Radiation Safety For Dental; Facilities

Presented by: Astarita Associates, Inc. Medical Physics Consultants www.AstaritaAssociates.com

General Information about Radiation

Often depicted by books, movies and news media as mysterious, deadly force

▶ In truth:

- Detection, measurement and radiation control are extremely common events
- ▶ The more it is understood, the less frightening it becomes
- ► A very beneficial diagnostic tool

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Radiation Quantities and Units

- Coulomb per kg or Roentgen:
- Measure of the exposure of radiation in
- Gray or Rad:
 - Amount of energy (from any type of ionizing radiation) deposited in any medium (e.g. water, tissue, air)
- Sievert or Rem
- ▶ Biological effect of a rad



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Radiation Quantities and Units

Entrance Skin Exposure

- Measurement of radiation output at the point of skin entry for an x-ray examination.
- Effective Dose

 - Effective dose is measured in millisieverts (mSv)



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Natural Background Radiation

- Relatively constant low-level radiation from naturally occurring sources such as the earth (or building materials), cosmic rays, and naturally occurring radionuclides found in the body
- Level of background radiation will vary depending upon location, altitude and the amount of natural radioactive material in the ground
- Highest known background levels recorded in mountains of South America 10 mSv (1000 millirem) in one year
- Average Natural background in US as stated by the Nuclear Regulatory Commission is 3.1 mSv (310 millirem) per year

Typical Natural Background **Radiation Levels**

- New York City
- Denver

- ~ 3 mSv/yr (300 mRem/yr)
- ~ 5 mSv/yr (500 mRem/yr)
- > 5 mSv/yr (500 mRem/yr)





Background Radiation

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- No known proven carcinogenic effects from radiation levels in the order of magnitude comparable to background radiation
- Exposures received by occupational radiation workers from diagnostic procedures typically fall within background levels

Exam	Dose to patient	B.E.R.T. Background Equivalent Radiation Term (or Time)
Dental Bitewing X-ray	0.008 mSv or 0.8 mRem	1 day
Dental CBCT	0.1 - 0.2 mSv or 10 - 20 mRem ¹	10 – 20 days
CT Angiogram	12 mSv or 1,200 mRem ²	4 years
Chest X-ray	0.1 mSv or 10 mRem ²	10 days
1. HPS.ORG 2. ACR.ORG		

Examples	Doses
light from Los Angeles to London	0.05 mSv
Annual natural background	3.10 mSv
Barium enema	8.70 mSv
leart catheterization (skin dose)	260 mSv
Radiation therapy (localized & ractionated)	60,000 mSv

 Limit

 Total Effective Dose Equivalent
 0.05 Sv (5 Rem)

 (Whole body)
 0.15 Sv (15 Rem)

 Lens of the Eye
 0.15 Sv (50 Rem)

 0.007cm deep averaged over 10cm2)
 0.5 Sv (50 Rem)



- Estimates the amount of radiation received by individuals who work around radiation
- Simply measures the amount of radiation to which one was exposed
- Offers no protection against radiation exposure

Personnel Monitoring

- Required when:
 - An individual is likely to receive more than 1/10th the yearly occupational dose limit (i.e. whole body limit: 1/10th of 5000mRem = 500 mRem)
 - An individual handles radioactive material
 - An individual works in a high radiation area (radiation therapy treatment room)
- Therefore, it is usually unnecessary to monitor occupational workers who are not likely to receive 500 mRem
- If monitored, pregnant workers are to wear a badge at waist level to monitor fetal exposure.





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ALARA - Time Minimize your time near energized radiation emitting equipment to only what it takes to complete the task.

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ALARA - Shielding

- Shielding is the 3rd component of radiation safety. To keep exposures as low as reasonably achievable, technologists should stand behind a protective barrier if available
- A radiation protection survey is performed by a Medical Physicist or other qualified personnel to ensure the safety of staff





Radiation Safety in Dental Facilities

- Occupationally exposed personnel must not hold a patient during exposures.
- Image receptors, i.e., film, phosphor plate (PSP) etc., must not be held in the patient's mouth during an exposure.
- Do not hold the X-ray tube housing or X-ray cone during an exposure and do not stand in the path of the primary beam.
- Remain at least six feet from the patient being radiographed during typical dental exposures.

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Radiation Safety in Dental Facilities

- Ensure manufacturer quality control procedures and service preventative maintenance are performed as scheduled. These tests are necessary for the protection of the patients, staff and the unit.
- Establish that dental X-ray equipment and imaging software is operated only by individuals adequately instructed in safe operating procedures.
- Tube head stability should be checked routinely. Stability will prevent repeats and therefore un-necessary exposure to staff and patients.

Radiation Safety in Dental Facilities Cone Beam CT units may need additional shielding and QA requirements and a Medical Physicist should be consulted prior to install Maintain documentation of training and of evaluation of competent use of the X-ray equipment and imaging software

Thank You for Participating

- Please be sure to print out your self attested certificate
- Questions or comments can be directed toward Astarita Associates, Inc. 631-265-2950

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