

X-RAY FACILITY TIPS

Topic 3: Lead and Lead-Equivalent Aprons and Thyroid Collars in Dentistry

Lead aprons for patients were first recommended in dentistry many years ago when dental x-ray equipment was much less sophisticated and films much slower than current standards. They provided a quick fix for the poorly collimated and unfiltered dental x-ray beams of the era. Doses from early full-mouth intra-oral examinations were reported to be as large as 5,000 millirem. Lead aprons were used to reduce this dose.

Doses from current panoramic or full-mouth intra-oral examinations using state of the art technology and procedures do not exceed 0.5 millirem. A significant portion of this dose results from scattered radiation arising within the patient's body and lead or lead-equivalent aprons do not significantly reduce this dose. Provided all other recommendations of NCRP Report 145 Radiation Protection in Dentistry are followed lead or lead-equivalent aprons are not required in dentistry. However, if any of these recommendations are not used in a specific case, then the lead or lead-equivalent apron shall be used. Some patients have come to expect the lead or lead-equivalent apron and may request that it be used. Its use remains a prudent but not essential practice.

The thyroid gland, especially in children, is one of the most sensitive organs to radiation-induced tumors, both benign and malignant. Exposure to the thyroid may be unavoidable, even if the x-ray beam is properly collimated to the size of the x-ray film and/or area of clinical interest, since any attempt to shield the thyroid would interfere with the production of a clinically useful image. Thyroid shielding should be provided for children and adults, when it will not interfere with the examination.

Recommendations When Lead or Lead Equivalent Aprons Are Not Available or Used

The operating potential of dental x-ray machines shall not be less than 50 kVp and not more than 100 kVp.

Occupationally exposed personnel shall not restrain uncooperative patients or hold the image receptor in place during an x-ray exposure on a frequent basis. It is acceptable for a related member of the public to restrain a patient during exposure as long as they are provided a lead or lead-equivalent apron.

The fastest speed image receptor for the clinical exam, as determined by the clinician, shall be used. NCRP Report 145 indicates speeds of at least ANSI Speed Group E films should be used for intra-oral radiography and high-speed (400 or greater) rare earth screen-film systems should be used for cephalometric and panoramic dental radiographic projections. Radiographic techniques for digital imaging shall be adjusted for the minimum patient dose required to produce a signal-to-noise ratio sufficient to provide good image quality to meet the purpose of the examination.

Dental radiographic films shall be developed according to the film and/or processor manufacturer's instructions using the recommended chemistry or its equivalent. The time-temperature method shall be used for manual developing. Sight developing shall not be used.

In the Absence of Lead or Lead-Equivalent Aprons and Facility Barriers

In the absence of a barrier in an existing facility, the operator shall remain at least 6 feet from the x-ray tube head during exposure and at 45 degrees from the primary beam as it exits the patient. If the 6 feet distance cannot be maintained, then a barrier shall be provided.

Thickness of Lead or Lead-Equivalent Apparel

For dental radiography lead or lead equivalent aprons must have an attenuation equivalent to 0.3 mm of lead.

Care of Lead or Lead-Equivalent Apparel

Lead or lead-equivalent aprons and thyroid collars shall be visually inspected for defects at a minimum of monthly intervals and replaced if they are damaged. Lead aprons that have cracks exposing the lead must be replaced since exposure to lead may be harmful to humans, especially children.

When not in use protective apparel must be hung flat or laid flat. If they are continuously folded or heaped in the corner, cracks can develop.

SOURCES:

National Council on Radiation Protection and Measurements, NCRP Report No. 105, Radiation Protection for Medical and Allied Health Personnel

National Council on Radiation Protection and Measurements, NCRP Report No. 127, Operational Radiation Safety Program

National Council on Radiation Protection and Measurements, NCRP Report No. 133, Radiation Protection for Procedures Performed Outside the Radiology Department

National Council on Radiation Protection and Measurements, NCRP Report No. 145, Radiation Protection in Dentistry