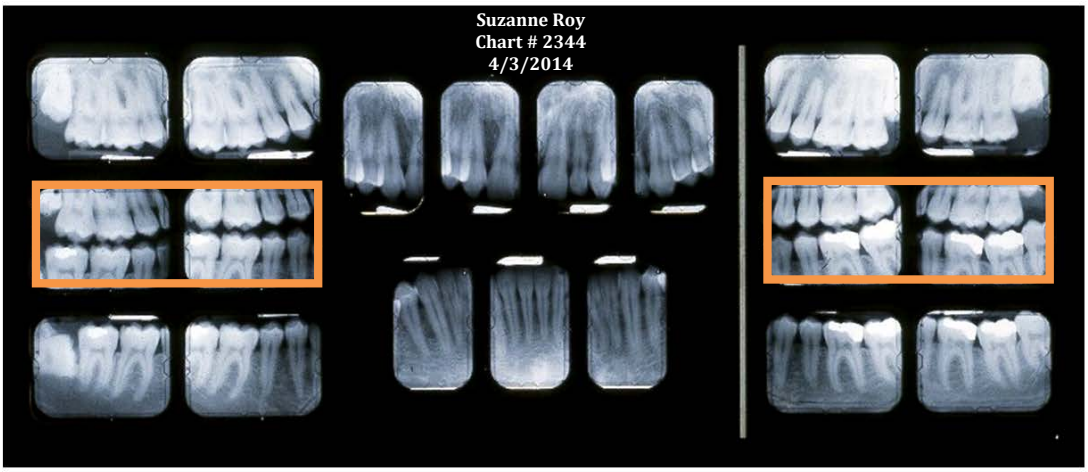
Chapter 3
Radiographic Techniques

Radiographs, when used with the patient's case history and clinical examination, are one of the most important diagnostic aids available to the dentist. Diagnostic radiographs reveal evidence of disease that cannot otherwise be found. They also play a major role in forensic identification.

This chapter will provide information about taking periapical and bitewing radiographs. Below is an illustration of a diagnostic full-mouth series which consists of 15 periapical (PA) images and 4 bitewing (BW) images which are outline in orange.



Full mouth series

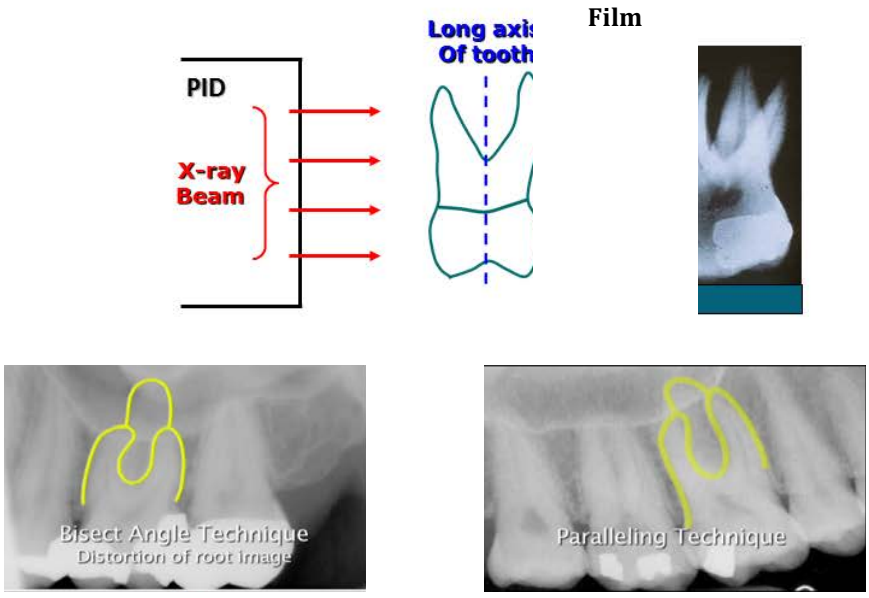
Bitewing (BW) Radiographs show details of the upper and lower teeth in one area of the mouth. Each BW shows a tooth from its crown to about the level of the supporting bone. Bitewings are used to detect decay between teeth and changes in bone loss caused by periodontal (gum and bone) disease.

Periapical (PA) Radiographs show the whole tooth from the crown to 2-3mm beyond the end of the root to where the tooth is surrounded by alveolar bone. Each PA shows the full tooth dimension and includes all the teeth in one portion of either the upper or lower jaw. Periapical radiographs are used to detect any abnormalities of the root structure and surrounding bone structure.

There are two types of techniques used for periapical radiographs: bisecting angle, and paralleling.

The bisecting technique may have to be used for patients unable to accommodate the film positioning device used in the paralleling technique. These patients may include adults with low palatal vaults and children. Disadvantages to the bisecting technique include image distortion, and excess radiation due to increased angulations exposing the eyes and thyroid.

Paralleling technique provides less image distortion, and reduces excess radiation to the patient. When the film is parallel with the long axis of the tooth, the image looks the same as the tooth itself. There is no distortion.



The paralleling technique is the preferred method, and will be illustrated throughout this chapter.

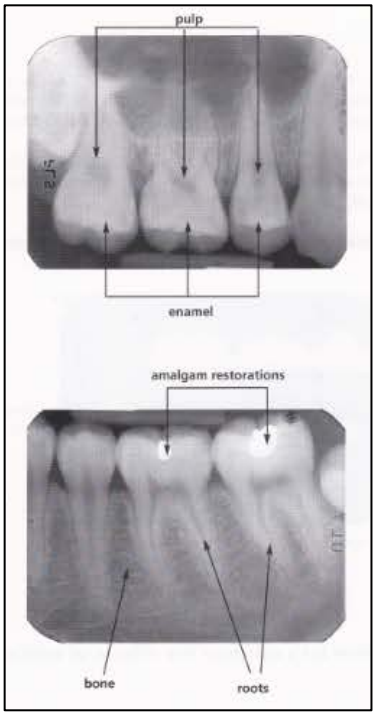
Diagnostic images show the following characteristics:

- Good contrast and density
- No image distortion

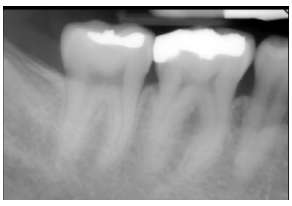
What is Density and Contrast?

Density is the overall darkness (blackness) of an image. Contrast is the difference in lightness and darkness between areas on a radiograph.

The goal in dental radiology is to use techniques that require the least amount of radiation exposure to produce images with the right amount of density and contrast. To better understand density and contrast, let's look at some dental radiographs.



The pulp is darker (radiolucent) than the root of the tooth. The enamel is lighter (radiopaque) than the rest of the tooth. The lightest areas are amalgam restorations. Notice the difference in the shades of grey between the root and bone areas. This is contrast. Without contrast, you would not be able to see any differences in dental images.

Examples of diagnostic PAs with good density and contrast

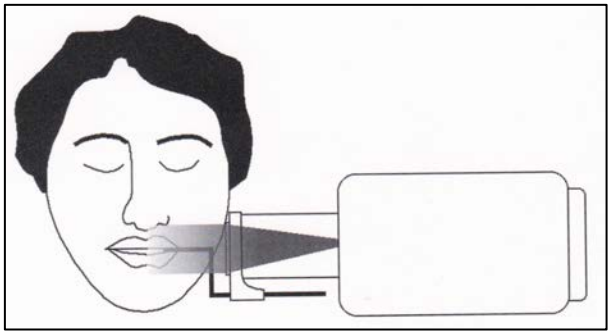
How does this happen?

Each of the oral structures in the path of the X-ray beam has different levels of penetration. Tooth enamel and metallic restorations (amalgams, crowns, etc.) are very dense, and deflect X-rays preventing them from reaching the film. Tooth enamel and amalgams look white (radiopaque).

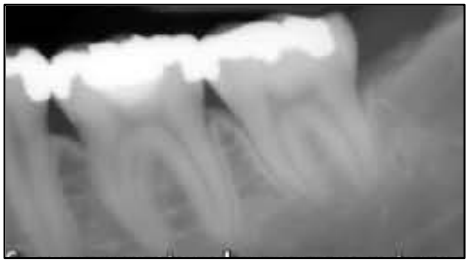
Tissues and bone are less dense and allow more X-rays to reach the film. Therefore, tissue and bone look darker (radiolucent). The different levels of penetration of the X-rays result in differences in density on the images.

Density and contrast is also affected by how close the PID is to the patient's face. Once the X-rays pass through the PID, there is a normal widening or spreading of the X-ray beam, similar to what occurs when a flashlight is moved further away from a wall. You should keep this in mind when you position the PID for an exposure.

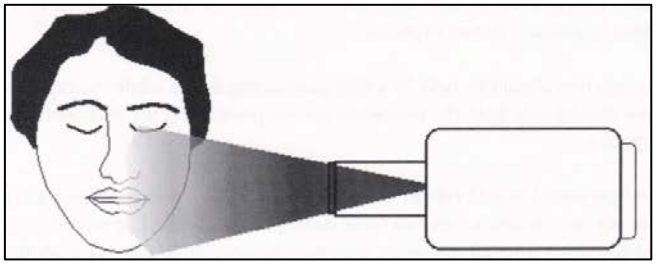
The closer the end of the PID is to the patient's face, the less X-ray spread. The results are better contrast and density of a radiograph, and a smaller area of tissue being exposed to radiation. The XCP ring should be close to the patient's face, and the PID close to the ring of the XCP.



XCP ring and PID close to the face.



This image shows good contrast and density.



PID is ***not*** close to face.

This image does not show good contrast and density.

Differences in density give the contrast needed in a diagnostic image.

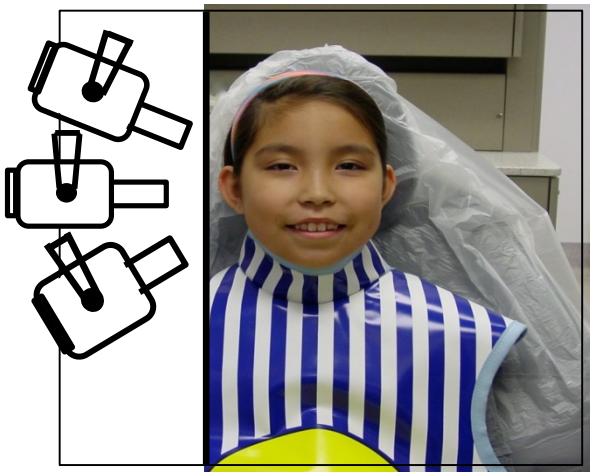
Example of a diagnostic bitewing series with good density and contrast

The information in this chart may be helpful if you are not getting radiographs with good density and contrast.

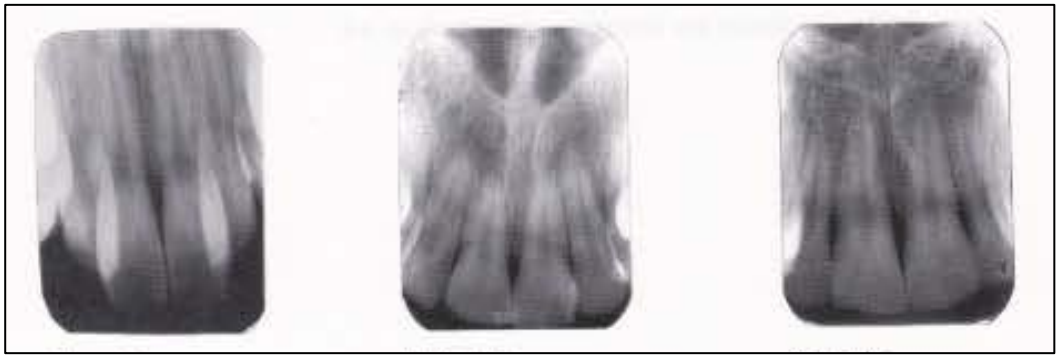
Problem	Cause	How to Correct
Image too dark	• kV too high • Exposure time too long	• Reduce kV • Reduce exposure time • Machine may need calibration (trained factory service person must check)
Image too light	• kV too low • mA too low • Not enough exposure time • X-ray source too far from patient	• Increase kV • Increase exposure time • Increase mA if unit is not preset • Hold button down for entire exposure • Place the XCP ring close to patient's face and the PID close to XCP ring • Increase mA (if unit is able to be adjusted) • Increase exposure time if indicated by size of patient
No image	• X-ray unit not on • Short circuit • Film never exposed	• Check on/off switch • Check for electrical problems • Keep exposed and not exposed films separated

What is image distortion?
Distortion is any change in the size or shape of a tooth on a radiograph. If the image of a tooth looks larger or smaller than it really is, it is distorted. This is caused by incorrect vertical angulation.

What does vertical angulation mean?
Vertical angulation is when the PID is placed in an upward or downward position anywhere along the line in this picture.



Look at these radiographs. See if you see any distortion.



A **B** **C**

A: Elongation - The image on the radiograph is longer than the actual tooth size.

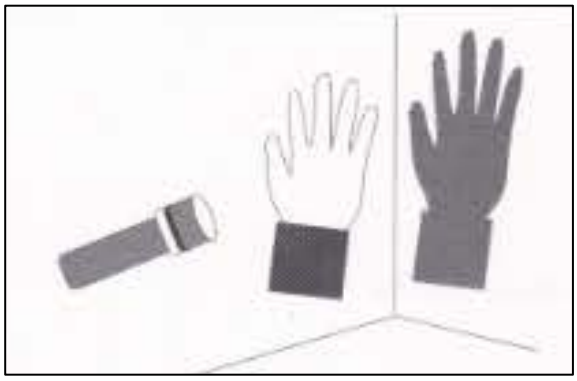
B: Foreshortening - The image on the radiograph is shorter than the actual tooth size.

C: No significant image distortion - The size of the tooth and the image on the radiograph are approximately the same.

Another way to understand distortion is to shine a flashlight on your fingers. Think of the flashlight as the PID and the shadow of your fingers as the image that appears on the X-ray.

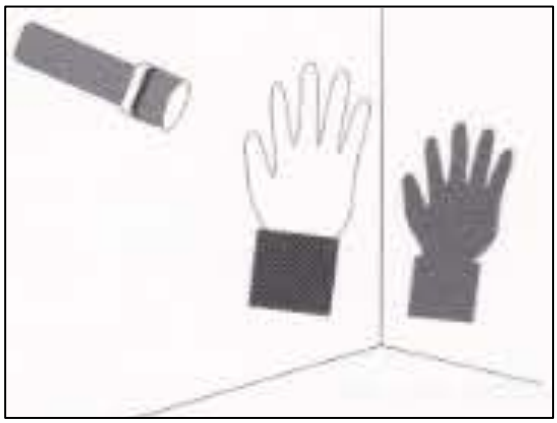
Elongation

Hold your hand next to a plain, smooth wall. Shine the flashlight below your hand on your wrist. See how the shadows of your hand and fingers look longer than they really are.

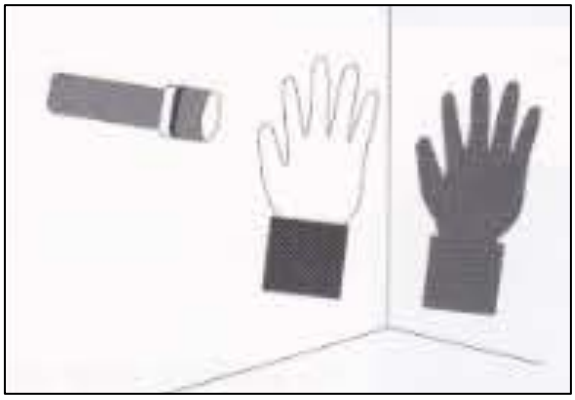


Foreshortening

Now raise the flashlight and shine the light above your fingers. See how the shadow of your hand and fingers look much shorter than they really are.



No Distortion
Now direct the flashlight so the light shines above your knuckles. See how the shadow of your hands and fingers are now approximately the same length as your hand and fingers.



How do you prevent distortion?
If you use a film positioning device like the XCP, you rarely get distortion of the image. However, if you are not using the XCP, you must pay attention to the correct vertical angulation of the PID.

Elongation and foreshortening are the result of vertical angulation problems.

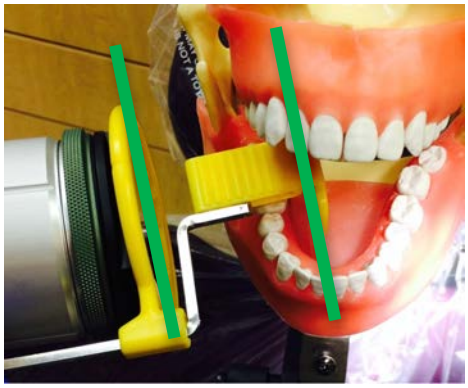
The XCP eliminates the need for the operator to determine the vertical angulation. It simplifies X-ray beam alignment, and you get radiographs with no distortion.

When using the XCP, it is important to keep the patient's chin parallel to the floor, and place the film as close as parallel to the teeth to ensure proper vertical angulation.

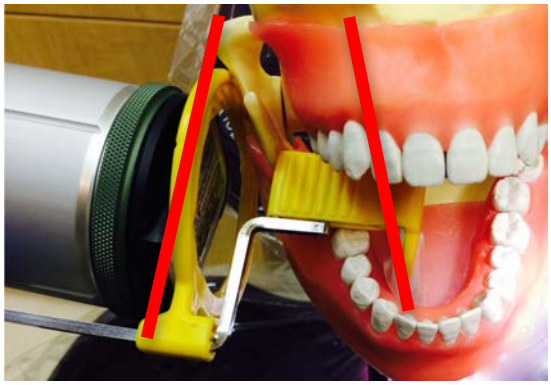
What is parallel?

To understand what parallel means, think about the rails of a train track. No matter the distance or curve of a train track, the rails are always the same distance apart. The rails are parallel.

Look at the photo on the left, the film is placed parallel to the mandibular molars…just like train tracks. The PID is parallel with film. In the photo on the right, the film is not placed parallel to the mandibular molars. The PID is not parallel with film.



PID, teeth, and film are parallel.

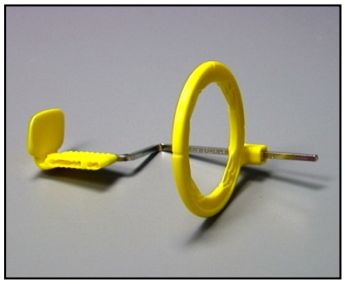


PID, teeth, and film are not parallel.

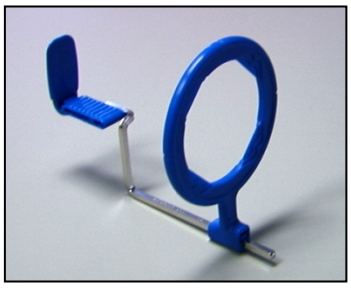
The paralleling technique reduces image distortion. The paralleling technique will be illustrated throughout this chapter.

XCP Film Positioning Devices

Use the yellow XCP for taking radiographs of posterior teeth.



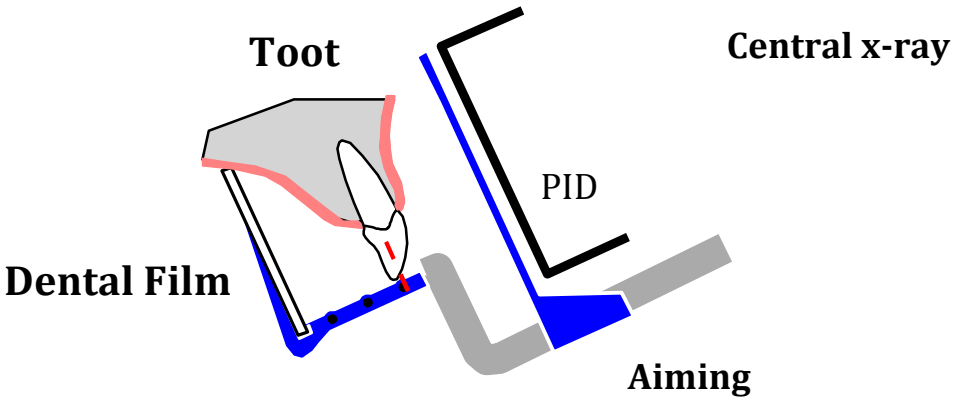
Use the blue XCP for taking radiographs of anterior teeth.



Purposes of film positioning devices:

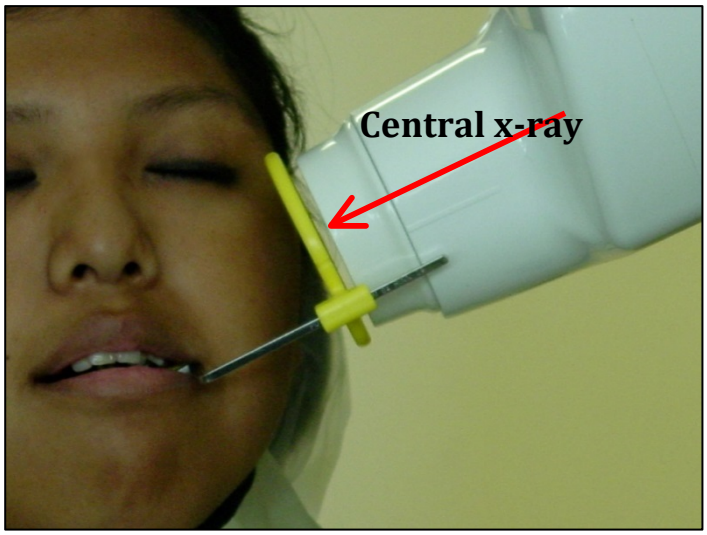
- Used to hold a film in the mouth.
- Keeps the film in position during an exposure.
- Eliminates the need for patient to stabilize film.
- Aligns film, tooth, and aiming ring in a parallel position.

When the PID (cone) is aligned with the aiming ring of the XCP, the central-ray will be perpendicular to the tooth and the dental film.



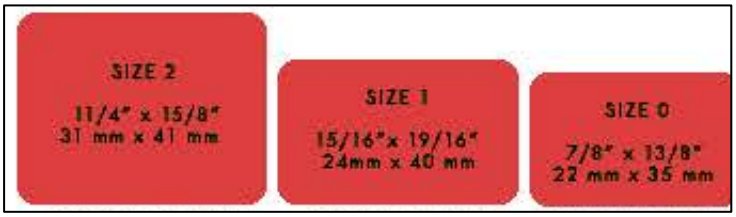
The XCP makes it easier for the operator to determine vertical and horizontal angulation for radiographs. It simplifies X-ray beam alignment, and you get radiographs with no distortion.

Tip: It is critical you know how to correctly place the film in the mouth to assure diagnostic radiographs.



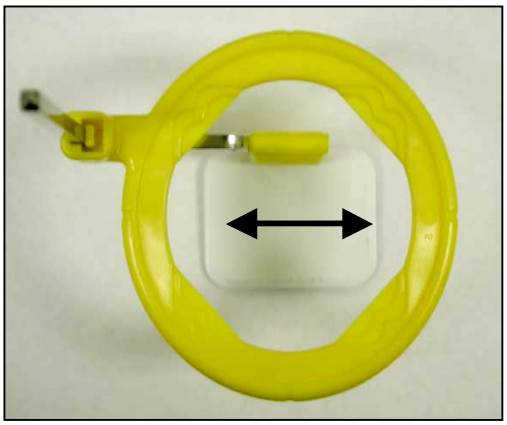
Film

For taking periapical radiographs on most adult patients, you need size 2 film for posterior areas, and size 1 or 2 for anterior areas. For children with small mouths, you will need size 0 film. However, if the child's mouth is large enough to accommodate size 1 or 2 film, and the child is cooperative, use the larger size film.

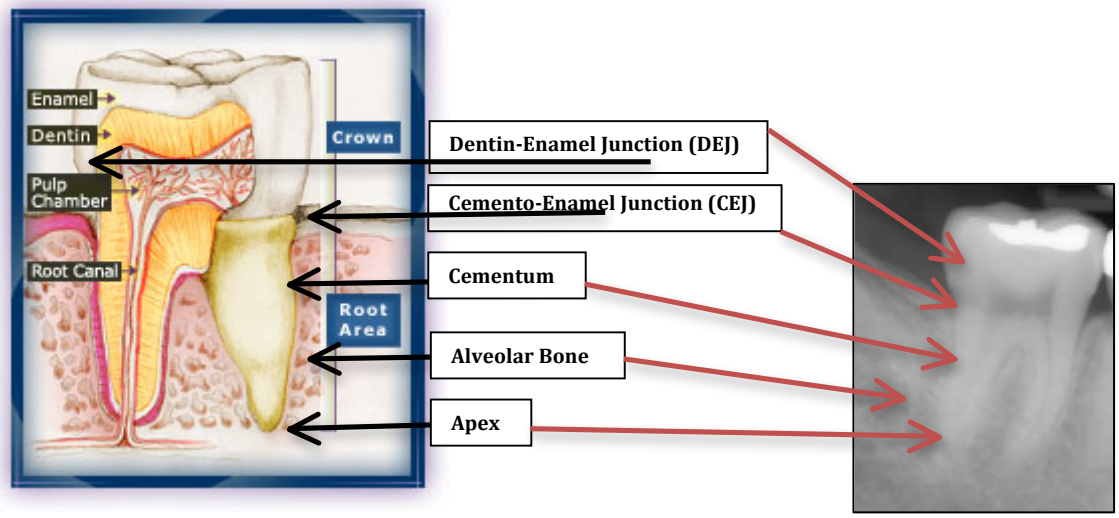


Film is placed in the biteblock of the XCP so that the white side (front) of the film packet faces the teeth. The colored portion (back) of the film is against the biteblock.

When the film is positioned correctly in the XCP, you can look through the ring and see the white side of the film packet centered in the opening.



Now would be a good time to briefly review key dental anatomy terms that are helpful when taking dental images.



- **Alveolar bone:** thickened ridge of bone that contains the tooth sockets.
- **Apex:** the tip of a root. The plural for apex is **apicies**.
- **Cementum:** very thin layer that covers the roots.
- **Cemento-Enamel Junction (CEJ):** the place where the root and crown meets.
- **Crown**: part of the tooth above the gum line that is covered by enamel.
- **Dentin**: bone-like substance that makes up most of the tooth. It is found under the enamel in the crown and under the cementum in the root.
- **Dentin-Enamel Junction (DEJ):** area of the crown where the dentin and enamel meet. This is important for diagnosing interproximal caries (decay).
- **Enamel**: covers the crown.
- **Pulp chamber:** found under the dentin, and contains the blood vessels, nerves and connective tissue that provide nutrients to keep the tooth alive.
- **Root:** part of the tooth that extends into the upper (maxilla) or lower (mandible) jaw.

Two basic rules of taking dental radiographs are:

1. The central beam should pass through the area to be examined;
2. The X-ray film should be placed in position so as to record the image with minimal or no distortion.

Using the XCP will help you follow these two rules.

The next section of this chapter shows placement of the film and PID to take diagnostic PA radiographs using the paralleling technique.

Maxillary Molar Periapical (PA) Radiograph

Film Pacement:

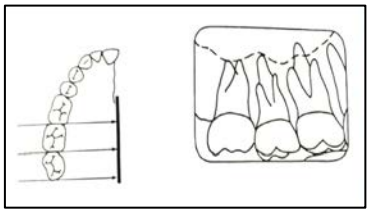
- Center film horizontally in yellow XCP
- Position distally to include all of the molars
- Film should not be touching the teeth

Positioning Indicator Device (PID):

- Place XCP ring as close to face as possible
- Align PID close to XCP ring

Radiograph should show:

- All crowns and roots of molars are visible
- 2-3mm above apicies of molars
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open



Maxillary Premolar Periapical (PA) Radiograph

Film Placement:

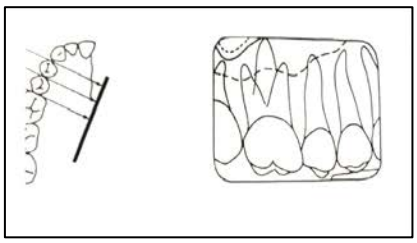
- Center film horizontally in yellow XCP
- Position mesially to include the distal half of the canine
- Film should not be touching the teeth

Positioning Indicator Device (PID):

- Place XCP ring as close to face as possible
- Align PID close to XCP ring

Radiograph should show:

- All crowns and roots of premolars and distal of canine are visible
- 2-3mm above apicies of premolars
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open



Maxillary Canine Periapical (PA) Radiograph

Film Placement

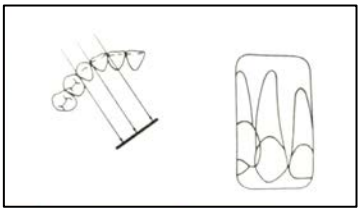
- Center film vertically in blue XCP
- Position directly behind the canine
- Film should not be touching the teeth

Positioning Indicator Device (PID):

- Place XCP ring as close to face as possible
- Align PID close to XCP ring

Radiograph should show:

- Crown and root of canine are visible
- 2-3 mm above apex of canine
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open



Maxillary Incisor Periapical (PA) Radiograph

Film Placement:

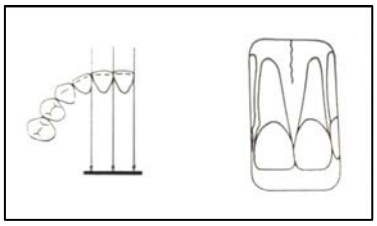
- Center film vertically in blue XCP
- Position directly behind the maxillary centrals
- Film should not be touching the teeth

Positioning Indicator Device (PID):

- Place XCP ring as close to face as possible
- Align PID close to XCP ring

Radiograph should show:

- All crowns and roots of central incisors are visible
- 2-3mm above apicies of central incisors
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open



Mandibular Molar Periapical (PA) Radiograph

Film Placement:

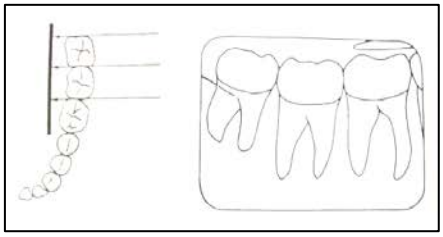
- Center film horizontally in yellow XCP
- Position distally to include the 3rd molar region
- Place film closer to the teeth because the floor of the mouth is deeper

Positioning Indicator Device (PID):

- Place XCP ring as close to face as possible
- Align PID close to XCP ring

Radiograph should show:

- All crowns and roots of molars are visible
- 2-3mm below apicies of molars
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open



Mandibular Premolar Periapical (PA) Radiograph

Film Placement:

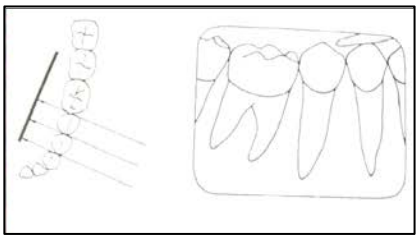
- Center film horizontally in yellow XCP
- Position to include the distal half of the canine
- Push back the tongue, and align the film parallel with the teeth

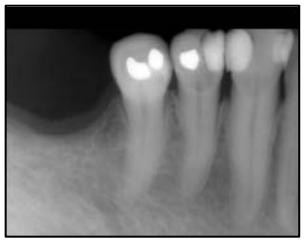
Positioning Indicator Device (PID):

- Place XCP ring as close to face as possible
- Align PID close to XCP ring

Radiograph should show:

- All crowns and roots of premolars and distal of the canine are visible
- 2-3mm below apicies of premolars
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open





Mandibular Canine Periapical (PA) Radiograph

Film Placement:

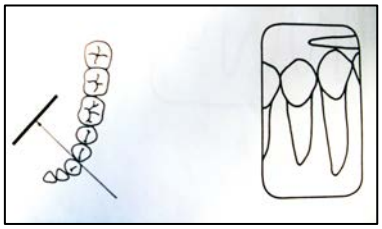
- Center film vertically in blue XCP
- Position behind the canine with bottom edge under the tongue
- Push back the tongue, and align the film parallel with the teeth

Positioning Indicator Device (PID):

- Place XCP ring as close to face as possible
- Align PID close to XCP ring

Radiograph should show:

- Crown and root of canine are visible
- 2-3mm below apex of the mandibular canine
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open



Mandibular Incisor Periapical (PA) Radiograph

Film Placement:

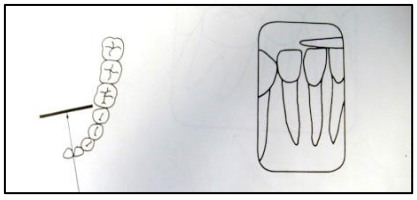
- Center film vertically in blue XCP
- Position directly behind central incisors with bottom edge under the tongue
- Push back the tongue, and align the film parallel with the teeth

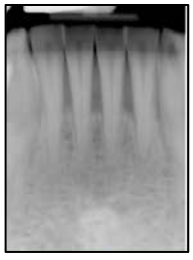
Positioning Indicator Device (PID):

- Place XCP ring as close to face as possible
- Align PID close to XCP ring

Radiograph should show:

- All crowns and roots of central incisors are visible
- 2-3 mm below apicies of the mandibular incisors
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open





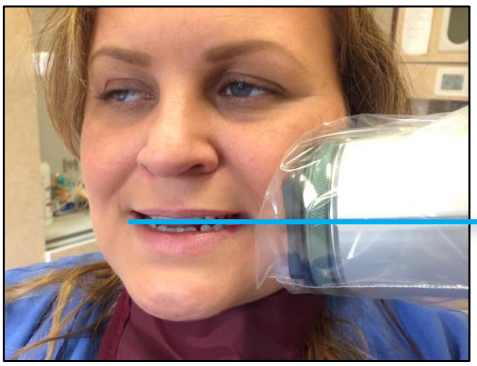
Bitewing Radiographs

BW images should show:

- All crowns for the maxillary and mandibular molars are visible
- Interproximal alveolar crest, and surrounding bone region
- Level occlusal plane
- Contact areas open

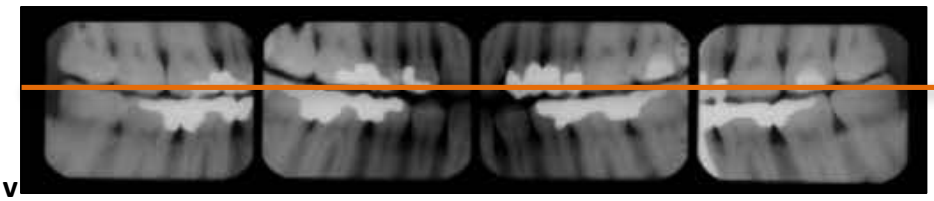
Patient Positioning

The patient's head needs to be positioned so the chin is parallel to the floor. The PID usually has a line on the side. That line should line up with the occlusal plane.



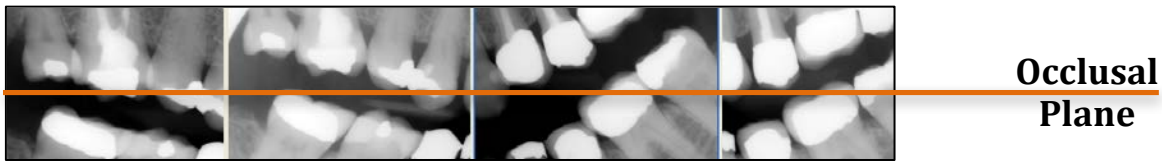
Level Occlusal Plane

For bitewing radiographs, maxillary and mandibular arches should show an equal amount from the occlusal plane.



v

Correct: You want to see an equal amount of maxiliary and mandibular arches..



Incorrect: You are not able to see an equal amount of maxiliary and mandibular arches.

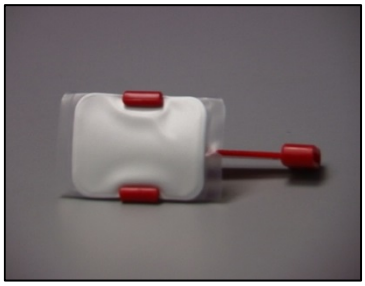
Tip: Remember to look into a patient's mouth before taking a radiograph. Teeth may be crowded or rotated. You will have to adjust for individual differences.

Taking Bitewing Radiographs Using XCP

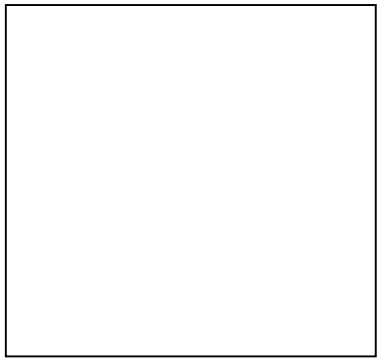
You use the red XCP for bitewing radiographs.

Film Placement for Bitewings

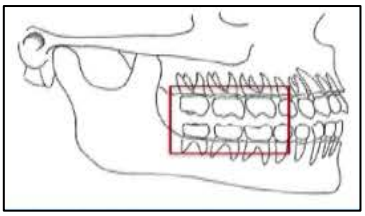
Place the film horizontally in the biteblock. The front (white) side of the film packet faces the lingual surfaces of the teeth. The back (colored) side of the film packet is placed against the biteblock.



When you look through the ring, you should see the white side of the film packet centered in the opening. The film should be placed in the holder so the distance from the front edge to the back edge of the film is the same.



Molar Bitewing (BW) Images Using XCP



Film Placement:

- Center horizontally
- Position distally to include the last erupted tooth in the arch
- Place front edge of the film at the distal of 2nd premolar

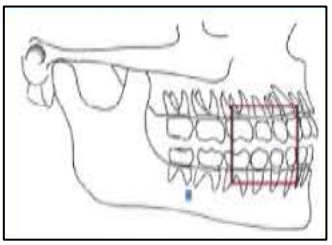
Positioning Indicator Device (PID):

- Place XCP ring close to patient's face, and PID close to XCP ring
- Central ray directed between maxillary first and second molars
- The middle of PID is placed at the occlusal surface

Image should show:

- All crowns for the maxillary and mandibular molars are visible
- The distal of the 2nd molar and distal of the 2nd premolar should be visible
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open
- Level occlusal plane

Premolar Bitewing Image Using XCP



Film Placement:

- Center horizontally
- Front edge includes the distal of the canine
- Place front edge of the film across to the opposite arch anteriors

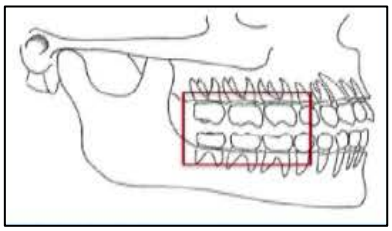
Positioning Indicator Device PID)

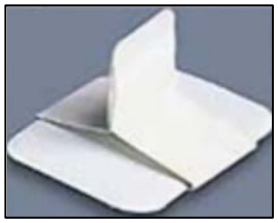
- Place XCP ring close to patient's face, and PID close to XCP ring
- Central ray directed between first and second premolars
- The middle of PID is placed at the occlusal surface

Image should show:

- All crowns for the maxillary and mandibular premolars are visible
- The distal of the mandibular canine is visible
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open
- Level occlusal plane

Molar Bitewing Image Using BW Tabs





Film:

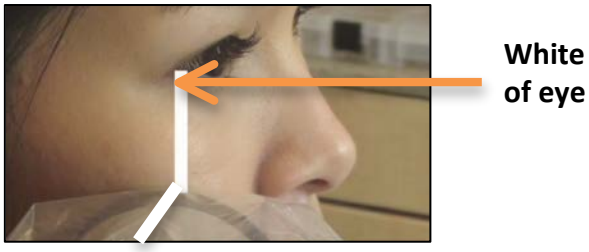
- Center horizontally
- Position distally to include the last erupted tooth in the arch
- Place front edge of the film at the distal of 2nd premolar

Positioning Indicator Device (PID):

- Central ray directed between maxillary first and second molars
- The middle of PID is placed at the occlusal surface
- Angle PID at positive 8-10 degrees vertical

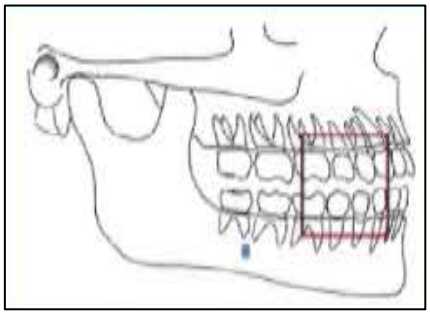
Image should show:

- All crowns for the maxillary and mandibular molars are visible
- The distal of the 2nd molar and distal of the 2nd premolar should be visible
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open
- Level occlusal plane



Tip: Put yourself at the back of the PID and look at the line on the PID. For molar bitewings, the front edge of the PID should be placed over the corner of the mouth to prevent cone cuts. The central ray marker on the PID should be lined up with the white part of the patient's eye. This will help to open up the contacts between the molar teeth.

Premolar Bitewing Image Using BW Tabs



Film:

- Center horizontally
- Front edge includes the distal of the canine
- Place front edge of the film across to the opposite arch anteriors

Positioning Indicator Device (PID):

- The middle of PID is placed at the occlusal surface
- Central ray directed between first and second premolars
- Angle PID at positive 8-10 degrees vertical

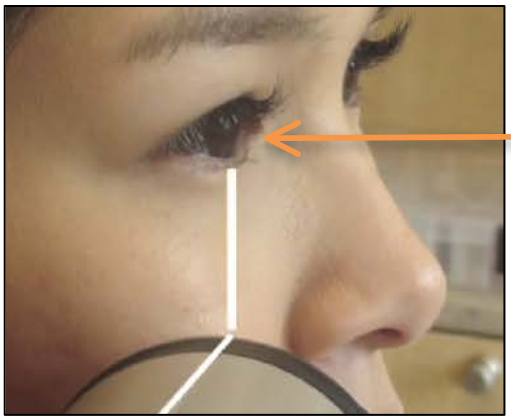
Image should show:

- All crowns for the maxillary and mandibular premolars are visible
- The distal of the mandibular canine is visible
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open
- Level occlusal plane

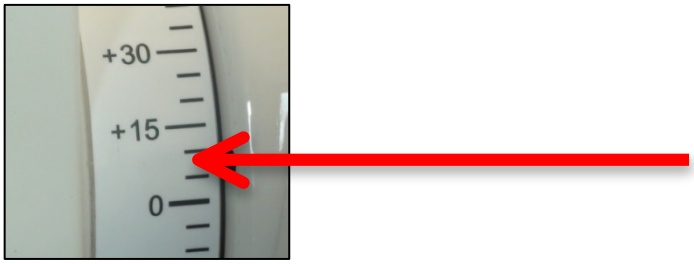
Tip: To obtain the distal of the canine in the image, angle the anterior edge of the film across to the opposite arch anteriors.

Tip: Put yourself at the back of the PID and look at the line on the PID. For premolar bitewings, the front edge of the PID should be placed over the ala of the nose to prevent cone cuts.

Tip: The central ray marker on the PID should be lined up with pupil of open the contacts between the premolar teeth.



Tip: Remember, if you do not use XCP when taking premolar and molar bitewings, the vertical angulation should be positive 8-10 degrees.


+30
+15
0

Whether using the XCP or tabs, diagnostic bitewing radiographs show the following characteristics:

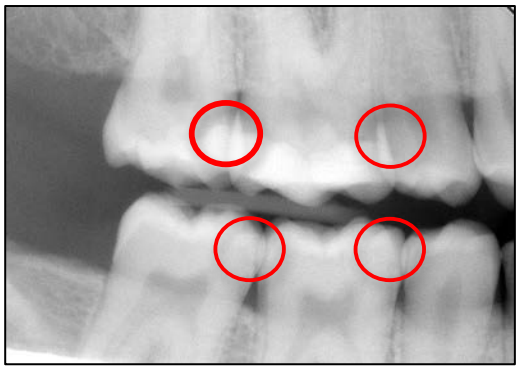
- Good contrast and density
- No image distortion
- No overlapping

Diagnostic BW image

What is overlapping?

Overlapping looks like there is no space between the teeth or like one tooth is covering another tooth. If an image shows overlapping interproximal contacts, it is not very useful to diagnose dental disease.

Look at these bitewing radiographs. See if you can see any overlapping.

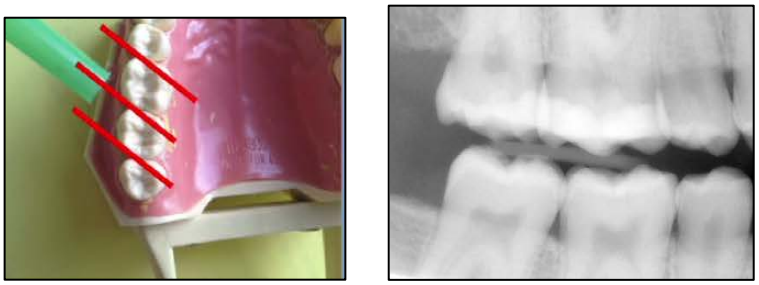


Red circles show overlapping.

Green circles show open contacts.

How does overlapping happen?

Overlapping happens when X-rays are not properly directed through the interproximal spaces or structures.



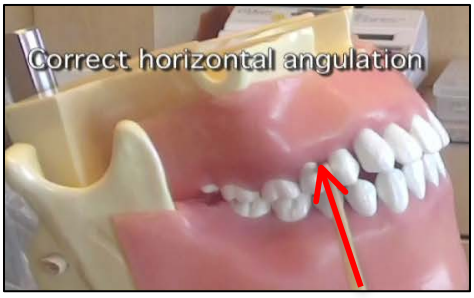
Incorrect horizontal angulation causes overlapping.

Correct horizontal angulation results in no overlapping.

To visualize where to direct the central ray, look at these photographs of typodonts with red arrows.

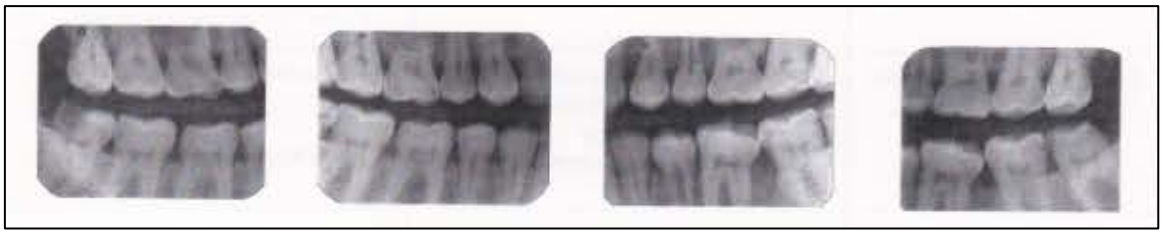
- Molar bitewings: the central ray is directed through the contact areas between the maxillary first and second molars.
- Premolar bitewings: the central ray is directed through the contact areas between the maxillary first and second premolars.

Molar Bitewing



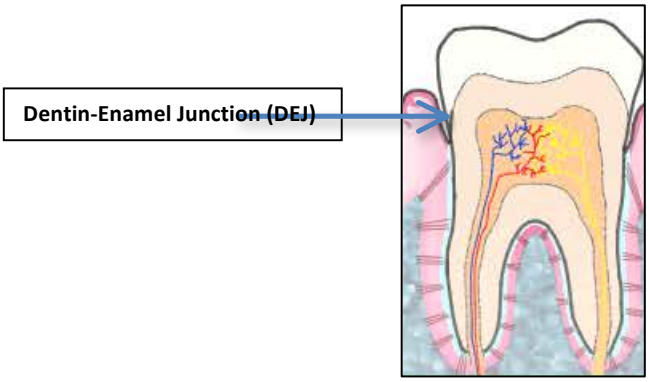
Premolar Bitewing

This set of bitewing images discloses no overlapping in the region of the mouth under study.



How does overlapping happen?

Overlapping happens when X-rays are not properly directed through the interproximal spaces or structures. If interproximal areas are slightly overlapped, the radiograph may still be diagnostic. However, you must be able to see the DEJ (dentin-enamel junction) of each tooth.

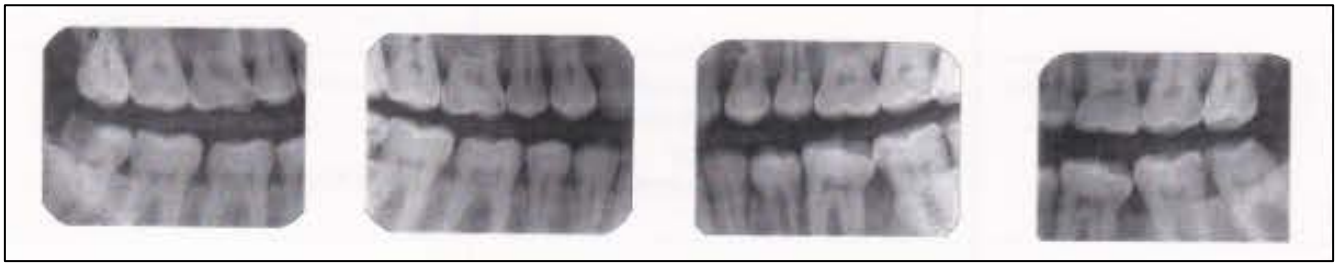


When using the XCP, errors can occur by improper horizontal alignment of the film. These errors can be avoided by placing the PID in alignment with the teeth so that the central ray travels directly through the contact area.

When using BW tabs, it is important to learn how to direct the central ray between specific teeth to get all the contacts open. Some PIDs may have a line on them to mark

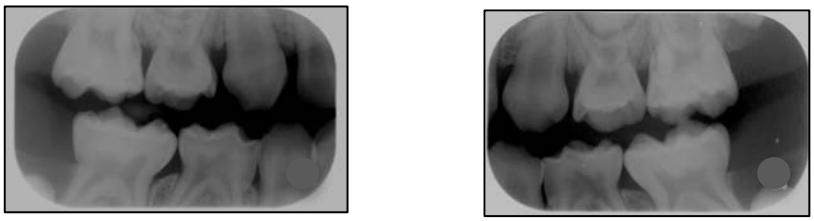
the central ray or you can look down the PID and imagine a line down the center of the cone.

For adult patients, it is recommended that premolar and molar radiographs are taken on each side. The premolar bitewing should include the distal of the canine. The molar bitewing should include the distal part of the second premolar and include the distal of the 2nd molar.

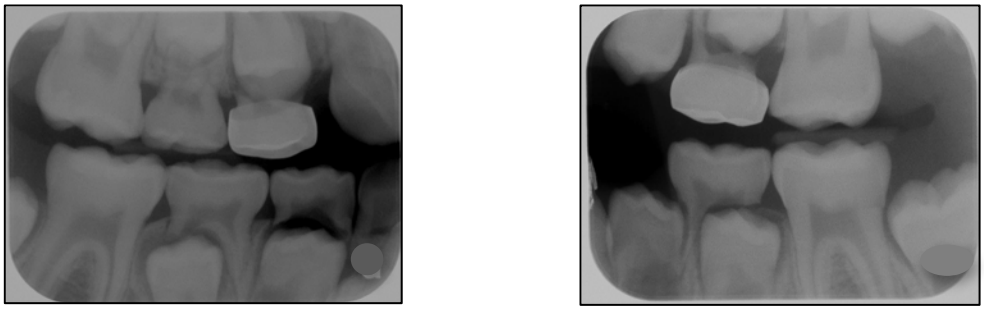


For younger children with primary teeth, use #0 or #1 film, and take one bitewing on each side. For mixed dentition (if first molar is present), use #2 film, and take one bitewing on each side.

Size 0 Film



Size 2 Film



Here are a few questions to check your understanding about taking quality bitewing images.

1.What causes overlapping?

a. incorrect horizontal angulation
b. improper vertical angulation
c. not removing a patient's partial

2. The central ray should be directed between which teeth when taking a premolar bitewing?

a. canine and first premolar on the maxillary
b. first and second premolar on the maxillary
c. second premolar and first molar on the mandible

3.What is the correct position of the patient's head when taking bitewings?

a. chin extended up towards the ceiling
b. chin down towards the chest
c. chin parallel with the floor

4. The central ray should be directed between which teeth when taking a molar bitewing?

a. first and second molars on the maxillary
b. first and second premolar on the maxillary
c. second premolar and first molar on the mandible

Answers to Quiz

1. a. Incorrect horizontal angulation will cause overlapping. The central ray must be directed through the interproximal spaces or contacts for the radiograph to be diagnostic.
2. b. The central ray should be directed through the premolars on the maxillary for the contacts to be open when taking a premolar bitewing.
3. c. The patient's chin should be parallel with the floor to assist in getting the correct angulation. This is especially important if you are not using an XCP.
4. a The central ray should be directed through the first and second molars on the maxillary for the contacts to be open when taking a molar bitewing.

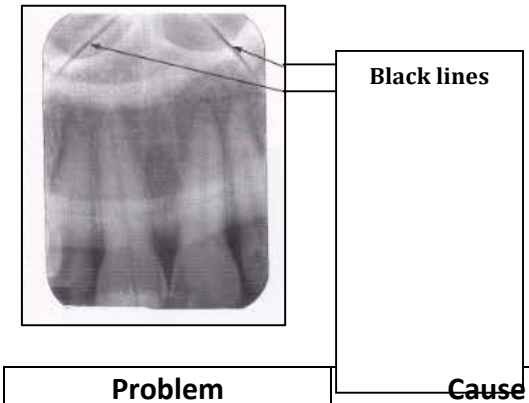
Radiograph Technique Errors

It is important to determine the cause of an error so you can correct your technique and prevent it from happening again.

Blurred Image

Problem	Cause	How to Correct
The image on this radiograph is blurred. The image is said to be distorted.	Blurring is caused by movement of the film, the patient, or the X-ray head during exposure.	Make sure the film is stable, and the X-ray head is not moving. Ask the patient not to move during the exposure. If there is no movement, there should be no blurring.

Black lines or streaks over the tooth image



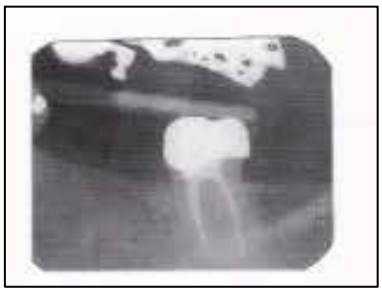
Problem	Cause	How to Correct
A radiograph with dark lines may not be useful because it changes the image under study.	Lines or streaks can happen when a film is sharply bent before or during film placement.	Avoid sharply bending the film. Use a film positioning device. This will reduce the need for bending films.

Double image

Problem	Cause	How to Correct
The images on the radiograph overlap each other.	A double image can result from accidentally exposing the same film twice.	It is a good idea to put exposed films in a different place than unexposed films.

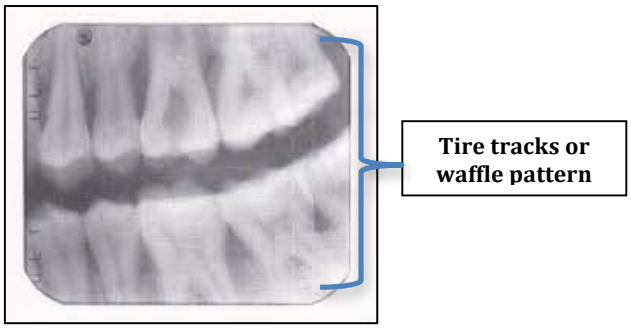
Tip: Place exposed films on a paper towel or in a paper cup. This keeps them away from unexposed films, and they are less likely to get mixed up.

Superimposed image



Problem	Cause	How to Correct
Teeth are not clearly visible because of white, superimposed images.	The patient's partial denture was left in the mouth during the exposure.	Be sure to examine the patient's mouth before taking a radiograph. Have the patient take out any removable appliances like dentures, partials, and orthodontic retainers.

Image is too light



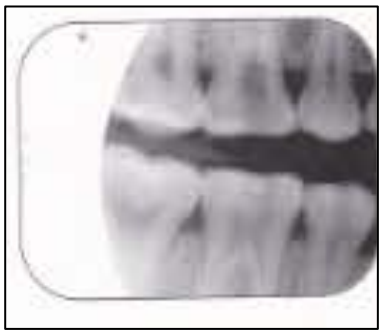
Problem	Cause	How to Correct
Tire tracks or waffle pattern appear on a radiograph.	The backside of the film packet was placed next to the teeth. The tire tracks are from the lead layer in the film packet.	Be careful when placing the film packet in a patient's mouth. The white side of the film packet should be placed next to the teeth. The back of the film is against the biteblock.

No image on radiograph

Problem	Cause	How to Correct
The film is clear. Nothing is on the radiograph.	No X-rays exposed the film.	Be sure X-ray unit is on when taking radiographs. Keep exposed and unexposed film separate.

What is a cone cut?

Cone cuts appear as a clear area on traditional radiographs after processing, due to the lack of x-ray exposure in the area of the cone cut.



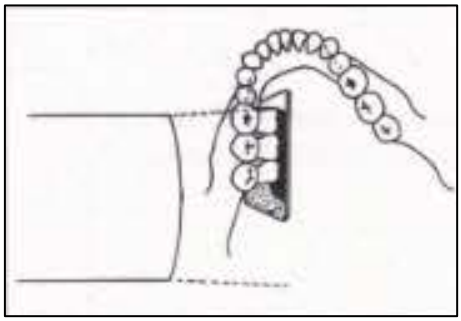
How does a cone cut happen?
This happens because the PID is not correctly positioned relative to the film. The beam of X-rays does not completely cover the film.

The shape of the PID cut depends on the type used when exposing the film. For example, if a round PID is used, a curved cone cut will appear. Square cone cuts occur when using a rectangular PID. To correct this error, the PID should completely cover the dental film.

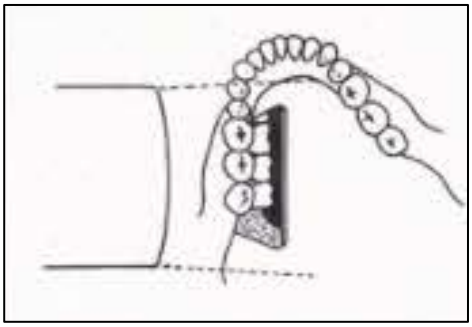
Remember to be careful when assembling the XCP to make certain that the entire dental film can be seen while looking through the indicator ring.

How does a cone cut happen?

This happens because the PID is not correctly positioned relative to the film. The beam of X-rays does not completely cover the film.



Cone cut



No cone cut

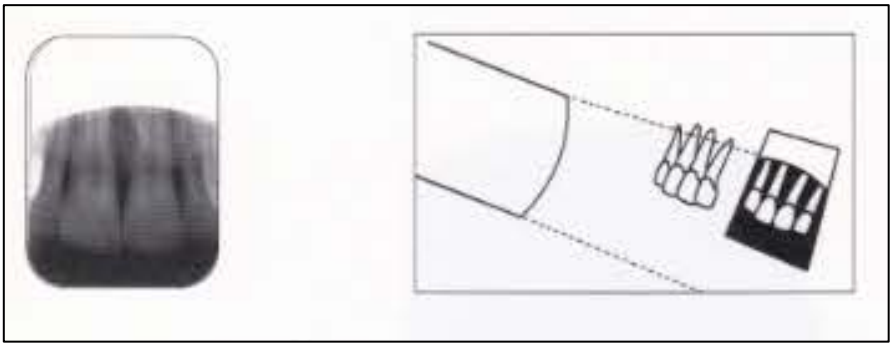
Tip: Always check to see if the beam of X-rays completely covers the film.

Anterior periapical radiographs can also have cone cuts if the proper technique is not used. This radiograph is not diagnostic because the apices of maxillary central and lateral incisors cannot be seen

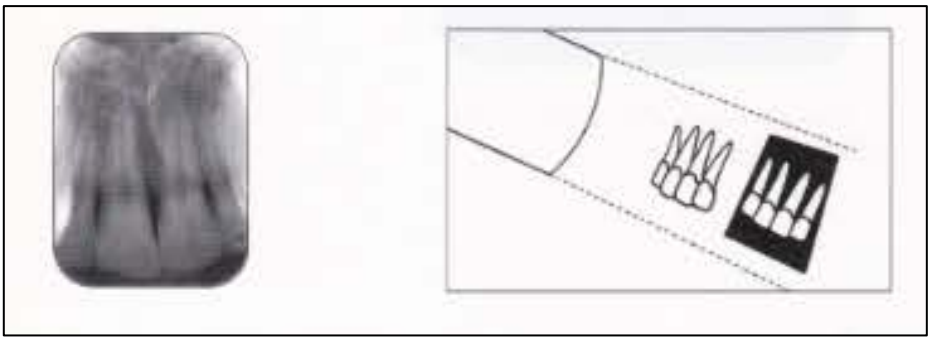
Maxillary anterior PA with cone cut

How does this happen?

The image shows a cone cut because the PID was directed at the incisal edge instead of the middle third of the teeth.



There would have been no cone cut if the PID had been correctly positioned.



Tip: Using a XCP would help eliminate cone cutting.

What happens if you have a cone cut, but not under the area of study?

You have been asked to take a maxillary anterior PA so the dentist can examine the apical area of the central incisors.

Here are three radiographs. Would they be considered useful for diagnosis?

If the cone cut is the only technique error, and the area under study is shown on the image, the radiograph may be diagnostic. The root and apical areas can be seen. The density and contrast are good. The images would probably not need to be retaken.

BUT

The cone cut indicates that you need more practice to visualize where the PID and the X-rays are in relation to the film. The X-rays must completely cover the film or you will get a cone cut.

Now let's look at another periapical radiograph. What do you think about the diagnostic value of this radiograph?

The X-rays completely covered the film, so there is no cone cut. You can see the apicies, teeth and surrounding area. The contrast and density are good. There is no distortion of the image. The size of the teeth and the image of the teeth are approximately the same. This would be considered a diagnostic radiograph.

This chart summarizes typical technique errors and how you can correct them.

Technique Errors, Causes, and Corrective Action

Technique Errors	Causes	How to Correct
Image elongated	For maxillary teeth - Too much negative vertical angulation For mandibular teeth - Too much positive vertical angulation	-Adjust vertical angulation -Use film positioning device
Image foreshortened	For maxillary teeth - Too much positive vertical angulation For mandibular teeth - Too much negative vertical angulation	-Adjust vertical angulation -Use film positioning device
Overlapped contacts	Incorrect horizontal angulation	Adjust horizontal angulation so central ray is aimed through contacts
Cone cut	Improper PID placement	-Align PID to cover film -Use film positioning device
Cone cut with no apex	-Incorrect film position -Patient not biting on film positioning device -Incorrect vertical angulation	-Use film positioning device -Adjust vertical angulation
Blurred image	Patient, film, or PID moved	-Instruct patient to hold still -Stabilize film with film positioning device -Do not expose film if X-ray head is moving
Occlusal plane on bitewings runs diagonal across film	Incorrect film position	-Have patient bite on bitewing tab so occlusal plane is straight across film -Position bitewing tabs horizontal -Have patient's chin parallel with floor

Here are some ideas to help you when taking radiographs.

Be prepared

- Set up the operatory with assembled XCP and dental films.
- Seat and inform the patient about the number of x-rays you will be taking.
- Remove the patient's glasses and any removable appliances.
- Raise or lower the chair to accommodate the operator.
- Place the lead apron and secure the thyroid collar.
- Adjust the headrest to stabilize the patient's head.
- Establish an exposure routine to prevent errors and use time efficiently.

What is an exposure routine?

- When taking a full series, start with the maxillary right molar, and move across the maxillary arch to the left molar. Then, you can drop down to the mandibular left molar, and move across the mandibular arch to the right molar.
- When taking a bitewing series, start with the right side and take the molar and premolar bitewings, then take the left side molar and premolar bitewings.
- If you have a patient with a strong gag reflex, begin with the anterior films and work your way back in the mouth. This sequence allows the patient to get used to the procedure with a minimum of discomfort, and helps to avoid stimulation of the gag reflex.

Gagging

- Be confident and understanding.
- Move quickly so the film is not in the mouth for longer than necessary.
- Try to distract the patient.
- Have patient breathe deeply through the nose or wiggle his/her toes.

Use of cotton rolls

- Place the cotton roll on the opposite arch from the one being radiographed.
- May be used in any area of the mouth to help support the biteblock.
- Make it more comfortable for the patient to bite.
- Place cotton roll in the place of a missing tooth.

Cotton roll used when taking anterior PA

Cotton roll placement when tooth is missing

This completes Chapter 3: Radiographic Techniques. You are now ready to test your understanding of the information you learned.