

A STUDENT GUIDE TO PERFECT BITEWINGS



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Introduction

Every dental student will remember the anticipation and mild anxiety when taking their first clinical intraoral bitewing radiograph. You have done your best to manage the patient's gag reflex, carefully position the image sensor or receptor, run behind the protective barrier, and press the exposure button. When you look at the computer monitor, expecting to have a textbook-quality bitewing radiograph, you are greeted with severe interproximal overlap that hinders the diagnosis of proximal caries or cone cut, with an unexposed white crescent slicing through the premolar or molar area.

The standard adult bitewing is done by using a size 2 receptor or sensor on each side of the jaw, while a child bitewing can be done using a size 0 receptor. While this keeps the radiation low according to the ALARA or ALADA principles,[1,2] it comes with a unique geometric challenge to capture both premolar and molar areas without overlap.

In this article, we will discuss the geometric mechanics of the bitewing errors and practical troubleshooting to improve the image quality.

The anatomy of a diagnostic bitewing

A single horizontal size 2 bitewing is expected to show these areas without overlaps or cone cut. The anterior boundary of the bitewing radiograph should include the distal surface of the mandibular canine, while the posterior boundary of the bitewing should include the distal surface of the mandibular second molar. Vertically, the bitewing radiograph should include the alveolar crest with 2 to 3 mm areas below the cementoenamel junction.

Clinical Exception: A two-plate per side protocol (premolar view + molar view) is reserved for patients with long dental arches, erupted third molars requiring evaluation, or severe crowding where a single beam angle cannot physically open both contact zones.

The arch curvature problem

Arch curvature may not be a big problem for U-shaped arches and V-shaped arches since one angulation should be able to open the interproximal area for both premolars and molars. However, patients with square-shaped arches may need separate premolar and molar bitewings. This is due to the different angulation for interproximal contact. If you direct the central ray perpendicular to the molars, the premolar contacts will overlap. If you direct it strictly through the premolars, the molar contacts will overlap.

Deconstructing the 'big three' technical errors

1. Horizontal overlapping

Geometric Cause: The central ray is not aligned parallel to the interproximal contact spaces, projecting adjacent proximal enamel surfaces over one another.

Diagnostic Impact: Overlap into enamel masks early lesions at the enamel-dentin junction (EDJ). Overlap extending into dentin renders the radiograph non-diagnostic, requiring a retake at different angulation.

Correction: Do not rely blindly on the indicator ring. Look along the patient's arch shape to visualise the arch curve before aligning the tube head.

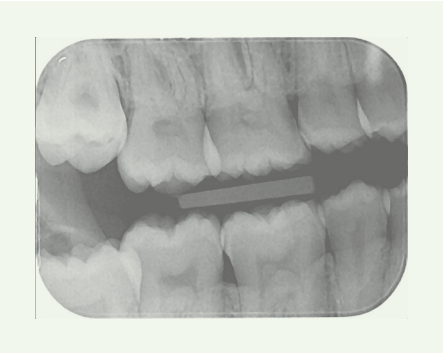


Fig. 1 Horizontal overlap

2. Cone cut

Geometric Cause: The primary X-ray beam fails to completely cover the area of the image receptor.

Diagnostic Impact: Unexposed, radiopaque (white) areas result in loss of anatomical information, often truncating posterior molar crowns or crestal bone.

Correction: With rectangular collimation, the margin for error is minimal. Slide the aiming ring as close to the patient's skin as possible without touching to minimize beam divergence and ensure the rectangular tube head is aligned perfectly with the ring.

3. The 'open-wing' and vertical distortion

Geometric Cause: The patient fails to bite completely onto the bite block, or incorrect vertical angulation creates coronal distortion.

Diagnostic Impact: Lack of occlusal contact and incomplete coverage of the alveolar crest.

Correction: Apply a positive vertical angulation of to compensate for the palatal tilt

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Table 1 Diagnostic errors summarised

Error Type	Visual Appearance on Radiograph	Underlying Technical Cause	Diagnostic Consequence	Retake Protocol
Horizontal Overlap	Double-density overlapping enamel boundaries.	Central ray directed obliquely across contact points.	Conceals proximal caries, simulates or hides furcation defects.	Adjust horizontal tube along the arch curve.
Cone Cut	Clear, unexposed (white) zone with a sharp border.	Central ray offset from the centre of the image receptor.	Loss of diagnostic data in unexposed regions.	Centre tube head flush to target ring
Incomplete Bitewing ('Open-Wing')	Vertical separation between maxillary and mandibular occlusal surfaces.	Patient only closing the lip rather than biting on the block	Insufficient crestal bone visibility on one arch.	Re-instruct patient; stabilise bite block against mandibular teeth before closing.
Plate Bending/ Artifacts	Geometric distortion.	Receptor flexing against narrow palatal vault or floor of mouth.	Distortion of the teeth shape.	Use rigid receptor holders; position receptor more medially into deeper vault space.

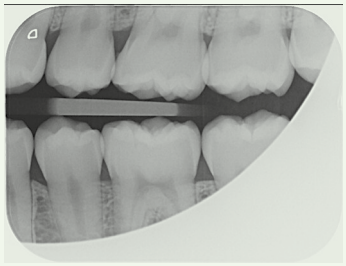


Fig. 2 Cone cut

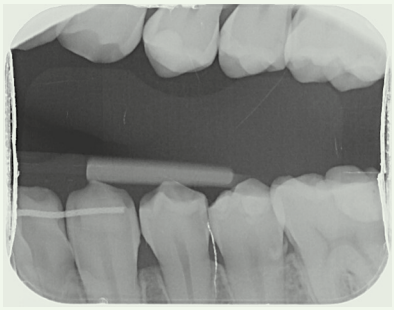


Fig. 3 Incomplete bite

of maxillary teeth and the curve of Monson. Instruct the patient to 'bite firmly on their back teeth' and visually check the bite before exposure. These are all shown in Figures 1, 2 and 3.

Table 1 summaries these errors.

Managing difficult patient anatomy

1. *Shallow palate*: Do not force or flex the receptor. Place the receptor medially into deeper vault space. Vertical angulation may be increased but expect some distortion.
2. *Mandibular Tori*: Placing a receptor directly against a torus causes severe pain and displacement. Place the receptor *medially* pushing it toward the midline where the floor of the mouth is deeper and softer.
3. *Hyperactive gag reflex*: Preset exposure factors and position the tube head *before* placing the receptor in the mouth. Next, encourage nasal breathing and divert the patient's focus by asking the patient to lift one foot slightly off the footrest.

Conclusion

Mastering the single-plate bitewing is an essential clinical skill in clinical dental practice. By understanding projection geometry, anticipating arch curvature, and applying systematic positioning habits, you can eliminate retakes and deliver precise diagnostic care.

References

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2. Lam E W N and Mallya S M. *White and Pharoah's Oral Radiology: Principles and Interpretation* (9th ed.). Elsevier, 2026.

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