

Interpretation of Small Animal Dental Radiographs

September 23, 2016

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Practitioner Dental Case Rounds

- 2 FREE hours of CE!
- Saturday, October 22, 2016
- 1:30 – 3:30 pm
- Bring rads and/or photos
- Round-table discussion of your tough cases
- Contact the Office of Public Engagement at 217-333-2907 or ope@vetmed.illinois.edu



<http://vetmed.illinois.edu/vet-resources/continuing-education/dentistry-case-rounds/>

This lecture is dedicated to the memory of Patricia Frost Fitch, DVM, DAVDC

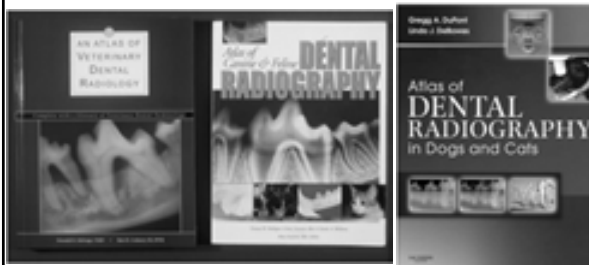


Dedication of the VTH Dentistry Suite
Janet Mertz - Benefactor



Left to right: Morgan Powell (Orthodontist), Börje Gustafsson (VCM Chair), Janet Mertz, Pat Frost, Bill Smith (VTH Surgeon), Richard Dierks (CVM Dean), Nicholas Sabbia (Dentist)

Veterinary Dental Radiography Textbooks



Why take dental radiographs?

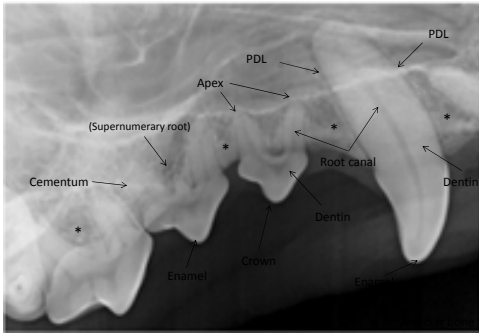
1. To determine the condition of the teeth and alveolar bone
2. To establish a baseline for future changes

FDA/ADA Recommendations for adults with permanent dentition:

- Survey radiographs as new patients, then every 24-36 months
- A full mouth intraoral radiographic exam is preferred when the patient has clinical evidence of generalized dental disease or a history of extensive dental treatment

<http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/MedicalImaging/MedicalX-Rays/ucm116504.htm> accessed 8/31/15

Normal anatomy



Dental Radiographic Evaluation

- Dental rads are a 2-dimensional representation of a 3-dimensional reality
- Normal structures may be misinterpreted as pathology, and vice versa
- Bone loss is generally UNDERestimated
- To help you reach a diagnosis:
 - Consider the oral exam/probing findings, patient signalment, and history
 - Compare findings to rad of contralateral side

Capture all the structures of interest

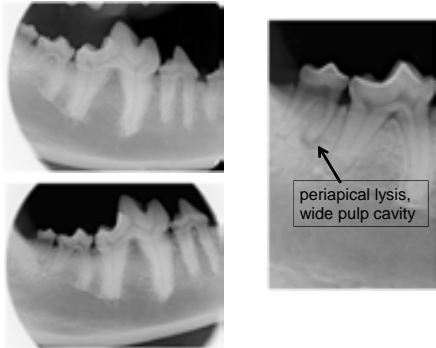
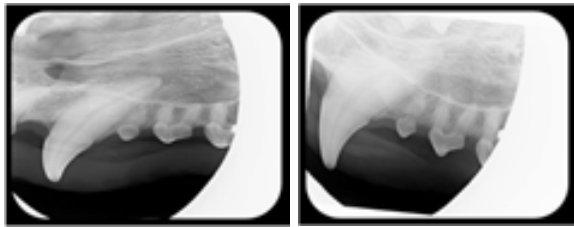


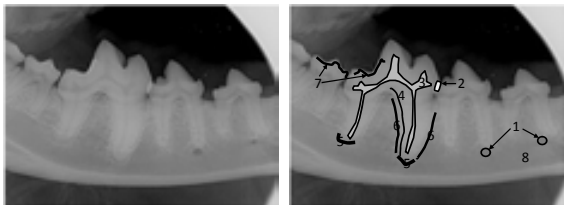
Image should have proportions of the actual teeth



Canine OK, premolars foreshortened

Canine distorted, premolars of correct proportion -- see anything new?

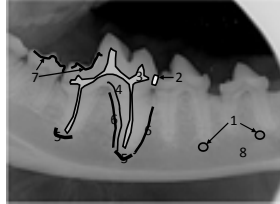
Normal Radiographic Structures



7 year old MC Cocker Spaniel
Caudal right mandible

Normal Radiographic Structures

- 1 – Middle and caudal mental foramina
- 2 – Superimposition of 4th premolar and 1st molar crowns
- 3 – Pulp cavity
- 4 – Radicular groove
- 5 – “Chevron” lucency
- 6 – Lamina dura
- 7 – Enamel, seen end-on
- 8 – Mandibular canal



7 year old MC Cocker Spaniel

Normal anatomy

The pulp canal splits into many smaller foramina at the apices of dog and cat teeth.

The apical delta contributes to the appearance of chevron lucencies.

Neurovascular structures enter via the many foramina of the delta.

Summation of these soft tissue structures around the apex with relatively spongy trabecular bone creates a lucent area that may be mistaken for an endodontic lesion (periapical lysis).



Apical delta – J Vet Dent, 18:9-13, 2001.

Normal anatomy

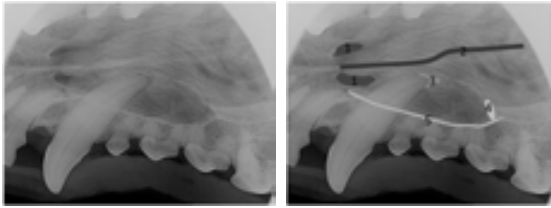
- Chevron lucencies** - mimic periapical lysis of endodontic disease
- trabecular bone and vascular channels less dense than alveolus
- very regular in shape
- “hug” the apex rather than expand
- periodontal ligament and lamina dura may be seen around it

Most apparent in the dog on:

- Canines
- Maxillary incisors
- Mandibular 1st molars



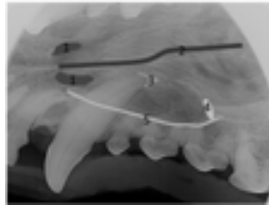
Normal Radiographic Structures



7 year old MC Cocker Spaniel
Left maxilla

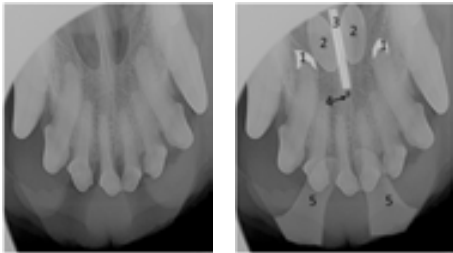
Normal Radiographic Structures

- 1 – Palatine fissures
- 2 – Vomer
- 3 – “Chevron” lucency
- 4 – Infraorbital foramen
- 5 – Nasal surface of the alveolar process of the maxilla



7 year old MC Cocker Spaniel

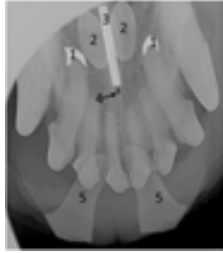
Normal Radiographic Structures



7 year old MC Cocker Spaniel
Rostral maxilla

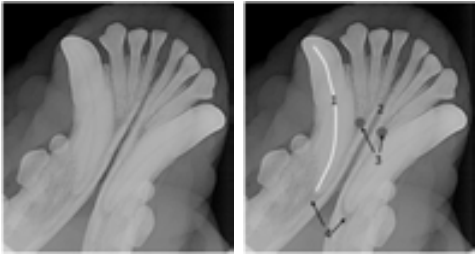
Normal Radiographic Structures

- 1 – “Chevron” lucency (normal)
- 2 – Palatine fissures
- 3 – Vomer
- 4 – Incisive canal
- 5 – Openings of the nares



7 year old MC Cocker Spaniel
Rostral maxilla

Normal Radiographic Structures



7 year old MC Cocker Spaniel
Rostral mandible

Normal Radiographic Structures

- 1 – Pulp canal
- 2 – Mandibular symphysis (a fibrocartilagenous union)
- 3 – Left and right rostral mental foramina
- 4 – “Chevron” lucency



7 year old MC Cocker Spaniel
Rostral mandible



The Periodontium


- All the structures that hold the teeth
 - Gingiva
 - Periodontal ligament
 - Cementum
 - Alveolar bone



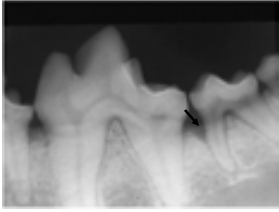
Radiographic Evaluation of Periodontal Disease

- Evidence of periodontitis:
- Widened periodontal ligament
 - Decreased alveolar bone density
 - Alveolar bone loss
 - May be focal or generalized
 - Horizontal: across one or more roots or teeth
 - Vertical: “down” a root
 - May occur at the furcation

Periodontal Disease

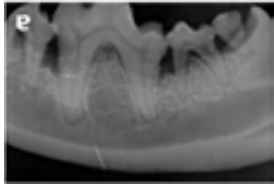


Horizontal bone loss

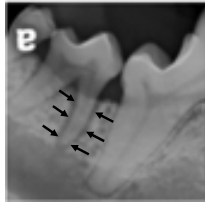


Vertical bone loss

Periodontal Disease




Horizontal bone loss
Vertical bone loss
Decreased alveolar bone density



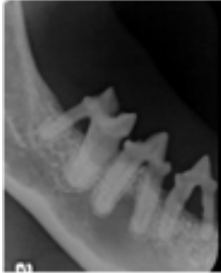
Widened periodontal ligament

What is your diagnosis for this right mandibular PM3-M1?



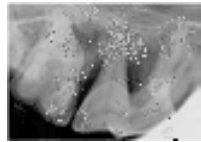
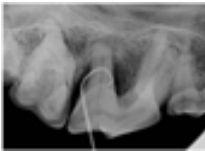
A. Vertical bone loss
B. Horizontal bone loss
C. Horizontal & vertical bone loss

What is your diagnosis for this right mandibular PM3-M1?



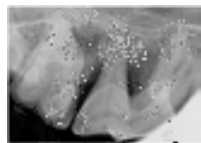
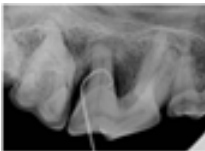
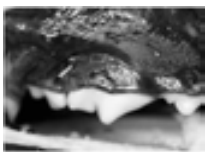
- A. Vertical bone loss
- B. Horizontal bone loss**
- C. Horizontal & vertical bone loss

What is the cause of the draining tract in this dog seen for facial swelling?



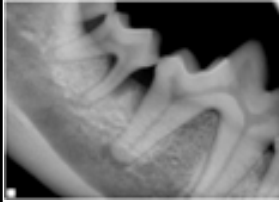
- A. Endodontic disease
- B. Vertical bone loss 2^o to periodontal disease
- C. Horizontal bone loss 2^o to periodontal disease
- D. Root resorption

What is the cause of the draining tract in this dog seen for facial swelling?



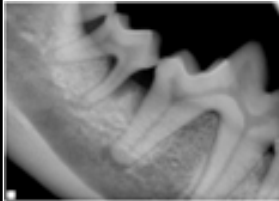
- A. Endodontic disease
- B. Vertical bone loss 2^o to periodontal disease**
- C. Horizontal bone loss 2^o to periodontal disease
- D. Root resorption

What is your diagnosis for this right mandibular M1-M3?



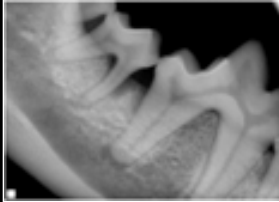
- A. Vertical bone loss
- B. Horizontal bone loss
- C. Horizontal & vertical bone loss

What is your diagnosis for this right mandibular M1-M3?



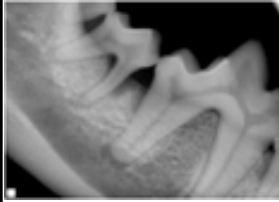
- A. Vertical bone loss
- B. Horizontal bone loss
- C. **Horizontal & vertical bone loss**

What is your optimal treatment plan for this right mandibular M1-M3?



- A. Extract M1-M3
- B. Extract M3, bone graft M2 and distal root M1
- C. Extract M2

What is your optimal treatment plan for this right mandibular M1-M3?



- A. Extract M1-M3
- B. Extract M3, bone graft M2 and distal root M1**
- C. Extract M2



Endodontic System



- Pulp chamber and root canals
- Contains living pulp tissue:
 - Nerves
 - Blood vessels
 - Lymph vessels
 - Connective tissue
 - Cells

Radiographic Evaluation of Endodontic Disease

- Periapical lysis – of bone around root tip
- Apical lysis – resorption of root tip itself
- Wide/asymmetrical endodontic system
 - Arrested secondary dentin formation
 - Resorption of dentin from inside pulp canal
- Secondary destruction of periodontium
- Gutta-percha point placed in draining tract points to apex of root

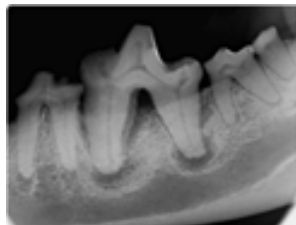
What is your diagnosis for the left mandibular 1st molar in this 7-year-old dog?

- A. Endodontic disease
- B. Periodontal disease
- C. Endodontic and periodontal disease
- D. Normal



What is your diagnosis for the left mandibular 1st molar in this 7-year-old dog?

- A. Endodontic disease
- B. Periodontal disease
- C. Endodontic and periodontal disease**
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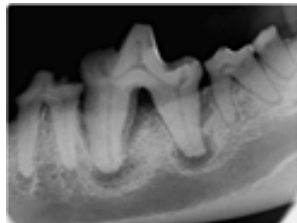
What is your treatment plan for the left mandibular 1st molar in this 7-year-old dog?

- A. Root canal
- B. Extraction
- C. Root canal and periodontal treatment
- D. Normal

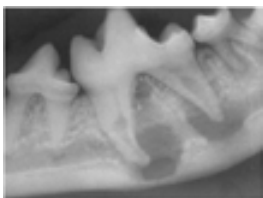


What is your treatment plan for the left mandibular 1st molar in this 7-year-old dog?

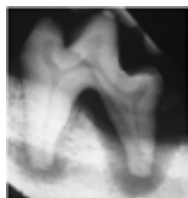
- A. Root canal
- B. Extraction**
- C. Root canal and periodontal treatment
- D. Normal



Endodontic disease



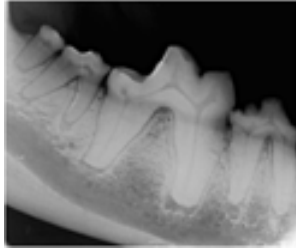
Endodontic disease with 2° periodontal disease



Periodontal disease with 2° endodontic disease

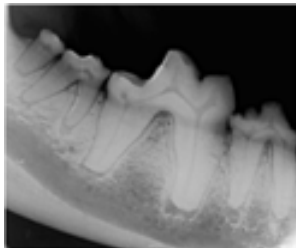
What is your diagnostic and treatment plan for the right mandibular 1st molar in this 8 year-old dog?

- A. Endodontic disease; root canal or extraction
- B. Periodontal disease; extraction
- C. Normal; no treatment
- D. Root resorption

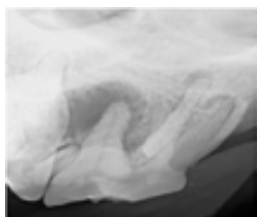


What is your diagnostic and treatment plan for the right mandibular 1st molar in this 8 year-old dog?

- A. Endodontic disease; root canal or extraction
- B. Periodontal disease; extraction
- C. **Normal; no treatment**
- D. Root resorption

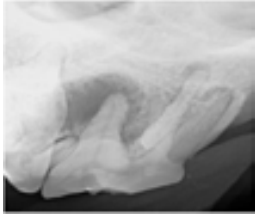


What is your radiographic diagnosis?



- A. Wide endodontic canal
- B. Vertical bone loss
- C. Periapical lysis of distal root only
- D. Periapical lysis of all 3 roots

What is your radiographic diagnosis?



- A. Wide endodontic canal
- B. Vertical bone loss
- C. Periapical lysis of distal root only
- D. Periapical lysis of all 3 roots**

Pulp canal may not appear widened, despite a periapical lesion, and vice versa.



Radiographic Evaluation of Tooth Resorption

- Supragingival lucencies
 - Cervical line, furcation, crown
- Root resorption
 - Replacement by bone
- Type 1: root not replaced (external)
- Type 2: root replaced by bone (replacement)
- Stages 1 through 5

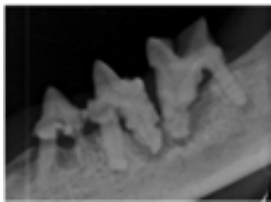
<http://www.avdc.org/Nomenclature/Nomen-Teeth.html#resorption>

Criteria for Crown Amputation versus Routine Extraction

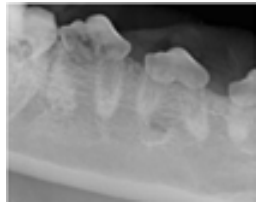
Crown amputation is acceptable IF:
Severe root resorption (absent roots or ghostly root remnants only)
Ankylosis of root (thin/absent periodontal ligament)
NO endodontic pathosis (no periapical lysis or widened pulp canal)
NO periodontal disease
NO stomatitis

Dental radiographs determine if extraction vs. crown amputation should be performed

Tooth Resorption

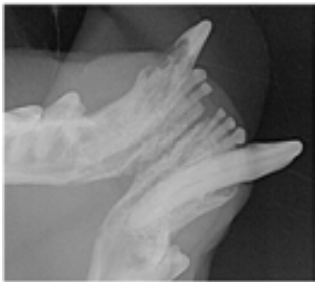


Type 1 tooth resorption, with horizontal & vertical bone loss -- MUST extract



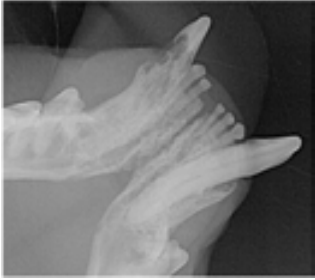
Type 2 tooth resorption in a dog -- crown amputation of PM4 (lesion on the crown)

Severe root resorption of right mandibular canine tooth, but no periodontal or endodontic disease



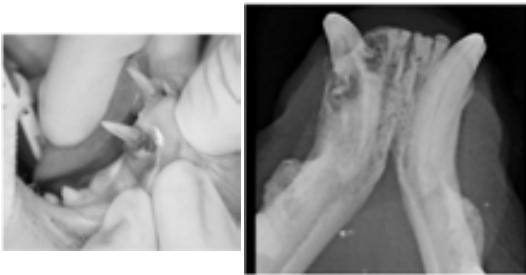
Treatment – Crown amputation (A), or Extraction (B)?

Severe root resorption of right mandibular canine tooth,
but no periodontal or endodontic disease



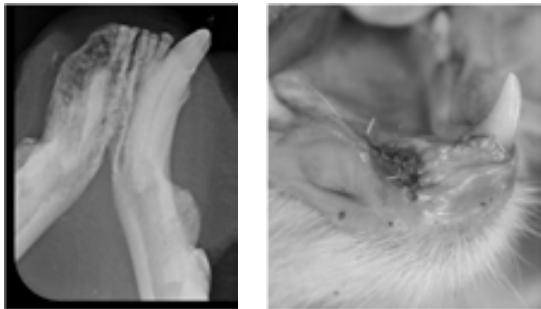
Treatment – **Crown amputation (A)**

Severe root resorption of right mandibular canine tooth;
moderate periodontal disease, but no endodontic disease



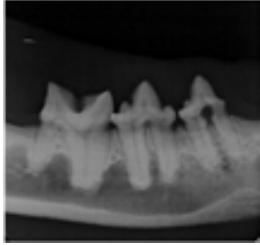
Treatment – Crown amputation (A), or Extraction (B)?

“Low” Crown Amputation



What is your diagnostic and treatment plan for the right mandibular 3rd premolar in this 4-year-old cat?

- A. Enamel hypoplasia, no Tx needed
- B. Normal
- C. Tooth resorption, extraction
- D. Tooth resorption, crown amputation

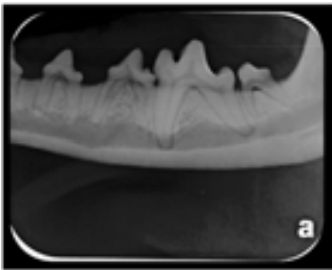


What is your diagnostic and treatment plan for the right mandibular 3rd premolar in this 4-year-old cat?

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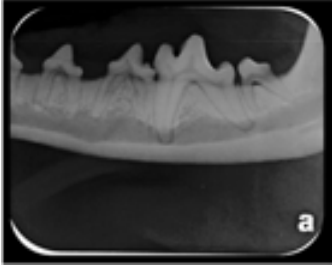


Resorptive lesion on the crown of this dog's left mandibular 4th premolar



Treatment – Crown amputation (A), or Extraction (B)?

Resorptive lesion on the crown of this dog's left mandibular 4th premolar



Treatment – Crown amputation (A) and Extraction (B)!
Crown amputate distal root, extract mesial root.



Radiographic Evaluation of Neoplasia

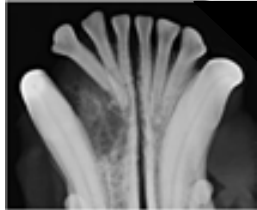
Clinical abnormalities that merit a dental rad:

- MX or MN swelling
- Gingival enlargement
- Proliferative or ulcerative soft tissue
- Mobility or spontaneous exfoliation of teeth
 - Especially if focal

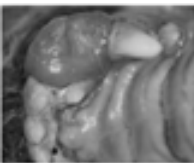
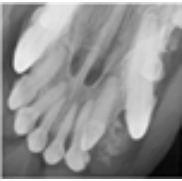
Radiographic Evaluation of Neoplasia

Radiographic abnormalities that merit biopsy:

- Disruption of normal structures
- Bony proliferation
- Bony lysis

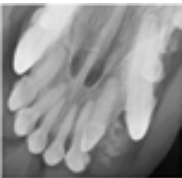


What is your conclusion and treatment plan for this 11-year-old mixed breed dog?



- A. Gingival hyperplasia – marginal excision
- B. Slow-growing tumor – monitor for pain
- C. Normal structures disrupted – biopsy indicated
- D. Normal

What is your conclusion and treatment plan for this 11-year-old mixed breed dog?



- A. Gingival hyperplasia – marginal excision
- B. Slow-growing tumor – monitor for pain
- C. Normal structures disrupted – biopsy indicated**
- D. Normal

What is your plan for this 16 month old FI hedgehog with a swollen rostral mandible?



- A. Severe periodontal disease – rostral mandibulectomy salvage procedure
- B. Lysis of rostral mandible – biopsy indicated
- C. Metabolic bone disease – administer calcitonin
- D. Symphyseal separation– apply cerclage wire

What is your plan for this 16 month old FI hedgehog with a swollen rostral mandible?



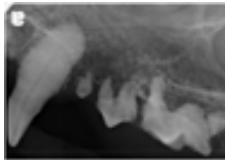
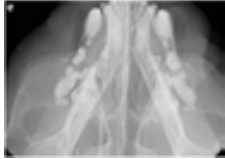
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- B. Lysis of rostral mandible – biopsy indicated**
- C. Metabolic bone disease – administer calcitonin
- D. Symphyseal separation– apply cerclage wire

What is your plan for this 17-year-old DLH cat with left maxillary swelling?



- A. Normal aging change – no action needed
- B. Periodontal disease – extract premolars
- C. Lysis of alveolar bone, proliferation of zygomatic arch – biopsy indicated
- D. Immediate head CT to determine extent of lesion

What is your plan for this 17-year-old DLH cat with left maxillary swelling?

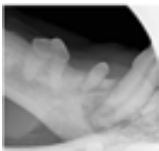


- A. Normal aging change – no action needed
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- C. Lysis of alveolar bone, proliferation of zygomatic arch – biopsy indicated**
- D. Immediate head CT to determine extent of lesion

Potpourri

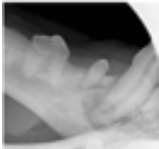


What is your radiographic diagnosis?



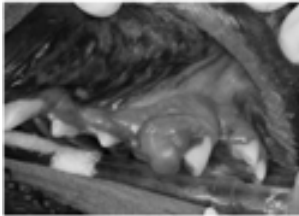
- A. Wide endodontic canal only
- B. Periapical lysis only
- C. Vertical bone loss
- D. Wide endodontic canal, periapical lysis, & vertical bone loss**

What is your radiographic diagnosis?



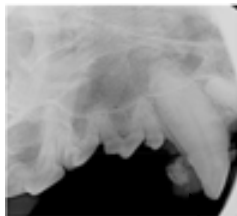
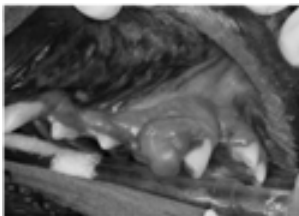
- A. Wide endodontic canal only
- B. Periapical lysis only
- C. Vertical bone loss
- D. Wide endodontic canal, periapical lysis, & vertical bone loss**

What is your top differential for the gingival mass in this 12-year-old dog?



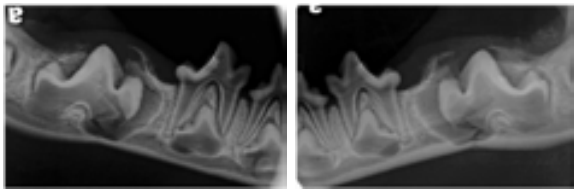
- A. Gingival hyperplasia
- B. Possible melanoma or squamous cell carcinoma
- C. Fibromatous epulis (peripheral odontogenic fibroma)
- D. Ossifying epulis (ossifying peripheral odontogenic fibroma)**

What is your top differential for the gingival mass in this 12-year-old dog?



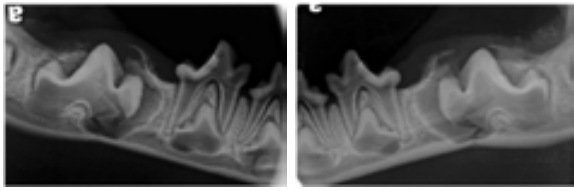
- A. Gingival hyperplasia
- B. Possible melanoma or squamous cell carcinoma
- C. Fibromatous epulis (peripheral odontogenic fibroma)
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4-Month-Old FI Yorkshire Terrier, unable to close mouth fully and painful on mandibular palpation



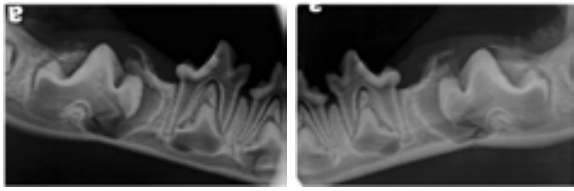
A. Dx: greenstick (minimally displaced) mandibular fractures
B. Dx: fractured M1s
C. Dx: normal eruption of permanent dentition

4-Month-Old FI Yorkshire Terrier, unable to close mouth fully and painful on mandibular palpation



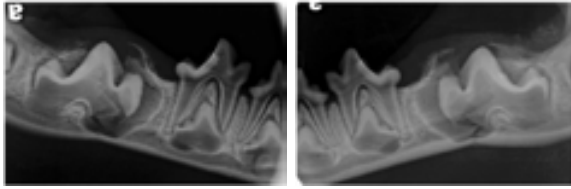
A. Dx: greenstick (minimally displaced) mandibular fractures
B. Dx: fractured M1s
C. Dx: normal eruption of permanent dentition

4-Month-Old FI Yorkshire Terrier, unable to close mouth fully and painful on mandibular palpation



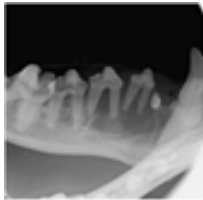
A. Tx: rigid fixation
B. Tx: extraction of M1s
C. Tx: benign neglect, monitor for normal eruption
D. Tx: tape muzzle

4-Month-Old FI Yorkshire Terrier, unable to close mouth fully and painful on mandibular palpation



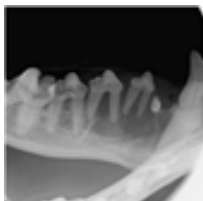
- A. Tx: rigid fixation
- B. Tx: extraction of M1s
- C. Tx: benign neglect, monitor for normal eruption
- D. Tx: **tape muzzle**

What is your most likely diagnosis for this 5-year-old mixed breed dog with a clinically absent mandibular 1st premolar and a mandibular swelling?



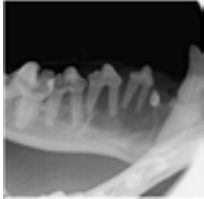
- A. Dentigerous cyst
- B. Possible melanoma or squamous cell carcinoma
- C. Peripheral odontogenic fibroma (epulis)
- D. **Abscess**

What is your most likely diagnosis for this 5-year-old mixed breed dog with a clinically absent mandibular 1st premolar and a mandibular swelling?



- A. **Dentigerous cyst**
- B. Possible melanoma or squamous cell carcinoma
- C. Peripheral odontogenic fibroma (epulis)
- D. Abscess

What is your treatment plan for this dog?



- A. Lance and drain
- B. Rostral mandibulectomy
- C. Remove unsupported teeth and entire capsule, submit for histopathology
- D. Radiation treatment

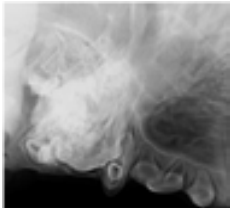

What is your treatment plan for this dog?



- A. Lance and drain
- B. Rostral mandibulectomy
- C. **Remove unsupported teeth and entire capsule, submit for histopathology**
- D. Radiation treatment

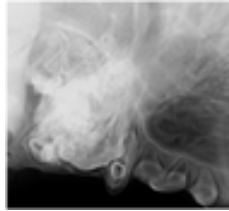
Note: Malignant transformation of dentigerous cyst epithelial lining has been reported in humans and dogs— removal is recommended!

What is your top differential for this 6 month old dog with absent right maxillary 4th premolar and 1st molar?



- A. Osteosarcoma
- B. Compound odontoma
- C. Dentigerous cyst
- D. Foreign body

What is your top differential for this 6 month old dog with absent right maxillary 4th premolar and 1st molar?



- A. Osteosarcoma
- B. Compound odontoma**
- C. Dentigerous cyst
- D. Foreign body

Compound Odontoma

- Multiple root and crown structures – “denticles”
- Covered by alveolar bone
- Could form a dentigerous cyst if not extracted



(Note: A **complex odontoma** appears as an amorphous agglomeration of tooth tissues.)

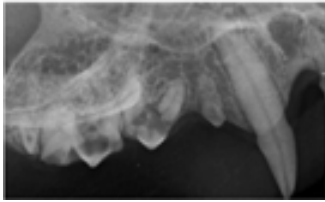
What is your diagnosis for this 4-year-old old cat?

- A. Tooth resorption of P3 and P4
- B. Bony proliferation by P3-P4
- C. Normal
- D. Periapical lysis of P2



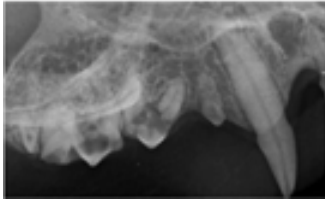
What is your diagnosis for this 4-year-old old cat?

- A. **Tooth resorption of P3 and P4**
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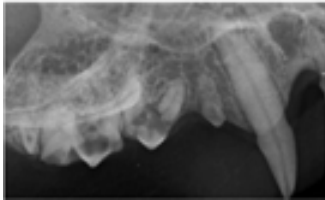
What is your treatment for this 4-year-old old cat?

- A. Crown amputate P3-P4
- B. **Extract P3-P4**
- C. Extract P3, crown amputate P4



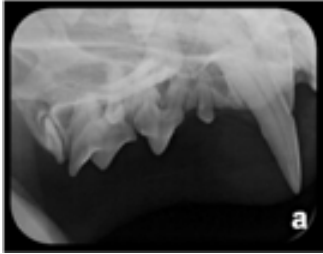
What is your treatment for this 4-year-old old cat?

- A. Crown amputate P3-P4
- B. **Extract P3-P4**
- C. Extract P3, crown amputate P4



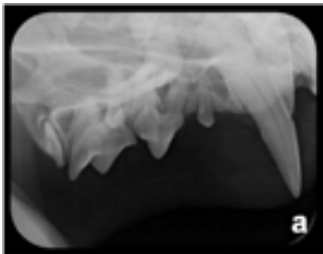
What is your diagnostic and treatment plan in this 3-year-old cat?

- A. Periodontal disease, deep cleaning
- B. Periapical lysis, PM4, extraction
- C. Missing PM1
- D. Normal

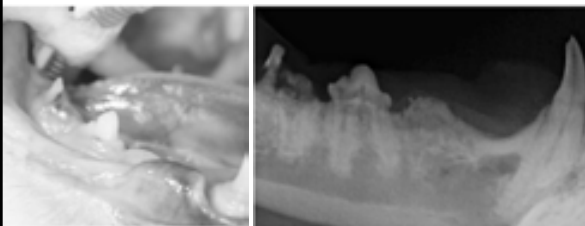


What is your diagnostic and treatment plan in this 3-year-old cat?

- A. Periodontal disease, deep cleaning
- B. Periapical lysis, PM4, extraction
- C. Missing PM1
- D. **Normal**

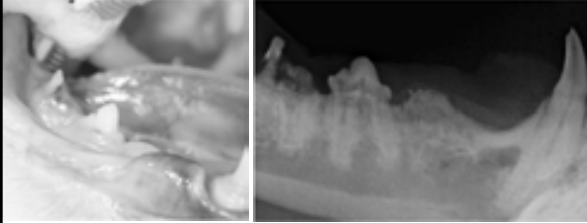


Tooth resorption noted on this right mandibular 3rd premolar (gingiva intact)



Treatment – Crown amputation (A), or Extraction (B)?


Tooth resorption noted on this right mandibular 3rd premolar (gingiva intact)



Treatment – None! (stage 5 tooth resorption)


What is your top differential for the rostral maxillary mass in this 10-year-old dog?

- A. Gingival hyperplasia
- B. Ossifying epulis
- C. Fibromatous epulis
- D. Possible melanoma or squamous cell carcinoma



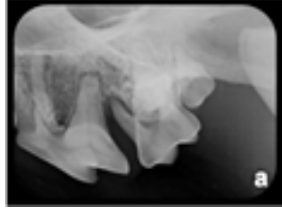
What is your top differential for the rostral maxillary mass in this 10-year-old dog?

- A. Gingival hyperplasia
- B. Ossifying epulis
- C. Fibromatous epulis
- D. **Possible melanoma or squamous cell carcinoma**



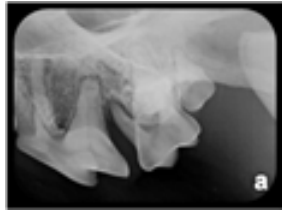
What is your diagnosis and treatment plan for the left maxillary first molar in this 10-year-old sheltie?

- A. Periapical lysis, root canal or extraction
- B. Periodontal disease, extraction
- C. Periodontal disease, closed or open root planing
- D. Normal



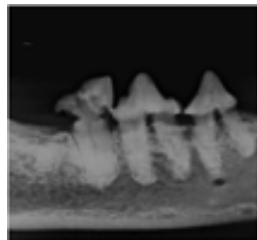
What is your diagnosis and treatment plan for the left maxillary first molar in this 10-year-old sheltie?

- A. Periapical lysis, root canal or extraction
- B. Periodontal disease, extraction**
- C. Periodontal disease, closed or open root planing
- D. Normal



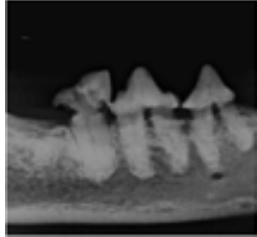
What is your diagnosis and treatment plan for the right mandibular first molar in this 15-year-old cat?

- A. Enamel hypoplasia, no treatment required
- B. Enamel hypoplasia, extraction
- C. Tooth resorption, crown amputation
- D. Tooth resorption, extract mesial root & crown amputate distal root



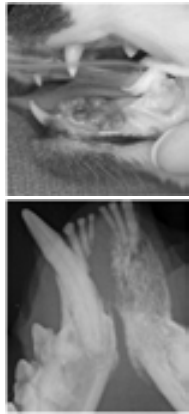
What is your diagnosis and treatment plan for the right mandibular first molar in this 15-year-old cat?

- A. Enamel hypoplasia, no treatment required
- B. Enamel hypoplasia, extraction
- C. Tooth resorption, crown amputation
- D. Tooth resorption, extract mesial root & crown amputate distal root**



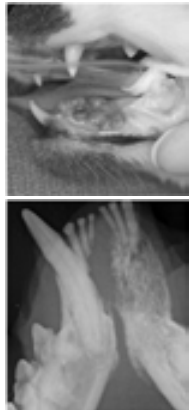
What is your top differential in this 10-year-old cat (canine spontaneously exfoliated)?

- A. Tooth resorption
- B. Squamous cell carcinoma
- C. Exuberant granulation tissue secondary to periodontal disease



What is your top differential in this 10-year-old cat (canine spontaneously exfoliated)?

- A. Tooth resorption
- B. Squamous cell carcinoma**
- C. Exuberant granulation tissue secondary to periodontal disease



Questions?