Radiography

Me pretending to know how to interpret a bitewing

Dental Relevance

In first year, you will be focussing on how to take, critique, and the theory behind bitewing radiographs. Bitewing radiographs has many functions for us, including the detection of dental caries (proximal, occlusal), non-carious tooth loss, monitoring the progress of any loss of tooth structure, assessment of existing restorations, assessment of periodontal status.

Contents:

1) *What should a bitewing radiograph show?*
    - Crowns of both upper and lower teeth
    - Coronal third of the roots of both upper and lower teeth
    - Crest of the supporting alveolar bone
2) *Radiation Safety*
    - ALARA
      Keep radiation dose As Low As Reasonably Achievable
    - Three Basic Principles for Staff Safety
        - Distance
            - Staff outside primary x-ray beam and minimum of 2m away from the x-ray tube and from the patient
            - Staff should not restrain/hold patient
                - Can provide lead aprons for relative, carer, or friend, if required
        - Position
            - Stand behind barrier or shield with window
            - Should be able to visually check patient when pressing the exposure button (windows/mirrors may be required)
        - Shielding
            - Operator must be protected by fixed protective barrier during exposure (if >2m from the x-ray tube)
            - Barriers are mandatory for panoramic units even if this distance is achievable
            - Shielding must have lead equivalent of at least 0.15mm

- Leaded door/window may be required
- Shielding needs to be determined by EPA

About 5 bitewing radiographs give the same radiation exposure as a Sydney to London return trip.

Radiology examinations	Effective dose range (mSv)[3 & 4]	Equivalent exposure to natural background radiation (2 mSv per year)[3]	Equivalent to times of travel on a 7 hour flight (0.05 mSv per 7 hours flight)[1]
MRI and Ultrasound Examinations	No radiation	N/A	N/A
X-ray tooth (dental film)	~ 0.004	< 1 day	< 1 time
X-ray jaw (OPG)	~ 0.014	< 3 days	< 1 time
X-ray chest (1 image)	~ 0.02	< 4 days	< 1 time
X-ray chest (2 images)	~ 0.04	< 8 days	< 1 times
X-ray extremities / X-ray skull / X-ray cervical spine (neck)	0 to 0.1	0-18 days	< 2 times
X-ray thoracic spine (middle spine) / X-ray lumbar spine (lower back) (1 image) / X-ray abdomen / X-ray pelvis / Mammography (2 images)	0.1 to 1	18 days to 6 months	2-20 times
Barium swallow / Barium meal CT head / CT cervical spine CT chest (without portal liver phase)	1 to 5	6 months to 2.5 years	20-100 times
Angiogram-coronary / Angiogram-pulmonary / Angioplasty-coronary Barium enema / CT chest (with portal liver phase) / CT renal (KUB) / CT abdomen and/or pelvis (single image) / CT thoracic spine / CT lumbar spine	5 to 10	2.5 years to 5 years	100-200 times
Angiogram-abdominal / Aortography-abdominal / CT chest / abdomen / pelvis CT abdomen / pelvis (multiple images) CT pulmonary angiogram[5] / CT coronary angiogram[5]	> 10	> 5 years	> 200 times

3) *What information needs to be provided to a Pt specific to a bitewing?*
    - Why Pt needs bitewings taken
    - Pt needs to stay very still when bitewing is taken to ensure sharpness
    - Discomfort associated with biting down on cardboard detector
    - Additional cost
    - Radiation exposure (only if Pt brings it up)
4) *X-ray production factors:*
    - Increase current→ more e- → denser image
    - Increase voltage → e- hit target faster and harder → resulting photons (x-rays) produced have more penetrative power → increased density, but increase scatter and reduce contrast (using a new detector can increase contrast)
    - Increase exposure time→ more e- → more photons → increase density
5) *What is absorbed dosage?*
   Dosage absorbed per unit of volume of tissue, quantity of energy imparted by ionising radiation to unit mass of matter such as tissue
6) *Bitewing technique*

(This may be a little overwhelming, but you'll learn everything during your session with Dr Lerche)

Steps	**Outcome observed in image (Assessing image criteria)**
Assemble detector/holder (orientation)	Image orientation (correct/incorrect)
Turn machine on and set exposure factors	Density, contrast (high/low/satisfactory)
Place detector in the correct horizontal position	Horizontal detector position
Ensure detector in correct vertical position	Vertical detector position
Align x-ray beam/tube- horizontal beam angulation	Contact points between adjacent teeth
Align x-ray beam/tube- vertical beam angulation	Superimposition/separation of cusp tips
Ensure beam position correct	Presence/absence of straight line cone cutting
Align rectangular collimator	Presence/absence of angled cone cutting
Advise patient to remain very still until advised okay to move	Sharpness of image
Expose detector	Overall diagnostic quality

7) *Radiographic artefacts*
    - Cervical burnout
        - RL (radiolucent), rounded, <u>diffused</u> inner borders (caries' borders are distinct): appearance
        - Cause: relatively higher x-ray penetration through the thin cervical region of teeth
        - Because of decreased x-ray absorption→areas appear RL
        - Can mimic proximal caries (<u>just below contact point</u>, caries are at contact point)
        - Don't assume it's cervical burnout- check clinically
    - Mach band
        - Optical illusion
        - A RL line in dentine along DEJ adjacent to proximal or occlusal enamel
        - May mimic proximal caries
        - Masks enamel, RL line will disappear if due to mach band effect
        - Not ever observer sees mach band

        - Perception is modified by projection, contour, film, and object density

8) *What are the radiopaque and radiolucent areas that you may find on a bitewing radiograph?*
    - Radiopaque: enamel, dentine, alveolar bone, tooth-coloured and metallic restoration
    - Radiolucent: lamina dura, interproximal caries, pulp chamber, pulp horns, pulp canal