Standardized Dental Radiographs Using the Cephalostat Method

Required Equipment and Supplies

Modified Cephalostat

Your cephalostat must be modified to accommodate positioning at +62 and -62 degrees from the lateral head position. This position minimizes overlap of the teeth in the radiographic image in the posterior segment.

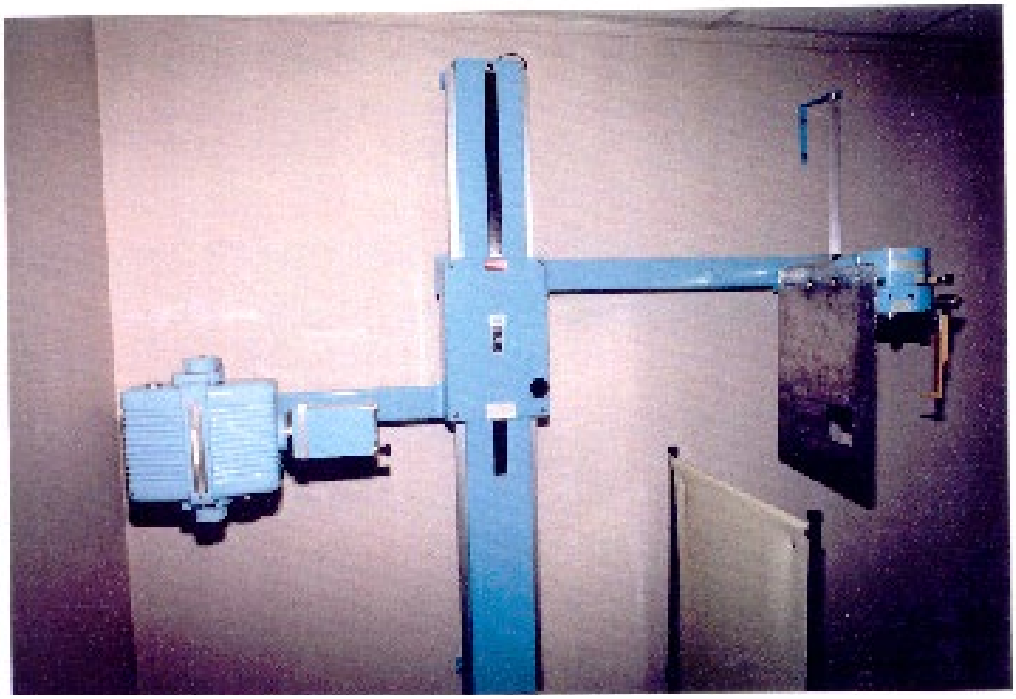
When taking a conventional intraoral film, you move the tube head to minimize overlap. Since the cephalostat fixes the position of the x-ray tube head, the patient's head must be rotated to obtain a radiograph with optimal geometry.

Your maintenance department can probably help with this modification. Remove the plate from the top of the cephalostat. You will be able to see where the positioning pin fits into the existing holes to obtain frontal, lateral, and on some cephalostat units, 45-degree images. Mark the position to +62 degrees and -62 degrees from the lateral hole. Before modifying the cephalostat place a phantom or skull in the cephalostat. The skull will need to be repositioned for left and right posterior films. Rotate the cephalostat to correspond to your markings. Expose an image. If the image is satisfactory, drill a hole in the cephalostat to fix the amount of rotation for left and right images. It is critical that the size of the hole be an exact fit to the pin on your cephalostat.

The cephalostat system is most easily used for posterior films. To expose anterior pins, rotate the cephalostat as for a anterior/posterior film and use a calibrated canine or bridge of the nose pointer to point to the incisal surface of the maxillary canine or the bridge of the nose, respectively. This will fix the rotation of the patient's head about the ear rods. Note the position of the pointer so that it can be repositioned in the same place for subsequent images.

Shield

The modified cephalostat system must be used with a custom shield to assure that the area receiving radiation is no larger than that exposed using a conventional dental x-ray tube (2.75 inches). Fabricate a lead-lined shielding plate with a sliding aperture so that only the area of interest will be irradiated.



Modified Cephalostat

Dental X-ray Film

To minimize patient radiation dose, use Kodak Ektaspeed film in double film packs. Ektaspeed film requires approximately half the radiation exposure of Ultraspeed film.

Film Holders

The purpose of the film holder is to prevent bending of the film and facilitate film placement. For posterior films, Rinn vertical bitewing film holders are used.

Reference Wedge

A reference wedge is needed in the first film for quantitative digital subtraction radiography. Reference wedges are not required for interpretive subtraction radiography. It is critical that the wedge be carefully positioned in the first film.

Film, film holder, and reference wedge

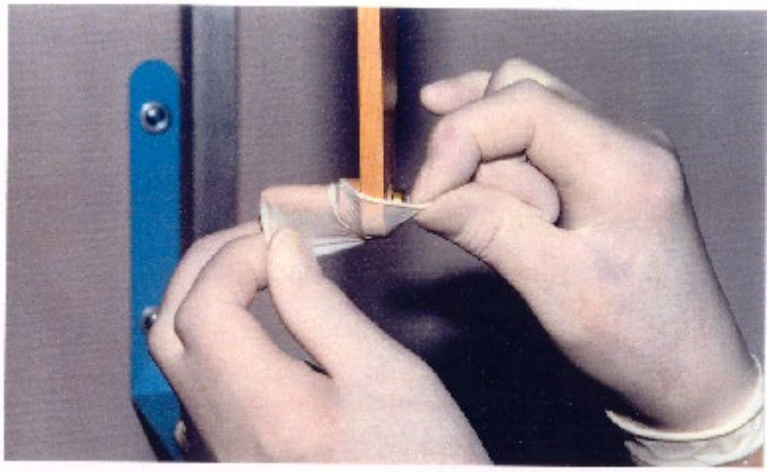
Standardized Vertical Bite Wing Technique

1. Confirm settings:
   8 MA and 70 KVp
   1-second exposure is usually adequate.

   The higher KVp reduces radiation dose to the patient and results in more gray levels in the x-ray image. Thus, small osseous changes may be detected more easily by the computer program.

   Be sure to confirm the length of the exposure using a skull prior to taking any radiographs for study validation purposes. Remember, the longer exposure time does not result in increased patient dose if you have shielded the cephalostat and the patient. This is because the cephalostat system uses an extremely long source to object distance (approximately 55 inches at UAB, approximately 39 inches at OHSU). Since the radiation dose falls off as the square of the distance, only a small portion of the radiation dose (less than 10%) actually reaches the patient and the film. Thus, the exposure time must be increased to result in an interpretable radiograph. In this system, both the patient shielding and the cephalostat shield are used to assure that the patient does not receive more radiation dose than required to expose the INSIGHT film.

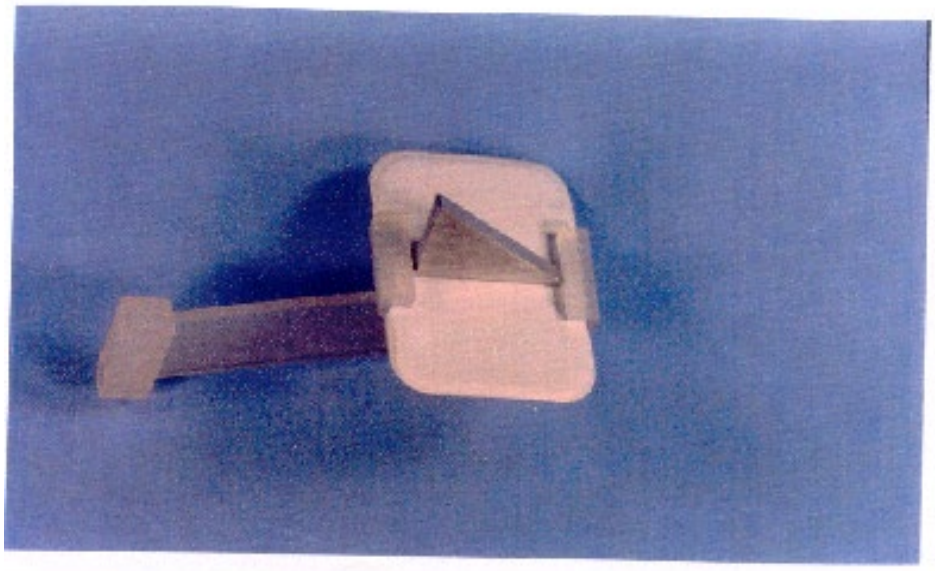
2. Cover the ear rods of the cephalostat with a protective covering.



Covering ear rods

3. Assemble the film, film holder and wedge.

   Insert the film white side up at right angles to the film holder extension. The film holder extension is ordinarily used to hold the positioning bar when the Rinn system is used to take conventional intraoral radiographs. For vertical bitewings the wedge is positioned across the center of the film with the right angle toward the film holder extension. For periapical films, the wedge is positioned across the top of the film with the right angle toward the film holder extension. The patient will bite on the wedge.



Wedge in position on film Holder

4. Adjust the opening in the lead shield to the correct position for left or right posterior radiographs.

5. Rotate the cephalostat to the correct position for left or right posterior radiographs.

6. Explain the procedure to the patient. It may be helpful to demonstrate how the cephalostat will work by putting yourself in it.

7. Place the thyroid shield on the patient.

8. Place the upper body shield on the patient. Drape the shield so that it covers the side of the patient facing the x-ray source.

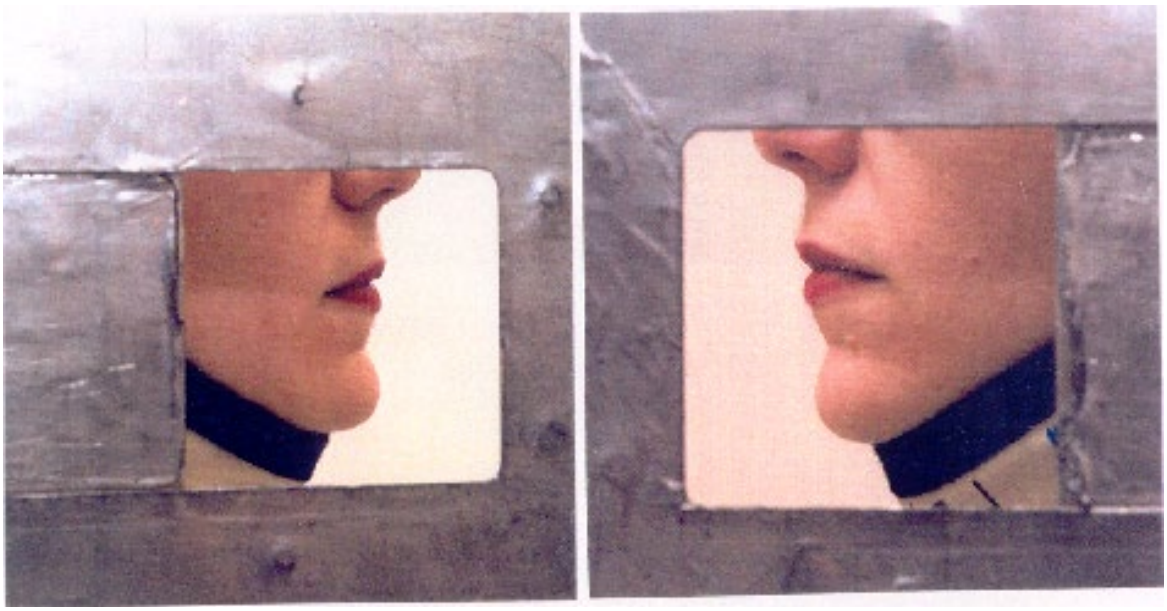
9. Position the accessory shield between the head holder and the source.

10. Position the patient

    Always assure that all previous steps have been completed before positioning the patient in the cephalostat. This will greatly improve patient comfort and compliance.

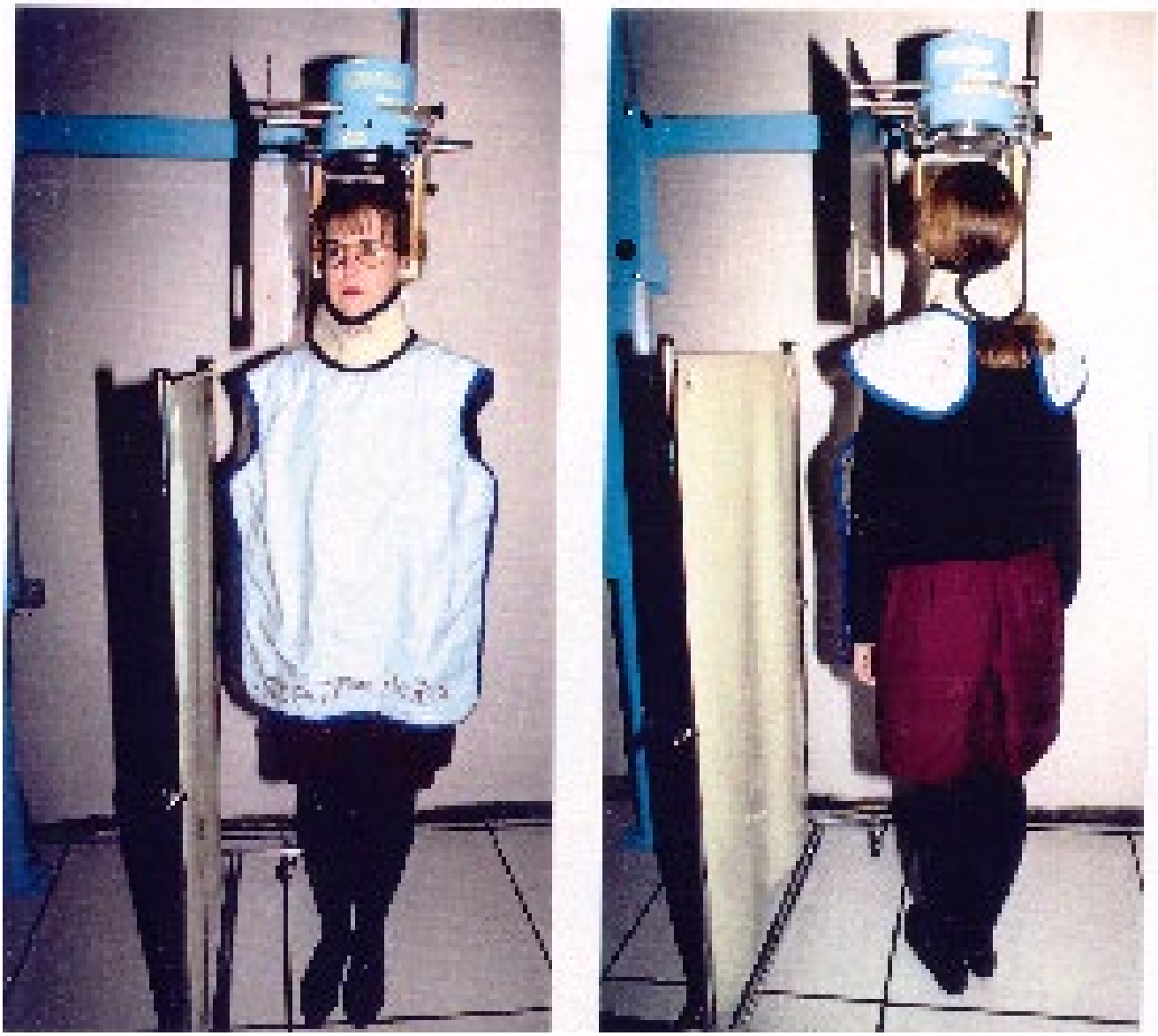
    To take a radiograph of the right posterior teeth, position the patient under the head holder. The patient should be standing or sitting (depending on the type of cephalostat) comfortably erect. For the right side, the patient should be facing forward in the conventional direction to take a lateral cephalometric radiograph, except that the cephalostat will have been rotated 62 degrees. Lower the head holder until the ear rods are level with the patient's ears. Gently close the ear rod mechanism until the ear rods are placed in the ears, and stabilize the head. The mechanism should be sufficiently tight to prevent lateral movement of the patient's head, but should not be unduly uncomfortable.

    Position the assembled film holder adjacent to the area of interest with the white side of the film package facing the lingual side of the teeth. As the patient closes, the wedge should rest evenly between the occlusal surfaces. Check to assure that the wedge has not rotated.



Right side *Left side*

Adjust opening in lead shield



Right side *Left side*

Patient in cephalostat

11. Confirm correct position of the patient's plane of occlusion through the opening in the lead shield.

12. Expose film to radiographic beam.

13. Remove film holder and position the second film holder for the periapical radiograph.

14. Again, confirm correct position of the patient's plane of occlusion through the opening in the lead shield.

15. Expose film to radiographic beam.

16. Release patient from head holder.

17. Develop, mount and label films.

Assure High Quality Processing

1. Remember INSIGHT is less forgiving to processing errors

2. Change the solutions at least once a week. Change solutions more frequently if the automatic processor or solutions receive a high volume of use.

3. Check the level of the solutions daily. Replenish as needed to a predetermined level.

4. Check the temperature of the solutions prior to developing any radiographs.

5. Assure the solutions are not contaminated.

6. Clean automatic processors, including the rollers, at least once a week.

7. Use the cleaning solutions recommended by the manufacturer to clean and oil the processor once a month.

Quality Control of Radiographs at the Center

1. Check the developed radiograph. Assure that the study sites are visible in the radiograph. Be sure that it is well fixed, and does not have blotches, scratches or roller marks. Since double film packs are used, be sure to send the best radiograph for digital image analysis. File the second radiograph in the study file.

2. Please take the following steps to assure quality of the film's geometry:

   Place the baseline film in a mount
   Compare all subsequent films to the baseline film by aligning the baseline and subsequent films on a view box.
   The films should align
   Films that vary more than 0.3 mm should be retaken.

Procedure for Labeling and Mailing Radiographs to the University of Alabama School of Dentistry for Analysis

1. Always store radiographs in the patient files in an envelope in order to protect the surface of the film.

2. Mount the radiograph to be analyzed in the specified film mount. This mount will hold up to four vertical bite-wing or periapical radiographs and fits in the custom hold for computer digitization at the University of Alabama School of Dentistry Department of Periodontics.

3. A small label must be placed at the top left-hand corner of the film mount. The label contains the following information:

   Patient number
   Center
   Date
   Exam number
   Study sites

4. Place the mount in an envelope. Place a duplicate label on the envelope. The envelope will protect the radiographs and help assure that radiographs that may have fallen out of the mounts are not lost or mislabeled.