

Bitewing Radiographic Technique

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Introduction

Bitewing radiography is a commonly used intraoral imaging technique in oral and maxillofacial radiology. The creation of ideal and diagnostic images is challenging and depends on good technique.

Background

The bitewing radiograph (BW) is an image that depicts the maxillary and mandibular crowns of the teeth, providing a clear image of the interproximal surfaces of the teeth and allowing for detection of interproximal caries. Simultaneously, the maxillary and mandibular alveolar crests are imaged, permitting the evaluation of their levels, contributing to the assessment of periodontal status. Additional important findings may be detected on BWs, including the condition of restorations and the presence of calculus.

The intraoral film that is used for producing BWs has the highest spatial resolution which is crucial for the detection of the subtle changes that occur in dental diseases. BWs may be taken with the film oriented with the long axis positioned horizontally or vertically. The horizontal orientation is standard, however, when there is significant periodontal bone loss then the vertical BW is required to image the crestal bone.

Digital radiographic sensors can also be used to produce BWs. The principles and technique are the same except for preparing the sensor. Both storage phosphor (SP) plates and charge-coupled devices (CCDs) must be wrapped in a protective sleeve before being placed in the patient's mouth, and CCDs require a sensor holder.

Procedure

1. Prepare the patient.

Seat the patient, in an upright position in the dental chair. Place the lead apron and thyroid collar on appropriately. Ensure that the patient's head is stabilized against the headrest and that their occlusal plane is parallel to the floor, in the closed position.

2. Preparing the film/sensor.

Bite tabs or a film/sensor-holding device (e.g. Rinn instrument), may be used to hold the film/sensor in the patient's mouth. Bite tabs are available in folding types, stick-on types and manufacturer applied tabs. The Rinn instrument has the advantage of an aiming ring and rod to help position the x-ray machine position indicating device (PID). However, the bite block on this kind of device is thicker and keeps the patient's teeth further apart, thereby limiting the anatomic coverage of the image. Also, the position of the aiming ring limits the customization of the beam angulation for the patient's anatomy. CCDs must be used with a sensor holder.

The rest of this procedure will outline the use of bitetabs with either film or a SP sensor. When the term "film" is used it will be taken to also include a SP sensor.

Place a bite tab on the white side of a Size #2 intraoral film. Intraoral films are available in different sizes; the #2 is the most commonly used size for BWs.

Common errors:

1. Placing the bite tab on the incorrect side of the film places it into the mouth backwards, producing an image that is reversed. When using the film, the image will also appear lighter (less dense) and have a herringbone pattern along one side.
2. Incorrectly positioning the bite tab positions the film incorrectly, so that a disproportionate amount of each arch is imaged on the film.

3. Positioning the film/sensor.

Horizontal BWs: Place the film/bite tab combination into the patient's mouth in a horizontal orientation (landscape view), with the film positioned lingual to the teeth, allowing the bite tab to project through the occlusal plane when the patient is biting. This allows equal coverage of the maxillary and mandibular crowns of the teeth simultaneously. BWs should also provide simultaneous imaging of both the maxillary and mandibular alveolar crests, so that if significant alveolar bone loss is present, Vertical Bitewings need to be taken.

Vertical BWs: Reorient the film/bite tab combination so that the long side of the film is positioned in an up/down orientation (portrait view).

When taking both types of BWs, ensure that the film is positioned parallel to the teeth and curvature of the arch that are being imaged. When positioning BWs in a partially edentulous arch, cotton rolls may be of assistance in providing stabilization.

Anterior/Posterior position of BWs:

1. Anterior bitewing – the film is positioned so that the distal aspect of the cuspid (providing a view that shows dentin) is visible on the film.
2. Posterior bitewing – the film is positioned so that the distal aspect of the last erupted crown is visible on the film

Common errors:

1. Inadequate stabilization of the film/bite tab combination causes the film to tilt/tip producing an image that is not oriented correctly.
2. Incorrect positioning of the film in relation to the teeth produces a BW image that doesn't provide a clear view of some areas of the teeth that are required. Two of the most common positioning errors are;
 1. Not positioning the film anteriorly enough in the arch, so that the BW doesn't provide an adequate view of the distal aspect of the cuspids.
 2. Not positioning the film posteriorly enough in the arch, so that the BW doesn't provide an adequate view of the distal aspect of the last molar.

4. Position the patient.

Instruct the patient to bite their teeth together, position their head straight with their occlusal plane parallel to the floor.

Common errors:

1. If the patient doesn't completely bite their teeth together, the film does not get seated into the correct position, producing an image with a black (radiolucent) air space seen in the occlusal plane and incorrect proportions of the maxillary and mandibular crowns and alveolar crests.
2. If the patient's head is not oriented correctly in the vertical and sagittal planes, the horizontal and vertical angles of the collimator may inadvertently be positioned incorrectly.
3. If the patient, film or x-ray tube is moving during the exposure, blurring of the image may result.

5. Aim the x-ray beam:

1. *Select the vertical angulation.*

The vertical angulation of the PID is set at +10 degrees in the vertical plane. This angulation is derived from the average vertical angulation of the maxillary and mandibular teeth when in occlusion and allows the x-rays to strike the film at a 90 degree angle providing the most accurate representation of the teeth on the film with maximal overlap of the buccal and lingual alveolar crests and cusps of the teeth.

Common errors:

1. Incorrect Vertical Angulation: positioning the central ray so that the vertical angulation is too steep (greater than the optimal +10 degrees) provides an image that is foreshortened, or too short in the vertical dimension.
2. Incorrect Vertical Angulation: positioning the central ray so that the vertical angulation is too flat (less than the optimal +10 degrees) provides an image that is elongated, or too long in the vertical dimension.

2. *Select the horizontal angulation.*

The horizontal angulation of the (PID) is chosen so that the central ray is aimed parallel to an imaginary plane that is formed by the interproximal contacts of adjacent teeth that are to be imaged.

3. This angulation allows the x-ray beam to pass through the contacts of the teeth, allowing a clear unobstructed (open, without overlap) view of the interproximal surfaces of the teeth. This angulation will generally aim the beam perpendicular to the plane of the film.

Some guidelines for horizontal angulation are:

- anterior BW: 30 degrees from the mid-sagittal plane, aimed at the inner canthus of the eye.
 - posterior BW: 60 degrees from the mid-sagittal plane, aimed at the outer canthus of the eye.
- Common errors:*

1. Incorrect Horizontal Angulation: positioning the central ray so that the horizontal angulation is not directed through the interproximal contacts of the adjacent teeth, provides an image that has overlap of adjacent structures in the horizontal plane (the contact areas of the teeth are superimposed over each other).

4. *Aim the PID so that the Central Ray strikes the center of the film.*

Instruct the patient to “smile wide” while keeping their teeth together on the bite tab. This allows the operator to visualize the film and teeth to be imaged, and therefore aid in the aiming of the x-ray beam.

The PID can be brought several inches away from the patient’s face to allow some dispersion of the x-ray beam and therefore better coverage of the film.

Common errors:

1. Positioning the central ray off-center produces a film with a partial image. The unexposed portion of the film is clear and follows the shape of the outline of the PID, so that a clear semi-circular image is seen on a portion of the film. This type of error is termed a “cone-cut”.

6. **Expose the film:**

Leave the operatory and stand behind a safe barrier and expose the film.

The film is exposed to radiation using constant pre-set x-ray machine settings, while adjusting the time of exposure to pre-determined settings for the individual machine, film type and patient size.

Common errors:

1. Incorrectly setting the time of exposure, early release of the activating button or incorrectly adjusting any other technique factor settings, produces a less than ideal image on the BW. Incorrect settings may produce a film that has improper density (too light or dark) or poor contrast (too much or too little) making the interpretation of the image on the film difficult.