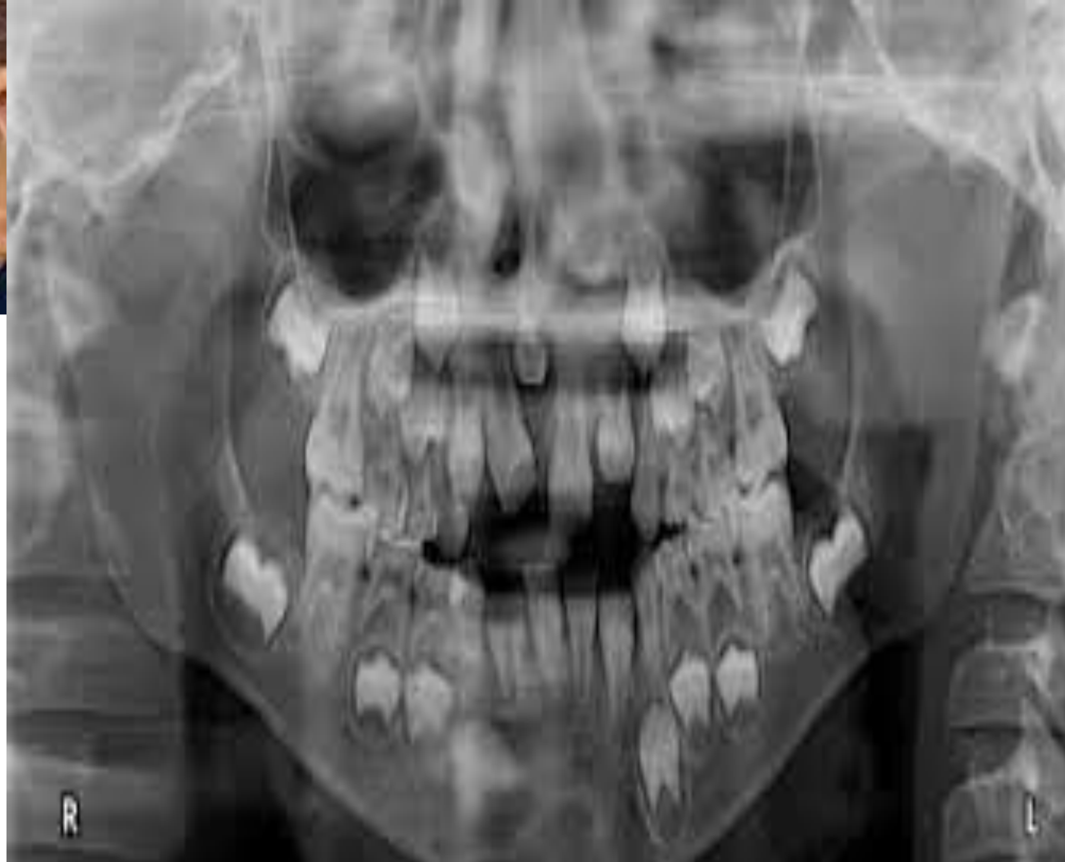
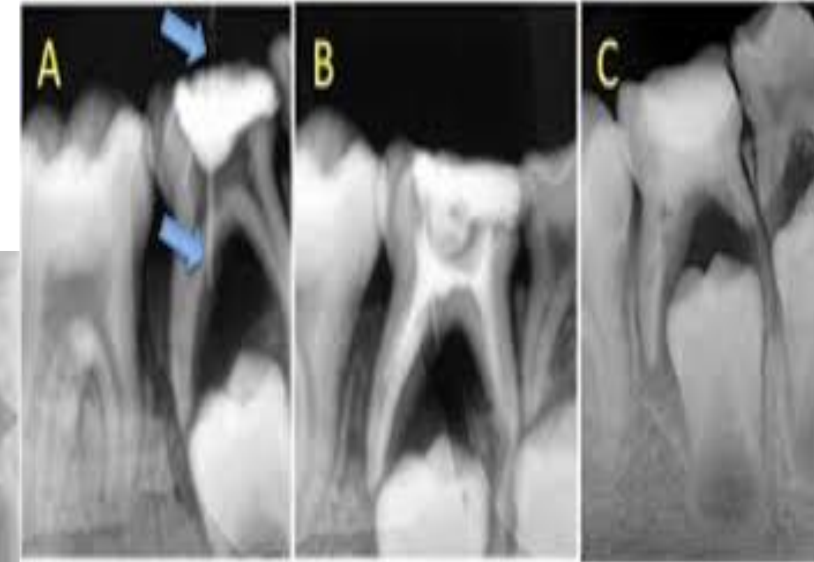
CHILDREN ORAL RADIOLOGY AND THEIR MANAGEMENT 10





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Radiographs serve as an excellent tool in the diagnosis and treatment planning of various dental conditions in children. Several modified radiographic techniques are available for the dentist and staff to obtain good quality radiographs. The goal is to eliminates unnecessary repeated radiographic exposure and provide maximum comfort for the **pediatric patients.**

Patient Management:

One of the most challenging tasks for the clinical staff is to obtain diagnostic quality radiographs on a young patient, (particularly those under three years of age) without causing psychological trauma. Radiographs are rarely taken for infants, for example, eruption cyst associated with natal or neonatal teeth. In such situations, the infant is held comfortably by the parent seated in the dental chair

Before radiographs are taken, the **patient must be informed** about the procedure and **consent obtained**. It is important to provide the patient with clear instructions to prepare them for the task at hand.

For toddlers, it is preferred to **desensitize the child to the dental experience** by explaining to the child what you plan to do in words easily comprehended by the child.

Using a **"tell, show, do" technique,** the clinician explains to the **child a tooth picture** will be taken of the child's tooth with tooth film and a tooth camera. The child is allowed to touch and examine the radiographic film and camera.

The child is positioned to gain maximum cooperation.

In the child less than **three years of age** it may be necessary for the child to sit in the parent's lap while the radiograph is exposed be needed to successfully take the radiograph. The child is seated in the parent's lap with the parent resting their arms around the child's upper body and their legs wrapped around the child's lower body.

Not only does this provide additional emotional security for the child and, thus, increased cooperation but also enables the parent to adequately restrain the child should there be any unexpected sudden movements

A positioning device such as a **Snap-A-Ray** can be used to aid the parent in positioning and securing the film.

Be sure to adequately protect the parent and child with lead aprons to reduce radiation exposure. Obtaining the least difficult radiograph first (such as an anterior occlusal) desensitizes the child to the procedure .Since many children have difficulty keeping the film in their mouth for extended periods of time, be certain the correct settings are made on the apparatus and the x-ray head is properly positioned before placing the film in the child's mouth. Once the child feels acclimatized with the setting, additional radiographs including left bitewing and right bitewing can be obtained

If the child is uncooperative, then additional restraint by **a second adult may be necessary to successfully obtain the radiograph.**

With the first adult restraining the child as described previously, **a second adult stabilizes the child's head with one hand while the other hand positions the x-ray holder in the patient's mouth**. Under no circumstances should staff be asked to perform this task.

If a second adult is not available, it may be necessary to place the child in a mechanical restraining device (**Papoose Board**) to adequately restrain the child (This frees the parent to stabilize the child's head and properly position the radiograph in the child's mouth. This approach is particularly useful on an uncooperative child in emergency conditions like dental injury or facial abscess following dental infection. In such situations, diagnostic radiograph could be followed by treatment rendered whilst the child is still seated in the restraining device.

This would potentially avoid placing child repeatedly in the restraining device

If the child is still too uncooperative, it may be necessary to manage the **child pharmacologically with inhalation, oral, or parental sedatives**.

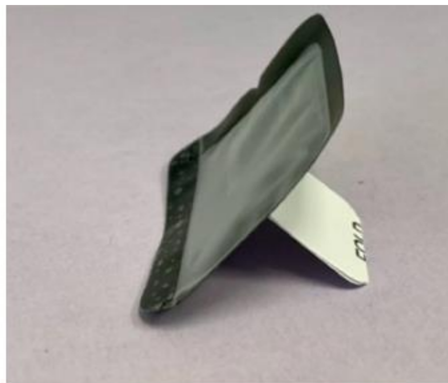
Older children may also be uncooperative for a variety of reasons. These can range from the jaw being too small to adequately accommodate the radiograph, fear of swallowing the radiograph, fear of the procedure itself, or the patient exhibits a severe gag reflex.

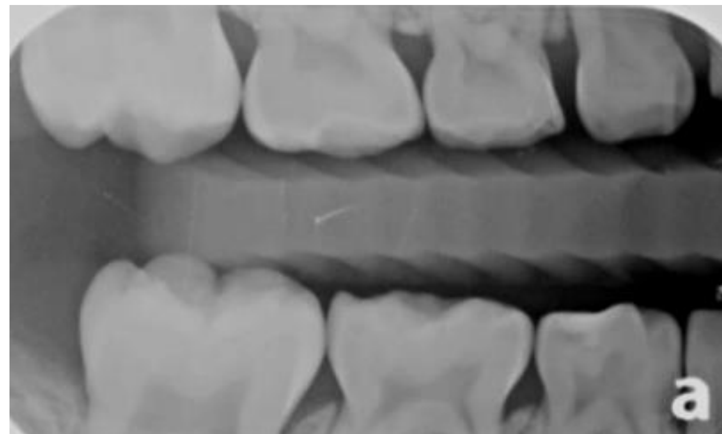
There are numerous techniques to overcome these problems.

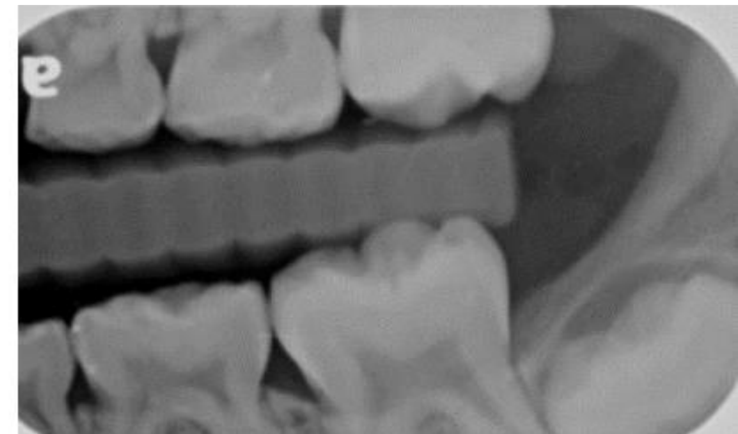
For the child with the small mouth, use the smallest size film available which is size 0 film followed by size 1 and size 2 .

Sometimes, rolling the film to avoid sharp bends can allow the film to accommodate the shape of the jaw and not impinge on the soft tissues

Use of the Snap-A-Ray as a bitewing tab will reduce impingement on the soft tissue but unfortunately will reduce the amount of detectable tooth structure on the radiograp







This approach is particularly useful **when conventional films are used** which is relatively thinner compared to **bulkier digital sensor**

Positioning the Radiograph:

Positioning the radiograph vertically in the mouth for both periapical and bitewing radiographs reduces the distal extension of the radiograph and may result in greater tolerance by patients, especially those with a mild gag reflex.
The vertical bitewing radiograph provides greater detail of the periapical area.
A self-sticking sponge tab may also reduce impingement of the radiograph on the intraoral soft tissue

Desensitization Techniques:

Desensitization is defined as **gradually exposing the child to new stimul**i or experiences of increasing intensity. An example of this is introducing the patient to x-rays by initially taking an anterior radiograph, which is easier to tolerate than a posterior radiograph.
Some patients, young and old, have an exaggerated gag reflex. The etiology of an exaggerated gag reflex had been attributed to psychological and physical factors.
There are numerous techniques to control the gag reflex during the radiograph procedure.
The easiest is through diversion and positive suggestion. The operator suggests to the patient the gag reflex can be reduced by concentrating on something other than the procedure.

The patient can look at a mirror, count fingers, raise and lower legs on a count, or employ audio-video distraction.

However, this technique is not always successful so other techniques must be brought into pla

An alternative is the use of nitrous oxide analgesia.

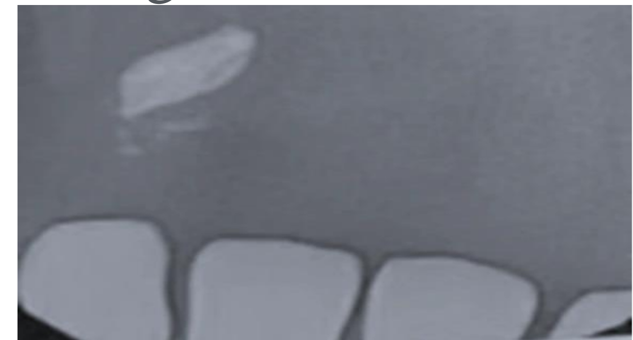
One of the effects of nitrous oxide analgesia is it reduces the gag reflex, but unlike general anesthesia it does not affect the cough reflex.

Another alternative is to place the radiograph in such a manner **to not contact the palate or tongue.**

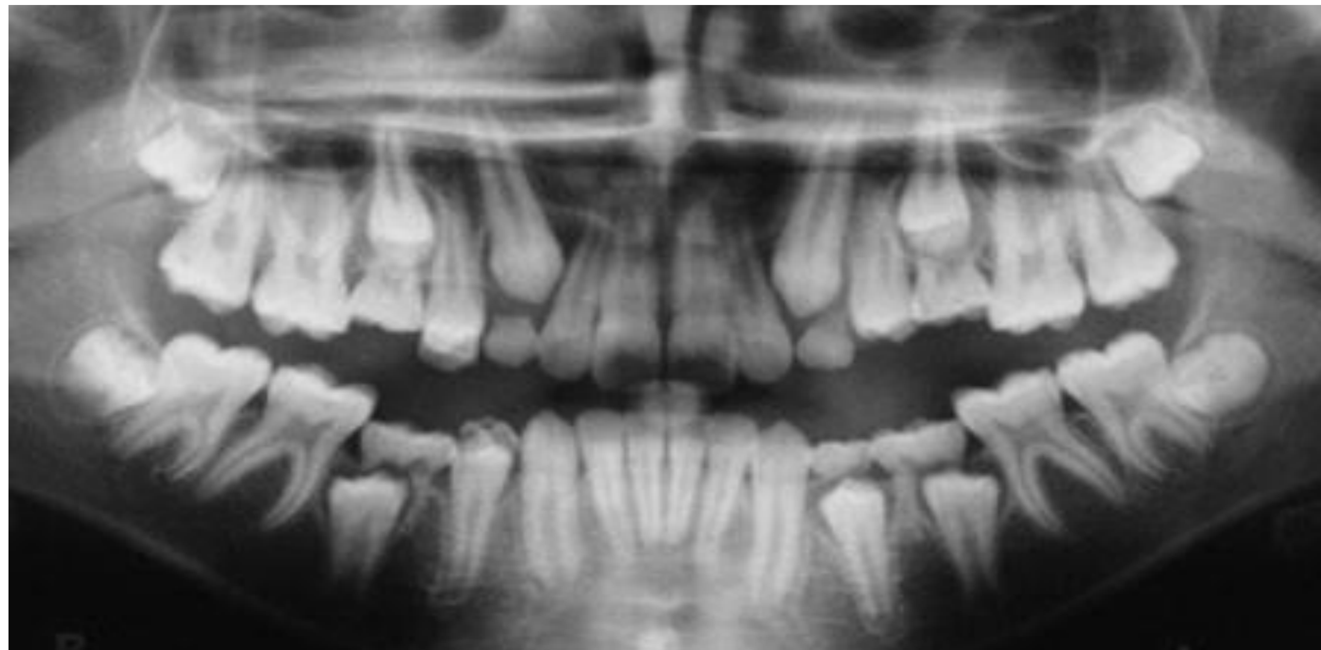
This is accomplished by either extraoral placement of the film or **placing the film between the cheek and the tooth** and exposing the film from the opposite jaw. In the reverse radiograph the film is placed on the buccal surface of the tooth between the tooth and the cheek.

The film side of the packet (the solid color side) is facing the buccal surface of the tooth. The x-ray head is **placed at the opposing side**, and the cone is positioned under the angle of the ramus on the opposite side.

The radiation is directed through the tongue, through the tooth structure, and onto the film. As the x-ray beam is traveling a longer distance to the film than in the typical positioning, it is necessary to double the exposure time.

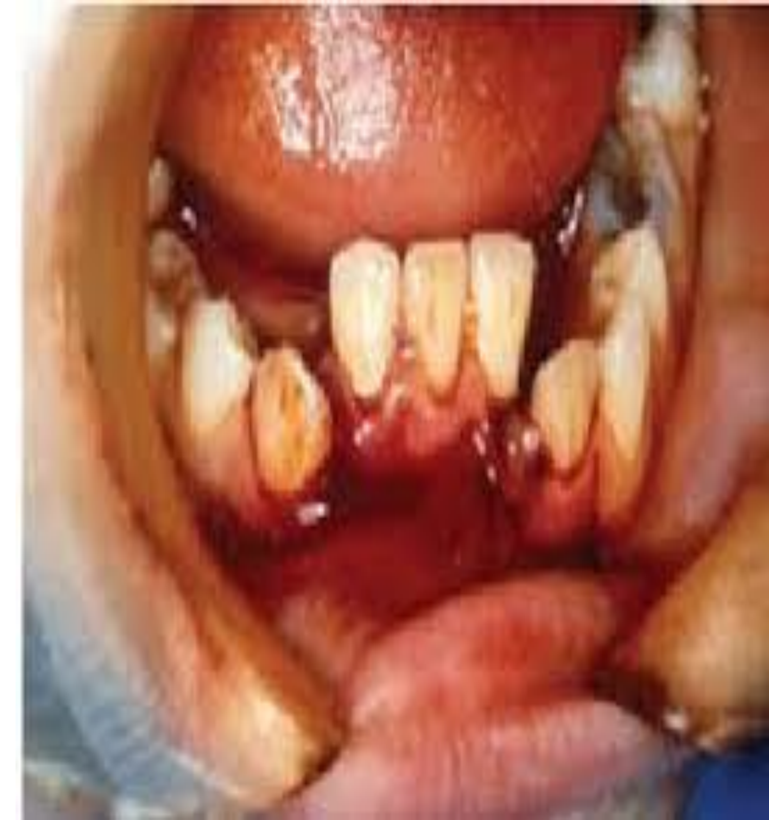


The prevalence of dental trauma in children is estimated at around 18%.
Following trauma resulting in tooth fracture and **concurrent lip l**aceration, it is always important to obtain a radiograph of the soft tissue to rule out any impregnation of tooth fSome of the newer digital panoramic radiographic units, i.e.,
Planmeca Promax, Sirona Panorex have programs that can take bitewing radiographs through extraoral techniques.
his has shown to have better patient compliance, easy patient positioning, and faster appointments using less radiation than conventional radiographs yet providing images of diagnostic quality ragments inside the soft tissue. For this purpose, the exposure time is reduced to one fourth of the original exposure



Trauma

A patient who has undergone trauma may have a dental or facial fracture. Dental fractures are best appreciated by using periapical or occlusal radiographs. Special care must be taken when making these views because of the condition of the patient. Skeletal fractures are usually best seen with panoramic or other extraoral views or a computed tomography examination. In some cases, patients with fractures of the facial skeleton may be bedridden because of other injuries. Consequently, an extraoral radiographic examination with the patient in the supine position is necessary. However, the circumstances need not compromise the techniques, and satisfactory intraoral images can be produced if the proper relative positions of the tube, patient, and receptor are observed.



Patients with Mental Disabilities

Patients with mental disabilities may cause some difficulty for the radiologist who is attempting an examination. The difficulty usually is the result of the patient's lack of coordination or inability to comprehend what is expected. When the radiographic examination is performed speedily, unpredictable moves by the patient can be minimized. In some cases, sedation may be required.

Patients with Physical Disabilities

Patients with physical disabilities (e.g., loss of vision, loss of hearing, loss of the use of any or all extremities, congenital defects such as cleft palate) may require special handling during a radiographic examination. These patients usually are cooperative and eager to assist. They may be accustomed to so much discomfort and inconvenience that their tolerance level is high, and they are not challenged by the relatively slight irritation represented by the x-ray procedures. Generally, intraoral and extraoral radiographic examinations may be performed for these patients if a good rapport between the patient and radiology technician is established and maintained. Members of the patient's family often are very helpful in assisting the patient into and out of the examination chair and in receptor positioning and holding, inasmuch as they usually are familiar with the patient's condition and accustomed to coping with it

Gag Reflex:

Occasionally, patients who need a radiographic examination manifest a gag reflex at the slightest provocation. These patients usually are very apprehensive and frightened by unknown procedures; others simply seem to have very sensitive tissue that precipitates a gag reflex when stimulated. This sensitivity is manifested when the receptor is placed in the oral cavity. To overcome this disability, the radiologist should make an effort to relax and reassure the patient. The radiologist can describe and explain the procedures. Often gagging can be controlled if the operator bolsters the patient's confidence by demonstrating technical competence and showing authority tempered with compassion

The gag reflex often is worse when a patient is tired; therefore it is advisable to perform the examination in the morning, when the individual is well rested, especially in the case of children.

Stimulating the posterior dorsum of the tongue or the soft palate usually initiates the gag reflex. Consequently, during the placement of the receptor, the tongue should be very relaxed and positioned well to the floor of the mouth; this can be accomplished by asking the patient to swallow deeply just before opening the mouth for placement of the receptor. (The dentist should never mention the tongue or ask patients to relax the tongue; this usually makes them more conscious of it and precipitates involuntary movements.) The receptor is carried into the mouth parallel to the occlusal plane. When the desired area is reached, the receptor is rotated with a decisive motion, bringing it into contact with the palate or the floor of the mouth. Sliding it along the palate or tongue is likely to stimulate the gag reflex. Also, the dentist must keep in mind that the longer the receptor stays in the mouth, the greater the possibility that the patient will start to gag. The patient should be advised to breathe rapidly through the nose because mouth breathing usually aggravates this condition.

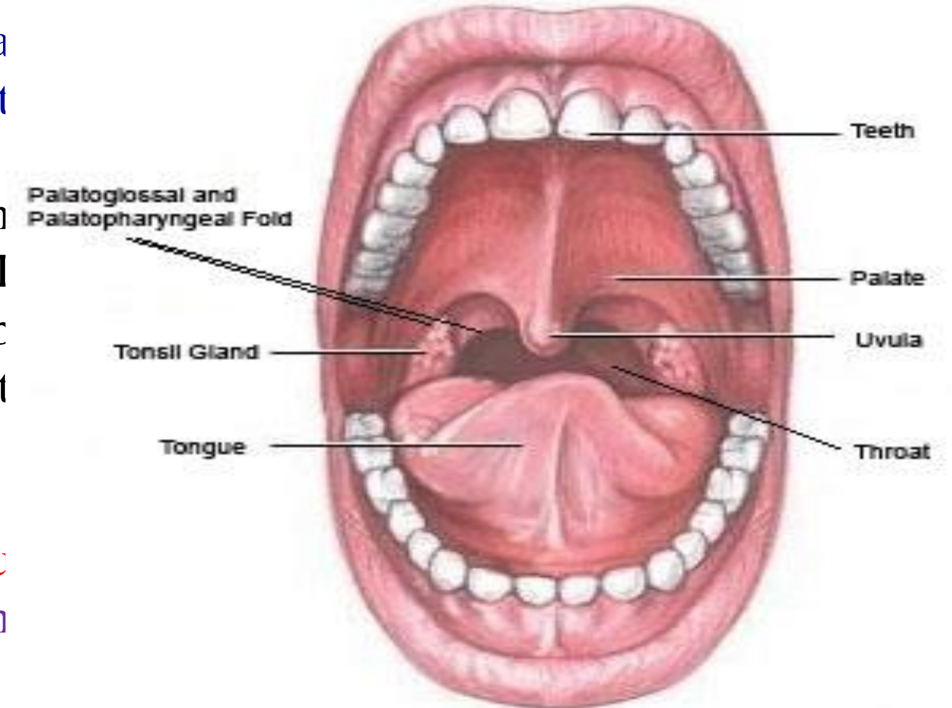
Any little exercise that can be devised that does not interfere with the x-ra examination but shifts the patient’s attention from the receptor and the mout is likely to relieve the gag reaction.

Asking patients to hold their breath or to keep a foot or arm suspended durin receptor placement and exposure often can create such a distraction. I extreme cases, topical anesthetic agents in mouthwashes or spray can b administered to produce temporary numbness of the tongue and palate t reduce gagging.

However, in our experience, this procedure gives limited results.

The most effective approach is to reduce apprehension, minimize tissu irritation via local anesthetic application , and encourage rapid breathin through the nose.

If all measures fail, an extraoral examination may be the only means, short administering general anesthesia, to examine the patient radiographically



localization technique:

The dental radiograph is a **two dimensional picture of a three** dimensional object , a radiograph depict in superio-inferior and anterio- posterior relation ship,so the dental radiograph does not depict the bucco – lingual relation ship ,or depth of an

An intraoral technique for **object localization** is the tube-shift method. It goes by different terms, including **Clark's rule**, the **buccal object rule** and **the same-lingual**, **opposite-buccal (SLOB) rule**.

The principle of this method requires exposing two different angulated intraoral x-ray images of one area.

The first image acts as a reference image. The horizontal or vertical angulation of the PID is then modified prior to taking a second image of the same area. Comparison of the two images for positional changes of the object of interest will determine if it is located more towards the buccal or lingual aspect. In situations where a foreign object is located in an edentulous region, the practitioner may still be able to apply the SLOB rule simply by utilizing dental anatomic landmarks as a guide. In this scenario, one must study the position of the object in relation to a reference landmark .

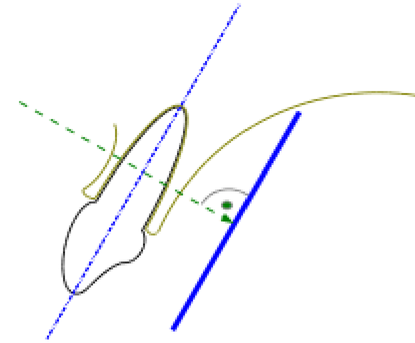
There are many times when it is necessary to establish the depth of the structure , such as a foreigh object or impacted tooth within the jaws , LOCALIZATION TECHNIGUES can be be used to obtain this dimensional information , **so we can use it to locate the following ;**

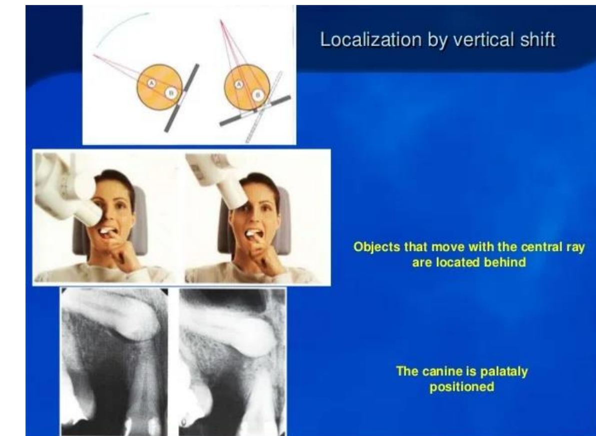
1-Foreign bodies

2-Impacted teeth

3-Unerupted teeth

4-Salivary stone





Types of localization technique:

1-Right – angle technique

2-Tube-shift technique

3-Stereo radiography (**The method of taking radiographs from two slightly different positions so as to obtain a stereoscopic effect)**

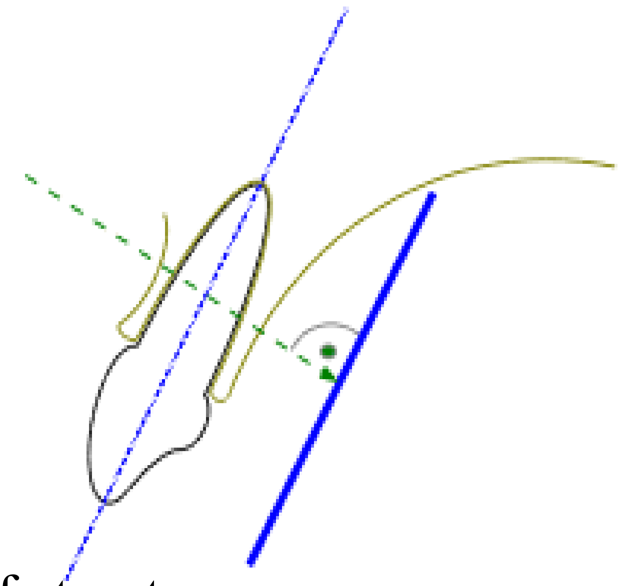
4-Radioopaque media technique(Radiopaque agents are drugs used to help diagnose certain medical problems. They contain iodine, which blocks x-rays. Depending on how the radiopaque agent is given, it localizes or builds up in certain areas of the body. **The resulting high level of iodine allows the x-rays to make a "picture" of the area)**

The first two technique are the more used because of **there simplicity and accuracy**

Right angle technique :

This technique involve the use of at lest two films taken in at right angle to each other ,

1-one periapical film is exposed using the proper technique and angulation to show the position of the object in a superrior –inferior and anterior – posterior relationship

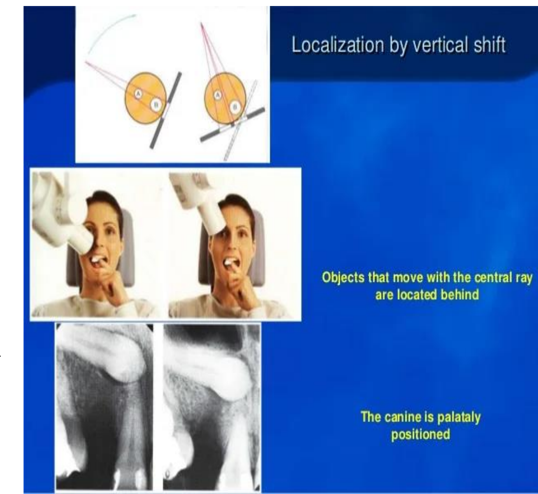


Tube –shift technique :

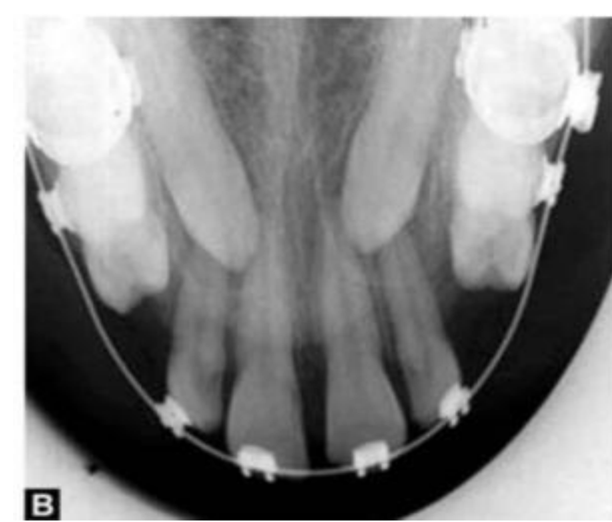
This technique is also called buccal object rule this govering the orientation of structure portrayed in two radiographs exposed at different angulations .

- One periapical or bite – wing film is exposed using proper technique and angulation ,
- A second periapical or bite –wing film is then exposed after changing the direction of the x- ray beam . A different horizontal or vertical angulation is used. For example a different **horizontal angulation** is used when trying to locate vertically aligned images (root canal), whereas a different vertical angulation is used when trying to locate a horizantally aligned images

  (mandibular canal)



after the two films have been exposed and processed , the radiograrhs are compared with each other .



When the dental structure or object seen in the second radiograph appears to have moved in the same direction as the shift of the tubehead,the structure or object in question is positioned to the lingual

For example , if the horizontal angulation is changed by shifting the tube mesially,and the object moves mesially on the dental radiograph , then the object lies to the lingual

This method involves taking of two radiographs and the use of the principle of horizontal or vertical parallax.

This method was first introduced by Clark (1909).

The horizontal parallax involves taking of two radiographs at different horizontal angles and with the same vertical angulation. Due to parallax the more distant object appears to travel in the same direction as the tube shift and the object closer to the tube appears to move in the opposite direction; the so **called Same Lingual** .**Opposite Buccal (SLOB) rule**; or this can be equally remembered as Buccal Opposite Palatal Same (BOPS)}.

The cone shift technique may also be applied when the radiographs are taken at different vertical angulations (vertical parallax).

The different combinations that are commonly tried based on the technique of parallax include

Two intraoral periapical radiographs taken at different horizontal angles (Clark, 1909).

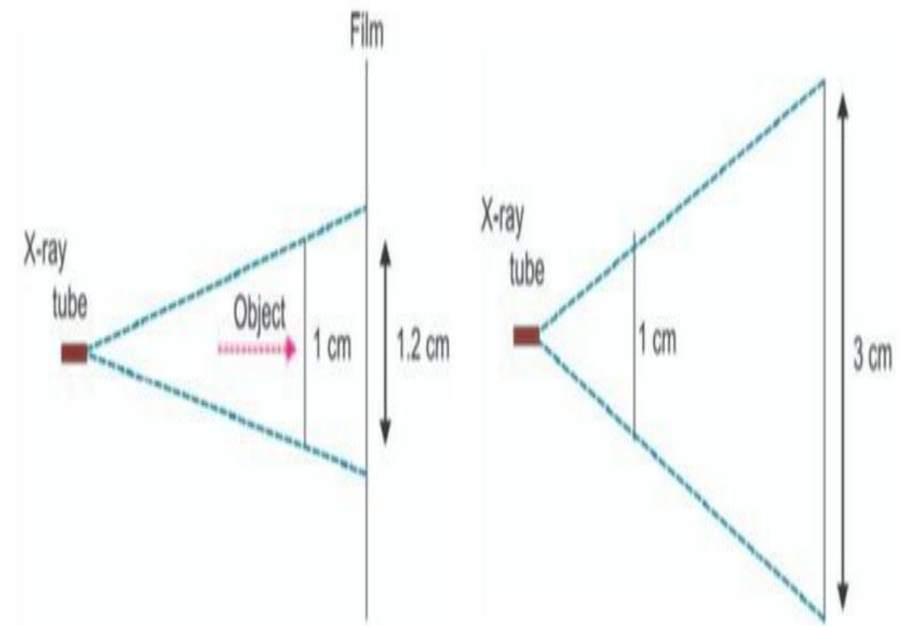
Clark’s rule is extremely useful in cases in which the position of the canines is such as to give a superimposition with respect to a chosen dental reference point. However, care should be taken about the fact that the radiographs being compared should be identical with respect to all other factors other than the angulation of the X-ray beam. It is also unfavorable from a biologic perspective as a single exposure for an intraoral radiograph amounts to about 2.4 to 4.3pS (micro Sievert). Magnification

For a given focal spot film distance, objects away from the film will be depicted more magnified than objects closer to the film; this is the principle of ‘**Image Size Distortion’**

There are two methods based on this principle:

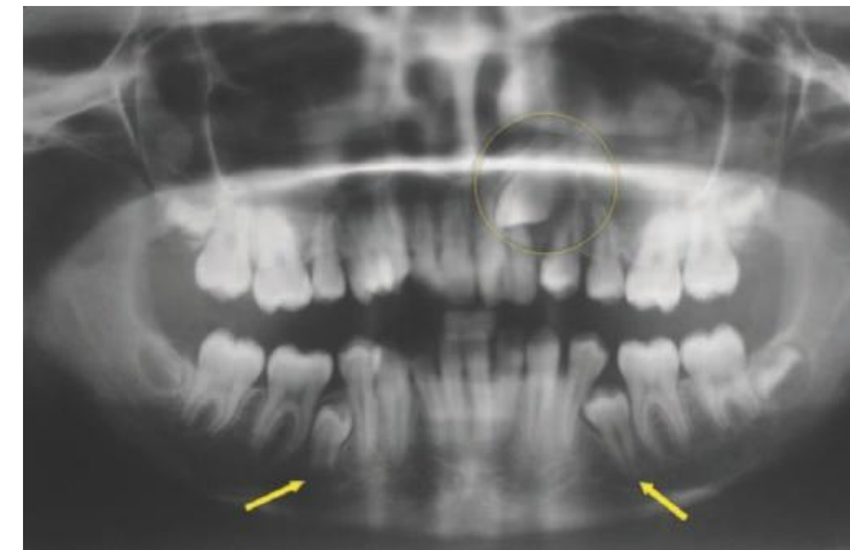
a. Status-X-Radiography (Ostrofsky, 1976)

This technique makes use of the fact that the anode of the status-X-machine is considered to have an almost point source of X-radiation. Here a special tube is inserted in the mouth of the patient and the film held around the face by the patient. Hence, there is a point source of radiation and the laws of central projection apply-the object closer to the source is magnified.



Showing how magnification increases with increase in the object film distance

b. Panoramic Radiography (OPG) This is a fundamental examination which gives an overview but does not permit precise localization of an impacted canine. The principle of image distortion can be applied in panoramic radiography. If a canine is relatively magnified in comparison to the adjacent teeth in the arch or the contralateral canine, it will be located closer to the tube, i.e. palatally, and if the size is relatively diminished it will be located further away from the tube, i.e. labially. **This method is most effective when the canine is not rotated, not in contact with the incisor root and there should be no tipping of the incisor roots**



- When the dental structure or object in the second radiograph appears to have moved in the direction opposite the shift of the tube , the object is positioned to the buccal
- For example, if the horizontal angulation is changed by shifting the tube distally and the object moves mesially on the dental radiograph , the object lies buccal

There is a mnemonic that can be used to remember the buccal object rule

SLOB

same= Lingual Opposite=Buccal

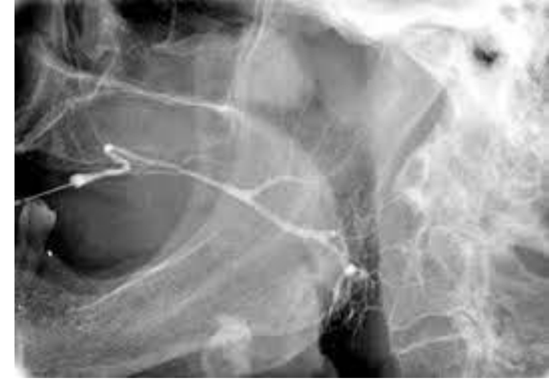
Stereo radiography

this not a widely used because it is time consuming , and the film taken with this technique require a special device , however the operater can train himselfe without such device

Radiopaque media

- Radioopaque media such as barium sulfate lipodol and dionsite can be used to demarcate cavernous area within hard and soft structure . Such materials are also used to outline soft tissue peripheries such as the profile of the face and neck.

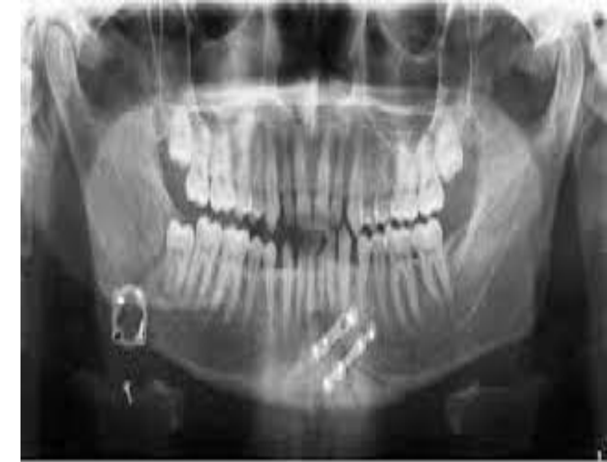
Contrast media & localization technique



Iodinated contrast media are contrast agents that contain **iodine atoms** used for x-ray-based imaging modalities such as **computed tomography** (CT).
They can also used in **fluoroscopy**, **angiography** and **venography**, and even occasionally, plain radiography.
the intravenous route of administration is most common, they are also administered by many other routes, **including gastrointestinal (oral, rectal), cystourethral**, **vaginal**, intraosseous, etc
Conray 80, Amipaque 440, Lipiodol UF, Myodil, and Duroliopaque appear to be the media most suited for sialography, provided glandular overfilling is avoided.
The ability to distinguish between tissues of different x-ray attenuation (image contrast) depends upon **two types of interactions** between photons and matter:
Compton scattering and photoelectric absorption.
Both these interactions depend upon physical density, but the latter also depends upon atomic number of the matter. As iodine has a high atomic number, 53, compared to most tissues in the body, the administration of iodinated material produces image contrast due to **differential photoelectric absorption.**

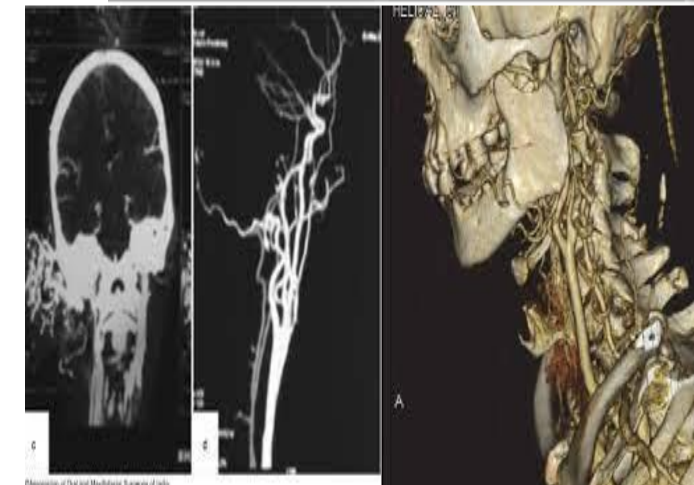
C ARM FLOUROSCOPY:

The anatomic complexity of the maxillofacial region makes the retrieval of foreign bodies a daunting task for the maxillofacial Surgeon. Moreover the inability of 2-dimensional imaging to precisely locate foreign bodies makes it challenging. The anatomic proximity of critical structures and esthetic considerations limits the access and thus poses a greater challenge for the surgeon in cases of foreign body retrieval. Hereby we propose a simple technique and a case report to support, the retrieval of small (<5 mm greatest dimension) objects from the maxillofacial region. The present technique uses a 2 dimensional mobile C arm Fluoroscopy and a needle triangulation method to precisely locate a loosened miniplate screw in the mandibular angle region



ANGIOGRAPHY It is very important and significant for doctors to determine the status of vascular-related diseases such as thrombosis and arteriosclerosis and to precisely visualize the three-dimensional (3D) structure of the vasculature before surgery

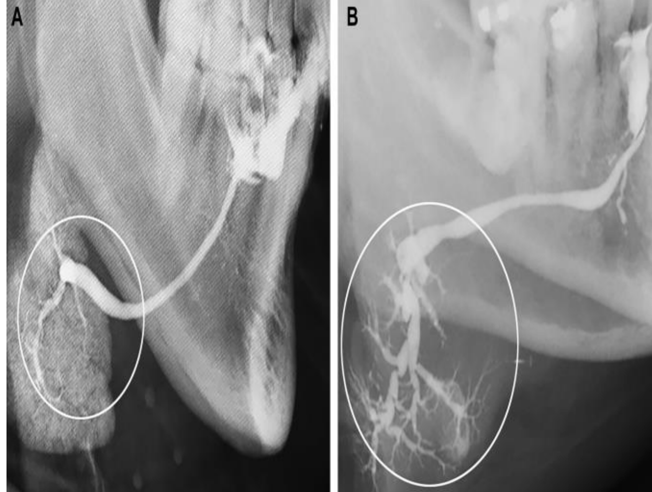
In dental fields, understanding the 3D structure of the vasculature is necessary and important for surgical operations on tumors and cysts

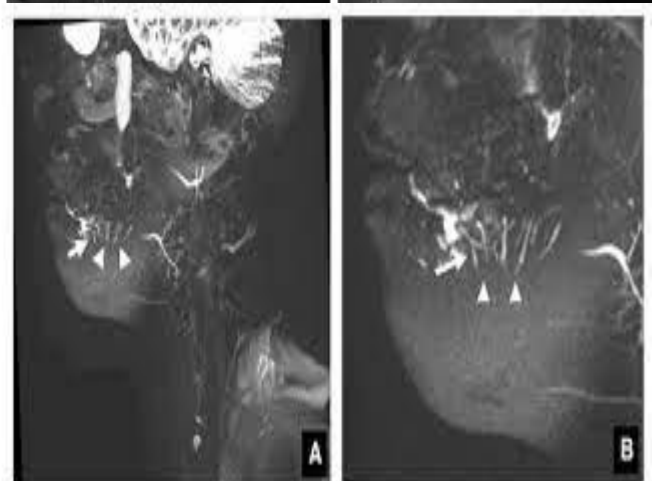


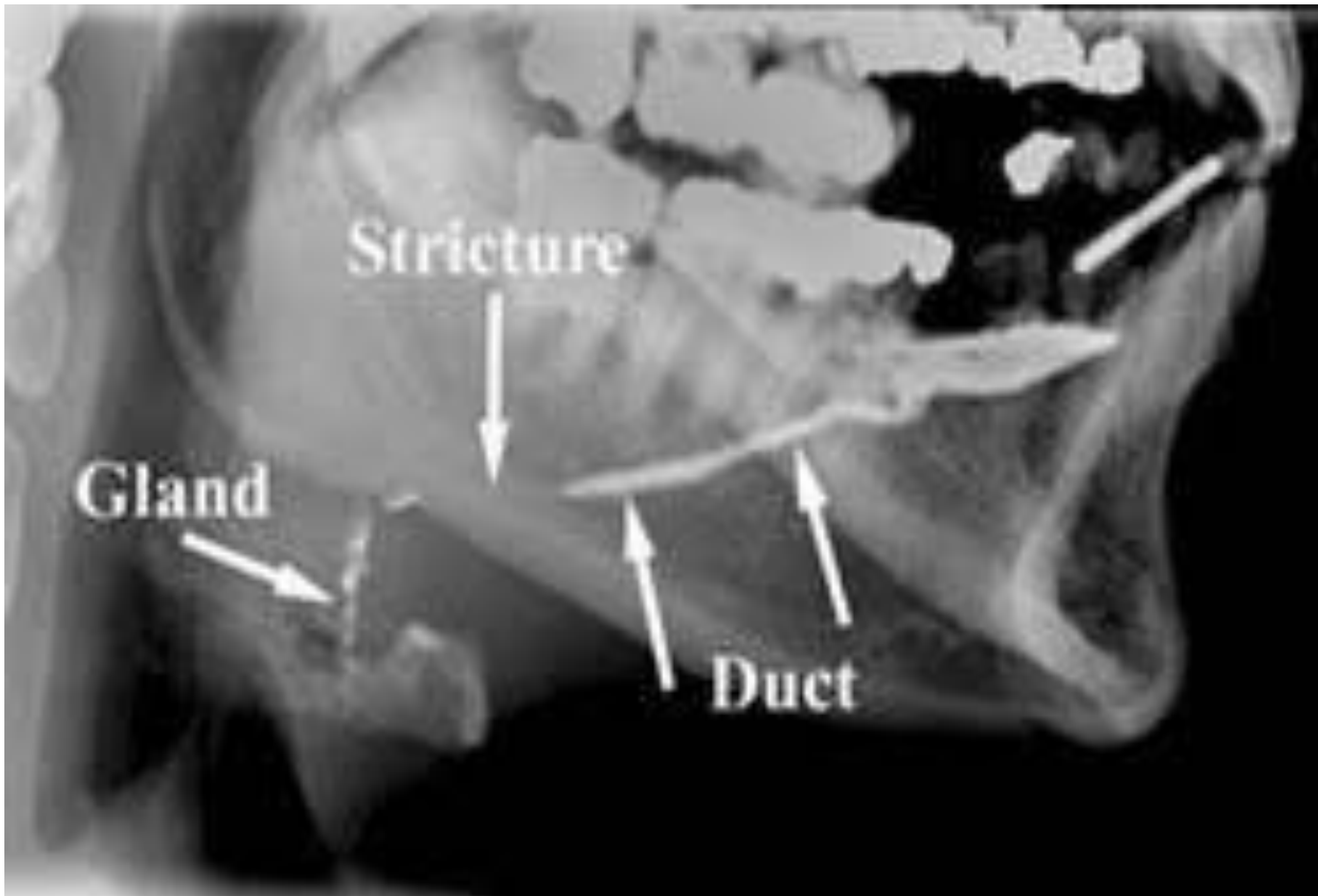
VENOGRAPHY: Vascular anomalies are lesions arising from the arterial and/or venous and/or lymphatic circulation. These have a wide array of histological and clinical features and constitute one of the commonest congenital anomalies in infants and children

A sialogram is **a test use to diagnose a blocked salivary gland or duct in your mouth**. T
he procedure uses X-rays. It's also called a **ptyalogram**.

A **Sialogram** is an x-ray procedure that looks at the salivary ducts and glands. A small tube is inserted into the gland







Thank You!