

IN PRACTICE *Infection Control*

Dentistry's Newsletter for Infection Control and Safety

New Radiation Safety Guidelines for the Dental Office

Introduction

While radiation risks for dental office personnel are low, they can be further minimized by close attention to safety and practicing good techniques. Oral health providers need to be knowledgeable about these risks to answer patients' questions and protect themselves. The National Council on Radiation Protection and Measurements (NCRP) recently released an update to their guidelines for taking x-rays in the dental office. The NCRP is a congressionally chartered nonprofit association that disseminates guidelines and standards on radiation protection and measurement. NCRP Report No. 145, "Radiation Protection in Dentistry," details the new radiation protection guidelines for the use of x-rays in dental practices.

Overview

The new NCRP guidelines discuss a number of recommendations for safe practices including:

- ▶ the use of a thyroid collar for children;
- ▶ the use of a thyroid collar for adults if it will not interfere with the examination; and
- ▶ the use of either E- or F-speed x-ray film.

A scientific paper published in the *Journal of the American Medical Association* reported a potential link between low birth-weight babies and dental x-rays during pregnancy. The American Dental Association (ADA) therefore recommends that a protective thyroid collar and apron be used when dental x-rays are required during pregnancy unless specific clinical conditions indicate otherwise.

In its recently released document, *The Selection of Patients for Dental Radiographic Examinations*, the ADA and Food and Drug Administration (FDA) concur with the NCRP Guidelines. The November 2004 document reminds practitioners to remember the ALARA Principle (As Low as Reasonably Achievable) to control unnecessary patient exposure, including:

- ▶ use of the fastest image receptor compatible with the diagnostic task;
- ▶ collimation of the beam to the size of the receptor whenever feasible;
- ▶ proper film exposure and processing techniques; and
- ▶ use of leaded aprons and thyroid collars.

continued on page 2

Learning Objectives

After reading this article, the reader should be able to:

- ▶ Discuss recent changes to dental radiology safety guidelines.
- ▶ Describe the different kinds of radiation to which people are exposed.
- ▶ Discuss patient and staff safety concerns and procedures regarding radiation.
- ▶ Describe the advantages of digital radiography.

Contents

- 3 Compliance Corner
- 3 Glossary
- 4 Putting It All Together
- 4 Ask OSAP
- 5 OSAP Chart & Checklist
- 6 Calendar
- 7 Continuing Education Test
- 8 Practice Tip

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Radiation Safety Guidelines

continued from front cover

Other recommendations include using equipment that has a long cone or beam-indicating device of 8" to 12" to reduce radiation scatter and undue exposure to the patient. To attain even greater reductions in radiation exposure to patient skin, offices should consider using rectangular cones or beam limiting attachments.

Aluminum filters inserted in the tube head selectively remove long-wavelength and low energy x-rays that increase the radiation dose to the soft tissue of the face.

Patient Perception

Because patients perceive dental radiation to be much higher and more dangerous than it really is, it might be interesting to share with them the theory that a person living in an average location in the United States would have to receive full-mouth x-rays and a panoramic radiograph every four months for the rest of his or her life to be at the same exposure risk as a person living in the Rocky Mountains who has never had a dental radiograph taken. Even so, dental offices are advised to follow the "ALARA" rule when prescribing x-rays.

Staff Radiation Protection

Initial staff training, and in states where required, certification, should be adequate for maintaining safety and minimizing radiation exposure. There are five main considerations for staff safety when taking radiographs:

- ▶ position (out of primary beam);
- ▶ distance (minimum 6 feet away);
- ▶ shielding (barriers, aprons, walls);
- ▶ film-holding devices; and
- ▶ processing.

The x-ray technician should stand behind a shielding barrier/wall that is of sufficient density and thickness to prevent the penetration of radiation.



Unless they are pregnant, dental x-ray technicians are not required to wear dosimeter badges (see "Ask OSAP"). According to most state regulations, dental offices do not need to have lead-lined walls. Even standard two-by-four dry-wall construction is sufficient to prevent detectable radiation leakage from dental x-ray machines.

Digital Radiography

There may be a misconception that digital radiography does not involve radiation. Like panoramic radiography, digital dental images require less radiation and exposure time than conventional dental film radiographs. Instead of using film, the digital sensor captures the exposure information, converts it into an electronic signal, and sends it to the computer where it processes the information and creates an image on the monitor. Once viewed, the image can be saved on the computer hard drive or printed. Perhaps the best thing about digital radiography is that it eliminates the darkroom and, therefore, darkroom errors. Other advantages include not having to use or dispose of chemicals or silver, being able to send images electronically to referring clinicians and insurance companies, and providing better information to patients as to their dental needs. -OSAP



Compliance Corner

CDC Centers for Disease Control and Prevention

1. Wear gloves when exposing radiographs and handling contaminated film packets. Use other PPE (e.g., protective eyewear, mask, and gown) as appropriate if spattering of blood or other body fluids is likely (IA, IC).
2. Use heat-tolerant or disposable intraoral devices whenever possible (e.g., film-holding and positioning devices). Clean and heat-sterilize heat-tolerant devices between patients. At a minimum, high-level disinfect semicritical heat-sensitive devices, according to manufacturer's instructions (IB).
3. Transport and handle exposed radiographs in an aseptic manner to prevent contamination of development (II).

4. The following apply for digital radiography sensors:
 - a. Use FDA-cleared barriers (IB)
 - b. Clean and heat-sterilize, or high-level disinfect, between patients, barrier-protected semicritical items. If the item cannot tolerate these procedures then, at a minimum, protect with an FDA-cleared barrier and clean and disinfect with an EPA-registered hospital disinfectant with intermediate-level (i.e., tuberculocidal claim) activity, between patients. Consult with the manufacturer for methods of disinfection and sterilization of digital radiology sensors and for protection of associated computer hardware (IB).

Guidelines for Infection Control in Dental Health-Care Settings, 2003.

Infection Control In Practice is a resource prepared for clinicians by the Organization for Safety & Asepsis Procedures with the assistance and expertise of its member-contributors. OSAP is a nonprofit, independent organization providing information and education on infection control and occupational health and safety to dental care settings worldwide.

Information in this issue has been brought to you with the help of the following individuals:

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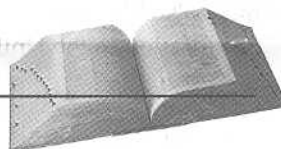
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The opinions expressed by the contributors are not necessarily those of the U.S. Air Force.

Glossary



ALARA: As Low As Reasonably Achievable principle includes taking radiographs based on the patient's needs (as determined by an examination).

Background radiation: The radiation of man's natural environment originating primarily from the naturally radioactive elements of the earth and from the cosmic rays.

Collimator: A metal disc used to control the size and shape of the x-ray beam.

Dosimeter badges: Used to measure radiation dosages; required for pregnant x-ray technicians only.

kVp: Kilovolt peak, measurement in thousands of volts. Higher kVp produces more penetrating x-rays and reduces contrast. Most dental x-ray machines use either 70 or 90 kVp settings.

mA: Milliampereage, the measure of tube current passing through the filament that generates x-rays. Increasing mA increases the amount of x-rays produced for a fixed exposure time. Typical values for dental x-ray machines are between 3 and 10 mA.

Primary radiation: Comes through tube-head of x-ray machine.

Radiation barrier: Lead apron or thyroid collar used to protect patients and/or x-ray technicians while x-rays are taken. May also refer to lead-lined walls or partitions.

Secondary radiation: "Scatter" radiation, usually occurs as a result of x-rays hitting patient's skull. Also occurs when using cone-shaped and plastic x-ray tips.

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Putting It All Together



Radiation Protection in Dental Facilities (adapted from NCRP Report N. 145)

1. Protection of the patient

- a. For each new or referred patient, obtain recent, pertinent radiographs from the patient's previous dentist.
- b. Perform radiographic examinations only when indicated by patient history, after a physical examination by the dentist, or laboratory findings.
- c. Use a long rectangular cone-head the same shape and size of the film to reduce x-ray scatter.
- d. Use either E-or F-speed x-ray film to reduce the amount of exposure time.

- e. Provide thyroid shielding for children, and thyroid shielding and leaded aprons when taking x-rays on pregnant women.
- f. Thyroid shielding should be provided for adults, when it will not interfere with the examination.

2. Protection for the Operator

Provide personal dosimeters for known pregnant occupationally exposed personnel.

3. Waste Management

- a. Treat spent film processing solutions containing silver in concentrations equal to or

greater than 5m/mL as a hazardous waste and dispose of accordingly.

- b. Consult local and state regulations regarding the silver contained in film processing fixer solutions because they may require the recovery of silver. Silver recovery through the discarded radiographs and scrap film is encouraged.
- c. Segregate lead foil from other solid waste after film processing, and dispose of according to local, state, and federal regulations.
- d. While x-ray film wash effluent is considered an industrial or commercial waste and disposed of through a municipal sewer or septic tank system, consult local and state regulations because a discharge permit may be required.

4. Quality Assurance

Maintain a log of all quality-assurance procedures. The log should contain date, procedure, results, and any corrective actions.

5. Informed Consent

Provide dental patients with information on the benefits and risks of dental procedures, including dental radiography.

There is no conclusive proof that the radiation exposure from dental x-rays is harmful. A few studies have demonstrated statistically significant associations between dental x-ray exposure and cancer. These studies do not demonstrate cause-and-effect. If a substantial risk existed, it would have been identified and reported. It seems reasonable to conclude that radiation-related risks to dental patients and dental x-ray equipment operators are numerically very small and may be zero.

(NCRP #145, page 45) — OSAP

Ask OSAP

Q : If a patient has a tongue piercing, is it necessary for them to remove the barbell for an x-ray or treatment?

A : Although intraoral radiographs can be used on patients who cannot remove their barbells, they will show up on a panoramic film. All known tongue barbells can be removed for at least three hours without the piercing closing. Patients should be advised that intraoral piercings may pose a risk for potentially serious infections. — OSAP

Q : What do you do regarding an employee who is trying to get pregnant but insists on running the x-ray machine?

A : All workers must follow precautions to prevent occupational exposure to dental x-rays. These precautions include ensuring that the machines are properly collimated, the proper kVp and mA are used, and that the highest speed x-ray film is used to reduce the amount of radiation needed to produce diagnostic film. Workers should never be present in the room during exposures and should stay at least 6 feet away from the active beam. The National Council on Radiation Protection and Measurements recommends that personal dosimeters be provided for known pregnant occupationally-exposed personnel. Work restrictions and the use of personal dosimeters should be based on the recommendations of their physician and compliance with institutional policies or state laws where applicable. — OSAP

Do you have an inquiry about infection control, occupational health, or practice safety?

Ask OSAP. Send your questions to office@OSAP.org

OSAP Chart & Checklist



Health and Safety Considerations for Dental Radiology

This information summarizes recommendations from the American Dental Association (ADA) and Food and Drug Administration (FDA) *The Selection of Patients for Dental Radiographic Examinations November 2004*, and the Centers for Disease Control and Prevention (CDC) *Guidelines for Infection Control in Dental Health-Care Settings-2003 December 2003*.

Patient Safety Precautions	Worker Safety Precautions	Infection Control Precautions
Use beam limiting attachment on film holder	Do not hold film or child patient during exposure	Use impervious barriers to prevent contamination of x-ray equipment (change between patients)
Collimation of the beam to size of target film	Collimation of the beam to size of target film	Heat sterilize intraoral devices that can withstand the heat process
Use highest speed film available	Use highest speed film available	High level disinfect or discard intra-oral devices that cannot withstand the heat sterilization process
Use leaded aprons and thyroid collars for all patients	Direct beam away from the location where the operator will be standing	Avoid contamination of daylight loaders, automatic processors and other processing equipment
Use long cone or beam indicating device (8"-12")	Stand behind barrier or wall of adequate density to prevent penetration of the beam during activation	Use barriers for digital radiographic sensors or intermediate level disinfectant between each patient use

ADA/FDA Guidelines available from: www.ada.org/prof/resources/topics/radiography.asp
 CDC Guidelines available from: www.cdc.gov/oralhealth/infectioncontrol/index.htm

Practice Tip

Infection Control in X-ray Processing Areas

Often the dental office will focus on disinfection procedures for the operator, forgetting the level of contamination that occurs regularly in the x-ray processing areas. Many offices try to establish technique protocols for the handling of exposed/contaminated films; the question is, how successful are those techniques and how often are they reviewed for staff compliance?

When performing x-ray procedures involving intraoral films, there are several options that can be used to assure aseptic procedure following exposure. LaDonna Drury-Klein, RDA, CDA, BS, a faculty member at Sacramento City College, offered some suggestions. "The use of film barriers is a very effective way to avoid cross-contamination of the darkroom/processing area when used properly. Following barrier removal, contaminated gloves

are removed, hands are washed, clean film packets are picked up and the employee enters the processing area with clean hands and is able to process films without the film packet contaminating the processing area. If traditional film packets are used, there are options which may help decrease the amount of contamination prior to entering the processing area. The most popular and convenient is the use of a germicidal wipe. Exposed film packets should be wiped down prior to entering the processing area. Entering the processing area with clean gloves and film packets helps decrease the level of contamination in the area where films are processed. The final key in containing contamination is to always have a disinfectant wipe or spray bottle in the processing area or darkroom in order to clean and disinfect all contaminated areas following processing.

Areas in the darkroom that should be cleaned and disinfected include the countertops, the door handle and the processing unit.

Frequent review of how each clinical staff member handles x-rays and automatic processors is key to ensuring that the dental team thinks outside the operator and focuses on the entire office in establishing successful disinfection protocols."

LaDonna Drury-Klein, RDA, CDA, BS is a faculty member of Dental Continuing Education at Sacramento City College in California and frequently lectures on infection control and OSHA. She is a member of the Dental Board of California and has chaired the state board's Infection Control Regulatory Committee.



LaDonna Drury-Klein, RDA, CDA, BS

Do you have a practice tip you'd like to share with other OSAP members and subscribers? Send your suggestions for enhancing dental infection control and safety in practice to editor@OSAP.org. Be sure to include contact information, a photo, and a brief bio. Thanks!

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