

Radiographic Techniques

Bisecting technique

▪ Principle

Bisecting technique is based on the principle of isometry given by Ceiszynski in 1907, which states that two triangles are always equal when they have two equal angles and a common side. The angle formed by the mean plane of the tooth and the mean plane of the film is bisected and the central ray is directed through the centre of the tooth perpendicular to that imaginary bisector (figure 1).

If the central ray passed perpendicular to the long axis of the tooth, elongation of image will occur (figure 2), and if the central beam is passed perpendicular to the long axis of the film, shortening will occur (figure 3). If the rays are directed to the bisector plane, the image produced will be as perfect as possible.

Placement of the film:

Position of the patient depends on the two planes:-

- i. Occlusal plane: the occlusal plane should be parallel to the plane of the floor.
 - *In maxillary teeth, an imaginary line drawn from the ala of the nose to tragus of the ear is almost parallel to maxillary occlusal plane.*
 - *In mandibular teeth, when the patient opens his mouth, the occlusal plane of lower teeth changes its position and, therefore, does not remain parallel to the floor. So it becomes necessary to tilt the head backward.*
- ii. Median sagittal plane: is the plane which is vertically passing through the centre of head, this plane should be perpendicular to the floor.

Adjusting these two planes is the first step in the production of the radiograph and the deviation of this will seriously affect the angulation. Horizontal movement of the x-ray tube is around the median sagittal plane and vertical movement is around the occlusal plane. Vertical angulation is either positive or negative depending on whether the tube head is facing toward the floor (positive) or when the tube head is facing upward (negative). Figure 4.

Rules guiding the placement of the film in oral cavity

- a. Avoid mis-shaping the film. Films can be bend if necessary, but without crease.
- b. Carry film into mouth by thumb and forefingers.
- c. Teeth under examination should be in the centre of the film.
- d. Position the lower margin of the film in such away that 1/8th inch of periapical area is included.

Placement of film, angulation of tube and direction of rays for various teeth:

- a. Maxillary central incisors:

The film is grasped by the patient in close contact with the teeth and alveolar mucosa. The incisors have a 15- 20° inclination away from a true vertical. Horizontal angulation is 0°. vertical angulation is 55° -60° .

- b. Maxillary lateral incisors:

The film is so positioned that the interproximal surface between the central and lateral incisor is centered on the film.

- c. Maxillary canines:

The techniqu is similar to one used for maxillary central incisors. Film is placed more apically keeping in view the long roots of canines. Bending the film is may become necessary.the central ray is passed at the tip of canine.

d. Maxillary premolar:

The film placement for premolars requires certain modification, because the operator stands on the right side of the patient. The anterior position of the film should be in the midline of the canine. The entry of x-ray should be along the interproximal surfaces of the canines and first premolar and between first and second premolars.

e. Maxillary molars area:

The film placement is the same as far as premolars, only the film is to be kept more distally. Rays are passed along the interproximal spaces of first and second molars. Angulations are adjusted accordingly.

f. Mandibular central & lateral incisors:

The lower border of the film is placed in the floor of the mouth under the tongue. The palm of the finger tips should rest on the edges of the teeth and not the film. The film should not be pressed along the lingual surface of the teeth. The remaining fingers are elevated in such away.

g. Mandibular canines:

Care should be taken so that the long axis of the film should be along the long axis of the tooth. The rays should be directed along the tip of the tooth after adjusting the angulations.

h. Mandibular premolars and molar area:

The operator should stand in front of the patient. The film is grasped by the upper anterior corner with the left hand when the film is placed on the left side and right hand if the film is placed on right side of the mandible. The finger will hold the film along the tooth surfaces. Horizontal and vertical angulations are adjusted.

Ala-tragus line: an imaginary plane from the ala of nose and tragus of ear is the plane of maxillary occlusal surfaces. For maxillary posterior teeth, this plane is very imported.

Parallel technique (long cone technique):-

When the long axis of the film lies parallel to the long axis of the tooth and the rays are directed perpendicular to either of the two, the image produced is of the same size. Figure (5).

The central beam of the rays can only be made perpendicular to the long axis of the film, where as the other peripheral x-rays are divergent as they emerge out of the target. As the rays are to move a longer distance, lesser will be divergence of peripheral rays and lesser will be the elongation. The increased source-film distance becomes necessary because of the reasons:

- To prevent magnification of the image during short TFD, divergent rays tend to magnify the image.
- To prevent blurring the image border.

Distance of 16, 20, 24 and 30 inches are employed and long cone is used.

Placement of the film:

The planes and the tooth movements are the same as described for bisecting technique. Only difference as the name indicates is the placement of the film, which is kept parallel to the long axis of the tooth. Only factor to be kept in mind is to increase the source film distance as the object film distance is increased. As the distance increased, intensity will be decrease, so it is essential to use, either or all the following three features:

- ❖ Fast film.
- ❖ Greater KVp.
- ❖ Greater mA.

In many cases, where vault is less deep and exact vertical placement of the film becomes difficult, there one will have to opt for bisecting technique.

Some times in maxillary molars, malar bone superimposes the roots of molars especially in bisecting technique. Here parallel technique is preferred.

In such cases, compromise is made between two tech. for better results.

This is called Le-Master's tech. (figure 6). A cotton roll is kept between the film and the tooth to make its angle less sharp. Two main disadvantages of bisecting tech. overcome in the paralleling tech. are:

1. superimposition of zygomatic bone over the roots of maxillary molars.
2. cervical area of teeth are distorted and also alveolar crest area.

Procedure of the film placement and angulation using bite wing films:

Bite wing films are useful especially to visualize interproximal carious lesions and the underlying periodontal conditions. bite wing films. The film is placed in the mouth like any routine film except the placement in the depth floor is not required. As the tab is place on occlusal surfaces, the patient is asked to close the mouth slowly. The upper surface of the film is kept away from the palatal surface using tongue blade.

A vertical angulation of 0-5° is used and the horizontal angulation is so designed as the rays pass through the interproximal spaces between the teeth under examination.

Procedure of the film placement and angulation using occlusal films:

Occlusal film is inserted in the oral cavity with the film being retained by the patients closing the mouth the tech. is also known as sandwich technique. In the edentulous arch, the film is held against the maxillary ridge by patient's thumb and on the mandibular ridge by the forefingers. The exposure side is placed towards the teeth.

When the entire dental arch is to be observed the rays are directed perpendicular to the centre of the film.(fig. 7).

The projection used for occlusal films are:

- 1) Anterior mandibular (mandibular symphysis): the central ray is passed through point of chin keeping the angulation of -55° to the occlusal plane.(fig. 8).
- 2) Cross- sectional mandibular (mandibular symphysis occlusal): the central ray is passed through point beneath the chin, 3.0 cm posterior to the point of chin, keeping the angulation of 90° to the occlusal plane.(fig. 9).
- 3) Lateral mandibular: the central ray is passed through 3.0 cm below the point of chin, and 3.0 cm lateral to the midline, keeping the angulation of 90° to the occlusal plane.(fig. 10).
- 4) Anterior maxillary: the central ray is passed through the tip of nose, keeping the angulation of $+45^{\circ}$ to the occlusal plane.(fig. 11).
- 5) Cross- sectional maxillary (topographic maxillary): the central ray is passed through the bridge of nose, keeping the angulation of $+65^{\circ}$ to the occlusal plane.(fig. 12).
- 6) Lateral maxillary: the central ray is passed through 2.0 cm below lateral canthus of eye, toward centre of film, keeping the angulation of $+60^{\circ}$ to the occlusal plane.(fig. 13).