Safe Use of Radiographs in Dentistry

Radiography is an essential tool in dental practice, but recent reports of possible overutilization and overdose of radiation in some areas of health care have raised concerns among patients and practitioners about the use of radiographs in dentistry. While the radiation dose from dental X-rays is low, there are a number of precautions that should be adopted to keep the dose at a minimum while still providing the diagnostic information needed.

The guiding principle in radiation is:

**ALARA – As Low As Reasonably Achievable**

In dentistry, the ALARA principle can be applied during many phases of the radiographic process:
- determining the need for and type of radiographs to take;
- using “best practices” during the actual making of images, including the application of office quality control procedures;
- interpreting the images completely and accurately to obtain all the diagnostic information they contain.

### When to take radiographs

Dentists must apply clinical judgment in deciding when and what type of radiographs to examine, realizing that the same examination may not be appropriate for all patients. There is no recommended frequency for panoramic radiographs or full-mouth surveys (FMS). The decision to repeat a panoramic radiograph or FMS should be based solely on the individual patient’s needs—not on the frequency allowed in the dental insurance contract.

The only imaging examination with a frequency recommendation is the bitewing. Its frequency is based on an assessment of the patient’s caries risk.

**The clinical decision should be:**
- based on findings from the patient history and clinical examination
- tailored to the needs of the individual patient
- influenced by the patient’s risk of dental disease
- supported by the dentist’s knowledge of disease progression and utility of various imaging techniques

**Some factors to consider in deciding to prescribe radiographs:**
- health status of a new or established patient
- date and availability of most recent prior radiographs
- patient age and stage of dental development
- risk of dental caries
- clinical evidence of periodontitis
- number of teeth and desire for prosthodontic care
- pain, swelling or other signs or symptoms of dental disease

### Best Practices in Dental Radiography

**Bitewing radiographs and caries detection**

The use of bitewing radiographs is based on an assessment of the patient’s caries risk.

**Factors that increase caries risk include, but are not limited to:**
- high level of oral hygiene
- history of recurrent caries
- ingestion of soft drinks
- poor oral hygiene
- diet with high sucrose frequency
- inadequate fluoride exposure
- sensitization from medications, radiation therapy or other causes
- drug/alcohol abuse

**X-RAY MACHINE FEATURES**
- Tube potential (kVp)
- Tube current (mA)
- Exposure time
- Source-to-image receptor distance (SID)
- Imaging receptor
- Film speed
- Film processing
- Use of collimation

**FILM EXPOSURE AND PROCESSING**
- Tube current and exposure time should be set to produce optimal images
- A technique that provides a “gray” level for ease of image contrast
- Films should be processed following manufacturer’s directions for time, temperature, and frequency of processing solution change
- Processing film by sight is a violation of proper radiographic procedure in many states.
- Films should be well-ventilated and dental staff should take precautions to avoid contact with processing solution
- Exposure of used-processing solutions and lead hot should be done following state or local waste

**IMAGING RECEPOTOR**
- Internal shielding
- Type of film or sensor
- Sensor/film holders
- Sensor or film
- Source-to-image receptor distance 20-40cm

**COLLIMATION OF X-RAY BEAM**
- Beam should conform to size and shape of sensor or film
- Collimation of x-ray collimator should reduce radiation dose up to 5-fold compared with round collimator
- No protective devices are needed for children
- The use of cone cutting or improper vertical or horizontal collimation of the beam can significantly increase radiation dose

**SENSOR/FILM HOLDERS**
- Sensors should be properly aligned with the sensor/film holders
- Sensor/film holders should be lead-mercury or disposable
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- Use lead-mercury or disposable sensor/film holders

**PATIENT PROTECTION EQUIPMENT**
- Lead aprons (or non-leaded equivalents) are recommended unless otherwise contraindicated
- Gloves should be worn when exposing radiographs and handling contaminated film packets or digital sensors
- Cap, coat, and protective shoe coverings are recommended for use when changing film packets or digital sensors

**INFECTION CONTROL**
- Standard precautions for infection control should be used routinely
- Use gloves when exposing radiographs and handling contaminated film packets or digital sensors
- Cover digital sensors with a new plastic bag or sterile cover for each patient
- Use lead-mercury or disposable sensor/film holders
- Gloves are preferred over lead aprons for infection control purposes

**RADIOGRAPH VIEWING AND INTERPRETATION**
- All radiographs, digital or film, should be viewed under optimal conditions, generally in a quiet location with reduced ambient light-tight, or a controlled computer monitor or well-maintained viewer
- All images should be interpreted in their entirety for all pathologic changes and variations of normal
- Dentists are responsible for interpreting the entire scan volume when using CBCT, consulting with an expert when necessary

**GROUP**

