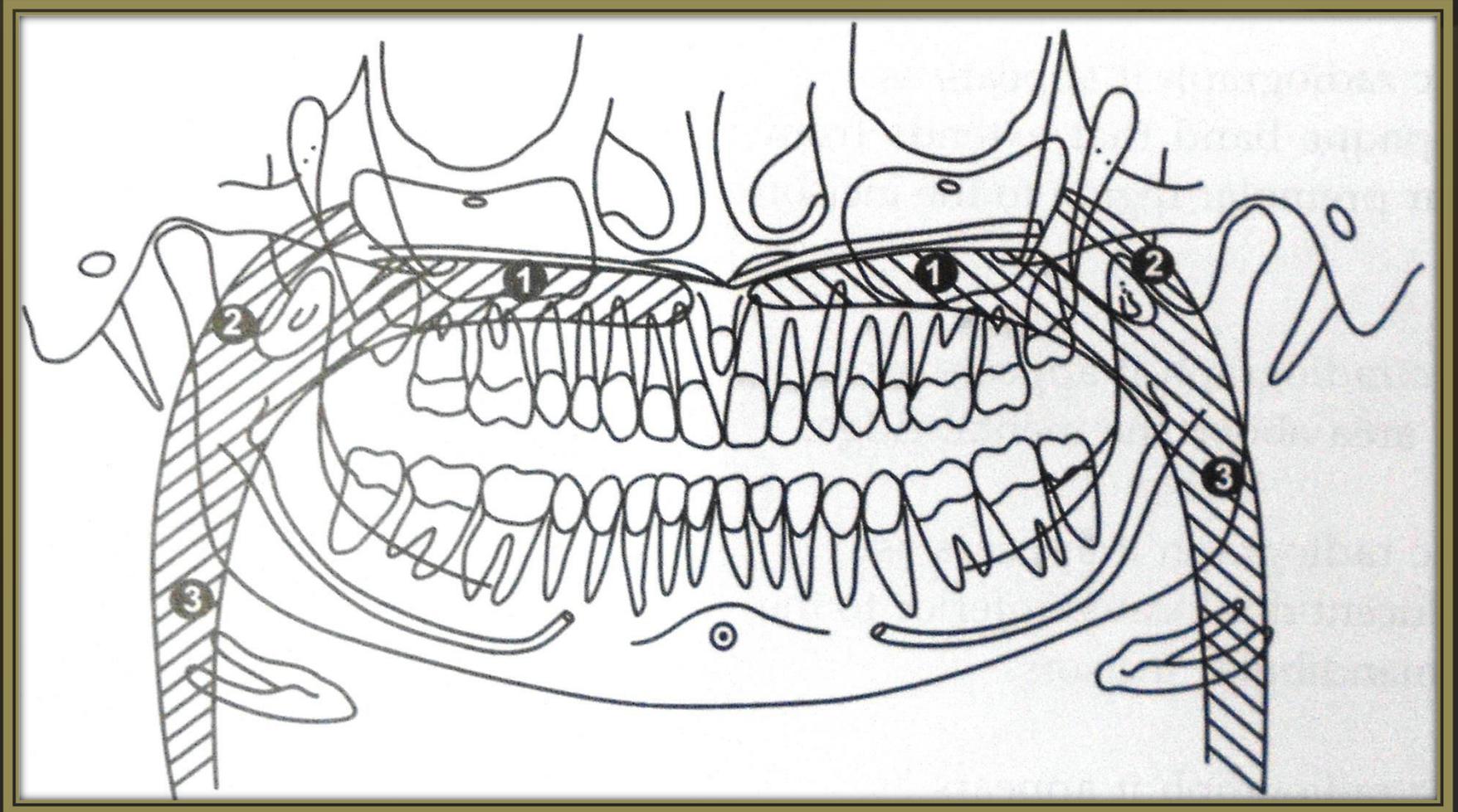
Normal landmarks of maxilla and surrounding structures :



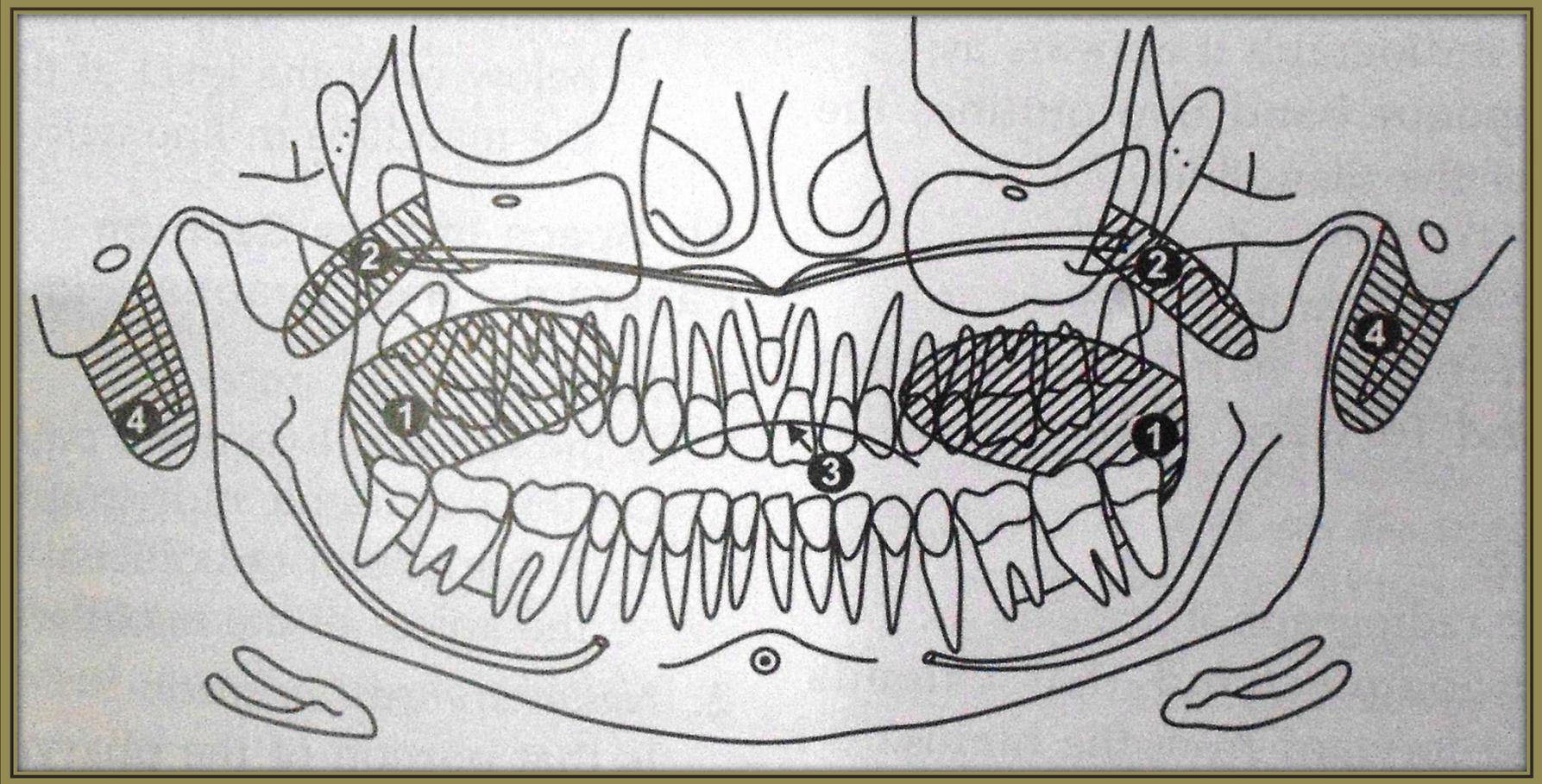
Normal landmarks of mandible and surrounding structures :



AIR SPACES :



SOFT TISSUE SHADOWS:





THE ERRORS...

Patient preparation errors :

1. Ghost Images :

- ❖ Metallic or radiodense objects not removed.
- ❖ These objects can be anatomic or non anatomic.
- ❖ The object is penetrated twice by the x-ray beam.

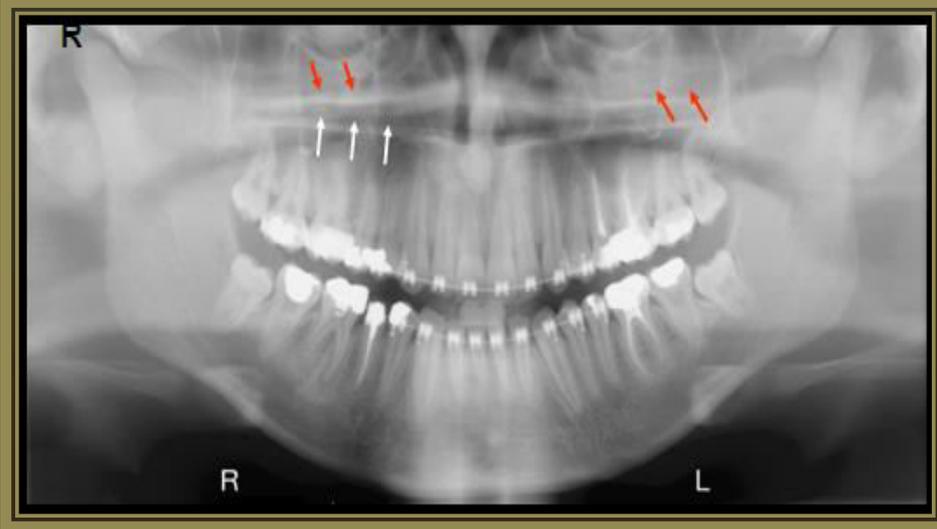


Patient preparation errors :

1. Ghost Images cont ...

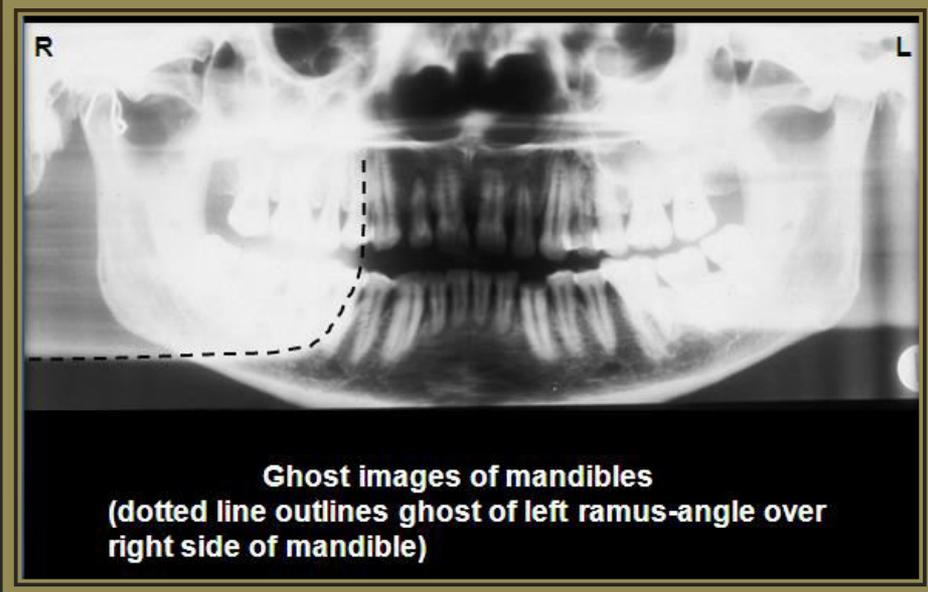


Ghost Images cont...



Hard Palate

Left ramus-angle



Ghost images of mandibles
(dotted line outlines ghost of left ramus-angle over right side of mandible)

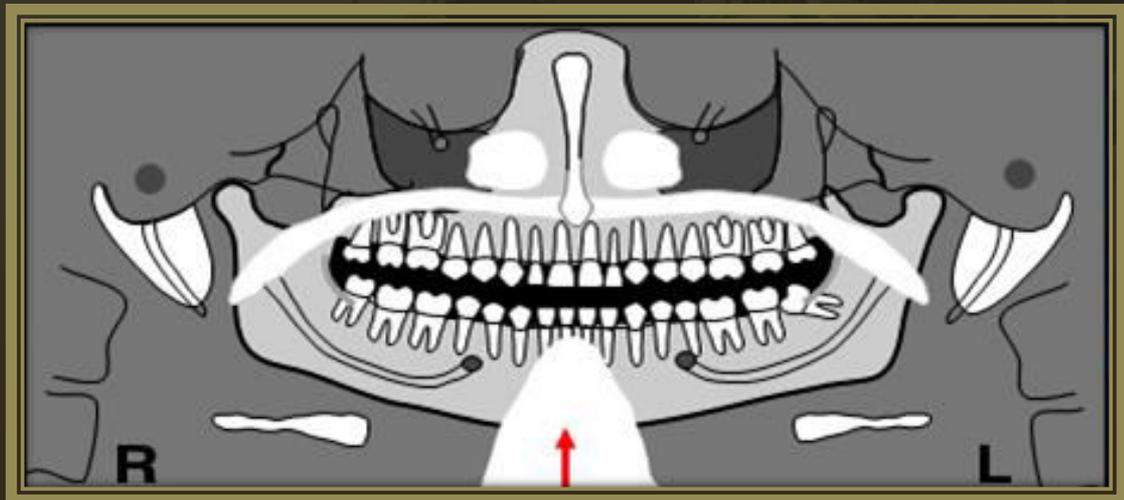
2. Lead apron artifact:

- ❖ Lead apron is placed high or along with thyroid collar.

high or along with thyroid collar.

- ❖ Results in a radiopaque cone shaped artifact.

- ❖ Use lead apron with no thyroid collar or placed low around the neck.



Lead apron shadow

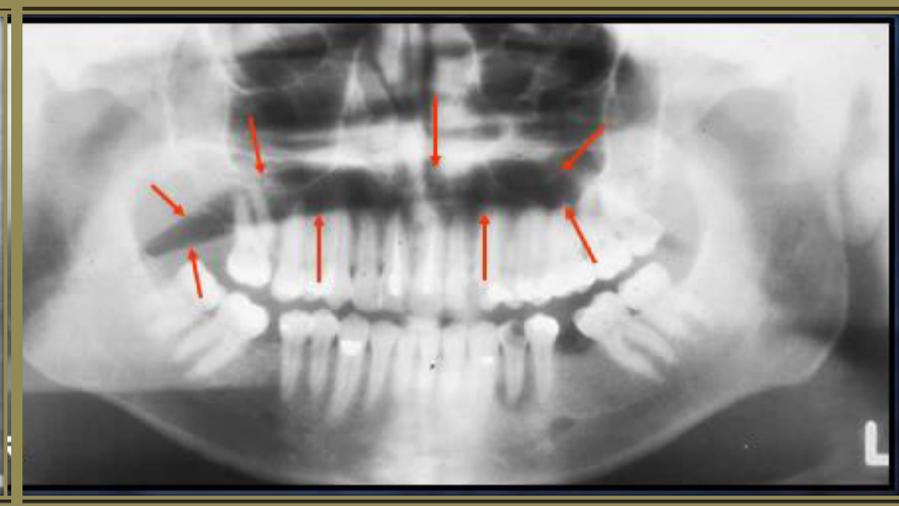
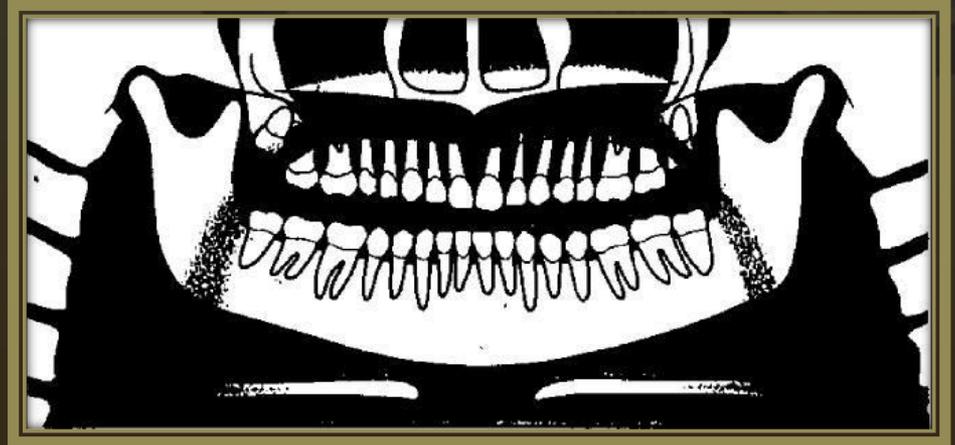
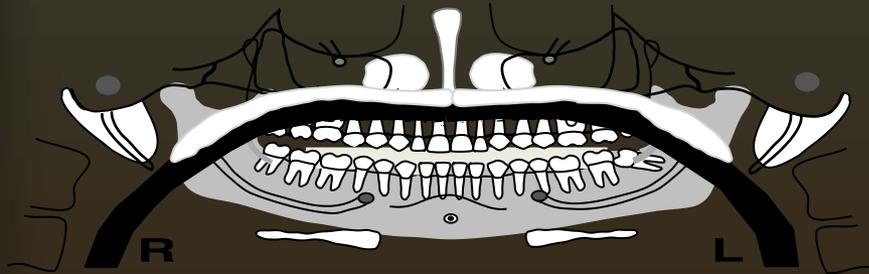


Patient positioning errors :

1.Positioning of lips and tongue :

- ❖ If patient's lips are not closed on the bite block during exposure of a panoramic film –radiolucent shadow.
- ❖ If tongue is not in contact with the palate during exposure, the palatoglossal air space appears as a dark radiolucent shadow obscuring the apices of maxillary teeth.

1. Positioning of lips and tongue cont...



Panoramic radiology-Rushton and raut.

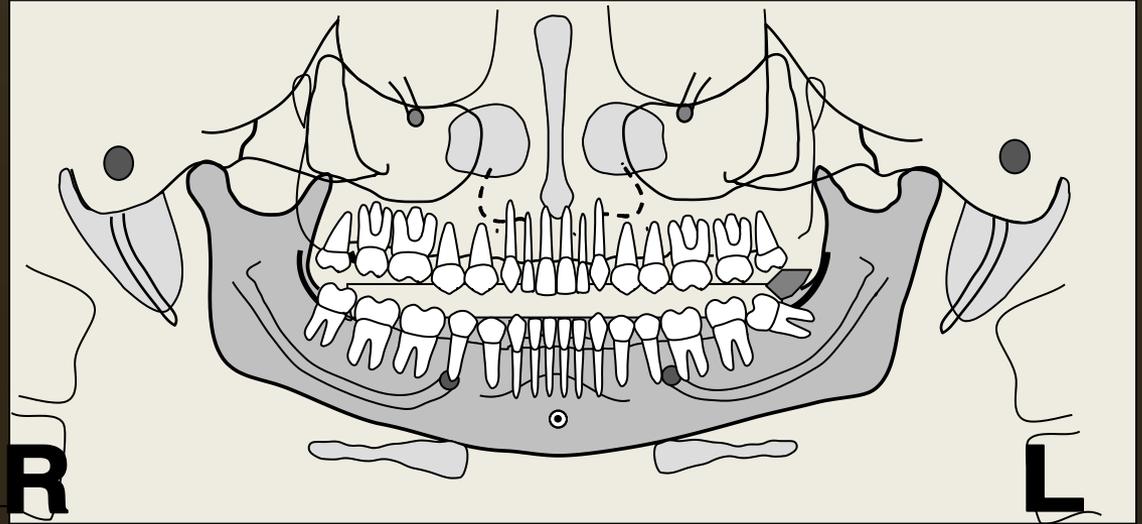
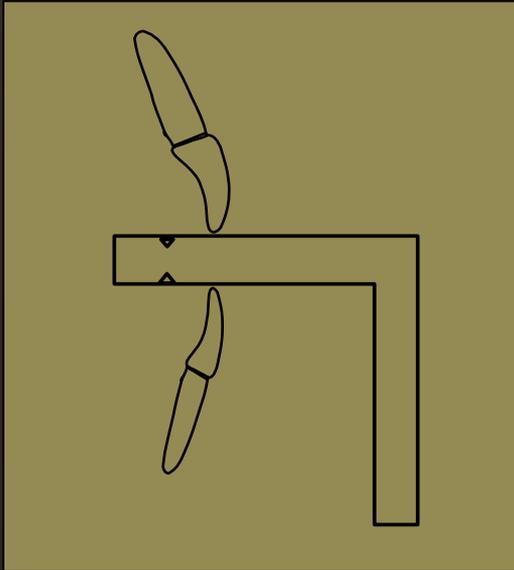
4. Positioning of teeth anterior to focal trough :

❖ If the patient's anterior teeth are not positioned in the focal trough, as indicated by groove in the bite block , teeth appear blurred.

❖ If the patient's teeth are positioned too far forward on the bite block or anterior to focal trough , anterior teeth appear **SKINNY** and out of focus.

❖ **Solution** :End to end position in groove on the bite-block

4. Positioning of teeth anterior to focal trough cont...

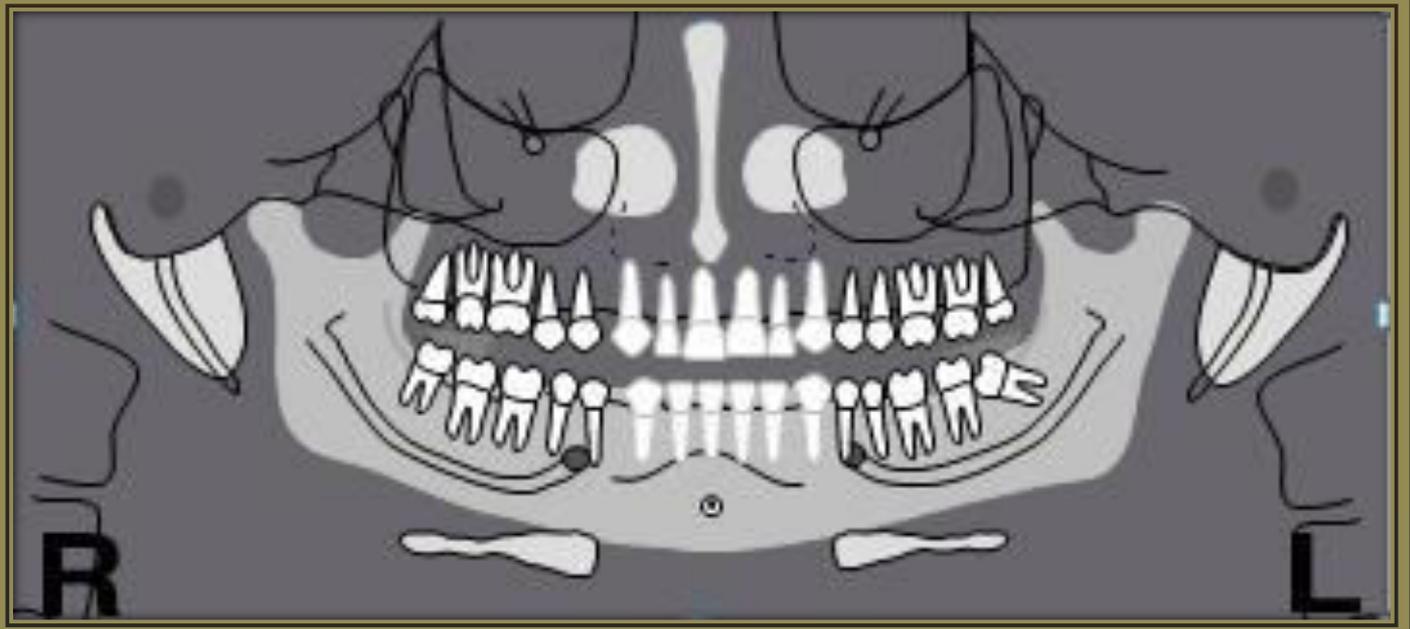


4. Positioning of teeth anterior to focal trough cont...



5. Positioning of teeth posterior to focal trough :

- ❖ If patient's anterior teeth are not positioned in the focal trough as indicated by the groove in the bite-block , teeth appear blurred,
- ❖ If positioned too far back on the bite block or posterior to focal trough, anterior teeth appear fat and are out of focus.
- ❖ Solution :End to end position.



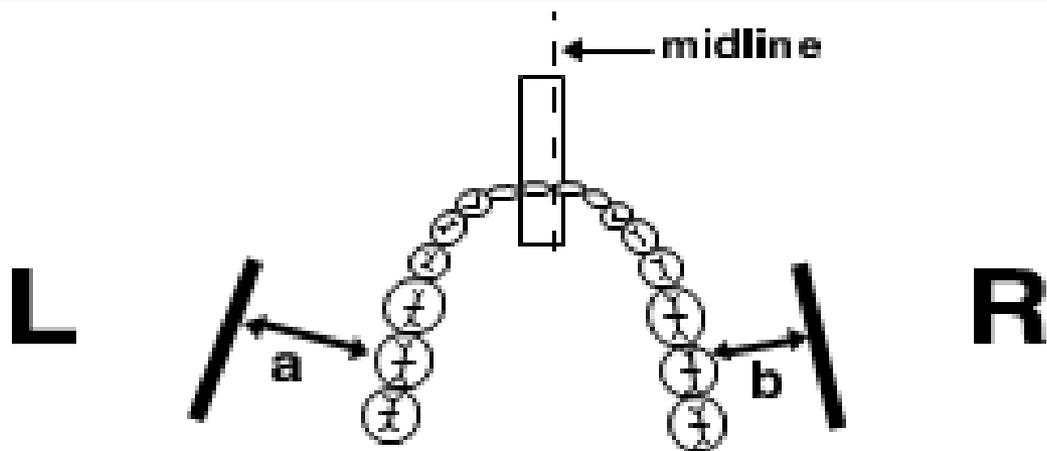
Essentials of dental radiography- orlen and Jhonson 8th ed.

The anterior teeth appear widened and blurred



6. Positioning of mid-sagittal plane :

- ❖ If patient's head is not centered, ramus and teeth appear unequally magnified.
- ❖ Side farthest from the film appears magnified, and the side closest to film appears smaller.
- ❖ Solution : Mid-sagittal plane should be perpendicular to the floor.



Left Appears magnified

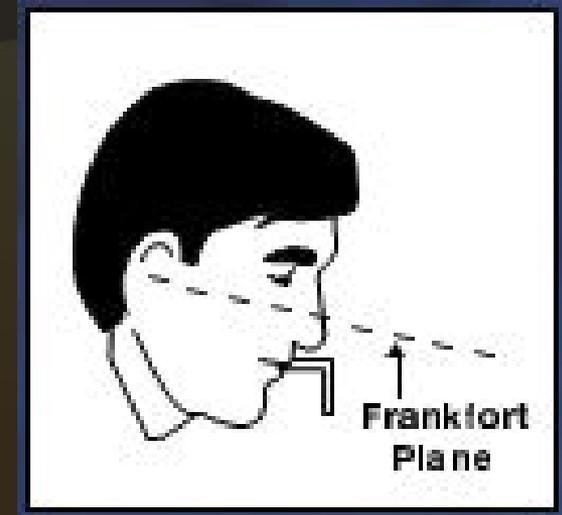


Right appears magnified

7. Occlusal positioning errors :

Head tipped down :

❖ If head is positioned with FH plane inclined downward, mandibular incisors will appear shortened and the mandible will be V-shaped-Exaggerated smile line.



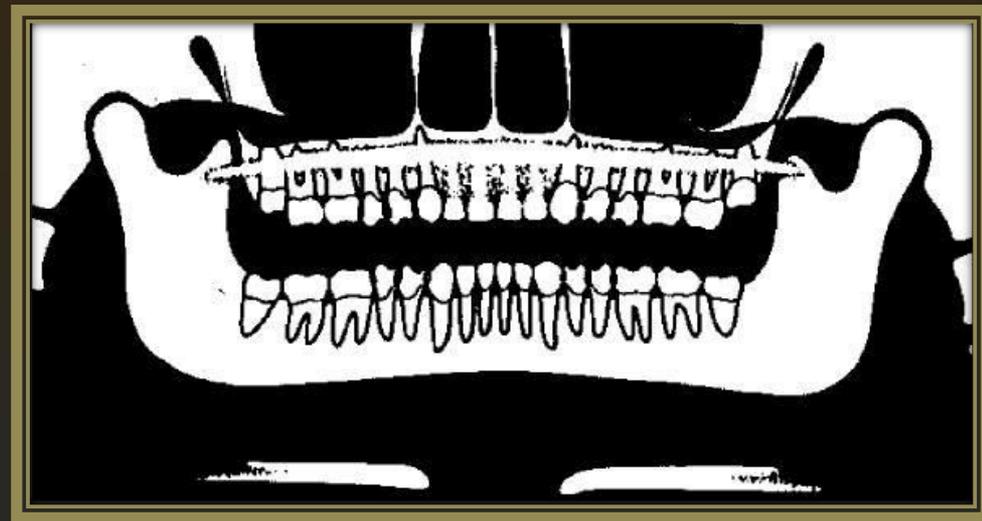
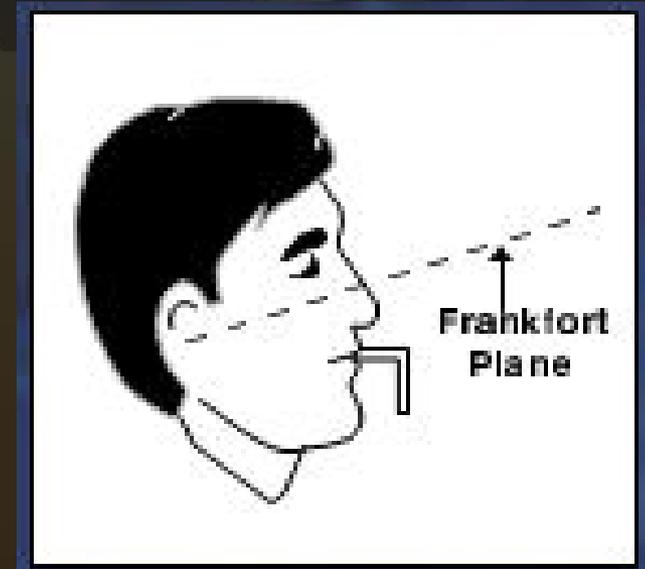
Head tipped down cont...



Essentials of dental radiography-ornen and Jhonson 8th ed.

Head tipped up :

❖ FH plane is angled upward,
mandible will be squared off
and the hard palate will be
superimposed over the roots of
maxillary teeth- Appears as a
Reverse smile line.



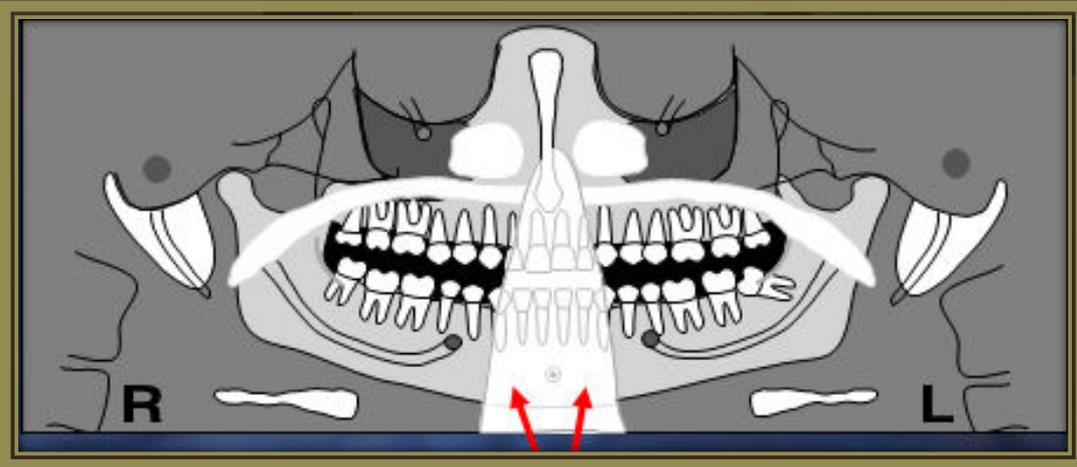
Head tipped up :



8. Positioning of the spine :

❖ If patient is not standing or sitting straight-radiopacity in the center.

❖ Instruct the patient to be straight.



9. Patient's shoulder hit during exposure :

- ❖ This will slow the cassette rotation resulting in prolonged exposure or completely stop the film movement.
- ❖ Produces a dense, black band which is the area of overexposure or a dense black edge may be seen at the end of the radiographic image, due to the eventual stopping of rotation
- ❖ **Solution** : Straighten neck as above and check for interference with apron.

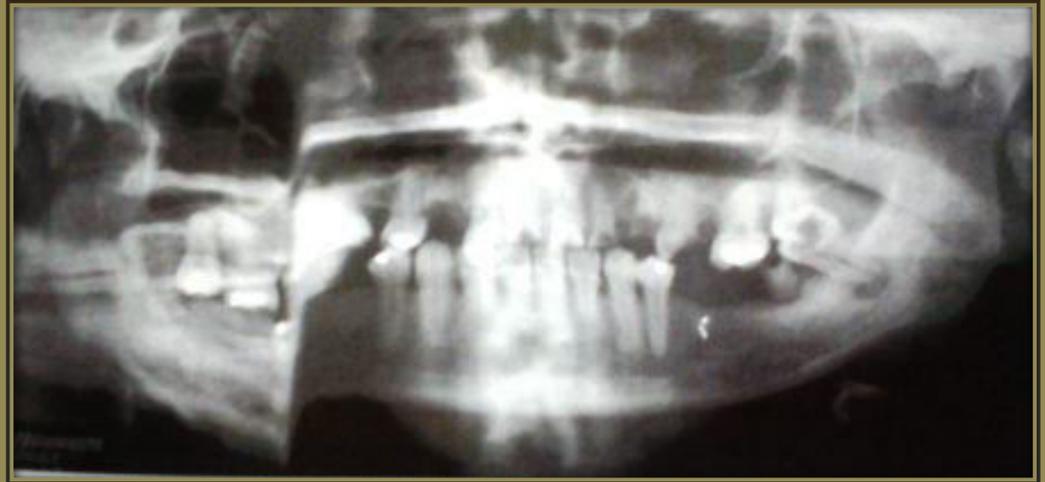
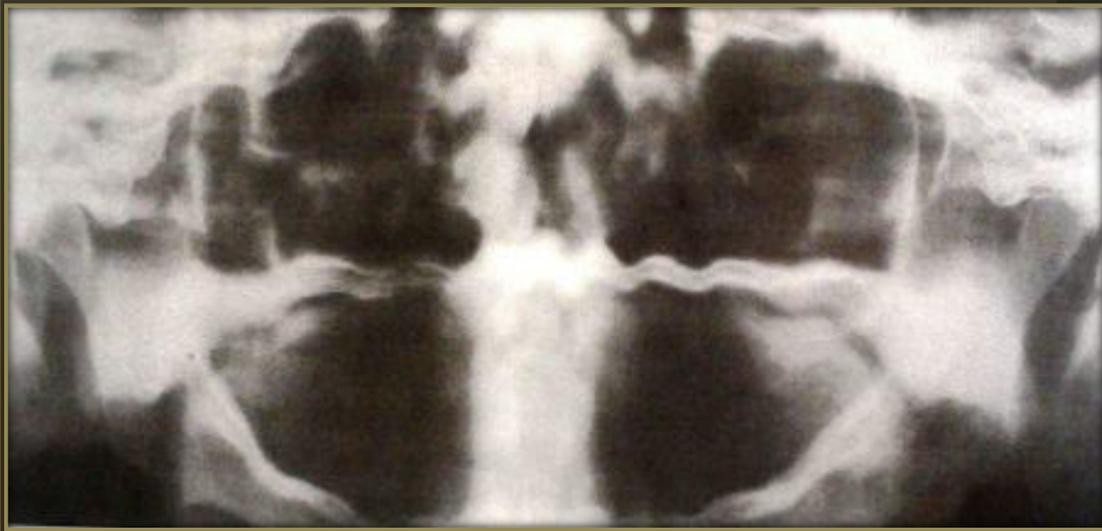


11. Patient movement :

❖ Sudden jerky movement of the patient may result in distortion of the resulting film.



11. Patient movement :



12. Problems in loading the cassette :

Fog:

- ❖ Due to light leak or film exposed to light –Overall grayness or blackness along one edge or corner of film.
- ❖ Solution : Should be inspected for light tightness.



13. Light or no image is visible :

- ❖ The problem is that the screens are reversed.
- ❖ Replace them appropriately and dull surface of the screen should face the film and not shiny.



14. Lightning bolt /Static electricity :

❖ Appears as black lines or dots on the film , having a tree branch appearance . It is caused by removing the film from the box or cassette too quickly , creating static discharge.



15. Multiple images :

❖ It is due to double exposure . To avoid it, storage of exposed and unexposed cassettes separately is essential.



16. Exposure errors :

<u>PROBLEM</u>	<u>CAUSE</u>	<u>HOW TO CORRECT</u>	<u>HINTS</u>
Light, pale film with few dark areas	Too little exposure	Increase mA or kVp or use next higher setting on machine	Also rule out worn-out or reversed screens
Dark film with loss of details, amalgams and unexposed areas are still clear	Too much exposure	Decrease machine settings	Don't confuse with film fogging, which is an overall grayness to film



17.Miscellaneous :



Dentomaxillofacial radiology 2003;32:255-7

Advantages:

- ❖ Field size
- ❖ Simple procedure
- ❖ Patient cooperation
- ❖ Minimal exposure.

Disadvantages :

- ❖ Image quality
- ❖ Focal trough limitation
- ❖ Distortion
- ❖ Cost of equipment.

REFERENCES:

- ❖ **PRINCIPLES OF DENTAL IMAGING 2ND EDITION-LANGLAIS ,LANGLAND,PREECE**
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- ❖ **TEXT BOOK OF ORAL AND MAXILLOFACIAL RADIOLOGY-FRENY KARJODKAR**
- ❖ **ESSENTIALS OF DENTAL RADIOLOGY – ERIC WHAITES 2ND ED**
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- ❖ **DCNA VOL 37 NO4 OCT1993**
- ❖ **ESSENTIALS OF DENTAL RADIOGRAPHY-ORLEN AND JHONSON 8TH ED.**
- ❖ **HONGKONG DENTAL JOURNAL 2005.**
- ❖ **DENTAL RADIOGRAPHY-PRINCIPLES AND TECHNIQUES-HARING AND HOWERTON
2ND ED.**
- ❖ **DENTOMAXILLFACIAL RADIOLOGY,2003;32:255-7**
- ❖ **DENTOMAXILLOFACIAL RADIOLOGY 1998;27:371-375**
- ❖ **DENTOMAXILLFACIAL RADIOLOGY 1999;28:48-51.**

PRODUCT PROFILE:OPG machines

❖Cranex 3D:



- ✓High quality imaging system with panoramic, cephalometric, and cone beam 3D imaging programs that provide enhanced tools for practicing advanced dentistry.
- ✓Features include:Clear touch, easy to navigate control.
- ✓Pick point :Allows for unlimited placement of cone beam volume within the dental arch.
- ✓Automatic exposure settings.
- ✓Easy scout :Ensures ideal placement of the field of view which eliminates retakes.

❖ Gendex GXD:



✓ It is an upgradable system from 2D panoramic to cephalometrics or 3D cone beam with expandable field of views.

✓ The power of repeatability :

- Smart motion : Adaptable motion technology adjusts the x-ray beam to compensate for changes in anatomical curvatures to optimize image quality.

- Easy position : Easy access column controls, sturdy chin support, balanced, comfortable handgrips, fully adjustable head support, laser alignment lights for accurate patient positioning.

❖ Gendex GXD:

✓ The power of flexibility :

- Flexibility to capture the images necessary for the procedures.

- 33 Panoramic projections, 11 selections for three patient sizes, including

TMJ and Bitewing views

- - 15 Cephalometric projections, 5 selections for three patient sizes

Ceph upgrade offers a movable single sensor or time-saving dual sensors

- Adjustable exposure - ability to customize dose within the allotted range

❖ Gendex GXD :

✓ The power of upgradability :

- GXDP-700 Panoramic System

- GXDP-700 C Panoramic and Cephalometric System

- GXDP-700 S Panoramic and 3D CBCT System

- -GXDP-700 SC 2D Panoramic, 3D CBCT, and Cephalometric System.

✓ Powerful 3D CBCT :

- Offers 3D views that can be sliced in any direction

- Utilize for diagnosis and treatment of endodontic, surgical, and implant procedures

- PerfectScout-integrated technology to easily target the exact region of interest

Totally integrated implant solutions — Use the scan to plan with multiple implant brands and for CAD/CAM applications.

❖ Orthophos XG plus :



- ✓ Easy operation and includes additional programs and enhanced diagnostic capabilities.
- ✓ Has an optional ceph arm.

❖ Orthophos XG plus :

✓ Additional programs :

-(P10) Pediatric panorama with a beam field reduced in height and length to protect the lens of the eye.

-(P12) Thick slice in the anterior tooth region for extreme anomalies.

-(S1) Sinus program for the imaging of paranasal sinuses.

-(MS1) Multislice in the posterior tooth region, e.g. for the determination of displaced molars.

(BW1) Bite wing exposure for the posterior tooth region.

❖ Orthoralix 9200:



- ✓ Fully robotic, software controlled motion path.
- ✓ Automatic exposure control
- ✓ Upgradable to pan/ceph
- ✓ Two digital options
- ✓ Operator flexibility
- ✓ Enhanced control panel

❖ Orthoralix 9200:

✓ Flexible positioning :

-Maximum patient positioning can be achieved even in the most challenging situations. A fully motorized and highly accurate positioning mechanism assures maximum precision. The patient remains stationary, thus requiring little adjustment from the operator.



❖ Planmeca 2000 cc:



- ✓ Consists of an x-ray tubehead and a cassette assembly mounted on a support column.
- ✓ Although the unit is designed for imaging patients who are standing, it easily accepts patients seated in wheelchairs.
- ✓ The unit uses three light beams, a chin rest, a bite guide, and a head guide to position and stabilize the patient.

❖ Planmeca 2000 cc:

- ✓ The focal trough is adjustable both for arch size (small, medium, large) and arch shape (narrow, tapered, square).
- ✓ All imaging parameters are easily adjusted using a touchpad mounted on the support column. In TMJ mode, four TMJ exposures can be made on each panoramic film. The small focal spot (0.5 mm by 0.5 mm) produces images with excellent resolution



❖ Planmeca proline XC:



- ✓ Proline XC is available in two versions: film based and fully digital. A film unit can be digitalised at any time in future.
- ✓ The side entry and open patient positioning minimise errors caused by incorrect patient positioning as the user can monitor the patient freely from the front and side.
- ✓ In Proline XC, the form of the focal layer follows scientifically defined shape of human dental arch and jaw, which results in panoramic radiographs with clearly superior image quality.

❖ Planmeca proline XC:

✓ A cephalometric system is available for the Xograph's Proline XC unit, either factory installed or as a retrofit.

✓ When cephalometric imaging mode is selected the unit automatically align itself for taking cephalometric exposures and selects a corresponding collimator.



❖ Rotograph digi 10:

- ✓ Column Height : 230 cm.
- ✓ Control : Touch panel, LCD display,
- ✓ Microprocessor based, interlocking with all proper consents, remote for Exposure, Test & Reset
- ✓ Toshiba Japan



❖ Rotograph digi 10:

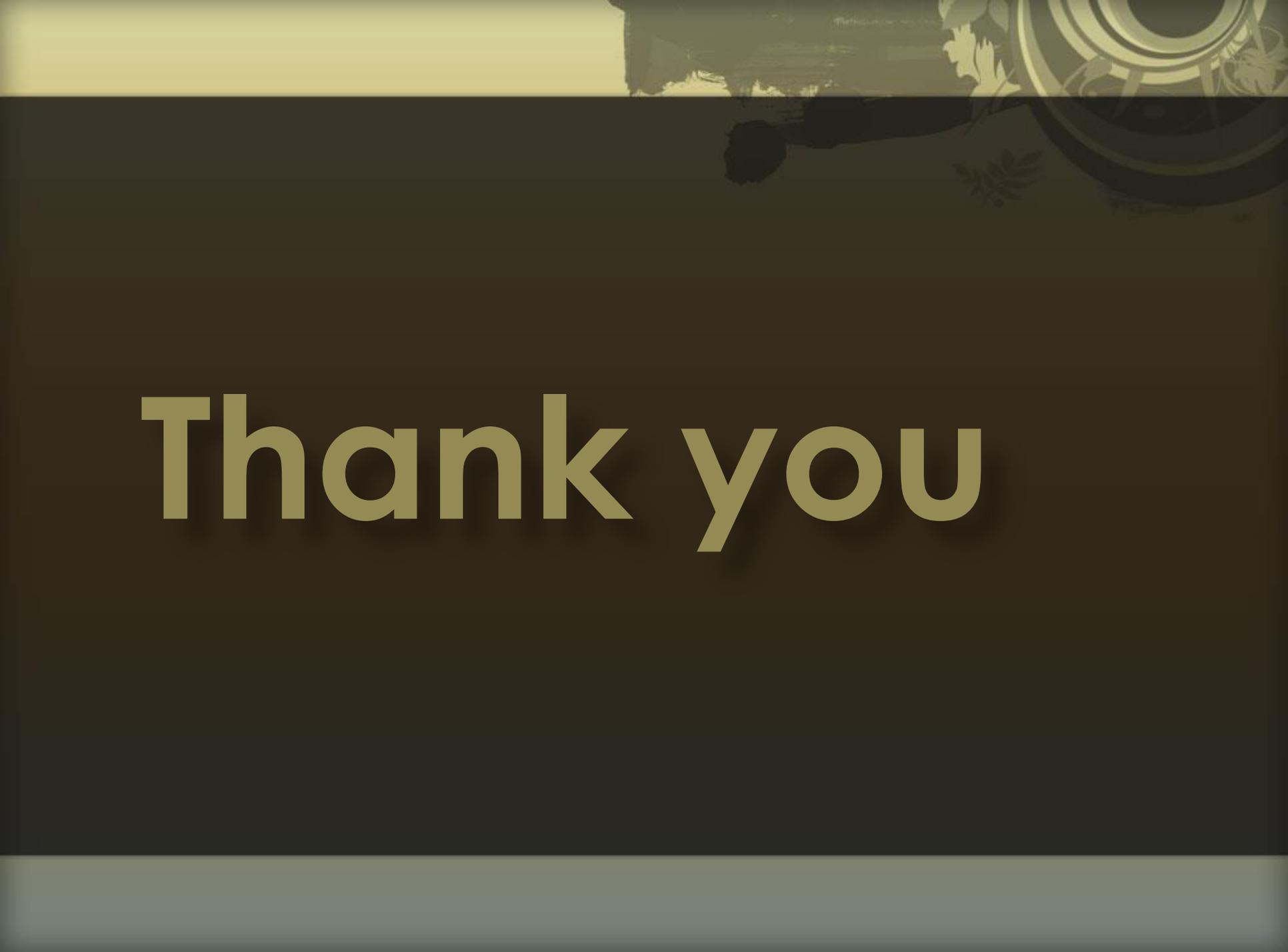
- ✓ Inherent filtration : 2.5mm Al
- ✓ Exposure time : OPG – 17 Sec. Adult, 14 sec Child
- ✓ CEPH – 0.2 sec. to 3 sec
- ✓ TMJ – 4 x 4 sec.
- ✓ Film size : OPG & TMJ – 6" x 12"
- ✓ CEPH – 8" x 10"
- ✓ Cassette : Flat 6" x 12" – OPG & TMJ
- ✓ FLAT 8" x 10" – CEPH
- ✓ Vertical movement : Motorized with foot switch
- ✓ Centering light : Cross light
- ✓ Centering reference : Chin rest with bite wing

❖ Sirona orthophos with bitewing :

✓ Sirona orthophos now have the capability of taking digital bitewing images extraorally in the posterior and anterior regions.

✓ According to the manufacturer, this low-dose alternative for diagnostic imaging is ideal for patients with difficult dental anatomy or for those who cannot tolerate intraoral film placement.





Thank you