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In Diagnostic X-ray (H-7)

A Brief Overview of Photo-Stimulable Phosphor Imaging for Dental Intraoral Imaging

Photo-Stimulable Phosphor (PSP) imaging is a digital technique for dental intra-oral radiography. This application uses an imaging plate similar to those used in diagnostic radiology for computed radiology applications to capture and store a latent radiographic image. The PSP plate is inserted into a plastic sleeve, or "barrier envelope," prior to insertion into the patient's mouth. After exposure to x-rays, excited electrons in the phosphor material on the plate remain "trapped" in the crystal lattice. The laser beam within the scanning unit stimulates the phosphor crystals, releasing the trapped electrons, and light is emitted in proportion to the amount of radiation absorbed by the phosphor crystals. This light is then converted into a digital image. This image file may be displayed on a video monitor for softcopy interpretation or may be transferred to other locations via a data network.

Laser scanning of PSP plates does not completely erase the latent image. Some phosphor crystals retain trapped energy; this energy can be erased by briefly exposing the plate to a bright source of full spectrum light, such as a viewbox. Once erased, the plates can be repackaged and re-exposed.

It is important to remember that PSP plates capture an analog latent image, which is subsequently digitized during the scanning process. The scanning process as well as routine clinical handling of the PSP plates can introduce artifacts to the image. The PSP plates usually do not have a resilient coating, so plates can scratch easily. PSP plates can be damaged by rough handling, heat, and prolonged exposure to bright light. Exposed plates that are subsequently exposed to excess light prior to processing in the scanner will result in loss of image signal. Artifacts decrease functional performance of the phosphor plates. Life expectancy of PSP plates, which is rated at about 1000 scans for medical imaging, is generally much less than that for intraoral use even with the greatest care.

Advantages of PSP imaging:

- Images can be viewed in multiple locations at the same time.
- Images may be digitally transferred to other locations.
- Storage of digital images takes up less physical space than film storage.
- Image retrieval is less labor intensive and faster.
- Reduced repeat exposures due to linear response and wide dynamic range of the PSP plate.
- Darkroom problems, such as odor, chemical hazards, shielded storage for film, and darkroom integrity QA, are eliminated.

- Images can be tagged with information such as patient, procedure data, laterality, etc.
- Dental X-ray units that use PSP plates can be inspected using the same procedures as those that use film.

Disadvantages of PSP imaging:

- No significant time-savings for taking digital images over conventional film radiographs.
- Can be prone to artifacts from mishandling of the PSP plate or from the scanner environment.
- There is the possibility of transfer of contaminated material to patient's mouth if integrity of plate's protective envelope is jeopardized.
- PSP plate erasure can begin prematurely. Ambient light can degrade the image if the exposed plates are handled in such a manner that ambient light reaches the plate.
- PSP plates need to be packaged before use rather than being delivered pre-packaged and ready for use.

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