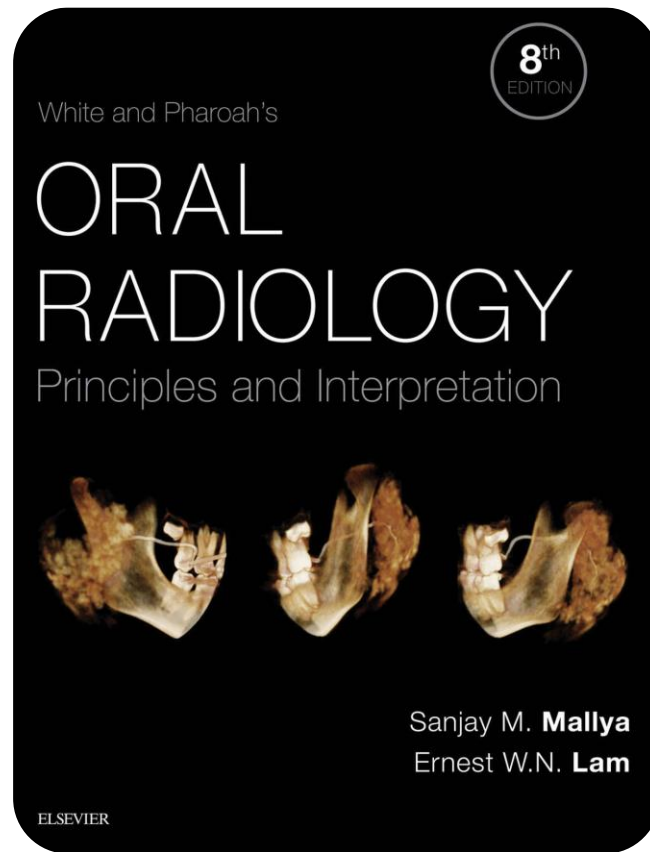
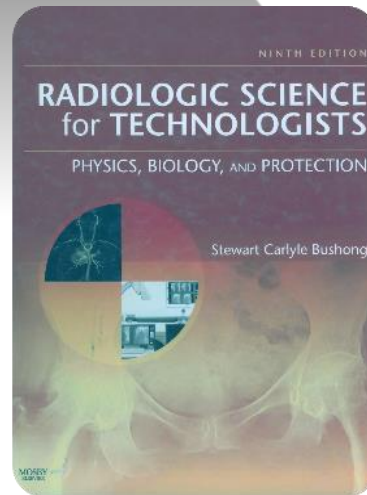
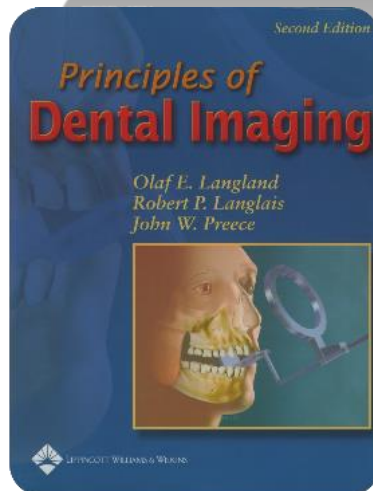




In the name of God

Tahmineh Razi (DDS. MSc)

Email: tahmine_razi@yahoo.com



- The perceived **nature or severity of an abnormality** (including its size and accessibility)
- The ability of the **imaging technique** to accurately reveal the characteristic diagnostic features of the abnormality (sensitivity and specificity)
- The amount of **image detail** required (resolution)
- The **radiation dose** to the patient

Radiologic Examinations



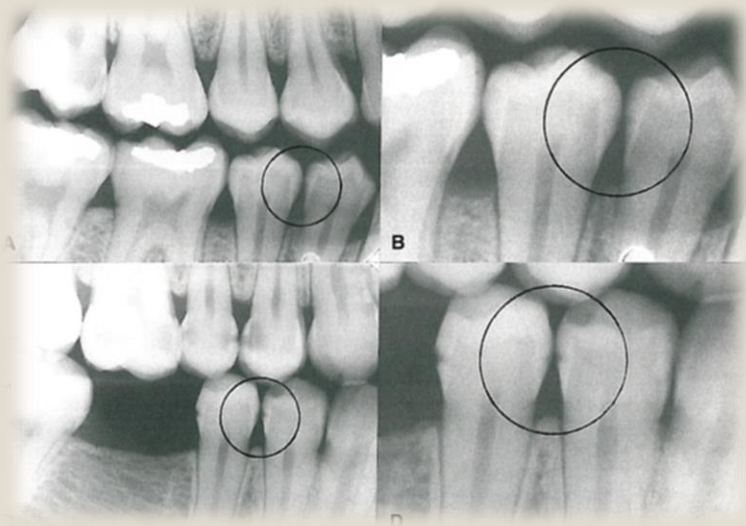
Diagnostic images:

- **Intraoral** radiographies



-
- **Extraoral** radiographies





Advantages and disadvantages

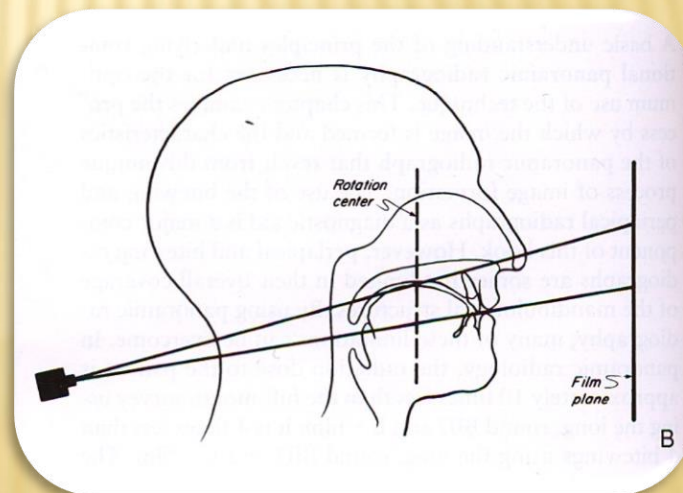
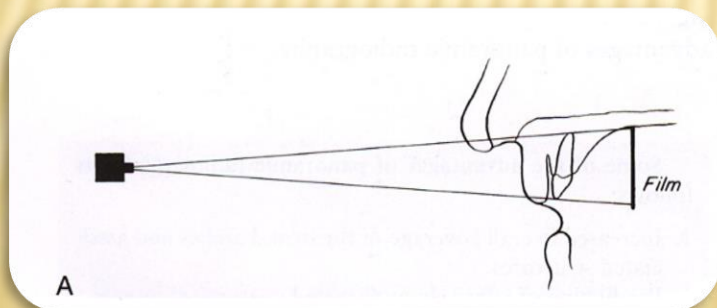
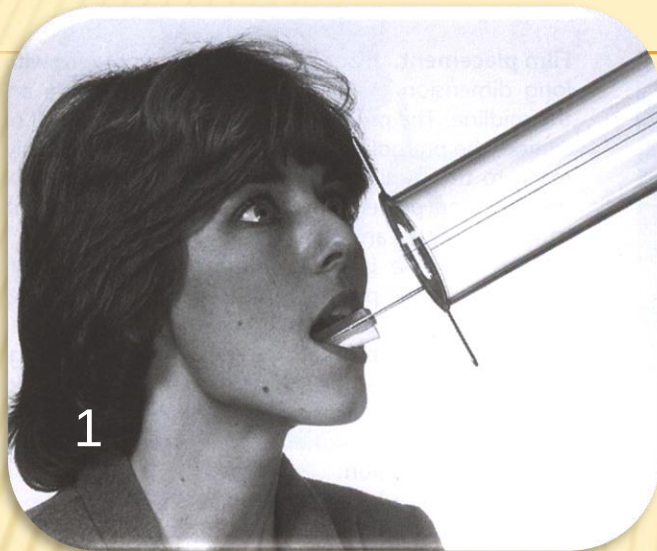


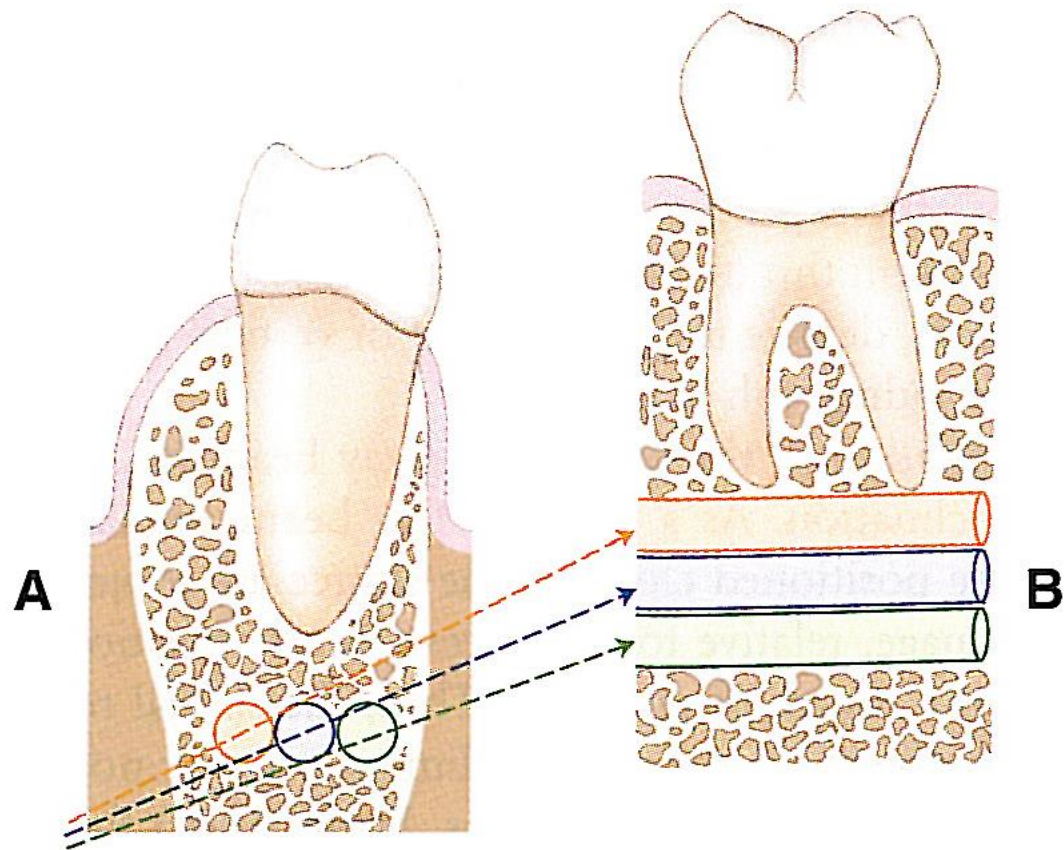
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68/ 8 TANNINE RAZI DR. RAZI RADIOLOGY

L

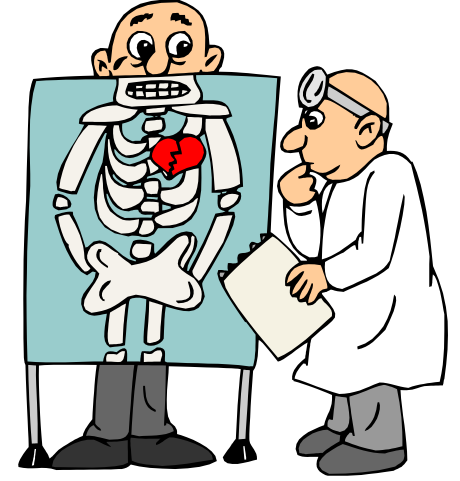






Orthopantomograph

~~OPG~~



✓ تصویر پانورامیک

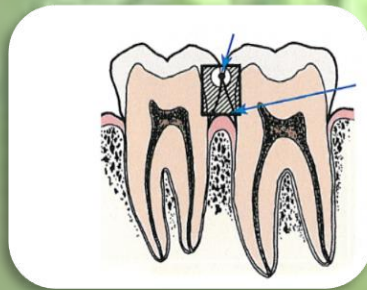
✓ Panoramic image

✓ پانورامیک عہسی ایسٹیرم

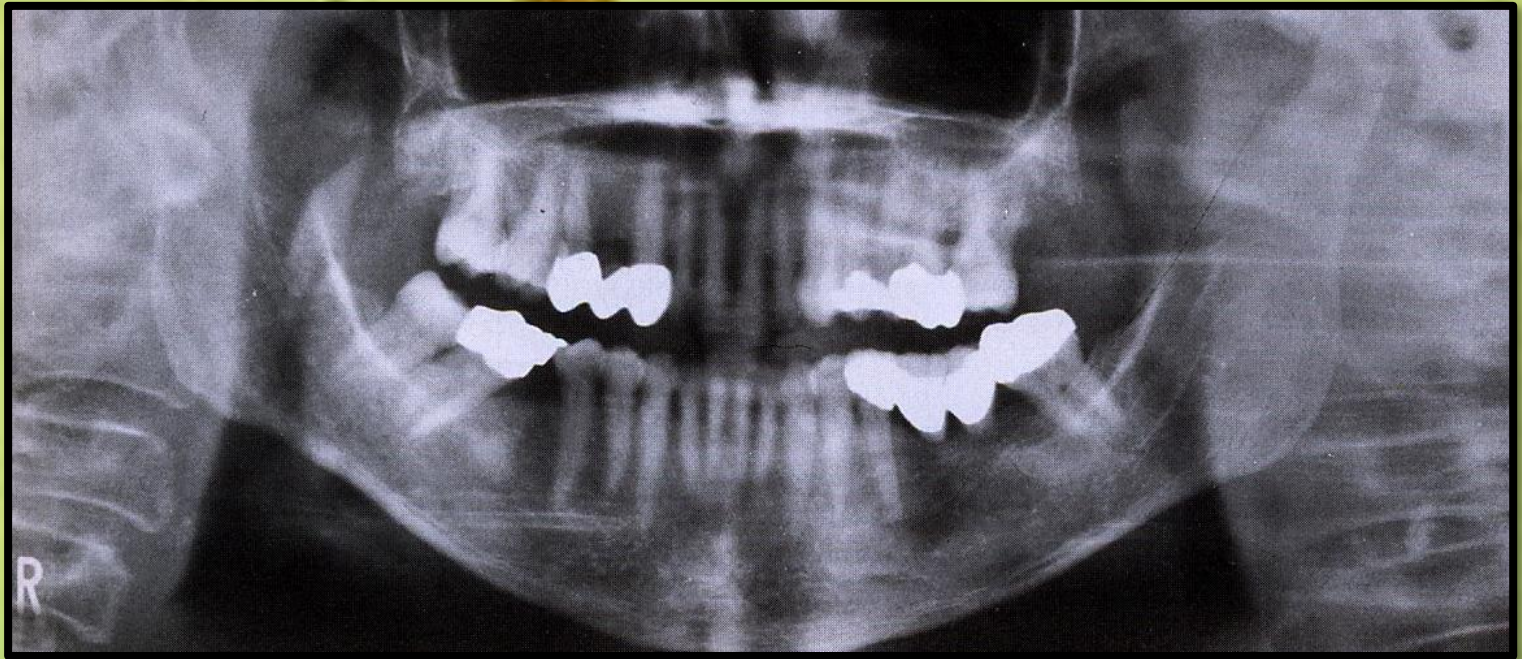
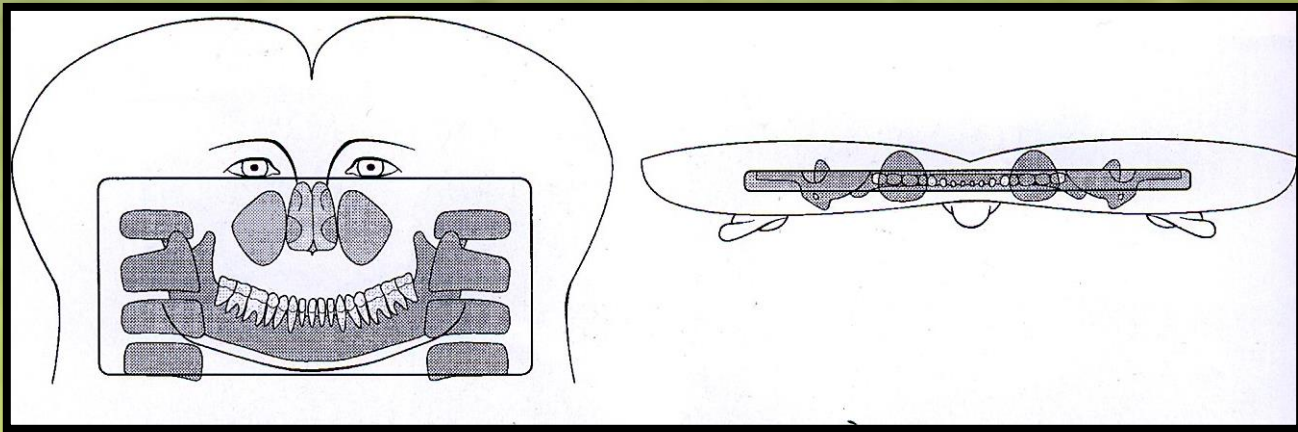


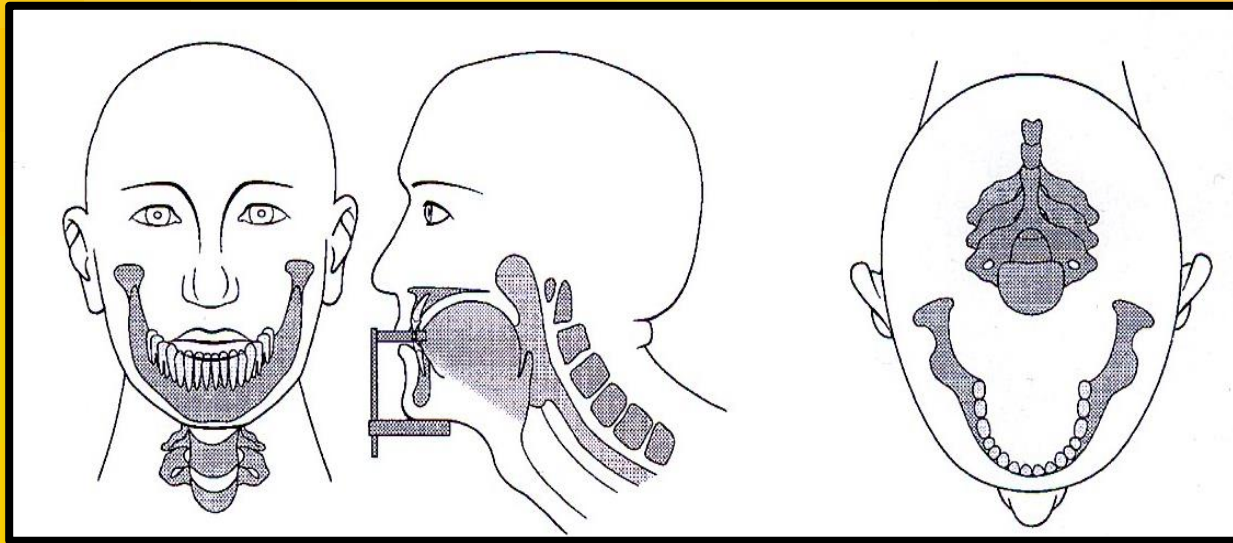
Occult Disease

- **Screening imaging** (mammography)
- **Occult disease** (interproximal caries)

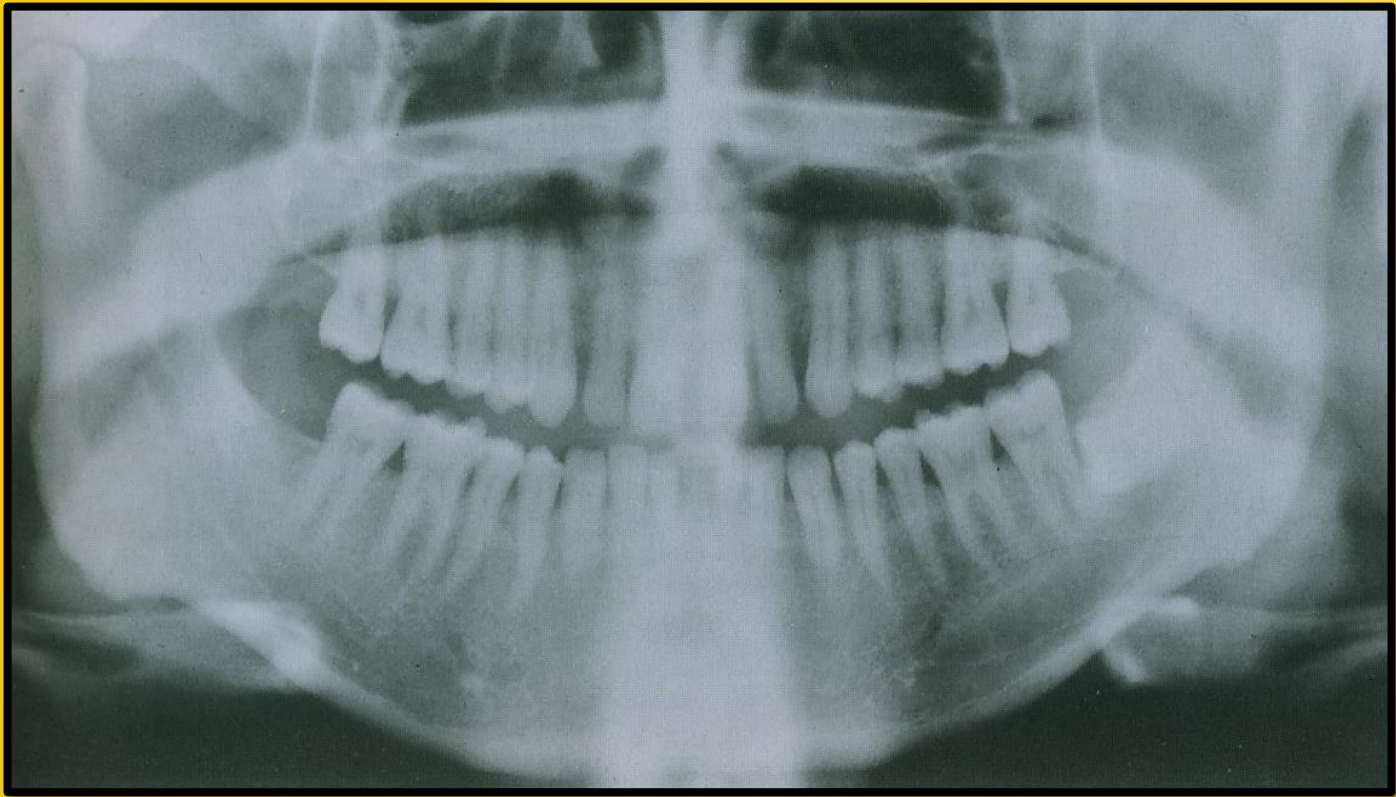
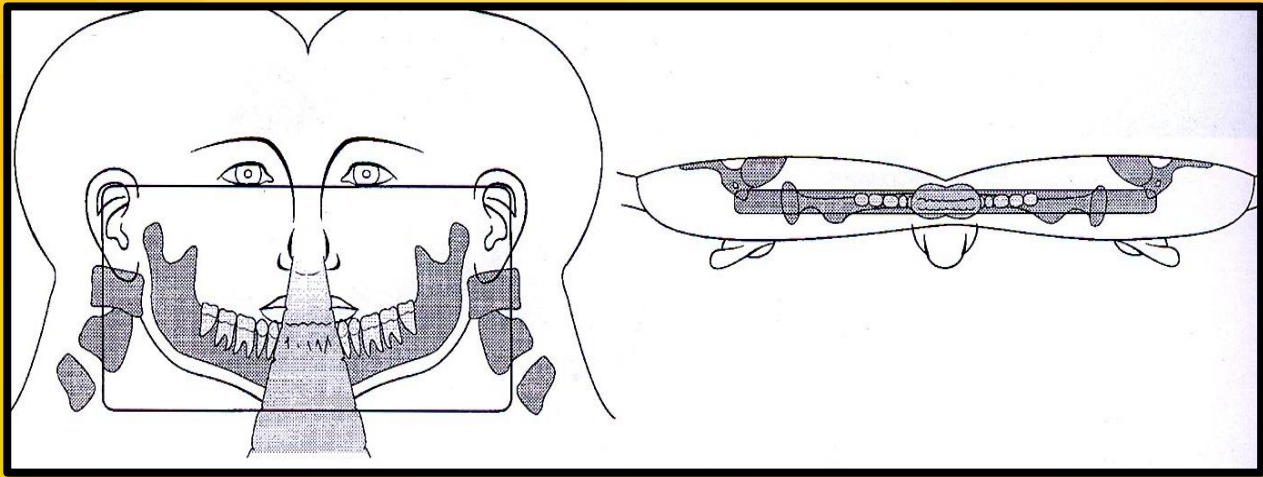


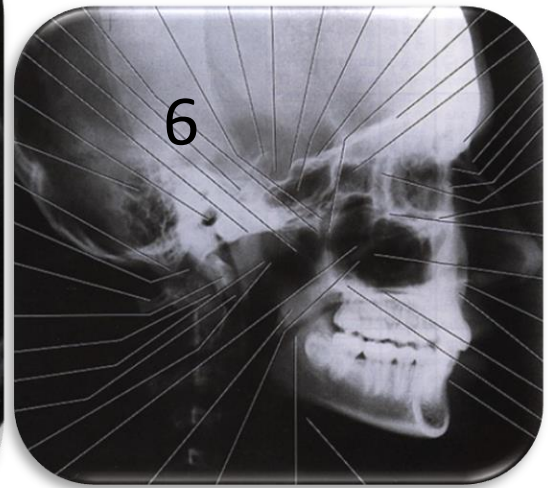
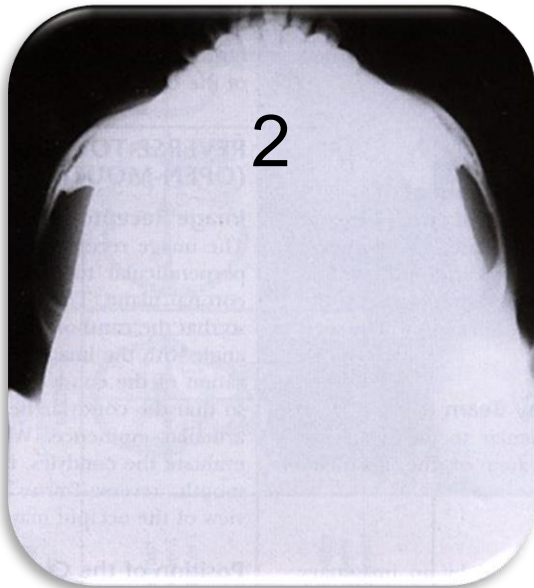
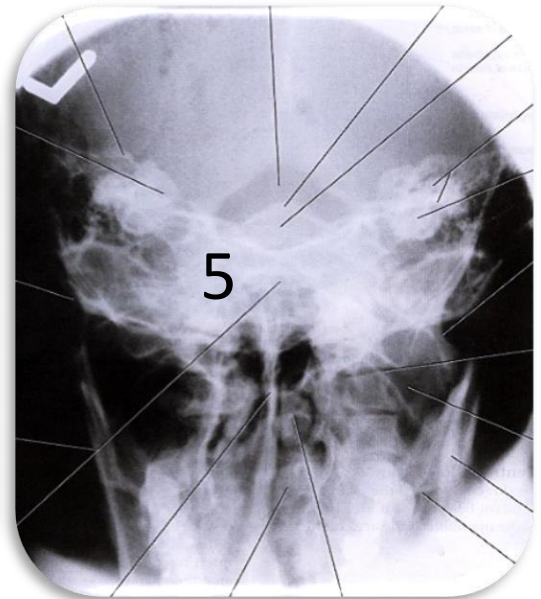
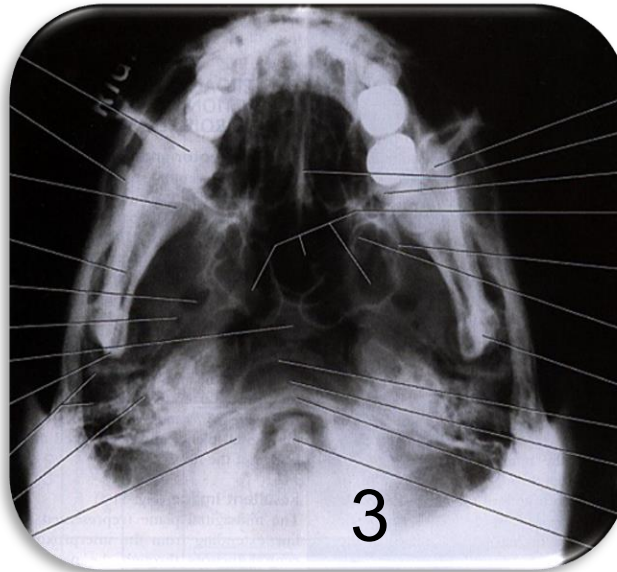
Our philosophy is that the prescription of diagnostic imaging should be based on the need for diagnostic information for patients on a case-by-case basis.



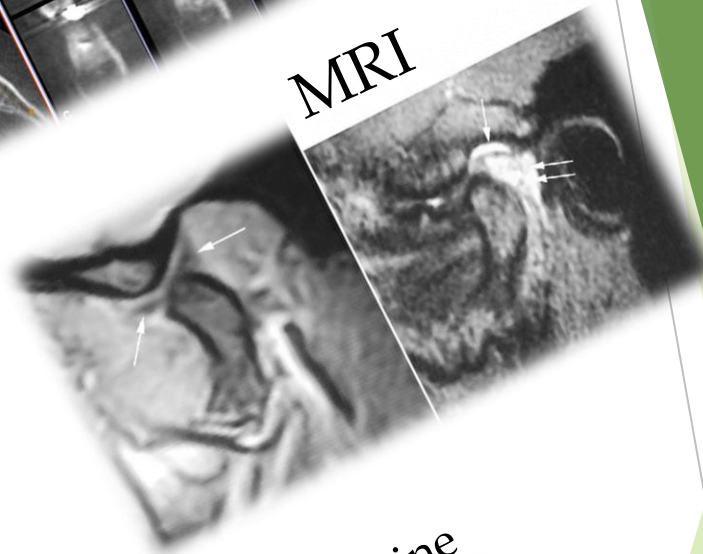
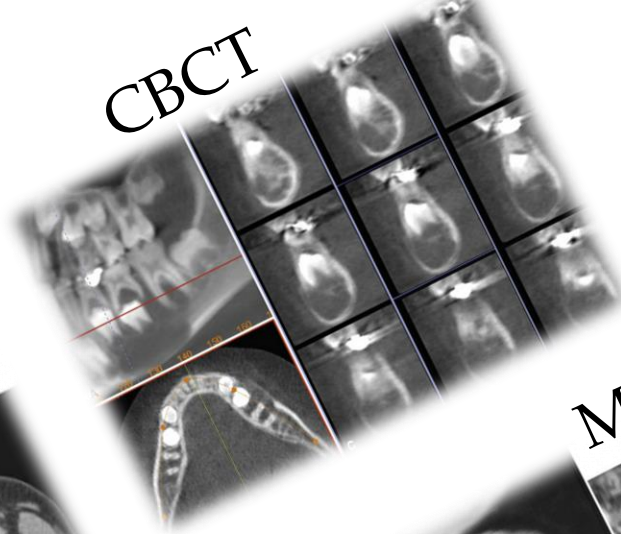
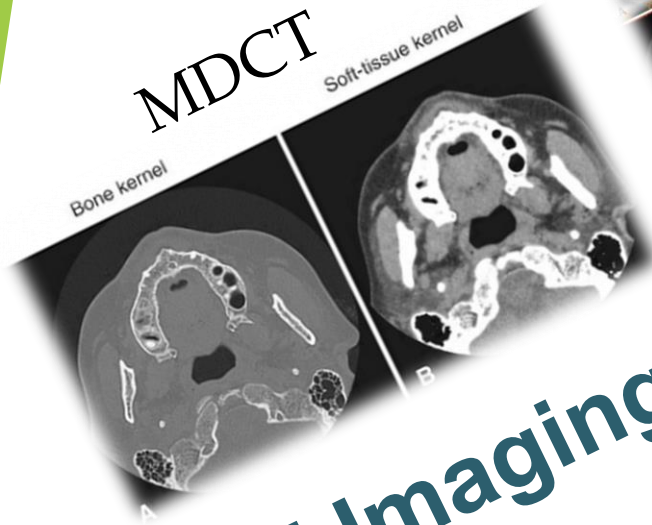


Slumping

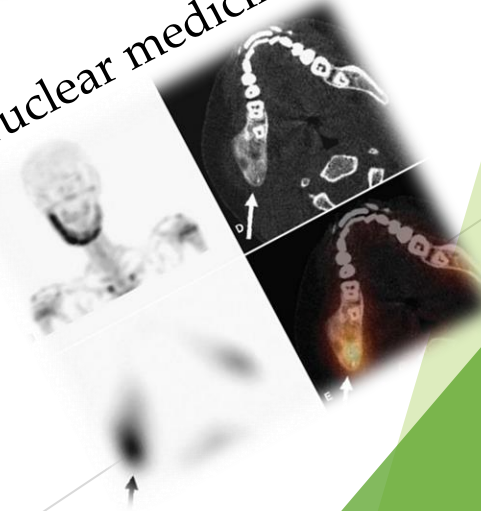




Advanced Imaging



Nuclear medicine



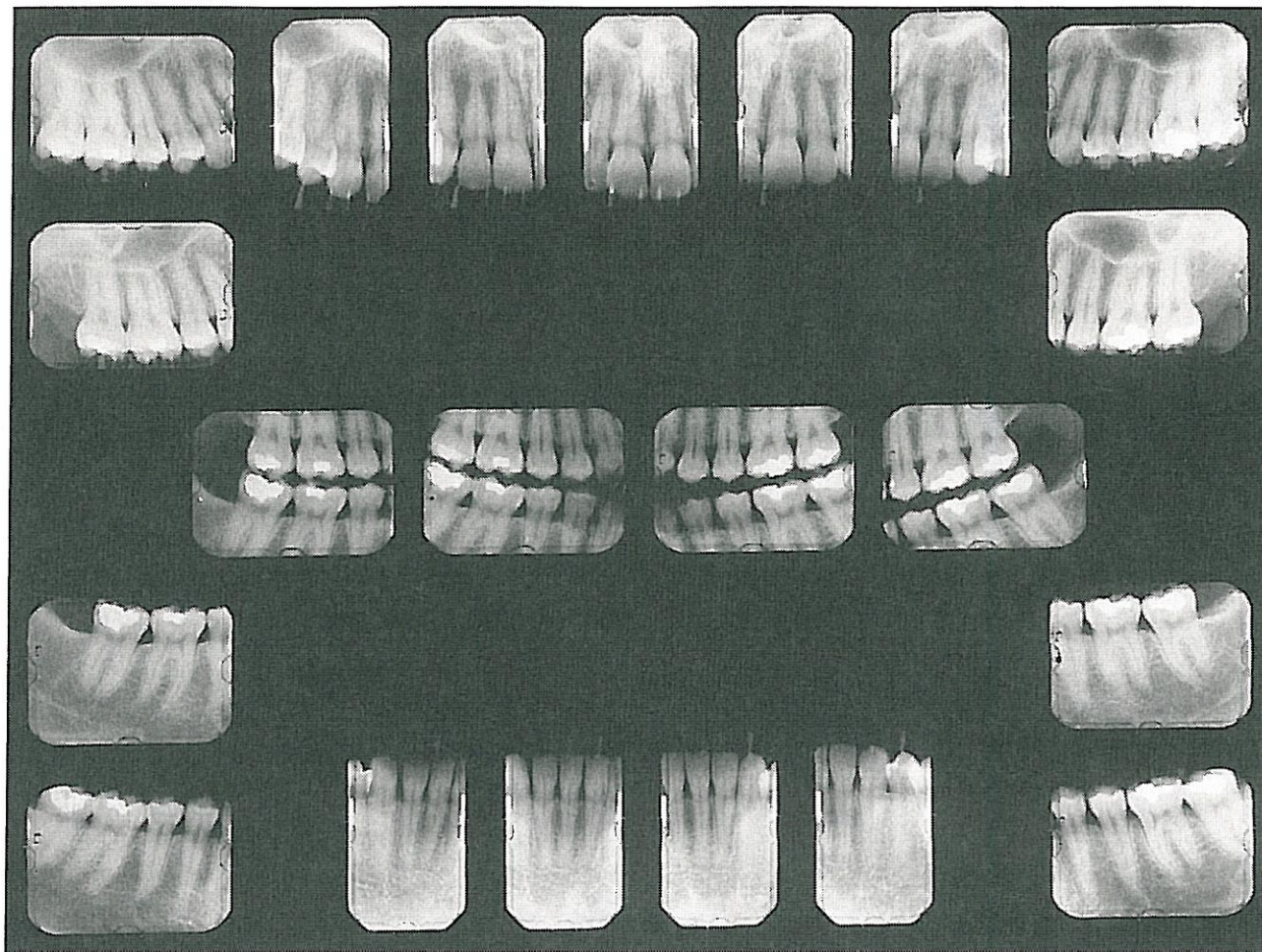
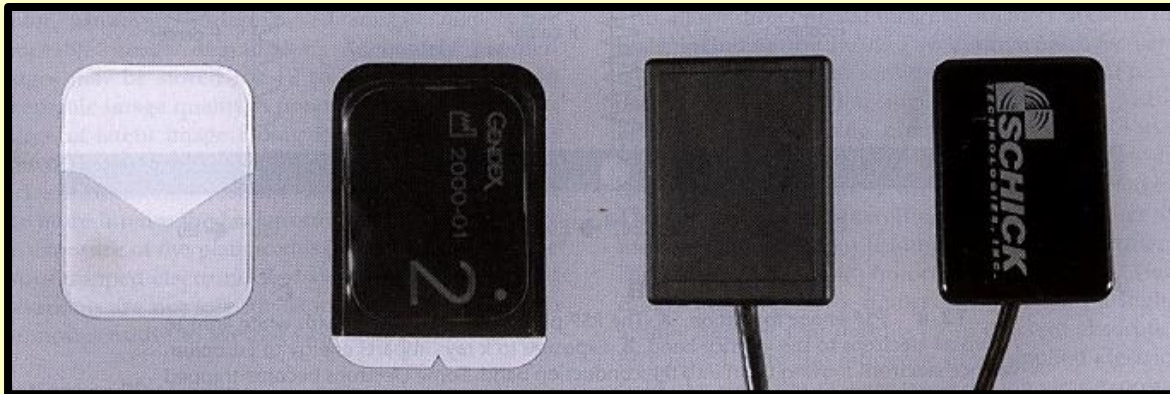


FIGURE 7-1 Mounted full-mouth set of film radiographs consisting of 17 periapical views and 4 bitewing views. Digital images may be positioned in various arrangements depending on the software and preferences of the user.

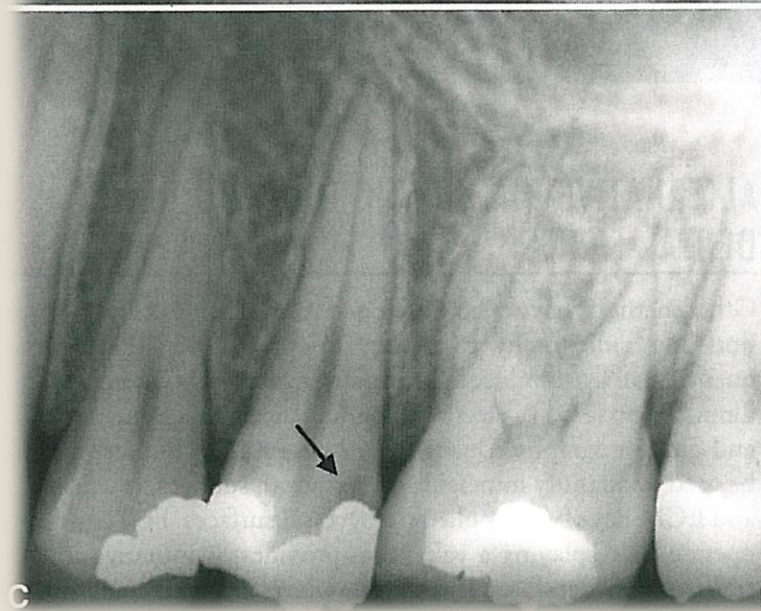
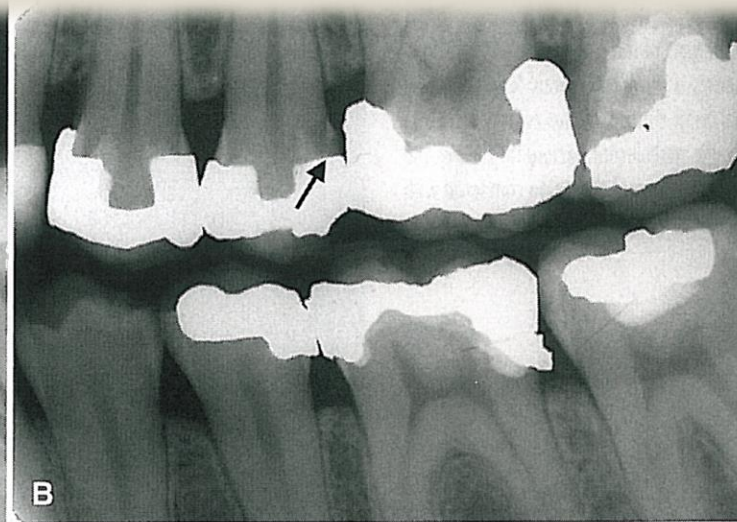
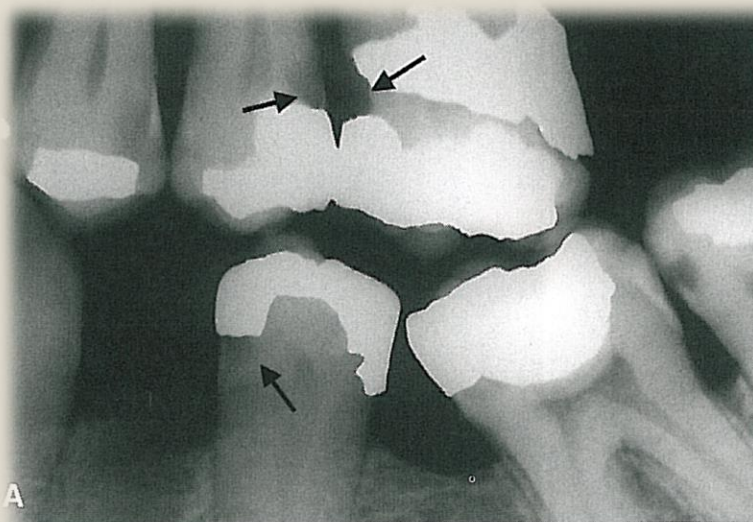
Digital images:



Caries

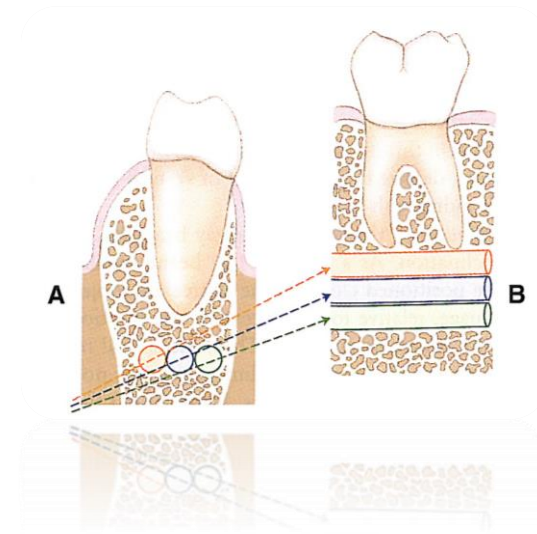
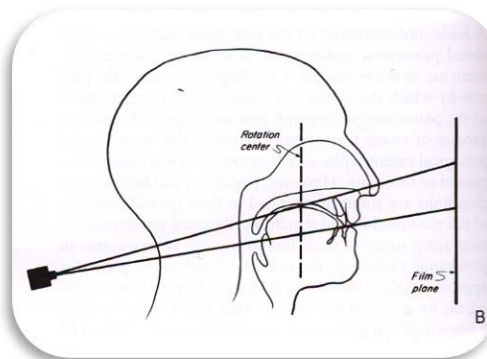
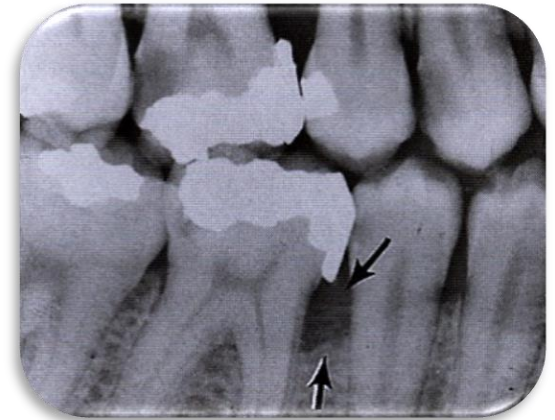
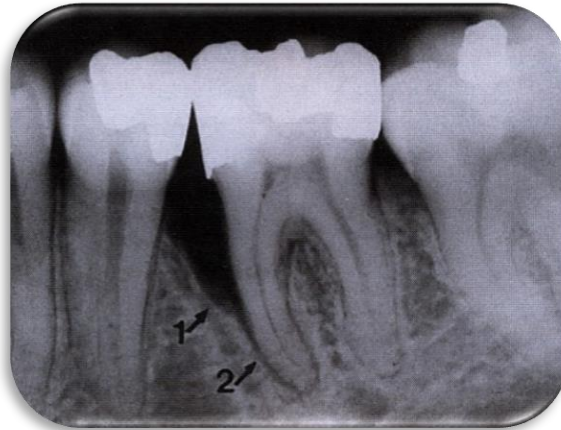
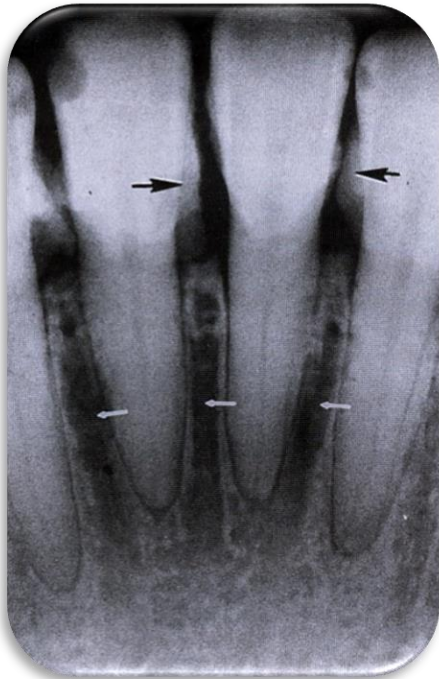
(the most common dental disease)







Periodontal diseases:

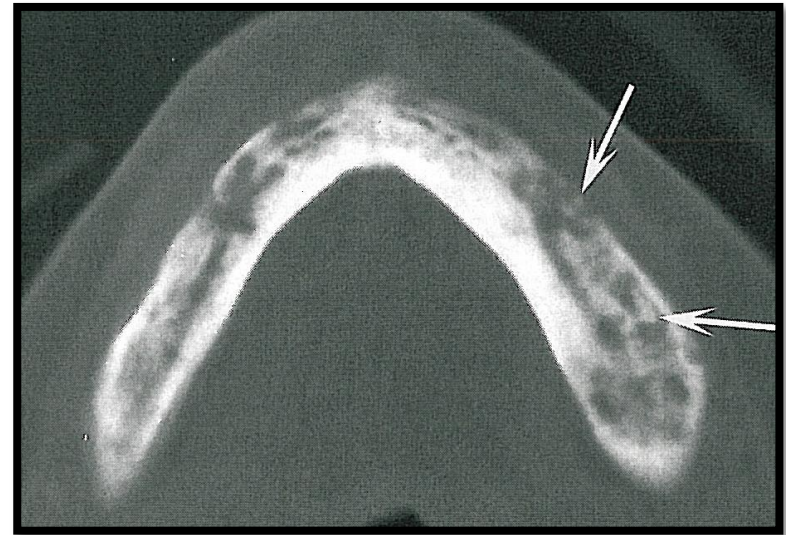


Periapical inflammation disease:

- Periapical



- CBCT



Abnomalities:



Flexion



Dilaceration



Concrescence



Fusion



Dwarfed roots



Accessory roots

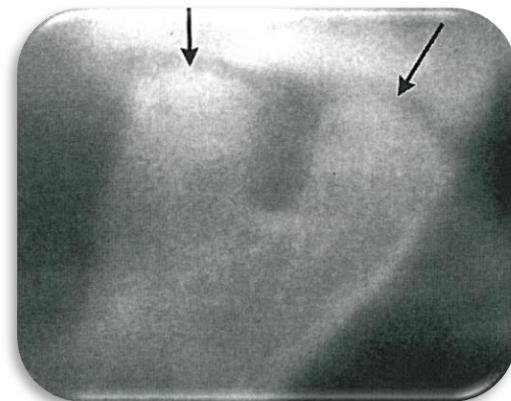
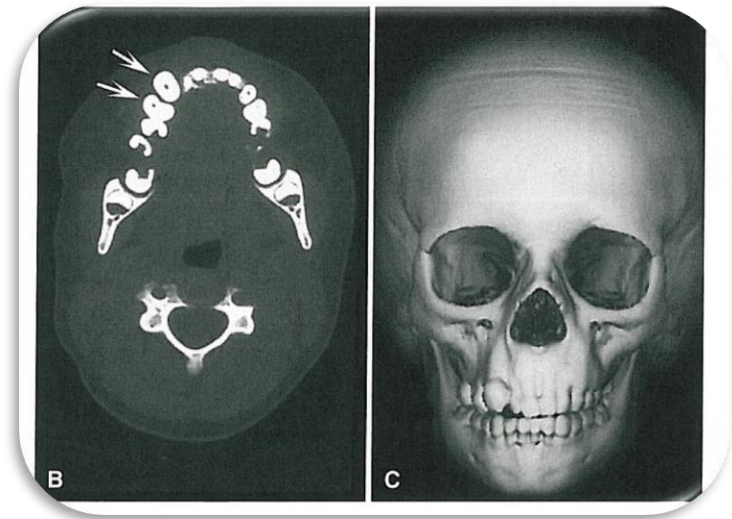
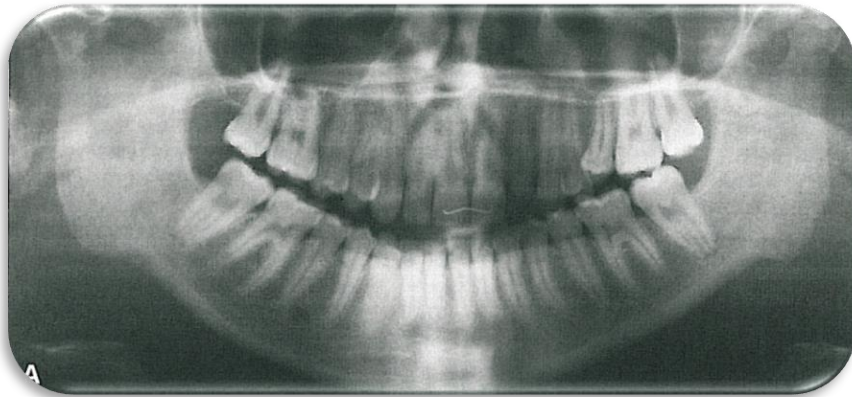


Hypercementosis

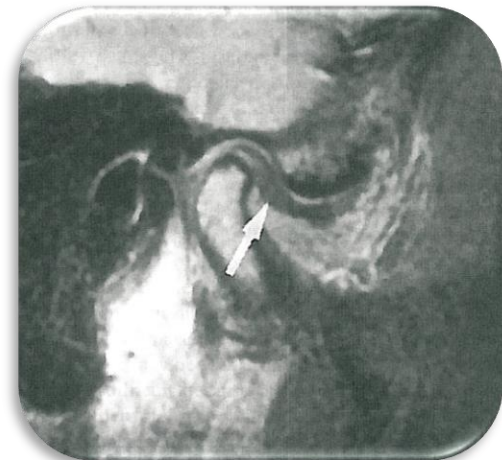
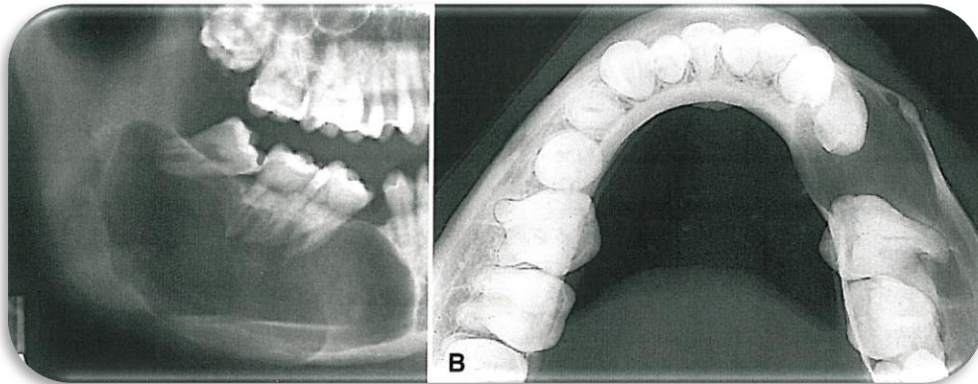


Enamel pearl

GROWTH AND DEVELOPMENT AND DENTAL MALOCCLUSION

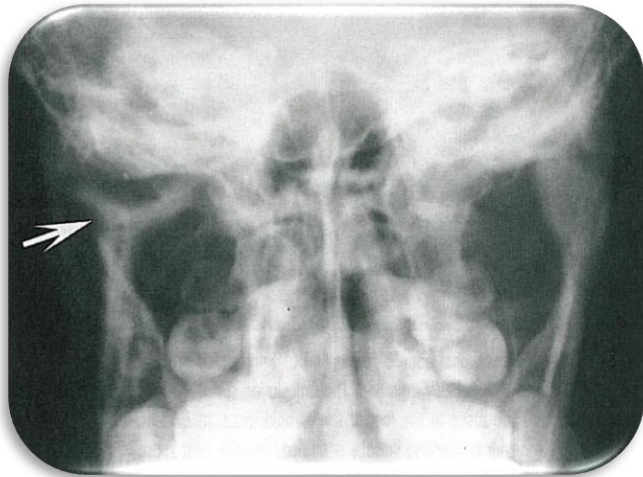
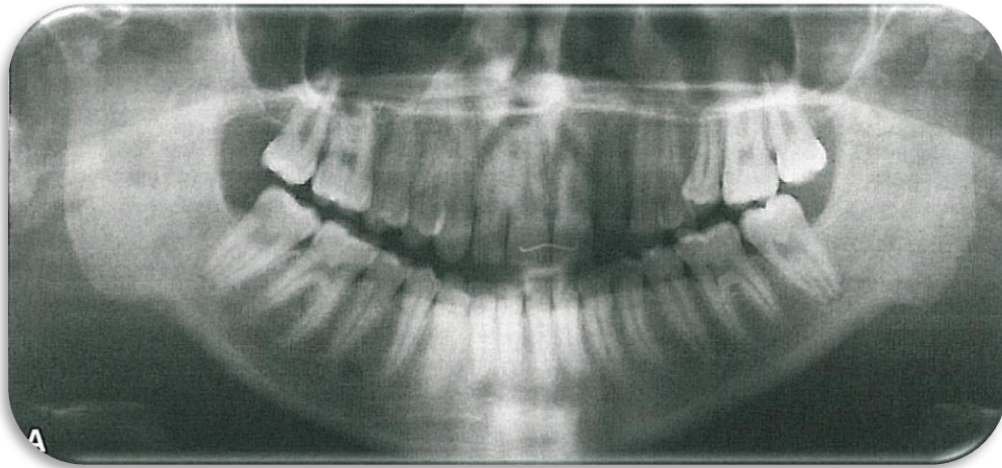


Jaw diseases

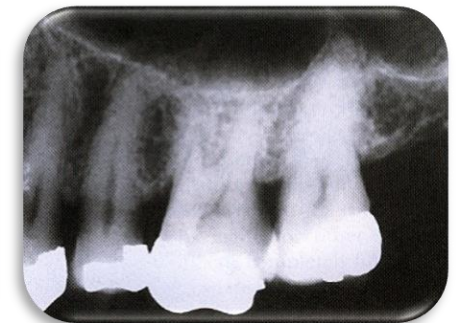
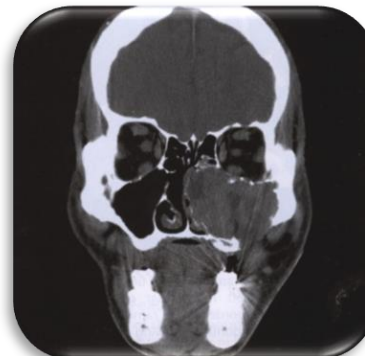
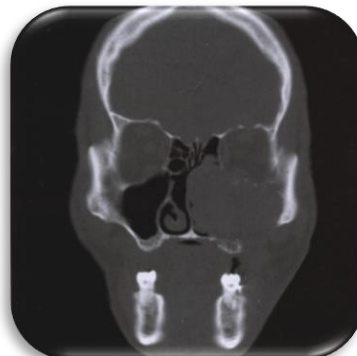
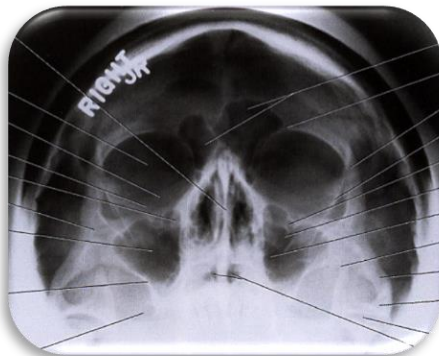
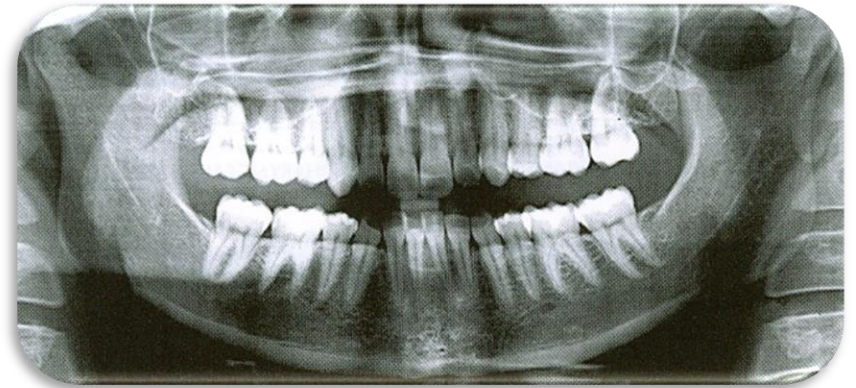
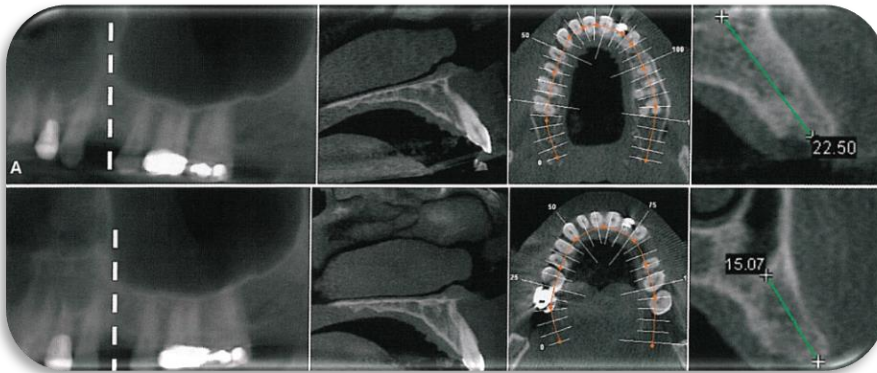




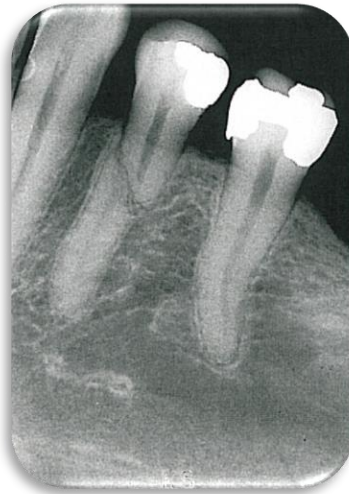
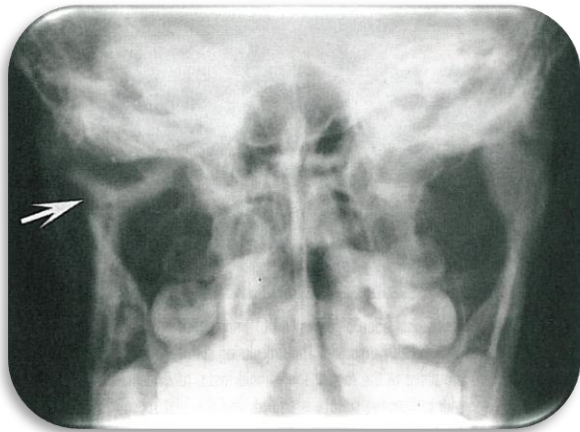
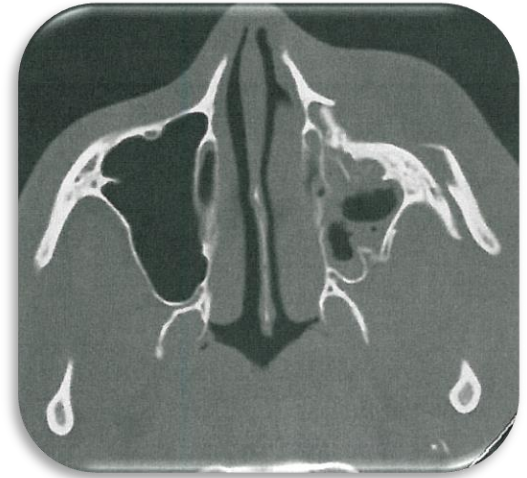
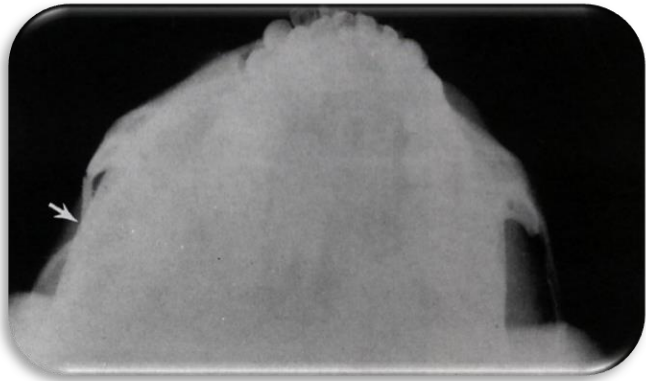
TMJ (TMD)



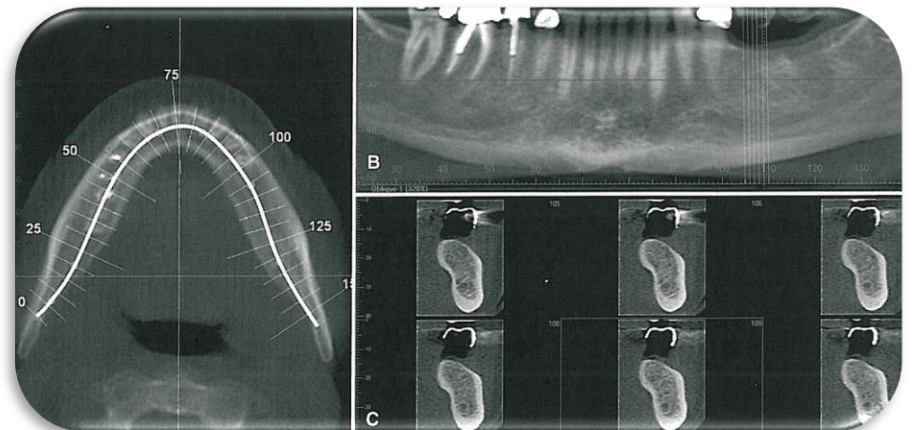
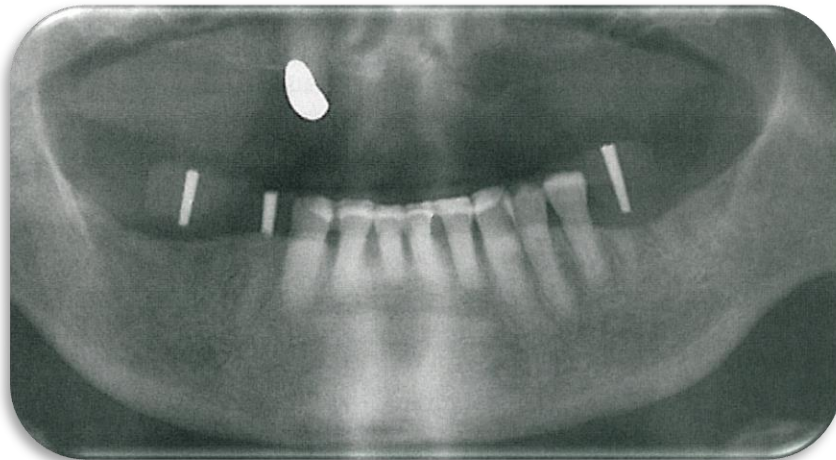
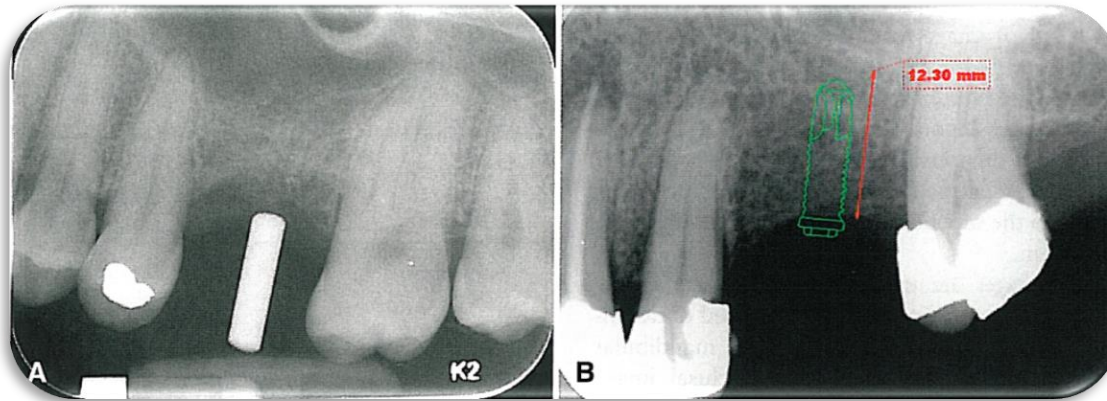
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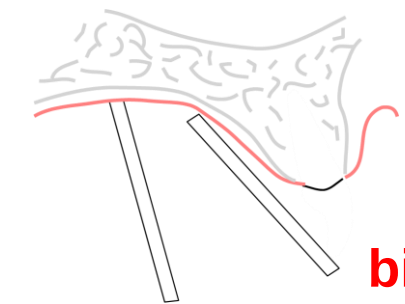


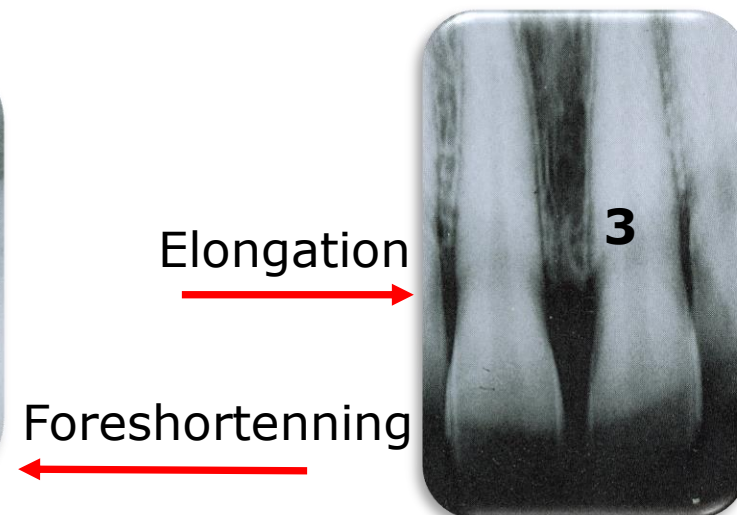
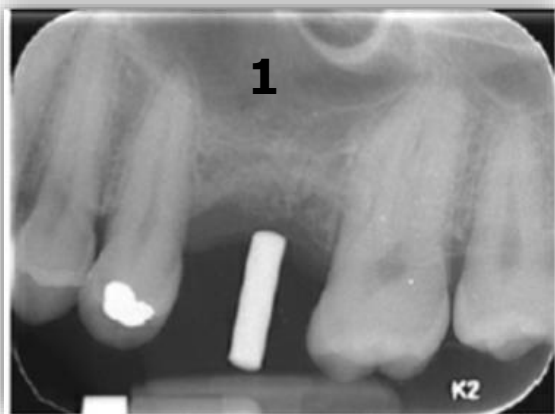
Trauma



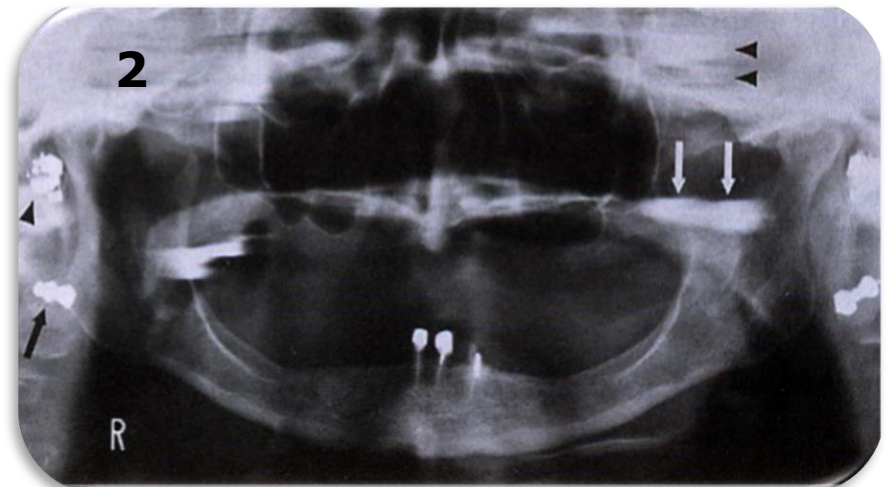
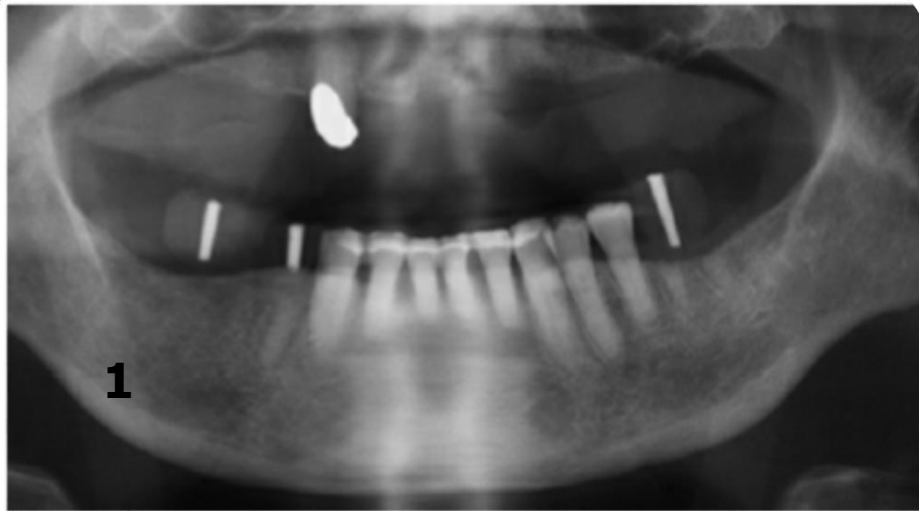
Implant



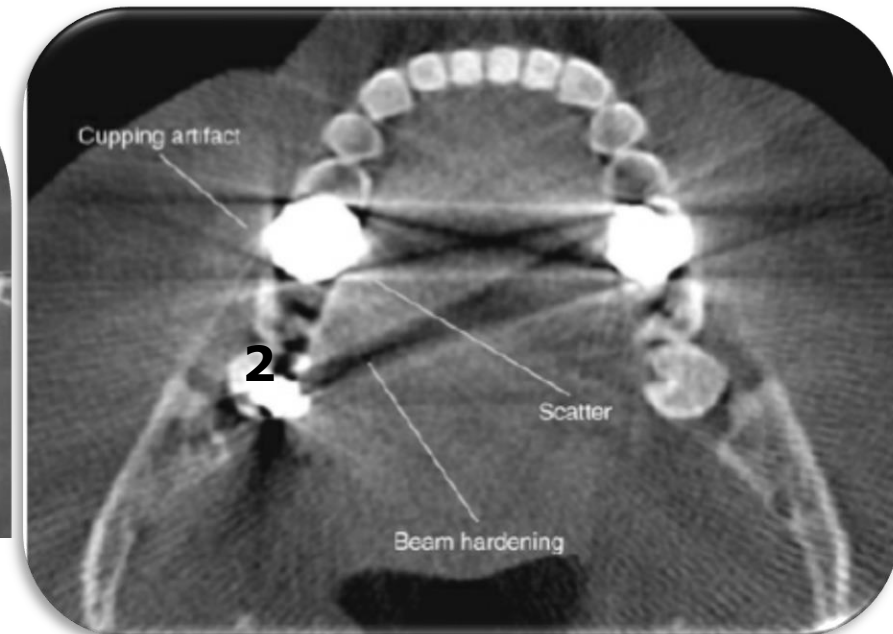
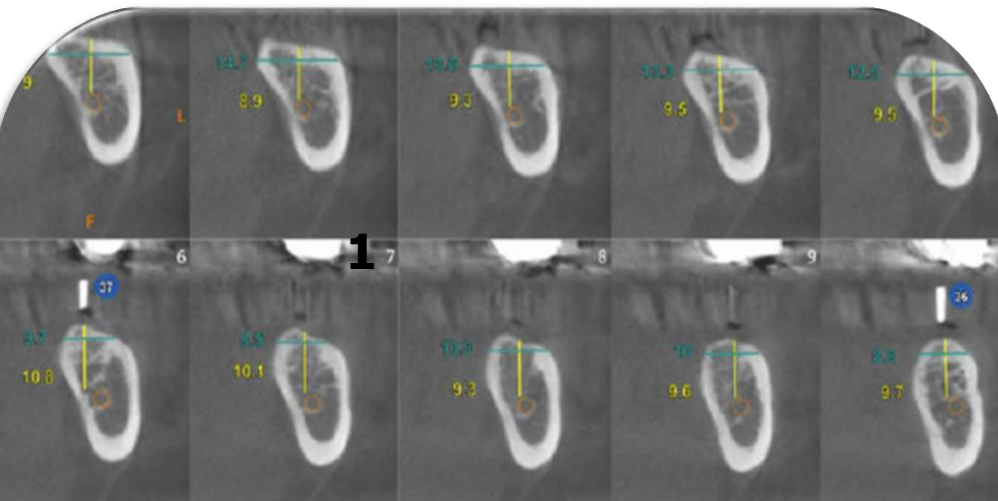
Imaging Technique	Advantages	Disadvantages	Recommendation
Periapical imaging	• Readily available • High resolution • Minimal distortion • Lowest financial cost and radiation exposure	• Restricted anatomic coverage • Cannot assess buccolingual dimension • Subject to elongation and foreshortening • Anatomic superimposition • Difficult to reproduce projection geometry • May be limited by patient compliance and anatomy	• Initial assessment of single edentulous space or short edentulous span • Intraoperative imaging during implant placement • Initial postoperative radiograph and recall imaging  bisecting paralleling



Panoramic imaging	• Readily available • Broad anatomic coverage • Low financial cost and radiation exposure	• Image distortion • Anatomic superimposition and ghost images • Lower • Cannot assess buccolingual dimension • Technique sensitive	• Initial examination of multiple edentulous spaces • Radiographic follow-up of multiple implants
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CBCT imaging	• Variable field of view: from single edentulous site to full jaws (manufacturer-dependent) • 3D tomographic imaging: no superimposition • Dimensionally accurate • Increasingly accessible • Simulate implant surgery with specialized software	• Moderate financial cost and radiation exposure • Susceptible to beam hardening artifacts • Technique-sensitive (especially to patient motion) • Special training for interpretation • Not calibrated for bone density measurements (HU) • Poor soft tissue contrast	• Following initial examination, CBCT is recommended for thorough radiologic assessment • Recommended before and after bone augmentation • Postoperatively, recommended for symptomatic implants (implant mobility, altered sensation, displaced implant) • Not appropriate for asymptomatic recall imaging
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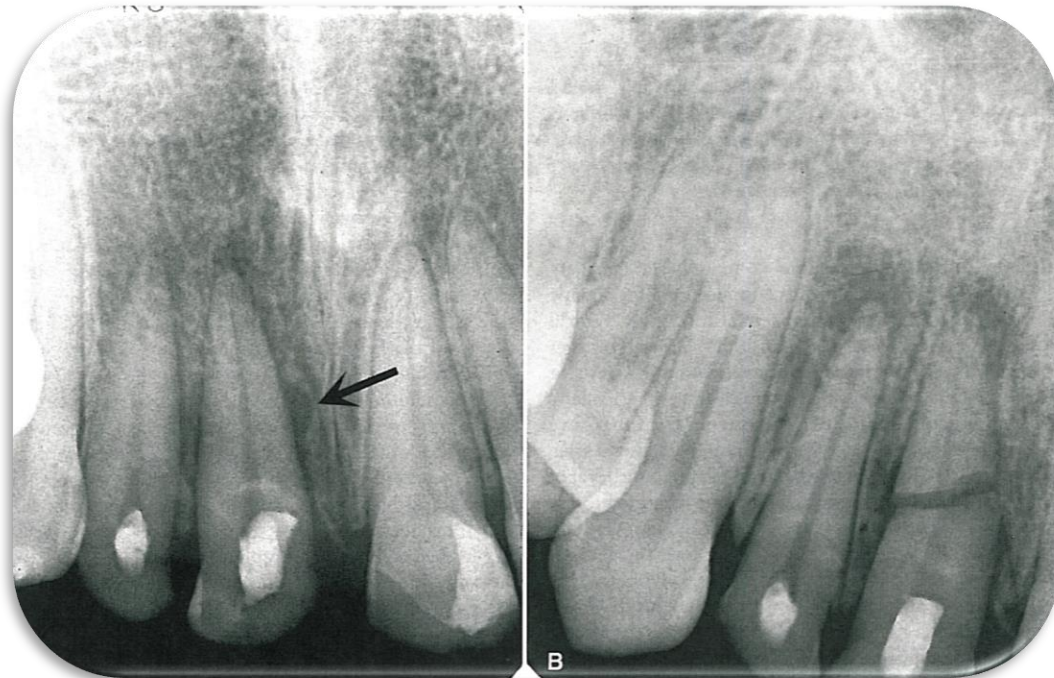
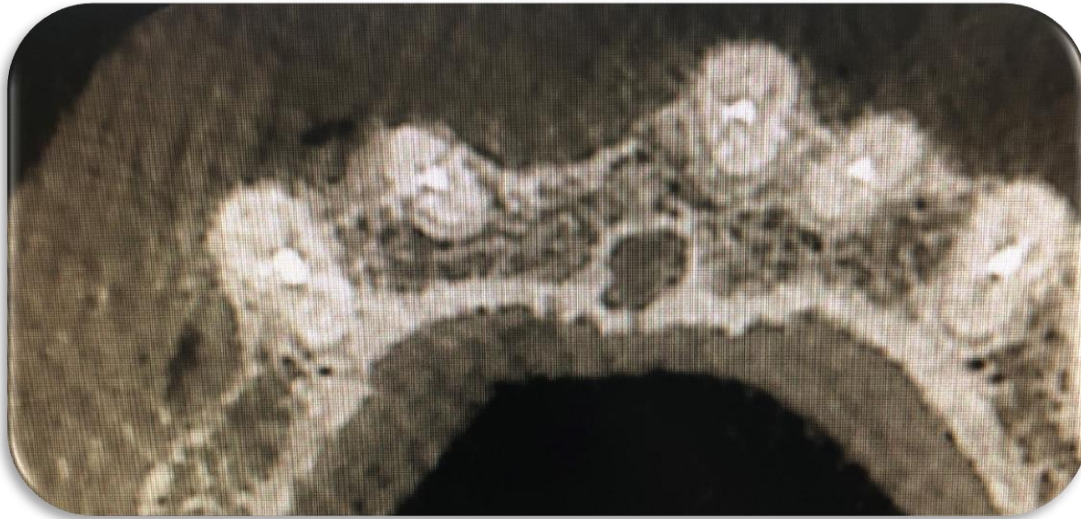






FIG. 15.1 Periapical image of a potential implant site in the posterior left maxilla. An imaging guide containing a cylindrical radiopaque marker has been inserted intraorally to depict the desired angle of implant placement.

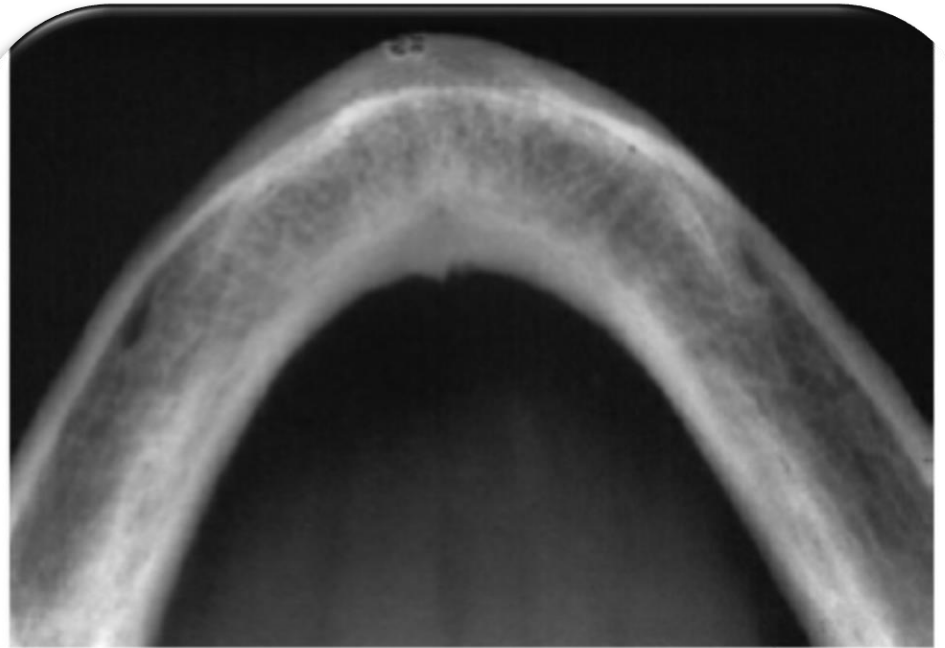
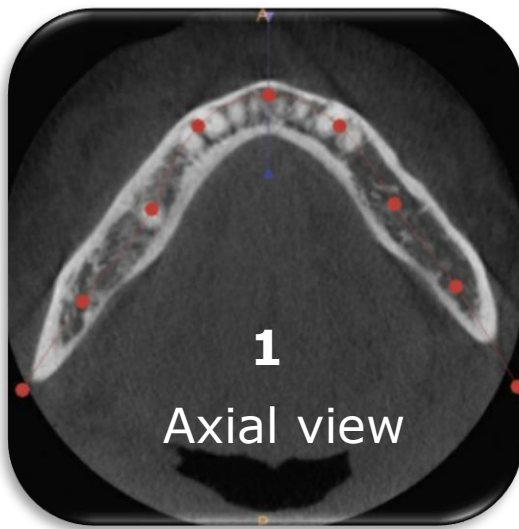


FIG. 15.2 Cross-sectional occlusal radiograph of the edentulous mandible. Note that only the widest buccolingual contours of the mandible are visualized; these are usually located inferior to the desired implant site. This could result in an overestimation of the amount of buccolingual bone available.

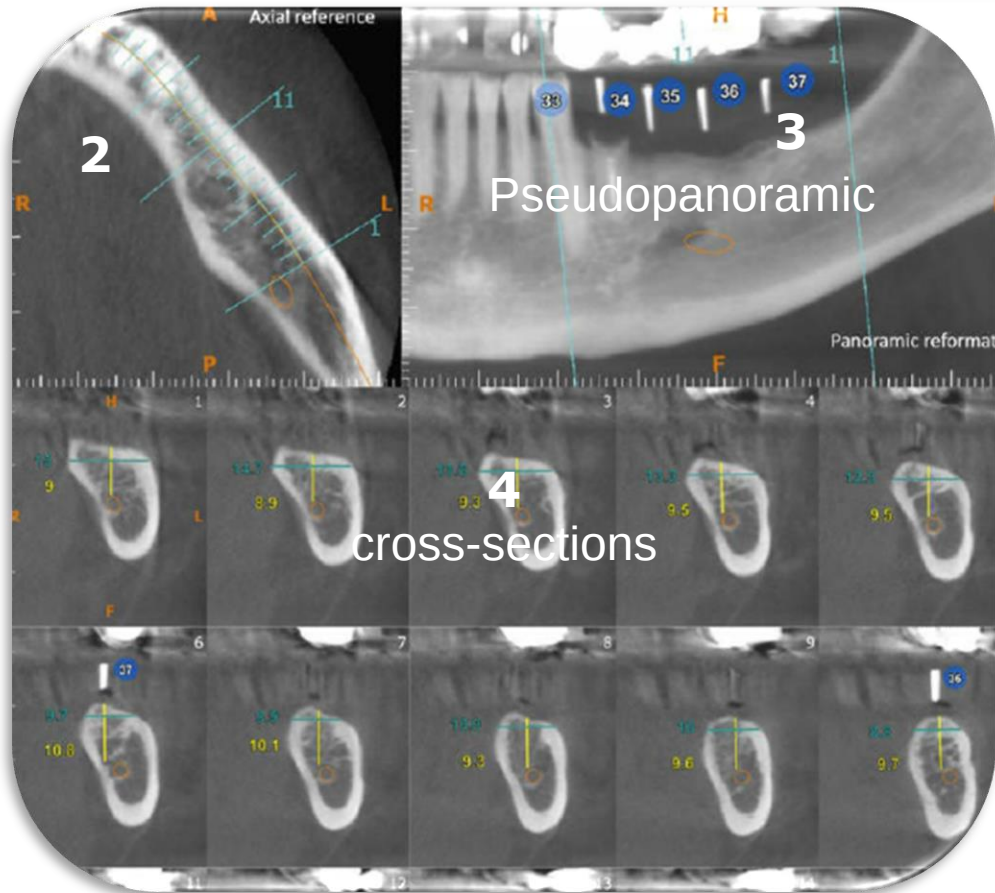
CBCT

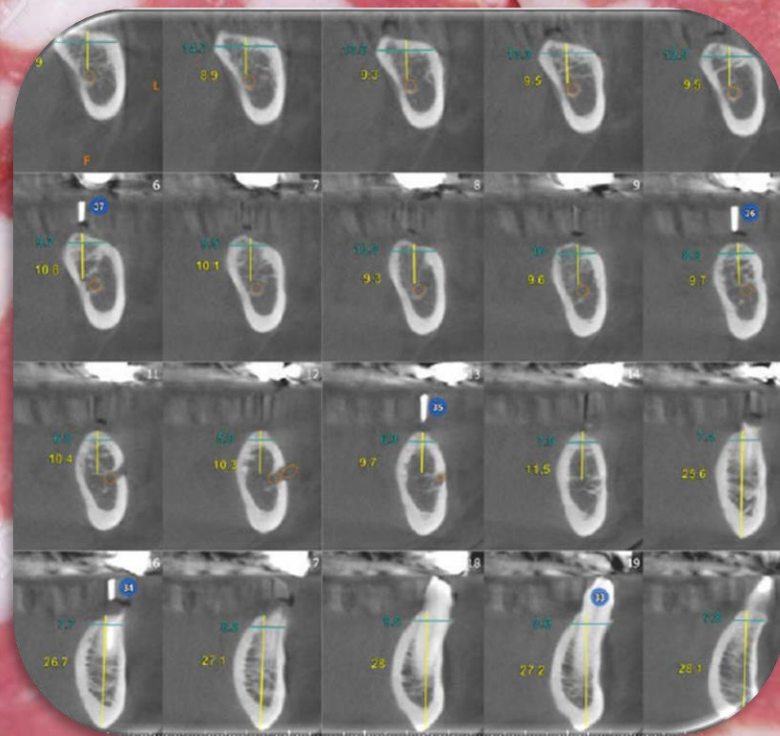
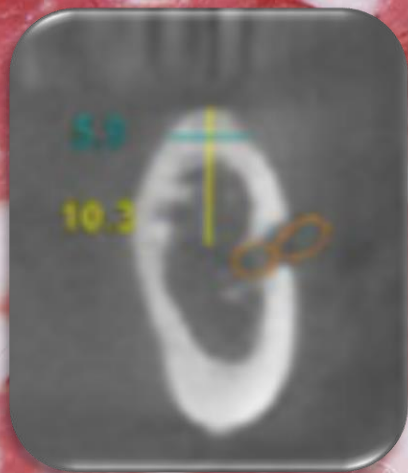


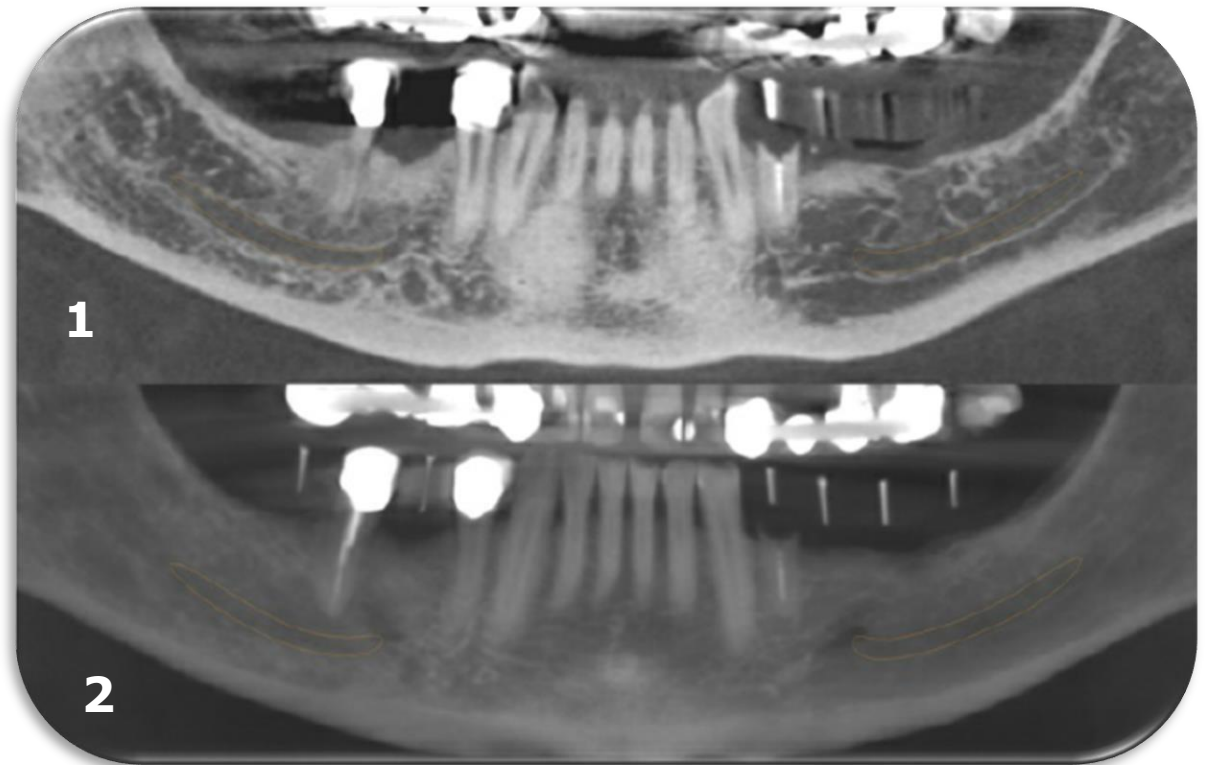
✓ thickness

✓ step

✓ slice







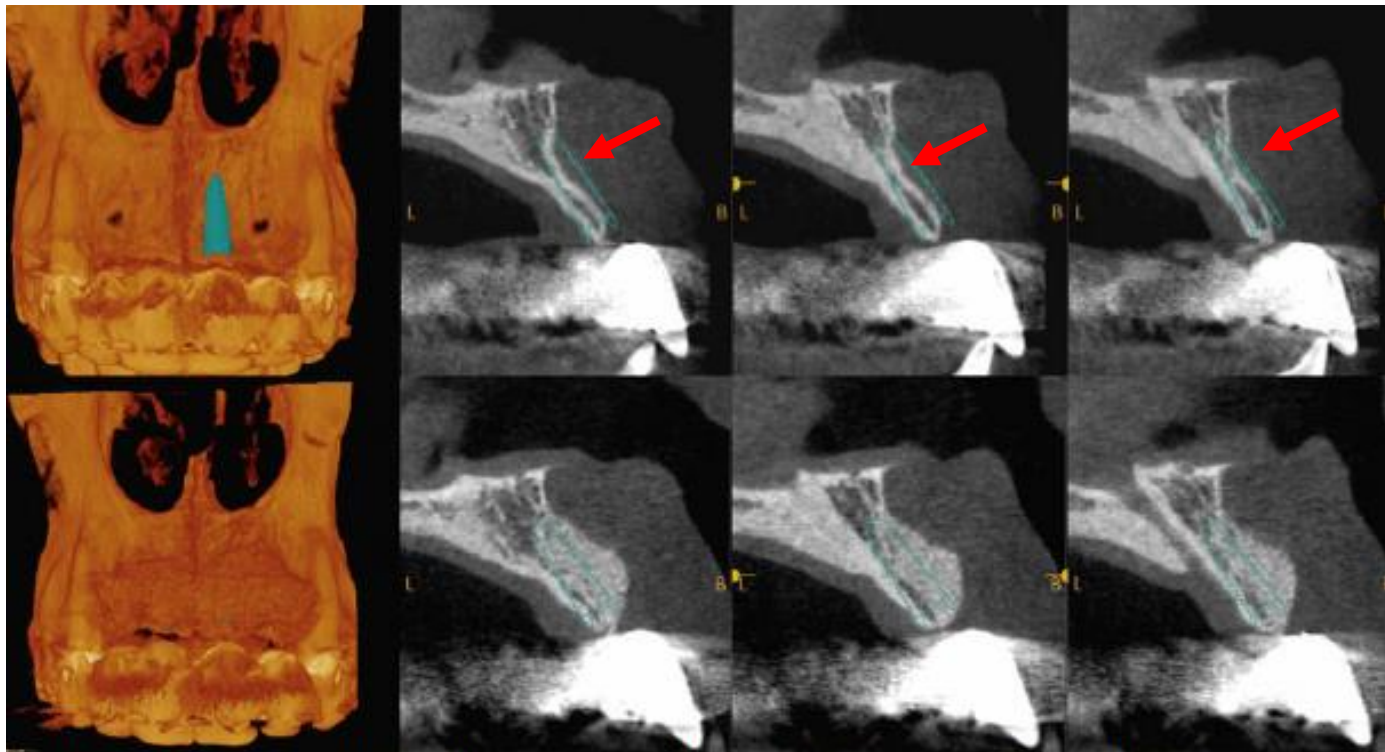


FIG. 15.5 *Top:* Three-dimensional volume rendering and buccolingual cross-sections of an edentulous maxillary left central incisor site. Note the prominent buccal concavity of the alveolar process, which prevents the desired implant to be placed without significant esthetic compromises. The virtual implant shows extensive buccal thread exposure if placed in the ideal inclination, identifying the need for buccal bone augmentation prior to implant placement. *Bottom:* Cone beam computed tomography sections following buccal bone grafting. Note how the desired implant size is now fully embedded in bone.

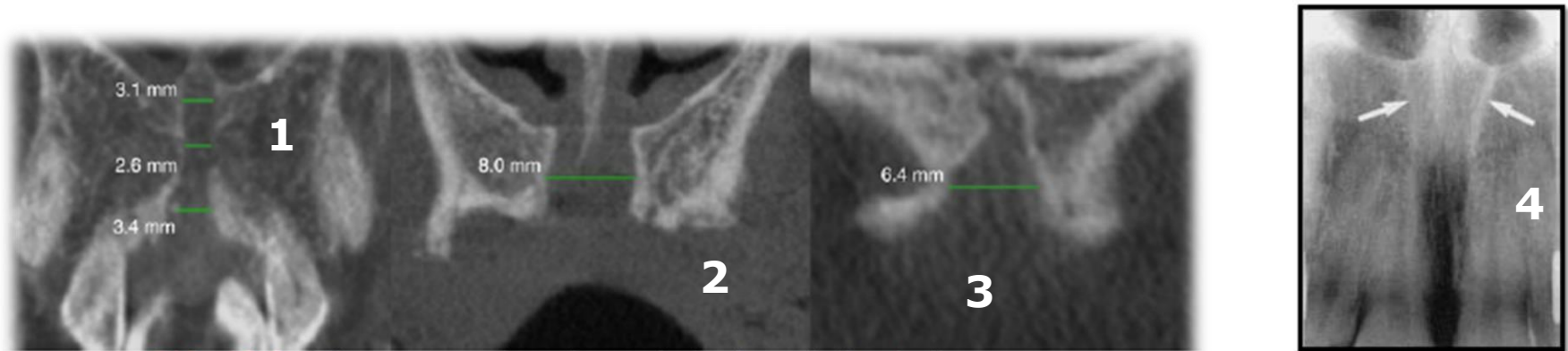


FIG. 15.6 Three examples of morphologic variation in the nasopalatine canal. Coronal slices depicting a thin, uniform canal (*left*), two wide, converging canals (*middle*), and a funnel-shaped canal (*right*).

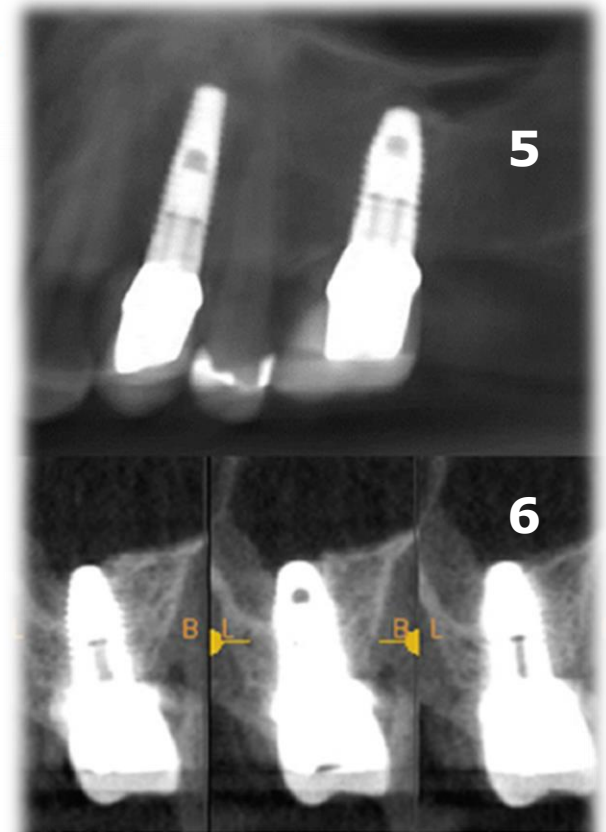
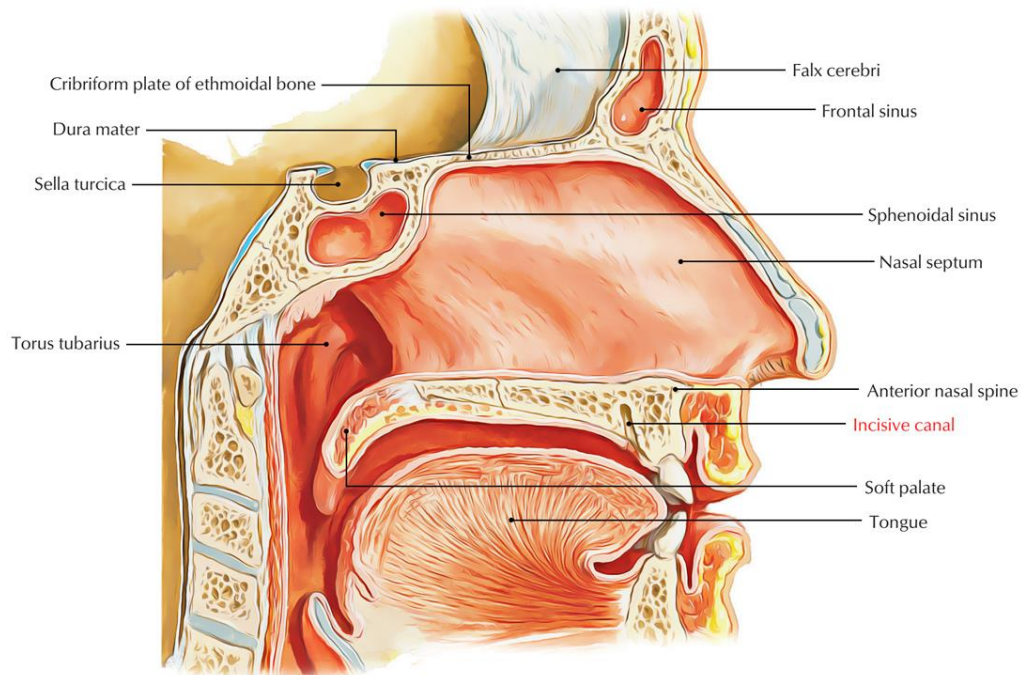


FIG. 15.7 Top: A simulated periapical projection reformatted from a cone beam computed tomography study. The position of the maxillary sinus floor relative to the apex of the implant placed at the maxillary left first molar site is difficult to determine due to anatomic superimposition.

- ✓ presence of septa
- ✓ inflammatory disease
- ✓ branches artery

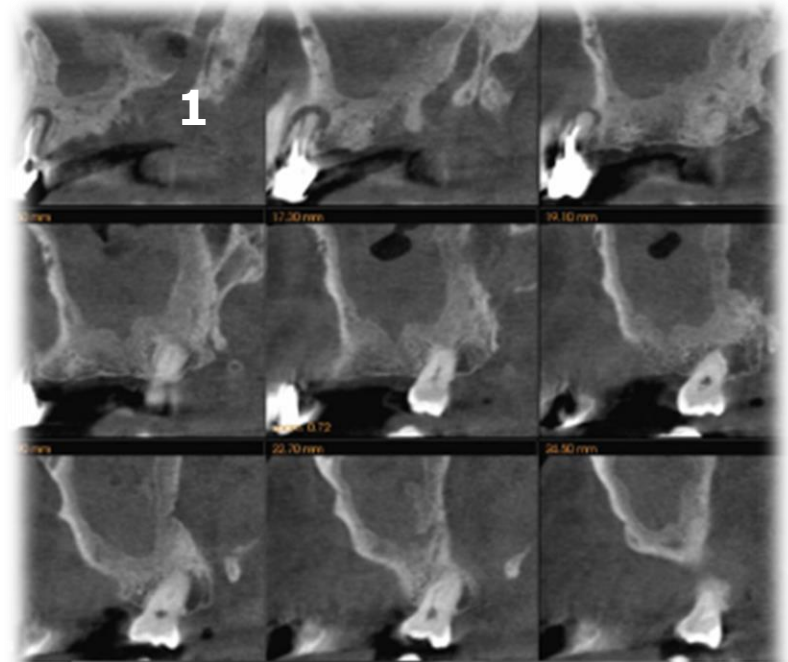
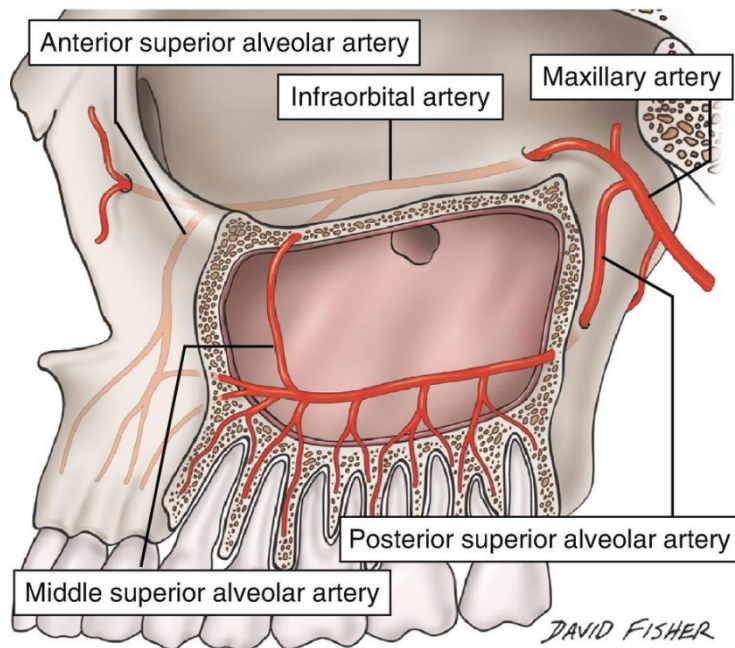
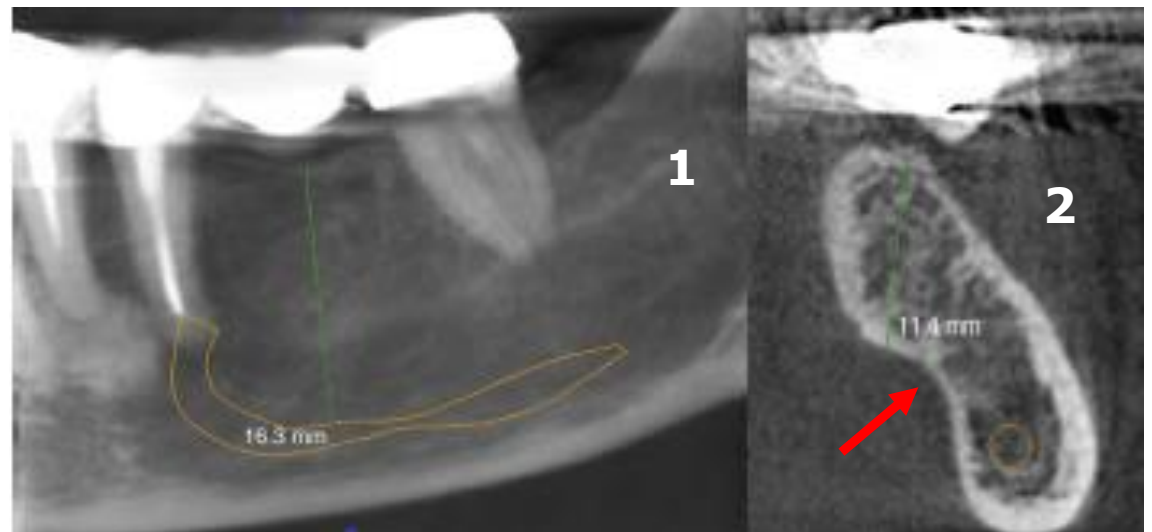
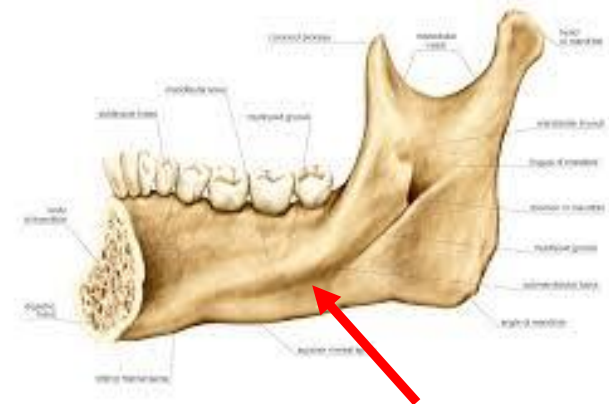
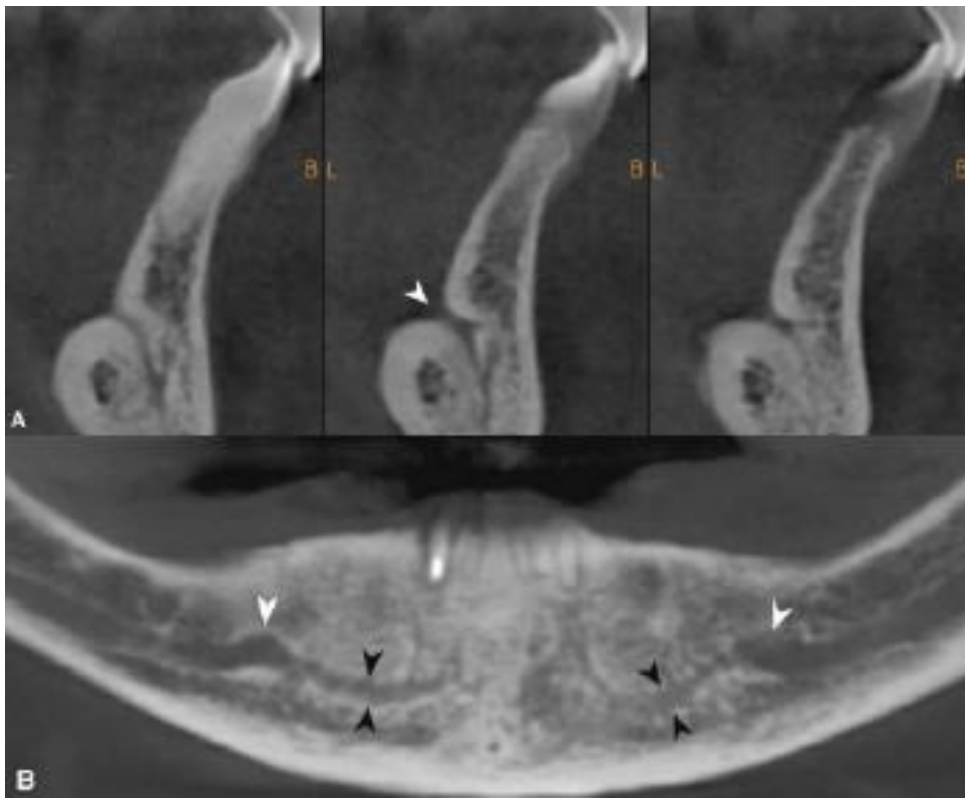
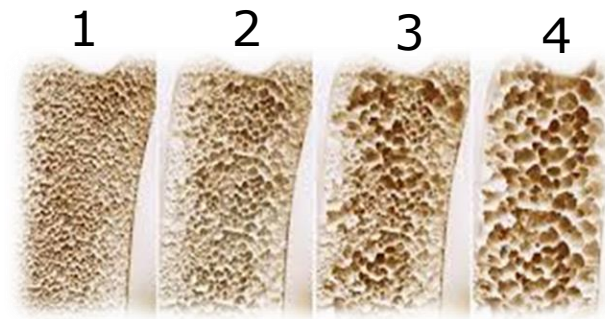
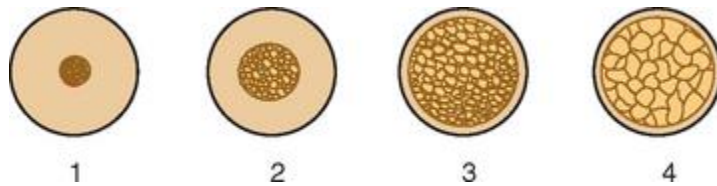


FIG. 15.8 (A) Serial sagittal cross sections of a right maxillary sinus demonstrating a transverse ridge located along the sinus floor apical to the edentulous first molar region, which may complicate a sinus lift





Radiologic Assessment of Bone Quality

TABLE 15.2

Misch Classification of Bone Density

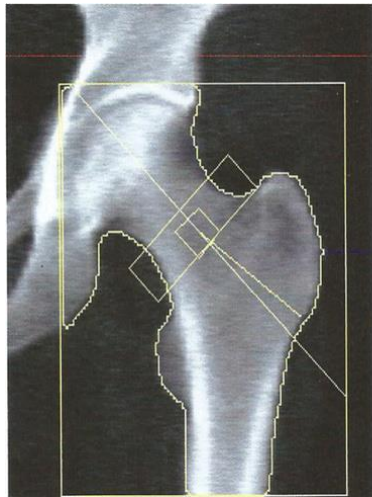
Classification Type	Radiographic Appearance	Typical Anatomic Location	MDCT Density Range (HU)
D1	Primarily composed of dense cortical bone Marrow spaces are hardly visible	Occasionally in anterior mandible Rarely in posterior mandible	>1250
D2	Thick outer layer of porous cortical bone Coarse trabecular bone pattern	Commonly in anterior and posterior mandible Occasionally in anterior maxilla	850–1250
D3	Thinner layer of porous cortical bone Fine trabecular bone pattern	Commonly in anterior maxilla, posterior maxilla, and posterior mandible Occasionally in anterior mandible	350–850
D4	Faint to imperceptible outline of thin cortical bone Alveolar process is primarily composed of fine trabecular bone	Commonly in posterior maxilla Rarely in anterior maxilla	150–350

- ✓ subjective evaluation (CBCT)
- ✓ mineral mass per unit volume (DEXA)

bone density:

in the anterior mandible is **higher**

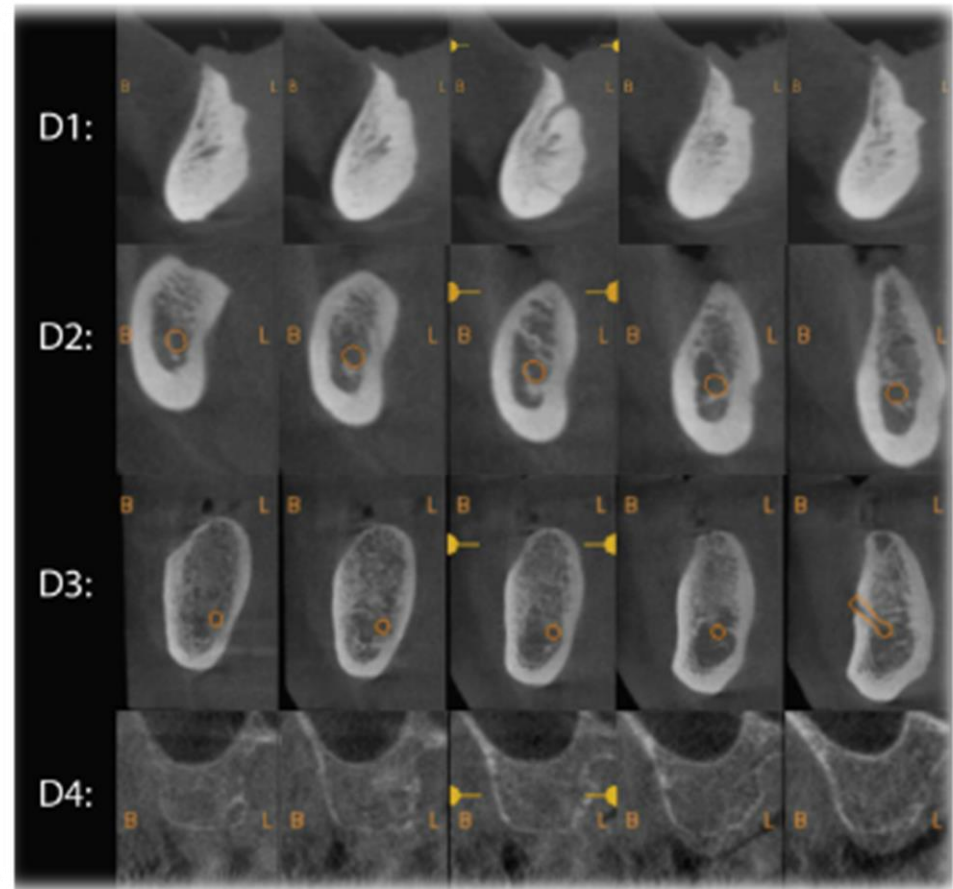
lowest in the posterior maxilla



DXA Results Summary:

Region	Area (cm ²)	BMC (g)	BMD (g/cm ³)	T-score	Z-score
Neck	4.98	4.30	0.864	-0.5	0.5
Total	39.48	42.62	1.079	0.3	0.8

Total BMD CV 1.0%, ACF = 1.028, BCF = 1.007, TH = 5.496
 WHO Classification: Normal
 Fracture Risk: Not Increased





- ✓ drill deflection
- ✓ lower vascularity

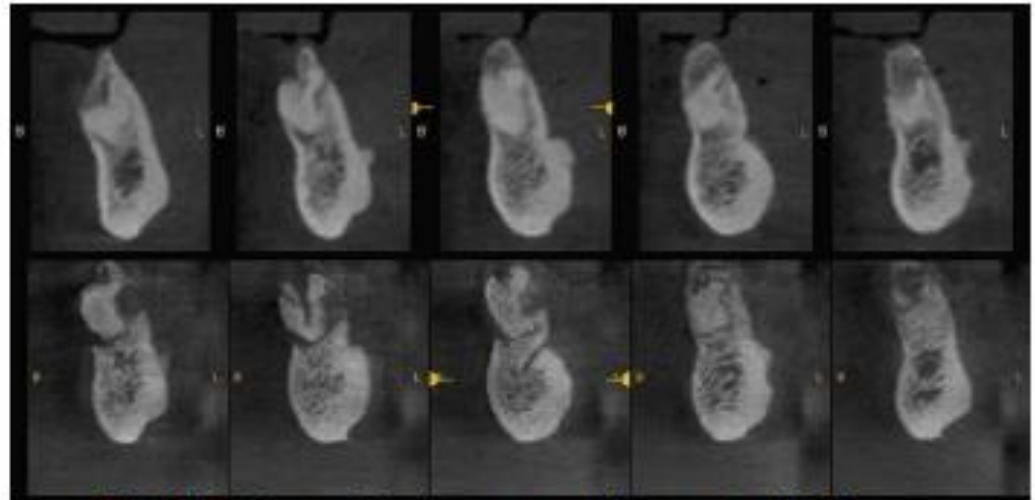


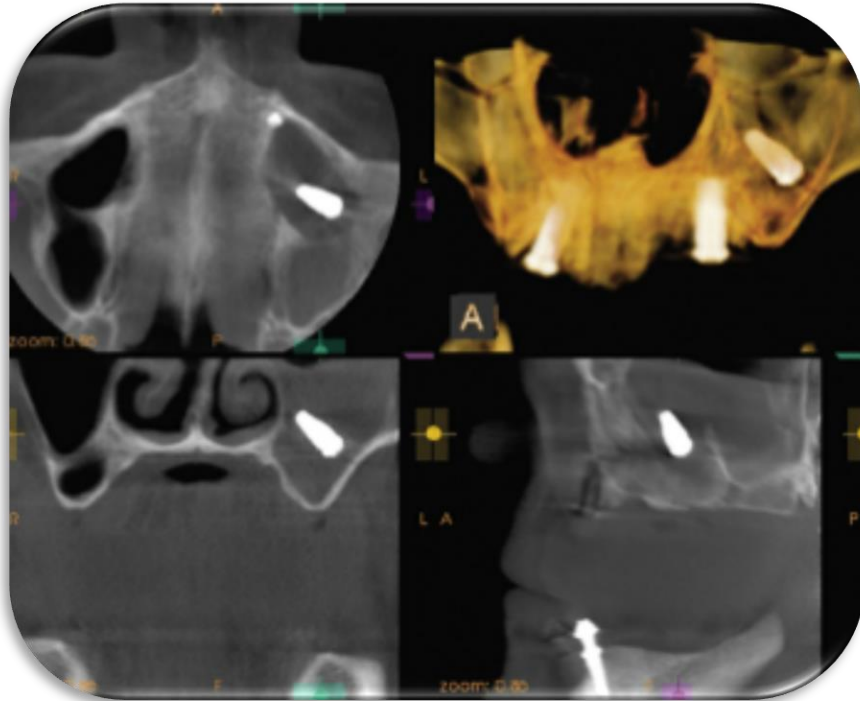
FIG. 15.13 Top row: Cone beam computed tomography (CBCT) images of a relatively mature focus of periapical osseous dysplasia in the anterior mandible of a patient evaluated for implant treatment planning. Bottom row: Following implant placement, the patient reported pain in the implant area. Two of the implants failed in the immediate postoperative period. Postoperative CBCT sections



FIG. 15.12 Cone beam computed tomography section through the posterior left mandible demonstrating a large area of osteosclerosis located in the mesial aspect of an edentulous mandibular left first molar site.



Intraoperative Imaging



- Periapical imaging
- Panoramic imaging
- CBCT imaging

Previous diagnostic images





- **Where** there is **clinical evidence of an abnormality** that cannot be fully assessed by physical examination alone
- **Where** there is a **high probability of disease** that is not clinically evident

Administrative images

Box 17.1

American Dental Association Selection Criteria for Prescribing Dental Radiographs

Positive Historical Findings	Positive Clinical Signs or Symptoms
1. Previous periodontal or endodontic treatment	1. Clinical evidence of periodontal disease
2. History of pain or trauma	2. Large or deep restorations
3. Familial history of dental anomalies	3. Deep carious lesions
4. Post-operative evaluation of healing	4. Malposed or clinically impacted teeth
5. Remineralization monitoring	5. Swelling
6. Presence of implants or evaluation for implant placement	6. Evidence of dental/facial trauma
	7. Mobility of teeth
	8. Sinus tract ("fistula")
	9. Clinically suspected sinus pathology
	10. Growth abnormalities
	11. Oral involvement in known or suspected systemic disease
	12. Positive neurologic findings in the head and neck
	13. Evidence of foreign objects
	14. Pain and/or dysfunction of the temporomandibular joint
	15. Facial asymmetry
	16. Abutment teeth for fixed or removable partial prosthesis
	17. Unexplained bleeding
	18. Unexplained sensitivity of teeth
	19. Unusual eruption, spacing or migration of teeth
	20. Unusual tooth morphology, calcification or color
	21. Unexplained absence of teeth
	22. Clinical tooth erosion
	23. Peri-implantitis

TABLE 17.1**American Dental Association Guidelines for Prescribing Dental Radiographs**

PATIENT AGE AND DENTAL DEVELOPMENTAL STAGE		
Type of Encounter	Child With Primary Dentition (Before Eruption of First Permanent Tooth)	Child With Transitional Dentition (After Eruption of First Permanent Tooth)
New patient ^a being evaluated for oral diseases	Individualized radiographic exam consisting of selected periapical/occlusal views and/or posterior bitewings if proximal surfaces cannot be visualized or probed. Patients without evidence of disease and with open proximal contacts may not require a radiographic examination at this time	Individualized radiographic exam consisting of posterior bitewings with panoramic exam or posterior bitewings and selected periapical images
Recall patient ^a with clinical caries or at increased risk for caries ^b	Posterior bitewing exam at 6- to 12-month intervals if proximal surfaces cannot be examined visually or with a probe	
Recall patient ^a with no clinical caries and not at increased risk of developing caries ^b	Posterior bitewing examination at 12- to 24-month intervals if proximal surfaces cannot be examined visually or with a probe	
Recall patient ^a with periodontal disease	Clinical judgment as to the need for and type of radiographic images for the evaluation of periodontal disease. Imaging may consist of but is not limited to selected bitewing and/or periapical images of areas in which periodontal disease (other than nonspecific gingivitis) can be demonstrated clinically	
Patient (new and recall) for	Clinical judgment as to need for and type of radiographic	

monitoring of dentofacial growth and development and/or assessment of dental/skeletal relationships	images for evaluation and/or monitoring of dentofacial growth and development or assessment of dental and skeletal relationships	
Patient with other circumstances, including but not limited to proposed or existing implants, other dental and craniofacial pathosis, restorative/endodontic needs, treated periodontal disease, and caries remineralization	Clinical judgment as to need for and type of radiographic images for evaluation and/or monitoring of these conditions	
PATIENT AGE AND DENTAL DEVELOPMENTAL STAGE		
Adolescent With Permanent Dentition (Before Eruption of Third Molars)	Adult, Dentate or Partially Edentulous	Adult, Edentulous
Individualized radiographic exam consisting of posterior bitewings with panoramic exam or posterior bitewings and selected periapical images; full-mouth intraoral radiographic exam is preferred when patient has clinical evidence of generalized dental disease or a history of extensive dental treatment	Individualized radiographic exam based on clinical signs and symptoms	
Posterior bitewing exam at 6- to 12-month intervals if proximal surfaces cannot be examined visually or with a probe	Posterior bitewing examination at 6- to 18-month intervals	Not applicable
Posterior bitewing exam at 18- to 36-month intervals	Posterior bitewing exam at 24- to 36-month intervals	Not applicable
Clinical judgment as to the need for and type of radiographic images for the evaluation of periodontal disease. Imaging may consist of, but is not limited to, selected bitewing and/or periapical images of areas in which periodontal disease (other than nonspecific gingivitis) can be demonstrated clinically		Not applicable
Clinical judgment as to need for and type of radiographic images for evaluation and/or monitoring of dentofacial growth and development or assessment of dental and skeletal relationships. Panoramic or periapical exam to assess developing third molars	Usually not indicated for monitoring of growth and development. Clinical judgment as to the need for and type of radiographic images for evaluation of dental and skeletal relationships	
Clinical judgment as to need for and type of radiographic images for evaluation and/or monitoring of these conditions		

^aRefer to [Box 17.1](#).



Initial Visit

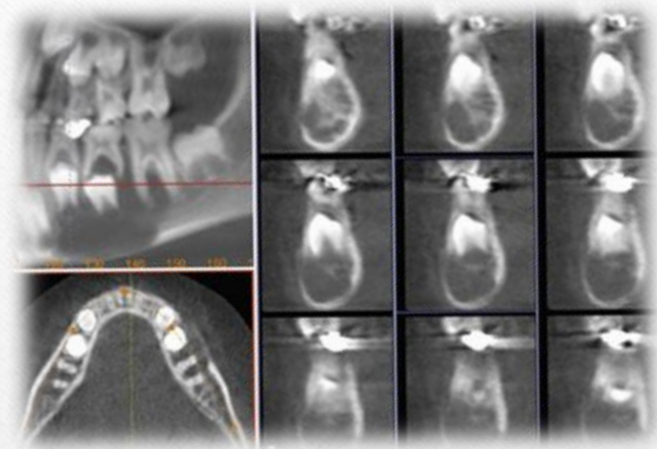


Recall Visit



IT'S CHECKUP TIME!

Guidelines for Ordering Cone Beam Computed Tomography Examinations



- Must not be prescribed unless a history and clinical examination have been performed
- Must be justified for each patient to ensure that the benefits outweigh the risks
- Should potentially add new information to aid the patient's management.

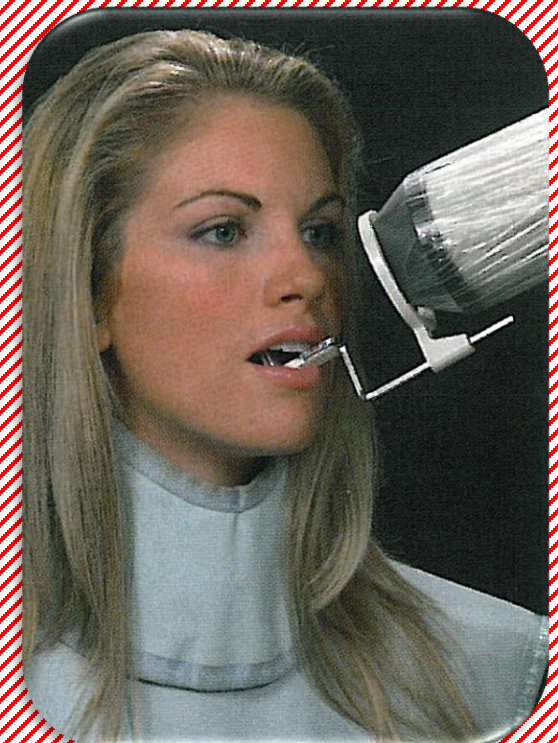
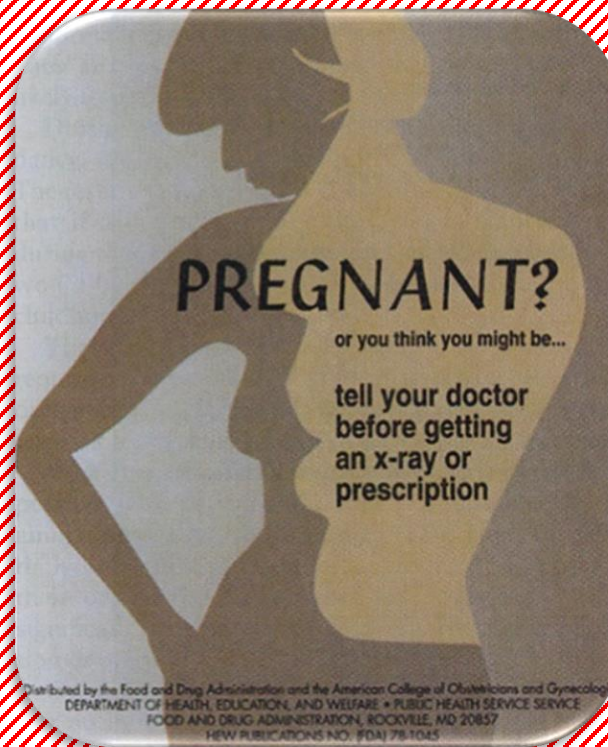
Imaging Considerations in the Absence of a Positive Finding

Prevalence of an abnormality

Ability of the imaging modality

Detection would influence management?

Radiation doses



Radiation therapy



Examination	Effective dose (μSv)	Equivalent background e. (days)
Periapical or bitewing	5 - 6	1
Panoramic & Full mouth	20	1 - 3
Lateral cephalometric	5	0.5 - 1

