Syrian Private University
Faculty of Dentistry
Department of Oral Medicine

Implants

Lecture 10

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Diagnostic imaging

- Imaging techniques are necessary in the various stages of contemporary implant dentistry.
- Radiologist is one of the implant team (restorative dentist, oral surgeon and oral radiologist).
- Radiography may be described in each stage of implantation: (Initial examination / Intra-operation / Post-operation).

The ideal imaging technique for implantation

- The ability to visualize the implant site in the mesiodistal, faciolingual, and superoinferior dimensions
- The ability to allow reliable, accurate measurements.
- A capacity to evaluate trabecular bone density and cortical thickness.
- A capacity to correlate the imaged site with the clinical site.
- Reasonable access and cost to the patient.
- Minimal radiation risk.

Imaging techniques limitations

Limitations of intraoral radiography:

- 25% of mandibular periapical radiographs do not demonstrate the mandibular canal.
- In cases in which the canal is identifiable, only 53% of measurements from the alveolar crest to the superior wall of the mandibular canal are accurate within 1 mm.

Imaging techniques limitations

Limitations of panoramic radiography:

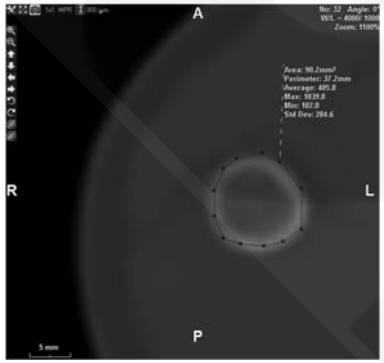
- Technique errors common.
- Angular measurements are nearly accurate.
- Linear measurements are not accurate.
- Magnification varies significantly between images acquired on different panoramic units and even within different areas of the same image.

Imaging techniques limitations

Limitation of CBCT / MDCT

- Relative bone density measurements (in Hounsfield unit [HU]) are not calibrated in CBCT
- Metallic artefacts (less in CBCT than in MDCT).
- Higher radiation dose (especially in MDCT).

Imaging techniques limitations



Measuring the radiographic density.

Radiographic procedures in different implant stages

Initial examination

- Usually, panoramic and / or periapical radiography to evaluate potential implants sites.
- They are used to determine whether the patient is candidate for implant procedures.
- When provisionally acceptable, cross-imaging techniques should be used.

Radiographic procedures in different implant stages

Initial examination

- According to the AAOMR (American Association of Oral and Maxillofacial Radiology), 3D imaging techniques should be performed before implant insertion.

Radiographic procedures in different implant stages

Initial examination

- Necessary surgical and prosthetic information to determine the quantity, quality, and angulations or bone.
- The relationship or critical structures to the prospective implant sites.
- The presence or absence of disease at the proposed surgery sites.
- Determine the place and the direction of the implant.

Radiographic procedures in different implant stages

Initial examination

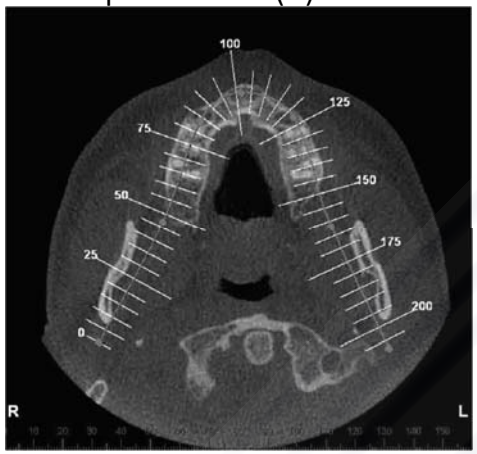
- The relationship with the adjacent anatomic structure (incisive foramen, maxillary sinus, mandibular canal).

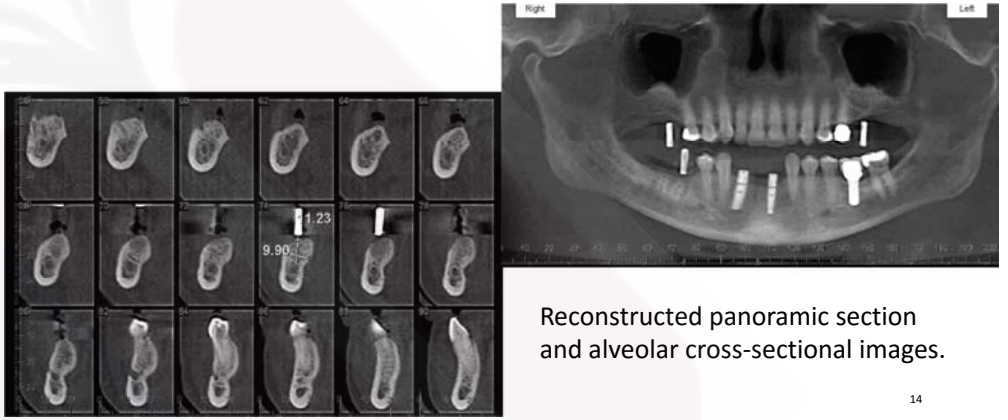
- For example, if the maxillary sinus is expanded (pneumatized), the patient cannot pay for augmentation, no need to prescribe sectional imaging techniques.

Bone quality assessment with MDCT

Misch Bone Density Class	Bone Type	MDCT Imaging Density Range (HU)
D1	Dense cortical	>1250
D2	Porous cortical and coarse trabecular	850–1250
D3	Porous cortical (thin) and fine trabecular	350–850
D4	Fine trabecular	150–350
D5	Immature and nonmineralized	<150

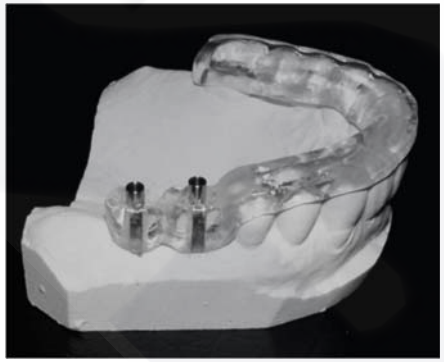
Studying the implant site(s)





Reconstructed panoramic section and alveolar cross-sectional images.

Surgical guide is used to correlate the imaged site with the clinical site. It depends on MDCT or CBCT images.



Radiographic procedures in different implant stages

During the operation

- Intraoral imaging techniques are the most appropriate and usually are the only available techniques.
- Some clinics may have panoramic devices (in cases of multiple implants). Fewer clinics may have CBCT.
- Intraoperative imaging may be required to confirm correct placement of the implant or to locate a lost implant

Radiographic procedures in different implant stages

Post-operation

- **Asymptomatic:** Intraoral periapical or panoramic if case is extensive; CBCT imaging is not appropriate for periodic review of clinical asymptomatic implants.

- **Mobility / altered sensation / anticipated implant retrieval:** cross-sectional imaging (CBCT imaging) • cross-sectional imaging (CBCT imaging)

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Radiographic signs associated with implant failure

Thin radiolucent area that closely follows the entire outline of implant	Failure of implant to integrate with adjoining bone
Crestal bone loss around the coronal portion of implant	Osteitis resulting from poor plaque control, adverse loading, or both
Apical migration of alveolar bone on one side of implant	Nonaxial loading resulting from improper angulation of implant
Widening of the periodontal ligament space of nearest natural (tooth) Abutment	Poor stress distribution resulting from biomechanically inadequate prosthesis-implant system
Fracture of implant fixture	Unfavorable stress distribution during function

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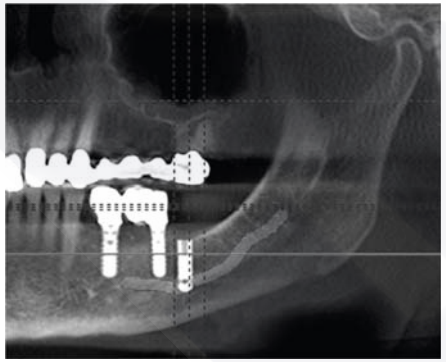

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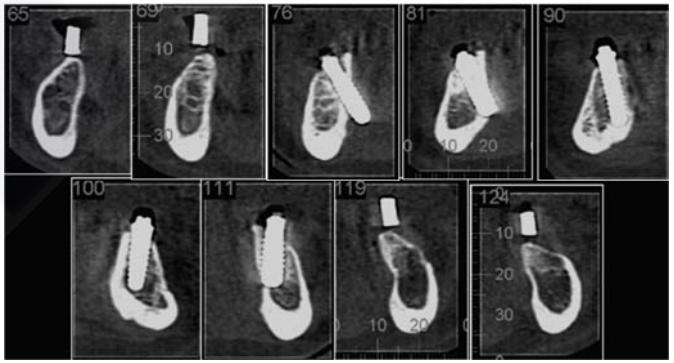

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