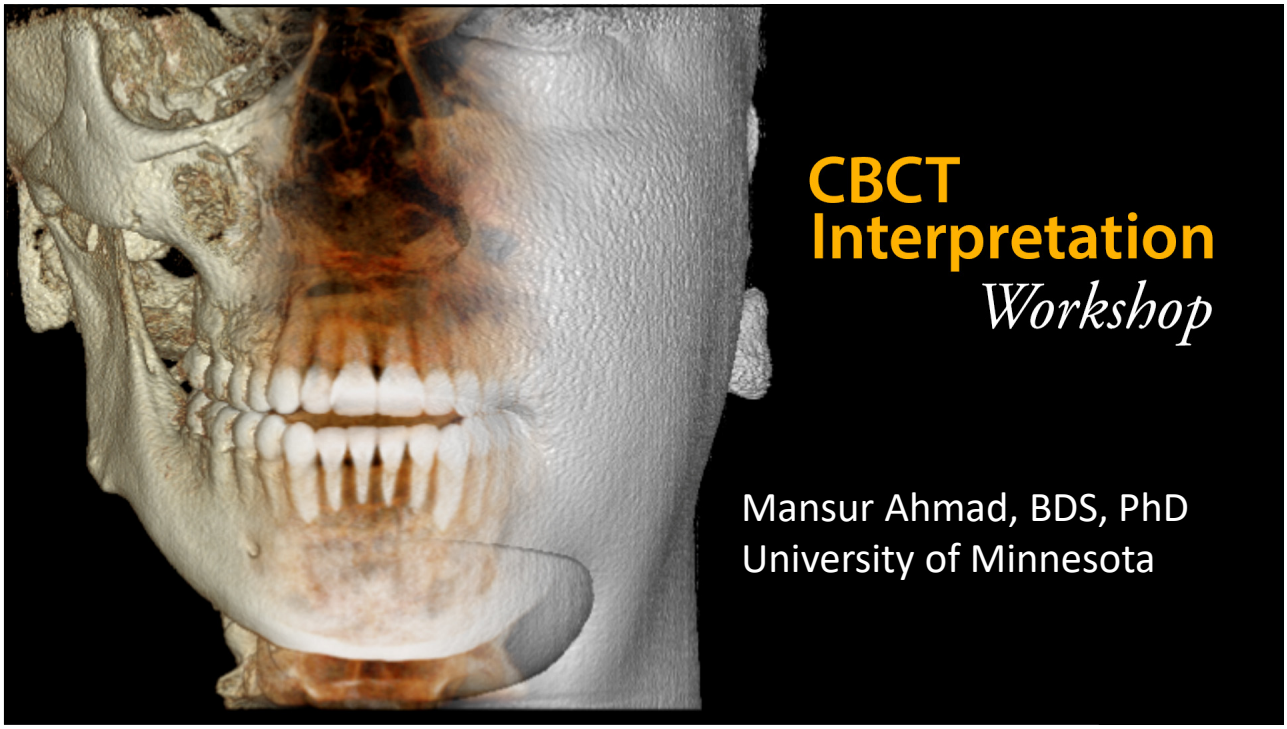


Plan for this morning

- CBCT cases. Mixed bag. No fixed order.
- It's kind of a Grand Rounds. More of a Workshop
- Traditional Grand Rounds: patient in amphitheater clinic
- OT: Operating theater
- Now, our turn to practice CBCT cases

Aims of the Workshop

- It is a WORKSHOP!
- Discuss the principles of image interpretation
- Systematic step-by-step evaluation of CBCT cases.
- About 10 cases, quality rather than quantity
- Develop a logical differential diagnosis

- We will use InVivo Viewer or InVivo Workspace
- Several excellent software options.

Two Steps of Reading Radiographs

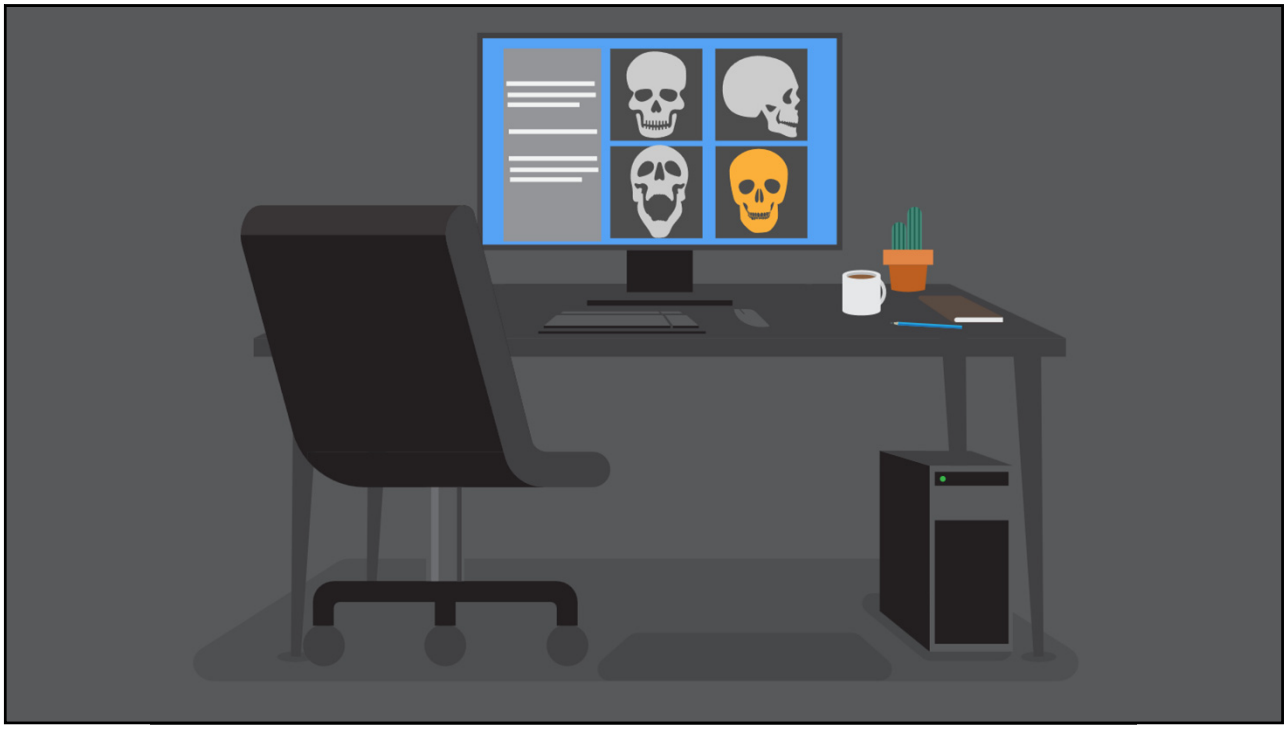
Telescope and Microscope

Telescope

- Broad overview
- Density and quality of the radiograph
- Number of the teeth
- Compare right and left

Microscope

- PDL spaces
- Trabecular bones
- IAC
- Root resorption
- Loss of cortex
- etc



Read FMX systematically

- Telescope:
- Count all the teeth
- Identify errors: overlap, elongation, foreshortening
- Microscope:
- Tooth #1 to #16, and then #17 to #32
- Crown, pulp chamber, pulp canal, PDL spaces, bone, adjacent structures

Read panoramic systematically

- Telescope:
- Check the density and contrast, positioning errors
- Count the teeth
- Microscope:
- Tooth #1 to #16, and then #17 to #32
- Then bone, joints, sinuses, orbital floors, neck, soft tissues

Systematic Approach: CBCT

- Panoramic view: Tooth #1 to #16, and then #17 to #32
- Multiplanar (MPR) views : Axial, coronal and sagittal
- You are ordering CBCT scans primarily for MPR views
- TMJ Views: Corrected sagittal and axially corrected coronal views

Image analysis

- Step-by-step systematic approach
- Textbook cases, vs what we get in our clinics

- Picture matching:
  - Aunt Minnie
- Picture matching for common conditions only

Habitat for Humanity

Picture matching

Step-by-Step Analysis

Know Your Anatomy

Know Your Anatomy (3D anatomy too)

What is the location?

- How many lesions?
- Localized vs generalized
- Single arch or both arches?
- Crown related?
- Root related?
- Superior or inferior to the mandibular canal

Location helps us narrow down the differential diagnosis

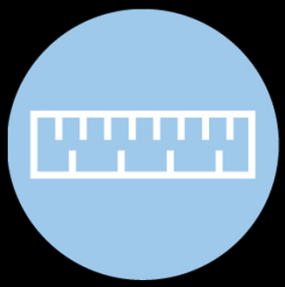
How dense is the lesion?

- Radiolucent
- Radiopaque
- Mixed

Density tells us the nature of the disease

What is the size

- In mm or inches
- All orientation
- Approx. size in panoramic



Size informs us history of the disease

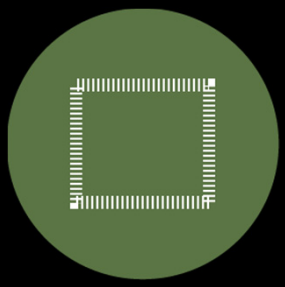
What is the shape?

- Circular
- Oval
- Scalloped
- Multilocular
- Irregular

Shape may tell us the nature of the disease

What are the features of the Border?

- Well defined or ill defined?
- Sharp margins
- Corticated margins
- Sclerotic margins
- Radiolucent band
- Blends into adjacent area
- Irregular margins



Border is crucial for the nature of the disease

What are the internal entities?

- Calcifications
- Tooth or similar entities

Only a few conditions will have radiographic internal contents

Effects on adjacent structures

- Expansion
- Resorption
- Displacement
  - Teeth
  - Lamina dura
  - Nerve canals
  - Maxillary sinuses

Effects : most important for diagnosis and tx planning

Seven Radiographic Features

Location | Density | Size | Shape | Border | Internal Entity | Effects on adjacent structures

Seven Radiographic Features

Location Density Size Shape Border Internal Entity Effects on adjacent structures

Mnemonic

Border Location Internal Entity Size Shape Effects on adjacent structures Density

Mnemonics

Border **L**ocation Internal **E**ntity **S**ize **S**hape **E**ffects on adjacent structure **D**ensity

Mnemonics

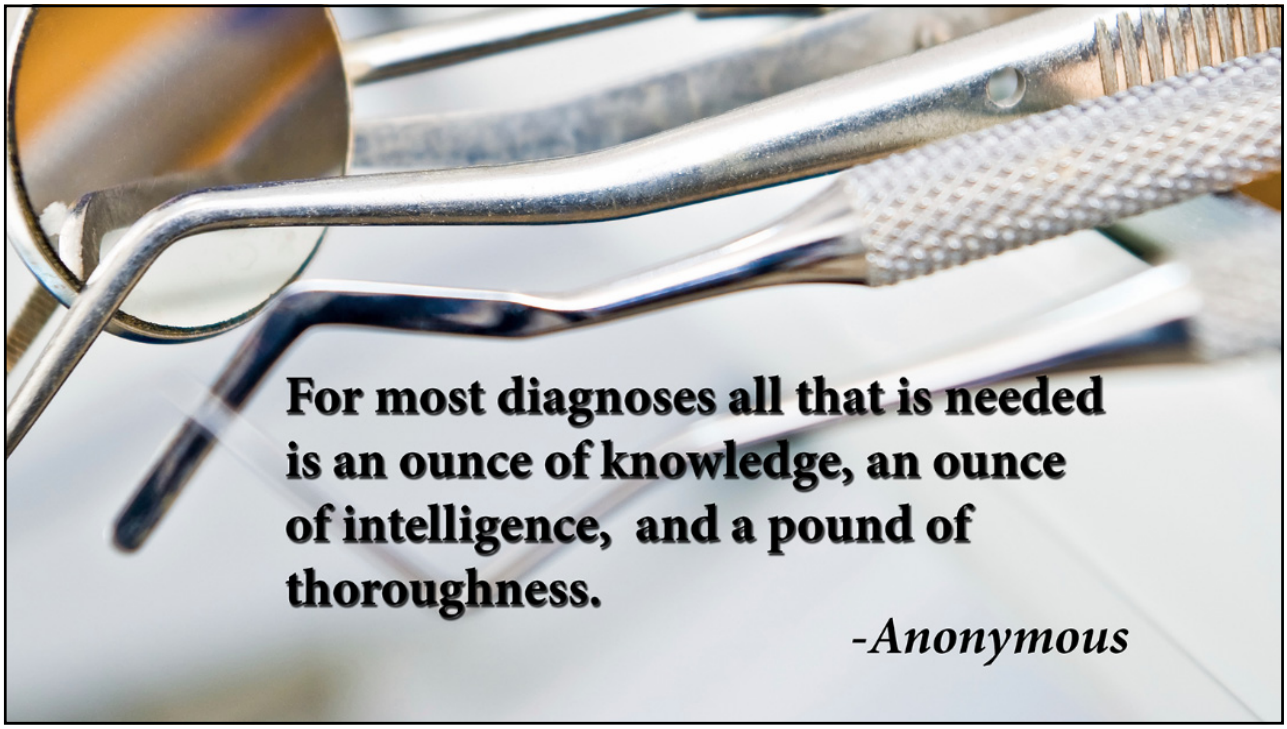
BLESSED

Mnemonics

Border **L**ocation Internal **E**ntity **S**ize **S**hape **E**ffects on adjacent structures **D**ensity

Blessed

- **B**order
- **L**ocation
- **E**ntity (internal entity or content)
- **S**hape
- **S**ize
- **E**ffects on neighboring structures
- **D**ensity



How to write a radiology report

- Description is the key
- Good description: Good diagnosis
- Speak out loudly
- List it down
- Compare findings in different images
- Clinical information

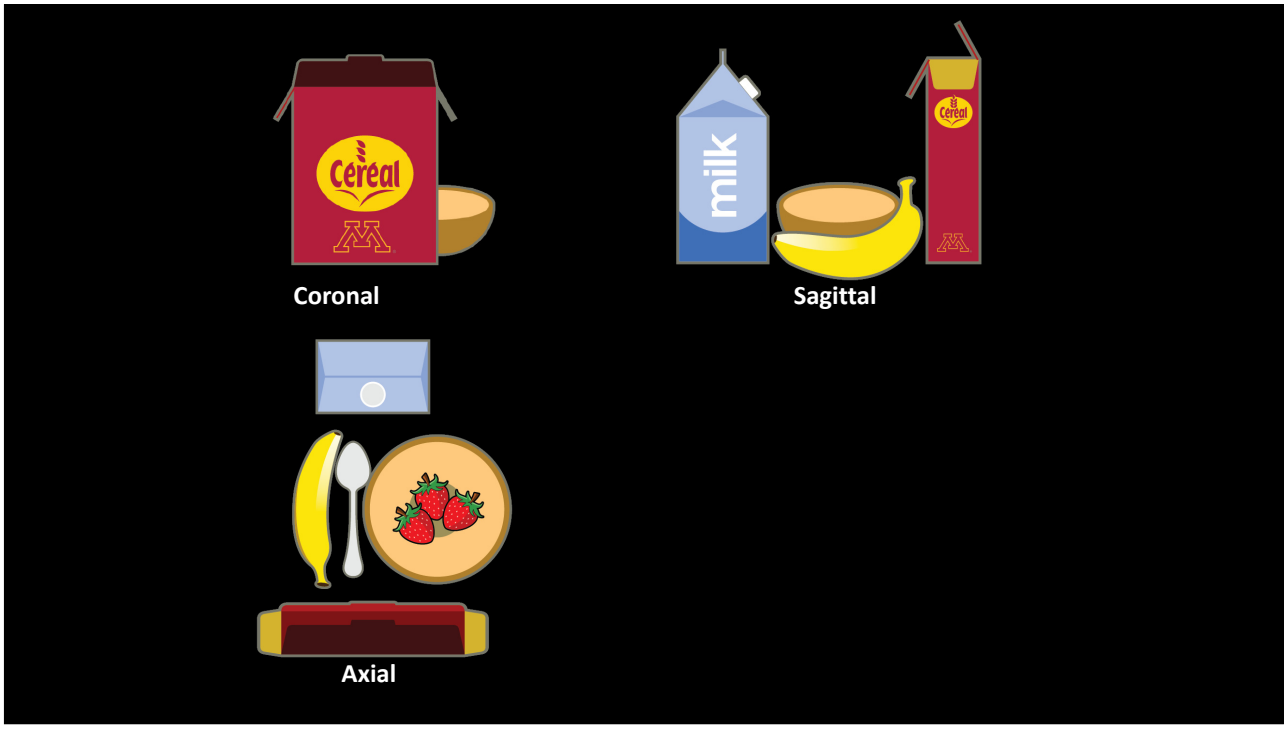
Avoid these words!

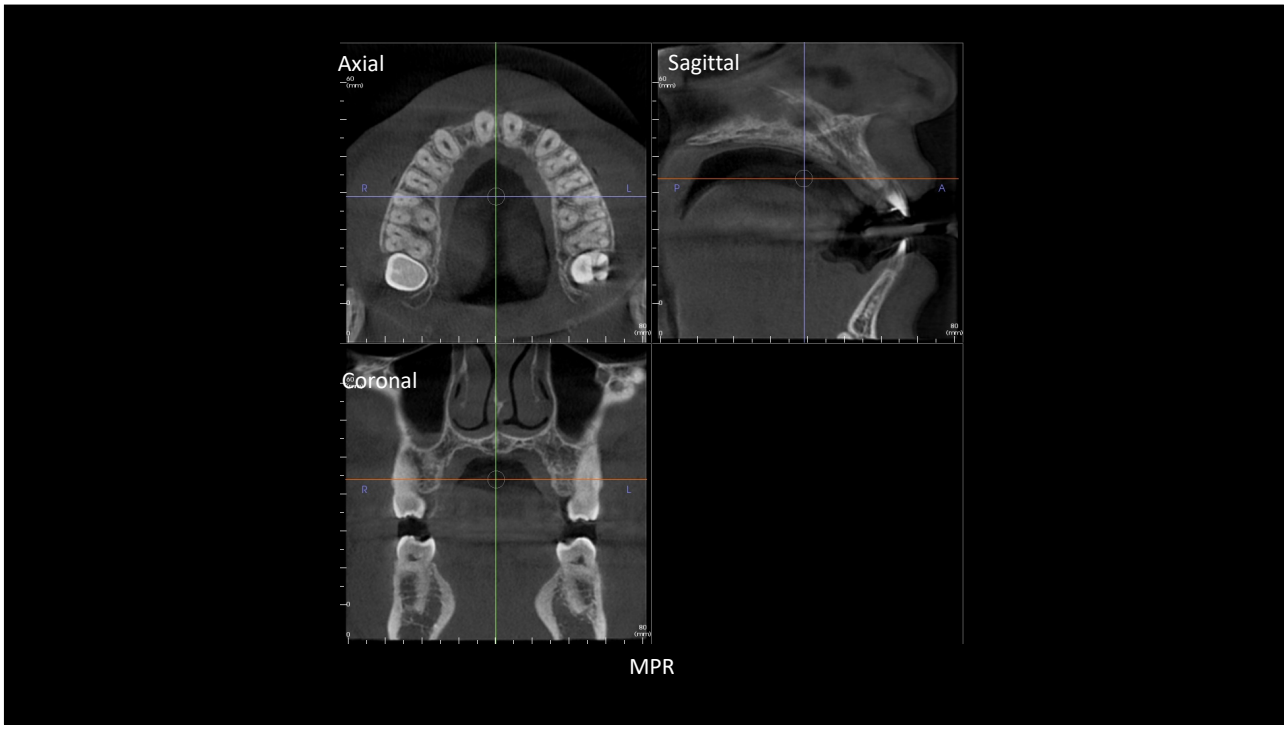
- Sun-ray appearance
- Ground glass
- Cotton wool
- Onion skin
- Driven snow
- ….

What goes on your note

- Date, type and number of examination
- Reasons for the examination
- Clinical information
- Relevant observation
- Radiographic Impressions
- Any further tests, examinations
- Goldilocks rules


Radiology Report?
Not too much, not too little


Cereal
Coronal
milk
Cereal
Sagittal
Axial


Axial
Sagittal
Coronal
MPR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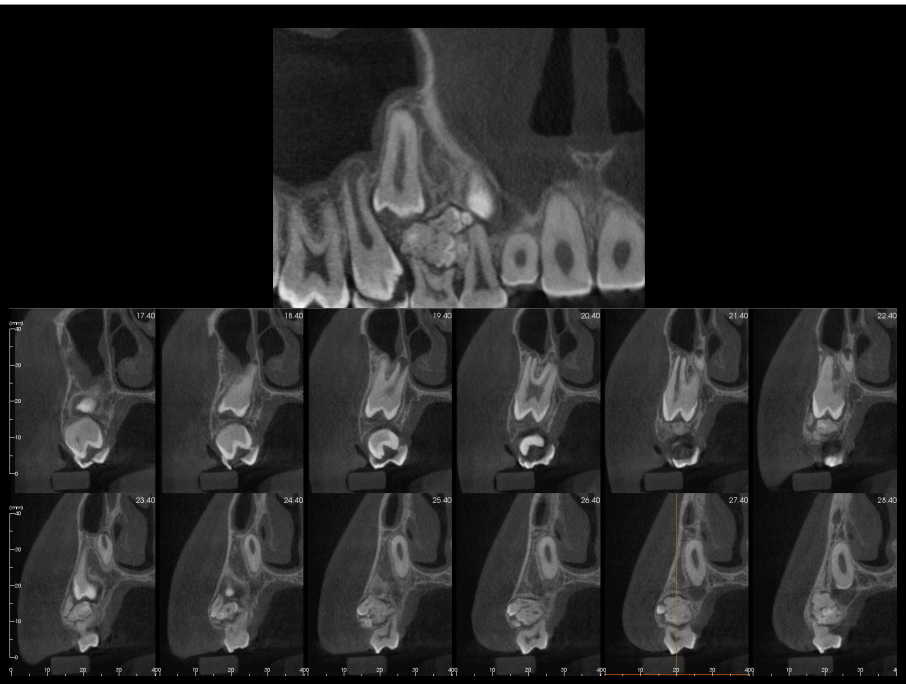


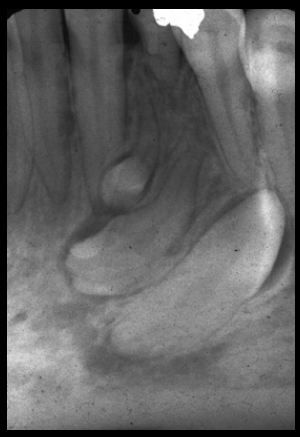
Odontoma

- Compound and complex
- Histologically, has mature enamel, dentin, cementum and pulp
- Complex: No morphological similarity to a tooth
- Compound: Similar to a tooth, may be small denticles

- Location:
  - Compound frequently in anterior maxilla, complex frequently in mandible. Can be in either jaws.
- Border:
  - Well-defined, soft tissue band, corticated margins

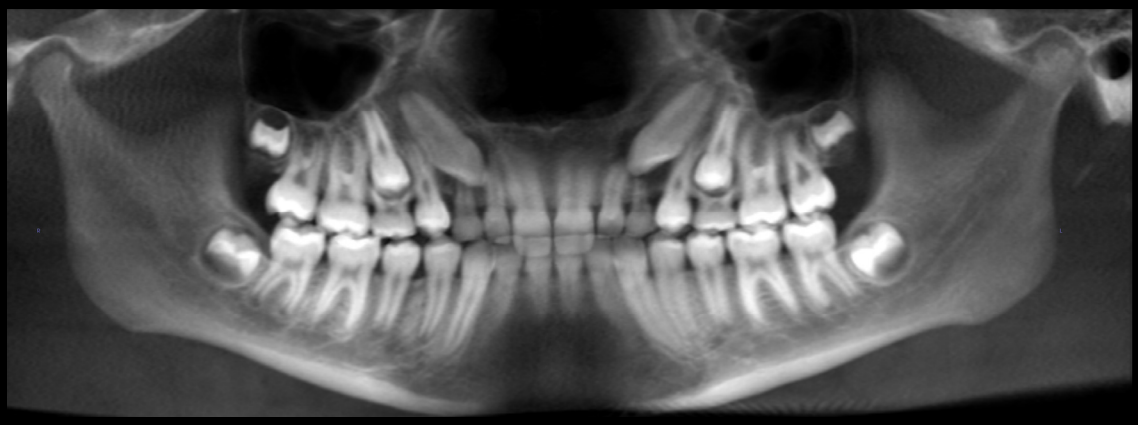
- Internal content:
  - Tooth-like radiopaque structures
- Effect on adjacent structures
  - Prevents eruption of normal teeth
  - Large odontomas may expand the jaws
  - Dentigerous cyst

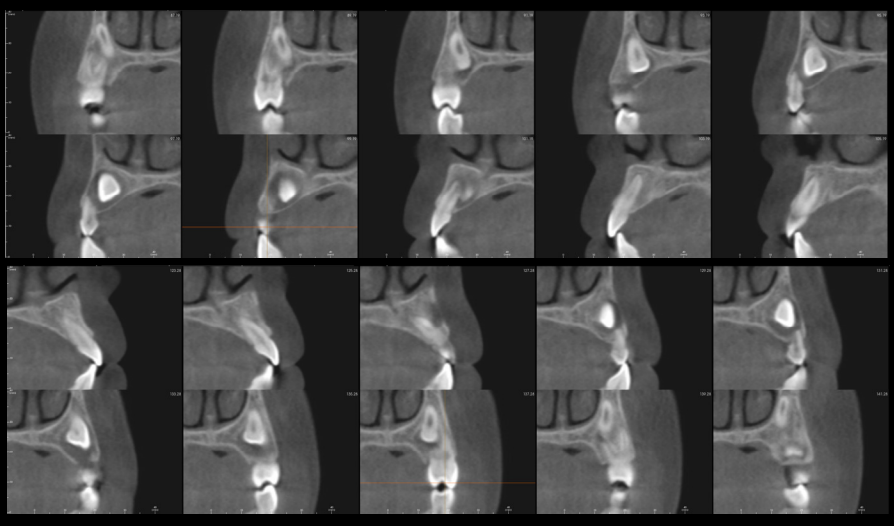
Compound Odontoma

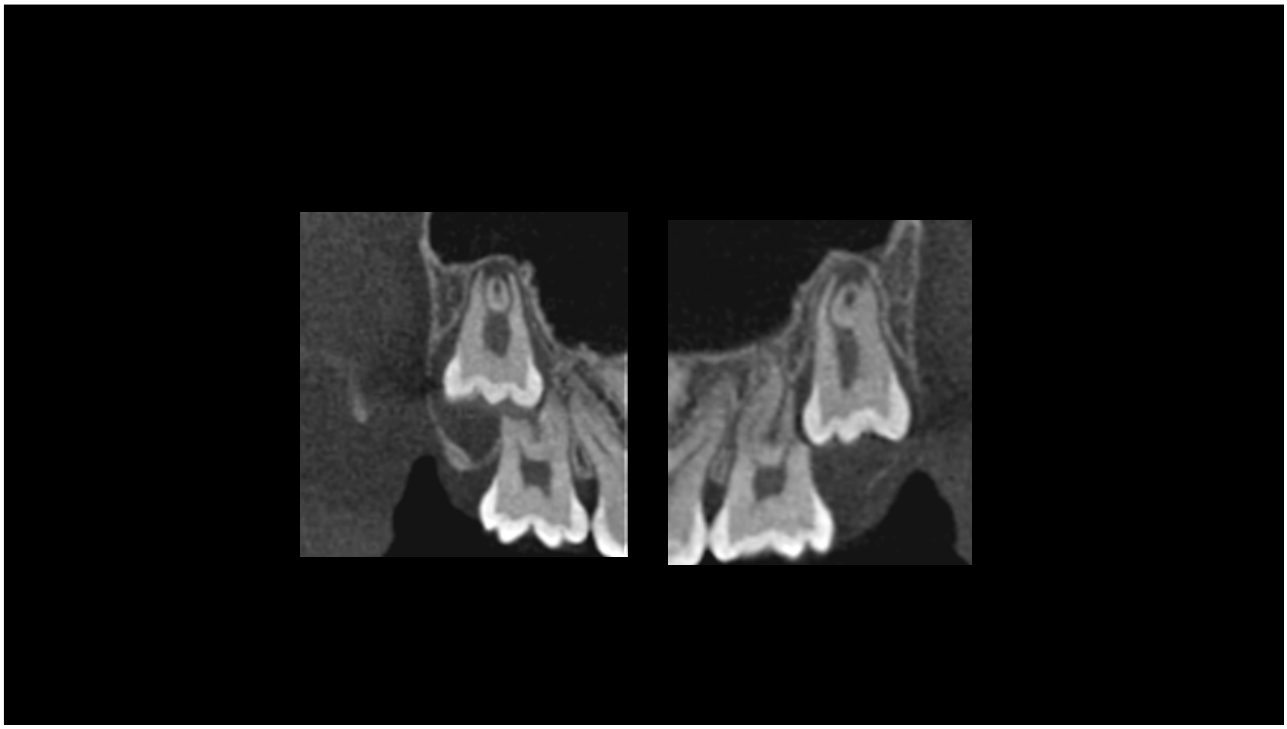


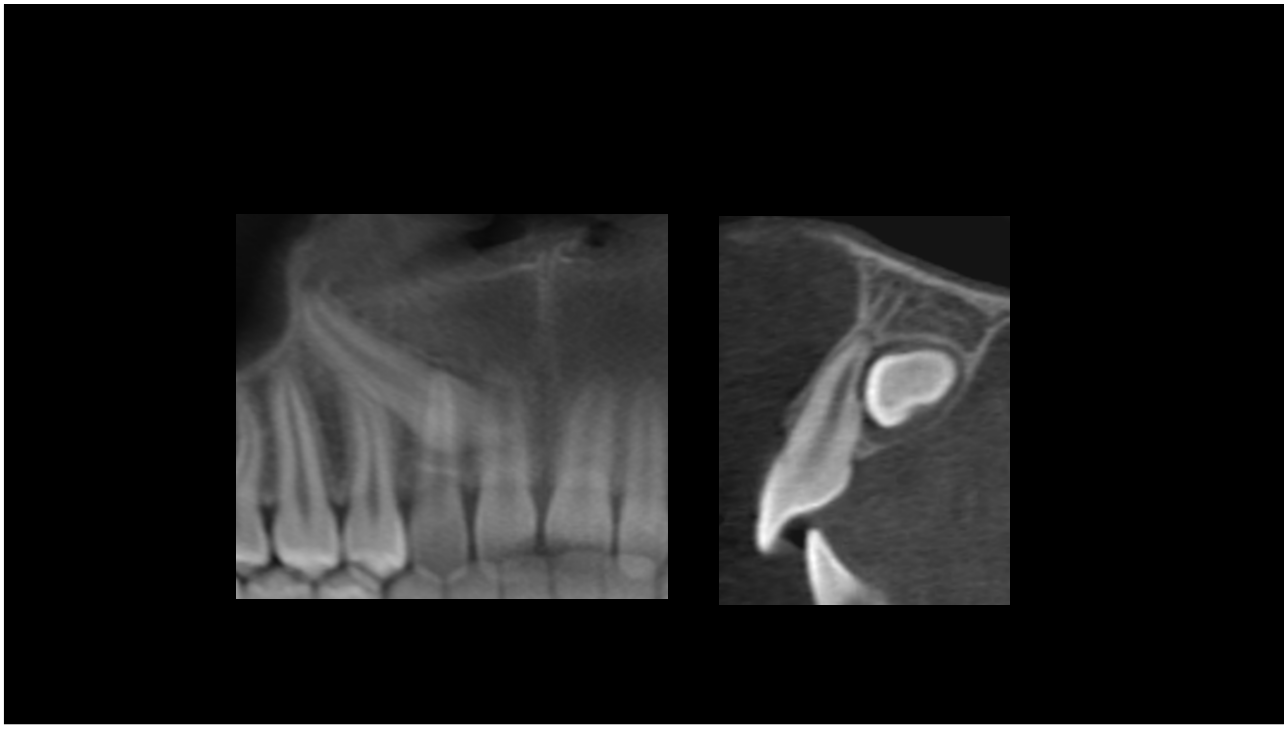
Complex Odontoma

Case review





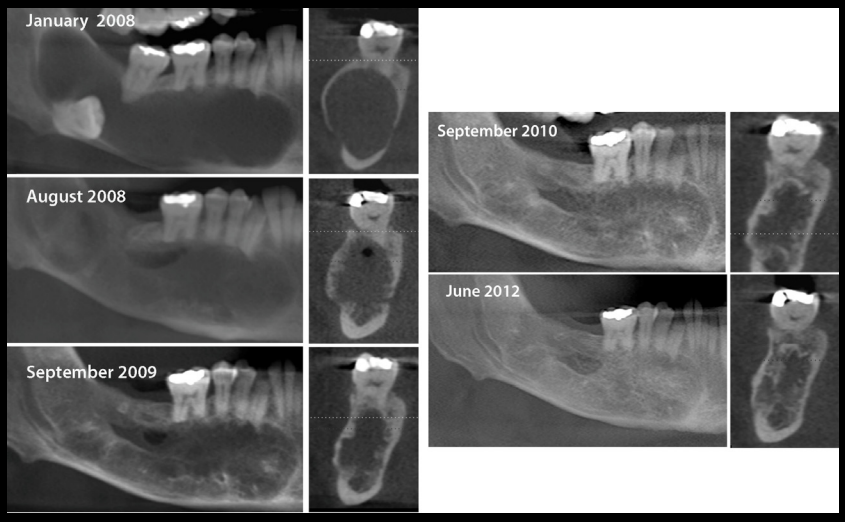




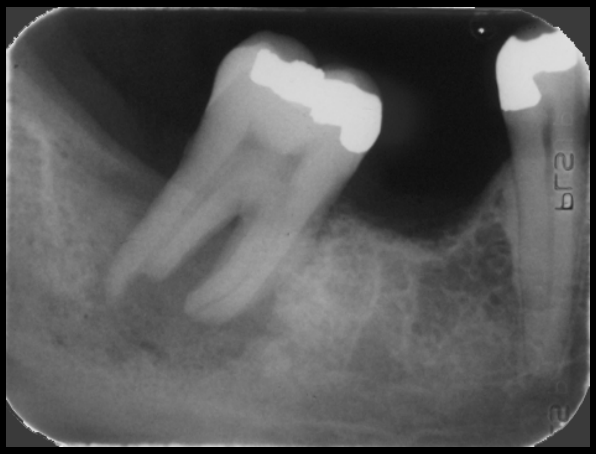
Resorption of teeth

- Internal
- External
  - Periapical pathology
  - Trauma
  - Mechanical forces
  - Tumors and cysts
  - Impacted teeth
  - Osteosclerosis
  - Idiopathic

Benign odontogenic cyst/tumors



Ext. Resorption: Periapical Path

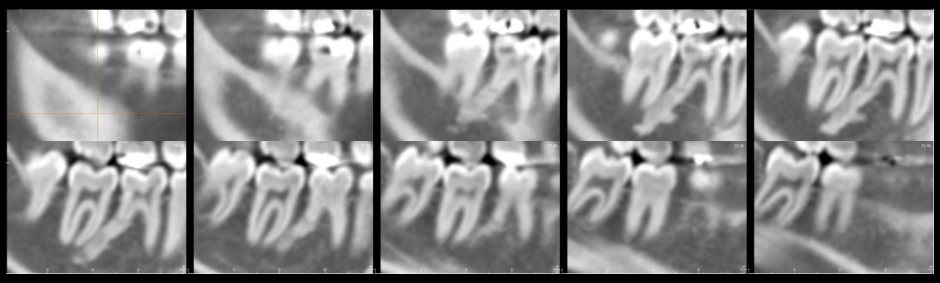


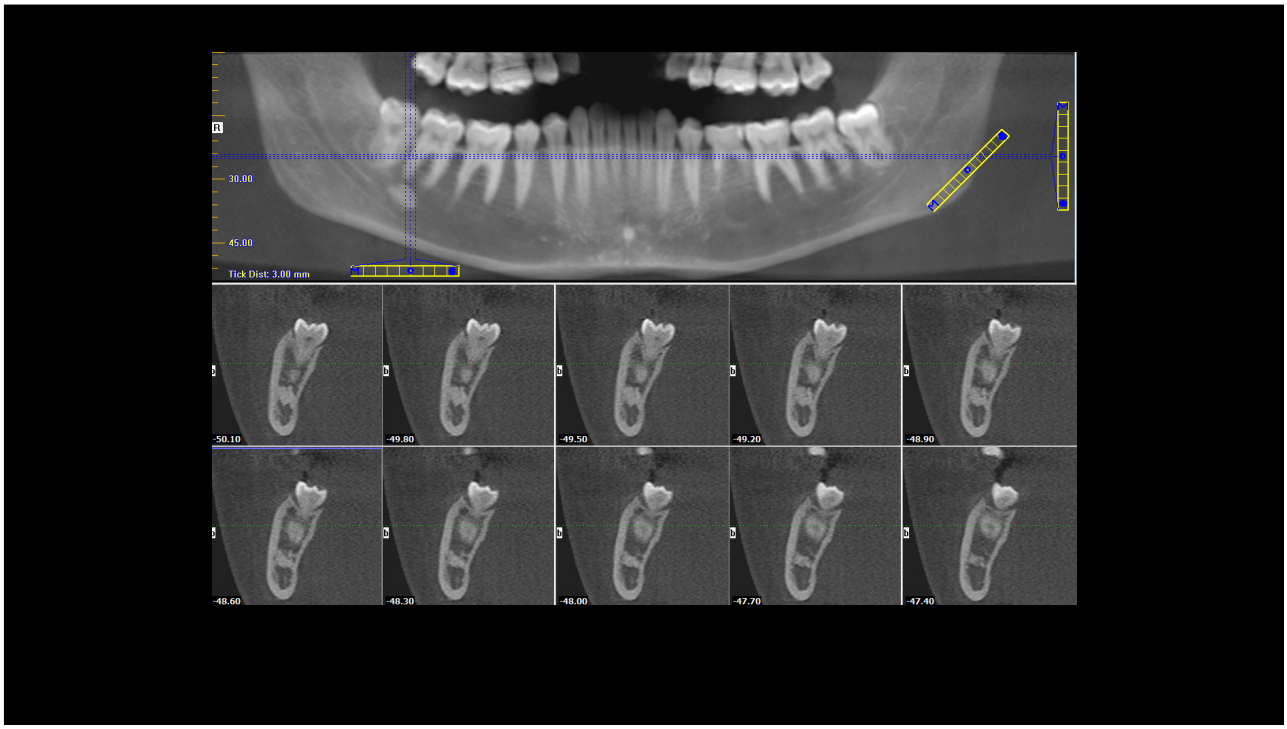
Ext. Resorption: Trauma

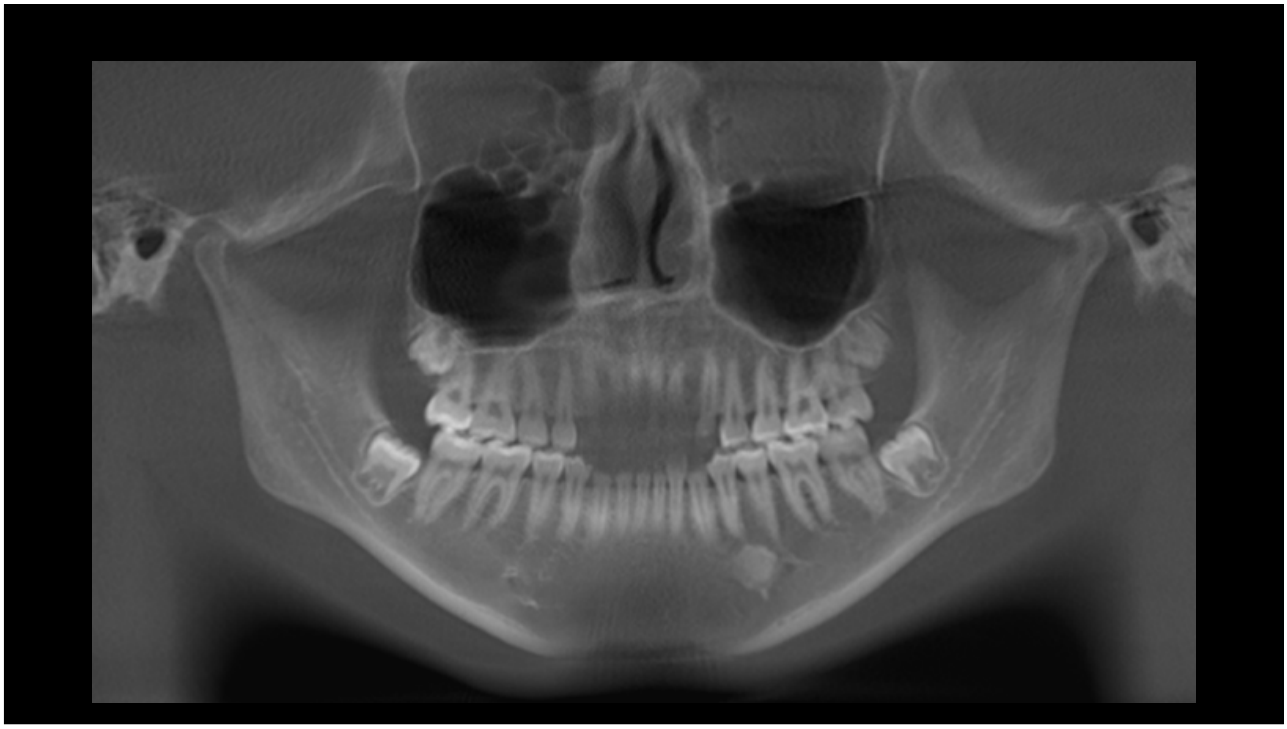
Ext. Resorption: by an impacted tooth

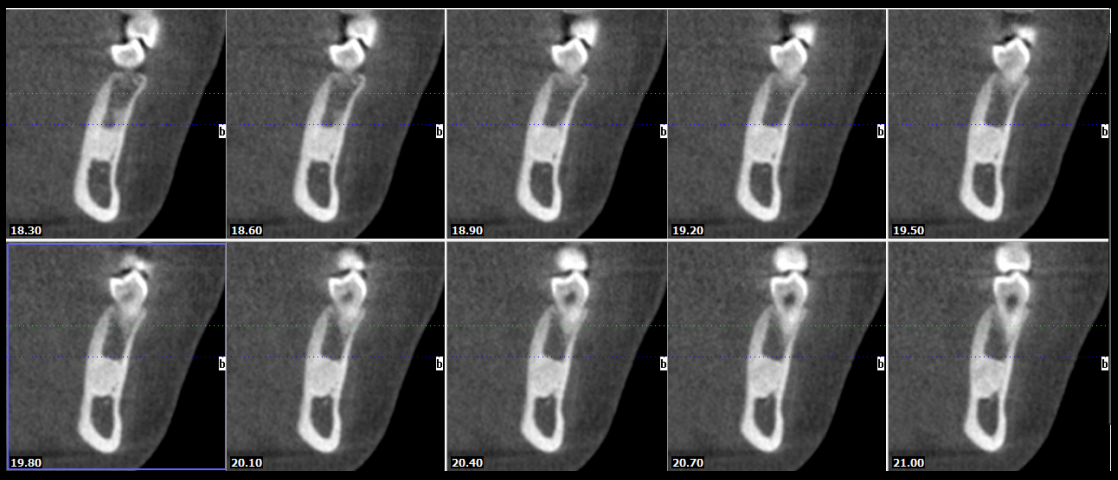
Ext. Resorption: by an impacted tooth

Enostosis and root resorption




30.00
45.00
Tick Dist: 3.00 mm
-50.10
-49.80
-49.50
-49.20
-48.90
-48.60
-48.30
-48.00
-47.70
-47.40





Enostosis/Dense Bone Island

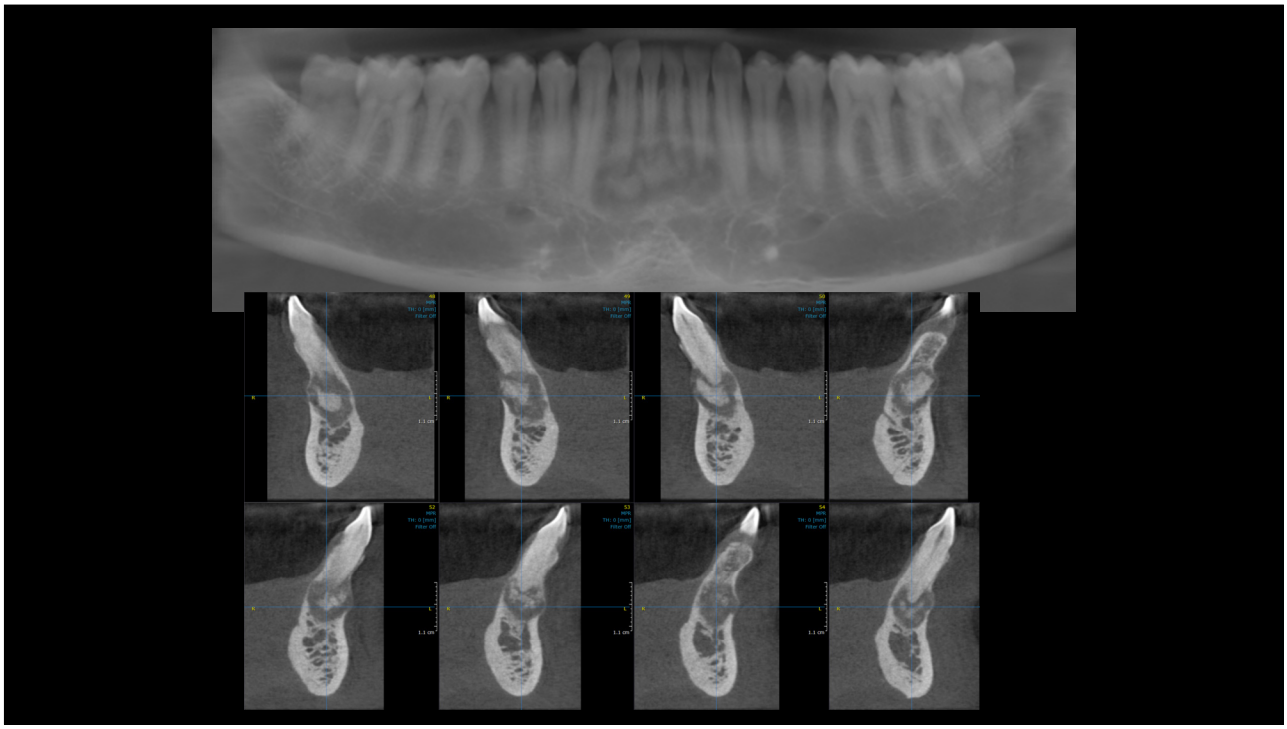
- Internal counterpart of exostoses
- Location
  - Mandible> maxilla; premolar-molar area
- Periphery
  - Well-defined, no lucent border, no cortication, blends
- Content
  - Uniformly radiopaque
- Effects on adjacent structure
  - Resorbs or displaces roots

Sclerosing Osteitis

Sclerosing Osteitis	Enostosis (Idiopathic Osteosclerosis)
Nonvital tooth/ exposed pulp	Vital tooth
Symptomatic	No signs or symptoms
Border is fuzzy	Border is well defined
Mixed density	Mostly uniform density
Extraction or endodontic therapy	No treatment needed

Developing Dense Bone Island

Developing Dense Bone Island



Periapical Cemento-Osseous Dysplasia (PCOD)

- Localized alteration in periapical area. Normal cancellous bone is replaced by fibrous tissue and amorphous bone, Abnormal bone trabeculae or a mixture of the two
- Pulp is vital. Patient is asymptomatic. There are no clinical signs.
- No treatment is required.
- Mean age is 39 years.

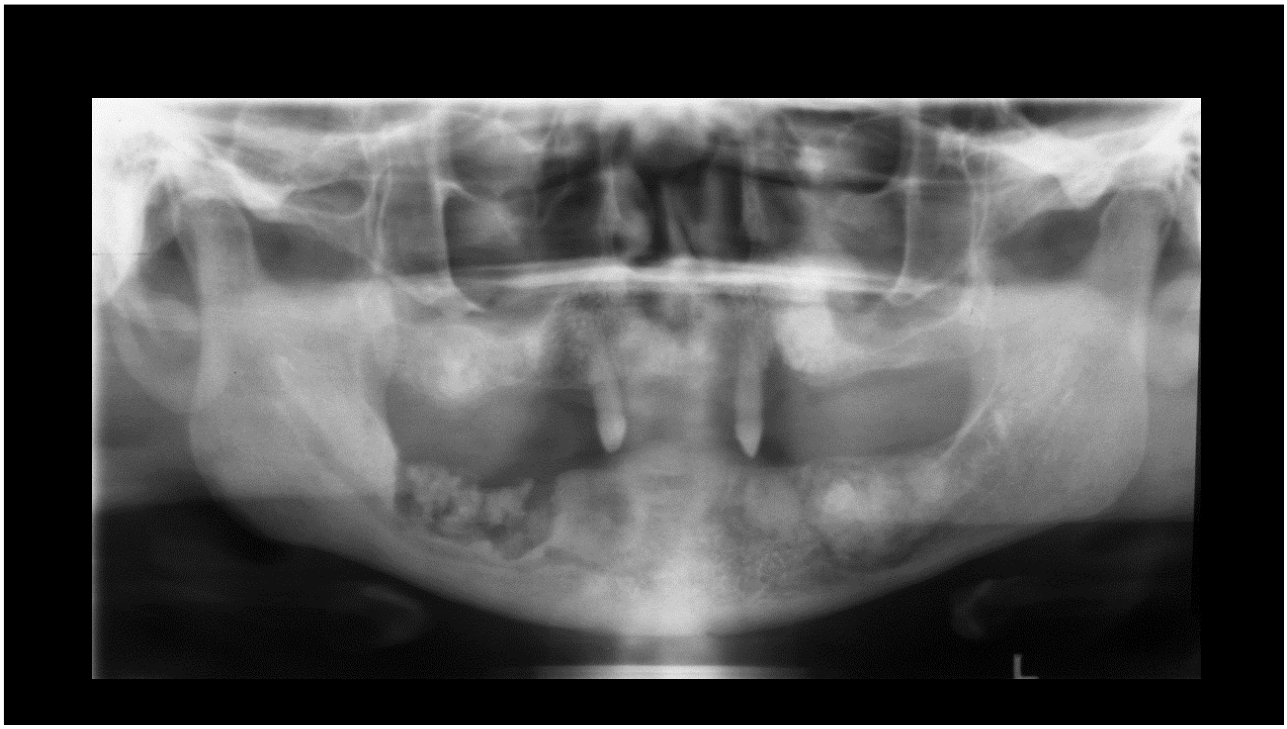
Periapical Cemento-Osseous Dysplasia

- 85% patients are females.
- 3 times more common in African-Americans.
- Most commonly seen in mandibular anterior areas.
- May be multiple.
- May be bilateral.
- Well-defined radiolucency, opacity or mixed.

Periapical Cemento-Osseous Dysplasia

- Stage I (radiolucent stage)
- Stage II (mixed stage)
- Stage III (mature stage)

Periapical Cemento-Osseous Dysplasia




CBCT
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Workshop
Case DaBr

CLINICAL ORAL IMPLANTS RESEARCH

Christiano de Oliveira-Santos
Izabel R. F. Rubira-Bullen
Solange A. C. Monteiro
Jorge E. León
Reinhilde Jacobs

Neurovascular anatomical variations in the anterior palate observed on CBCT images

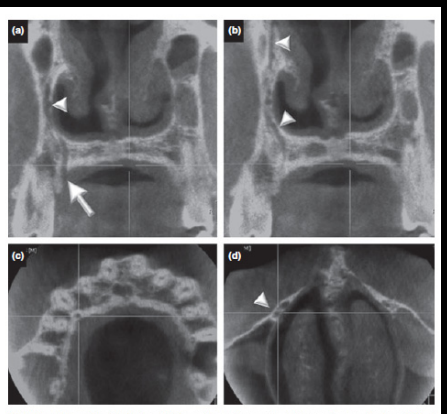


Fig. 2. Coronal [a and b] and axial [c and d] views of a cone beam computed tomography scan showing additional foramen [arrow] and canal presenting as a direct extension of canalis sinuosus [arrow head].

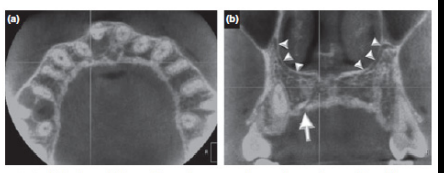


Fig. 3. Axial [a] and coronal [b] views of a cone beam computed tomography scan showing additional foramen in the anterior palate [arrow], lateral to the incisive foramen associated with bony canal with oblique upward-medial direction toward anterior portion of nasal cavity floor. Note the circumarial path of the canalis sinuosus, bilaterally [arrow heads].

Clinical Paper
Dental Implants

Assessment of accessory canals of the canalis sinuosus: a study of 1000 cone beam computed tomography examinations

V. de C. Machado[1], B. R. Chrcanovic[2], M. B. Felippe[3], L. R. C. Manhães Júnior[4], P. S. P. de Carvalho[3]
[1]Sítio Diagnóstico Volumétrico por Imagem, Belo Horizonte, Brazil; [2]Department of Prosthodontics, Faculty of Odontology, Malmö University, Malmö, Sweden; [3]Clínica de Radiologia, Faculdade de Odontologia São Leopoldo Mandic, Campinas, Brazil; [4]Faculdade de Odontologia, Universidade Estadual Paulista Júlio de Mesquita Filho, São José dos Campos, Brazil; [5]Departamento de Cirurgia e Clínica Integrada, Faculdade de Odontologia de Araçatuba, Universidade Estadual Paulista Júlio de Mesquita Filho, Araçatuba, Brazil

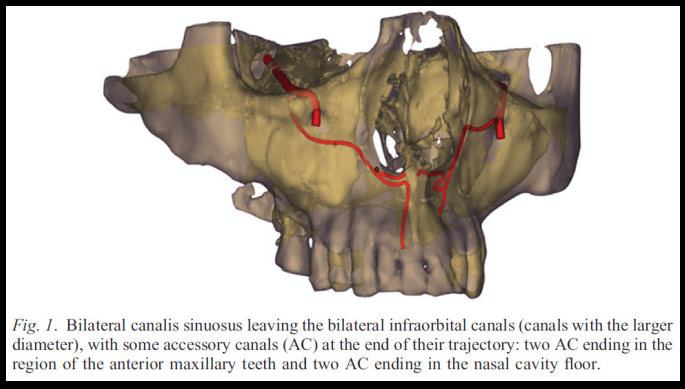


Fig. 1. Bilateral canalis sinuosus leaving the bilateral infraorbital canals (canals with the larger diameter), with some accessory canals (AC) at the end of their trajectory: two AC ending in the region of the anterior maxillary teeth and two AC ending in the nasal cavity floor.

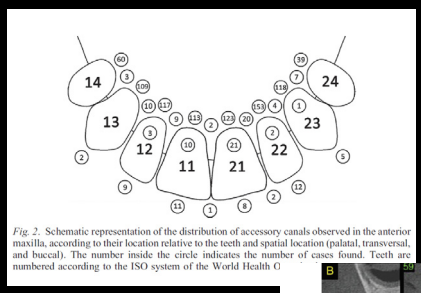


Fig. 2. Schematic representation of the distribution of accessory canals observed in the anterior maxilla, according to their location relative to the teeth and spatial location (palatal, transversal, and buccal). The number inside the circle indicates the number of cases found. Teeth are numbered according to the ISO system of the World Health O

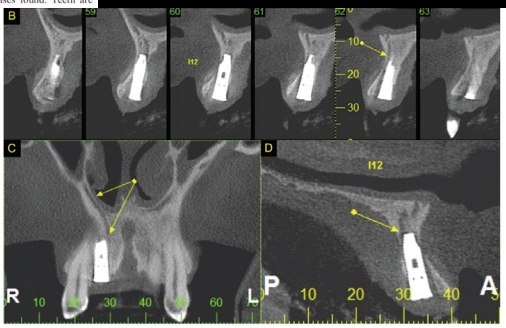
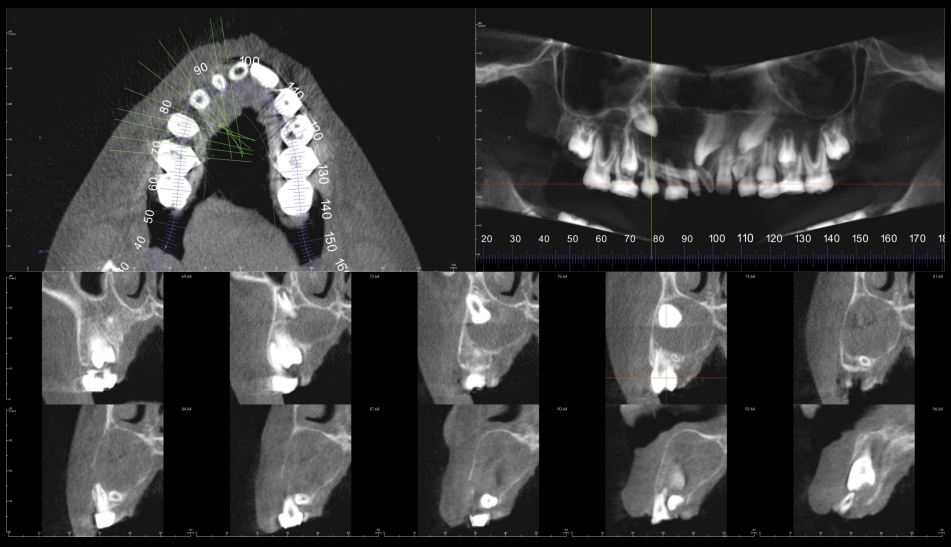


Fig. 4. Clinical case 1: postoperative pain after the placement of a dental implant in the premaxilla. (A) Panoramic view; (B) eross-sections; (C) coronal view; (D) sagittal view.

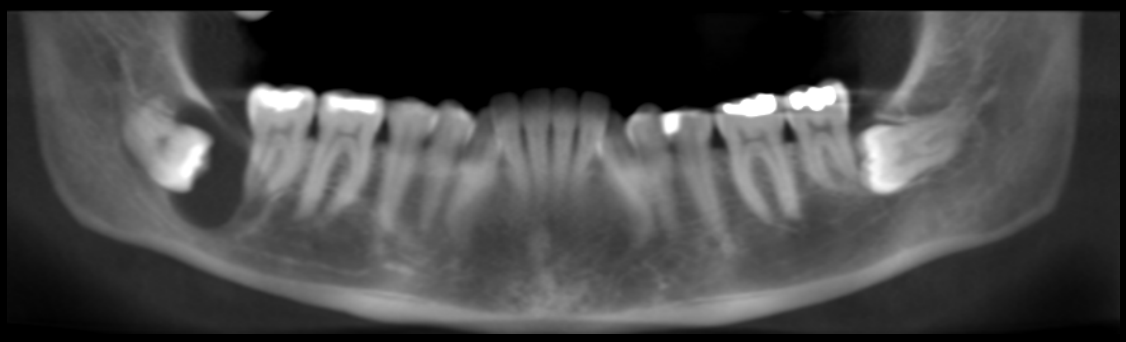
Large maxillary cyst

Large maxillary cyst



Dentigerous Cyst (Follicular Cyst)

- 2nd most common type of jaw cyst
- Always associated with crown of an impacted or unerupted tooth.
- Fluid accumulation between layers of reduced enamel epithelium or between epithelium and crown.
- Most in permanent dentition. Rarely in deciduous dentition.
- 5% of these cysts are related to supernumerary teeth.



Dentigerous Cyst (Cont.)

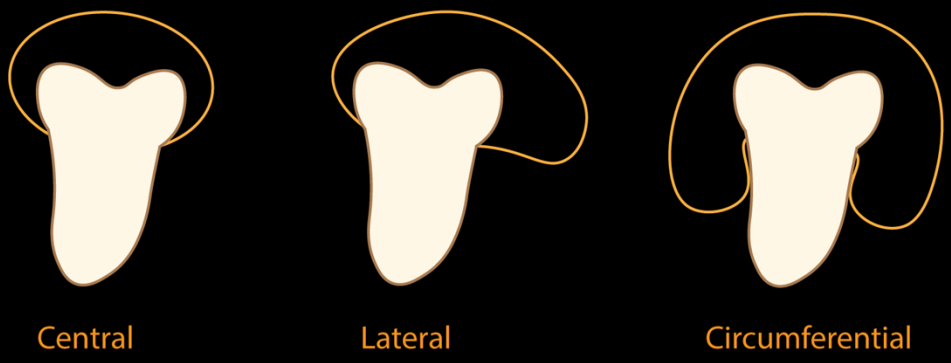
- Location
  - Most common location: Mandibular 3rd molar and maxillary canine.
  - Attaches at CEJ.
  - Central or lateral
- Border
  - Well-corticated radiolucency
- Size
  - Differentiation from hyperplastic tooth follicle: If follicular space exceeds 3 mm in periapical radiographs, there is greater likelihood of dentigerous cyst.

Dentigerous Cyst (Cont.)

- Effect on adjacent structures
  - cause considerable bone destruction, displaces teeth
  - Displaces the associated tooth : to the inferior border of the mandible, or towards the orbit
  - Cortical plate expands, thins, resorbs
- Potential complications:
  - Ameloblastoma (mural ameloblastoma).
  - Squamous cell carcinoma.
  - Mucoepidermoid carcinoma.
- Cyst lining should always be submitted for microscopic examination.

Dentigerous Cyst

Different radiographic views of dentigerous cysts

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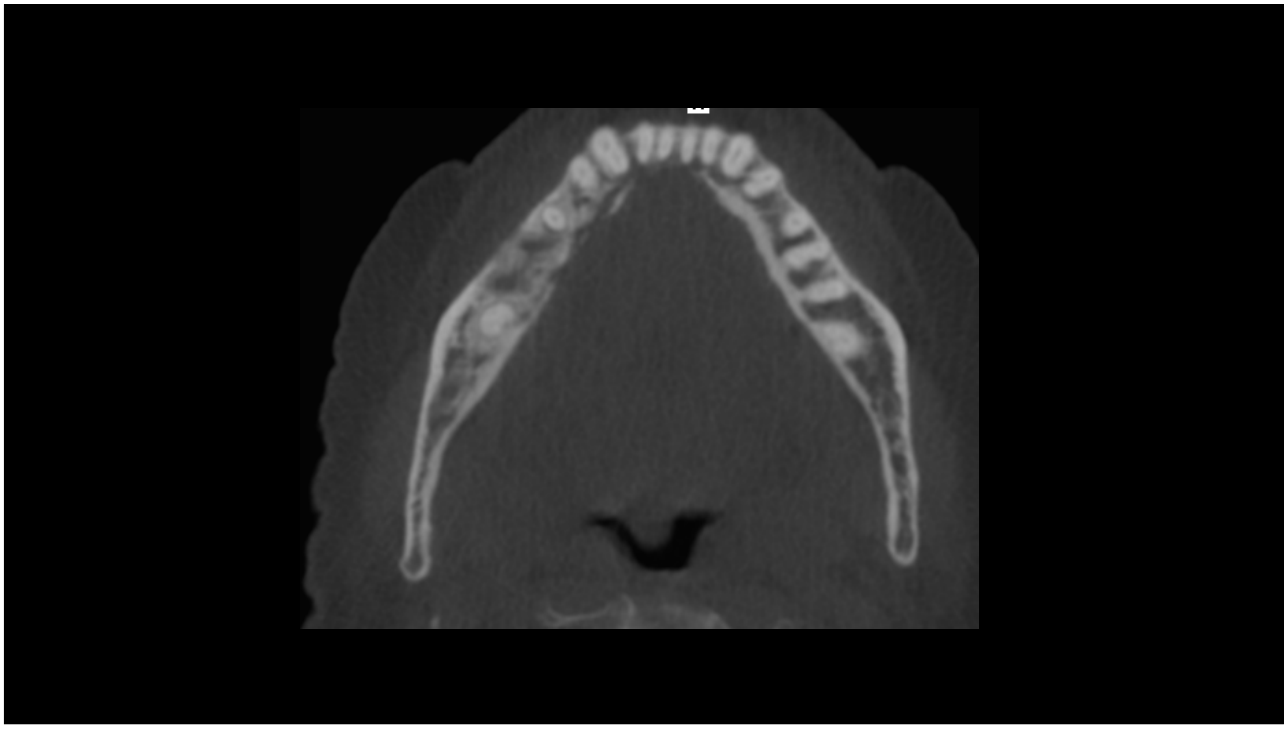

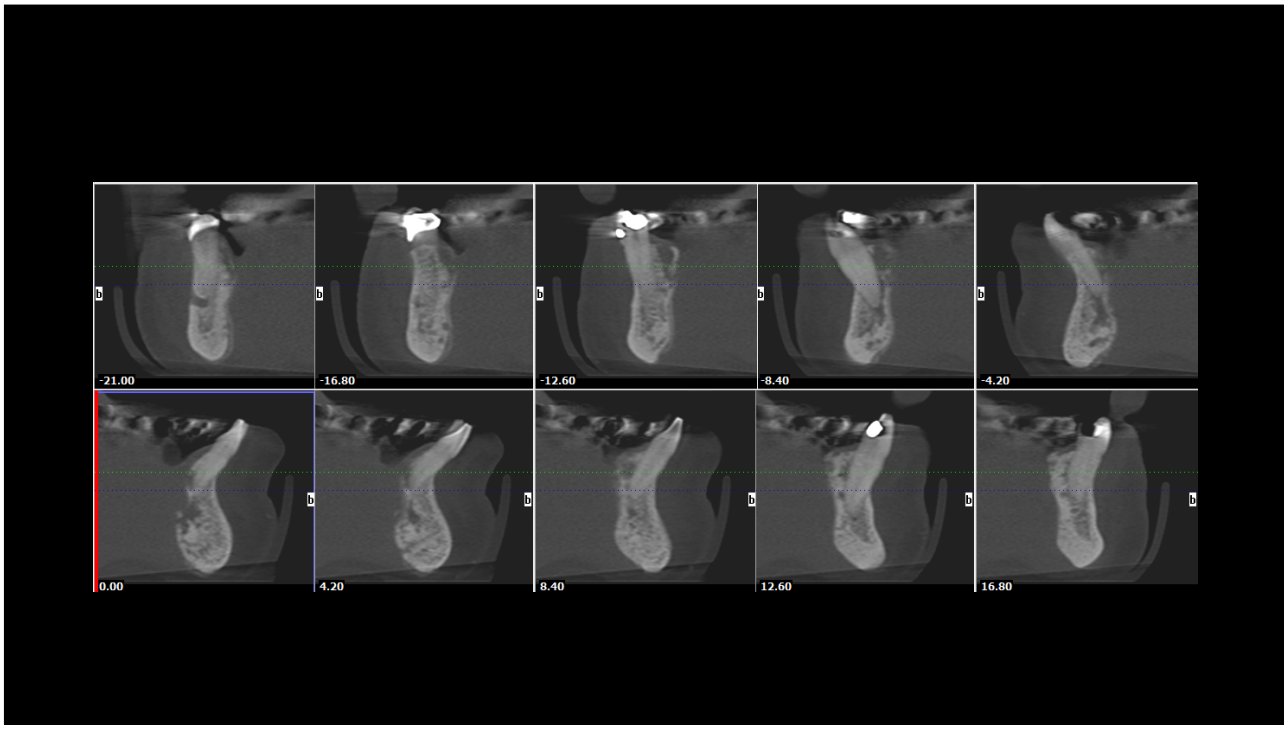
-21.00
-16.80
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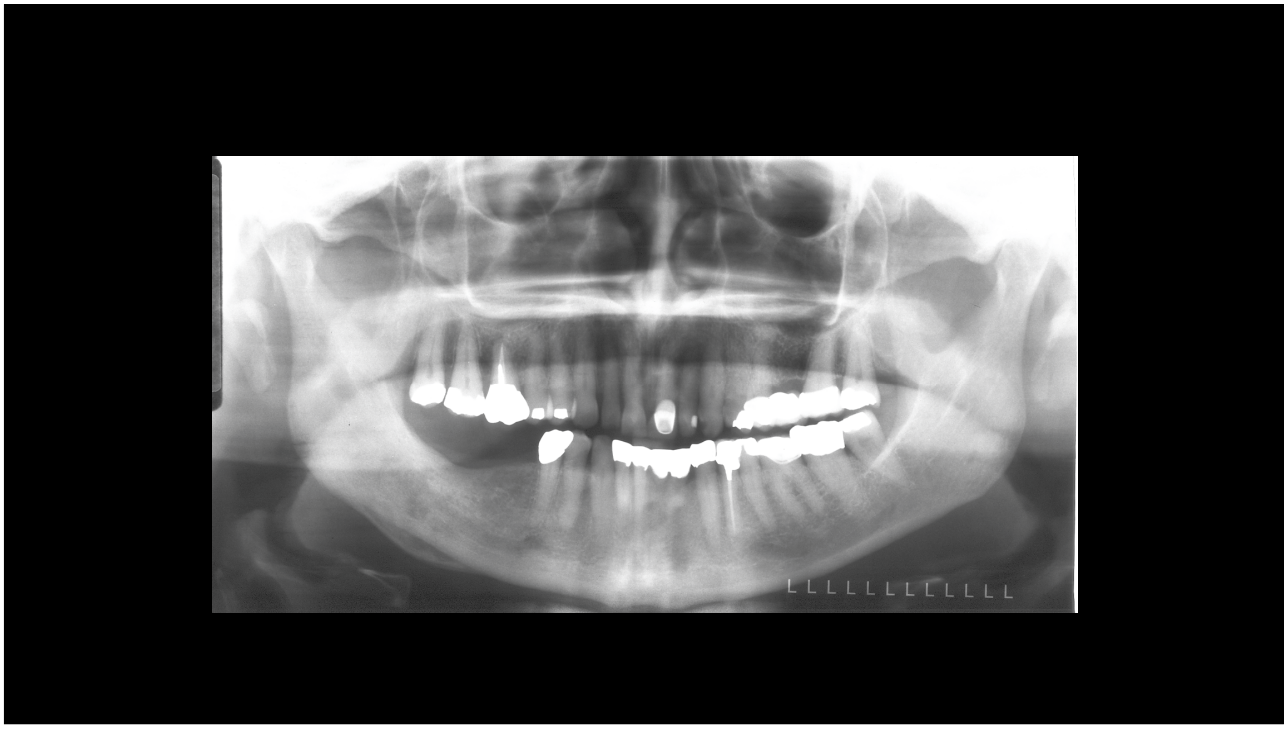

Radiographic features of Osteomyelitis

- Early stages: no radiographic changes
- Ill-defined periphery, fading into normal trabecula
- Decrease in the density of bone: localized or discrete
- Followed by increased radiolucency
- Sclerosis at a later stage

Radiographic features of Osteomyelitis

- Resorption
- Periosteal new bone formation
- Proliferative periostitis
- Fistula formation
- Pathologic fracture
- Radiographic features similar to malignant lesions


CBCT
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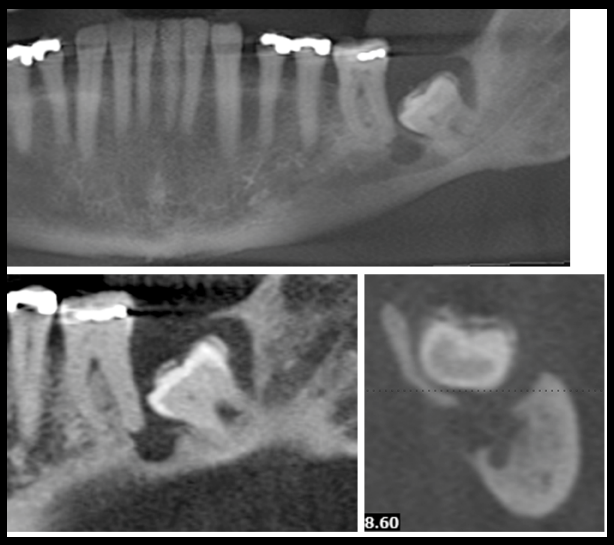
Workshop
Case RoHa

1 of 2



2 of 2

Malignancy

- Uncontrolled growth
- Locally invasive, metastasizes to lymph nodes or to distant parts

- Malignancy of epithelial origin: Carcinoma
- Malignancy of mesenchymal origin: Sarcoma
- Malignancy of hematopoetic origin
- Metastasis

Usual Radiographic Features of Oral Cancer

- Location
  - Anywhere
  - Carcinoma in the tongue, FOM, tonsillar area, lips
  - Sarcoma in mandible, or posterior jaws
- Border
  - Poorly defined, lacks cortication, no capsule, extends into different depth,
- Internal Content
  - Usually radiolucent
- Effects on adjacent structures
  - Rapid destruction, destroys bone rather than roots, minimal displacement of teeth, sarcomas may resorb roots, destroys cortical bone

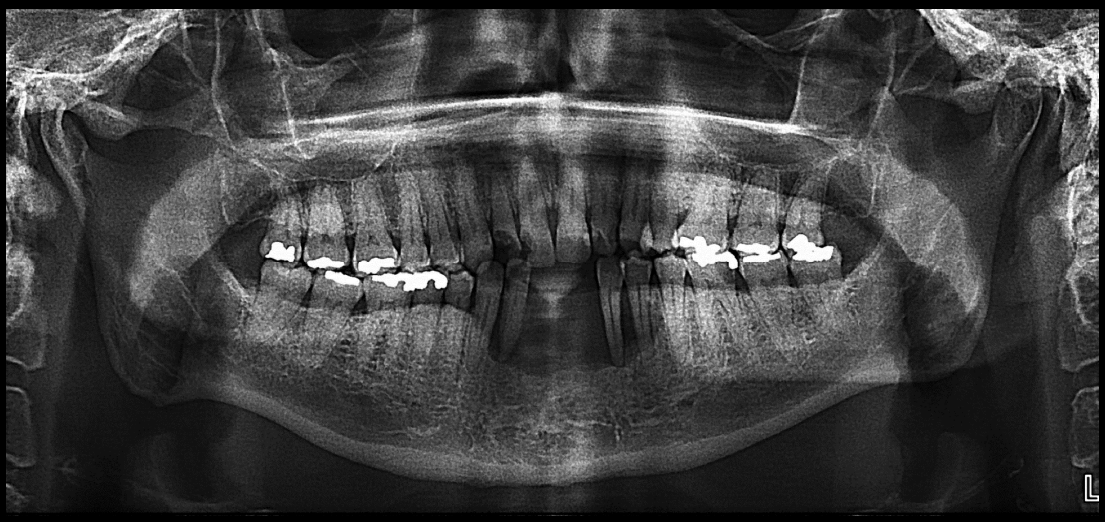
Squamous cell carcinoma

- Originates from surface epithelium
- Spreads by invasion
- Pain, paresthesia, sudden loosening of teeth, foul smell, weight loss

Squamous Cell Carcinoma

- Border
  - Irregular, rarely smooth, sclerosis of surrounding bone only if the tumor is infected
  - Pathologic fracture
- Internal Content
  - Totally radiolucent
- Effects on adjacent structures
  - Widened PDL with loss of lamina dura
  - 'Floating' teeth
  - Destruction of the cortex, and pathological fracture

1 of 3 (May 2015)



12/29/15	[redacted]	Note	0

OMFS Consult and Procedure Note:

S: 47 yo woman presents to Grad OMFS clinic for biopsy as referred by [redacted]
CC: The patient notes that according to an x-ray she had done that her jaw bone is deteriorating and she is here to figure out why that is happening.
HPI: Patient is a 47 y/o female with a history of a non-healing lesion encompassing the anterior mandibular body and accompanying gingival and mucosal tissues of the area following auto-exfoliation and extraction of mandibular anterior dentition, referred to OS grad clinic from [redacted] Dental for evaluation of the lesion. The patient notes that she had two mandibular anterior teeth which fell out on their own, which prompted her to visit her local dentist/dental therapist in May/June of 2015. The patient had additional teeth extracted at that time in addition to other restorative dental care. The patient notes that the extraction were without complication and that initial post-op was uneventful. The patient notes that the gum tissue never healed and increased in pain/sensitivity in the following months. Additional radiographs were obtained which showed additional bone loss. The pt states that the teeth were originally extracted due to periodontal disease and that they were never painful. The patient denies loss of sensation in V3 distribution but notes intense pain to maniuplation of the mandibular lip or mucosa neighboring the lesion. Intraorally, the

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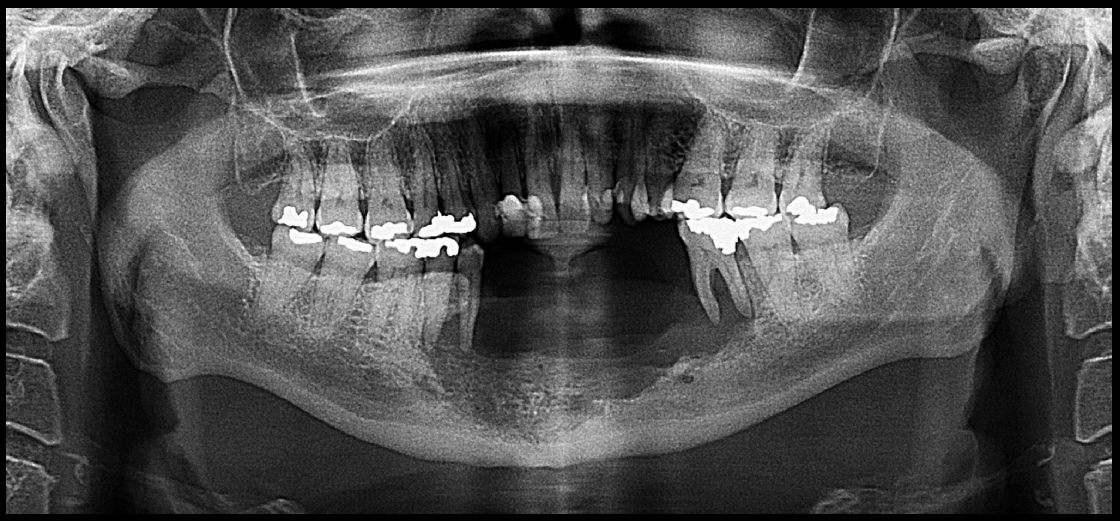

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