

### Inflammatory Lesions of the Jaws

Steven R. Singer, DDS

## Inflammatory Lesions

- Most common pathologic conditions of the jaws
- Teeth create a direct pathway for inflammatory agents and pathogens to invade the bone when caries and periodontal disease are present

## Inflammatory Lesions

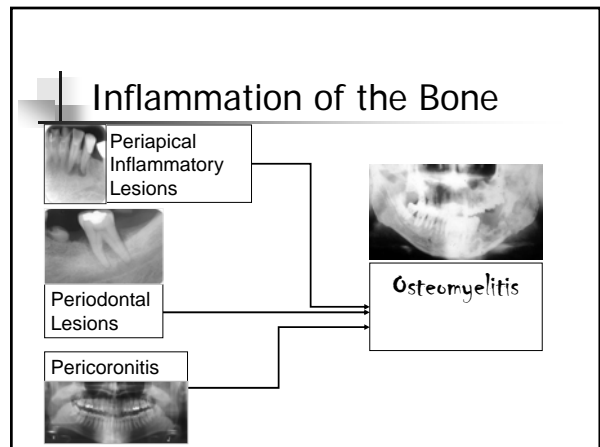
- Inflammation is the body's response to chemical, physical, or microbial injury
- First, the inflammatory response destroys the causative agent and walls off the injured area
- Second, it sets up an environment for repair of the injured tissue

## Bone Metabolism

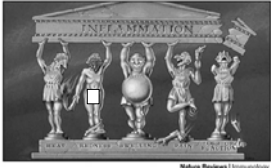
- Balance of bone resorption by osteoclasts and bone deposition by osteoblasts
- Osteoblasts mediate the resorptive activity of the osteoclasts
- Inflammatory conditions of bone exist along a continuum, with varying clinical features



## Inflammation of the Bone



## The Cardinal Signs of Inflammation

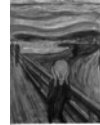


- Heat
- Redness
- Swelling
- Pain
- Loss of Function

## Acute v. Chronic Lesions

### Acute Lesions

- Recent onset
- Rapid
- Pronounced pain
- Often with fever and swelling



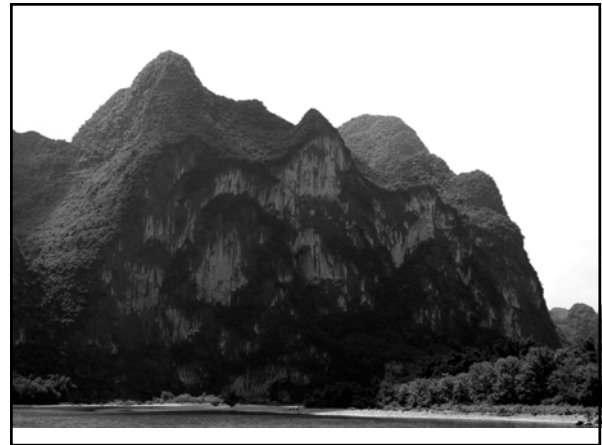
### Chronic Lesions

- Long, insidious onset
- Prolonged course
- Intermittent, low-grade fever
- Gradual swelling



## Acute v. Chronic Lesions

- Without a second radiograph, exposed at a different time, it is often impossible to determine if a lesion is chronic or acute.
- Therefore, temporal descriptors are usually omitted from radiographic descriptions



## Radiographic Features



Courtesy of USC School of Dentistry

## Location

### Periapical Inflammatory Lesions

- Epicenter of the lesion is usually at the apex
- May also be along the lateral root surface due to accessory canals, root fractures, or iatrogenic perforations



## Apical Rarefying Osteitis



## Location

### Periodontal Lesions

- Epicenter of the lesion is located at the alveolar crest
- Inflammatory changes in bone may extend to the apex and into the furcation of posterior teeth

## Periodontal Disease and Apical Rarefying Osteitis



## Location

### Osteomyelitis

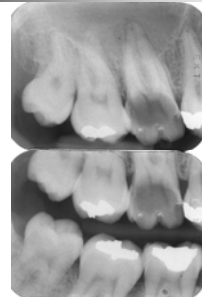
- Usually found in the posterior mandible
- Involvement of the maxilla is rare, due to greater vascularity

## Borders

- Generally poorly demarcated
- Blending into normal trabeculation



## Apical Rarefying Osteitis



## Internal Architecture

- Resorption will give a radiolucent appearance to the lesion
- Bone formation (osteosclerosis) will give trabeculation a denser and more numerous appearance
- Usually, lesion will present as a combination of altered density
- Osteomyelitis will often yield sequestra of bone

## Effects on Adjacent Structures

- Stimulation of surrounding bone, producing a sclerotic border
- Bone resorption, resulting in radiolucent areas
- Widening of the periodontal ligament space. The greatest widening will be at the epicenter of the lesion

## Condensing Osteitis



## Osteomyelitis



## Apical Rarefying Osteitis



## Periapical Inflammatory Lesions

### Synonyms

- |                                |                              |
|--------------------------------|------------------------------|
| ■ Acute apical periodontitis   | ■ Radicular cyst             |
| ■ Chronic apical periodontitis | ■ Apical periodontitis*      |
| ■ Periapical abscess           | ■ Apical rarefying osteitis* |
| ■ Periapical granuloma         | ■ Sclerosing osteitis*       |
|                                | ■ Condensing osteitis*       |

**\*Preferred radiographic terminology!**

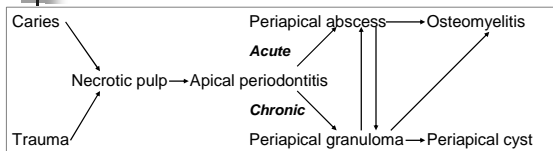
## Periapical Inflammatory Lesions Unacceptable Terminology

- PAP or periapical pathology
- Area
- Endo tooth
- Perio-endo lesion
- Endo-perio lesion



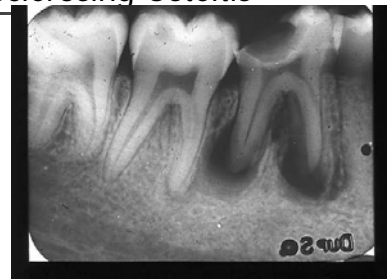
Radiology Station™

## Interrelationship of possible results of periapical inflammation



From White and Pharoah, 5<sup>th</sup> edition p.367

## Apical Rarefying Osteitis and Sclerosing Osteitis



## Apical Rarefying Osteitis and Sclerosing Osteitis



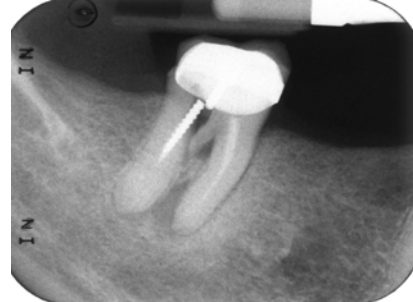
## Periapical Inflammatory Lesions

- Local response of bone secondary to pulpal necrosis or severe periodontal disease
- At least **60%** demineralization must occur before the lesion can be seen on a radiograph. Therefore, it is inappropriate to use a radiograph as a vitality test

## Periapical Inflammatory Lesions

- Histologically, the lesion is apical periodontitis, which is defined as a periapical abscess or periapical granuloma
- The reaction is initiated by toxic metabolites from the necrotic pulp
- Clinically, the symptoms may include pain, swelling, fever, lymphadenopathy, or may be asymptomatic

## Periapical Inflammatory Lesions



## Periapical Inflammatory Lesions

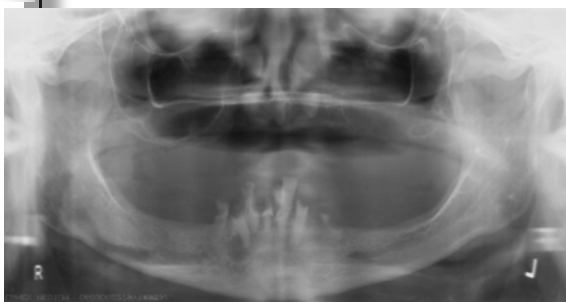
- Acute lesions may evolve into chronic ones
- Therefore, it is important to note that the clinical presentation may not correspond with the histopathological or radiographic findings

## Periapical Inflammatory Lesions

### Location

- At the apex of a tooth
- May be along the root surface if associated with a lateral canal or perforation from root canal treatment

## Apical Rarefying Osteitis



## Periapical Inflammatory Lesions

### Borders

- Ill-defined, gradually blending with normal trabeculation
- Can occasionally have a well-demarcated border

## Periapical Inflammatory Lesions

### Internal Architecture

- Earliest change is loss of bone density resulting in widening of periodontal ligament space
- As the lesion progresses, loss of density involves a larger area
- As the lesion progresses, a mixed rarefying and sclerotic appearance may be seen.

## Periapical Inflammatory Lesions

### Internal Architecture

- The region of the lesion closest to the apex is generally lucent, while the periphery tends to exhibit sclerotic changes
- When the lesion is mostly lucent, the term *Apical Rarefying Osteitis* is used
- When the lesion is mostly sclerotic, the term *Apical Condensing Osteitis* is used

## Periapical Inflammatory Lesions

### Internal Architecture

- When closely examined, the sclerotic areas exhibit both increased number *and* thickness of trabeculae

## Periapical Inflammatory Lesions

### Effects on adjacent structures

- Lesions may stimulate resorption or deposition of surrounding bone.
- The sclerotic lesion may be localized or may extend over a wider area
- The lesion may destroy cortical borders, such as the floor of the maxillary sinus or cause displacement or remodeling. This remodeling is called *halo effect*

## Halo Effect

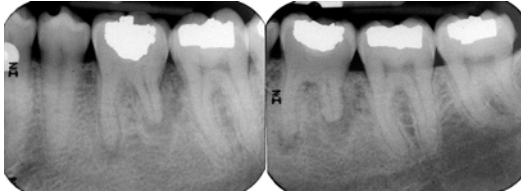


## Periapical Inflammatory Lesions

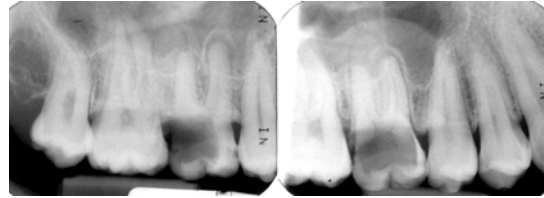
### Effects on adjacent structures

- Chronic lesions may result in root resorption
- If the cortical border of the maxillary sinus is perforated, there may be a localized thickening of the schneiderian membrane. This is called *mucositis*

## Root Resorption



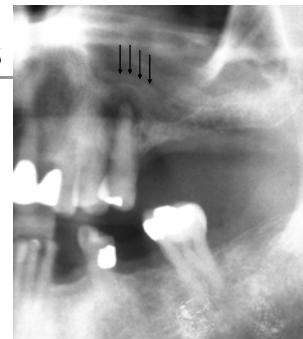
## Halo Effect and Mucositis



## Mucositis



## Mucositis



## Periapical Inflammatory Lesions

Effects on adjacent structures

- Internal or external resorption of the root, calcification of the pulp chamber, and wide appearance of the pulp chamber may be evident

## Internal Resorption





## Internal Resorption



## Internal Resorption

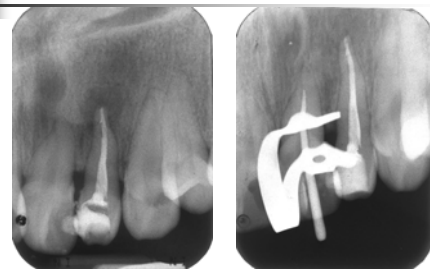


## Periapical Inflammatory Lesions

### Differential Diagnosis

- Early lesions of Periapical Cemental Dysplasia (PCD) often have an appearance similar to that of a periapical inflammatory lesion. Pulp vitality testing must be performed to differentiate the two lesions.
- Idiopathic osteosclerosis

## Periapical Inflammatory Lesions



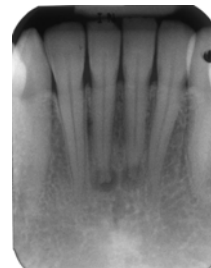
8/06

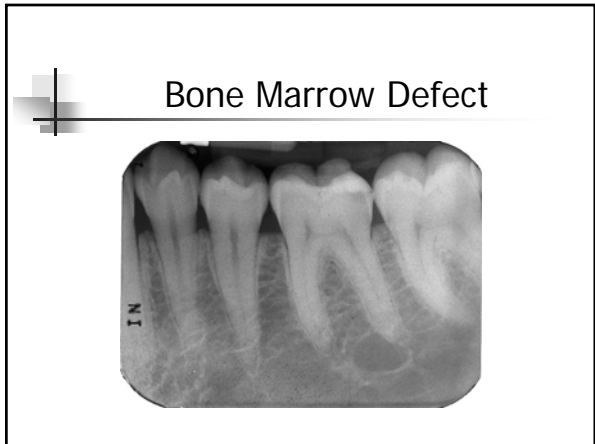
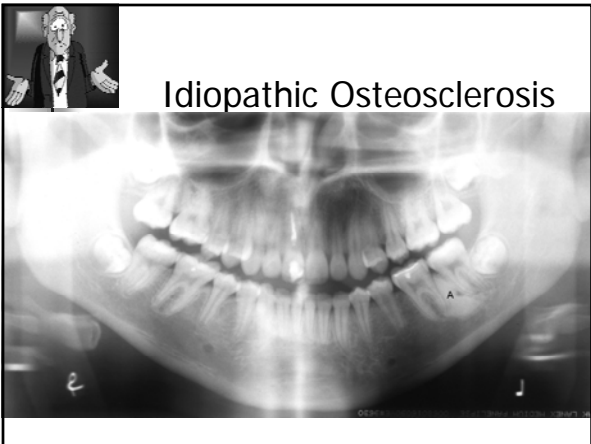
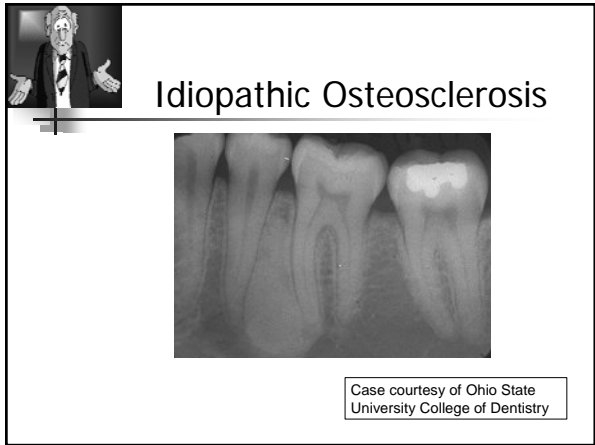
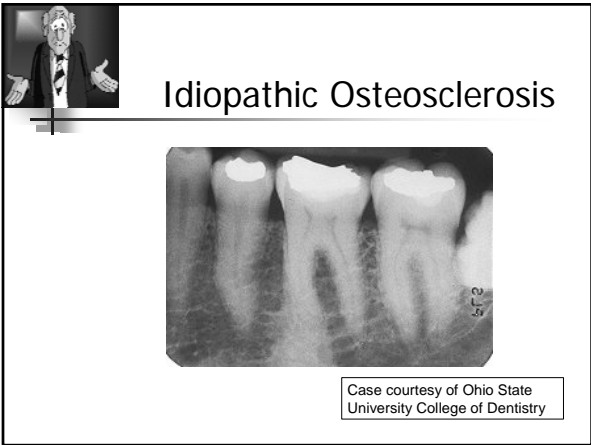
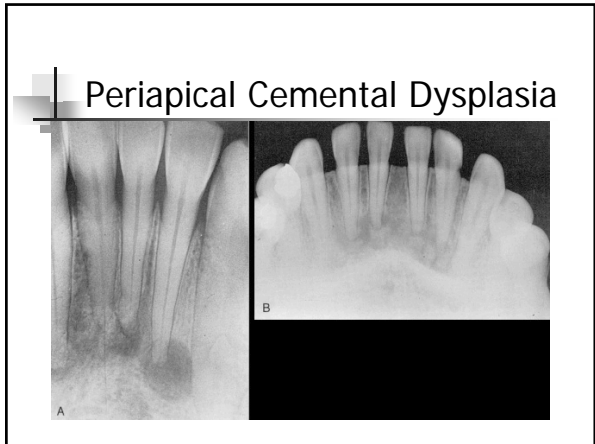
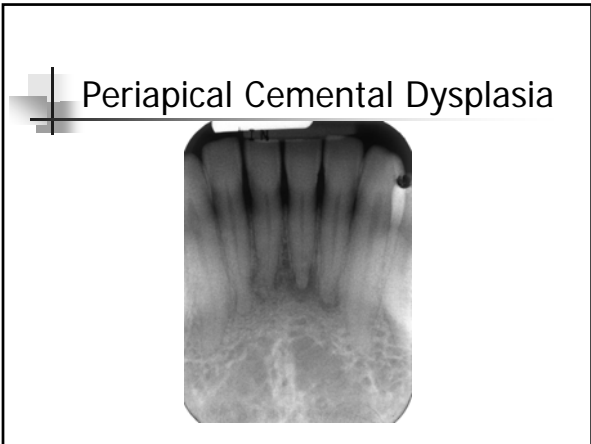
3/07

## Differential Diagnosis



## Periapical Cemental Dysplasia





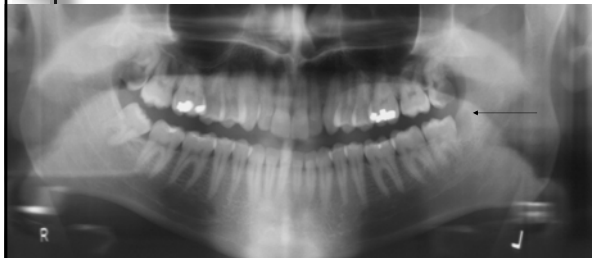


## Pericoronitis



- Inflammation of the tissues surrounding a partially erupted tooth.
- Usually occurs around 3<sup>rd</sup> molars
- Starts in soft tissue surrounding erupting tooth
- May extend into the bone surrounding the tooth
- Often associated with trismus

## Pericoronitis



## Radiographic Features of Pericoronitis

### Location

- Early lesions may show no radiographic features
- Follicular space may be expanded around the crown. >3mm should be monitored



## Radiographic Features of Pericoronitis

### Borders

- May be ill defined
- A sclerotic border is not unusual



## Radiographic Features of Pericoronitis

### Internal Architecture

- Radiolucent, with thin, sparse trabeculae
- Increased trabeculation toward periphery



## Radiographic Features of Pericoronitis

### Effects on adjacent structures

- Sclerotic border
- In larger lesions, periosteal new bone formation may be evident



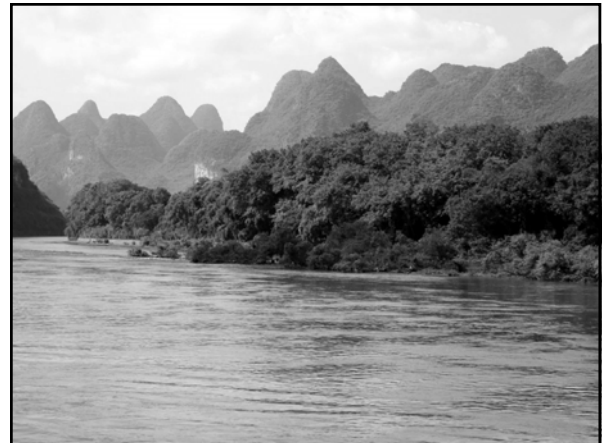
## Radiographic Features of Pericoronitis

### Differential diagnoses

- Enostoses and osteosclerosis
- Fibrous dysplasia
- Malignancies such as osteosarcoma and squamous cell carcinoma



## Pericoronitis



## Osteomyelitis

- Inflammation of the bone
- May spread to involve:
  - Marrow
  - Cortex Periosteum
  - Cancellous portion
- Caused by pyogenic organisms from abscessed teeth, trauma, or surgery
- Source of infection can not always be identified

## Osteomyelitis

- Bacteria and by-products stimulate an inflammatory reaction in bone
- In young patients, the periosteum is lifted by inflammatory exudates. New bone is laid down. This is called Garre's Osteomyelitis
- Presence of sequestra is a hallmark of osteomyelitis. These can be seen in both plain films and CT

## Osteomyelitis

- Acute and chronic forms exist
- Acute form demonstrates purulent drainage
- Paresthesia of the lip may be present, suggesting a malignancy

## Radiographic features of Osteomyelitis

### Location

- The most common location of osteomyelitis of the jaws is the posterior body of the mandible
- Involvement of the maxilla is rare, perhaps due to its excellent vascularity

## Radiographic features of Osteomyelitis

### Borders

- The borders of these lesions are ill-defined, gradually blending into the normal trabecular pattern

## Radiographic features of Osteomyelitis

### Internal architecture

- Initially, there is a slight *decrease* in the radiodensity of the bone, with the trabeculae becoming less well defined
- There may be scattered areas of lucency in the area
- Later, areas of sclerotic bone are seen
- Sequestra are most apparent in the chronic forms

## Radiographic features of Osteomyelitis

### Internal architecture

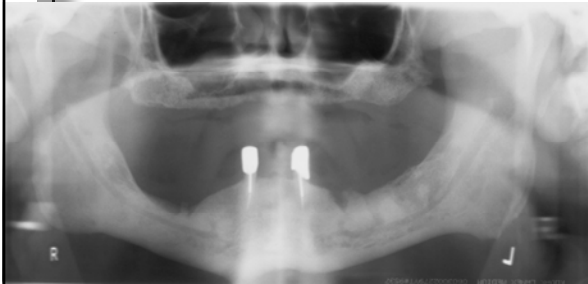
- Chronic osteomyelitis may arise from the acute form or *de novo*
- In the chronic form, the balance tips in favor of osteoclastic activity
- Trabeculae may be completely obscured, yielding a uniformly opaque appearance to the bone
- Sequestra are generally larger in the chronic form

## Radiographic features of Osteomyelitis

### Effects on adjacent structures

- Surrounding bone may be resorbed or laid down
- May cause resorption of the cortex
- In Garre's osteomyelitis, the cortex is expanded through deposition of new bone. The radiographic appearance of these new layers of bone is termed *onion skin* or *proliferative periostitis*

# Osteomyelitis



# Osteomyelitis in a 12 yo male



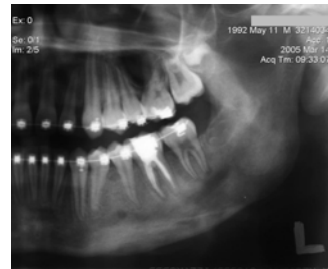
Case courtesy of Dr. Grace Petrikowski

# Osteomyelitis in a 12 yo male



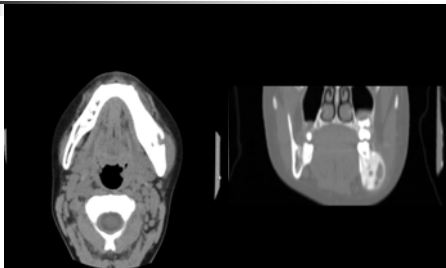
Case courtesy of Dr. Grace Petrikowski

# Osteomyelitis in a 12 yo male



Case courtesy of Dr. Grace Petrikowski

# Osteomyelitis in a 12 yo male

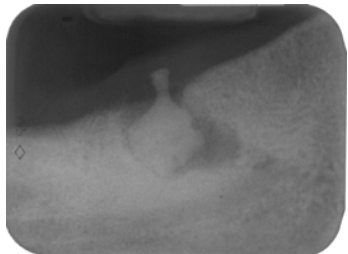


Case courtesy of Dr. Grace Petrikowski

# Osteomyelitis and FCOD



## Sequestrum of Osteomyelitis



## Garre's Osteitis



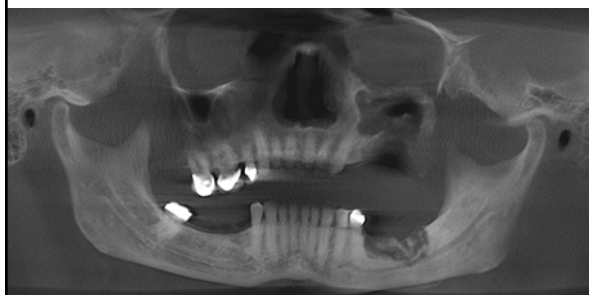
## Garre's Osteitis



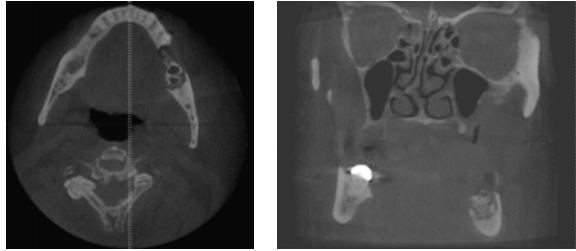
## Osteonecrosis of the Jaw (ONJ)

- Found in patients using Bisphosphonates for chemotherapy
- May also be found in patients using Phosamax for osteoporosis
- Radiographic appearance resembles chronic sclerosing osteomyelitis

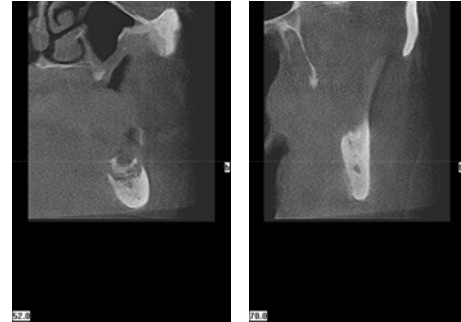
## ONJ Case 1



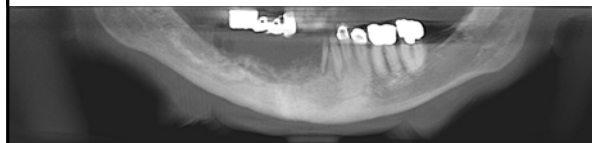
ONJ Case 1



ONJ Case 1



ONJ Case 2



ONJ Case 2

