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“Monday Morning Pearls of Practice by Bobby Baig”

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CBCT and Implant Dentistry: Part II

Purpose:

The purpose of this newsletter is to illustrate the advantages, limitations, and indications of CBCT imaging for;

- A. The pre-surgical and postsurgical evaluation of implant treatment,
- B. Pre-surgical diagnostic evaluation of potential implant sites,
- C. Implant-related complications.
- D. Implant simulation, treatment planning,
- E. Computer generation of surgical guides.

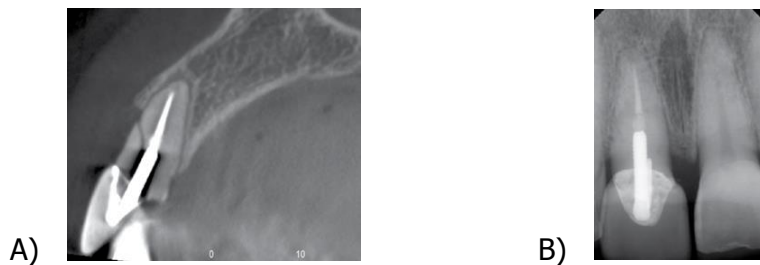
Selected cases are presented to illustrate key benefits of three-dimensional diagnostic imaging for dental implant patients.

In this Newsletter: A: Pre-surgical diagnostic evaluation of potential implant sites: (PART A)

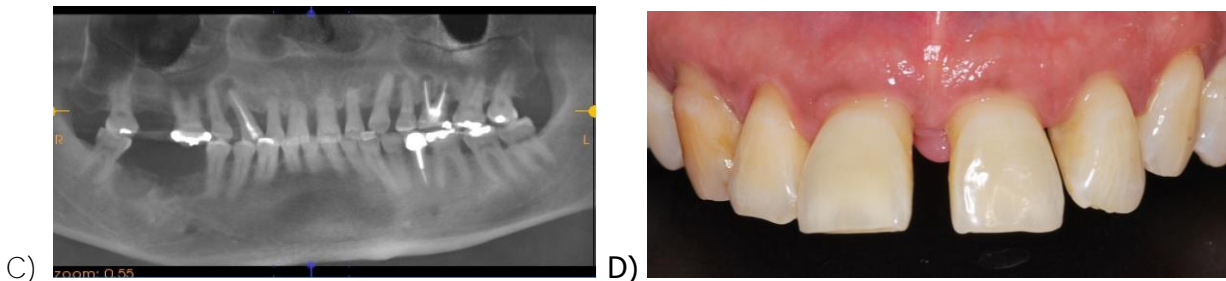
1. One of the most common indications for CBCT imaging is the pre-surgical diagnostic evaluation of potential implant sites.
2. Three-dimensional scans are primarily used to evaluate the quantity and quality of bone available in a site.
3. This process ultimately aids in the determination of the size and position of implant(s) to be placed, imaging details, the location of vital structures in the area to be avoided, assesses areas of bone deficiency that may require augmentation and evaluates bone quality as well as position of bone relative to the proposed implant site and planned prosthetic restoration.
4. For cases involving compromised teeth, CBCT images may facilitate diagnosis of dental pathology, help determine tooth prognosis and allow pre-extraction surgical planning.

Teeth:

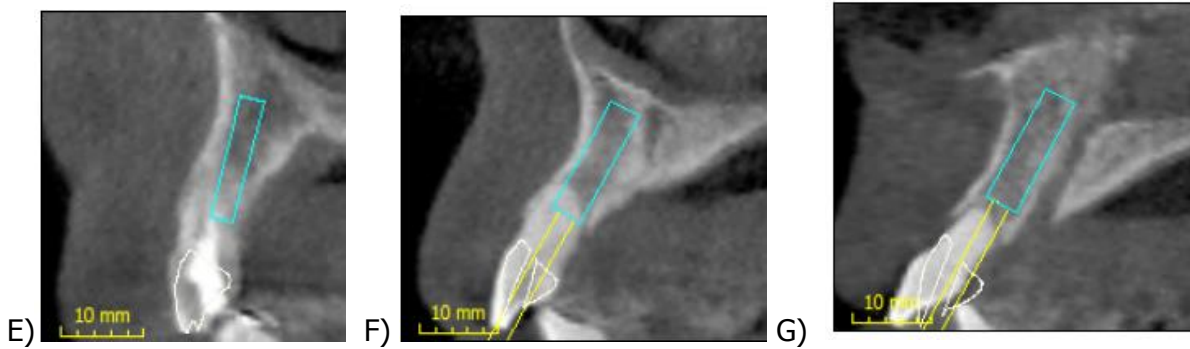
1. Often the initial evaluation of potential implant sites begins with the diagnosis and prognostic assessment of a failing tooth or teeth.
2. Conventional periapical radiographs are the standard of care for dental diagnostics. However, some difficult to identify problems are best visualized using CBCT imaging.
3. Intraoral radiography has very good diagnostic capability for dental pathology as well as structure and density assessment in the superior-inferior and mesial-distal plane.
4. CBCT has excellent diagnostic capability for dental and jaw pathology as well as structure, density, shape, and contour of bone in all dimensions as long as the device is calibrated and meticulous techniques are used.
5. CBCT is a superior tool for identifying problems with teeth such as root fractures, unfilled root canals and other dental pathologies that are better visualized in the buccal-lingual perspective.
6. This is especially true when the problem is not evident in conventional two-dimensional views.
7. The CBCT buccal-lingual cross-sectional image of a central incisor with vertical fracture that runs obliquely through the root, in the mesial-distal plane, from the lingual cervical area of the crown to the apical third of the root on the labial surface. (Fig A) (P Klokkevold JCDA 2015)
8. The root fracture was not evident in the periapical radiograph. The definitive diagnosis obtained with CBCT imaging confirmed the hopeless prognosis and provided the opportunity to plan for extraction and implant placement. (Fig B) (P Klokkevold JCDA 2015)



9. Briefly, the cross-sectional image reveals a labial tooth position with a lack of bone on the buccal surface of this fractured central incisor, which clearly indicates the need for bone augmentation if implant placement is desired. (Fig A)
10. The panoramic radiograph reveals that there is generalized bone loss around the maxillary anterior teeth and periapical lesions on tooth # 13 and 26. (Fig C)
11. Teeth # 13-22 has blunt roots, grade M1 Mobility and generalized spacing. With less than 1:1 crown root ratio. (Fig C and D)



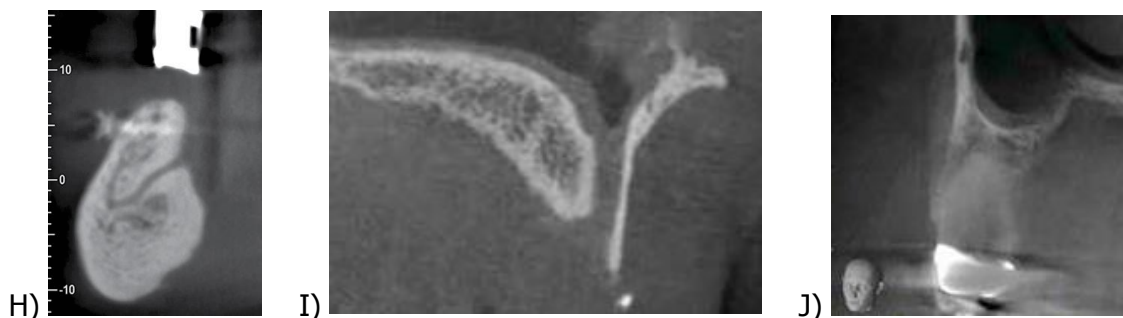
12. CBCT cross sectional views of teeth 13 (E), 12 (F), 11 (G)



Vital Structures:

1. Numerous studies have documented the advantage of 3-D imaging over conventional imaging for the assessment of potential implant sites, especially when implants are planned to be in close proximity to neurovascular canals, neighboring teeth or spaces such as lingual concavities and the maxillary sinus.
2. CBCT imaging greatly enhances visualization of anatomical structures by revealing the anatomy in three dimensions, often with details that are not appreciated in conventional images.
3. Reconstructed data can be viewed as two-dimensional slices with varying slice thickness in any plane or as three-dimensional segmental or complete volumes.
4. Reconstructed data is especially useful because user-defined curvilinear slices can be created to evaluate specific segments of the jaw (i.e., data with a defined thickness is selected by points along the area of interest within jaw).
5. Contrast, brightness, and filtering controls also allow the clinician to enhance images for improved visualization and detection of anatomical structures.
6. Perhaps the most important use of CBCT imaging in pre-surgical implant diagnosis and treatment planning is the identification and location of vital anatomical structures in relation to the proposed implant position.
7. Namely, three-dimensional images are very useful for identifying and measuring intraosseous neurovascular canals in the mandible and maxilla.

Fig H) Anterior edentulous mandible demonstrate the presence of a mandibular incisive canal, I) A very large maxillary incisive canal and extremely narrow buccal-lingual plate, J) Presence of intraosseous vessel in the Buccal-lateral wall of the maxillary sinus.



8. The MIC is rarely visible on conventional radiographs. However, cross-sectional images from a CBCT scan clearly show the presence of a MIC in up to 93 percent of cases. (Fig H)
9. Inadvertent injury to the structures within these canals can result in severe bleeding and/or damage to nerves.
10. Adverse effects of nerve injuries, (e.g., paresthesia, anesthesia or dysesthesia) whether transient or permanent, can be devastating for patients.
11. Traumatic nerve injuries must be avoided, which is why identification is an essential part of the

pre-surgical diagnostic evaluation.

12. Nerve damage is most often associated with injury to the inferior alveolar nerve or its branches.
13. While these types of injury are not new there is an increased risk with the surgical placement of dental implants in the posterior mandible because the osteotomy is drilled into the space occupied by these nerves.

Continued in next edition: **Pre-surgical diagnostic evaluation of potential implant sites: (PART B)**

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