

Intraoral and localization Radiographic Techniques

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Intraoral Radiographic Techniques

1. Periapical radiographic techniques:

A. paralleling technique

B. bisecting-angle technique

2. Bitewing film angulations and placement

3. Occlusal Film Projection:

1. Maxillary occlusal projection:

- Upper standard occlusal,
- Upper oblique occlusal,
- Vertex occlusal.

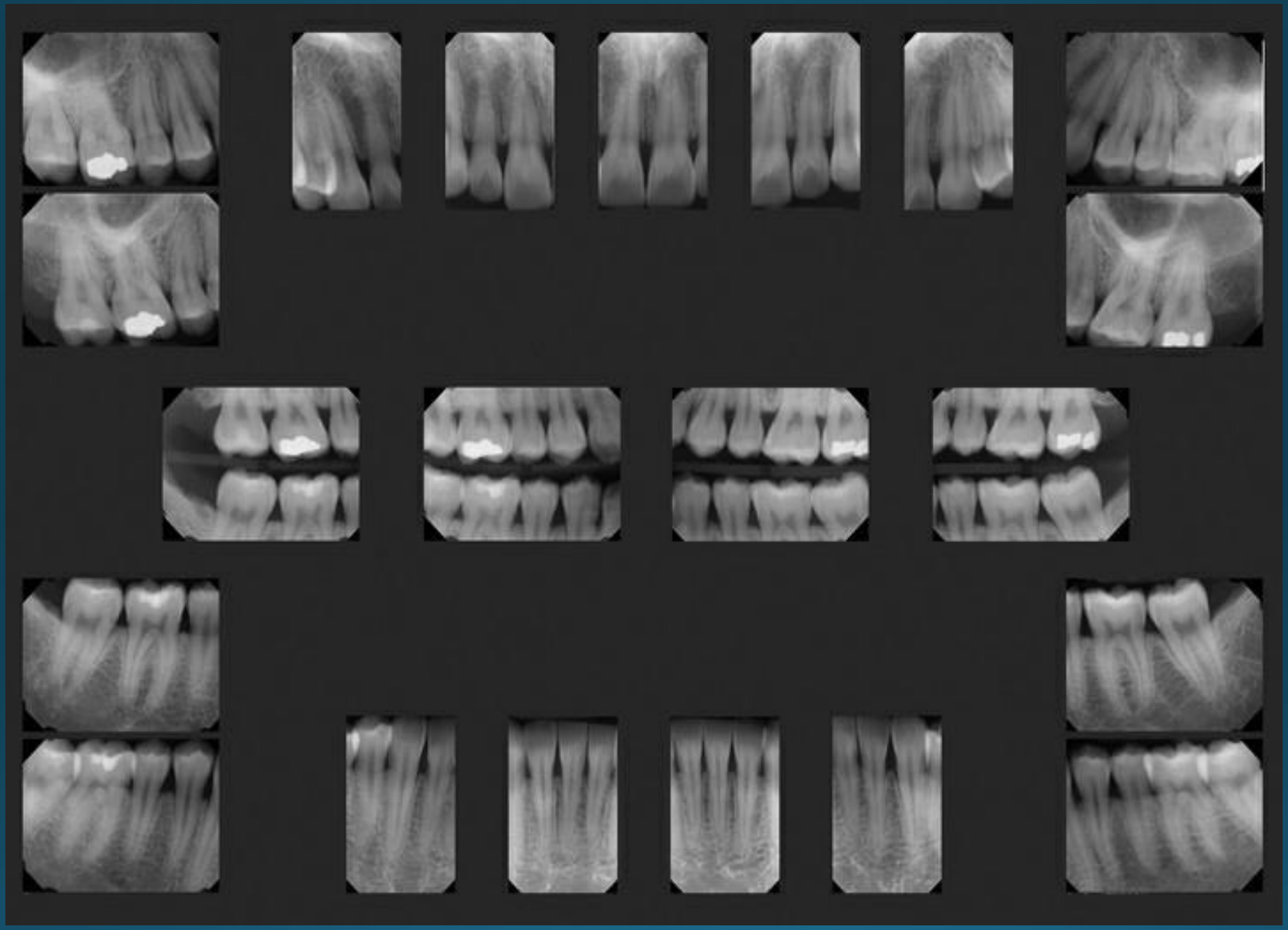
2. Mandibular occlusal projection:

- Lower 90° occlusal "true occlusal,
- Lower standard occlusal,
- Lower oblique occlusal.

Intraoral Radiographic Techniques

1. Periapical radiographic techniques:

- Periapical radiographs is taken of both anterior and posterior and are commonly used in dentistry to show the entire length of the tooth and the surrounding bone. It must show the full length of the roots and at least 2 to 3 mm of periapical bone.
- The name periapical is derived from the Greek peri, which means around, and apical, which means tip.



- Typical full-mouth set of radiographs consisting of 17 periapical views and 4 bitewing views.

Indications

- Detection of apical infection/inflammation.
- Assessment of periodontal status after trauma to the teeth and alveolar bone.
- After trauma to assess the teeth and alveolar bone.
- Assessment of the presence and position of unerupted teeth.
- Assessment of root morphology before extractions.
- During endodontic therapy.
- Preoperative and postoperative assessment of apical surgery.
- Detailed evaluation of apical cysts and other lesions within the alveolar bone.
- Presurgical implant insertion bone evaluation .

Two intraoral projection techniques are commonly used for periapical radiography:

(1)Paralleling technique

(2)Bisecting-angle technique.

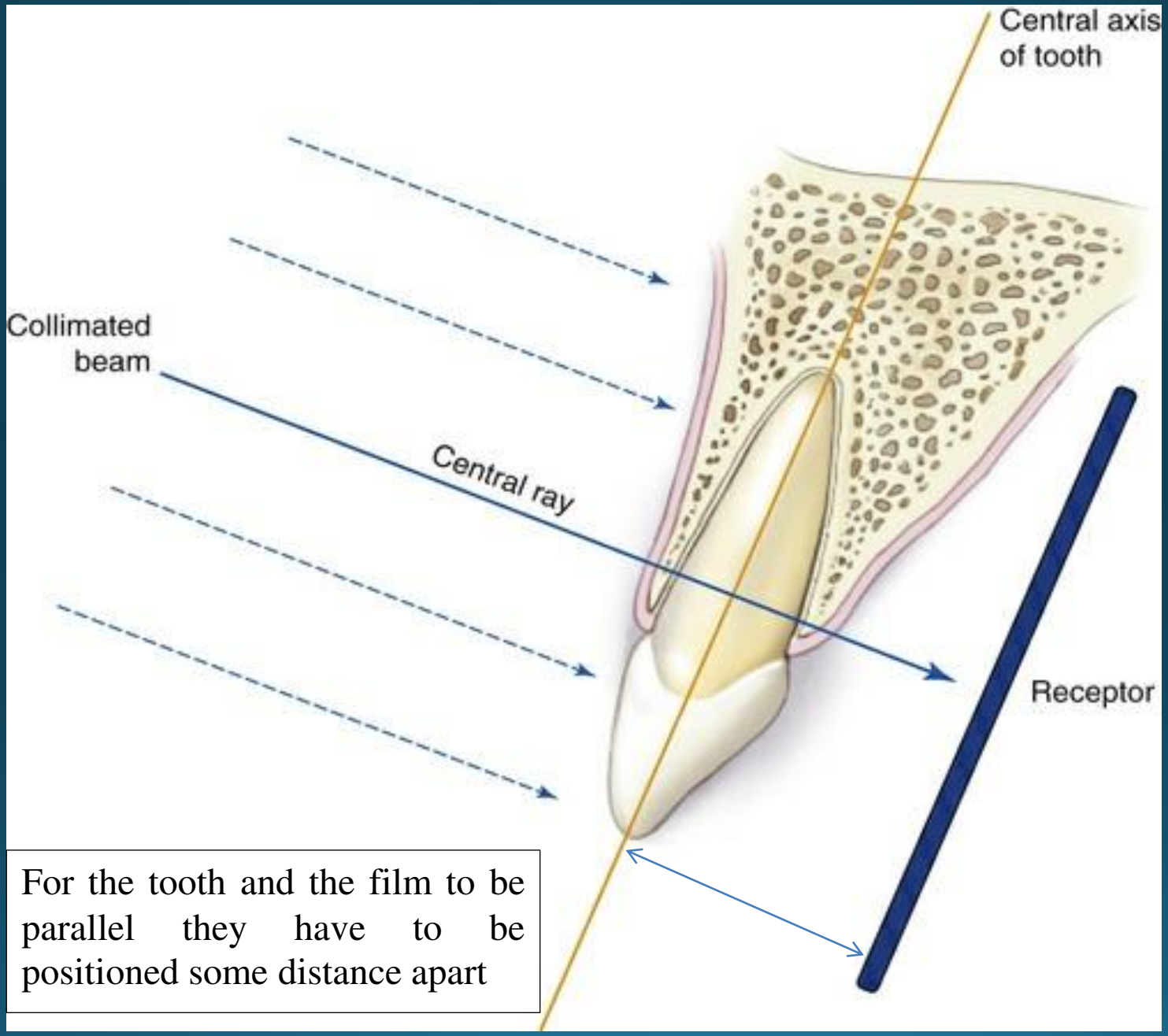
Both techniques can be applied to digital- and film-based imaging. The paralleling technique is preferred because it provides images with less distortion of the dentition.

Paralleling Technique:

- Also called as extension cone paralleling technique (XCP), right angle technique, and long cone technique.
- In this technique, the film is placed in the mouth parallel to the long axis of the tooth and the central x-ray beam is directed perpendicular to or at a right angle to the long axis of the tooth and the film.

- **Requirements of this technique:**

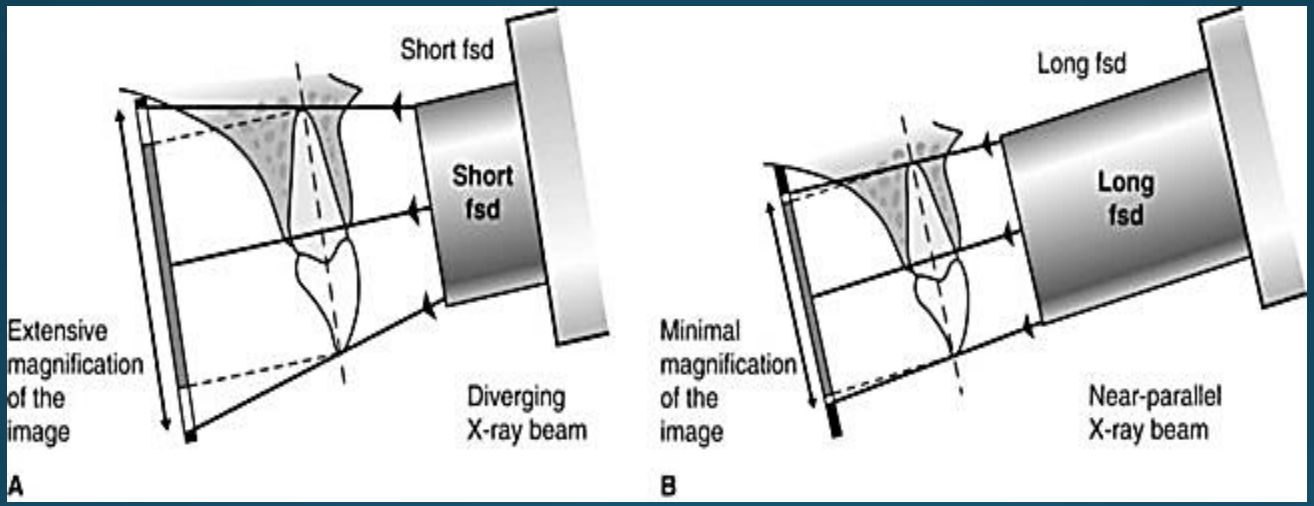
1. It requires the target-object distance **as long as** possible.
2. It requires the X-ray strike the object (tooth) and the film at **right angle (90°)**.
3. It requires the film to be placed in apposition **parallel** with the plane passing through the long axis of all teeth being examined.



For the tooth and the film to be parallel they have to be positioned some distance apart

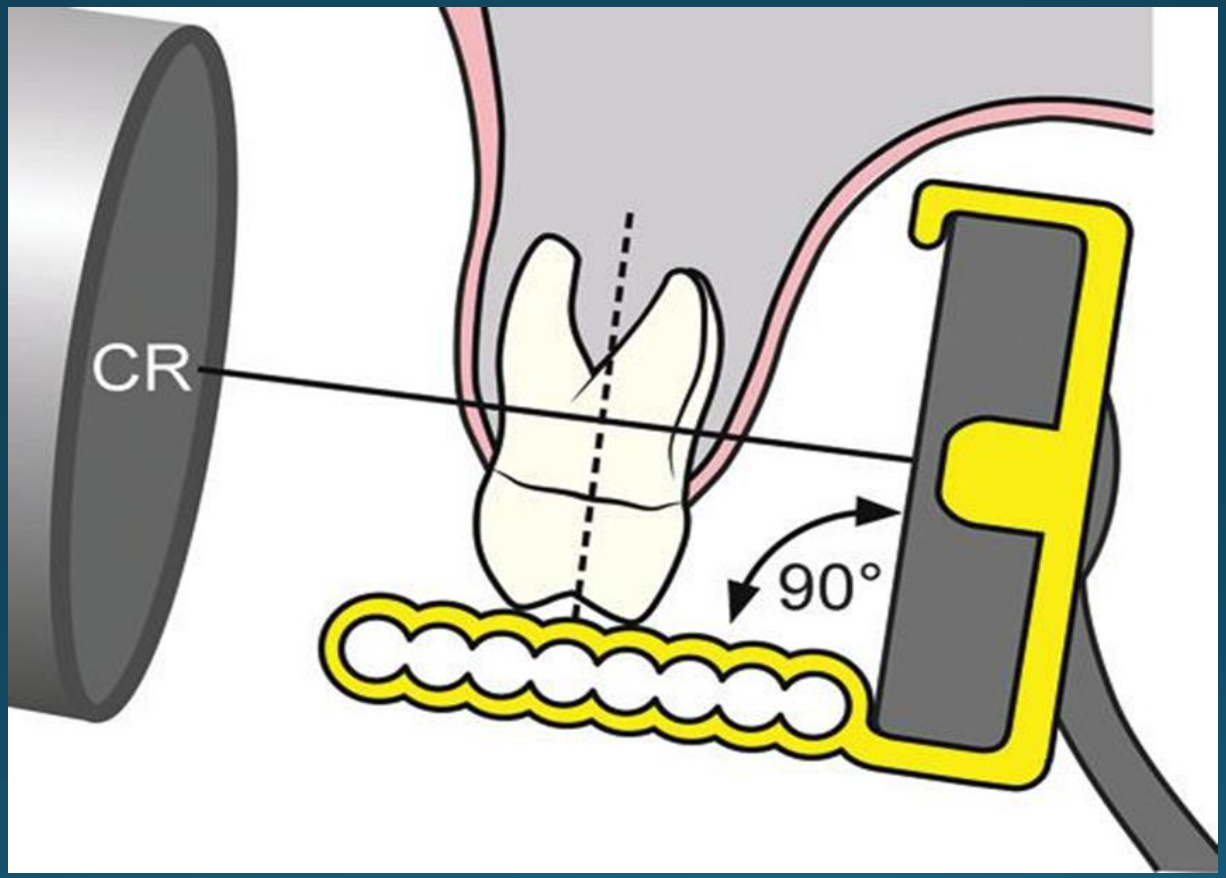
- Due to anatomic constraints, this parallel orientation places image receptor toward **the middle of the oral cavity**, away from the teeth. This increases the object-to-receptor distance and results in **higher image magnification and poor geometric sharpness.**

- To compensate for the resultant distortion and lack of sharpness, the paralleling technique is used with a relatively **long source-to-object distance by using extended long cone of 16 inches.**



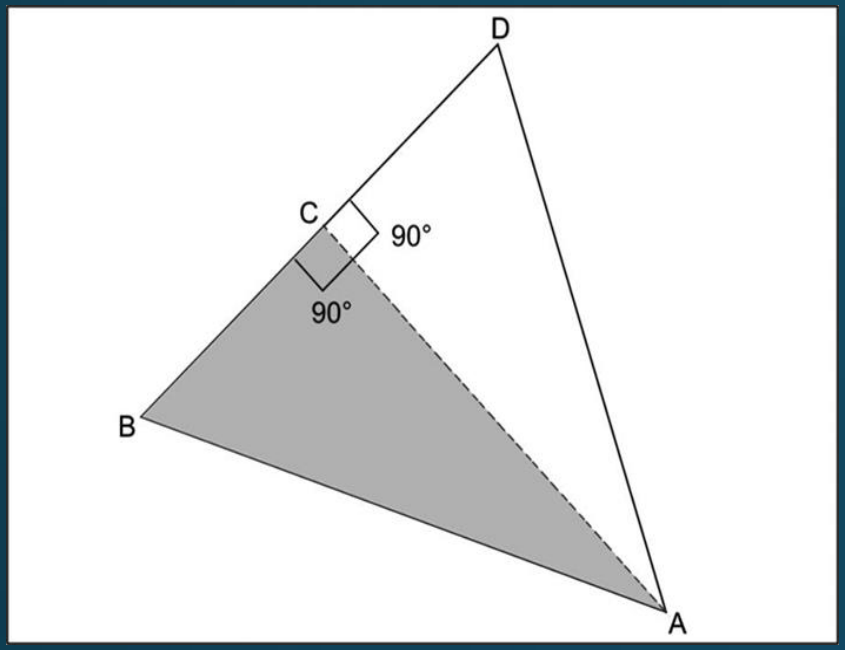
- **A film holder:** is a device that is used to position an intraoral film in the mouth and retain the film in position during exposure.

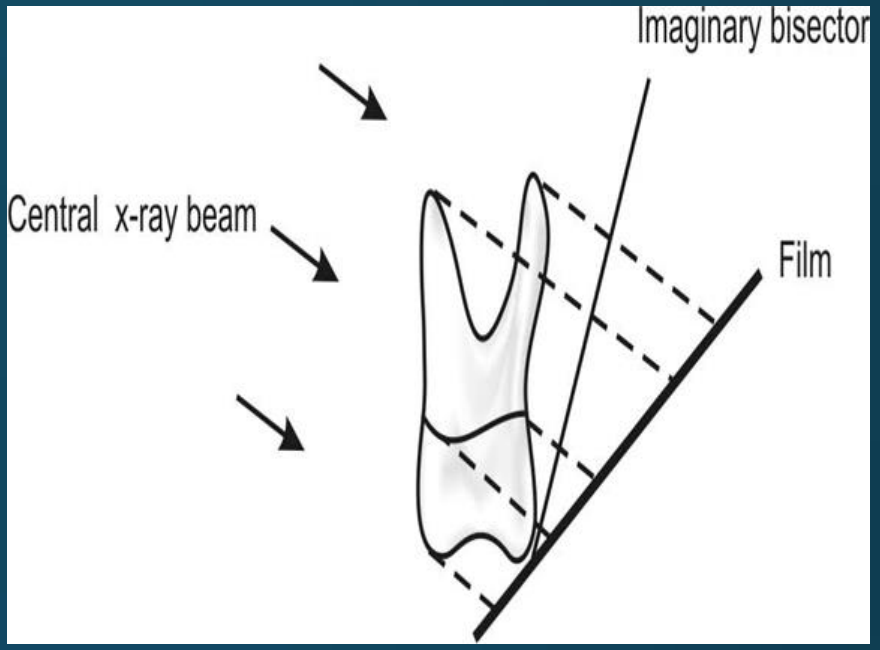


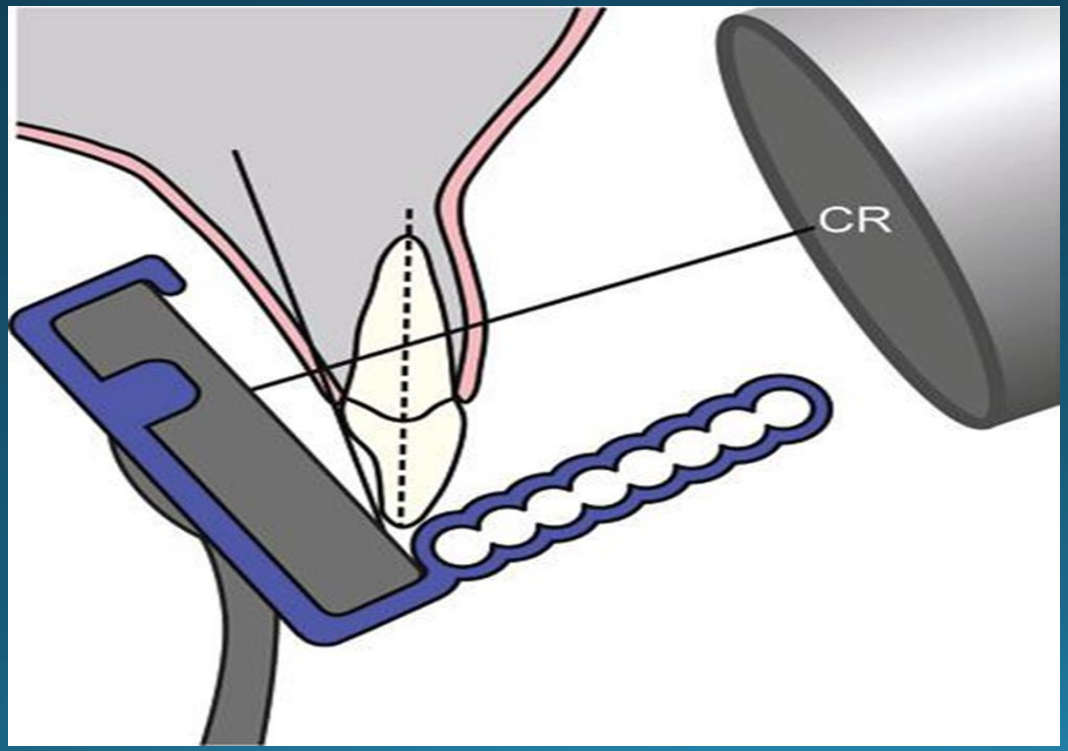

CR
90°

Bisecting angle technique:

- Also called as bisecting technique, bisection-of-the-angle technique.
- This technique is performed by **keeping the film as close to the teeth as possible.**
- The central x-ray beam is directed **perpendicular to an imaginary bisector** that bisects the angle formed by the long axis of the tooth and the film.


D
C
90°
90°
B
A


Imaginary bisector
Central x-ray beam
Film


CR

Requirements of this technique:

1. Operator envision an imaginary bisector of the angle formed by the long axis of the tooth and the long axis of the film, this angle formed where the film contacts the tooth crown.

2. Operator direct the central ray of the beam through the apex of the tooth so central ray **strikes the bisector at 90°** so the result is a tooth image that is exactly the length of the tooth.

In this technique, as a result of lack of parallelism between the tooth and the film since the film is in contact with the tooth crown, we have all the areas below the apex of the tooth as well as above are **distorted** and the degree of distortion can **reduce** by the use of **long cylinder** because the longer distance between the source of radiation and the object the more is the parallel will be the rays.

2. Bitewing film angulations and placement

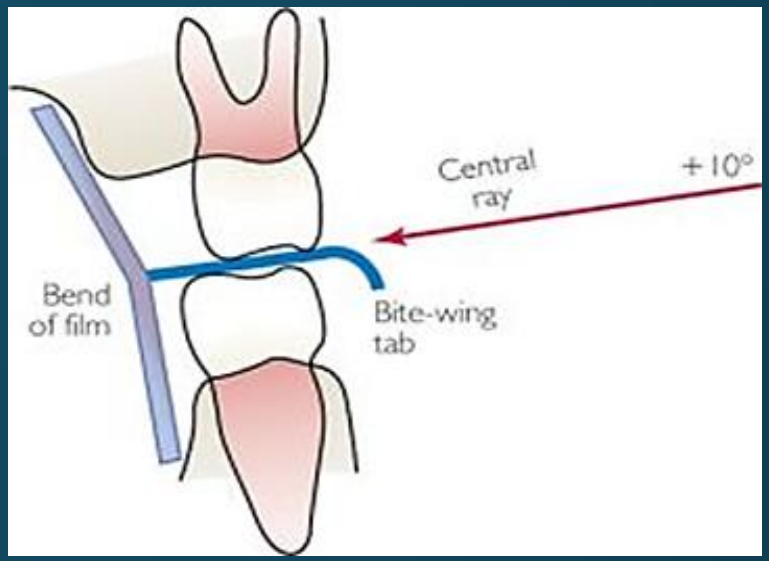
- Bitewing (also called **interproximal**) radiographs include the crowns of the maxillary and mandibular teeth and the alveolar crest on the same receptor.

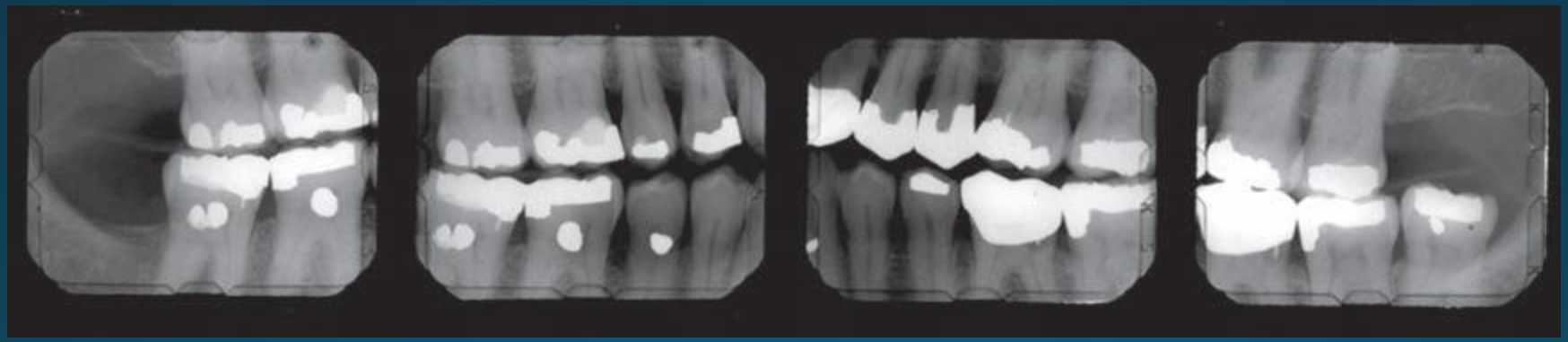
- The beam is directed **through the interproximal spaces** and **perpendicular to the buccal and lingual surfaces of the teeth** being examined and is **parallel to the occlusal plane**.

- The vertical angulation used for tab bitewings ranges from **5° to 10°** of the X-ray beam compensating for the curve of Monson.

- The most common error associated with bitewing radiography is **horizontal overlap** which can render the image non-diagnostic.

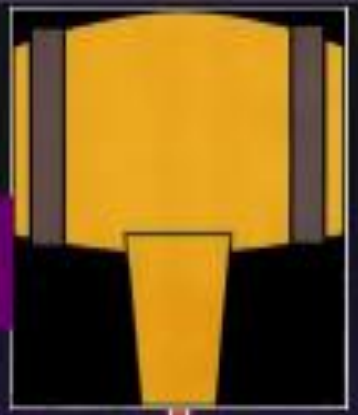






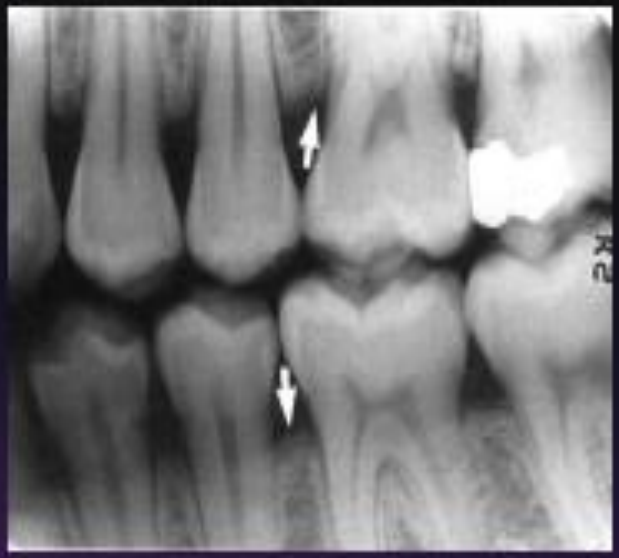
- Bitewings can be taken with a ringed instrument or with a tab. (A) Bitewing taken with the tab bitewing technique. (B) Tab bitewing survey

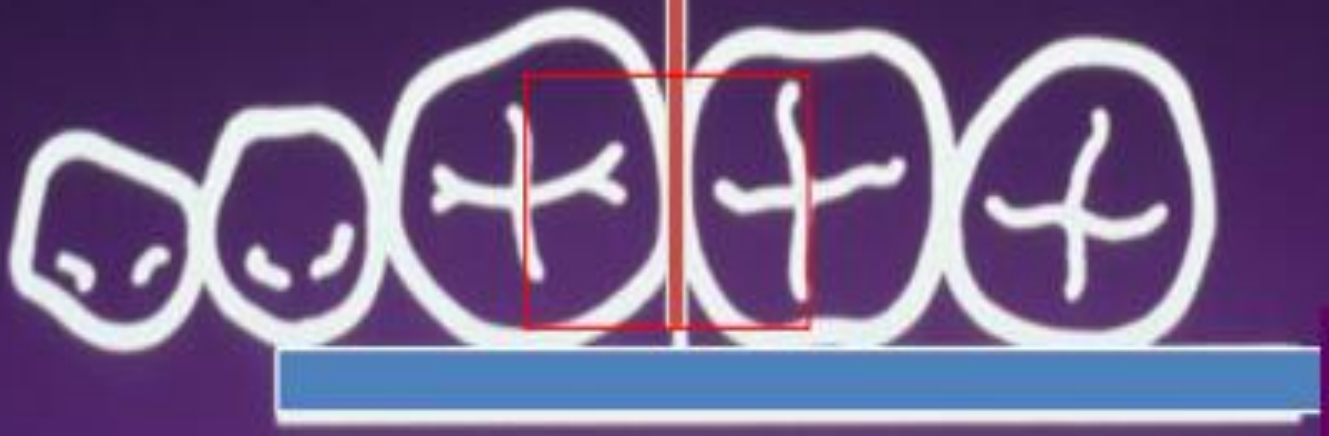
Correct Horizontal Angulation



X-RAY TUBE

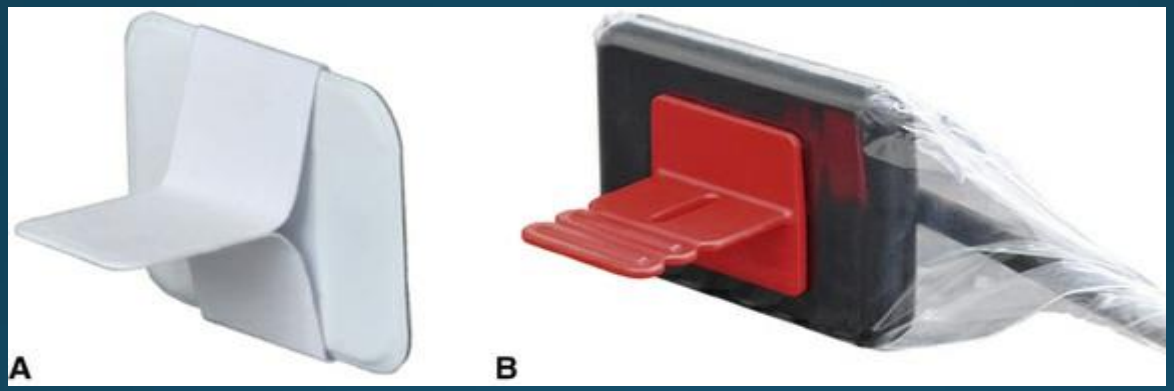
Central Ray →

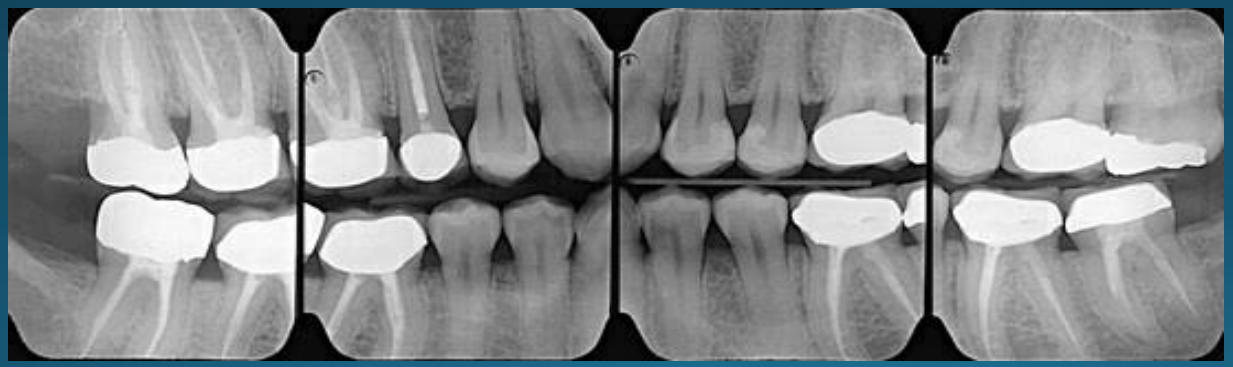




film/
receptor







Vertical anterior and posterior bitewing survey

Indications For Bitewing Radiograph:

- ✓ In the diagnosis of interproximal caries
- ✓ To study the height of the pulp chamber
- ✓ In the diagnosis of secondary caries below restoration
- ✓ To study the height of the alveolar bone or assessment of bone loss
- ✓ In the diagnosis of pulp stone
- ✓ To study occlusion of the teeth
- ✓ Evaluating periodontal conditions.

Angulation of the Tube Head

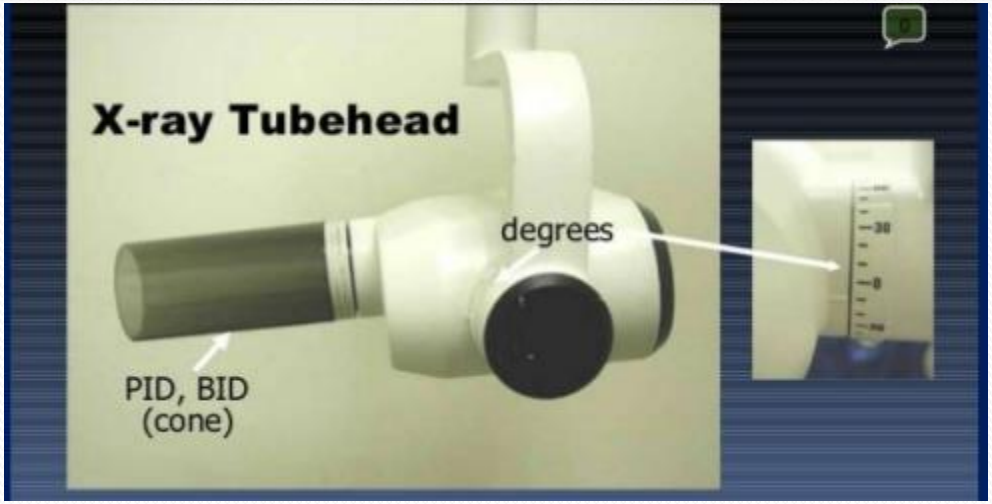
- **Horizontal angulation**

The central ray of the X-ray beam is directed in a horizontal plane directed perpendicular to the curvature of the arch and through the contact of the teeth.

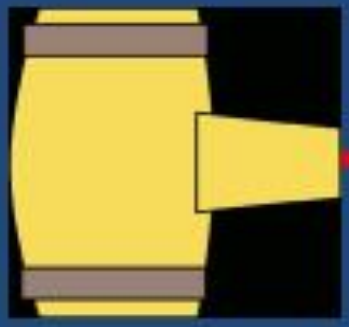
- **Vertical angulation**

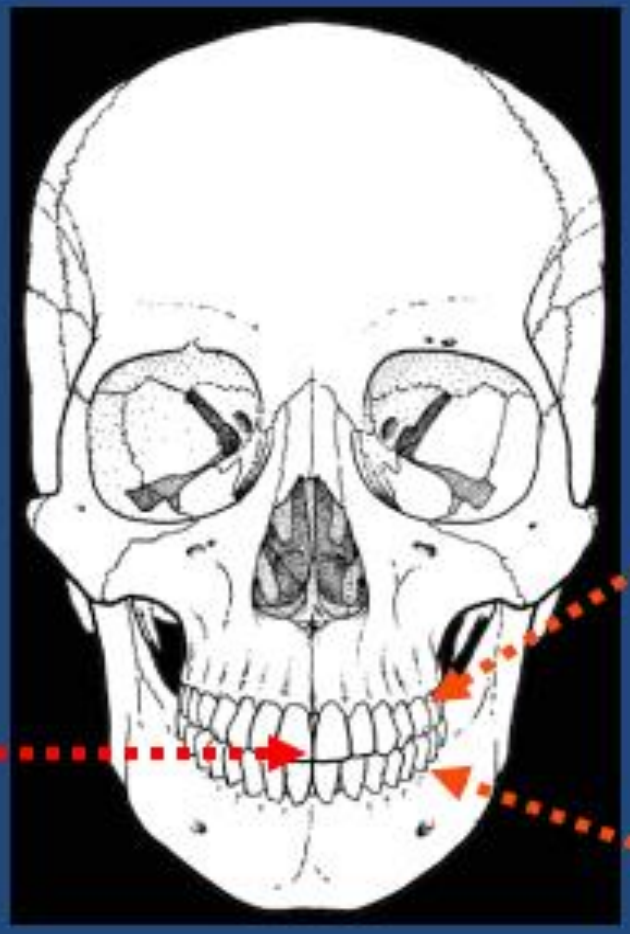
The central ray of the X-ray beam must be directed in a vertical plane perpendicular to the imaginary line formed by the bisecting angle formed by the long axis of the tooth and the film.

- **Plus vertical angulations:** when the beam is tipped down ward.
- **Minus vertical angulations:** when the beam is tipped upward.

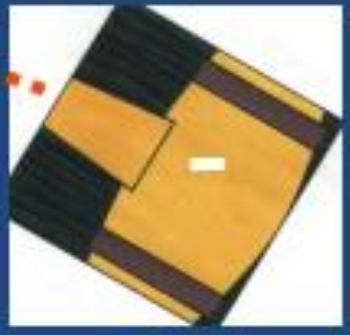


Maxilla = +10, +45 etc.
Mandible= -10, -45 etc









Average Vertical Angles

Bisecting angle Technique



Film	Maxilla	Mandible
Molar	+20	-5
Premolar	+30	-10
Canine	+45	-20
Incisors	+40	-15
Bitewing	+10	

Occlusal Plane is oriented Parallel to the floor = 0

3. Occlusal Film Projection:

- An occlusal radiograph displays a relatively large segment of a dental arch.
- It may include the palate or floor of the mouth, also are useful when patients are unable to open wide enough for periapical image.
- Occlusal radiographs may be used with conventional periapical images to determine the location of objects in all three dimensions.

Diagnostic Objectives of Occlusal Radiography:

1) To locate supernumerary, unerupted, and impacted teeth
2) To localize foreign bodies in the jaws and floor of the mouth
3) Show the location of developing teeth in children using #2size film
4) To identify and determine the full extent of disease (e.g., cysts, osteomyelitis, malignancies) in the jaws, palate, and floor of the mouth
5) To evaluate and monitor changes in the midpalatal suture during orthodontic palatal expansion.
6) To detect and locate sialoliths in the ducts of sublingual and submandibular glands
7) To evaluate the integrity of the anterior, medial, and lateral outlines of the maxillary sinus
8) To aid in the examination of patients with trismus, who can open their mouths only a few millimeters
9) To obtain information about the location, nature, extent, and displacement of fractures of the mandible and maxilla

Individual Occlusal Projections:

1. Maxillary occlusal projection:

- Upper standard occlusal,
- Upper oblique occlusal,
- Vertex occlusal.

2. Mandibular occlusal projection:

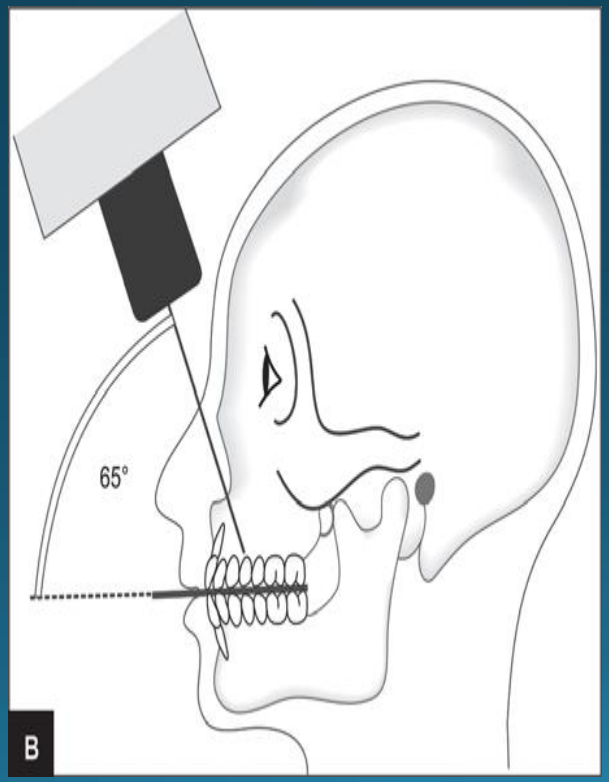
- Lower 90° occlusal “true occlusal”,
- Lower standard occlusal,
- Lower oblique occlusal.

Maxillary occlusal projection:

1.Upper standard occlusal:

- ***Image Field:*** Includes the anterior maxilla and its dentition and the anterior floor of the nasal fossa and teeth from canine to canine.



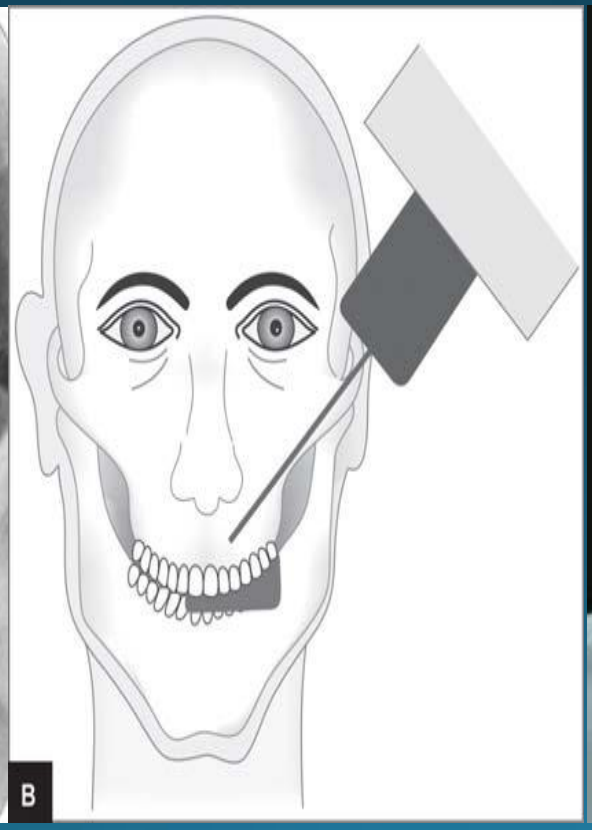




2. Upper oblique occlusal

- ***Image field:*** This projection shows half of the alveolar ridge of the maxilla, infero-lateral aspect of the antrum, the tuberosity and the teeth from the lateral incisor to the third molar.

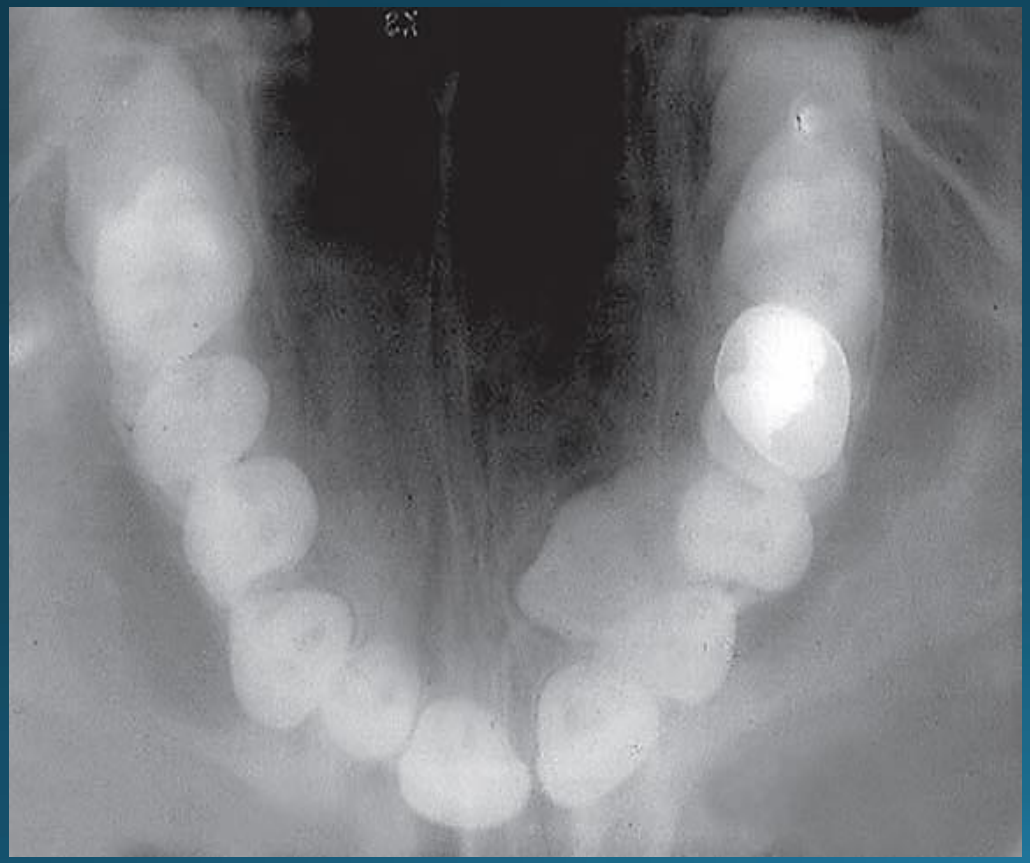






3. Vertex occlusal

- ***Image field:*** This projection produces an unusual horseshoe-shaped image, for it depicts all of the maxillary teeth bucco-palatally so it is useful in positioning of unerupted canine bucco-palatally.

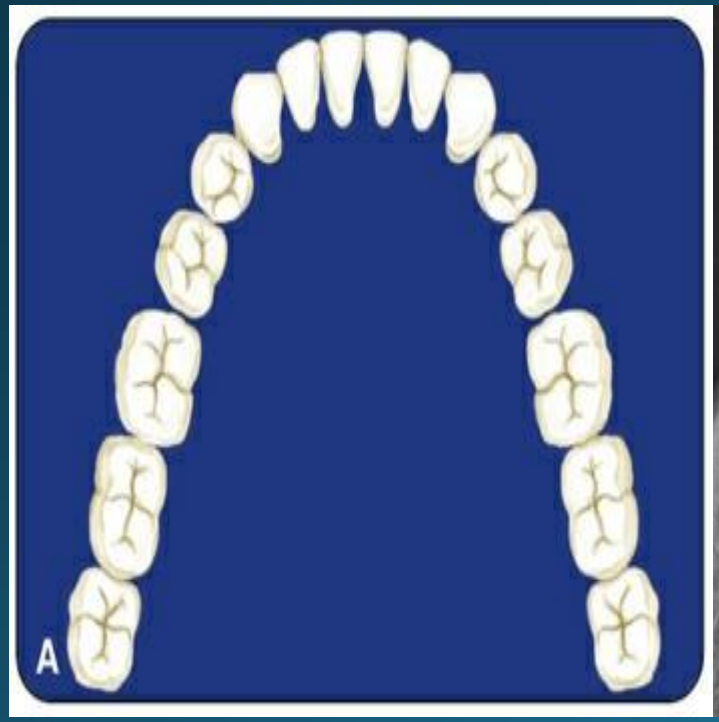




Mandibular occlusal projection:

1. Lower 90° occlusal (True lateral)

- ***Image Field:*** This projection includes the soft tissue of the floor of the mouth and reveals the lingual and buccal plates of the mandible from second molar to second molar and also made to examine the floor of the mouth (e.g., for sialoliths).







2. Lower standard occlusal

• ***Image Field:*** This projection includes the anterior portion of the mandible, the dentition from canine to canine, and the inferior cortical border of the mandible.







3. Lower oblique occlusal

- ***Image field:*** This projection shows the mandibular salivary gland on the side of the interest.







Localization techniques:

- Standard intraoral periapical and bitewing images show the teeth and bone in only two planes: **superoinferior and anteroposterior (mesio-lateral) planes**.

- However, many clinical situations require a proper radiographic diagnosis to establish the position of structures in the **buccolingual plane**. These are methods used to locate the position of a tooth or an object in the jaws.

- ***Indications:***

1) Foreign bodies.
2) Impacted teeth.
3) Unerupted teeth.
4) Retained roots.
5) Salivary stones.
6) Jaw fractures.
7) Broken needles and instruments.
8) Root positions.
9) Filling materials.

- The radiograph presents as the two-dimensional image of three-dimensional object so need for determining spatial relationship of the structures imaged by localization techniques discussed as fallow:

1. Right angle technique
2. Tube shift technique
3. Definition evaluation
4. Use of radio-opaque media (Contrast media)

1. Right angle technique:

- Two projections are taken at right angles to each other, which helps to localize an object in the maxilla or mandible.

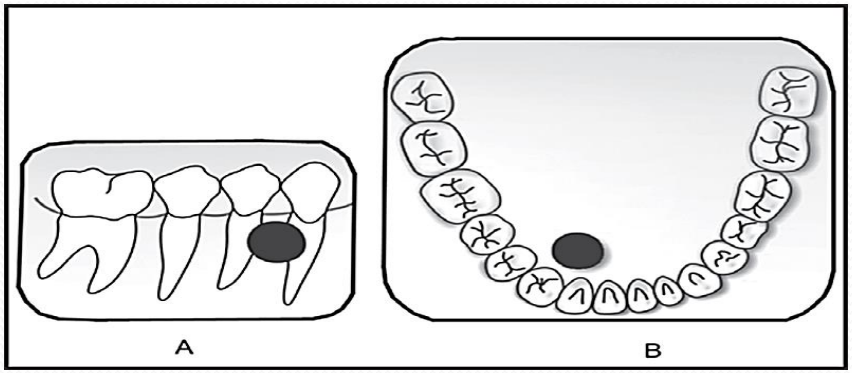
- ***Method:***

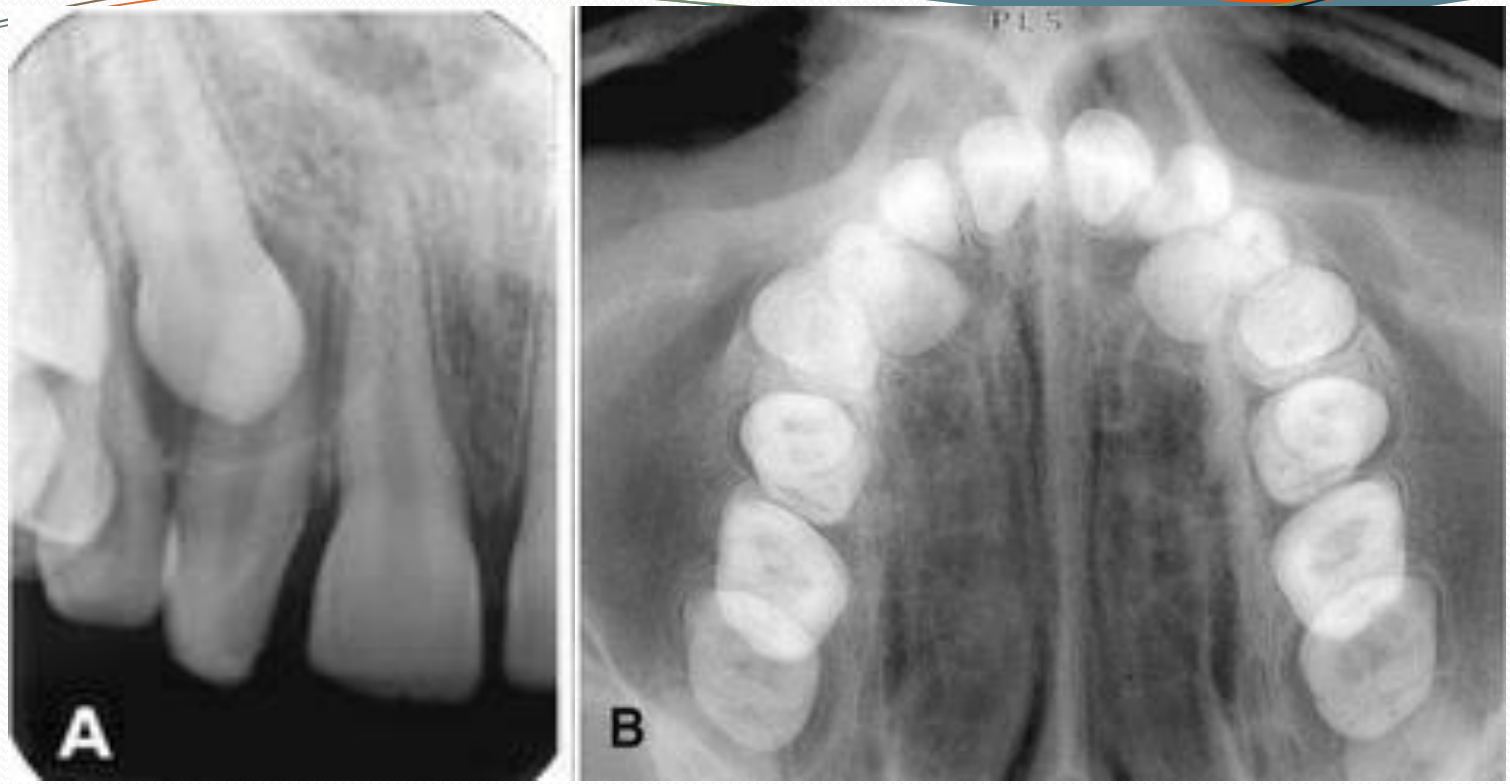
❖ **A periapical radiograph** is taken to show the position of the object **superio-inferior and mesiodistal relationships.**

❖ Next, **an occlusal radiograph** is taken which will show the **mesiodistal and bucco-lingual relationships.**

❖ The two radiographs when studied together help to localize the object in all three dimensions.

❖ It is useful to define the relationships of an impacted maxillary canine to the adjacent teeth, which is necessary for planning the surgical approach to expose the canine crown for subsequent orthodontic tooth movement.



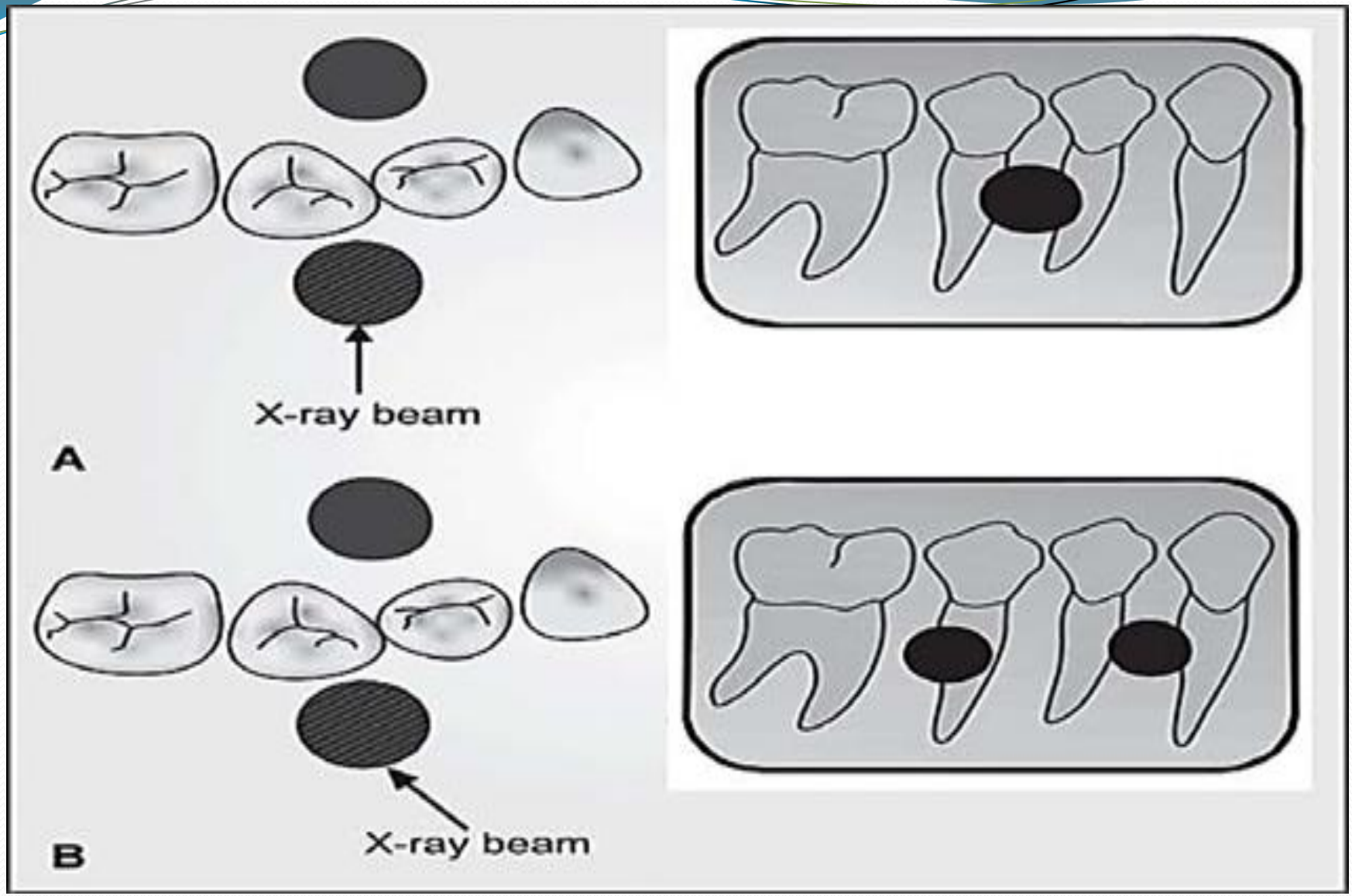


(A) Periapical radiograph shows impacted canine lying apical to roots of lateral incisor and first premolar. (B) Maxillary cross-sectional occlusal view shows that the canine lies palatal to the roots of the lateral incisor and first premolar.

2. Tube shift technique:

- Other names for this procedure are the buccal-object rule, slob rule, and Clark's rule (Clark described this method in 1910), in the horizontal plane.

- Its advantage to the practitioner is that it can be accomplished by using a standard periapical technique.
- To determine the relative buccolingual relationship between two structures that appear radiographically superimposed, a second radiograph is taken with a different horizontal angulation (or a horizontal tube shift).
- All factors remain the same for the second exposure, except that the tube is shifted about 20 degrees either mesially or distally.
- The point of entry, receptor position, and vertical angulation remain the same as in the previous projection.


X-ray beam
A
X-ray beam
B

- When the two radiographs are compared,

The buccal object appears to have moved in the opposite direction from the direction of the tube shift when compared with other structures on the radiograph.

- If the tube is shifted mesially by changing the horizontal angulation, the buccal object appears to have moved distally.

- Conversely, a distal shift results in the more buccal object moving mesially.

- Furthermore, if on the second radiograph the object does not appear to move after the tube is shifted horizontally, the object is said to be situated in the middle of the jaw.

- This can be demonstrated on the fingers by holding the hand so that the second and third fingers are superimposed.

- **Now, apply the buccal-object rule. The key phrase is "same lingual, opposite buccal;" the acronym is SLOB.**

Method:

- In the first radiograph, the object is superimposed over the apex of the second premolar. The x-ray tube head is then shifted and directed from a more 20 degrees mesial angulation.

- ***When an object lies lingual to the reference object, its image appears to move in the direction of the tube shift.***

- The application of acronym ***SLOB***: *s*ame *l*ingual, *o*pposite *b*uccal.

- Thus, if the object in question appears to move in the *same* direction with respect to the reference structures as does the x-ray tube, it is on the *lingual* aspect of the reference object.

- if it appears to move in the *opposite* direction as the x-ray tube, it is on the *buccal* aspect.

- If there is not any significant movement of the object, the object is positioned in the middle of the jaw and will not appear to have moved at all.

- For example, the mental foramen is often superimposed over the apex of the adjacent premolar, and may mimic a periapical radiolucency, the same principle can be applied to examine superimposition of the incisive foramen over the apex of a maxillary central incisor.

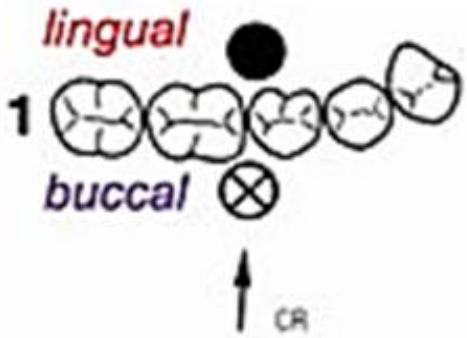








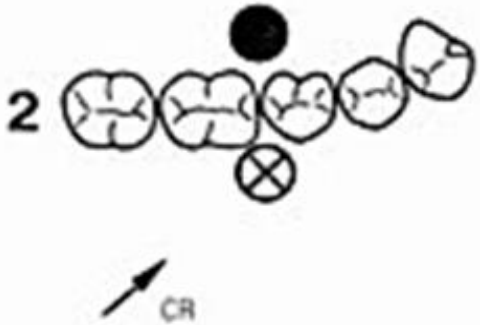
The tooth is positioned palataly







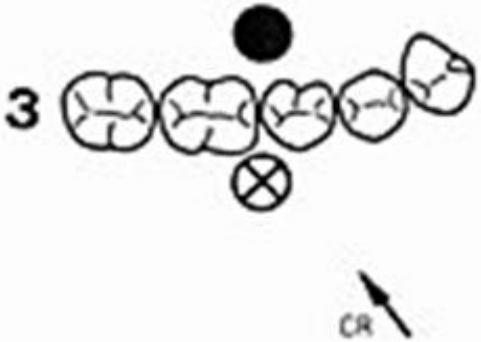
1. **Usual paralleling technique.** The extra objects are superimposed on each other

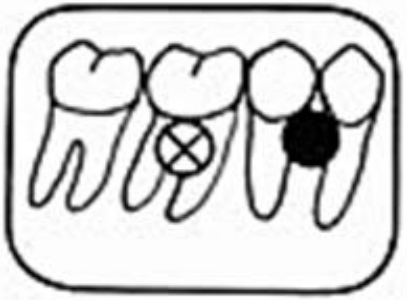






2. **BID shifted in the <u>distal</u> direction.** Notice how the Lingual object moved in a distal (same) direction as the BID, while the buccal object moved in a mesial (opposite) direction.







3. ***Work through this example on your own.***

B

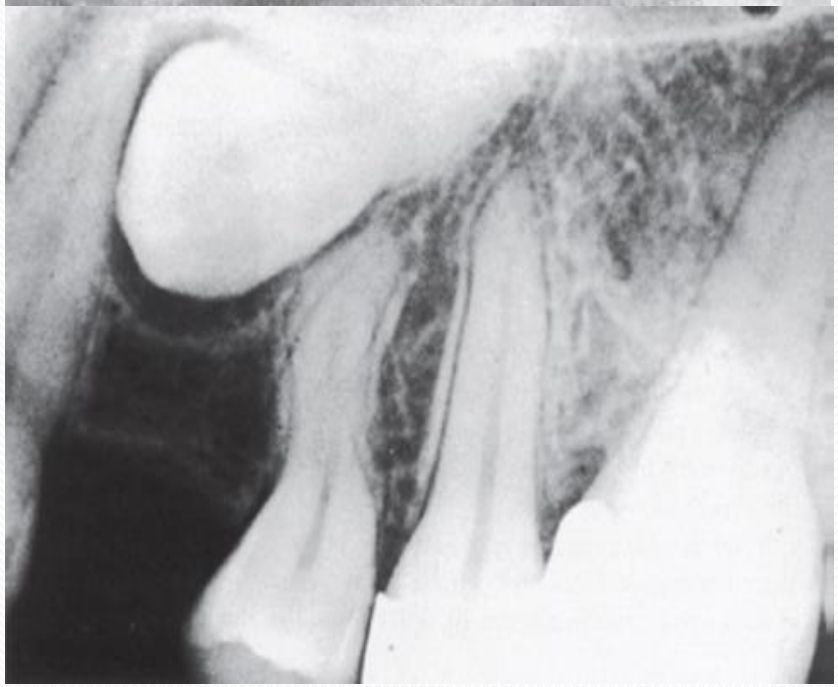
"SLOB"

Langland – Figure 11.14

3. Definition Evaluation:

- Structures that lie closer to the receptor have better radiographic definition than those that are farther from the receptor. This is true for both intraoral and extraoral films.
- Because an intraoral receptor is positioned lingually in the patient's mouth, the superimposed structure that is more sharply defined is positioned lingually in relation to the other structures.
- An advantage of this technique, when compared with the others that follow, is that it requires no further x-ray exposures of the patient.
- It is, however, the least reliable of the techniques mentioned and is not recommended.



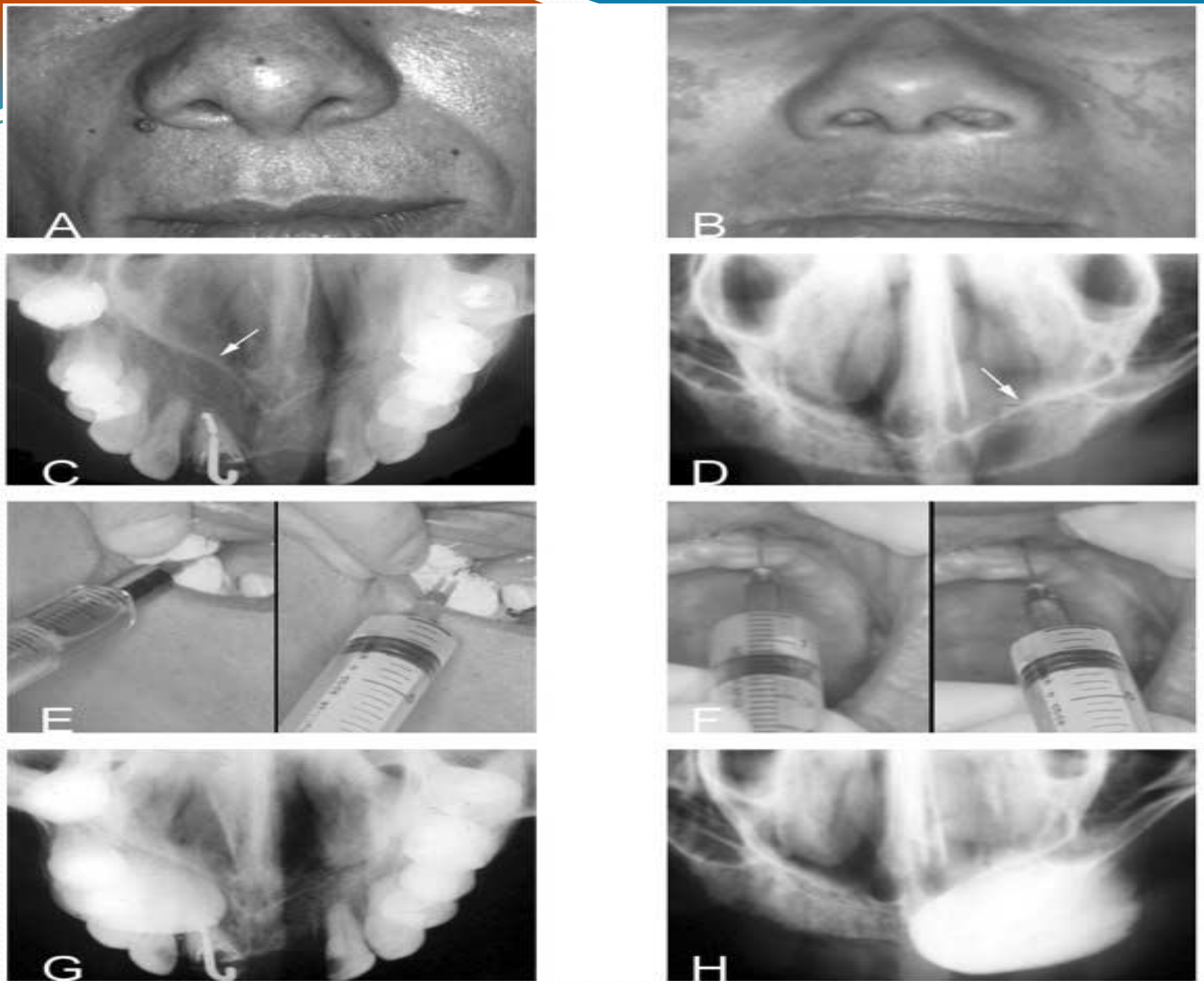


- Localization by definition.
- Is the impacted supernu-merary tooth more clearly defined than the rest of the teeth?
- If yes, it is probably positioned lingually.

If not, it is probably positioned buccally.

4. Use of radio-opaque media (Contrast media):

- Barium sulfate, lipiodol and dionosil can be used to demonstrate cavernous areas with hard and soft structures. After the injection of the radio-opaque media (mostly lipiodol) in cyst for example, processed and viewed to see the extension of the cyst. Radio-opaque media used in sialogram to demonstrate salivary glands and their ducts.


A
B
C
D
E
F
G
H


Thank You
For Your
Attention