CHAPTER 5 RADIOGRAPHIC TECHNIQUES

McDonald, Avery, Dean. Dentistry For The Child And Adolescent, 8th Ed. Page: 33-49

Tuesday 11\10\2016

1:00 pm-2:00 pm
LECTURE OUTLINE

• RADIATION SAFETY AND PROTECTION

• SELECTION CRITERIA AND RADIOGRAPHIC EXAMINATIONS

• COMMONLY USED RADIOGRAPHIC TECHNIQUES

• LOCALIZATION TECHNIQUES

• DIGITAL RECEPTORS FOR PEDIATRIC PATIENTS

• INTERPRETATION
OBJECTIVES

YOU SHOULD BE ABLE TO ANSWER THE FOLLOWING QUESTIONS AT THE END OF THIS LECTURE:

• WHEN TO TAKE RADIOGRAPHS IN PEDIATRIC DENTISTRY?

• WHY RADIOGRAPHS ARE TAKEN IN PEDIATRIC DENTISTRY?

• WHAT TO LOOK FOR IN THE RADIOGRAPHS?

• WHICH FILMS TO USE AND THE VIEWS USED IN PEDIATRIC DENTISTRY?

• HOW TO POSITION THE CHILD PATIENT TO GET NEEDED IMAGES?
INTRODUCTION

EARLY DIAGNOSIS OF CARIES: prevents pediatric patient from experiencing dental pain, extraction, and emotional stress.

ERUPTIVE OR DEVELOPMENTAL PROBLEMS CAN BE DISCOVERED: early treatment of these problems may reduce the need for prolonged orthodontic procedures.

RESTORATIVE PROCEDURES REQUIRE AN ACCURATE REGISTRATION: of pulpal outline that only a radiograph can reveal.
INTRODUCTION

The selection of appropriate radiographs for the pediatric patient depends on the:

AGE of the child,

SIZE of the oral cavity,

Level of patient COOPERATION.

Ideal technique should expose patient to a

MINIMUM amount of radiation,

Require as FEW radiographs as possible,

Take as little TIME as possible,

and provide a diagnostically accurate EXAMINATION of dentition and supporting structures.
Dental radiographic equipment can be THREATENING or can GENERATE CURIOSITY, depending on child. It is wise to allow patient to run a hand over x-ray head and become acquainted with "camera." Patient hold films and be shown where it will be placed.

If it is a film that requires biting pressure, patient should be shown how to bite on film. "Show and tell" will go a long way in gaining cooperation.

Careful WORDING of description of procedure is essential to gain patient cooperation. Potential cooperation of many a patient has been lost when patient hears that you will be "shooting" a couple of films.

Imaging EASIEST REGION FIRST. This is particularly important if the child has an exaggerated gag reflex or objects to the placement of the film. The use of T A agents may be beneficial.
INTRODUCTION

The dentist should be PATIENT with child in obtaining radiographs. REPEATED attempts at film placement may be necessary before actual radiation exposure is made.

If the child is uncooperative, firmness, voice control, and tender loving care are often effective.

Emotionally, mentally, and physically disabled children require special handling.
RADIATION SAFETY AND PROTECTION

Reduction in radiation to patient also reduces error from patient movement:

FASTER FILM SPEEDS

EXTRAORAL (PANORAMIC).

BEAM-POSITIONING DEVICES

LENGTH AND THE SHAPE OF THE CONE

LONG RECTANGULAR COLLIMATOR

HIGHER KILOVOLT PEAK TECHNIQUES
SELECTION CRITERIA AND RADIOGRAPHIC EXAMINATIONS

Decision to make radiographs is based on a thorough evaluation and examination. Radiographs should be made only when there is an expectation that disease is present or when an undetected condition left untreated could adversely affect patient's dental health.

Selection criteria are clinical signs or symptoms that allow practitioner to identify patients who will benefit from a radiographic examination. Two important considerations when deciding whether to perform a radiographic examination for children are

- Stage of dentition development and
- Risk of dental caries.
CRITERIA FOR EXPOSING OF RADIOGRAPHS IN ASYMPTOMATIC CHILDREN

The criteria for exposing radiographs assume that child is asymptomatic and dentist finds no specific clinical indications for radiographic examination.

Exceptions to this rule include those conditions in which there is *clinical evidence of injury, disease such as caries, pulpal pathosis, delayed or accelerated eruption or exfoliation of teeth, swelling, hemorrhage, pain, or ulceration, or those conditions in which there is a need to evaluate treatment*. In such cases, taking appropriate radiographs is indicated to confirm diagnosis and facilitate and evaluate treatment.
DEVELOPMENT OF THE DENTITION AS CRITERION

Dental radiographs are indicated in the following situations.

**PRIMARY DENTITION**

If proximal surfaces of primary teeth cannot be visually and tactiley inspected and child can be expected to cooperate to determine presence of interproximal caries.

If all surfaces of all primary teeth can be examined clinically because of open contact, then radiographs are not indicated.

If the child's behavior that obtaining films of adequate diagnostic quality is doubtful, then radiographs should be deferred until behavior improves.
Dental radiographs are indicated in the following situations.

**EARLY TRANSITIONAL DENTITION**

(After appearance of permanent first molars or permanent mandibular incisors, or both.)

- To evaluate presence of interproximal caries,
- developmental anomalies of teeth,
- and pathologic conditions of hard and soft tissues of mouth, jaws, and associated structures.
DEVELOPMENT OF THE DENTITION AS CRITERION

Dental radiographs are indicated in the following situations.

EARLY PERMANENT DENTITION.

(After puberty; after patients have achieved most of their adult stature; late adolescence).

• To evaluate same tissues as in early mixed dentition and

• to check position and developmental status of third molars.

• No other dental radiographs are routinely needed in children.
DEVELOPMENT OF THE DENTITION AS CRITERION

Bite-wing radiographs would be taken to detect presence of interproximal caries if risk of caries activity were HIGH.

Discolored marginal ridges are indications of high risk of caries activity.

Periapical films of canine areas could be taken if these teeth were NOT clinically palpable by 9 years of age.

DEVELOPMENT OF THE DENTITION AS CRITERION

Dentist must use clinical judgment and evaluate such factors as oral hygiene practices, diet, attitude and compliance, fluoride history, alignment of teeth, and morphology of teeth to determine the necessity for, the extent of, and the type and frequency of diagnostic radiographs.
RISK OF THE PATIENT FOR DENTAL CARIES AS CRITERION

High risk of dental caries may be:

*Poor OH,*

*Fluoride deficiency,*

*Prolonged nursing (bottle or breast),*

*High-carbohydrate diet,*

*Poor family dental health,*

*Developmental enamel defects,*

*Developmental disability*

*And acute or chronic medical history,*

*And genetic abnormality.*
High risk of dental caries should have BW radiographs made as soon as posterior primary teeth are in proximal contact. The age of patient is not an important variable. If interproximal caries is detected, then follow-up radiographs are indicated semiannually until child is caries free and therefore is classified as having a low risk for dental caries.

Low risk for dental caries may be defined as a:

*Normal, healthy, asymptomatic patient exposed to optimal levels of fluoride (preferably since birth), who performs daily preventive techniques and consumes a diet with few exposures to retentive carbohydrates between meals.*
RISK OF THE PATIENT FOR DENTAL CARIES AS CRITERION

Posterior bite-wing radiographs should be made for low-risk patient with closed proximal contacts. If no evidence of caries is found, then radiographs may be retaken every 12 to 18 months.

If primary teeth are in contact or after up to 24 months if permanent teeth are in contact.

Bite-wing radiographs may be taken more frequently if child enters the high-risk category.

*The more rapid progression of caries in primary teeth should be considered in determining time interval between bite-wing radiographs.*

RISK OF THE PATIENT FOR DENTAL CARIES AS CRITERION

*The more rapid progression of caries in primary teeth should be considered in determining time interval between bite-wing radiographs.*
TYPES OF FINDINGS ANTICIPATED AS CRITERIA

B.W. radiographs are indicated when a clinical examination discloses posterior tooth contact, at first clinical evidence of caries and usually taken every 12 to 18 months in absence of dental caries with primary tooth contact or every 24 months with permanent tooth contact.

TYPES OF FINDINGS ANTICIPATED AS CRITERIA

By time first permanent tooth has erupted (posterior or anterior), an anterior occlusal radiograph should be made. This allows detection of conditions such as supernumerary teeth, missing teeth, and dens in dente.

A radiographic examination that includes tooth-bearing areas of mandible and maxilla is recommended at approximately time of early mixed dentition to assess dental age and to aid in early diagnosis of congenital and developmental anomalies.
TYPES OF FINDINGS ANTICIPATED AS CRITERIA

Radiographic examination may consist of one of the following: posterior periapical radiographs, panoramic radiograph, or lateral jaw 45-degree projections.

Another similar radiographic examination may be made within 2 years after eruption of permanent second molars.

To check on growth and development, a cephalometric radiograph may be prescribed by practitioner who is providing orthodontic diagnosis or treatment.
When a new patient is seen at dental office and no previous radiographs are available, it may be
necessary to obtain a baseline series of radiographs. Again, we cannot overemphasize that
decision to make a radiographic examination is based on the criteria previously outlined.

These examinations include the following.

Four-Film Series. This series consists of a maxillary and mandibular anterior occlusal and two
posterior bitewings.

Eight-Film Survey. This survey includes a maxillary and mandibular anterior occlusal (or
periapicals), a right and left maxillary posterior occlusal (or periapicals), right and left primary
mandibular molar periapicals, and two posterior bite-wings.

Twelve-Film Survey. This examination includes four primary molar-premolar periapical
radiographs, four canine periapical radiographs, two incisor periapical radiographs, and two
posterior bite-wing radiographs.

Sixteen-Film Survey. This examination consists of the 12-film survey and the addition of 4
permanent molar radiographs.
COMMONLY USED RADIOGRAPHIC TECHNIQUES

- Bite-Wing Technique

- Paralleling Technique

- Bisecting Angle Technique

- Specific Dental Projections: Periapical, Molar projection, Premolar or primary molar projection, Permanent or primary canine projection, Permanent or primary incisor projection

Anterior maxillary occlusal technique, Posterior maxillary occlusal technique, Anterior mandibular occlusal technique, Occlusal

- Panoramic Radiography

Several techniques are commonly used to radiograph a child's dentition. The technique used depends primarily on the size of the oral cavity, the number of teeth present, and patient cooperation. The procedures commonly used by the private practitioner include the following:

1. Bite-wing

2. Periapical

3. Occlusal

4. Panoramic
COMMONLY USED RADIOGRAPHIC TECHNIQUES

- Bite-Wing Technique
- Paralleling Technique
- Bisecting Angle Technique

Specific Dental Projections:

- Panoramic Radiography
LOCALIZATION TECHNIQUES

One method of localizing embedded or unerupted teeth uses buccal object rule, which states that the image of any buccally oriented object appears to move in the opposite direction from a moving x-ray source. On the other hand, the image of any lingually oriented object appears to move in the same direction. Makes two radiographs of unerupted tooth.

Technique consists in positioning patient's head so that sagittal plane is perpendicular to floor and ala-tragus line is parallel to floor. An intraoral periapical film is placed in mouth and then exposed. A second film is placed in mouth in same position as first film, with patient's head position remaining same. The second film is then exposed. The vertical angulation should be same for each exposure. However, horizontal angle is shifted either anteriorly or posteriorly, depending on area being examined, for second view.

COMMONLY USED RADIOGRAPHIC TECHNIQUES

Another localization technique is the cross-section occlusal radiograph. Depending on size of child's mouth, either adult occlusal or a No. 2 periapical film may be used. To obtain a cross-section occlusal radiograph of the maxilla, the patient's sagittal plane is perpendicular to
the floor, and the ala-tragus line is parallel to the floor. The patient is asked to occlude lightly on
the film. The central ray is projected through the midsagittal plane and enters the skull 1 cm
posterior to bregma. (Bregma is the point at which the sagittal suture meets the coronal suture.)

The proper vertical angulation is determined when the central ray is directed through the long
axis of the maxillary central incisor roots.

Cross-section occlusal film can be employed for localization of anomalies in mandible. Either
adult occlusal or a No. 2 periapical film can be used. The patient's head is tilted backward
sufficiently to direct central ray through long axis of erupted teeth. The patient's head must be
 tilted on its long axis to accommodate positioning of x-ray tube. If determination of buccal or
lingual position of an impacted mandibular third molar is desired, central ray should be
projected through long axis of mandibular second molar. If it is necessary to localize an
unerupted second premolar, central ray should be directed through long axis of first premolar.
DIGITAL RECEPTORS FOR PEDIATRIC PATIENTS

Digital x-ray systems use solid-state detector technology such as CCD (charge-coupled devices) or CMOS (complementary metal oxide semiconductors) for image acquisition. Most of these systems have electronic wires attached to the sensor. Children under 4 or 5 years of age may not tolerate these wired sensors, may damage the cables because they do not understand the procedure and may "chew" on the cable, or may be more fearful just of the appearance of a wired system.

For these reasons a phosphor-based digital x-ray system may be ideal for the pediatric patient.

There is one “wireless" solid-state image detector from Schick Technologies, the Schick CDR Wireless sensor.

This device has just been introduced to the dental market, so there is not much experience with its use with children as yet.

DIGITAL RECEPTORS FOR PEDIATRIC PATIENTS

Photostimulable phosphors (PSPs) or storage phosphors are used for digital imaging for image acquisition. Unlike panoramic or cephalometric screen materials, PSPs do not fluoresce
instantly to produce light photons. Instead, these materials store the incoming x-ray photon
information like a latent image in conventional film based radiography until the plates are
scanned by a laser beam in a drum scanner. The laser scanning excites the phosphor to give up
the stored energy as an electronic signal, which is then digitized, with various gray levels
assigned to points on the curve to create the image information. The currently available
phosphor imaging systems are from Soredex (Digora.), AirTechniques (ScanX) and Gendex
(DenOptix).

These phosphor plates have no wire to the computer and resemble intraoral film in every way,
including size, thickness, rigidity, and receptor placement. They are soft and flexible much like
film, and as with conventional x-ray film techniques, infection control procedures must be
employed. The plates must be wrapped, exposed, and unwrapped and then carefully shaken out
of the barrier envelope onto a clean surface, wiped with a disinfectant, and fed into the laser
scan.

DIGITAL RECEPOTORS FOR PEDIATRIC PATIENTS

In some machines like the DenOptix system the plates are put into a template holder that is then
placed into the drum scanner. The Dentsply-Gendex DenOptix phosphor plate scanner. After the scanning process is completed, the resultant digital image can then be viewed on a monitor in about 30 seconds to 2.5 minutes depending on the system. This is called analog-to-digital conversion and it is how the phosphor imaging system becomes "digital." The technology is not new. This type of signal readout by laser scanning has been used in the laboratory industry for reading biologic fluid samples for decades. This "digital" imaging technique requires two steps to retrieve the final image, just like film. The technique also requires the same two-stage infection control procedures as film. But the final image is digital and can be subjected to electronic image processing to extract disease features more readily for treatment decision making. An interproximal carious lesion on the distal surface of tooth No. 29 (left) made more apparent by electronic image processing (right). An excellent explanation of the PSP process appears in the April 2000 issue of Dental Clinics of North America. The advantage of these digital-like phosphors is really in the image processing that can be applied after the image is acquired. Although electronic image processing can be performed on conventional x-ray film, the film must first be converted to digital information by scanning the image. Storage phosphors
(PSPs) and true digital images from solid-state detectors like CCD and CMOS receptors provide a virtually instantaneous digital image and require no additional data conversion prior to electronic image processing.

If the dentist wishes to employ these digital systems, either solid state or phosphor, he or she must use a good paralleling instrument system and paralleling technique to be successful.
When interpreting radiographs, the dentist must develop a systematic approach so that no areas of the radiographs are missed. No one way is necessarily better than another, provided that the approach is consistently followed. Viewing conditions should be adjusted so that the maximum information can be obtained from the radiographs. The radiographs should be placed in a mount that does not allow light to be transmitted through the periphery, only through the film itself. Other extraneous light from around the mount should also be masked out. It is preferable for the room in which the radiographs are reviewed to have subdued lighting. Finally, it is recommended that a magnifying glass be used. If these viewing conditions are followed, more information will be obtained, and thus better care will be provided for the patient.
Never explain the radiographic procedure to the child to avoid frightening him.

- True
- False

The Dentist should talk of the radiograph as taking a “picture” of the tooth with a “camera”:

- True
- False

When dealing with the child in dental radiography; you should be: confident, use the show and tell procedure, reassure the patient and never postpone the procedure:

- True
- False