College of Dentistry
UNIVERSITY of FLORIDA

A Deep Dive into Intra-oral and Panoramic Radiographic Diagnosis

A STEP-BY-STEP RADIOLOGIC APPROACH

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Radiographs and the Diagnosis: What Do You See? Radiographic navigation in the diagnosis of lesions within the jaws

- Radiographic diagnosis of 2D images are key to everyday practice of dentistry. A plethora of conditions are seen within the maxillofacial complex including developmental, inflammatory, neoplastic, and metabolic conditions. A case-based approach will be used to methodically review radiographic findings. The presentation will include 2-D illustrated case presentations, discussions, and interactive radiographic interpretations.
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- Learning Objectives:
  - To systematically review a 2D radiograph
  - Identify intra-oral and panoramic positioning errors and their limitations in interpretations
  - Understand anatomical variations and identify incidental findings
  - To recognize when CBCT imaging is needed

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Audience Poll

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Adequate Diagnostic Images

- Image analysis is limited by the information contained in the available diagnostic radiographs.
- An adequate number of images of diagnostic quality that display the region of interest in its entirety is an essential first step.

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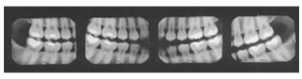

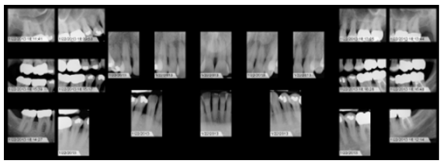

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WHY to IMAGE

Imaging is a universal diagnostic tool.

Detect underlying cause of symptoms and form a basis for scientific investigation.

Detect the presence or absence of disease, leading to further investigations.

A picture is worth a thousand words

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Radiographs in Diagnosis

Radiographs do not reveal disease	Reveals only the effect or aftermath of disease	Radiographs are an instantaneous glimpse of a continuous process

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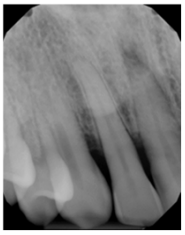
Interpretation case 1



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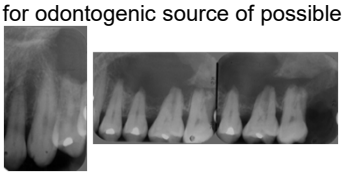
Interpretation Case 2

- 30 year old male
- Pain/discomfort in the left maxillary sinus region
- Referred for odontogenic source of possible maxillary sinusitis



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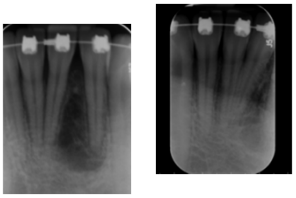
Case 3



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Case 4

- 8-year old girl
- Foul smell from mouth
- Has been sick on and off for the last year
- Referred by her doctor for dental check-up

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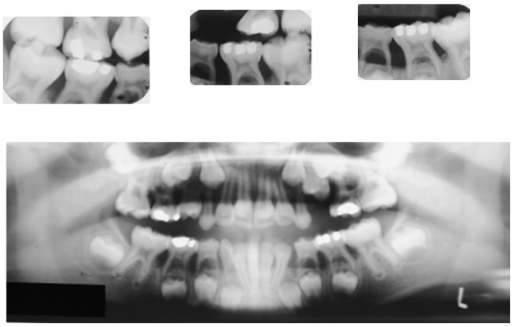

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Case 5

History:	47 y/o male presented with complaint of h/o TMJ problems and prominent right TMJ "bump"(protuberance). Pt. denies pain and has no limitations or pain on opening. Duration is unknown.
Indications:	Right TMJ radiopacities visible on panoramic xray. Dx: Osteochondroma. Considering further imaging to arrive at diagnosis.

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Case 6

History: None noted

Indications: Not sure what is the diagnosis; there are 2-radiopaque areas on sides of panorex. Please review and explain.

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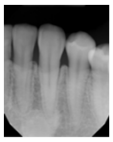
Case 7

History: None. Patient is asymptomatic. No signs nor symptoms.
Indications: What is it? Does it require intervention or just monitor?



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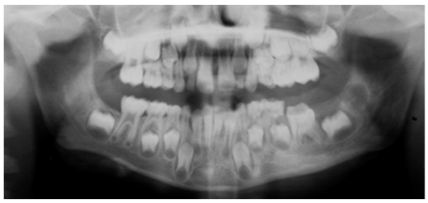
Case 8



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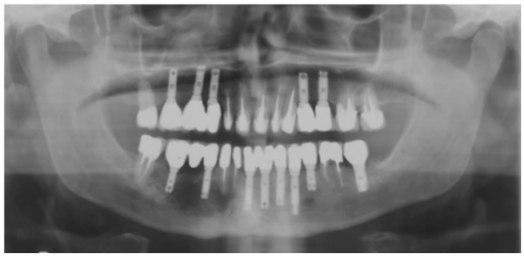
Case 9



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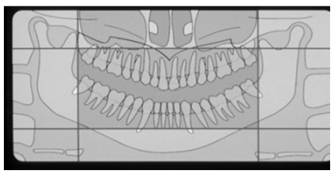
Panoramic Radiographs



- The panoramic radiographic image is a curved slice of the jaws.
- This slice varies in thickness in the various panoramic machines and in the different areas of the oral cavity.
- Panoramic radiographs suffer from imcosistent and variable magnification that is not the same in the vertical and horizontal planes.
- Equalization of the vertical and horizontal magnification is achieved only for a limited zone that lies within a curved plane called the central image layer or the focal trough.
- The focal trough is the zone where the structures usually have uniform magnification and appear sharp on the radiograph.
- The focal trough shape and width vary from machine to machine

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Indications

- Overall evaluation of dentition
- Examine for intraosseous pathology, such as cysts, tumors, or infections
- Gross evaluation of temporomandibular joints
- Evaluation of position of impacted teeth
- Evaluation of eruption of permanent dentition
- Dentomaxillofacial trauma
- Developmental disturbances of maxillofacial skeleton

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Disadvantages

- Lower-resolution images that do not provide the fine details provided by intraoral radiographs
  - Pixel size :
    - Panoramic units: 60 µm - 200 µm
    - Intra-oral sensors: 19-30 µm
- Magnification across image is unequal, making linear measurements unreliable
- Image is superimposition of real, double, and ghost images and requires careful visualization to decipher anatomic and pathologic details
- Requires accurate patient positioning to avoid positioning errors and artifacts
- Difficult to image both jaws when patient has severe maxillomandibular discrepancy

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Effective dose for commonly used dental radiographic examinations: comparison of International Commission on Radiological Protection (ICRP) methods from 1990* and 2007.†

TYPE OF EXAMINATION	EFFECTIVE DOSE (MICROSIEVERTS)		CHANGE IN EFFECTIVE DOSE 1990-2007 (%)
	ICRP 1990 Tissue Weights	ICRP 2007 Tissue Weights	
FMX‡ with PSP§ or F-Speed Film and Rectangular Collimation	12.2	34.9	186
BW¶ with PSP or F-Speed Film and Rectangular Collimation	1.0	5.0	422
FMX with PSP or F-Speed Film and Round Cone	58.4	170.7	192
FMX with D-Speed Film and Round Cone#	133	388	192
Panoramic Orthophos XG** (CCD††)	4.3	14.2	231
Panoramic ProMax‡‡ (CCD)	7.1	24.3	241
Posteroanterior Cephalometric (PSP)	3.9	5.1	32
Lateral Cephalometric (PSP)	3.7	5.6	51

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TABLE 4

Detriment from common dental radiographic examinations: comparison of International Commission on Radiological Protection (ICRP) methods from 1990* and 2007.†

TYPE OF EXAMINATION	PER CAPITA BACKGROUND‡ (DAYS)		PROBABILITY OF X IN A MILLION STOCHASTIC EFFECT, ICRP 1990	PROBABILITY OF X IN A MILLION FATAL CANCER, ICRP 2007
	ICRP 1990	ICRP 2007		
FMX§ with PSP¶ or F-Speed Film and Rectangular Collimation	1.5	4.3	1	2
BW# with PSP or F-Speed Film and Rectangular Collimation	0.1	0.6	0.1	0.3
FMX with PSP or F-Speed Film and Round Cone	7	21	4	9
FMX with D-Speed Film and Round Cone**	16	47	10	21
Panoramic Orthophos XG†† (CCD‡‡)	0.5	1.7	0.3	0.8
Panoramic ProMax§§ (CCD)	0.9	3.0	0.5	1.3
Posteroanterior Cephalometric (PSP)	0.5	0.6	0.3	0.3
Lateral Cephalometric (PSP)	0.4	0.7	0.3	0.3

* Source: International Commission on Radiological Protection.[1]

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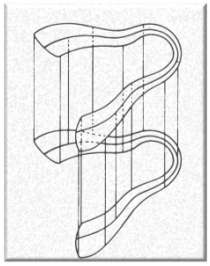
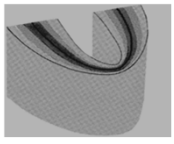
Focal Trough



- A three-dimensional curved zone or image layer in which structures are reasonably well defined.



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Panoramic Radiography

- Obtained by rotating a *narrow* beam of radiation in the horizontal plane
- The sensor is rotated in the opposite direction while the object (jaws) is stationary

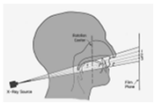

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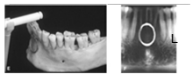
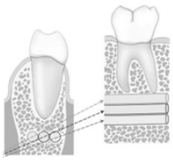
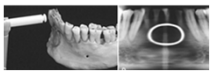
IMAGE LAYER ANALYSIS

- Buccal Objects
  - Narrow
  - Lower





- Lingual Objects
  - Wider
  - Higher



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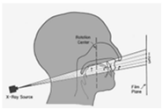

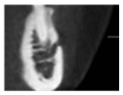

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Ghost Shadows

- Arise from structures located on the opposite side of the center of rotation away from the image layer

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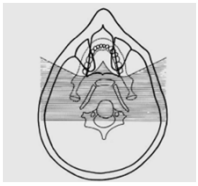
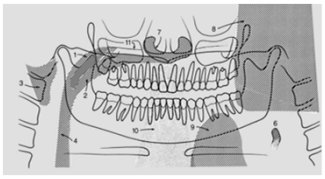
Ghost images





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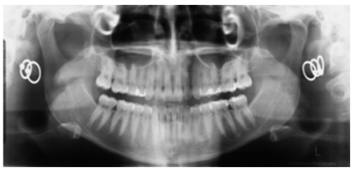
Ghost Shadows (Cont.)

- Characteristics
  - Same general shape
  - Appears on the opposite side
  - Positioned higher than real structure
  - More blurred than the real structure



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Points to remember

- Negative angulation of the beam
  - Lingual and palatal aspects are higher
- Structures that are lingual are more horizontally enlarged
- Ghost images exist and superimpose on normal anatomic structures.

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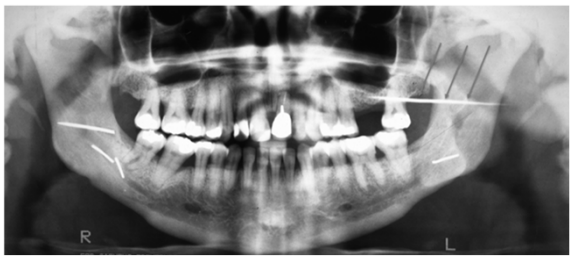
Case 10



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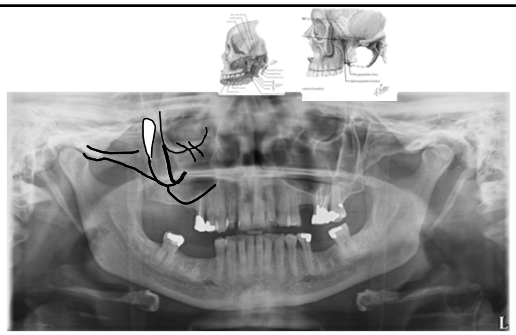

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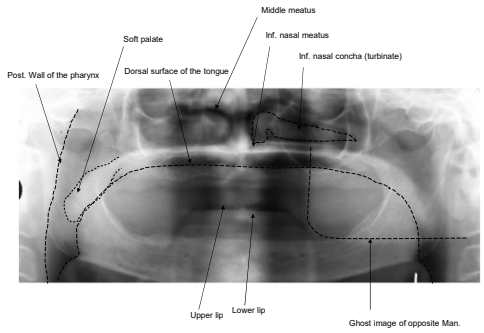

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Case 11

- Well-defined radiopacity noted on the panoramic radiograph above # 7 and 8.
- My differential included a supernumerary tooth or a benign tumor

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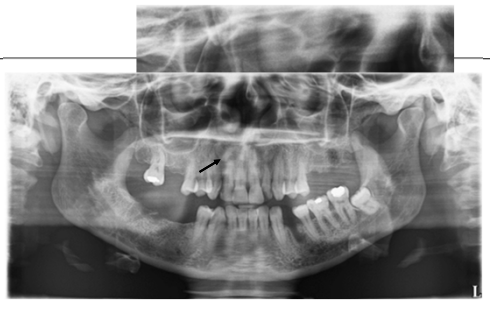

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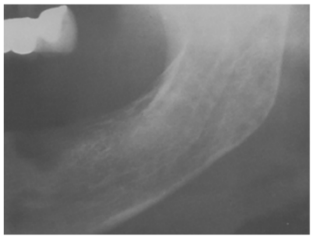
Panoramic radiograph and osteoporosis



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Bone Volume 43, Issue 1, July 2008, Observer performance in diagnosing osteoporosis by dental panoramic radiographs: Results from the osteoporosis screening project in dentistry (OSPD) Taguchia et al, OSPD International Collaborative Group1

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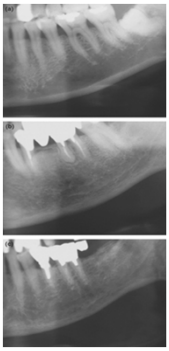

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Systematic approach to evaluating panoramic radiograph

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Systematic approach to evaluating a panoramic radiograph

- Patient positioning error
- Maxillary sinus and nasal fossa
- Submandibular region
- TMJ
- Maxilla and mandible

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1. **Remove jewelry, glasses and denture**
2. **Bite in biteblock groove**
3. **Stand patient upright**
4. **Position chin on chinrest**
5. **Check the lights**
6. **Close side guides**
7. **Have the Pt. close their lips, swallow & place tongue on the palate and hold still**
8. **Expose the radiograph**

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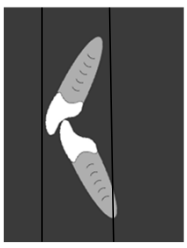
Ideal Panoramic Image



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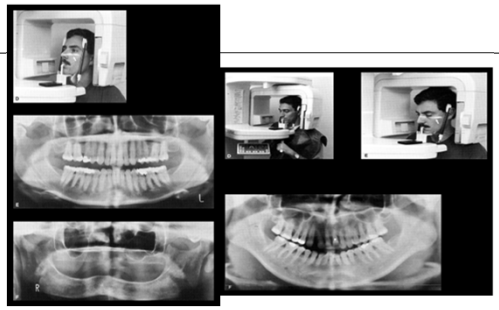

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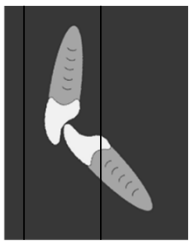
Chin Down



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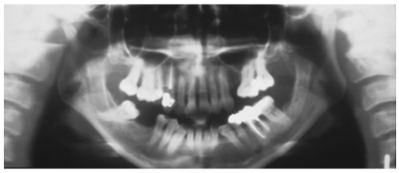

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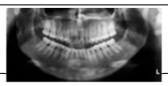

- **HOW TO CORRECT:**
  - Follow the directions by the equipment manufacturer on how to position anatomical points on the face planes/lines that correspond with the reference lines on the panoramic units.
- **HINTS:**
  - Each panoramic equipment manufacturer has different instructions on how to align anatomical structures with specific lines on the machines.
  - If the reference lines are missing or not seen, alignment would be closer to being correct if the occlusal plane was positioned approximately minus 5 degrees from parallel to the floor. It is better to err with the chin “too far down”than “too far up.”

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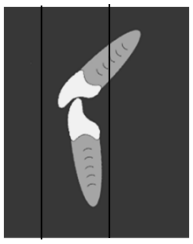
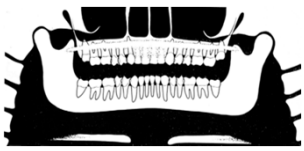
Chin up





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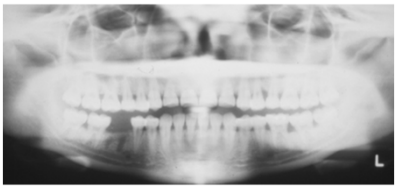

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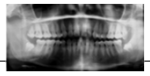

- **HOW TO CORRECT:**
  - Follow the directions provided by your equipment manufacturer on how to position anatomical points on the face with the reference line on the unit.
- **HINTS:**
  - This error can be intentionally created if you wish to more clearly see the lower anterior incisors and surrounding bone, especially with panoramic equipment that allows collimation so that a limited segment of the jaw can be imaged.

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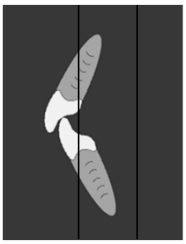
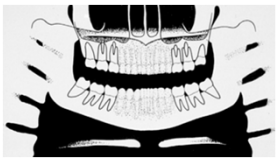
Too far forward





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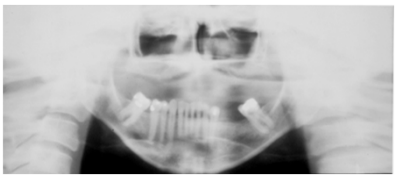

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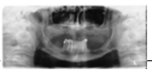

- **HOW TO CORRECT:**
  - Check to be sure the patient's teeth are correctly biting the bite block. The anterior incisors must be in the groove indicated on the block.
- **HINTS:**
  - This problem usually occurs when the anterior teeth are missing. In order to maintain the slight distance that the anterior teeth would have had in relation to the ridge, the patient's ridge should be placed slightly **behind** the groove
  - Use a roll of cotton or gauze could be used to raise the ridge to a more normal orientation.
- If this problem persists, the chin rest or bite block may be incorrectly positioned. If you cannot adjust the chin rest, you may need to call the manufacturer.

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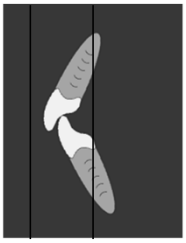
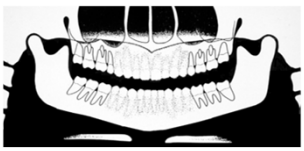
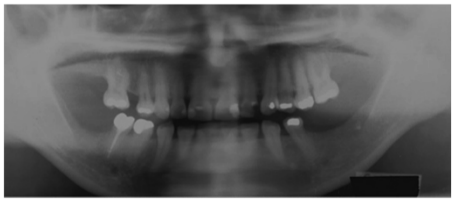
Too far Back





54

Patient too far back



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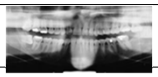
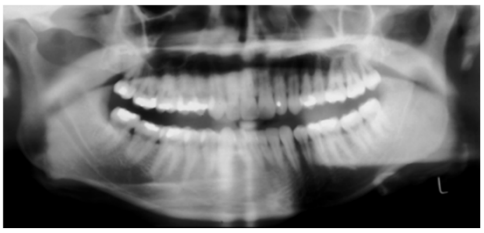


- **HOW TO CORRECT:**
  - Check the placement of the patient's chin in the chin rest and position of the incisor teeth in the bite block groove.
- **HINTS:**
  - If the patient has anterior teeth which are very flared-out, correct positioning of incisors in the groove will result in the above error.
  - For these patients, you must purposely move him/her further forward in order to move the apices into the image layer.

56

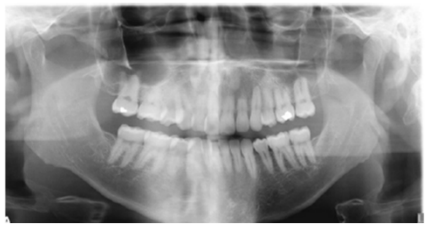
Head twisted/turned



57

Head twisted/turned

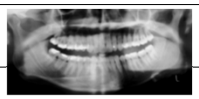
58



59

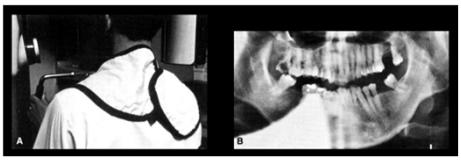
Patient rotated

60



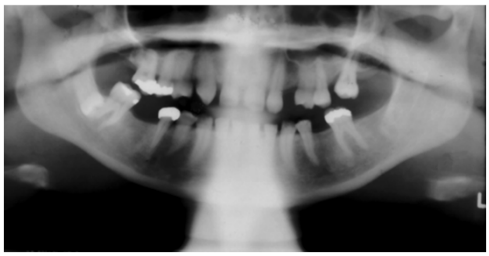
- **HOW TO CORRECT:**
  - Problem usually lies with the alignment of the mid-sagittal plane. The tip of the nose and the center of the chin must fall on the reference line.
- **HINTS:**
  - A visual exam of the patient will identify the asymmetric patient. If there is an anatomical variation or a pathological difference in the size of the ramus, the teeth will not display a difference in size between right and left.

61

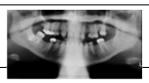


62

Patient slumped/stooped

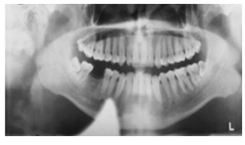


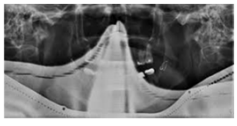
63



- **HOW TO CORRECT:**
  - Keep the spine erect. Don't allow patients to "reach" their chin to the chin rest. Ask them to "drop" (lower) their shoulders.
- **HINTS:**
  - Hard to eliminate this artifact in pts. with short, thick necks or those with arthritis.

64





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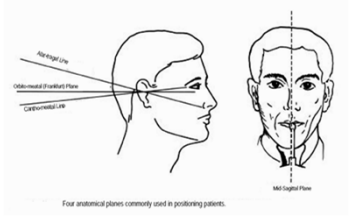
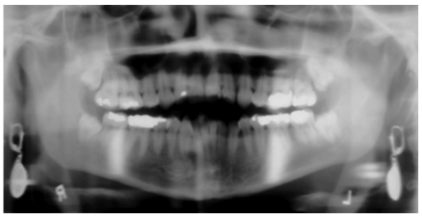


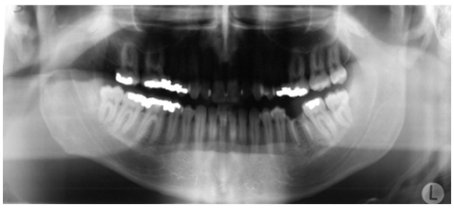
66

Panoramic errors



67

Panoramic errors



68

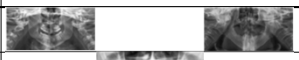
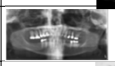
Tongue not against the palate

- **HOW TO CORRECT:**
  - Be sure to instruct the patient how to bite on the bite block, close his/her lips and place the tongue against the roof of the mouth.
  - Ask the patient to place tongue fully against the roof of the mouth and hold it there during the exposure.
  - If only a portion of the film shows a dark area, patient may have lowered the tongue during exposure.
- **HINTS:**
  - To help patients understand about placing the tongue, ask the patient to swallow and note how the tongue feels against the roof of the mouth. Then, ask the patient to hold that position for the duration of the exposure.

69

Panoramic errors

70

Error	Radiographic findings	
Too far forward	Anterior teeth narrow and blurred Spine may be superimposed on ramus Good view of sinuses	
Too far back	Anterior teeth wide and blurry Condyles close to the edge of the image Ghosting of the ramus of mandible Turbinates spread out	
Chin tipped high	Flattened or reverse occlusal plane Maxillary incisors blurry Hard palate superimposed on the apices of upper teeth Condyles at edge of the image Mandibular anterior region seen well	
Chin tipped too low	Excessive smile line (V-shaped) Roots of lower anteriors blurry Condyles on top of the image Maxillary anterior region seen well	
Head twisted/rotated	Unequal magnification on right versus left side Few teeth blurry on one side The condyles will be at different horizontal level if head is tipped.	
Patient Slumped	Ghost image of spine superimposed in the anterior region	
Tongue not against the palate	Dark area over the maxillary teeth	

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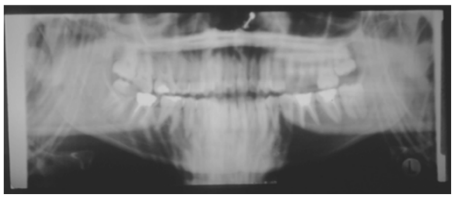
Case 12



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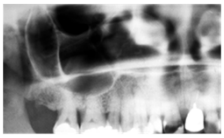
Useful Panoramic Errors

ERROR	REGION OF IMPROVED IMAGING
Too far forward	Nasal Fossa and Sinus
Chin too low	Ant. Maxilla
Chin too high	Ant Mandible

73

Systematic approach to evaluating a panoramic radiograph: Maxillary sinus

- Patient positioning error
- Maxillary sinus and nasal fossa
- Submandibular region
- TMJ
- Maxilla and mandible



- Maxillary sinus walls
- Sinus size and symmetry
- Root proximity
- Mass: Soft tissue or hard tissue
- Common findings: Mucous retention pseudocysts, turbinates, mucosal thickening

74

- An orthodontist colleague consulted me regarding a radiopaque entity in the right maxillary sinus which was found incidentally in a 13y10mon old boy.

75

Case 13

76

Study Details
•Panoramic with patient too far back and rotated slightly to the right.
Region of Interest
•Superior to the left hyoid, superimposed over the base of the tongue, a round, corticated radiopacity is noted with a linear component. A similar, round, corticated radiopacity is noted in the same position on the right.
General Report
•Missing teeth: 1, 3, 5, 10, 13, 14, 16, and 17.
•Restored implants are present in the edentulous spaces of 3, 5, 10, and 13.
•PDL widening is noted along the distal aspect of 2.
•Advanced attrition is seen throughout the mandibular dentition. The cupped pattern suggests a compounded condition, such as erosion.
Sinuses
•The floor of the right maxillary sinus is superiorly positioned with granular density bone noted inferiorly, suggestive of sinus augmentation surgery. The apical aspect of the implant at the site of 3 is superimposed over the granular density bone.
•The left maxillary sinus floor is pneumatized inferiorly within eh edentulous space of 14.
Airway
•A dome-shaped, soft-tissue radiopacity is noted along the hard palate, superimposed over the nasal fossa. The hard palate/anterior nasal spine appears thinned compared to the contralateral side.
IMPRESSION:
•The radiopacity superior to the hyoid is most consistent with ossification of the stylohyoid ligaments, a variation of normal.
•Findings in the right nasal fossa area are suggestive of possible polyps or other soft-tissue mass. If a previous CBCT is available, evaluation is recommended. Medium FOV CBCT is recommended including the maxilla and nasal fossa for further evaluation and to rule out a palatal or a minor salivary gland lesion. Referral to OS/ENT is advised.

77

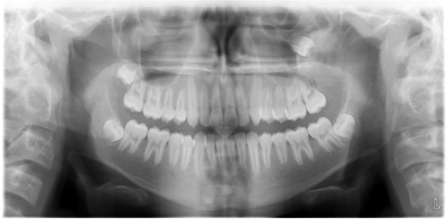
Mucositis

78

Case 14

79

Interpretation Case 15



80

Systematic approach to evaluating a panoramic radiograph

- Patient positioning error
- Maxillary sinus and nasal fossa
- Submandibular region
- TMJ
- Maxilla and mandible

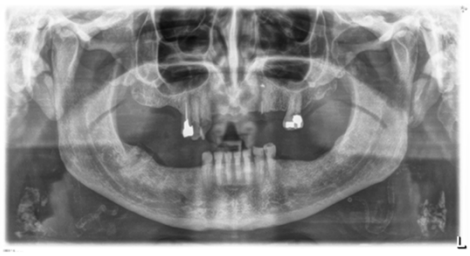
81

Panoramic Interpreattation

- Patient positioning error
- Maxillary sinus and nasal fossa
- Submandibular region
- TMJ
- Maxilla and mandible
- Carotid artery region (C3–C4)
- Tonsilloliths
- Sialoliths
- Triticeous/thyroid cartilage ossifications

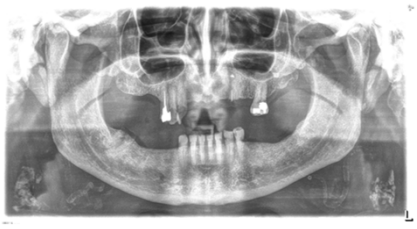
82

Carotid artery calcifications



83

Case 10:55 yr old female



84

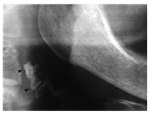
CAC

- Carotid artery calcification is important in clinical practice because stenosis leads to high morbidity and mortality.
- The pathophysiology of CAC is an immediate inflammatory response that results in microcalcifications.
- Microcalcifications cause plaque instability, while macrocalcification causes plaque stabilization.
- Carotid artery calcification as a cerebrovascular risk indicator is still debated.

85

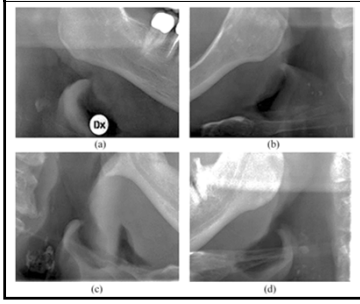
CAC

- Some patterns, such as rim calcification, are suggestive of plaques with inflammatory activity.
- Other patterns, such as dense, nodular calcification confer greater mechanical stability to the plaque and can reduce the risk of embolization for a given degree of plaque size and luminal stenosis.




86

Carotid Artery Calcifications



- CACs in PRs are described as nodular, verticolinear, irregular and heterogeneous radio-opacities at the level of the third/fourth cervical vertebra that sometimes appear as two parallel radio-opacities

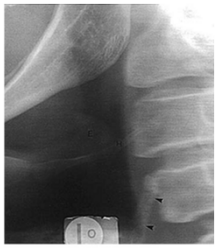
Garoff M, Ahlqvist J, Levring Jäghagen E, Johansson E, Wester P. Carotid calcification in panoramic radiographs: radiographic appearance and the degree of carotid stenosis. Dentomaxillofac Radiol. 2016 Jul;45(6):20160147. doi: 10.1259/dmfr.20160147. Epub 2016 May 10.

87

Triticeous Cartilage calcifications

88

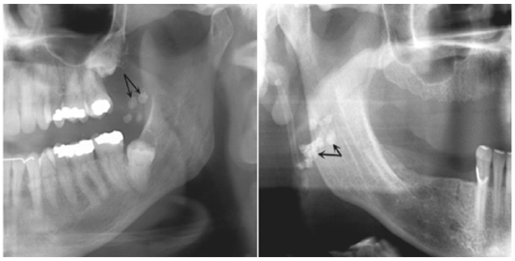
Triticeous cartilage and thyroid cartilage ossifications

Carter LC; Discrimination between calcified triticeous cartilage and calcified carotid atheroma on panoramic radiography. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2000 Jul;90(1):108-10.

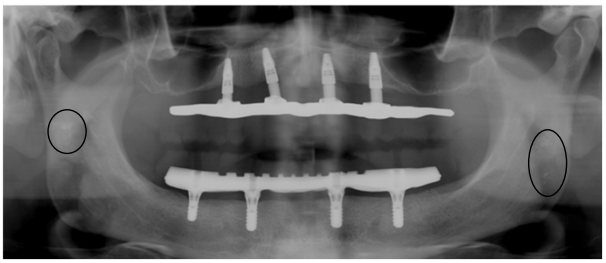
89

Tonsillar calcifications



90

Tonsillar Calcifications



91

Dystrophic Calcifications

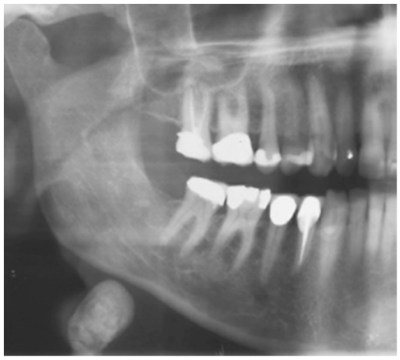
After repeated inflammation, the tonsillar crypts enlarge and cause incomplete resolution of organic debris (dead bacteria and pus, epithelial cells, and food) which can lead to dystrophic calcification.

92

Case 16

History:	Patient was referred by pulmonologist for oral OSA device. Exam revealed pt had difficulty swallowing on left side stating fullness. Exam revealed slightly elevated left floor of mouth, no palpable pathology of floor of mouth and neck. She had been to ER several times and was dismissed stating no findings/problems.
Indications:	Pan was taken showing radiopaque lesions in both ascending ramus. Pt has transient HBP. Apparent in lower left is carotid stent ??? My concern is that the patient is not responding to CPAP for OSA bc there is some other pathology causing the patient to have difficulty breathing. Recommendations for further study

93



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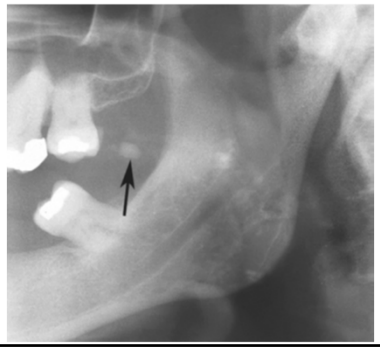

95

Sialolith

Stones found within the ducts of salivary glands

- Submandibular gland (83% to 94%)
- Parotid gland (4% to 10%)

- Patients may be asymptomatic, but they may have a history of pain and swelling at mealtimes

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Systematic approach to evaluating a panoramic radiograph

- Patient positioning error
- Maxillary sinus and nasal fossa
- Submandibular region
- TMJ
- Maxilla and mandible

97

Normal condyle

98

Degenerative Joint Disease: Mandibular condyle

- Cortices
- Articular surface flattening
- Osteophytes
- Subcortical and generalized sclerosis
- Subchondral cysts
- Condylar surface erosion
- Reduction in joint space
- Loose bodies

99

Degenerative Joint Disease

- Any age, incidence increases with age
- Female
- Asymptomatic or symptomatic
- Joint dysfunction
- Onset may be sudden or gradual

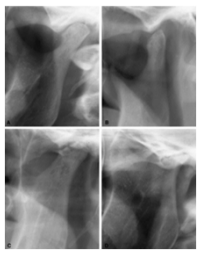
100

Remodeling

- Adaptive response to forces applied to the joint.
- Flattening and sclerosis.
- Abnormal only if accompanied by pain or dysfunction or if the degree of remodeling seen radiographically is severe.

101

Panoramic Radiographs and the TMJ



L. Mia J. Helenius *et al*; **Clinical and radiographic findings of the temporomandibular joint in patients with various rheumatic diseases. A case-control study** Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology, Volume 99, Issue 4, 2005, 455–463

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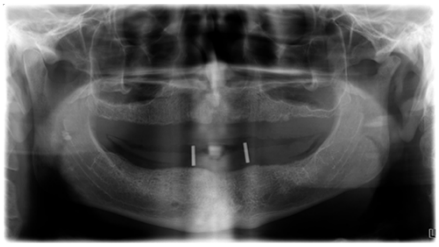
Case 17: Pain while opening mouth on left side



103

Case 18

- 57-yr-old female
- **Chief Complaint:** Pain in throat especially upon yawning, pain deep to b/l mandibular angles, odynophagia, difficulty rotating head
- **History of Present Illness:**
- Myofascial pain. She reports worsening L sided pain that she feels deep to her mandibular angle and in her throat. The pain is especially worse upon yawning and swallowing to the point that she sometimes feels as though she can't swallow or is afraid to.
- PollEv.com/anitagohel118

104

105

Panoramic Interpretation

- Patient positioning error
- Maxillary sinus and nasal fossa
- Submandibular region
- TMJ
- Maxilla and mandible
- Count teeth
- Missing, impacted, supernumerary teeth
- Gross caries and restorations
- Developmental stage (children)
- Radiolucencies/radiopacities
- Loss of lamina dura
- Symmetry across arches
- Trace canal posterior → anterior
- Look for displacement or narrowing
- Identify mental foramen correctly

106

Case 19

107

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Case 20

- “Evaluation #18:
- Extraction tooth #17 with Dr. X in 2013. Advanced attachment loss, furcation involvement and 1+ mobility.
- Food impaction distal tooth #18. Chemical burn: using Ambesol, Peridex, and salt water rinses excessively. Refer back to Dr. X for extraction of tooth #18 and (bone)graft for future implant.

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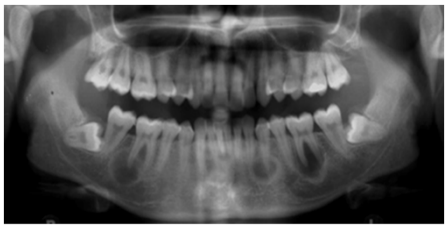
Case 21

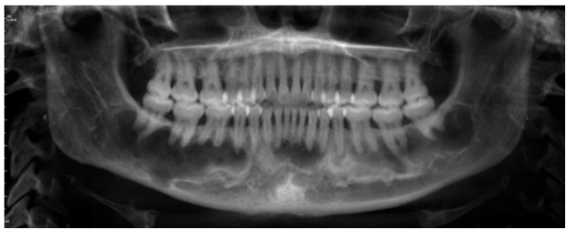
110

Case 22



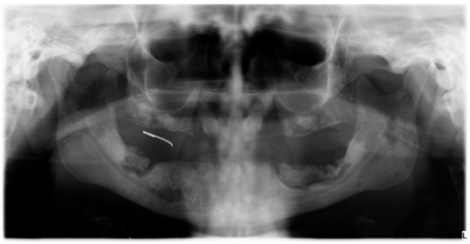
111

Case 23: 22-yr old female



112

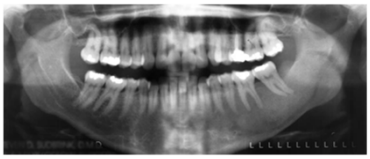
Case 24



113

Case 25

- A thirty-four year old female complained of swelling in the left side of lower jaw.
- Clinical exams revealed bony hard swelling in the left mandible.



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Case 26

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Case 27

116

Case 28

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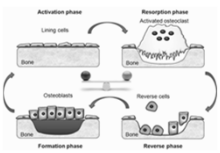
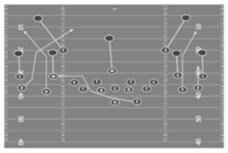
The game plan of radiographic analysis

Offense: The lesion

Defense: Surrounding tissues

Radiographic Vision: Understanding the body response





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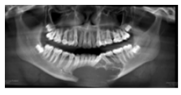
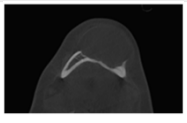
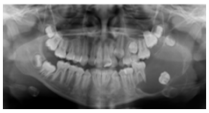
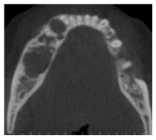
Radiographic Diagnosis









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Systematic Approach to Radiographic Diagnosis

* Case History/Information
Step 1: Lesion location, Size and Number of Lesions
Step 2: Margins/ Zone of transition
Step 3: Matrix
Step 4: Effect of lesion on surrounding structures
Step 5: Periosteal Reaction
Step 6: Presence of soft-tissue component

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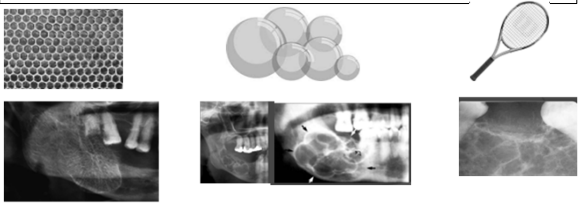
Multilocular lesions



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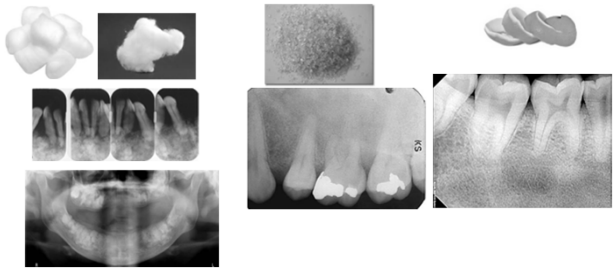
Radiopaque/mixed density lesions



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	Age	Features	
Fibrous dysplasia	Usually young patients	Early lesions radiolucent Later, ground glass appearing bone Displacement of structures Expansion	
Cemento-osseous dysplasia	Black females, 3th to 5th decade	Apices of vital teeth Early lesions radiolucent Then mixed density and then radiopaque lesions	
Ossifying fibroma		Well-defined RL with radiopacites, displacement, root resorption, expansion	
CGCG	Young	Multilocular lesion, Granular bone Expansion, displacement and root resorption	
Paget's	Older Men	Cotton-wool appearing bone, Usually bilateral Hypercemtentosis	

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Radiographic features of malignant lesions

Poorly defined

Non-corticated, irregular margin

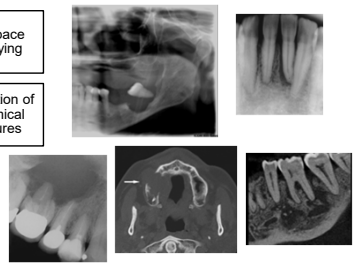
Non-space occupying

Irregular widening of PDL

Non-resorption of teeth (usually)

Destruction of anatomical structures

Teeth floating in space



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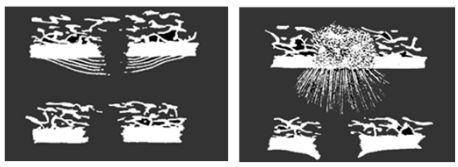
Periosteal Reaction



Adapted from White & Pharoah, sixth edition

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Case 29 1/16

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Features that differentiate malignancies from inflammatory lesion

Features	Inflammation	Malignancy
Location	Can invade bone from adjacent structures	Can invade bone from adjacent structures
Shape	Irregular	Irregular
Borders	Ill-defined, permeative, rarely corticated; wide transition zone	Ill-defined, permeative, rarely corticated; wide transition zone
Density	Depending on stage & type, Varies from radiolucent to opaque and also mixed Sequestrum formation	Mostly radiolucent Remnant trabeculation may mimic sequestra
Size	Any size	Any size
Internal structure	Altered/resorbed trabecular pattern	Same
Effects on surrounding structures	Resorptive and/or stimulating new bone formation effects on adjacent cortices/medullary bone Root resorption Interruption/perforation of cortices Periosteal reaction ("onion skin")	No effect in surrounding trabecular bone No periosteal reaction (exception osteosarcoma: "sunburst", codman's triangle) Most frequently no root resorption Perforation, pathologic fracture, invasion present

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Case 30

- 59 yrs-old female
- Implant evaluation
- Breast cancer in remission for 12 years
- Oral bisphosphonate

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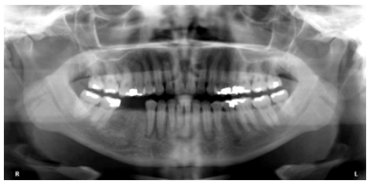
Case 30



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Widened PDL

- Localized:
  - Occlusal trauma
  - Osteosarcoma/metastatic lesions
- Generalized
  - Scleroderma

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Radiographic Features of Metastatic Lesions:

Metastatic tumors do not possess a pathognomonic radiographic appearance.

Can be a lytic or opaque lesion with ill-defined margins.

Metastases from prostate cancer nearly always form osteoblastic lesions in bone. Breast cancer metastasis may also appear radiopaque.

Maybe seen as a solitary radiolucency of the jawbone which may simulate an infected cyst or osteomyelitis.

The entire mandible may also have a moth-eaten appearance.

The cortical bone of adjacent structures such as the mandibular canal, maxillary sinus and nasal floor is resorbed/destroyed.

Extension through the cortical plate of the jaws may stimulate a spiculated periosteal reaction.

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Why is it important?

The prevalence of oral malignancy is low, many general dentists practice years without encountering a patient with a malignant neoplasm.

This rarity may make a dentist less likely to recognize a malignant condition when it is present.

The risks of lack of attention to this possibility are delayed diagnosis, delayed treatment, increased need for aggressive treatment with added morbidity, and, in the worst case, premature death.

Radiologic investigation can determine the presence of osseous involvement from soft tissue neoplasm, help to determine good biopsy sites, and allow the practitioner to assess the involvement of lymph nodes and treatment outcome.

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Final Thoughts

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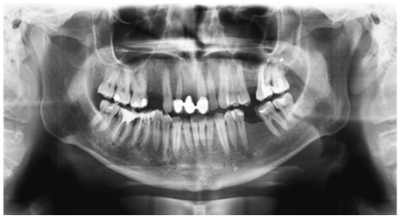
Case Discussion

- Bones tell the truth
- Caries, PDL widening, and early periapical disease are poorly assessed on panoramics
- Bone pattern, symmetry, borders, and displacement are far more reliable
- If a pano *suggests* pathology, confirm with targeted intraoral or CBCT imaging.



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Section	Item to Evaluate
1. Image Quality	Patient positioning errors
2. Dentition (Right → Left)	Tooth count appropriate for age
	Missing / impacted / supernumerary teeth
	Periapical radiolucencies or radiopacities (screening)
3. Alveolar Bone	Crestal bone height (generalized vs localized)
	Trabecular pattern
	Furcation involvement (screening)
	Edentulous ridge morphology
4. Mandible	Inferior border continuity and symmetry
	Body, angle, ramus pathology
	Inferior alveolar canal traced bilaterally
	Mental foramina identified and symmetric
5. TMJs	Condylar size and symmetry
	Cortical integrity
	Degenerative changes
6. Maxilla & Maxillary Sinuses	Sinus size and symmetry
	Sinus floor integrity
	Mucosal thickening / opacification
7. Nasal Cavity & Midface	Nasal septum alignment, Inferior turbinates
	Hard palate continuity
	Incisive canal / foramen
8. Soft Tissue & Cervical Region	Hyoid bone / ghost images
	Stylohyoid ligament calcifications
	Cervical spine appearance
	Soft-tissue calcifications (screening)
9. Artifacts & Pseudolesions	Ghost images identified
	Air spaces recognized
	Jewelry / prostheses
10. Global Assessment	Right–left symmetry assessed
	Borders well-defined vs ill-defined
	Additional imaging needed

If something feels odd, it probably is
That quiet gut feeling matters.
- •Pause
- •Re-trace anatomy
- •Consider additional imaging

first clue that something's off.

Key Reminders
Panoramic radiographs are screening exams.
Suspicious findings require focused imaging for diagnosis.

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Thank You!!

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