

Radiographic Techniques for the Pediatric Patient

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Abstract

Obtaining quality radiographs on pediatric patients can be a challenge. Suggestions for communicating with patients about radiation safety and the need for radiographs can facilitate the process. Guidelines for radiographic exposure intervals for young patients are key elements in the reduction of exposure to ionizing radiation and are presented in this paper. The child patient presents unique challenges for the dental professional and special techniques are presented in this article that may be helpful in the conducting radiographic examinations for this patient population.

Keywords: Radiographs, gagging, radiographic guidelines, child restraint

Principles for Proper Radiographic Examination

The foundation of an accurate diagnosis and treatment plan is based on a comprehensive medical and dental history, a thorough clinical examination, and diagnostic radiographs. Of the three, obtaining diagnostic radiographs in the pediatric dental patient is probably the most difficult to accomplish, not only from a technical standpoint but because of parental fears and misconceptions.

Communicating with Parents

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With the news media reporting on a daily basis the environmental insults experienced by the human body, parents may be preoccupied with the effects of diagnostic and treatment procedures on their child's health. Reducing the possible deleterious effects of preventive and restorative materials, sterilization protocols, and diagnostic techniques should be a concern of parents and dentists.

During the first appointment, a dental professional reduces a parent's resistance to the use of radiographs by informing the parents of the diagnostic need for radiographs and educating them about current radiation hygiene practices and radiographic techniques. An explanation should include the concept that without radiographs, an examination only detects the tip of the iceberg. It should be emphasized that visual examination reveals only three of the five surfaces of the teeth because if the child's teeth are close together the dentist cannot see between them. Furthermore, the dentist cannot see the insides of the teeth, their roots, nor the permanent teeth developing in the jaws. Radiographs enable the dentist to detect the start of visually undetectable cavities between teeth, infections of the teeth, gums and bones, the shape and presence of unerupted permanent teeth, potential orthodontic problems, and a host of other pathological conditions.

Although excessive radiation exposure can result in cancer, birth defects, and genetic defects, the amount of radiation needed to expose the newer X-ray film has significantly reduced the amount of radiation to which patients are exposed. As digital radiography gains wider use in the dental practice, dental professionals who use this new technology should mention that it further reduces the amount of X-radiation exposure to a minimum.

Along with the above explanation and use of the proper equipment, the dentist should follow guidelines shown in Table 1. The guidelines are recommended by the American Dental Association.

Table 1.			
Patient Category	Child		Adolescent
	Primary Dentition (Prior to eruption of the first permanent tooth)	Transitional Dentition (Following eruption of the 1st permanent tooth)	Permanent Dentition (Prior to the eruption of the third molars)
New Patient			
All new patients in order to assess dental disease & growth development.	Posterior bitewing examination of proximal surfaces of primary teeth cannot be visualized or probed.	Individualized radiographic examination consisting of perioapical/occlusal views and posterior bitewings or panoramic examination and posterior bitewings.	Individualized radiographic examination consisting of posterior bitewings and selected periapicals. A complete mouth radiographic examination is appropriated when the patient presents with clinical evidence of generalized dental disease or a history of excessive dental treatment.
Recall Patient			
Clinical caries or high risk factors.	Posterior bitewing examination at 6 month intervals or until no carious lesions are evident.		Posterior bitewing examination at 6 to 12 month intervals or until no carious lesions are evident.
No clinical caries and no high risk factors for caries.	Posterior bitewing examination at 12 to 24 month intervals.		Posterior bitewing examination at 18 to 36 month intervals.
Periodontal disease, or a history of periodontal therapy.	Individualized radiographic examination consisting of selected periapicals and posterior bitewings for areas where periodontal disease (other than non-specific gingivitis) can be demonstrated clinically.		
Growth and development.	Usually not indicated.	Individualized radiographic examination consisting of perioapical/occlusal or panoramic images.	Periapical or panoramic examination to assess developing third molars.

The Guidelines strongly suggest that:

- X-rays should not be taken routinely. A dentist should first examine a child's teeth and medical status before ordering radiographs. The guidelines suggest the number and types of radiographs necessary depends on the age of the child, the presence and amount of visual decay, the child's and family's history of dental treatment, and spaces between teeth.
- If possible, obtain copies of prior radiographs (from other office, if available).
- The patient should be protected with a lead apron and thyroid collar to reduce body exposure to radiation.
- The highest film speed and largest film that the child can tolerate should be used so as to reduce the number of radiographs needed.
- Use the manufacturer's recommended time and temperature for processing.

Parents have the right to ask that the dentist refrain from taking radiographs. However, the dentist has the responsibility to refuse treatment if not taking the radiograph compromises the patient's treatment. Parents cannot relinquish the right to competent care by a dentist.

Management Techniques

In the rare occasion when a very young dental patient under three years of age needs a radiograph, the dental office should be prepared with techniques to reduce any psychological trauma.

The first step in desensitizing a child to the dental experience is to explain what you plan to do in words that are easily comprehended. Using a tell, show, do technique, the clinician explains to the child that a tooth camera will be used to take a picture of their tooth. The child is allowed to touch and examine the radiographic film and camera. To gain maximum cooperation in the child under three years of age, it may be necessary for the child to sit in the parent's lap while exposing the radiograph. This position may reduce the child's anxiety to such a degree that minimal restraint may be needed to successfully take the radiograph. The child is seated in the

parent's lap with the parent's arms around the child's upper body (Figure 1) and the legs wrapped around the child's lower body. (Figure 2)



Figure 1.



Figure 2.

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

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. A positioning device such as a Snap-A-Ray instrument can be used to aid the parent in positioning and securing the film. (Figure 3) Be sure to adequately protect the parent and child with lead aprons to reduce radiation exposure. 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 Snap-A-Ray instrument in the patient's mouth. (Figure 4) Under no circumstances should staff be asked to perform this task.



Figure 3.



Figure 4.

If a second adult is not available, it may be necessary to restrain the child in a "papoose board". (Figure 5) This frees the parent to stabilize the child's head and properly position the radiograph in the child's mouth. (Figure 6)



Figure 5.



Figure 6.

If the child is still uncooperative, it may be necessary to manage the child pharmacologically with inhalation, oral, or parental sedatives. (Figure 7)



Figure 7.

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 a severe gag reflex. There are numerous techniques to overcome these problems.

Bitewing radiographs are usually used to detect proximal decay, so for the child with a small mouth use the smallest size film available (size 0 film). As a less desirable alternative, roll the film (don't place sharp bends) to allow the film to accommodate the shape of the jaw and not impinge on the soft tissues. (Figure 8) It should be noted that rolling the film increases the distortion of the radiographic image at its edges.

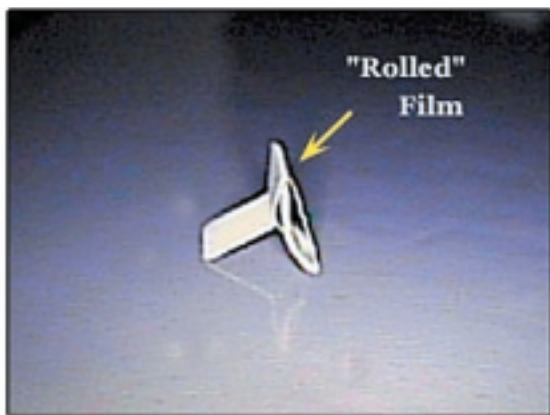


Figure 8.

Use of the Snap-A-Ray instrument with a #1 size film (Figure 9) as a bitewing tab will reduce impingement on the soft tissue. Using a #0 size film with this device will unfortunately reduce the amount of detectable tooth structure on the radiograph.

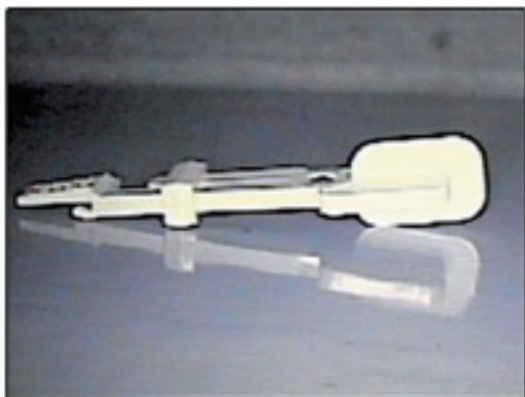


Figure 9.

The Snap-A-Ray instrument is also a useful addition to the radiographic technique for those patients who have a fear of swallowing the radiograph. By biting on the large positioning device and watching in a mirror they are assured they won't swallow the radiograph. (Figure 10)



Figure 10.

For patients who are frightened of the procedure itself, desensitization techniques may be necessary to gain the patient cooperation. Desensitization involves gradually exposing the child to new stimuli or experiences of increasing intensity. An example of this would be the "Lollipop Radiograph."



Figure 11.

The child is given a sugarless lollipop to lick. (Figure 11)



Figure 12.

After a few licks, the lollipop is taken from the child and a radiograph is attached to the lollipop with an orthodontic rubber band on the lingual side of the film. (Figure 12)



Figure 13.

The lollipop with the attached film is returned to the child, who is told to lick the lollipop again. After a few licks, the child is told to hold the lollipop in his mouth while we take a tooth picture. The exposure is made. (Figure 13)

The child has now associated the radiograph procedure with a pleasurable experience (the licking of the lollipop) and has been desensitized to the extent that the more difficult posterior radiographs can be attempted.

Posterior radiographs can be made more pleasant by associating them with a pleasurable taste such as bubble gum. Before placing the radiograph in the patient's mouth apply bubble gum flavored toothpaste to the film. (Figure 14) The child will be more accepting of the radiograph.



Figure 14.

Some patients, young or old, may have an exaggerated gag reflex. The etiology of an exaggerated gag reflex has been attributed to psychological and physical factors. There are numerous techniques to control the gag reflex during the radiographic procedure.

The easiest is through diversion and positive suggestion. It is advisable to avoid suggesting to a patient that the film may cause them to gag. In doing so it is likely you are psychologically preparing the patient to respond to your suggestion. As a diversion, the patient can be instructed to hum a tune, raise a leg, or look at themselves in a mirror. However, this technique is not always successful, so other techniques must be brought into play.

Using a cotton tip applicator, the patient's palate and tongue can be coated with a topical anesthetic to reduce the sensation of the radiograph. This technique is more successful with adults rather than children since a pleasant tasting topical anesthetic has yet to be invented and children often object to the numb feeling.

An alternative is the use of nitrous oxide analgesia. One of the effects of nitrous oxide analgesia is that it reduces the gag reflex, but unlike general anesthesia does not affect the cough reflex. (Figure 15)



Figure 15.

Another alternative is to place the film in such a manner so that it does not come in contact with the palate or tongue. This is accomplished by either extraoral placement of a #4 sized film, or placing the film between the cheek and the tooth. The film is then exposed from the other side of the jaw.



Figure 16.

The film is placed on the buccal surface of the tooth between the tooth and the cheek. The film side of the packet (the white side) is facing the buccal surface of the teeth. (Figure 16)



Figure 17.

The X-ray head is placed at the opposing side and the cone is positioned under the angle of the ramus. The radiation is directed through the tongue, through the tooth structure, and onto the film. (Figure 17) 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.

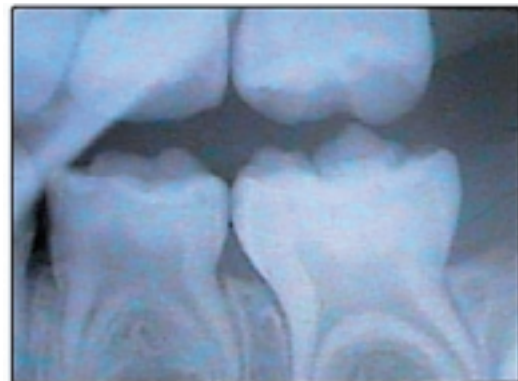


Figure 18.

In spite of increased magnification of the image and loss of detail due to scatter radiation (Figure 18), this can provide adequate information to develop an accurate diagnosis. It is imperative when the radiographs are mounted you note that the radiographs are reversed. What appears to be a radiograph of the right side is really a radiograph of the left side and vice versa. Incorrect mounting and labeling of these radiographs can result in misdiagnosis and treatment of the wrong tooth.

Conclusion

Through the use of proper and innovative radiographic techniques, dental professionals can obtain diagnostic radiographs with minimum harm and maximum comfort for the pediatric patient.

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About the Author

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Dr. Steven Schwartz has maintained a successful pediatric dental practice since 1976. He is a diplomate of the American Board of Pediatric Dentistry and director of pediatric dentistry at Staten Island University Hospital. He is the author of numerous scientific and practice management articles, a member of the National Speakers Association and the primary lecturer for WOW! Seminars. Additional information can be found at WWW.WOWSEMINARS.COM and he can be contacted by e-mail at: WOWSMNRS@AOL.COM

