

Radiology Compliance Branch
RADIATION PROTECTION SECTION



Division of Health Service Regulation • N.C. Department of Health and Human Services

ENTRANCE SKIN EXPOSURE (ESE) FACTS- DENTAL

There are several factors that affect Entrance skin exposure and image quality. This information is not a substitute for communication with a medical physicist to determine how best to lower the ESE and improve the image quality in your facility.

Film speed

Varying film speeds can affect how much exposure a patient receives. D-speed film is the slowest speed film and requires 40 to 60 percent more radiation exposure than F-speed or film to produce an acceptable image. E-speed film requires 20 percent more radiation exposure than F-speed or film. The cost of F-speed film as compared with D-speed is usually only five cents more per film. Changing to a faster speed film is a low cost method that can significantly reduce the ESE. The American Dental Association recommends using the fastest speed film that is compatible with the diagnostic task as stated in the April 27, 2004 edition of the ADA news.

Technique

Technique factors are the machine settings chosen to produce an acceptable x-ray image. Technique factors include tube voltage (kVp), tube current (mA) and exposure time (seconds or pulses). Most intro-oral units have fixed kVp and mA settings. Therefore, in most cases the exposure may be the only factor that can be adjusted. Technique factors should be set to optimize the radiograph and minimize the radiation exposure to the patient.

Technique should be adjusted for the imaging system used. For example, F-speed or film or digital imaging systems require less radiation than D-speed film to produce an acceptable image. If you change to a faster speed or a digital imaging, the technique should be adjusted accordingly.

Patient size, the projection and age also should be considered when setting technical factors. Technical factors for pediatrics should always be set lower. Selection of appropriate technical factors and maintaining a current technique chart for pediatric and adult patients will facilitate optimized imaging at the minimal dose. Film manufacturer technical staff or a medical physicist can provide assistance in these areas.

Film Processing

Dental X-ray films are developed using either automatic or manual processing techniques. Two of the main components that affect film processing are chemistry and development time. It is imperative that processor chemistry is fresh, maintained at proper levels and not contaminated. The processor temperature should be set and maintained according to manufacturer recommendations. Use of expired, weak or contaminated chemistry can cause films to appear light or have poor contrast. Additionally, underdevelopment can also cause images to appear light or have poor contrast. A 1993 U.S. Food and Drug Administration national study determined that 50 percent of all automatic processors tested at dental offices were under-developing films. Such results may cause the operator to increase exposure time and repeat the film to obtain a better diagnostic film, thus causing additional radiation exposure to the patient.

Manual processing should only be done using the time and temperature method. Sight processing should never be used.

While digital systems do not use film, they do involve image processing. The Radiation Protection Section has observed that digital systems often have a higher ESE than needed because over-exposed images can be salvaged by enhancing the images after exposure. Therefore, if your facility uses digital imaging, it is imperative that you check or revise your techniques to avoid unnecessary radiation exposure to your patients. Manufacturer service provider technical staff or a medical physicist can provide assistance in these areas.