# Pre-reading - radiolucencies

- Multiple radiolucencies
  - Suggests a systemic cause
  - Most likely: cherubism or KCOT's of nevoid basal cell carcinoma syndrome
  - Sometimes: florid osseous dysplasia (if limited to alveolar process)
- Multiple discrete radiolucencies? No Poorly defined? Symmetrical? No HPT = Hyperparathyroidism MDCT = multidetector CT Other malignant features? Floating teeth and/or Spiking of roots and/or Widening of PDM Confined to the alveolus? Clinically PET = positron emission tomography malignant? PDM = periodontal membrane Multisystem? Cherubism No PRIO = periapical radiolucency of Yes No inflammatory origin Blood chemistry No (granulomas + radicular cysts) No Yes positive? ST = soft tissue (Oral) primary known? Multiple Osseous Benign neoplasm? Yes dysplasia No Yes No Yes No NBCCS? Metastasis MDCT\* Endocrine from MR\* СВСТ Soft-tissue distant disease? involved? Metastasis? S/T is involved? No Yes Multiple Myeloma PRIO Figure 2 PET\* MDCT/MR MDCT/MR
- Odontogenic neoplasms
  - Mainly benign, but have the potential to be malignant
  - Have the tendency to recur
  - Includes ameloblastomas, keratocystic odontogenic tumors, odontogenic myxomas, and glandular odontogenic cysts

#### Cherubism

Imaging	-Pan reconstruction of a CBCT -Bilateral RL on posterior mandible and on left posterior maxilla -A RL like this would prompt one to think ameloblastoma -If there is little evidence of B-L expansion, then think KCOT -Palmar pitting can be checked to see if it is multiple KCOT's due to NBCC -Also, ameloblastomas do not cross the midline unlike	
Background	-Autosomal dominant genetic disorder	
information	-During earliest and active stage, cherubism lesions contain giant cells -When cherubism inactivates, the lesions is replaced with woven bone first ("sketch line appearance") then back to lamellar bone (normal bone) -Earlier the onset, earlier the involution to normal bone -Europeans = onset in earlier 1st decade -East Asians = onset in later 1st decade -Could permanently affect tooth development, even after active phase is over	
Clinical	-Bilateral swollen cheeks	
manifestation	-Tooth germs in affected areas are destroyed, already developed teeth are displaced	
Shade	-Could affect the airway, blockage of nasal passage, or even affect the orbits -Radiolucency	
Shape	-Multilocular	
Site	-Usually bilateral and almost symmetrical	
	-Almost always the posterior mandible	
	-Frequently the maxilla	
	-Rarely affects the eyes	
Size	-Variable	
Surroundings	-Corticated borders around radiolucent lesion	
Diameter		
Density		
Displacement	-Possible displacement of teeth	

## Periapical radiolucency of inflammatory origin (PRIO)

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Imaging	-Axial view and sectional coronal view -Unilocular RL on patient's RIGHT side -Erosion of the lingual cortex and buccal cortex -Buccal cortex erosion is due to a fistula -Root resorption visible -DDx: radicular cyst, ameloblastoma, KCOT	
	-Draining fistula makes it likely a lesion of inflammatory origin, but should never rule out ameloblastoma	
	-Sagittal view and axial view -Lesion is not due to the nasopalatine duct, as it can be seen on the right image -Radiopacity on midline of right image is a maxillary torus	
	-Vitality testing can help differentiate between NPDC (vital) and PRIO (non vital)	
	-If a PRIO, would be a radicular cyst due to size and tooth being previously RCT'ed	
ļ	-KCOT would also be on the differential (commonly in maxillary canine/lateral area)	
Background	-Represents 3 histological diagnoses: granuloma, radicular cyst, and abscess	
information	-Happens to a tooth when there is caries or trauma	
	-After RCT, most resolve within a year. If there is no resolution, likely a radicular cyst that is self	
	sustaining regardless of infection	
Clinical	-Varies depending on histological diagnosis, but all associated with a non vital tooth	
manifestation	-Toothache, tenderness on biting/percussion	
Shade	-Radiolucent	
Shape	-Unilocular	
Site	-Associated with a tooth apex	
Size	-Any PRIO larger than 1.5cm is considered to be a radicular cyst	
Surroundings		
Diameter		
Density		
Displacement		

## Nasopalatine duct cyst (NPDC)

Nasopalatine da		
Imaging	-Panoramic reconstruction and sagittal view -Well defined unilocular RL in anterior maxilla -Teeth are not seen in pano due to narrow width used on reconstruction	
Background	-Enucleation of NDPC's can be difficult due to proximity to the nasal mucosa	
information	-Adjacent teeth are usually vital	
Clinical		
manifestation		
Shade	-Radiolucent	
Shape	-Unilocular	
Site	-Anterior maxilla on/near midline	
Size		
Surroundings	-Nasal mucosa superiorly, roots of maxillary anterior teeth laterally	
	-In the image above, a communication with the oral cavity can be seen in the panoramic image and a	
	communication can be seen with the nasal cavity in the sagittal image	
Diameter	-Enlargement of the nasopalatine duct, duct not visible elsewhere	
Density		
Displacement		

### Keratocystic odontogenic tumor

**Imaging** 

Clinical

Shade

Shape

Site

Size

Density

Displacement

# -Pan reconstruction and transaxial sections -Multilocular radiolucency extending from the canine to the site of the 3<sup>rd</sup> molar -Transaxial sections below show a little displacement and erosion of the lingual cortex -Left canine has some root resorption on the apex -No B-L expansion -Axial view and sagittal view -Well defined RL lesion extending from anterior midline to first molar site -Displaced and eroded anterior wall of the maxillary sinus -Infiltrating the lumen of the sinus -B-L expansion is half of M-D expansion -Unerupted tooth is seen (blue arrow) -Provisional diagnosis is KCOT, as it commonly starts at the lateral/canine region -Panoramic reconstruction of a CBCT Maxillary -Floor of maxillary sinus elevated -Growth is much less restricted in the maxilla due to thin bone and less cortical bone -Although this is KCOT, it may present with large B-L expansion in the softer maxillary bone Background -Mean presentation age is 38 years information -Used to be called "odontogenic keratocyst" which encompassed para-keratotic and ortho-keratotic **lesions** -Now, para-keratotic lesions are called KCOT's as they are neoplastic -Also, ortho-keratotic lesions are called OOC's as they are a true cyst -OOC's are unique radiographically. They have huge B-L expansion and no root resorption -Mixed ortho/para keratotic lesions are treated as if they were KCOT's -Global recurrence rate of 28%. Anterior, smaller lesions are more likely to recur because they are thought to be non-neoplastic and enucleated conservatively by surgeons -Presents with swelling, pain (1/3 of pts) manifestation -Radiolucent -2/3 are well defined and unilocular -Older lesions are more likely to be multilocular and expand M-D -3/4 occurs in the mandible, overwhelmingly in ramus and posterior sextant -1/4 occurs in the maxilla, of which 2/3 is between the canine and lateral, and 1/3 is in anterior sextant -Spreads easier in the maxilla, likely due to less cortical bone Surroundings -Like ameloblastoma, 1/4 of KCOT's cause root resorption but to a lesser degree Diameter

-2/3 had some fusiform B-L expansion, but nowhere near the extent of an ameloblastoma

## Nevoid basal cell carcinomas

Imaging	-Left is axial view, middle is coronal view, right is sagittal view -Lateral wall of sinus in coronal view: missing bone due to biopsy taken prior to radiograph -Multiple radiolucencies resembling KCOTs	
Background	-A multi system disorder requiring treatment from maxillofacial + head + neck specialties	
information	-NBCCs involve basal cell carcinomas, multiple KCOT's, and 4 other major criteria	
	-Most frequent in North Europeans	
	-Less frequent in East Asians (darker skin), but more frequently present with multiple KCOT's	
	-Syndromic KCOT's usually presents in 2 <sup>nd</sup> ~3 <sup>rd</sup> decade, non syndromic KCOT's 3 <sup>rd</sup> ~4 <sup>th</sup> decade	
	-Syndromic KCOT's are more likely to recur after surgery than non syndromic	
Clinical	-Swelling, pain	
manifestation		
Shade	-Radiolucent	
Shape	-Maxilla: usually unilocular, small, and round	
	-Mandible: usually unilocular +/- scalloped margins. Could be multilocular	
Site		
Size	-Minimal B-L expansion (as seen in left image)	
Surroundings	-Corticated borders around lesion	
Diameter		
Density	-In the middle and right image, the lesion has infiltrated the right maxillary sinus	
	-Buccal wall of sinus is missing as radiograph was taken AFTER the biopsy (don't do this!)	
Displacement		

### Dentigerous cyst

Dentigerous cyst Imaging	Mesial Mesial
	Distal-> Ramus
Background	-Most commonly seen with unerupted 3 <sup>rd</sup> molars
information	-Also possibly seen on maxillary anteriors, supernumerary teeth, and premolars
	-False myth: ameloblastomas arise from untreated dentigerous cysts
	-Most common in white south Africans
Clinical manifestation	
Shade	-Radiolucent
Shape	-Unilocular
Site	-Pericoronal with attachments to the CEJ of an unerupted tooth
Size	
Surroundings	
Diameter	
Density	-Lingual cortex becoming eroded, hence reducing density
Displacement	-In the image, we see a displacement of the lingual cortex and some erosion

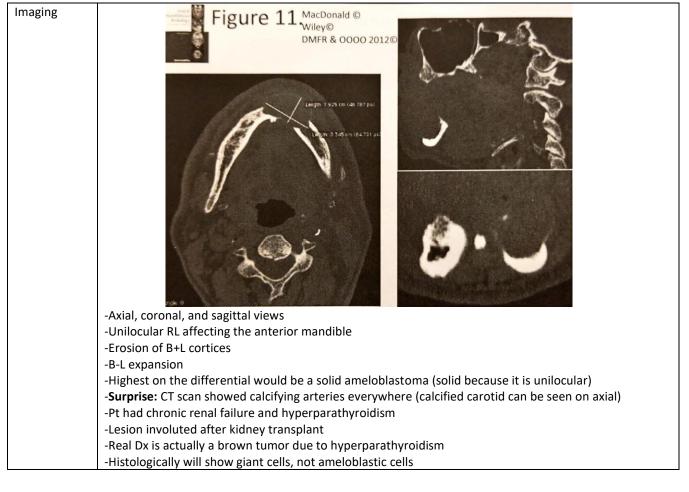
## Ameloblastoma

Imaging	of a C -Unic -Erod -Exte of the amel -Axia -Larg B-L e: -Sept	onal and axial reconstruction CBCT ystic ameloblastoma led lingual cortex is visible nsion beyond lower border e mandible is unique to oblastomas I reconstruction of a CBCT e unilocular RL with extreme expansion ae are visible in lesion if ameloblastoma
	-Desr	ttal reconstruction of a CBCT moplastic ameloblastoma t resorption can be seen
Background information	-Usually presents before 25 years old -Ameloblastomas arising from the jaw bones are classified as: solid (multilo desmoplastic -Most ameloblastomas in Western countries are solid. Mostly treated by re -Most ameloblastomas in Chinese are unicystic. Mostly treated by enucleat	section
Clinical	-Expansion of jaw	ion, carnoy 3, sinan surgery
	Expansion of Jaw	
manifestation		
Shade	-Radiolucent	
	-Radiolucent -Unicystic may appear unilocular	
Shade Shape	-Radiolucent -Unicystic may appear unilocular -Solid is usually multilocular	
Shade	-Radiolucent -Unicystic may appear unilocular -Solid is usually multilocular -Unilocular usually affects the ramus and posterior sextant of the mandible	
Shade Shape Site	-Radiolucent -Unicystic may appear unilocular -Solid is usually multilocular	
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Shade Shape Site Size Surroundings	-Radiolucent -Unicystic may appear unilocular -Solid is usually multilocular -Unilocular usually affects the ramus and posterior sextant of the mandible	
Shade Shape Site	-Radiolucent -Unicystic may appear unilocular -Solid is usually multilocular -Unilocular usually affects the ramus and posterior sextant of the mandible -Solid usually affects the anterior sextant of the mandible	

#### Odontogenic myxoma

Odontogenic my	
Imaging	-Took a random picture off google for sake of consistency
Background	-First presents around 30 years
information	-Cells infiltrate the bone around the lesion, so 1cm margins are recommended when resecting
Clinical manifestation	-1/2 present with swelling and/or pain
Shade	-Radiolucent septae
Shape	-Multilocular "tennis racket" pattern is only seen in a minority of myxomas
Site	-Mainly in the posterior sextants of max/mand
Size	
Surroundings	-Only well defined half the time
	-Suggests that this lesion does not contain a capsule
Diameter	
Density	
Displacement	-Fusiform B-L expansion in the body of the mandible
	-Will displace into the lumen of the sinus nearly every time it's near the sinus

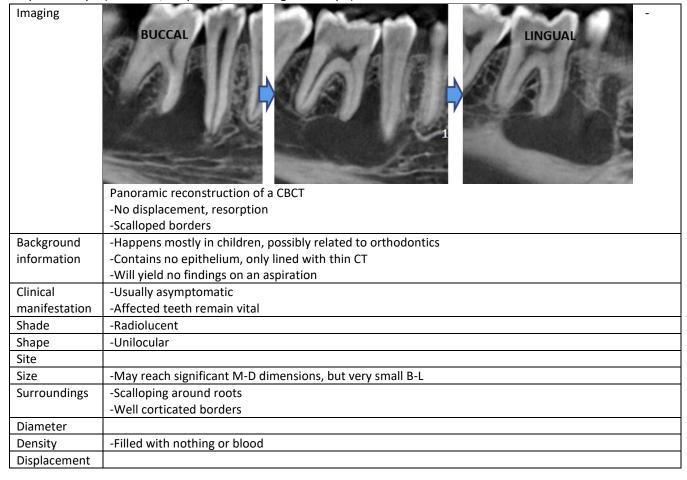
### Brown tumor



Lingual bone defect (Stafne's bone cyst)

Imaging	
Background	-Must weaken the mandible, but no pathologic fractures have been reported
information	-Likely because it is mostly found in older adults (~50), who rarely participate in contact sports
Clinical	-Asymptomatic
manifestation	
Shade	-Radiolucent
Shape	-Ovoid
Site	-Basal process of the posterior mandible
	-In relation to the submandibular gland or below the mandibular canal
Size	
Surroundings	-Corticated, radiopaque
Diameter	
Density	
Displacement	-Could erode the buccal cortex

• Simple bone cyst (traumatic, idiopathic, hemorrhagic bone cyst)



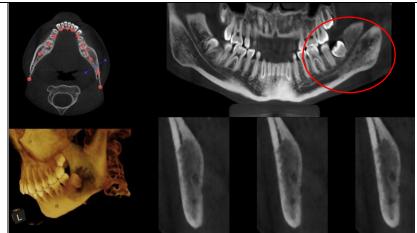
## Glandular odontogenic cyst

Giandular odonti	
Imaging	-Poorly defined unilocular RL -Root resorption of the 5 -Some B-L expansion -IAN displaced inferiorly (yellow arrow), basal process affected -Superior cortex eroded -It is a GOC, but may be KCOT until proven otherwise  -Axial, 3D, coronal, and sagittal views -Unilocular well defined radiolucency -No B-L expansion -Some extension into the basal process -Mandibular canal slightly placed downward -Root resorption visible
Packground	Maan procentation ago is 46 for westerners, decade earlier for East Asians L Africans
Background	-Mean presentation age is 46 for westerners, decade earlier for East Asians + Africans
information	-Can appear like an innocent dentigerous cyst to a well defined mucoepidermoid carcinoma
	-Wide range of radiological and histological presentations: we don't know enough about it yet, and it
	could even be a collection of unidentified lesions
Clininal	-Multilocular + root resorption should be treated as if it were neoplastic
Clinical	-90% have swelling, 33% with pain, 15% with numbness
manifestation	Dadish sant
Shade	-Radiolucent
Shape	-Varies from unilocular (small) to multilocular (large)
Site	-80% in the mandible, nearly always in the anterior sextant
Size	
Surroundings	-1/3 have root resorption
Diameter	
Density	
Displacement	-1/2 have tooth displacement
	-Minimal B-L expansion
	-Displacement of IAN (seen in picture above)

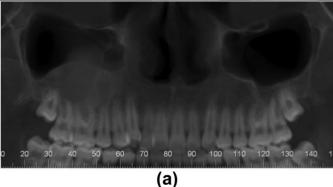
# Pre-reading – Radiopacities

## Fibrous dysplasia

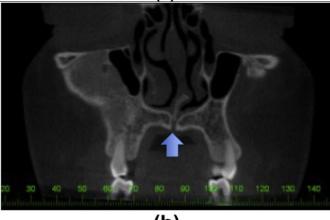
**Imaging** 



- -Poorly defined radiopacity resembling a ground glass appearance on the posterior sextant of the left mandible -Cortex surrounding the IAN on right side has been eroded
- -Little B-L expansion
- -Diagnosed as fibrous dysplasia



- -Pan reconstruction of a CBCT (scale on the bottom, no superimposition of other structures, slightly worse resolution than a regular pan)
- -Ground glass radiopacity in the posterior sextant of the right maxilla
- -Poorly defined
- -Displacement of the floor of the sinus is seen
- -Dx: monostotic fibrous dysplasia



- -Note: this is same patient as above
- -Coronal reconstruction of a CBCT
- -Appears to be somewhat well defined → FD in the jaw is poorly defined, but in other bones it is well defined. Possibly due to difference in embryonic bone formation
- -Appears to stop right at the zygoma  $\Rightarrow$  only one bone affected
- -Blue arrow points to the nasopalatine duct
- -Dx: monostotic fibrous dysplasia

(b)



- -Radiopacity resembling ground glass seen on mandible, maxilla, zygoma, and sphenoid
- -Maxillary antrum has been completely obturated
- -Buccal expansion of the zygoma
- -Medially directed expansion of the lateral wall of the nasal cavity
- -Substantial B-L expansion of the mandible

Background	-Benign, non inheritable disease affecting 1:30,000 individuals
information	-Overall, FD is seen on average at 15 years, but 25 years in the jaw
	-Can be a local lesion (monostotic, 93%) or systemic lesion (polyostotic, 7%)
	-Polyostotic + hormonal disorder + café au lait spots = McCune Albright syndrome
	-Hormonal disorders: precocious puberty, ovarian follicular cysts
	-Believed that all FD's arise in childhood, but remain undetected until it reactivates later in life
	-Earlier the mutation starts, the more severe the manifestations
	-If monostotic, not necessary to treat unless evident deformity or threat to vision
	-Can remain dormant after childhood, and reactivate during pregnancy
	-Monitor for reactivation or possible associated lesions (aneurysmal bone cyst, osteosarcoma)
Clinical	-Monostotic: affects one bone
manifestation	-Polyostotic: affects multiple bones throughout the body
	-90% presents with swelling, but only 18% reported pain
Shade	-Radiopaque
	-Ground glass appearance (seen 38% of the time on normal radiographs, 100% on CT)
Shape	
Site	-58% in maxilla, 42% in mandible, overwhelmingly in the posterior sextants
Size	
Surroundings	-Poorly defined with a 1mm zone of transition
	-This zone of transition is only found in jaw-related FD's, not FD's on other bones
	-Root resorption is rare
Diameter	
Density	-Sometimes see thinning of the lower border of the mandible
	-Possible loss of lamina dura of affected teeth
Displacement	-Maxillary sinus is completely or partially obturated in nearly every case of maxillary FD
	-Expansion seen (enlargement in maxilla, fusiform expansion in mandible)
1	-Teeth were displaced in 35% of cases

### Dense bone island

Imaging	-Well defined RO at apex of 47 -Could be cementoblastoma, condensing osteitis, or a dense bone island -Could also be osteomyelitis if it extended below IAN  -No RL border = less likely cementoblastoma -PDL space visible throughout the root = less likely cementoblastoma -No B-L expansion = less likely cementoblastoma -Tooth is vital = cannot be condensing osteitis
Background information	-More prevalent in areas of high [F] in water -Seeing 5+ DBI's → suspect Gardner's syndrome -If associated with an infected, non vital tooth → it is called condensing osteitis -Does not regress
Clinical manifestation	-No symptoms
Shade	-Radiopacity
Shape	
Site	-Most common in posterior mandible
Size	
Surroundings	
Diameter	
Density	
Displacement	

## Ossifying fibroma

o FD can be distinguished from OF based on their margins, which are poorly defined for FD and well defined for OF

	be distinguished from OF based on their margins, which are poorly defined for FD and well defined for OF
Imaging	-Well defined ground glass radiopacity -Can trace the thin radiolucent outline (capsule) on A -Rounded B-L expansion is seen on B and C -Buccal and lingual corticies are thinned on B and C -If it was the juvenile type of OF, it would not have a capsule -The B-L expansion and displacement of the teeth make it less likely to be osseous dysplasia
Background	-Usually seen in female (71%) adults (mean 31 yo) in teeth bearing jaws
information	-Overall recurrence rate is 12% after careful surgery
	-Can re-activate or accelerate in growth at the onset of menopause
	-Secreting carcinoma is the underlying cause of OF's in 10~15%. An example of this is familial
	hyperparathyroidism (autosomal dominant disorder)
Clinical	-31% of OF's are incidental findings, 66% present with swelling, 16% with pain
manifestation	
Shade	-Ground glass radiopacity
Shape	
Site	-Mandible is affected 75% of the time
Cina	-Even distribution of anterior or posterior segments
Size	Has an observable cancula (shall of radiolysansy around locion) most of the time
Surroundings	-Has an observable capsule (shell of radiolucency around lesion) most of the time -"Radiopacity within a radiolucency"
	- 16% of the time, it is completely radiopaque
	-20% have root resorption
Diameter	·
Density	
Displacement	-84% present with B-L expansion
	-27% have teeth displacement
	-If arising in the maxilla, the sinus is affected 90% of the time
	The ansing in the maxina, the sinus is affected 90% of the time

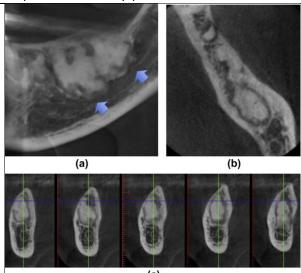
## MRONJ/osteomyelitis

Imaging	-Coronal and axial reconstructions -Unilocular radiopacity surrounded by a radiolucent line on the right mandible -Erosion of buccal and lingual walls			
Background	-Happens on patients taking bisphosphonates			
information	-MRONJ and osteomyelitis often come hand in hand, and appear very similar			
Clinical	-Visible necrotic bone			
manifestation	-Fever, pain			
Shade	-Necrotic bone with concurrent infection (osteomyelitis) can appear RL, RO, or both			
	-Usually appears radiopaque and laminated			
Shape				
Site	-Spreads from alveolar process to basal process			
Size				
Surroundings				
Diameter				
Density				
Displacement	-Expands the bone, similar to the way fibrous dysplasia does			

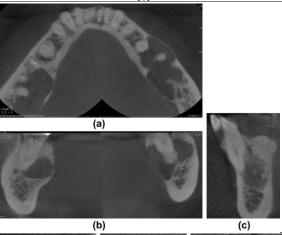
#### Osseous dysplasia

- A tooth with a periapical radiolucency but tests vital may be a focal osseous dysplasia
- Florid and focal osseous dysplasias are monitored and removed only if causing symptoms
- Expansive osseous dysplasias need to be removed due to their aggressive nature

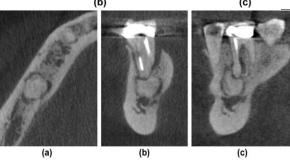
**Imaging** 



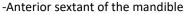
- -A: Multiple well defined radiopacities in the alveolus of the mandible
- -B: Axial reconstruction show no B-L expansion
- **-C:** There is a clear boundary between dysplastic tissues and normal bone. All the dysplastic tissues are situated in the alveolus
- -Lesion is situated above the mandibular canal
- -Dx: florid osseous dysplasia



- -A: Axial view presenting bilateral multilocular radiolucencies in posterior sextant of the mandible. There is significant M-D expansion but minimal B-L expansion. Cortices are eroded but intact. Radiopacities are seen within the radiolucencies, but it may also be a tooth root
- -C: Sagittal view or reconstructed transaxial image. one lesion also in the anterior sextant with a well defined radiopacity at the apex. Texture is ground glass
- **-B:** radiopacities are seen at the apices of the molars. This medium FOV cannot image the PDL, but small FOV's can.
- -Dx: florid osseous dysplasia
- **-DDx:** KCOT (2x), fibrous dysplasia, osseous dysplasia, ossifying fibroma



- -A: Axial view showing unilocular radiopaque lesion with radiolucent border affecting left mandible. There is no B-L expansion
- **-B:** Sagittal view showing lesion is at the apex of 35/36, and no RR is seen
- **-C:** Coronal view, no RR is seen. 46 has some hypercementosis, but is unrelated to the lesion
- -Dx: focal osseous dysplasia
- -RCT on 46 was likely done when FocOD was in early stages and looked like a PARL



- -Multiple radiolucencies at the apices of the teeth
- -Depending on the view, it is evident that there are radiopacities within each radiolucency
- -Teeth were diagnosed as vital
- -Slight internal root resorption can be seen (irregular pulp outlines)
- -Dx: periapical osseous dysplasia

	Florid osseous dysplasia	Focal osseous dysplasia	Expansive osseous dysplasia	
Background information	-Confined to the alveolar process (above mandibular canal, below junction of hart palate), but are generally not considered to be odontogenic			
Clinical manifestation	-Females affected 97% of the time -Mean age 49 years old -50% are incidental findings, 31% swelling, 30% drainage or fistula	-Females affected 88% -Mean age 41 -64% incidental, 25% swelling, 28% pain, 17% numbness	-Expansion affects alveolar and basal processes -Affects males and females evenly -Presents in young ages	
Shade	-Can be just a radiolucency or a radiolucency with >1 central radiopacities	-Radiolucency (31%) -Radiopacity within radiolucency (37%) -Complete radiopacity (32%)	, 5	
Shape				
Site	-More than 1 sextant needs to be affected to be considered FOD -Presentation is usually bilateral -Mandible affected in 100%, maxilla affected in 67% -Osseous dysplastic tissues (radiopacities) are positioned centrally within the lesion on CT	-Confined to a single sextant -Can be a single lesion or a group of juxtaposed lesions -85% in mandible -Posterior sextants more common		
Size				
Surroundings		-53% well defined -40% sclerotic periphery		
Diameter				
Density				
Displacement			-Extensive B-L expansion	