Chapter 3  
Dental Imaging Techniques

Digital dental images, when used with the patient’s case history and clinical examination, are one of the most important diagnostic aids available to the dentist. Diagnostic images 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 images. Below is an illustration of a diagnostic full-mouth series which consists of 14 periapical (PA) images and 4 bitewing (BW) images. The PA images are outlined in yellow. The BW images are outlined in blue.
**Bitewing (BW) Images** show details of the upper and lower teeth in one area of the mouth. Each bitewing shows a tooth from its crown to about the level of the supporting bone. Bite-wings are used to detect decay between teeth and changes in bone loss caused by periodontal (gum and bone) disease.

![Bitewing (BW) Image](image)

**Periapical (PA) Images** 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 periapical image shows the full tooth dimension and includes all the teeth in one portion of either the upper or lower jaw. Periapical images are used to detect any abnormalities of the root structure and surrounding bone structure.

![Periapical (PA) Image](image)

There are two types of techniques used for periapical images: the 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 gland.
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 an image.

The goal in dental imaging is to use techniques that require the least amount of radiation exposure to produce images with the right amount of density and contrast.

Examples of diagnostic PAs with good density and contrast

Example of a diagnostic bitewing series 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 receptor. Tooth enamel and amalgams look white (radiopaque).

Tissues and bone are less dense and allow more X-rays to reach the receptor. 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 an image, 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.
Differences in density give the contrast needed in a diagnostic image.

This is an example of a diagnostic bitewing series with good density and contrast.

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

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>How to Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image too dark</td>
<td>kV too high</td>
<td>-Reduce kV</td>
</tr>
<tr>
<td></td>
<td>Exposure time too long</td>
<td>-Reduce exposure time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Machine may need calibration (trained factory service person must check)</td>
</tr>
<tr>
<td>Image too light</td>
<td>kV too low</td>
<td>-Increase kV</td>
</tr>
<tr>
<td></td>
<td>mA too low</td>
<td>-Increase exposure time</td>
</tr>
<tr>
<td></td>
<td>Not enough exposure time</td>
<td>-Hold button down for entire exposure</td>
</tr>
<tr>
<td></td>
<td>X-ray source too far from patient</td>
<td>-Place the XCP ring close to patient’s face and the PID close to XCP ring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Increase mA (if unit is able to be adjusted)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Increase exposure time if indicated by size of patient</td>
</tr>
<tr>
<td>No image</td>
<td>X-ray unit is not turned on</td>
<td>-Check on/off switch</td>
</tr>
<tr>
<td></td>
<td>Short circuit</td>
<td>-Check for electrical problems</td>
</tr>
<tr>
<td></td>
<td>Receptor never exposed</td>
<td>-Check that unit and computer are turned on, and template is selected and acquired</td>
</tr>
</tbody>
</table>
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 images. See if you see any distortion.

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

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

C: **No significant image distortion** - The size of the tooth and the image 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 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 images with no distortion.

When using the XCP, it is important to keep the patient’s chin parallel to the floor, and place the receptor 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 receptor is placed parallel to the mandibular molars...just like train tracks. The PID is parallel with receptor. In the photo on the right, the receptor is not placed parallel to the mandibular molars. The PID is not parallel with receptor.

PID, teeth, and receptor are parallel. PID, teeth, and receptor are not parallel.

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

Use the yellow XCP for taking images of posterior teeth. Use the blue XCP for taking images of anterior teeth.

**Purposes of receptor positioning devices:**
- Used to hold a receptor in the mouth.
- Keeps the receptor in position during an exposure.
- Eliminates the need for patient to stabilize receptor.
- Aligns receptor, tooth, and aiming ring in a parallel position.

When a receptor is positioned correctly in a patient’s mouth, it will be as parallel as possible to the teeth you want in the image. See in the illustration below how the receptor, tooth and PID are parallel to each other. The central X-ray beam is then directed through the area to be examined.
Digital Sensors and Phosphorous Storage Plates

Digital receptors are available in sizes comparable to traditional dental film. Rigid digital sensors are typically available in sizes 0, 1, and 2. Phosphorous storage plates (PSP) are available in sizes 0, 1, 2, 3, and 4.

Examples of Size 1 and Size 2 sensors used for taking periapical and bitewings images.

Purpose and Size of Sensors and PSPs

- Size 0 sensors are usually used for bitewing images on children.
- Size 1 sensors are used for children, and for anterior periapical images on adults.
- Size 2 sensors are used with adult patients for posterior periapical and bitewing images, and for occlusal images on children.
- Size 4 sensors are used for occlusal images on adults.
The receptor is placed in the XCP so that the front side faces the teeth. The back of the receptor is against the XCP. Look at the illustration below to see the different sides of a receptor compared with traditional dental film.

<table>
<thead>
<tr>
<th>Top Row: Back of receptors</th>
<th>Bottom Row: Front side of receptors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid Digital Sensor</td>
<td>Dental Film</td>
</tr>
<tr>
<td>Dental Film</td>
<td>PSP</td>
</tr>
</tbody>
</table>

When the receptor is positioned correctly in the XCP, you can look through the ring and see the front side of the sensor or PSP 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 **apices**.
- **Cementum**: very thin layer that covers the roots.
- **Cemento-Enamel Junction (CEJ)**: the place where the root and crown meet.
- **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 for taking dental images:

The central beam should pass through the area to be examined.

And

The X-ray receptor should be placed in a position to produce a digital image with minimal to no distortion.

Using the XCP will help you follow these two rules.

The next section of this chapter shows placement of the receptor and PID to take diagnostic PA images using the paralleling technique.
Maxillary Molar Periapical Image

Receptor:
- Center horizontally in yellow XCP
- Position distally to include all of the molars
- Place toward the middle of the palate and parallel to teeth

Positioning Indicator Device (PID):
- Place XCP ring as close to face as possible
- Align PID close to XCP ring

Image should show:
- All crowns and roots are visible
- 2-3mm above apices of molars
- Interproximal alveolar crest and surrounding bone region
- Contact areas open
Maxillary Premolar Periapical Image

Receptor:
- Center horizontally in yellow XCP
- Position mesially to include the distal half of the canine
- Place toward the middle of the palate and parallel to teeth

Positioning Indicator Device (PID):
- Place XCP ring as close to face as possible
- Align PID close to XCP ring

Image should show:
- All crowns and roots are visible
- 2-3mm above apicies of premolars
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open
Maxillary Canine Periapical Image

Receptor:
- Center vertically in blue XCP
- Position directly behind the canine
- Place toward the middle of the palate and parallel to teeth

Positioning Indicator Device (PID):
- Place XCP ring as close to face as possible
- Align PID close to XCP ring

Image should show:
- All crowns and roots are visible
- 2-3mm above apex of canine
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open
Maxillary Incisor Periapical Image

Receptor:
- Center vertically in blue XCP
- Position directly behind the maxillary centrals
- Place toward the middle of the palate and parallel to teeth

Positioning Indicator Device (PID):
- Place XCP ring as close to face as possible
- Align PID close to XCP ring

Image should show:
- All crowns and roots are visible
- 2-3mm above apicies of central incisors
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open
**Mandibular Molar Periapical Image**

**Receptor:**
- Center horizontally in yellow XCP
- Position distally to include the 3rd molar region
- Push back the tongue, and align the receptor parallel with the teeth

**Positioning Indicator Device (PID):**
- Place XCP ring as close to face as possible
- Align PID close to XCP ring

**Image should show:**
- All crowns and roots are visible
- 2-3mm below apicies of molars
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open
Mandibular Premolar Periapical Image
Receptor:
- Center horizontally in yellow XCP
- Position to include the distal half of the canine
- Push back the tongue, and align the receptor parallel with the teeth

Positioning Indicator Device (PID):
- Place XCP ring as close to face as possible
- Align PID close to XCP ring

Image should show:
- All crowns and roots are visible
- 2-3mm below apicies of premolars
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open

Tip: To obtain the distal of the canine in the image, angle the anterior edge of the receptor across to the opposite arch anteriors.
Mandibular Canine Periapical Image

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

Positioning Indicator Device (PID):
- Place XCP ring as close to face as possible
- Align PID close to XCP ring

Image should show:
- All crowns and roots are visible
- 2-3mm below apex of the canine
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open
Mandibular Incisor Periapical Image

Receptor:
- Center vertically in blue XCP
- Position direct behind central incisors with bottom edge under the tongue
- Push back the tongue, and align the receptor parallel with the teeth

Positioning Indicator Device (PID):
- Place XCP ring as close to face as possible
- Align PID close to XCP ring

Image should show:
- All crowns and roots are visible
- 2-3mm below apicies of the mandibular incisors
- Interproximal alveolar crest, and surrounding bone region
- Contact areas open
Bitewing (BW) Images

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 images, maxillary and mandibular arches should show an equal amount from the occlusal plane. The BW image should show both the maxillary and mandibular teeth and bone.

Correct

Incorrect

Tip: Remember to look into a patient’s mouth before taking an image. Teeth may be crowded or rotated. You will have to adjust for individual differences
Molar Bitewing (BW) Images Using XCP

Receptor Placement:
- Center horizontally
- Position distally to include the last erupted tooth in the arch
- Place front edge of the receptor 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

Receptor Placement:
- Center horizontally
- Front edge includes the distal of the canine
- Place front edge of the receptor 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
Using Plastic or Paper BW tabs for BW Images

Place the tab on the sensor or PSP.

Examples of sensors with adhesive bitewing tabs

BW tab loop on sensor  PSP with bitewing tab

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Molar Bitewing Image Using BW Tabs

**Receptor:**
- Center horizontally
- Position distally to include the last erupted tooth in the arch
- Place front edge of the receptor 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.

Tip: 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

Receptor:
- Center horizontally
- Front edge includes the distal of the canine
- Place front edge of the receptor 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 receptor 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 the eye to 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.
Whether using the XCP or tabs, diagnostic bitewing images 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.
If interproximal areas are slightly overlapped, the image may still be diagnostic. However, you must be able to see the DEJ (dentin-enamel junction) of each tooth. You may remember the DEJ is the area of the crown where the dentin and enamel meet. The DEJ is important for diagnosing interproximal caries (decay).

This set of bitewing images below discloses slight or no overlapping. The bitewings show slight cone cuts, but not in the area under study, and illustrate how difficult it may be to obtain a perfect bitewing image using a receptor.

For adult patients, it is recommended that premolar and molar images 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 receptor or PSP, and take one bitewing on each side. For mixed dentition (if first molar is present), use #2 receptor or PSP, and take one bitewing on each side.

Child bitewing series

![Size 0 PSP](image1)

![Size 2 PSP](image2)

It is important to review the manufacturer’s instructions for placing PSPs in the computer template. Most PSPs have a symbol (“a,” “o,” “cr”) which helps in identifying correct placement. On the PSPs shown below the “a” must look like an “a” and not a “g” for accurate placement.

![Incorrect Placement of PSP](image3)

![Correct Placement of PSP](image4)

See how #19 could be confused for #30 if not placed in the template correctly. This could compromise patient treatment. The clinic needs to set a protocol specifying where the symbol is always placed for bitewing and periapical images. This will ensure the dentist is viewing the images correctly.

Tip: It is a good practice for you to review a patient’s mouth to confirm accuracy while the patient is in the chair.
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 image 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.
Digital Dental Imaging 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**

Blurring is caused by movement of the sensor, the patient, or the X-ray head during exposure. Make sure the sensor 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.

**Scratched Image**

PSP (phosphor storage plate) can become scratched from operator’s fingernails or laying PSP on the counter or during processing. Careful handling of the PSP can prevent the problem of scratches.

**Missing Apices**

Tip: Sometimes a patient cannot tolerate proper receptor placement. The result is missing apices on the image. Placing the receptor more lingual to the teeth where the palate and floor of the mouth are deeper will make placement easier and more comfortable for the patient.
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. When using digital imaging, the cone cut appears as an opaque area. The cause: the central ray is not aligned over the center of the receptor.

The shape of the cone cut depends on the type of collimator used when exposing the receptor. 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 receptor.

Remember to be careful when assembling the XCP to make certain that the entire receptor 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 receptor. The beam of X-rays does not completely cover the receptor.

![Cone cut](image)

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

Anterior periapical images 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](image)
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.

Here are three digital images. 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, it 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 receptor. The X-rays must completely cover the receptor or you will get a cone cut.

Now let’s look at another digital image. What do you think about the diagnostic value of this image?

The X-rays completely covered the receptor, 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 image.
Here is a chart that summarizes technique errors and how you can correct them.

### Technique Errors, Causes, and Corrective Action

<table>
<thead>
<tr>
<th>Technique Errors</th>
<th>Causes</th>
<th>How to Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image elongated</td>
<td>For maxillary teeth - Not enough vertical angulation</td>
<td>- Adjust vertical angulation</td>
</tr>
<tr>
<td></td>
<td>For mandibular teeth - Not enough vertical angulation</td>
<td>- Use XCP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Image foreshortened</td>
<td>For maxillary teeth - Too much vertical angulation</td>
<td>- Adjust horizontal angulation so central ray is</td>
</tr>
<tr>
<td></td>
<td>For mandibular teeth - Too much vertical angulation</td>
<td>aimed through correct contacts</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overlapped contacts</td>
<td>Incorrect horizontal angulation</td>
<td>- Adjust horizontal angulation so central ray is</td>
</tr>
<tr>
<td></td>
<td></td>
<td>aimed through correct contacts</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cone cut</td>
<td>Improper PID placement</td>
<td>- Align PID to cover receptor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Use XCP</td>
</tr>
<tr>
<td>Cone cut with no apex</td>
<td>- Incorrect receptor position</td>
<td>- Use XCP</td>
</tr>
<tr>
<td></td>
<td>- Incorrect vertical angulation</td>
<td>- Adjust vertical angulation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blurred image</td>
<td>Patient, receptor, or PID moved</td>
<td>- Instruct patient to hold still</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Stabilize receptor with XCP</td>
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<td></td>
<td></td>
<td>- Do not expose image if X-ray head is moving</td>
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<tr>
<td>Scratches in PSP (phosphor</td>
<td>PSP can become scratched from operator’s fingernails or</td>
<td>- Careful handling of the PSP can prevent the</td>
</tr>
<tr>
<td>storage plate)</td>
<td>or laying PSP on the counter or during processing.</td>
<td>problem of scratches.</td>
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<tr>
<td>Occlusal plane on bitewings runs</td>
<td>Incorrect film position</td>
<td>- Have patient bite on bitewing tab so occlusal</td>
</tr>
<tr>
<td>diagonal across image</td>
<td></td>
<td>plane is straight across film</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Position bitewing tabs horizontal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Have patient’s chin parallel with floor</td>
</tr>
</tbody>
</table>
Here are some ideas to help when taking digital images.

Be prepared
• Set up the operatory with assembled XCP and receptor.
• Seat and inform the patient about the number of images you will be taking.
• Remove the patient’s glasses and any removable appliances.
• Raise or lower the chair to accommodate the operator.
• Place and secure the protective apron and/or the thyroid collar.
• Adjust the headrest to stabilize the patient’s head.
• Follow the exposure routine in the computer template to prevent errors and use time efficiently.

What is an exposure routine?
Establish an exposure routine to help you not miss an area.
• Review the computer templates and access the correct template for the image(s) required.
• Begin with the area that is designated by the computer software.

Gagging
• Be confident and understanding.
• Move quickly so the sensor 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 imaged.
• May be used in any area of the mouth to help support the XCP.
• Makes it more comfortable for the patient to hold the sensor.
• 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: Dental Imaging Techniques. You are now ready to test your understanding of the information you learned.