Chapter 7
Special Techniques

This chapter presents information about:

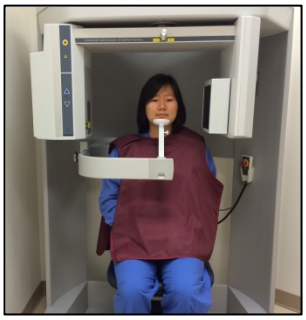
- Panoramic radiographs
- Occlusal radiographs
- Vertical bitewing radiographs
- Digital dental images
- Cone Beam Computed Tomography (CBCT)
- Portable equipment

Panoramic Radiographs

You are not able to see large areas of the jaw or skull on a single bitewing or periapical film. A panoramic radiograph gives a view of the entire maxilla and mandible on a single panoramic film.

Panoramic radiograph

Panoramic radiographs are made with X-ray units that are different from those used to make periapical or bitewing radiographs. The X-ray head of the unit rotates around the patient. The X-rays are always directed at the film.



Patients with different types of panoramic X-ray units

A thyroid collar is not used with panoramic radiographs because it interferes with the angle of the beam during rotation of the unit. The upward angulation of the X-ray beam reduces direct exposure to the patient's thyroid. Most of the rotation of the X-ray head is around the back of the patient's head. It is recommended that a lead apron cover both the front and back of the patient when taking panoramic radiographs.

Patient with protective apron and panoramic X-ray machine

To get better panoramic films, explain to patients what you are doing and why. They will feel more comfortable and be more cooperative.

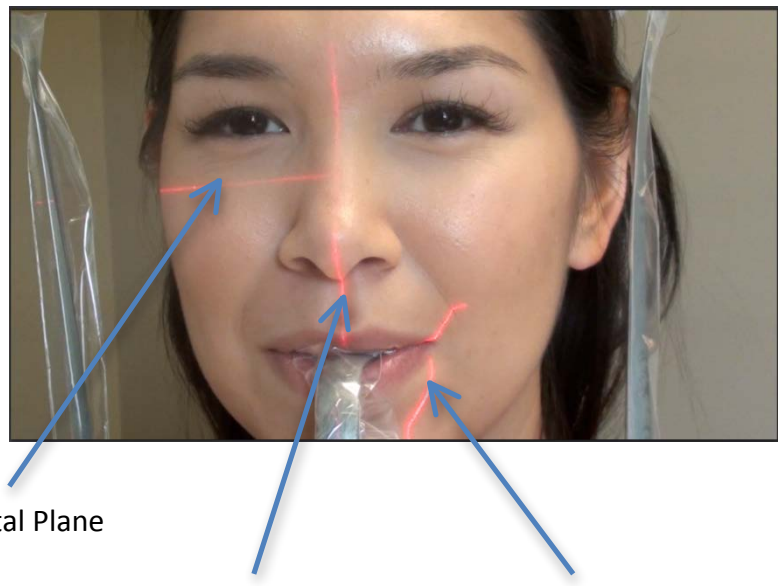
Can you see the patient's glasses and earrings on this panoramic radiograph?

Panoramic film with artifacts

Ask the patient to remove eyeglasses, earrings, hearing aids, neck jewelry, facial and intraoral piercings, partial dentures, retainers, or dentures before taking a panoramic radiograph. These items will block out critical areas in the mouth or cause artifacts. If the patient does not remove these items, the radiograph may have to be retaken. This increases both the patient's and your exposure to radiation.

Parts of a Panoramic Unit

Controls/Positioning Lights



Mid-sagittal Vertical Plane

Focal Trough

How to Take Panoramic Radiographs

Each panoramic unit will have slight differences in directions for taking radiographs based on the manufacturer recommendations. The following are basic steps that almost all units will require when taking a panoramic radiograph.

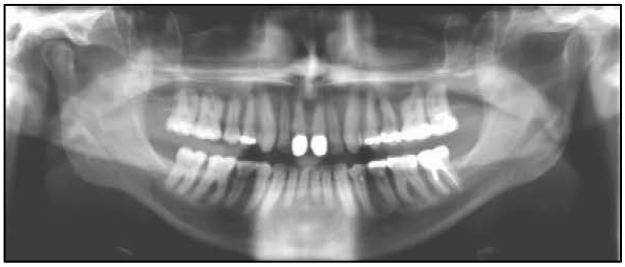
Steps to take a Good Diagnostic Panoramic Radiograph

- Adjust settings on control panel for patient size, type of radiograph, etc.
- Raise or lower the unit so the chin rest is at the appropriate height for the patient
- Have the patient hold the hand grips firmly
- Have the patient bite edge-to-edge on the bite stick
- Have the patient extend their spine and stand tall
- Adjust the controls and/or positioning lights
    - Mid-sagittal vertical plane – this divides the face in half equally
    - Frankfurt horizontal plane – this adjusts the occlusal plane correctly
    - Focal trough (if equipment has this feature)- this focuses the teeth in the anterior region of the image
- Close the temple supports
- Have the patient swallow, placing the tongue on the roof of the mouth and close the lips around the bite stick – this removes shadows on the radiograph
- Double check the control panel settings
- Remind the patient to stand still
- Press the exposure button

How to Take Better Panoramic Radiographs

If a patient has a large upper body, the shoulders could block the arm of the unit. Have patients take a couple of steps forward while holding on to the handles. This will lower the shoulders. To further reduce the height of the shoulders, have the patient cross the arms and grasp the handles. Be sure and recheck the positioning lights after having the patient make these adjustments.

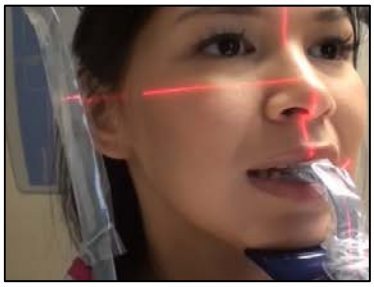
Make sure the patient is standing up straight. This improves the image of the anterior teeth on a panoramic film. If the patient does not stand up straight, the spine will be superimposed over the anterior region of the panoramic radiograph causing loss of clarity in this area.

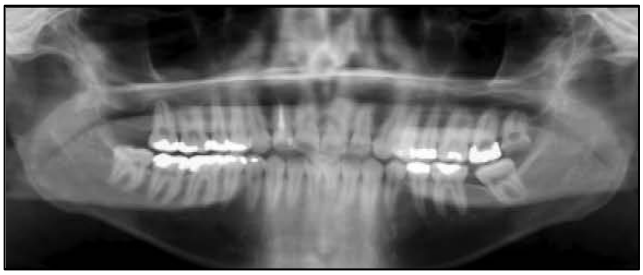


You can help the patient stand tall, by placing a hand at the back of the occipital bone, and gently raising the patient's head.

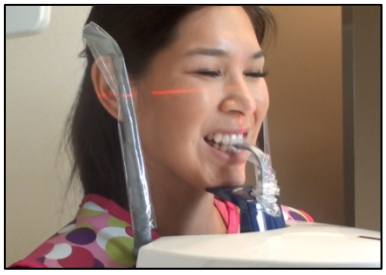
Common Errors When Taking Panoramic Radiographs

If the patient's ***chin is positioned too high***, the occlusal plane will be flat, and cause the radiograph to be stretched, and distorted.



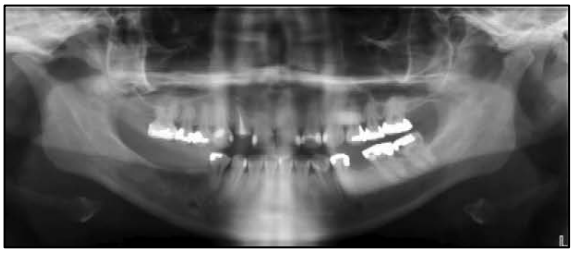


If the patient's ***chin is positioned too low***, it will cause the radiograph to look like a smile. The radiograph will be smaller and distorted especially in the anterior region.

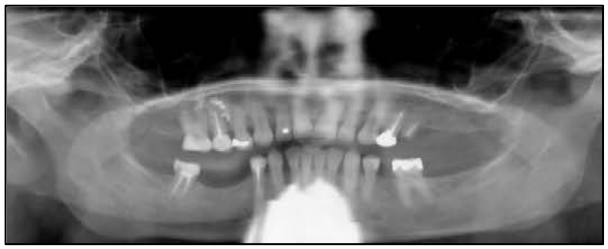


The focal trough is the horseshoe-shaped zone where images appear sharp. Structures outside of the focal trough will be distorted. If the ***focal trough is positioned too far forward***, or the ***patient is biting too forward*** on the bite stick, the anterior teeth will appear narrow and distorted.

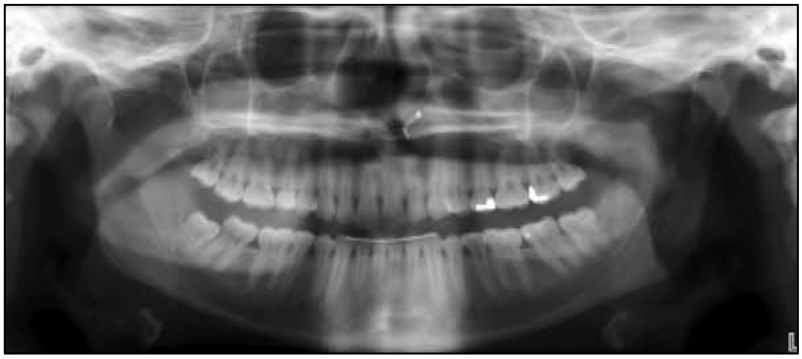
If the ***focal trough is position too far back***, or the patient is ***biting too far back*** on the bite stick, the anterior teeth will appear wide and distorted.



If the ***protective apron is too high*** on the patient's neck or shoulders, it will be superimposed on the radiograph as a solid white V, eliminating visibility in the area.

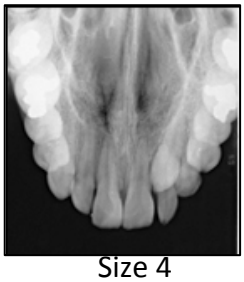


If the patient does not keep the tongue up to the roof of the mouth during the exposure, a dark shadow may appear over the apices of the maxillary teeth. It reduces visibility in this area.



Occlusal Radiographs

An occlusal radiograph shows large areas of the maxilla, mandible, or floor of the mouth. Occlusal radiographs are used to locate root fragments, supernumerary, unerupted, and impacted teeth. They can also be used to determine the nature and the extent of fractures to the maxilla or the mandible.

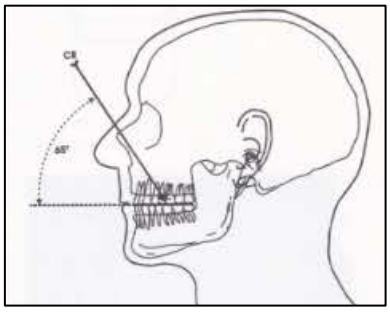


Size 4

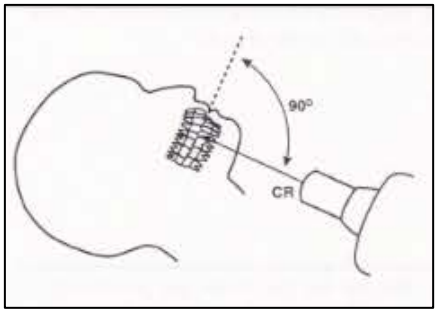
Size 2

Use size 4 film for adults; size 2 film for children. The film is placed in the mouth as if the patient were biting a sandwich. The film should be placed as far back in the mouth as possible without gagging the patient. Remember: If you are using a rectangular collimator, remove it before taking the radiograph to allow a larger exposure area.

For a **maxillary occlusal** radiograph, the patient sits up straight. The film is put toward the maxillary occlusal surfaces. The PID is directed just above the bridge of the nose at 60^0 - 65^0angle.



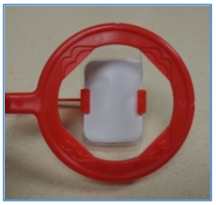
For a **mandibular occlusal** radiograph, the patient tilts back his/her head. The cone is directed through the chin at a 90^0 angle. The patient may also be laid back in a more supine position with the chin up. The cone is directed at 30-35^0 angle perpendicular to the film.



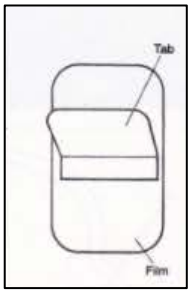
Vertical Bitewing Radiographs

Vertical bitewing radiographs show more of the bone surrounding the teeth. This improves the dentist's ability to evaluate the level of alveolar bone in different areas of the mouth. Vertical bitewings are used to diagnose dental decay and bone loss due to periodontal disease.

You can use the red XCP or tabs to position the film vertically in the patient's mouth.


Film placed in XCP

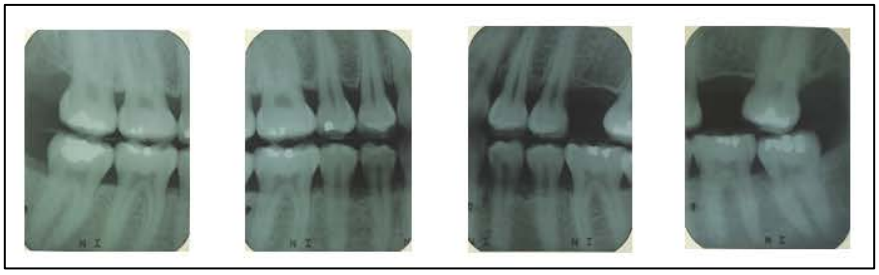

XCP placement for vertical BW



Film with BW tab


Vertical BW radiograph

Size 2 film is used to take vertical bitewing films. Usually premolar and molar bitewings are taken on each side. The techniques for opening contacts and cone placement are similar to taking horizontal bitewing films except the film is put vertically in the mouth.



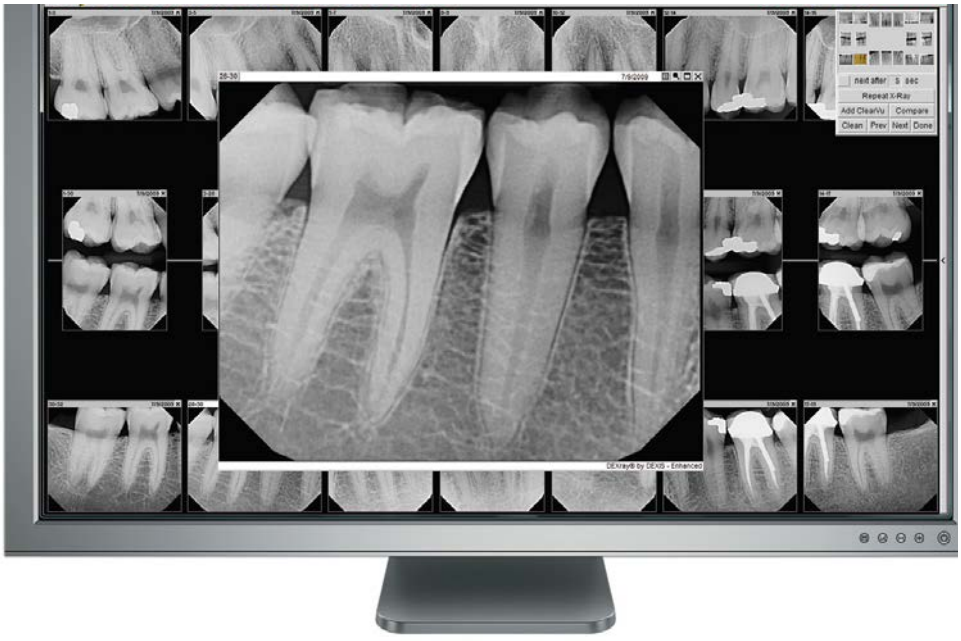
Set of vertical BWs

Tip: A longer tab is needed for anterior vertical bitewings. You can buy special tabs and positioning devices or you can use two tabs stuck on top of each other. The patient has to bite on the tab so the anterior teeth are touching at the incisal edge.

Dental Digital Imaging

For many years, dentists have used radiographs as a valuable tool in diagnosing disease and planning treatment for patients. Now, a new technology called dental digital imaging is replacing traditional radiography. The major benefit of digital imaging is it significantly reduces radiation exposure to the patient compared to film-based radiography. Dental images can be seen immediately on the computer screen. This is helpful for the clinician to show and explain conditions to a patient. Another advantage of digital imaging is an image can be easily stored, and correctly identified in a patient's chart. Because digital imaging does not require darkroom processing, the storage and disposal of hazardous chemicals used in film processing are eliminated. Additionally, film-based processing errors are prevented, thereby reducing retakes and unnecessary radiation to a patient and an operator.

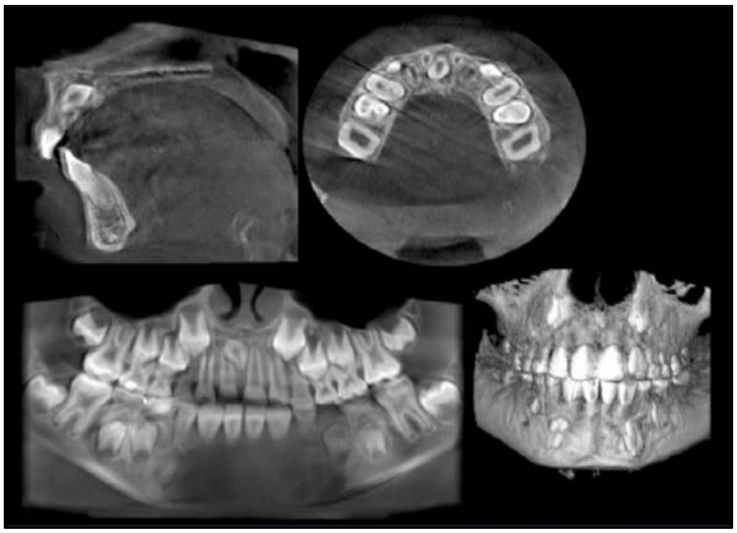
Digital imagine offers other benefits. Clinicians are able to manipulate an image on the computer by adjusting the contrast and density, and enhancing anatomical structures. An image can be enlarged and the color changed. Duplication of images is easy, and images can be sent electronically, and stored indefinitely. The dentist can compare previous images with current conditions which is helpful for diagnosis and treatment planning.



Cone Beam Computed Tomography (CBCT)

Unlike two-dimensional imaging, CBCT produces three-dimensional (3D) views of the mouth, face and jaw. CBCT greatly enhances the diagnostic abilities of the dentist.

CBCT images involve more radiation exposure than a two dimensional image like a panoramic image. You should be well trained on the use of the unit and positioning so the image does not have to be taken more than once. Use of this technology requires a dentist to carefully assess the need and to specifically order the CBCT image prior to a dental assistant taking the exposure.



Different examples of CBCT images

These types of images are vital for the exact placement of implants, for visualizing the buccal/lingual position of impacted teeth that are to be removed, and for determining the exact location of the mandibular nerve before surgery is performed.

Patient with CBCT unit

CBCT machine

Portable Equipment

Hand held radiographic equipment was introduced into dentistry around 2003. The technology is evolving quickly and units are becoming lighter and easier to use.

Dental assistant taking molar bitewing using NOMAD

It is essential to use proper positioning and shielding on the portable X-ray units to prevent operator exposure to unnecessary radiation.

Radiation protection for operator

NOMAD screen

Check with the manufacturer's website for more information about using portable X-ray units.

This completes Chapter 7: Special Techniques. You are now ready to test your understanding of the information you learned.