Tips and Hints on how to make Radiographic Technique easier for the Operator and the Patient

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Paralleling technique

- To allow you to see the position of your image receptor is parallel to the tooth in question the head should be upper occlusal plane parallel to the floor (ala-tragus) for upper teeth
- Lower occlusal plane parallel to the floor (corner of the mouth-tragus) for lower teeth
- Image receptors – size 0 vertical for anterior teeth
  size 2 horizontal for posterior teeth
  size 0 and 2 for bitewings children and adults
  occlusal image receptors

Operator Position

To position your image receptors as accurately as possible, you will pretend your eye is the x-ray beam. This means that your body position must be as close as possible to the tube as it will be positioned before exposure of the image receptor i.e. for tooth 11 stand on right side of patient; for 21 stand on left side. Stand as close as possible to the chair, close one eye, allowing you to look through the ring at the correct angle down the rod! All will become clear – read on!

Cotton Wool

Cotton wool will be used for taking all paralleling technique image receptors, apart from bitewings. It will be placed in the mouth on the opposing occlusal surface to the one being radiographed. It is best to place the cotton wool:

- **before** the image receptor is placed for **upper teeth** and
- **after** the image receptor is placed for **lower teeth**.

Therefore, **first** for uppers, **second** for lowers.

Anteriors:

Cotton wool should be placed across the arch for anteriors, like a cigarette.

Posteriors:

Along the arch for upper posteriors and obliquely across the arch for lower posteriors.

Locator Rings

The ring must be brought close to the skin, approximately one centimetre away, before exposure to give the correct anode/skin distance. If the ring is too far from the patient's face the exposure will be reduced quite markedly.

Bite block Position (approximate position only – every patient is different)

Patient bites: **When the patient bites onto the block, raise the rod about 5 degrees to meet the teeth being radiographed**

Upper Anterior:	on the outer aspect of the block i.e. furthest from the image receptor
Lower Anterior:	halfway across the block
Upper Posterior:	on the outer aspect only of the block
Lower Posterior:	approximately one third across the block i.e. close to the image receptor

Technically Challenging Patients

Patients with a Strong Gag Reflex

It has become clear to me that most dentists ask patients to breathe through the nose when taking radiographs to stop gagging. Possibly from the time when, as students, they were taught nose-breathing when taking impressions. After many years as a radiographer in dental work, I believe the only way to control a strong gag reflex is to mouth breathe. As the patient's teeth come together on the block, loud breathing should commence through the teeth – quite shallow breaths with the patient being aware of trying to hold the soft palate high. You can only gag if you stop breathing, and it usually happens on an out breath, so suggest to the patient that he/she breathe loudly through the teeth so that you can hear them - in breath and out breath joined together – **no gaps between the two.**

Remove image receptors, cotton wool, bite block etc, with patient breathing one long breath in. Try it – it works (happy breathing).

Cotton Wool

Cotton wool is usually used on the opposing occlusal surface to the one you are x-raying.

There are some exceptions:

Deciduous teeth/Short crowns/ Shallow palates/ Cleft palate patients

- It may be necessary to lengthen the crown slightly in these patients to allow access into the palate. The cotton wool can be placed against the tooth in question and bitten hard so that the crown is only slightly lengthened and the image receptor still shows the apex of the tooth.

Partially edentulous patients

- It may be advisable to fill the spaces with "pretend crowns" (cotton wool) to allow the patient to bite the block with the image receptor along the line of occlusion and not falling into an edentulous area.

Totally edentulous patients

- These patients should have cotton wool along both the occlusion of interest "pretend crowns" and the opposing occlusion to allow the patient to bite in comfort and to give the operator control of the image receptor angle. The edentulous patient should not wear any dentures as a) their bite is not strong enough and b) they can dislodge the appliance. The patient should hold a grimace during the bite as this will help them bite strongly with their gums and not their lips. SMILE!

PERIAPICAL IMAGES

Paralleling Technique – Upper Teeth

Maxillary Incisors

Head Position

Upper occlusal plane parallel to the floor (straight head) allowing the operator to check the position of the image receptor by looking through the ring down the rod at the bite block and tooth position before aligning the spacer cone, with the rectangular collimator aligned to the notches.

Locator Ring

At distance from block, to allow access into the mouth, brought close to skin for exposure.

Cotton Wool

The cotton wool is placed in the mouth before positioning the image receptor.

Used for all image receptors taken with paralleling technique – cotton wool is placed on the corresponding tooth on the lower arch. Cotton wool is placed across the arch like a cigarette and is held in position with the operator's non-dominant hand. This hand holds the cotton wool until the correct bite is achieved. The cotton wool will allow the operator to achieve positioning of the image receptor parallel with the long axis of the root. The cotton wool may need to be moved many times to achieve the correct image receptor position.

Positioning image receptor

Hold rod and tilt image receptor at an angle (flat) to insert into mouth. Raise image receptor into upright position into the palatal vault at its highest point. Sit bite block onto the lower occlusion on top of the cotton wool (dominant hand holding rod; non-dominant hand holding cotton wool). The patient bites on to the block, probably at the furthest area of the block from the image receptor. **When the patient bites onto the block, raise the rod about 5 degrees to meet the teeth being radiographed** The palatal vault should be able to accommodate the image receptor height without too much compromising of parallelility. When checking position is correct, move the locator ring close to the teeth (not touching) and look through the ring (**exactly the centre of the ring**). You will see where the centre of the beam is passing (**best done with one eye closed**). Is the tooth or teeth biting centrally on the block? Will the beam pass through the spaces on either side of the teeth and show bone levels and possible caries? If not, change position of cotton wool and bite block independently, until your eye sees the result you want. Bring the spacer cone into position, parallel to the rod, and adjust the rectangular collimator to line up with the notches, close but not touching. The vertical position will have notches to match size 0 image

receptor. As the patient bites their teeth gently on to the block, they should breathe through their teeth loudly, so that you can hear the breathing. To align the tube the operator's hands should be on top of the X-ray tube, and on top of the spacer cone, to stop the rod being displaced by the operator. After exposure, the image receptor and cotton wool should be removed, with the patient taking a long in breath.

Maxillary Canines

Head Position

The Ala- tragus line is parallel to the floor – i.e. a straight head.

Locator ring

Is placed at a distance from the block to allow access into the mouth and brought to the skin before exposure.

Cotton wool

The cotton wool is placed in the mouth before positioning the image receptor.

Is placed across the lower arch on the occlusal surface of the lower canine.

Image receptor position

The image receptor is placed into the palatal vault at its highest point behind the canine. The patient bites with the maxillary canine central on the block. The cotton wool determines that the image receptor position is parallel to the long axis of the root. As before, for maxillary incisors, complete the positioning using the breathing technique.

Problems imaging Maxillary Canine teeth

Place the cotton wool on the lower three. Bring your image receptor into the mouth as you would when imaging a central. Go as far as you can into the palatal vault and rotate the image receptor block onto the cotton wool. Raise the rod five degrees as the patient closes their teeth. Canine on the midline of the block.

Very frequently there is an overlap with the maxillary canine and the first pre-molar. Distomesial angulation of tube of about 8 degrees can sometimes throw

the teeth apart by off-centring the beam. Usually, if a bone level is required or caries is to be detected, two image receptors will need to be done.

- First image receptor size 0 vertical anterior paralleling technique as above.
- Second image receptor size 2 horizontal premolar image receptor should be taken as explained below but the bite block image receptor and rod should be placed more mesially in the mouth to include the canine. This angle will throw the canine and first molar apart.

Maxillary Pre-Molars

Head Position

Upper occlusal plane, Ala- tragus parallel to the floor.

Locator Ring

At distance from block. Brought to skin for exposure.

Cotton Wool

The cotton wool is placed in the mouth before positioning the image receptor.

Held with non-dominant hand, along the line of the arch, on top of the occlusal surfaces. The cotton wool will extend just far enough out of the mouth to allow the operator to hold the end of the cotton wool roll until after the patient has bitten onto the block. If not held, the roll will fall off the occlusal surface before the block is bitten. The cotton wool will be very effective in holding the image receptor up into the mid-line of the mouth; without it, the image receptor will want to tip forward, possibly "cutting off" the distal roots of the teeth you wish to see on the radiograph.

Positioning of Image receptor

The image receptor will be laid flat for access into the mouth and brought into the mid-line at the highest point, around the position of the first molar. The rod is then rotated mesially towards the front of the mouth, until it lines up the block with the pre-molars. This allows the image receptor to be positioned without bending on the hard palate. The patient bites. **When the patient bites onto the block, raise the rod about 5 degrees to meet the teeth being radiographed.** The operator looks down the rod with one eye and checks that the pre-molars are biting clearly on the block. The eye will see that the beam will pass between the teeth and show bone levels and caries etc. and the height of the image receptor in the mid-line and position of cotton wool will ensure that all roots are showing on the resultant radiograph. The patient will be biting halfway - to the outer aspect of the block.

Bring the ring close to the skin. Position the spacer cone parallel to the rod and with the rectangular collimator matching horizontal notches. Breathing as before.

Maxillary Molars

Head Position

Ala- tragus parallel to the floor.

Locator Ring

At distance for access. Brought to skin for exposure.

Cotton Wool

The cotton wool is placed in the mouth before positioning the image receptor.

Placed along the line of the arch being held into position by the non-dominant hand, as for pre-molar.

Position of Image receptor

Lay image receptor flat for access into the mouth, brought upright into the mid-line of the mouth. Staying in the mid-line should be a good position for the first and second molars. To access the third molar, ask your patient to open their mouth slightly and move the image receptor further back. **When the patient bites onto the block, raise the rod about 5 degrees to meet the teeth being radiographed**
He/she must start mouth-breathing. The patient should be biting on the outer aspect of the block. Any closer and the roots will be foreshortened due to the steep non-parallel angulation. Bring the ring close to the skin and position the spacer cone parallel to the rod and rectangular collimator to the notches.

Paralleling Technique – Lower teeth

Common problems when dealing with lower paralleling technique are:

- Patient complaining of pain in the floor of the mouth due to image receptor pressure
- Inability to achieve teeth/bite block position
- Pressure of image receptor on lingual aspect of the mandible

Mandibular Anteriors

Head Position

Chin up, corner of the mouth-tragus of ear, parallel to the floor i.e. lower occlusal plane.

Locator Ring

At distance for access and brought to the skin for exposure.

Cotton Wool

The cotton wool is placed in the mouth after positioning the image receptor across the arch like a cigarette.

Feel the floor of the mouth and place the image receptor down into the softest area until the block is on the occlusion of the tooth or teeth to be radiographed. Place the cotton wool across the block and ask the patient to bite and hold the block with their teeth. The operator hands will push the tube upwards so as not to dislodge the rod. Bring the ring close to the skin and check through the ring (one eye only) and see where the beam will travel. The patient should be biting at least halfway across the block. Bring the ring close to the skin, line up the spacer cone parallel to the rod and with the collimator against the notches.

Mandibular Pre-Molars

Head Position

Corner of mouth - tragus of the ear parallel to the floor.

Locator Ring

At distance for access, brought to skin for exposure.

Cotton Wool

The cotton wool is placed in the mouth after positioning the image receptor obliquely along the line of the arch.

Check the floor of the mouth, place the image receptor parallel down the side of the first molar. Rotate the rod mesially until the pre-molars are parallel to the image receptor. Push the image receptor down until the block is on the pre-

molar occlusal surfaces. Place the cotton wool along the line of the arch and with the patient biting on the bite block bring the ring to the skin for exposure. Check beam position by looking through the ring (one eye only). The patient should be biting halfway/outer aspect of block. Bring the spacer cone into position parallel with the rod and collimator against the notches.

Mandibular Molars

Head Position

Corner the mouth- tragus of the ear, parallel to the floor.

Locator Ring

At distance for access. Brought to the skin for exposure.

Cotton Wool

The cotton wool is placed in the mouth <u>after</u> positioning the image receptor obliquely along the line of the arch.

This area of the mouth is the closest the image receptor and teeth will be in paralleling technique. The teeth should be biting approximately one third onto the block - no closer as this can be very painful. Check the floor of the mouth, flatten the image receptor to enter the mouth, and gently push the tongue out of the way as you place the image receptor into the sulcus next to the molar area. If you place the image receptor down into the sulcus and the block onto the occlusion, the floor of mouth should not tighten as the patient has put no pressure on it. To place the image receptor further back, ask the patient to breathe through his/her teeth and to open the mouth slightly. Slide the image receptor further back until the third molar area will be shown. The floor of the mouth should remain relaxed and the gag reflex controlled by the breathing. Place the cotton wool obliquely along the line of the arch and with the patient biting gently on the block bring the spacer cone parallel to the rod and adjust collimator to the notches.

BITEWING IMAGES

4 Holders: 2 horizontal – size 0 used in children
size 2 used in adults
predominantly used for the detection of caries

2 vertical – size 0 and size 2 used to show bone levels but will not show apices of teeth.

Check if the patient has any third molars

If so, and also a full complement of other posterior teeth, take 2 image receptors per side. The first for pre-molars, second for molars.

If no 8s do one image receptor per side, showing mesial four to distal seven unless it is specified that the mesial five to distal eight is wanted.

Check the patient's arch formation.

- Are the proximal spaces lying at the same angle as each other?
- Are there any teeth out of the arch?
- Is the arch pointed, square or a gentle curve?

Ascertain the most anterior canine/premolar proximal space on either side in turn. Is it the upper or lower that is most anterior when the teeth are in occlusion? If it is the lower, **place the image receptor with the block on the occlusion** and the image receptor 2 or 3 millimetres anterior to mesial four. If it is the upper, place the image receptor anteriorly by the number of millimetres the upper is anterior to the lower canine/premolar space.

Place the image receptor parallel to the line of the arch, to allow the beam to pass through the spaces with the teeth in occlusion and no cotton wool. If the patient smiles when checking position through the ring, you will be able to ascertain what will show on the image receptor before lining up the spacer cone. Bring the ring close to the skin and position the spacer cone parallel to the rod and adjust rectangular collimator to the notches – close but not touching.

When taking bitewings on children with deciduous teeth, the small bitewing holder is used with a size 0 image receptor. For a few minutes before placing the image receptor in the mouth, have the child practise big smiles with soft tissues pulled back, almost in a grimace. This will allow them to clench their teeth together when the image receptor is placed in the mouth. If the child is much younger, have the child practise by growling like a bear. Sounds silly but it works!

Vertical Bitewings

Vertical bitewings can be used with the same technique as above. Two image receptors must be taken on either side – first for pre-molars and second for molars. They show excellent bone levels as the operator will automatically use their bitewing technique which is excellent for proximal spaces. Therefore this will also show excellent bone levels. The only drawback is that apical attachment is not shown and, if this is needed, periapical image receptors must be done.

Endodontic imaging

A little trick to carry out before positioning

Turn the bite block back to front. Either the older grey or the newer green endo bite block is suitable for this way of positioning. There is a u shaped empty area at the back of the block. Before placing files or rubber dam line up the bite block in the mouth (no rod or ring and no image receptor) in front (not behind) the tooth in question. The tooth in question must be visualised exactly central on the block and the shoulders on either side of the bite block will be resting on adjacent teeth. Make a note of exactly where the outer aspect of the shoulders are resting. Remove the block and rotate it correctly for setting up on the holder
Now you can place your rubber dam and files and when you are ready to take the image remove the dam frame and close the rubber dam like closing an umbrella.
You can no longer see the tooth in question but when you are positioning the image receptor you will place the shoulders on the block exactly where you documented on the adjacent teeth. The tooth will not be visible but will be central on your image.

Soft Tissue Lip

Place size 2 image receptor behind the lip and draw on a piece of paper where the dot is. A flash exposure on the image receptor can be used, which is at least half the exposure of an anterior periapical image receptor. The image receptor can then be mounted in the same position as is drawn on the paper and will show tooth fragments etc.

Bisecting Angle Technique

For some patients paralleling technique cannot be used. Bisecting angle occlusals can be the image receptor of choice for these patients. Occlusal image receptors will give much more information than bisecting angle periapicals and there is only a 5 degree difference between bisecting angle periapical and bisecting angle occlusals of the same area.

Occlusal image receptors are often the image receptor of choice when a large area is required, showing excellent detail radiographs, for example areas of infection,

uneruption or tumour. Occlusals are also taken for parallax to locate unerupted teeth and mesiodens.

All oblique occlusals will show a large periapical area with excellent image receptor quality.

Head Positions

Oblique occlusals upper:

Upper occlusal plane parallel to the floor.

Central beam passes through the roots of interest, one centimetre above the ala tragus line. The angle of the tube is 60 degrees to the floor for anteriors, flattening to 45 degrees for posteriors

i.e. 60 degrees for central incisors
55 degrees for canines
50 degrees for pre-molars
45 degrees for molars

When centring for an upper standard central oblique occlusal, first align your tube with the operator standing at the side of the patient. The top of the rectangular collimator should be touching the lowest eyebrow hair with the tube in the mid-line. The operator then stands at the bottom of the chair and checks the alignment of the tube. When oblique occlusals are necessary for other areas of the mouth, first position centrally and then rotate the tube to point at the roots of interest.

Oblique occlusals lower:

Lower occlusal plane parallel to the floor.

Central beam passes through the roots of interest. Align the tube along the lower border of the mandible. The angle of the tube is 35/40 degrees to the head for anteriors, flattening to 20/25 degrees for posteriors

i.e. 35/40 degrees for lower central incisors
30/35 degrees for lower canines

25/30 degrees for lower pre-molars
20/25 degrees for lower molars.

For all oblique occlusals, the collimator is rotated to allow as much information as possible on the image receptor.

True Occlusals (only lower)

Used for bucco-lingual expansion or submandibular calculi.

Head is positioned as far back as comfortably possible, chin high and beam centred to the image receptor over area of interest at 90 degrees.

PANORAMICS

All panoramic machines differ from each another but a few points seem to be universal.

- The patient removes all artefacts (hair grips, earrings, chains, high zips, dentures, braces
- The patient removes bulky clothes around the shoulders (jackets etc)
- Before the patient goes into the machine
- The patient sits or stands "tall" with their back as straight as possible...standing is ideal. Tummy thrust forward to keep the cervical spine as straight as possible
- Check the patients "edge to edge bite" and practice how they bite in the bite block...at this stage you will see if the "bite" is naturally central.
- If it is impossible for the patient to achieve an edge to edge bite with both upper and lower dentition in the bite block then ascertain which area is of most importance ...upper or lower ...and place that area in the focal trough bite block.
- Now remove the bite block
- Before positioning in the machine look at the patient from the side (lateral skull position) and place one finger in the lower border of orbit and one in the upper part of the external auditory meatus. This line is the Frankfort plane Tip the chin up and down till you see this line is parallel to the floor. Now you see what you are trying to achieve when the patient is in the machine.
- Start positioning the patient
- Direct the patient into the panoramic machine
- Start positioning the patient from the floor to the ceiling i.e.:
  Feet first, then ... Hips.... Hands... Chin... Teeth.....Forehead
- Feet slightly apart and central to the x- ray machine
- Hips not rotated

- Hands holding the handles and tuck the thumbs under
- Shoulders stroked down and not rotated
- A slight tummy thrust forward will help straighten the cervical spine or a small step forward!
- The operator gently holds the patient at the base of the skull i.e. nape of neck with one hand while controlling the height of the machine with the other.
- Chin slightly raised from Frankfort plane…not too high as it is uncomfortable for the patient.
- Machine height… just a couple of centimetres higher than needed for completed positioning. This helps the patient not to slouch.
- Chin onto the ledge (if the machine has one) and stretch the cervical spine up to reduce ghost shadows…hold the nape of the neck to control the stretch…as the spine straightens tip the forehead forward into Frankfort plane parallel to the floor.
- The focal trough is ascertained and the teeth bite edge to edge in the trough. The trough is narrow and it is very important to be as particular as possible on this point. The head must be mid sagittal centred
- Bring the machine down the short distance to allow Frankfort plane positioning still holding the nape of the neck to assist positioning…tip the forehead slightly forward
- The Frankfort plane (lower border of orbit - tragus of the ear) will be parallel to the floor
- The mid sagittal light is positioned down the centre of the face and the head is supported in the correct position.
- The tongue is placed against the roof of the mouth behind the front teeth to minimise the amount of air in the mouth as this will show as a dark area on the resultant radiograph.
- Ask the patient to swallow to push the tongue onto the palate reducing air shadows
- The eyes are closed during the exposure so that the patient does not move their head by watching the rotating cassette.
- Lips are closed gently to minimise the air shadow that is formed when the lips are apart.

See diagram handout for common positioning faults