Veterinary Radiology

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What makes dentistry important?

[Image of a cartoon with a dialogue box: "FRANK, YOUR TEETH ARE BAD. Clean on this! Blow me! Your mother loves these!"]

[Image of a dental filling]

[Image of a dental implant]
When should we take dental radiographs?

- Pre-extraction
- Post-Extraction
- Tooth Resorption
- Oral Masses

When should we take dental radiographs cont…

- Missing teeth
- Fractured Teeth
- Pockets >3 mm in dogs
- Pockets > 2 mm in cats

When should we take dental radiographs cont…

- Full Mouth Radiographs on every patient
  - AAHA standard
    - 41.7 % clinically important finding in cats without clinical lesions
    - 27.8% clinically important findings in dogs without clinical lesions


Why is dental radiology important? What does it do for the veterinarian?

- Evaluate tooth structures below the gingiva
- Treatment planning
- Extraction planning

Why bother with dental radiographs?

- Higher standard of care
- More than above the gum cleanings and wiggly tooth dentistry

Why is dental radiology important? What does it do for the veterinarian?

- Client education
- Medical record documentation
- Patient follow-up
- Progression of disease
How can we image the oral cavity?

- Skull radiographs

![Skull radiographs](https://example.com/skull_radiographs.jpg)

What equipment is needed?

- Source of radiation
- Method of developing x-rays
- Film

![Radiographic equipment](https://example.com/radiographic_equipment.jpg)

Intraoral radiographs

- Dental film
  - Individually packaged
  - Waterproof package
  - Non-screen film
- Developing
  - Developed in existing darkroom
    - Coffee cups and hand dipping
    - Developer, rinse, fixer
  - Automatic film processor
    - Chairside developer

![Intraoral radiographs](https://example.com/intraoral_radiographs.jpg)
Dental film advantages

- Much better quality and definition than skull radiographs
- Developing can be performed manually or with an automatic processor
- Film and chemicals relatively inexpensive

Dental film disadvantages

- Errors in positioning and exposure take time
- Storage of films can be bulky and unorganized
- Images cannot be altered
- Images take longer to process

Digital radiographs

- 2 types of digital systems
  - Wired sensor
    - Sensor attached to the computer directly
    - Image viewed 3-5 seconds
  - Phosphor screen
    - Appears similar to dental film
    - Fed through a scanner
    - Image viewed within 1-2 minutes
Digital radiograph advantages

• Less radiation needed
• Image viewed within seconds
• Errors in positioning/exposure corrected easily
• Image retrieval easier

Digital radiograph disadvantages

• Sensors can be expensive
  - $6000-$20,000
  - Sensors can damage easily
    - Costly replacement
• Less radiation is a false sense of security
• Computer savvy operators

Radiographic survey of oral cavity

• 6 Views
  - Right maxilla
  - Left maxilla
  - Rostral maxilla
  - Right mandible
  - Left mandible
  - Rostral mandible
Radiographic imaging
- Maxilla
  - Easiest when patient is in sternal recumbency
- Mandible
  - Easiest when patient is in dorsal recumbency

Radiographic positioning
- Parallel technique
- Bisecting angle technique

Radiographic positioning
- Primary radiographic techniques
  - **Parallel**
    - Ideal radiograph taken by the parallel technique
    - Film is parallel to the long axis of the tooth
    - Radiographic beam is perpendicular to the film and the long axis of the tooth
Parallel technique

Only achieved in canine and feline:
- Mandibular molars
- Caudal mandibular premolars
Parallel technique

Atlas of Dental Radiography in Dogs and Cats, DuPont G, DeBowes L.

Bisecting angle technique

- Find 3 planes
  - Plane of the tooth
  - Plane of the film
  - Bisect the angle that forms from these 2 points
- Tube head should be positioned perpendicular to the bisecting angle
- Bisect the angle INSIDE the animal's mouth


Bisecting angle
Bisecting Angle Technique

Bisecting angle examples
SLOB rule

- Same Lingual (Palatal) Opposite Buccal
  - Aka Clark’s Rule
- Used for imaging 3-rooted teeth
  - Separate out tooth roots

SLOB rule

- The root that moves in the same direction as the tube head is the LINGUAL (palatal root)

- The root that moves in the opposite direction is the BUCCAL root
Maxillary incisor teeth
- Film parallel with tongue
- Aim tube head perpendicular to film
- Tip the base of tube head toward tail (20 degrees)

Mandibular incisor teeth
- Film parallel with tongue
- Aim tube head perpendicular to film
- Tip the base of tube head toward tail (20 degrees)
Positioning for mandibular incisors

Maxillary canine teeth
- Place film parallel with tongue angled slightly
- Aim tube head perpendicular to canine tooth
- Tip tube head toward tail 20-30 degrees
- Tip tube head laterally 20-30 degrees

Maxillary canine teeth

Effective positioning
- The closer the tooth/object is to the film, more accurate the image
- Position the beam of radiation as close to the bisecting angle as possible for the middle and rostral mandible and the maxilla
- Position the beam of radiation as perpendicular as possible to the film and the tooth/object for the caudal mandible

Orientation of the radiographs
- Determine if mandible or maxilla
  - Maxilla
    - Crowns should point downward
    - Roots should point upward
  - Mandible
    - Crowns should point upward
    - Roots should point downward

Maxilla or mandible?
Maxilla or mandible?

Orientation

• Determine rostral/caudal
  ◦ Rostral
    ▪ In the front of the mouth
  ◦ Caudal
    ▪ Towards the tail/back of the mouth

• Determine right or left
  ◦ Which direction does the head appear to be pointing?
  ◦ Jaw adjacent to the film

Rostral or caudal?

Right or left?
Common problems

- Foreshortening
- Elongation
- Cone cutting
- Missing the apex

Foreshortening

- Teeth shorter than they should be

Foreshortening

[Images of foreshortened teeth]
Elongation

- Teeth longer than they should be

Photos courtesy J. Menerwald-Jecenovic, University of Wisconsin

Cone cutting

- Not exposing the entire film
Missing the apex

- Incomplete apex viewed on the film.
  Ideally 2 mm of tissue apical to the root is present on the film.

Normal feline radiographs

Normal canine radiographs maxilla
Normal canine radiographs mandible

Self-evaluation of radiographs
- All teeth to be evaluated are clearly visible
- Radiographs are well positioned

Self-evaluation of radiographs
- The maxillary cheek teeth should have the roots facing upward and the crowns downward
- The mandibular cheek teeth have the crowns facing upward and the roots downward
Maxillary incisors have the roots facing upward and the crowns downward.

Mandibular incisors have the roots facing downward and the crowns upward.

Self-evaluation of radiographs

When viewing the right side of the mouth, the rostral teeth are on the right side of the radiograph.

When viewing the left side of the mouth, the rostral teeth are on the left side of the radiograph.

Self-evaluation of radiographs

Proper angulation is used.

There is no foreshortening or elongation.

Visualization of all roots and apices is adequate.
Self-evaluation of radiographs

- Exposure and developing techniques are adequate
- No artifacts appear on the film

Quiz Time!!!!

What is wrong with this image?
So what if your radiographs on your patient look like this?

Frequent causes for repeated radiographs

- Improper positioning
- Improper settings
  - Overexposed
  - Underexposed
- Improper placement of film
  - Backwards
  - Too angled

For more information on veterinary dentistry

Nashville Tennessee Veterinary Dental Forum
September 14-17, 2017
Questions????

I hate dental

Ma tung ith numb

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