Benign Fibro-osseous Lesions

Plus…

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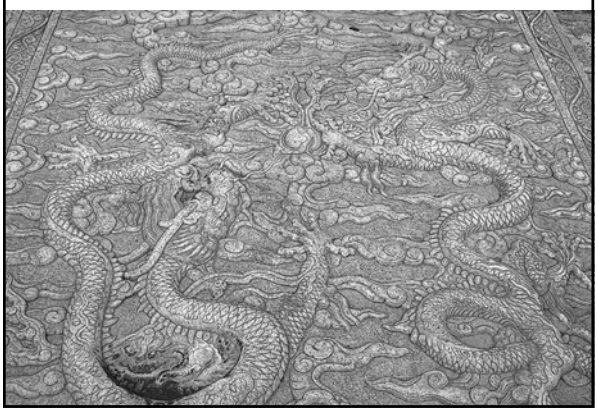
"Vision is the art of seeing things invisible."
Jonathan Swift 1667 - 1745



Benign Fibro-osseous Lesions

- A group of lesions in which normal bone is replaced initially by fibrous connective tissue
- Over time, the lesion is infiltrated by osteoid and cementoid tissue
- This is a benign and idiopathic process

Fibrous Dysplasia

- Localized change in bone metabolism
- Normal cancellous bone is replaced by fibrous connective tissue
- The connective tissue contains varying amounts of abnormal bone with irregular trabeculae
- Trabeculae are randomly oriented. (Remember that normal trabeculae are aligned to respond to stress)

Fibrous Dysplasia

- Lesions may be solitary (monostotic) or involve more than one bone (polyostotic)
- Monostotic form accounts for 70% of all cases
- Polyostotic form is more common in the first decade
- M=F except in McCune-Albright syndrome, which is almost exclusively found in females

Fibrous Dysplasia

- Fibrous dysplasia is non-hereditary
- Caused by a mutation in a somatic cell.
- Extent of lesions depends on the timing of the mutation.
- If the mutation occurs earlier, the disease will be more widespread throughout the body. An example is McCune-Albright Syndrome

Fibrous Dysplasia

Café au lait pigmentation

McCune-Albright Syndrome
- -Almost exclusively females
- -Polyostotic fibrous dysplasia
- -Café au lait spots
- -Endocrine hyperfunction
  - Hyperthyroidism
  - Pituitary adenomas
  - Hyperparathyroidism
- -Precocious puberty

Fibrous Dysplasia

- Monostotic and polyostotic forms usually begins in the second decade of life
- Slow, painless expansion of the jaws
- Patients may complain of swelling or have no complaint
- Growth stops when bones stop growing at the end of puberty
- Lesions may start to expand again during pregnancy

Fibrous Dysplasia

- May cause neurological symptoms if the lesion closes foramina

Fibrous Dysplasia

Radiographic Features

Location

2:1 maxilla to mandible ratio
More frequent in posterior
Lesions are usually unilateral

Shape and Borders

Usually poorly defined, with the lesion gradually blending into the normal trabecular pattern

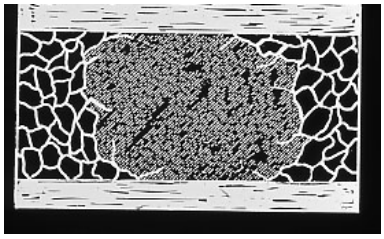
Fibrous Dysplasia

Radiographic Features

Internal Architecture

Highly variable
Mixed lucent and opaque
Early lesions may be more lucent
Trabeculae are shorter, thinner, more numerous, and irregularly aligned

Fibrous Dysplasia



Early intraosseous lesion of Fibrous Dysplasia

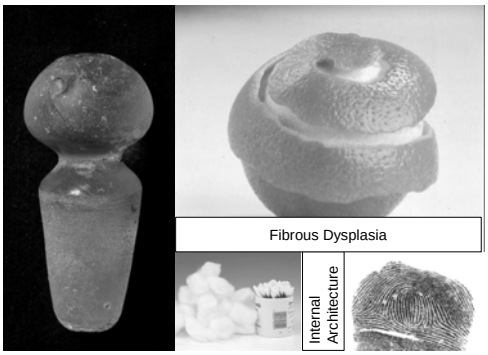
Fibrous Dysplasia

Radiographic Features

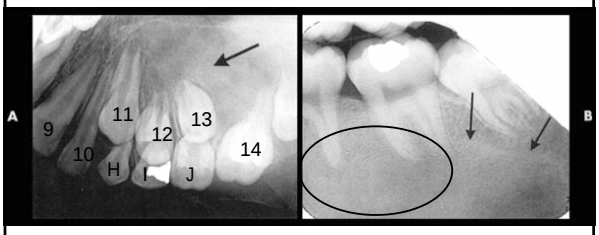
Terms used to describe the internal architecture include:

- ground glass
- orange peel
- cotton wool
- thumb whorl

The lesion may contain a central lucent area that is analogous to a simple bone cyst



Fibrous Dysplasia



Thumbprint Pattern

Fibrous Dysplasia

Radiographic Features

Effects on adjacent structures

1. Small lesions are entirely contained in the bone
2. Expanded and thinned cortices
3. Maxillary lesions may expand into the maxillary sinus
4. Teeth may be displaced
5. Lamina dura may be replaced with the abnormal bone of the lesion
6. PDL space may appear narrowed

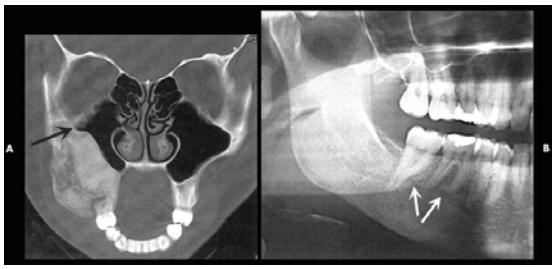
Fibrous Dysplasia

Radiographic Features

Effects on adjacent structures

A pathognomonic feature of fibrous dysplasia may be the superior displacement of the mandibular canal. This is due to the epicenter of the lesion being below the canal

Fibrous Dysplasia



Effect on adjacent structures

Fibrous Dysplasia

Differential Diagnosis

While many other lesions present similar alterations in radiographic appearance, the patient's age, unilateral, monostotic lesions, and painless bony expansion often lead to a diagnosis of fibrous dysplasia based on the radiographic appearance alone. It is usually confirmed by histopathological study.

Fibrous Dysplasia

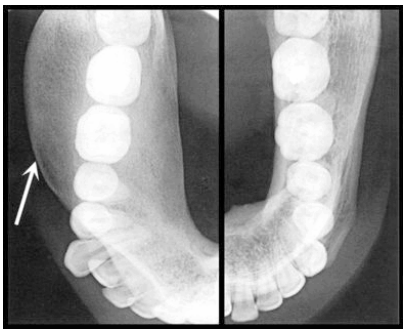
Differential Diagnosis

Lesions to be considered include:

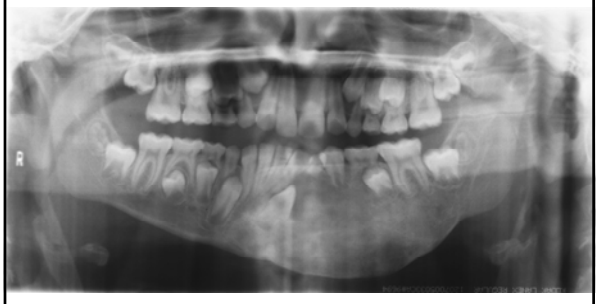
- Periapical cemental dysplasia
- Pagets disease of bone
- Healed simple bone cyst
- Osteomyelitis
- Osteosarcoma
- Cementoossifying fibroma

Fibrous Dysplasia

Fibrous Dysplasia



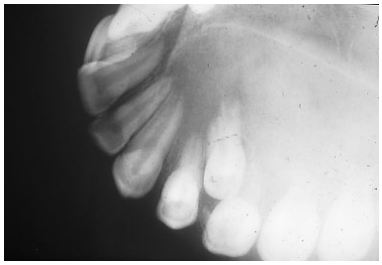
Fibrous Dysplasia



Fibrous Dysplasia

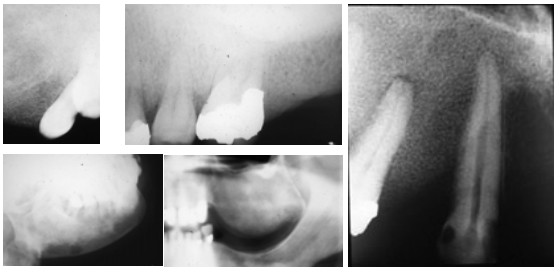
Cropped Panoramic Radiograph

Fibrous Dysplasia



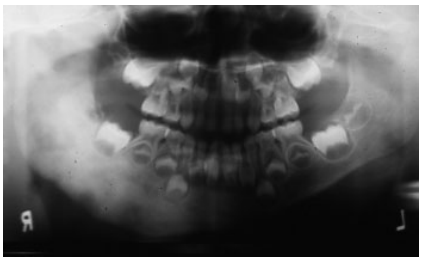
Occlusal Radiograph

Fibrous Dysplasia



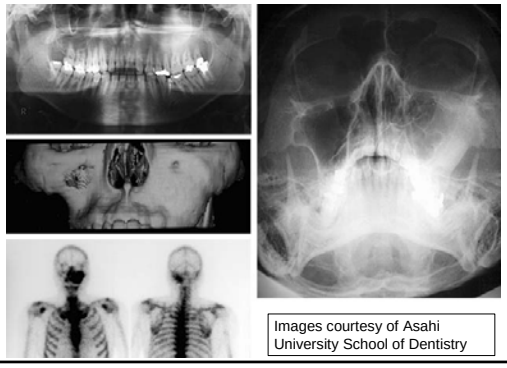
Fibrous Dysplasia

Fibrous Dysplasia



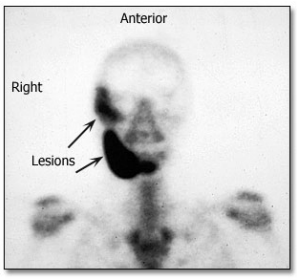
McCune Albright Syndrome

Fibrous Dysplasia



Images courtesy of Asahi University School of Dentistry

Fibrous Dysplasia



technetium 99 bone scan

Fibrous Dysplasia

Case report

- A.R., a 40 yr old male
- Referred to the NJDS-OMFR clinic for radiographic exam of the mandible
- Chief complaint: occasional pain in the left jaw for approximately 3 yrs

Fibrous Dysplasia

Fibrous Dysplasia

Fibrous Dysplasia

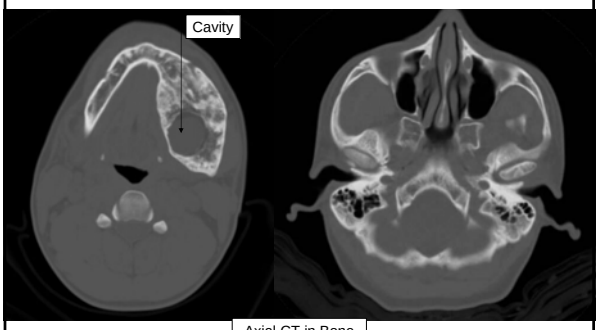
Lateral Oblique projection-body

Reverse Towne projection

Fibrous Dysplasia

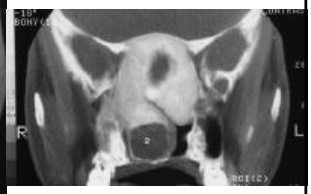
PA projection

Fibrous Dysplasia



Axial CT in Bone Windows

Fibrous Dysplasia



Ethmoid sinuses

Sphenoid sinus involvement

Coronal CT in Bone Windows

Polyostotic Fibrous Dysplasia

Facial asymmetry

Courtesy
Dr D. Hatcher

Polyostotic Fibrous Dysplasia

Courtesy
Dr D. Hatcher

Polyostotic Fibrous Dysplasia

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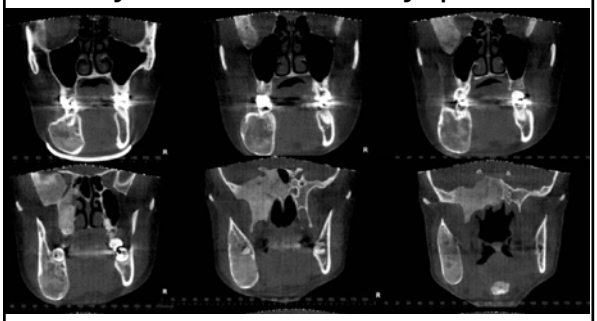
Polyostotic Fibrous Dysplasia



Courtesy
Dr D. Hatcher

Malignant Potential?

- Lesions of fibrous dysplasia may have a slightly higher potential for malignant transformation into osteosarcoma than normal bone.

Cemento-Osseous Dysplasias

- **Includes**
  - Periapical Cemental Dysplasia (PCD)
  - Florid cemento-osseous dysplasia (aka Florid Osseous Dysplasia, FCOD, FOD)
  - Focal Cemento-osseous dysplasia (aka Focal osseous dysplasia, FCOD, FOD)

  All of these lesions represent the same histopathological process, but are distinguished by the location and extent of lesions in the jaws

Cemento-Osseous Dysplasias

- **Confused?**

Periapical Cemental Dysplasia

- PCD is a localized change in bone metabolism. It occurs at the apices of lower anterior teeth
- Clinical Features
  - Teeth are vital
  - Usually an incidental radiographic finding
  - F:M 9:1
  - 3:1 African: Caucasian
  - Frequent in Asians
  - Mean age = 39 yrs

Periapical Cemental Dysplasia

Radiographic Features

- **Location**
  - Apices of mandibular anterior teeth
  - Multiple or solitary
- **Shape and Borders**
  - Well defined
  - Round, oval or irregular shape
  - May have a sclerotic border

Periapical Cemental Dysplasia

Radiographic Features

- **Internal Architecture**
  - Varies from lucent to mixed density to opaque as the lesion matures
  - Early lesions appear as apical lucencies
  - Mixed stage lesions have irregular amorphous opacities within the lucency. Sometimes, these are well-defined and can be mistaken for an odontoma
  - Mature lesions are uniformly radiopaque, often with a lucent rim or margin

Periapical Cemental Dysplasia

Radiographic Features

- Effects on adjacent structures
  - May efface the lamina dura of adjacent teeth
  - Root resorption is rare
  - Surrounding bone may become sclerotic
  - Occasionally, large lesions may cause expansion of the jaws

Periapical Cemental Dysplasia

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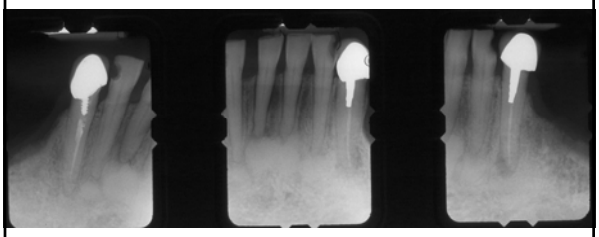
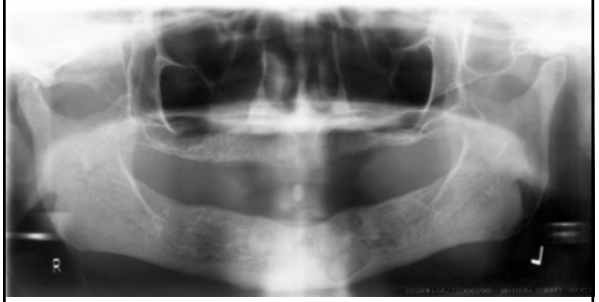
Periapical Cemental Dysplasia



Periapical Cemental Dysplasia



Florid Cemento-osseous Dysplasia

- Same histopathology as PCD
- Called FCOD when lesions are present in three or more quadrants
- Similar distribution in the population to PCD
- Usually an incidental radiographic finding

Florid Cemento-osseous Dysplasia

- Large lesions may expand the cortices
- May be associated with simple bone cysts
- Lesions with SBC's may produce a dull pain
- May become infected as surrounding bone resorbs. Pressure from a denture may cause perforation of the overlying mucosa, exposing the lesion to the oral environment. The result may be osteomyelitis

Florid Cemento-osseous Dysplasia

Radiographic Features

- **Location**
  - Often bilateral
  - Found only in tooth-bearing areas
  - Often present in both jaws
  - More common in mandible

Florid Cemento-osseous Dysplasia

Radiographic Features

- **Shape and Borders**
  - Irregularly shaped
  - Well-defined, with a sclerotic border
  - Soft tissue capsule may disappear in long-standing lesions

Florid Cemento-osseous Dysplasia

Radiographic Features

- **Internal Architecture**
  - Varies from mixed opaque/lucent to completely opaque
  - Opacities may have a cotton wool appearance
  - Some lesions may have a large central lucent area. This may represent a simple bone cyst. SBC's may enlarge over time

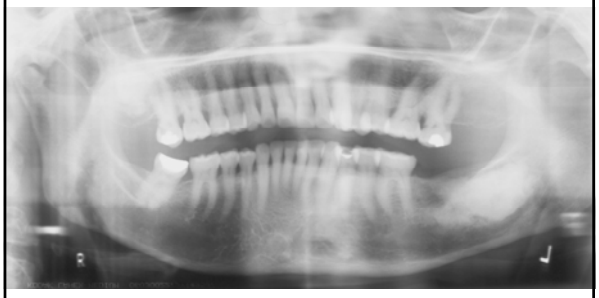
Florid Cemento-osseous Dysplasia

Radiographic Features

- **Effect on adjacent structures**
  - May displace the inferior alveolar canal inferiorly, or the floor of the maxillary sinus superiorly

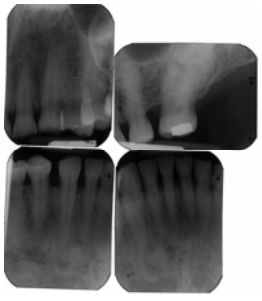
Florid Cemento-osseous Dysplasia

Florid Cemento-osseous Dysplasia

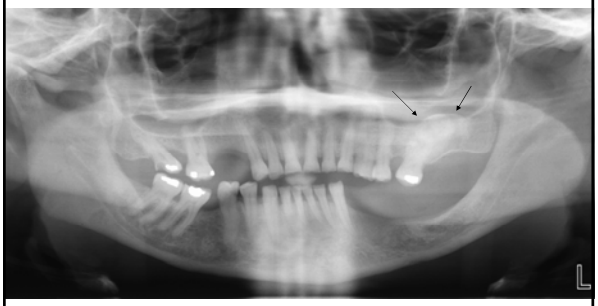


Florid Cemento-osseous Dysplasia

Florid Cemento-osseous Dysplasia



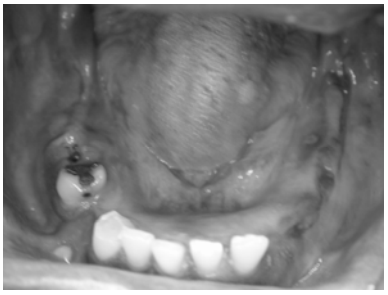
Florid Cemento-osseous Dysplasia



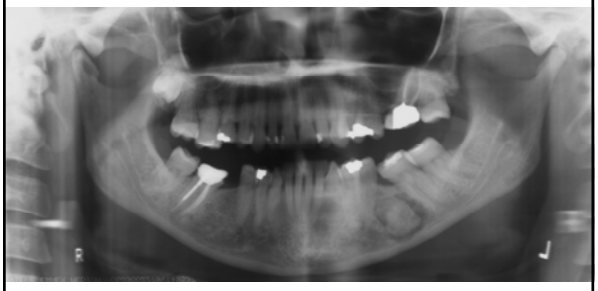
Florid Cemento-osseous Dysplasia With Simple Bone Cysts

Osteomyelitis and FCOD

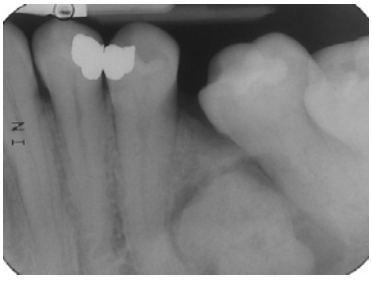
Osteomyelitis and FCOD



Focal Cemento-osseous Dysplasia



Focal Cemento-osseous Dysplasia



Cemento-ossifying Fibroma

- Classified and behaves like a benign neoplasm of bone
- Also considered a type of fibro-osseous lesion
- Similar histopathology to fibrous dysplasia
- Juvenile form (first 2 decades of life) is very aggressive

Cemento-ossifying Fibroma

- Can occur in any decade, but most common in young adults
- F>M
- Usually discovered due to facial asymmetry

Cemento-ossifying Fibroma

Radiographic Features

Location

- Most common in the mandible
- Inferior to the premolars and superior to the mandibular canal
- In maxilla commonly appears in the canine fossa or the zygomatic process of the maxilla

Cemento-ossifying Fibroma

Radiographic Features

- **Borders and shape**
  - Well-defined
  - May have a thin lucent rim around lesion. This represents a soft tissue capsule, which may help to differentiate COF from Fibrous Dysplasia

Cemento-ossifying Fibroma

Radiographic Features

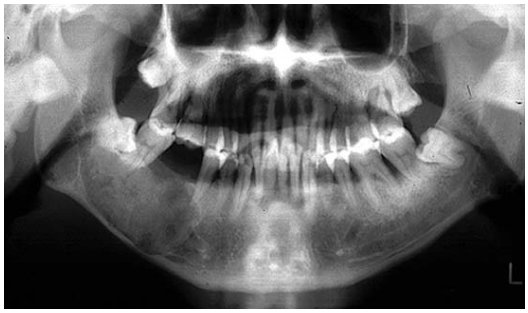
- **Internal Architecture**
  - Variable mixed lucent/opaque
  - Variable patterns, similar to Fibrous Dysplasia
  - May have flocculent (snowflakes) or wispy pattern

Cemento-ossifying Fibroma

Radiographic Features

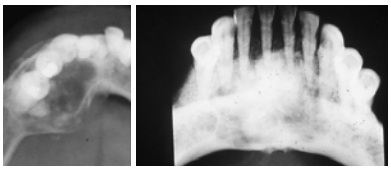
- **Effects on adjacent structures**
  - Tumor-like behavior
    - Concentric growth and expansion
    - Displaces teeth
    - Expands and thins cortices
  - May fill entire maxillary sinus, but retains bony cortex around lesion

Cemento-Ossifying Fibroma

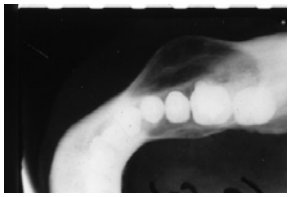


Images courtesy of Asahi University School of Dentistry

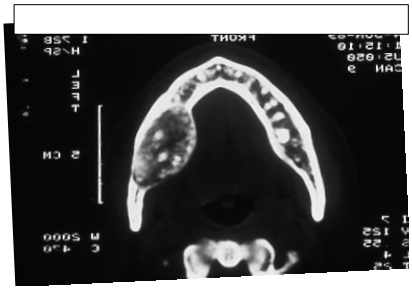
Cemento-Ossifying Fibroma



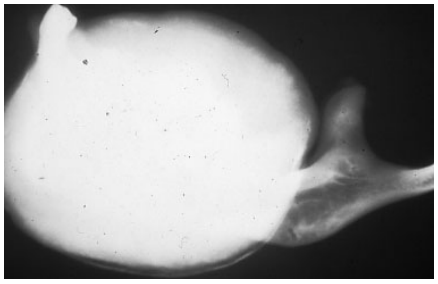
Cemento-Ossifying Fibroma



Cemento-Ossifying Fibroma



Cemento-Ossifying Fibroma



Cherubism

Cherubism

- Rare, inherited, developmental abnormality that causes bilateral enlargement of the jaws, giving the child a cherubic facial appearance.
- Formerly called “Familial Fibrous Dysplasia”, although it is **not** fibrous dysplasia
- Usually develops at 2-6 years of age
- Characterized by painless bilateral swelling of the posterior mandible

Cherubism

- Cosmetic recontouring recommended for esthetics

Cherubism

- Researchers have isolated the gene responsible for cherubism – chromosome 4p16
- Tiziani V*, Reichenberger E*, Buzzo CS, Niazi S, Fukai N, Stiller M, Peters H, Salzano FM, Raposo do Amaral CM, and Olsen BR (1999) The gene for cherubism maps to chromosome 4p16. Am J Hum Genet 65(1):158-166

Cherubism

Radiographic Features

- **Location**
  - Bilateral, multilocular lesions, well defined periphery
  - May affect maxilla as well as mandible
  - Epicenter is in the ramus or maxillary tuberosity area

Cherubism

Radiographic Features

- **Shape and Border**
  - Well-demarcated
  - May have corticated borders
- **Internal architecture**
  - Granular Lesions get filled in with granular bone after the active phase ends
  - Thin trabeculae or septae

Cherubism

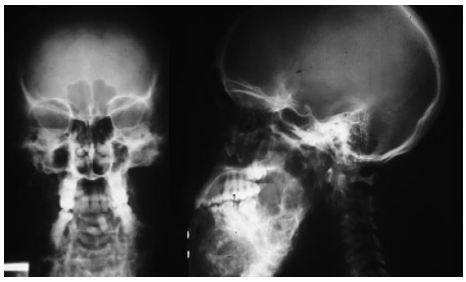
Radiographic Features

- **Effects on adjacent structures**
  - Expands cortices of the mandible
  - Maxillary lesions may expand into the maxillary sinus
  - Teeth are displaced anteriorly as lesions expand

Cherubism

Cherubism

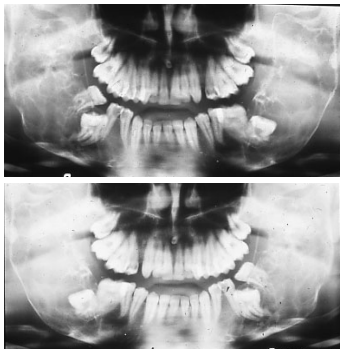
Cherubism



PA Skull View

Lateral Ceph

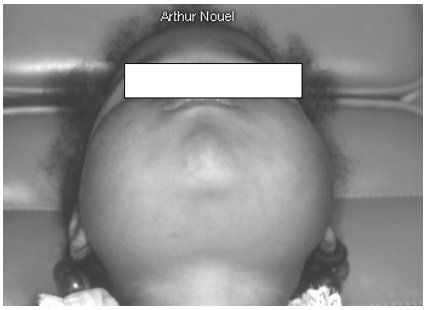
Cherubism



Cherubism

Case courtesy: Dr. Art Nouel, Santo Domingo

Cherubism



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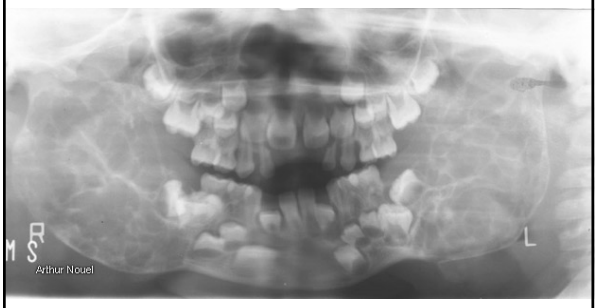
Cherubism



Cherubism

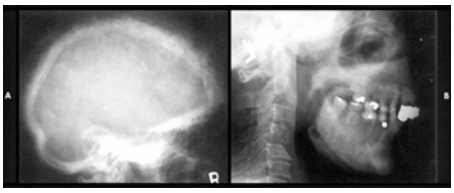
Paget's Disease of Bone

- AKA Osteitis Deformans
- Abnormal resorption and deposition of bone
- May involve many bones, although it is <u>not</u> generalized
- Initially, osteoclastic activity creates bone cavities
- Later, new bone is deposited in an abnormal pattern

Paget's Disease of Bone

- Pelvis
- Lumbar spine
- Femur
- Thoracic spine
- Skull
- Tibia
- Humerus
- Cervical spine

Paget's Disease of Bone



Skull changes

Paget's Disease of Bone

- Disease of late middle and old age
- 2:1 Male:Female ratio
- Skull and mandible may be enlarged
- Teeth may shift
- Dentures may feel tight or no longer fit
- Most commonly seen in Great Britain and Australia

Paget's Disease of Bone

- Slow healing of extraction sites is common
- Increased incidence of osteomyelitis
- Approximately 10% of patients with polyostotic Paget's Disease of Bone develop osteosarcoma
- Always exhibits bone enlargement
- Kidney stones are common in patients with Paget's

Paget's Disease of Bone

- Skull bones may enlarge 3-4 times their normal thickness
- Outer cortex may remain the same or slightly thinned
- Bone scans reveal the activity of the lesion (increased uptake)
- Extreme elevation of serum alkaline phosphatase levels aid in the diagnosis

Paget's Disease of Bone

Radiographic Features

- **Location**
  - Found most commonly in pelvis, femur, skull, and vertebrae
  - Involvement of the jaws is uncommon
  - Maxilla to mandible 2:1
  - Usually bilateral, but one side may have greater involvement

Paget's Disease of Bone

Radiographic Features

- **Internal Architecture**
  - Three stages (which overlap)
    1. Radiolucent stage representing osteoclastic activity
    2. Granular appearing stage resembling Fibrous Dysplasia
    3. Denser, later stage (cotton wool appearance)
  - Linear trabecular pattern

Paget's Disease of Bone

Radiographic Features

- **Effects on adjacent structures**
  - Affected bones are enlarged
  - Cortices may be thinned
  - Sinus floor is usually involved in maxillary lesions
  - Associated teeth may develop hypercementosis

Paget's Disease of Bone

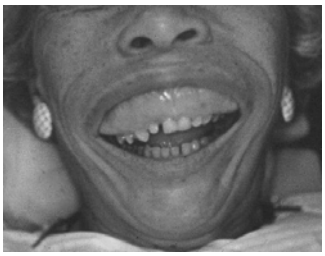
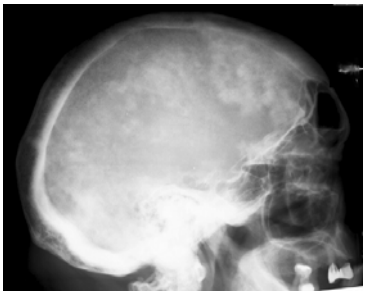
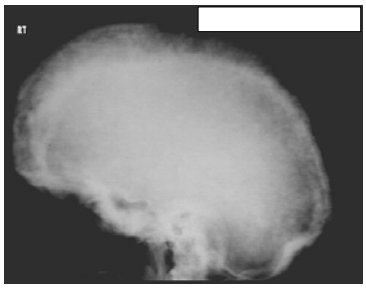


Image courtesy of University of Alberta School of Dentistry

Paget's Disease of Bone

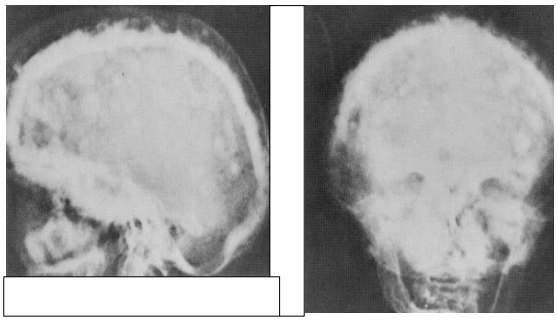


Paget's Disease of Bone



http://www.e-radiography.net/radpath/p/pagets.htm

Paget's Disease of Bone



Central Giant Cell Granuloma

- Thought to be a reactive lesion to unknown stimulus
- Seen in 2 or 3rd decade
- Presents as a painless swelling on routine examination
- Usually slow growing; rapidly-growing lesions may resemble malignancy

Central Giant Cell Granuloma

Radiographic Features

- **Location**
  - 2:1 Mandible to maxilla
  - Usually anterior to first molar in mandible
  - Usually anterior to canine in maxilla
  - Mandibular lesion occasionally crosses the midline

Central Giant Cell Granuloma

Radiographic Features

- **Borders**
  - Mandibular lesions are well-defined, but non-corticated
  - Maxillary lesions usually have ill-defined borders. This may give the radiographic appearance of a malignancy

Central Giant Cell Granuloma

Radiographic Features

- **Internal Architecture**
  - Usually completely radiolucent
  - May have subtle granular pattern or septae that are difficult to distinguish. Proper viewing conditions are imperative

Central Giant Cell Granuloma

Radiographic Features

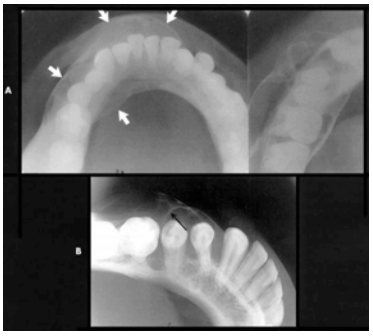
- **Effects on adjacent structures**
  - – May displace or resorb teeth
  - – Effaces lamina dura of adjacent teeth
  - – Expands cortices unevenly

Central Giant Cell Granuloma

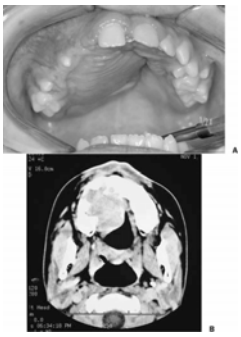
Radiographic Features

- Differential Diagnoses include
  - – Cysts
    - Radicular
    - OKC
    - Primordial
    - Residual
  - – Ameloblastoma
  - – Odontogenic myxoma

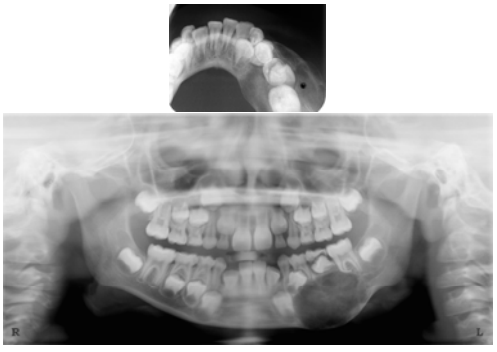
Central Giant Cell Granuloma



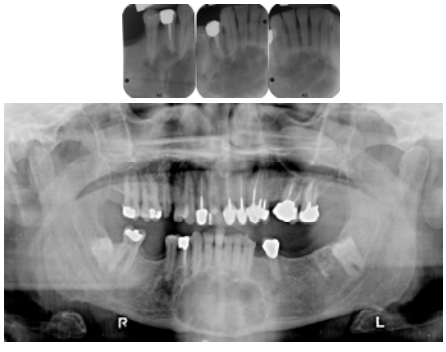
Central Giant Cell Granuloma



Central Giant Cell Granuloma



Central Giant Cell Granuloma



Aneurysmal Bone Cyst

- A reactive lesion of bone
- Resembles CGCG due to the histologic presence of giant cells
- ABC's may develop in association with other primary lesions such as fibrous dysplasia, central hemangioma, giant cell granuloma and osteosarcoma.
- Occurs in individuals <30 yrs, mostly females
- Rapid bony swelling, painful

Aneurysmal Bone Cyst

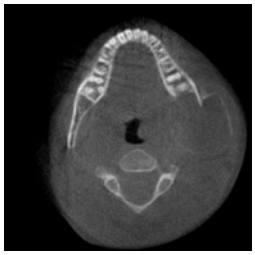
- Mandible to maxilla 3:2, molar region > anterior region
- Well defined periphery, circular
- Multilocular and septate resembling central giant cell granuloma (CGCG)
- Extreme expansion of outer cortical plates
- ABCs can displace and resorb teeth
- A hemorrhagic aspirate favors the diagnosis of ABC
- Advanced imaging: CT

Aneurysmal Bone Cyst
Case 1

Source: http://ddmfr.ath.cx/dentalexpert/main/Cases

Aneurysmal Bone Cyst
Case 1

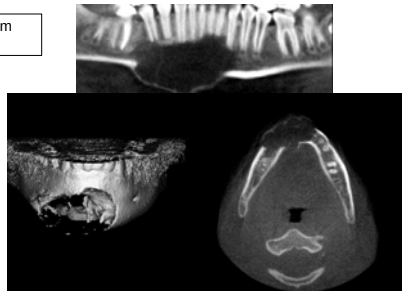
Cone Beam CT Study – Axial View



Source: http://ddmfr.ath.cx/dentalexpert/main/Cases

Aneurysmal Bone Cyst
Case 2

Cone Beam CT Study



Source: http://ddmfr.ath.cx/dentalexpert/main/Cases

Langerhans Cell Histiocytosis

- Abnormal proliferation of Langerhans cell or their precursors (skin derived)
- 10% of all patients with LCH have oral lesions
- Eosinophilic granuloma commonly appears in the skeleton (ribs, pelvis, long bones, skull, jaws) and occasionally in the soft tissues

Langerhans Cell Histiocytosis

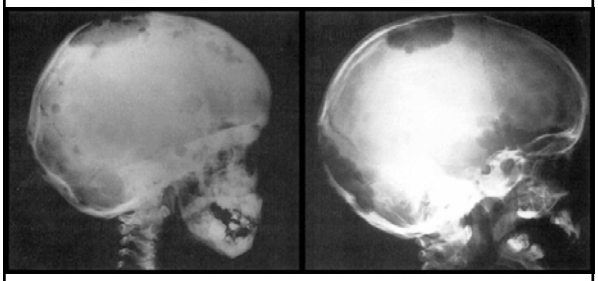
- Swelling, pain,bleeding and loosening of teeth intraorally
- Well defined periphery of the lesions radiographically, sometimes punched out appearance
- Usually no root resorption
- May stimulate new periosteal bone formation

Langerhans Cell Histiocytosis

- The epicenter of bone destruction starts at midroot level as opposed to the periodontal lesions where the destruction starts at the crestal level
- Letterer-Siwe disease is the most severe form - fatal outcome. Considered malignant, it occurs in children under 3 years old

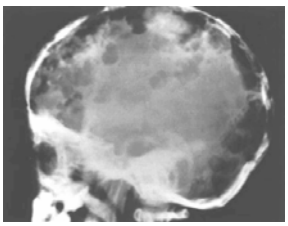
Langerhans Cell Histiocytosis

Langerhans Cell Histiocytosis



Images courtesy of White & Pharoah, 5th Edition

Langerhans Cell Histiocytosis



Eosinophilic granuloma

- Diagnosis by positive S100 protein staining of Langerhans cells
- Detection of rod shaped Birbeck granules of Langerhans cells
- Radiographic features consistent with the histiocytosis

	Benign	Malignant	Other
Birth- 5 yrs	1.Eosinophilic Granuloma [onion skin periosteal Rxn] 2.(Unicameral bone cyst- rare)	1.LEUKEMIA 2.METASTATIC NEUROBLASTOMA 3.Letterer-Siwe disease	1.Osteomyelitis 2. Healing/ stress fracture 3. Cherubism
6-18 yrs	1.Unicameral Bone Cyst 2.Aneurysmal Bone Cyst 3.Nonossifying Fibroma 4.Eosinophilic Granuloma 5.Enchondroma 6.Chondroblastoma 7.Chondromyxoidfibroma 8.Osteoblastom a 9. Juvenile Ossifying fibroma	1.Ewing's sarcoma 2.Osteosarcoma	1.Osteomyelitis 2.Fibrous dysplasia 3.Central Giant Cell Granuloma
19- 40yrs	1.Giant cell tumor 2.Aneurysmal Bone Cyst 3.Eosinophilic granuloma 4.Ossifying fibroma	1. Ewing's sarcoma	1. PCD
40+ yrs		1.Metastases (lung, breast, prostate, renal, thyroid, colon) 2.Multiple Myeloma 3.Lymphoma 4.Osteosarcoma 5.Chondrosarcoma 6.Fibrosarcoma 7. Histiocytoma	1.Hyperparathyroidism 2.Osteomyelitis 3.Paget's disease 4.FCOD

Thanks
for
listening!