**OSAP PRESENTATION**

**Safety Issues in Dental Radiography**

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**Objectives**

- Identify areas of possible cross-contamination (lead apron, door knobs, mouse, cabinet tops).
- Describe correct infection control protocols before, during and after radiographic procedures.
- Discuss the ALARA (As Low As Reasonable Achievable) principle as it pertains to radiographic procedures.
- List ways to protect the patient and staff from unnecessary radiation.
STANDARD PRECAUTIONS

Infection Control Issues

- Be prepared—have supplies ready
- Use barriers when handling equipment such as the lead apron, door knobs, control buttons and computer equipment.
- Lay contaminated equipment such as image receptor holders and aiming rings, and hand held unit on a barrier.
Infection Control Issues

- Have tissues ready for drooling patients.
- Utilize disposable barriers over digital sensors. Clean and disinfect cords.
- Use a disposable barrier over the head of the x-ray machine.
Positioning Devices

ALARA

- As
- Low
- As
- Reasonable
- Achievable
Background Radiation ~ 360 mrem/year, which is 3.6 mSv/year

- Dental x-rays: 0.1%
- Radon: 200 mrem (54%)
- Cosmic (sun): 27 mrem (8%)
- Rocks/soil: 28 mrem (8%)
- Internal: 40 mrem (11%)
- Medical x-rays*: 39 mrem (11%)
- Nuclear medicine: 14 mrem (4%)
- Consumer products: 10 mrem (3%)
- Other sources < 1 mrem (1%)
  * Dental x-rays: 0.1%

- Form of electromagnetic energy
- Invisible
- Penetrating
- Neutral
- Travels in straight lines
- Speed of light in a vacuum: $3 \times 10^8$ m/s
- Able to ionize matter
- Cannot be focused

Maximum Permissible Dose (MPD)

The amount of radiation an individual is allowed to receive per year from artificial sources (such as x-ray machines).

- Occupationally exposed
  - 50 mSv (5 rem) NCRP*
- General Population
  - 5 mSv (.5 rem) NCRP

*National Council on Radiation Protection
New Technologies

- Digital Imaging
- Handheld Portable Unit
- CBCT

Handheld Portable Unit

- less time-consuming
- less cumbersome
- more cost-effective
- more versatile for positioning*
- easier on the patient

- external backscatter shield
- internal radiation shielding
Image Quality

Which is conventional wall mounted unit image & which is the portable hand held unit image?

Wall-mounted unit  Portable hand-held unit

Radiographic & photographic images by Saylors & Warren
ADVANTAGES OF CT

- minimizes superimposition of parts
- improved image contrast
- records small differences in tissue contrast (low contrast resolution)
- detectors, not film, can quantify small differences in soft tissue densities

CBCT

CT Images
Radiation Exposure & Dose CReEP....

<table>
<thead>
<tr>
<th>Procedure</th>
<th>mSV</th>
<th>mrem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental Bitewing</td>
<td>0.005-0.001</td>
<td>0.5-1</td>
</tr>
<tr>
<td>Panoramic Image</td>
<td>0.019</td>
<td>1.9</td>
</tr>
<tr>
<td>FMX (19 digital images)</td>
<td>0.06</td>
<td>6</td>
</tr>
<tr>
<td>CBCT</td>
<td>1.3-8.2*</td>
<td>130-820</td>
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<tr>
<td>Lateral Skull</td>
<td>0.01</td>
<td>1.0</td>
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<tr>
<td>Head CT</td>
<td>2</td>
<td>200</td>
</tr>
<tr>
<td>Chest Radiograph</td>
<td>0.05-0.08</td>
<td>5-8</td>
</tr>
<tr>
<td>Chest CT</td>
<td>7-9</td>
<td>700-900</td>
</tr>
</tbody>
</table>

*Great variation among equipment/settings used.

Field of View and Dose

CONVENTIONAL VS CBCT

7cm PID to 6cm PID  
decreased dose ~25%

7cm round PID to rectangular 
PID, decrease dose ~55%

With CBCT, decrease FOV, 
decrease dose....
  lens, thyroid

Making Headlines!

“Frequently Used CT Scans May Raise Cancer Risk”

“With Rise in Radiation Exposure, Experts Urge Caution on Teeth”

Dental X-rays Linked to Brain Tumors, US Study Finds

Published April 10, 2012
Proper Positioning

Direct Factors Affecting Dose in CT

PATIENT CENTERING

miscenter laterally

by 3cm results in dose incr by 18%

6cm…………………………….. 41%!

miscenter in elevation

by 20-60 mm results in dose incr by 140%
Protecting Personnel

Pediatric CBCT Dose Concerns

- Inherently greater radiosensitivity
- Greater number remaining years of life

Image Reconstruction

3D ALGORITHMS

Surface reconstruction
## References

- AR State Board of Health: Rules & Regulations for Control of Sources of Ionizing Radiation, Revised, 2005.
- The University of Texas Health Science Center at San Antonio: Dental Radiology Educator’s Workbook, 1994, 2001.