Eight Edition

Quality Resource Guide

Intraoral Bitewing Radiographic Technique

Author Acknowledgements

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Educational Objectives

Following this unit of instruction, the dental team member should be able to:

1. Describe the characteristics of a diagnostic bitewing radiograph.
2. Recognize the guidelines for proper receptor placement and beam orientation.
3. Recognize the common errors found in bitewing projections and their cause.
4. Describe the ways in which common errors can be avoided.

MetLife designates this activity for **1.0 continuing education credits** for the review of this Quality Resource Guide and successful completion of the post test.

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The content of this Guide is subject to change as new scientific information becomes available.

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Introduction

Bitewing radiographs are the most common intraoral radiographic tool used for diagnosis in dentistry. It is estimated that bitewings account for nearly 60% of all dental radiographic surveys taken. When combined with thorough clinical examinations, bitewings are a valuable diagnostic tool. They are excellent aids for the identification of certain types of pathology, defective restorations, dental caries, and periodontal disease. However, like most radiographic procedures, posterior bitewings are technique sensitive. To prevent or reduce the frequency of technique-related problems, this module will describe the characteristics of good diagnostic bitewings, present three common technique errors, and describe methods for solving technique errors.

Bitewing Devices

There are primarily two common devices used to expose bitewing projections, bitewing tabs and XCP® bitewing holders. The technique and strengths/weaknesses are discussed.

Bitewing Tabs

The bitewing tab is attached to the active side of the receptor cover and the circular collimator aligned to completely irradiate the receptor. The collimator is preset at a positive 10 degrees angulation. This angulation allows for maximum display of the proximal contact area of the tooth. The disadvantages of this technique are the inability to use rectangular collimation and the freehand alignment of the beam to the receptor.

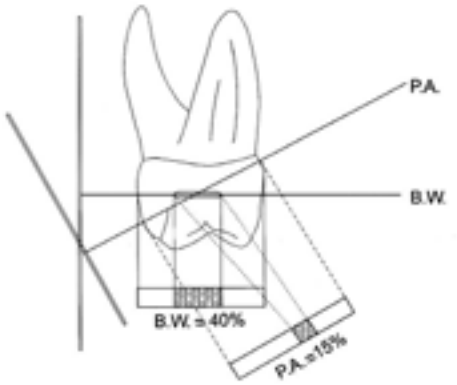
Beam-Alignment Device (XCP®)

Use of a beam-alignment receptor holder (*i.e.*, XCP®) allows for the use of a rectangular collimator, which decreases the radiation dose to the patient. The receptor is placed in the holder with the active side facing the collimator. Once the receptor is placed intraorally, as described in this module, the rectangular collimator is aligned to the positioning ring. By anchoring the rectangular collimator into the positioning ring, the radiographic beam is automatically aligned at 90 degrees to the receptor. The one limitation to using the beam alignment device is the potential to sacrifice horizontal alignment resulting in interproximal overlap. To address this limitation, place the holder intraorally and then rotate the biteblock and aiming ring horizontally (mesial or distal) to open the interproximal contact.

Characteristics of Diagnostic Bitewing Projections

The radiographic projection best suited for the interpretation of dental caries and periodontal disease in the posterior area of the mouth is the bitewing radiograph. This is primarily due to the vertical angulation used in exposing the projection. In contrast, in a periapical projection the vertical angulation can distort the caries lesion or superimpose other structures to mask or hide a lesion or distort bone topography. **Figure 1** depicts the projection geometry principles for bitewing and periapical radiographs. With the angulation of a bitewing projection, approximately 40% of a proximal surface is imaged compared to only 15% in a periapical projection.

Figure 1



The beam positioning for the bitewing (BW) allows more of the contact area to be imaged compared to the periapical (PA).

Because radiographs can detect proximal caries lesions and alveolar bone not easily seen in a clinical examination, it is essential that the radiograph clearly display interproximal surfaces of the teeth and the crestal ridge of the adjacent alveolar bone. For a caries lesion to be detected radiographically, the mineral content of the tissue must change or demineralize 30-50%. As a result, a lesion will often tend to be larger clinically than that displayed by the radiographic image. Thus, an image with adjacent interproximal surfaces not overlapped will enhance the ability to detect lesions early, which in turn impacts management considerations.

Problem-Solving Techniques

Receptor Placement

Packet placement is one of the most critical elements in exposing a diagnostic radiograph. It is also one of the most common sources of error. Because of the contour of the dental arch, it is often difficult to place the packet and angle the beam to create an open proximal contact between those teeth. There are two easy steps that ensure proper placement of the receptor. First, for a premolar bitewing, place the receptor as far forward in the mouth as possible. Second, angle/rotate the receptor so it is positioned behind the mandibular lateral on the opposite side of the mouth. Remember, for improved patient comfort and ease in positioning the packet, place the packet towards the tongue or midline of the floor of the mouth by pushing towards the tongue. This also allows for proper positioning behind the mandibular lateral on the opposite side. This technique is also effective when tori are present.

Beam Orientation

Proper orientation of the central beam is essential to obtaining diagnostic projections. Horizontal misalignment of the x-ray beam through the interproximal spaces can cause overlap of the proximal areas. When this occurs, the SLOB rule

(Same Lingual Opposite Buccal) can be used to determine the angulation that caused the error and thus correct the error on the retake projection. To identify the cause of the horizontal overlap, the clinician can use the following rule. First, identify the lingual cusp on either maxillary premolar on the receptor. This would be the shorter cusp. Then, determine whether the lingual cusp is mesial or distal to the facial cusp (the longer cusp). Using the SLOB Rule when viewing a radiograph, the tubehead would be positioned too mesial if the lingual cusp is mesial to the facial cusp and too distal if the lingual cusp is distal to the facial cusp. Thus, the horizontal overlap error can be corrected by moving or repositioning the tubehead in the opposite direction.

Notice that the radiographs shown in **Figures 2 and 3** meet the four criteria of diagnostic premolar and molar bitewings. These criteria are:

- For the premolar projection, at least the distal of the canine (**Figure 2**) should be imaged and in the molar projection no more than the distal of the mandibular second premolar should be imaged (**Figure 3**).
- The interproximal spaces should be open with no horizontal overlap between the maxillary premolars on the premolar projection. For the molar projection, there should be no horizontal overlap between the maxillary 1st and 2nd molars
- The alveolar crestal bone should be imaged with about the same amount of bone in both arches displayed on the receptor.
- For the molar projection, all of the erupted terminal molar should be displayed with the retromolar area imaged.

Figure 2

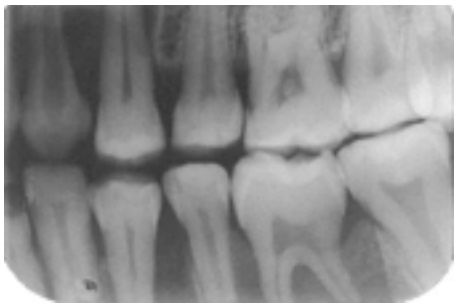
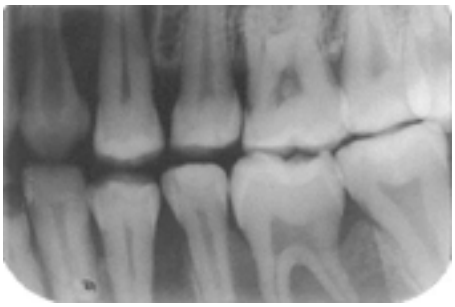


Figure 3



Common Errors

Figure 4

Problem:

This projection did not image the mesial of the first premolars onto the receptor due to improper packet placement in the mouth.

Solution:

This error can be corrected by moving the receptor anteriorly and by placing the anterior edge of the receptor behind the mandibular lateral on the opposite side of the arch.

Figure 5

Problem:

The interproximal contact areas are overlapped on this premolar bitewing.

Solution:

This error can be corrected by adjusting the horizontal angulation. The tubehead was positioned too mesial with the beam directed toward the distal. To correct, reposition the tubehead by rotating it toward the distal and redirecting the beam more mesial.

Common Errors(continued)

Figure 6

Problem:

The third molar is not imaged on the receptor.

Solution:

This error can be corrected by positioning the receptor more distal. Align the front edge of the receptor so that it is no further forward than the mesial of the mandibular first molar. If the tooth is still not imaged on the receptor, then a third molar disto-oblique projection should be exposed.

Figure 7

Problem:

This premolar bitewing image is tipped and a conecut is present.

Solution:

The packet placement error occurred due to the receptor being placed too anterior in the mouth. The tipped image can be corrected by repositioning the biteblock so that the horizontal plane of the biteblock is parallel to the occlusal plane and the receptor is positioned in the midline of the oral cavity. The conecut error can be corrected by covering the entire receptor with the beam. A useful landmark is to align the front edge of the positioning collimator with the front edge of the receptor.

Figure 8

Problem:

The level of alveolar bone imaged in the projection is unequal in the maxillary and mandibular arches. This error could be due to the receptor-holding device not centered on the receptor, or incorrect vertical angulation positioned too steep (tubehead positioned at an angle greater than +10).

Solution:

Reposition the receptor so that it is centered in the holder. The vertical angulation should be positioned at +10 degrees (beam is angled down). If the patient exhibits periodontal pocketing of 5 mm or more, then a vertical bitewing should be exposed to ensure that the crestal bone is imaged on the projection.

Summary

Bitewing projections play an important role in aiding the identification and treatment of dental disease. Therefore, it is imperative that good diagnostic bitewing radiographs be exposed. This guide describes the desired characteristics of posterior bitewings, problem-solving techniques and common problems with associated solutions. It was written based upon existing guidelines, however, organizations such as NCRP often provide periodic updates. Readers are encouraged to source the appropriate agency or organization for the most current recommendations.

Suggested Reading

Mallya SM and Lam E. White and Pharoah's Oral Radiology: Principles and Interpretation, 8th Ed. Elsevier Inc., St. Louis, Missouri. 2019. Chapters 5, 6, 7, and 16.

Dental Radiographic Examinations: Recommendations for Patient Selection and Limiting Radiation Exposure. American Dental Association, Council on Scientific Affairs and US Department of Health and Human Services, Public Health Service, Food and Drug Administration, 2012.

POST-TEST

Internet Users: This page is intended to assist you in fast and accurate testing when completing the "Online Exam." We suggest reviewing the questions and then circling your answers on this page prior to completing the online exam.

(1.0 CE Credit Contact Hour) Please circle the correct answer. 70% equals passing grade.

1. **The use of beam alignment devices for bitewing radiography is recommended so that:**
   a. rectangular collimation can be used to reduce patient dose
   b. the technology improves horizontal angulation
   c. cone cuts don't occur
   d. the technique is more comfortable to the patient

2. **A molar bitewing should image no more than the distal of the mandibular second premolar.**
   a. True
   b. False

3. **When exposing a bitewing projection using a beam alignment device, the vertical angulation:**
   a. is preset at a +10 degrees.
   b. is determined by the positioning ring.
   c. is positioned by changing the beam direction either mesial or distal.
   d. will result in overlapping the interproximal contact area.

4. **Vertical bitewings are indicated when there is ___ mm of periodontal pocketing.**
   a. 3
   b. 4
   c. 5
   d. All of the Above

5. **The use of bitewing tabs requires all EXCEPT:**
   a. Freehand alignment of the beam to the receptor.
   b. The use of rectangular collimation.
   c. The use of circular collimation.
   d. Presetting the vertical angulation to +10 degrees.

6. **A bitewing radiograph that exhibits unequal amounts of alveolar bone in each of the arches is most likely a result of:**
   a. incorrect vertical angulation
   b. incorrect horizontal angulation
   c. Both a and b
   d. None of the above

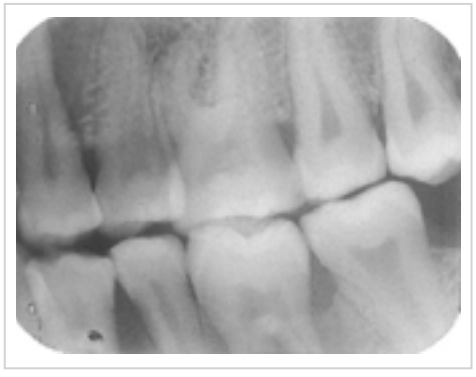
7. **A molar bitewing radiograph that displays a partial third molar, most likely is a result of:**
   a. incorrect vertical angulation
   b. incorrect horizontal angulation
   c. incorrect packet placement
   d. None of the above

8. **Bitewings are used to aid in the identification of all of the following EXCEPT:**
   a. defective restorations
   b. caries lesions
   c. periodontal disease
   d. periapical lesions

9. **Identify the main technique error in this premolar bitewing projection.**

   a. incorrect vertical angulation
   b. incorrect horizontal angulation
   c. incorrect packet placement
   d. incorrect cone centering/conecut

10. **Using the SLOB rule, determine the cause of the horizontal overlap in the maxillary premolar area in this radiograph.**



   a. The tubehead is too mesial.
   b. The tubehead is too distal.
   c. The tubehead is positioned correctly, the receptor is turned.
   d. None of the above

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11. Please identify future topics that you would like to see:

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