Diagnostic Tools: Equine Dentistry

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TO DISCOVER. TO TEACH. TO HEAL.
Objectives

• Know 3 useful diagnostic tools.
• What is most important aspect about dental radiology?
• Know 3 standard radiographs of equine skull.
• Know landmarks of taking radiographs of cheek teeth
• Importance of Scintigraphy for dental disease
• Know Computed Tomography general uses of algorithms for dental diagnostics
Dental Exam
Oral Endoscopy

- Exploration, visualization, magnification and recording of lesions
- Flexible fiberoptic or videoendoscope
- Rigid telescope (laparoscope)
  - 40-50 cm telescope with 30-90° viewing angle
Dental Stick (by Dr. Fritz)
Dental Stick

- Detailed exam
- 90 degree camera
- Record medical record
- Educate owners
- Educate Students
Dental Stick
Upper Respiratory Endoscopy

- Unilateral Nasal Discharge
  - Sinus disease
    - Nasomaxillary opening
- Mass
  - Neoplastic
  - Foreign Body
Dental Imaging

• Radiography
  – superimposition
    • 2-D image of 3-D structure
  – Most important
    • **Technique**/Radiology Safety
    • Types of Artefacts
      – Positioning
      – Exposure
      – Workstation
Dental Imaging

• Radiographs (tennis ball analogy)
  – kV
    • How fast throw tennis ball
      – Hard tissues need to “throw harder”
  – mAS
    • How many tennis balls throwing
      – More detail needed throw more (longer time)
        » Yet longer time—more motion
Radiology

• Technique/Safety
  – Patient prep
    • Heavy Sedation (α-2 agonist – add butorphanol?)
    • Rest nose (stool or head stand)
    • Fabric halter (no metal)
Radiology

• Technique/Safety
  – Patient prep
    • Lidocaine spray in the mouth for intraoral radiographs
      – A few minutes
Radiology

• Technique/Safety
  – Imaging system
    • Fast screens (rare-earth screens)
      – Less motion/less exposure
    • Computed systems (CR)/Direct Digital Radiographs (DR)
      – High quality able to adjust factors
        » Brightness, contrast, and magnification
Radiology

• Uses
  – Periapical dental disease
  – Head trauma
  – Developmental abnormalities
  – Periodontal disease
Radiology

• Standard Radiographs
  – Lateral
  – Lateral oblique
  – Dorso-ventral
This document is provided as an informational resource for AVDC Equine residents who are generating an equine dental radiograph set for Credentials Committee review. It is not intended to be a comprehensive guide to equine dental and nasal radiography. It is a companion document to the Radiograph Requirement – Information for Equine Residents file, which is available in the Radiology section of the Information for Registered Residents page and the Equine Training Program Information page of the AVDC web site.

Standard Views

Occlusal Intraoral Views of the Maxillary Incisor and Canine Teeth – Bisecting Angle Technique

The imaging plate/sensor is placed in the mouth so that the edge of the plate/sensor is contacting the mesial aspect of the maxillary 2nd premolars. In some cases, the direct digital (DR) sensor can be turned 45 degrees, so that the corner of the sensor is advanced between the maxillary cheek teeth.

The central beam is directed 90 degrees to the plane that bisects the angle between the incisor reserve crown-root and the imaging plate. Due to the curvature of the incisors, the reserve crown-root, rather than the clinical crown, is used to determine the angle between the tooth and the imaging plate/sensor.
Radiology

• AVDC/AVD convention
  – image as looking at the horse.
  – When presenting the image of the right arcades (100 & 400) the horse’s nose should be pointing to the viewer’s right.
  – nose should be pointing to the viewer’s left when presenting the image of the left arcades (200 & 300)
  – Maxillary incisor radiographs should be oriented with crowns pointing down, with 100s on the left.
  – Mandibular incisors should be oriented with crown pointing up, and with 400s on the viewer’s left.
Radiology

- **Regions**
  - Incisors/canines
    - Intra-oral
    - Lateral
  - Sinus
    - Lateral/Lateral oblique
  - Maxillary cheek teeth
    - Lateral/Lateral oblique
  - Mandible cheek teeth
    - Lateral/Lateral oblique
  - Skull
    - Dorso-vental
  - Cheek teeth occlusal aspect
    - Open-mouthed oblique
Portable & wireless Imaging center that does it all

Designed specifically for equine veterinary workflow and patients.
Radiology

- Off set mandibular arcade DV
  - Offset wood blocks for incisor
Radiology

• Incisors/Canines
  – Intra-oral
    • Smallest cassette
    • In-between incisors and caudle as much as possible
    • 60-80° from dorsal plane (hard palate)
    • Center on -01 teeth (unless other focus)
  – Lateral
    • Adding 5-10° rostro-caudal may help separate canines
Radiology

• Position is key
  – Facial Crest, Diastema, and Medial Canthus of Eye
  – Area of interest against plate
  – Tape Technique
    • Demo
Radiology

• Oblique radiographs
  – dorsolateral-ventrolateral (Maxillary apical area)
  – ventrolateral-dorsolateral (Mandibular apical area)
  – Open mouth oblique
    • Occlusal surface (both maxillary and mandibular cheek teeth)
Radiology

- Open mouth oblique (maxillary cheek teeth)
  - Apical region
    - 30 degrees DV (beam-apical region maxillary cheek teeth)
    - 60 degree DV (view through interarchade space)
  - Crown region
    - 30 degrees VD (beam-crown region maxillary cheek teeth)
Radiology

- Open mouth oblique (mandibular cheek teeth)
  - Apical region
    - 30 degrees DV (beam-apical region mandibular cheek teeth)
  - Crown region
    - 30 degrees VD (beam-crown region mandibular cheek teeth)
    - 15 degree DV (view through interarchade space)
Radiology

• Monday Lab:
  A. Highlight apical root area of 409 (best shot)
  B. Highlight occlusal surface of 207 (best shot)
Radiology

• Monday Lab:
  A. Highlight apical root area of 409 (best shot)
Radiology

• Monday Lab:
  A. Highlight apical root area of 409 (best shot)
Radiology

• Monday Lab:
  B. Highlight occlusal surface of 207 (best shot)
Radiology

- Monday Lab:
  B. Highlight occlusal surface of 207 (best shot)
Which one?
Radiology

• Contrast
  – Draining Tract
    • Paper clip
    • Dull probe
    • Barium
  – Area of interest marker
Scintigraphy

- $^{99m}$ Technetium ($^{99m}$Tc)
  - Bound to phosphate (bone remodeling)
  - Detects active physiological process
    - Periapical infections
    - Other skull lesions
  - Motion causes distortion (blurring)
Computed Tomography

• Cross section images of tissue
  – Contrast of bone and soft tissue
  – Localize/specific area of interest (equine head)
    • Fractures
    • Dental disease
    • Infection
    • Neoplasia
Computed Tomography

• Algorithms
  – Soft-tissue
  – Bone/tooth (higher resolution)
    • Can separate out cementum, enamel, and dentin

• General anesthesia
  – New: Standing sedated CT head

• 2-D and 3-D images
  – 3-D requires special table to move head through the machine
Computed Tomography
What’s great about CT?

• You can see thru stuff
• A narrow x-ray beam produces signals cross-sectional images or “slices” of the anatomy
• 3-D images can be formed – 3-D printers!
• “Human” tables will not work with horse weights; but the table is critical, as it is set to move the selected slice distance
• Bigger tables are made to accommodate the weight and move appropriately
Equine computed tomography (CT)

Elizabeth M. Santschi DVM, DACVS
What is CT?

Basically a spinning radiograph generator and detector
3D reconstruction

• Can be very helpful to surgeons to plan internal fixation, determine the extent of tumor, trauma or infection, and to find foreign bodies
3-D printer

partolutions.com
Magnetic Resonance Imaging

• Useful for soft-tissue imaging
  – Not ideal for dental imaging
  – Periodontal disease
    • Looking at Periodontal Ligament

Moon et al, 2013
MRI-Equine
Questions
Radiology

• Cadaver Radiographs
  – Incisor
  – Maxillary CT
  – Mandibular CT