

Dec 05, 2016

“Monday Morning Pearls of Practice by Bobby Baig”

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CBCT and Implant Dentistry: Part I

Purpose:

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

- A. The presurgical and postsurgical evaluation of implant treatment,
- B. Implant-related complications.
- C. Presurgical diagnostic evaluation of potential implant sites,
- 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 and Post-Surgical Evaluation of Implant Treatment: CBCT:

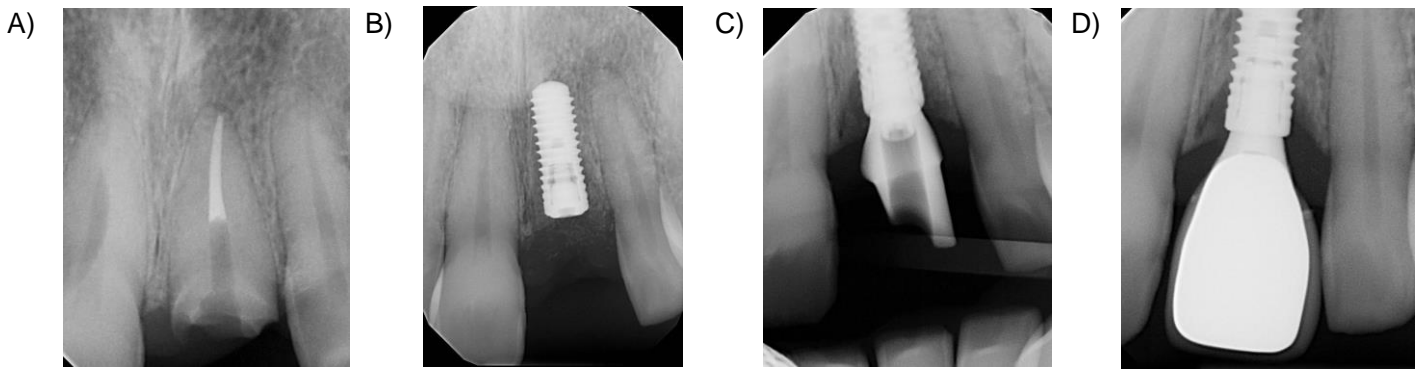
1. Diagnostic imaging has evolved tremendously over the past few decades.
2. Initial attempts to capture cross-sectional images of potential implant sites used conventional X-ray tomography or multi slice medical (linear or spiral) CT scanners.
3. These technologies, applied to the mandible and maxilla for the purpose of implant planning, provided usable images, albeit of marginal quality, in the early stages of implant dentistry.
4. There were many deficiencies in terms of clarity and detail caused by artifacts, beam scatter and poor resolution.
5. Cone beam computed tomography (CBCT) scanners, developed in the late 1990s, are now the most prevalent and commonly used diagnostic imaging device for evaluation of head and neck structures.
6. They are evolving rapidly and are now used to create 3-D diagnostic images of all aspects of the dentoalveolar and maxillofacial region.
7. Recent advances in detectors, processors and software have significantly increased image resolution while reducing the radiation exposure to patients. Image capture and reconstruction time has been greatly reduced as well with scan acquisition times in seconds as compared to minutes for older systems.
8. The increased affordability and relatively compact size of CBCT scanners has allowed many dental

practitioners to install them in their offices, which has further increased the accessibility to use 3-D imaging for a greater number of patients and purposes in dentistry.

Conventional 2-D Imaging:

1. Periapical and panoramic radiographs are very good diagnostic tools for assessing pathology and normal anatomy.
2. They allow accurate vertical (superior-inferior) and horizontal (mesial-distal) measurement of bone in potential implant sites as well as precise measurement of distances from important anatomic structures such as teeth, neurovascular canals, foramen and sinuses.
3. However, measurement of bone for implant placement is limited to a single plane (i.e., superior-inferior height and mesial-distal width).
4. Conventional images do not allow measurement or assessment of structures in the buccal-lingual dimension and volumetric evaluation is nonexistent.
5. Evaluation of the ridge position and trajectory relative to the planned prosthesis is not possible with two-dimensional images.
6. This is not meant to suggest that three-dimensional CBCT imaging can or should replace conventional imaging.
7. On the contrary, it should be considered a complementary diagnostic tool that can be advantageous when used selectively in appropriate situations.
8. Proper application of CBCT imaging for patient examination requires a thorough understanding of the technology and guidelines for use of this powerful tool.

Illustration of a case from initial case assessment, Implant placement to final restoration of my case:
(Radiographs Fig: A-D) (Surgeon Dr. Ghanem)



Advantages of CBCT:

1. One of the most obvious advantages of CBCT imaging over conventional radiographic imaging is the ability to view and measure anatomic structures in three dimensions.
2. The anatomy of any imaged site or structure can be viewed in multidirectional 2-D slices or as a physical shape in volumetric reconstructions.
3. Image data can be viewed in a plane or curve defined by the operator.
4. Measurements can be made in linear or volumetric fashion, with the latter being well suited for implant simulation and treatment planning. Some scanners include software that facilitates visual labeling and identification of important anatomic structures such as nerve canals and sinuses as well as computer simulation of implant placement.
5. The ability to export data as digital imaging and communications in medicine (DICOM) files also permits uploading of image data to third-party software applications for anatomical structure visualization, implant simulation and treatment planning.

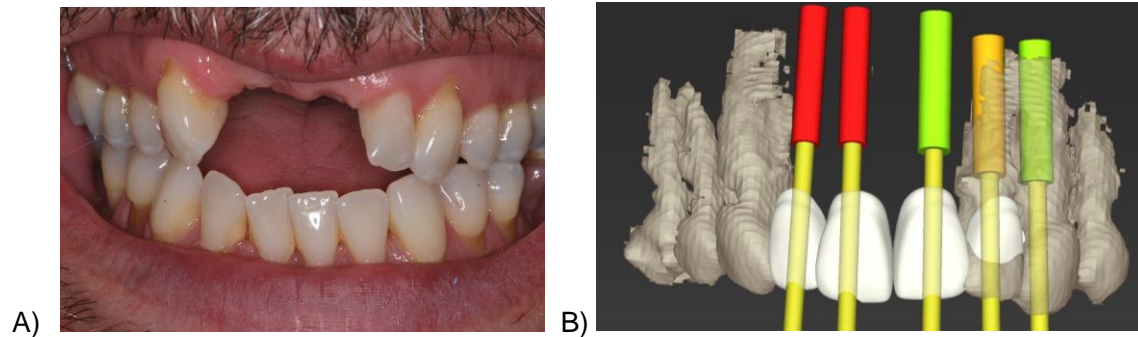
Pre-Surgical Planning:

1. CBCT imaging is useful for pre-surgical implant planning but, as with any procedure that includes radiation exposure, it is not without risk.

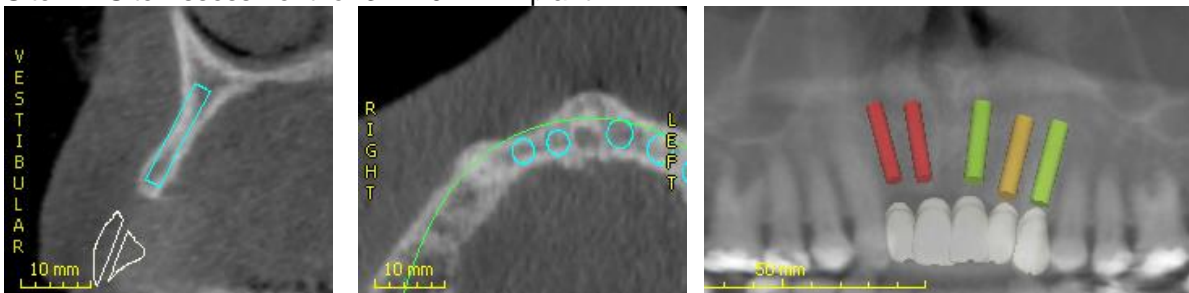
2. The amount of radiation exposure from a CBCT scan is significantly less than a multi slice medical CT scan but more than conventional imaging.
3. The precise amount of radiation exposure varies from one machine to another and greatly depends on the settings or parameters used. There are many questions that clinicians must consider when deciding whether the use of 3-D imaging is appropriate and indicated for any given patient with a potential implant site(s).

CASE PRESENTATION: Presurgical – Planning, Implant Surgery and Final Restoration:

Case: Initial Photos and CBCT Evaluation of my case: (Surgeon Dr. Herman Tang Periodontist, Oral Radiologist Dr. Madhavji)

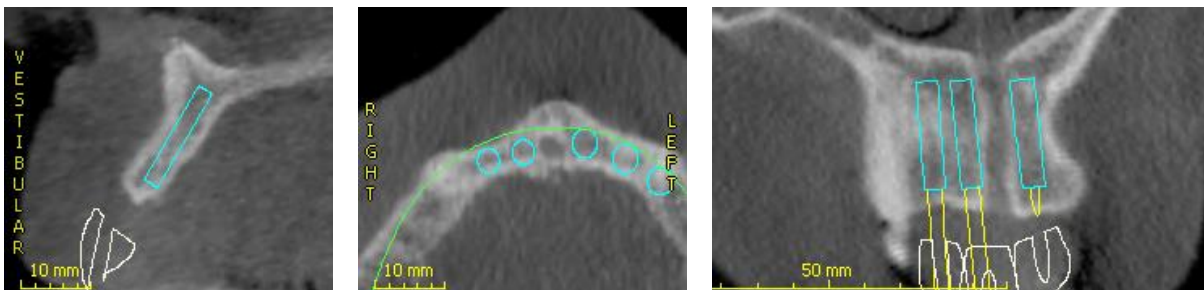


Site 12: Site Assessment for 3 X 10mm Implant:

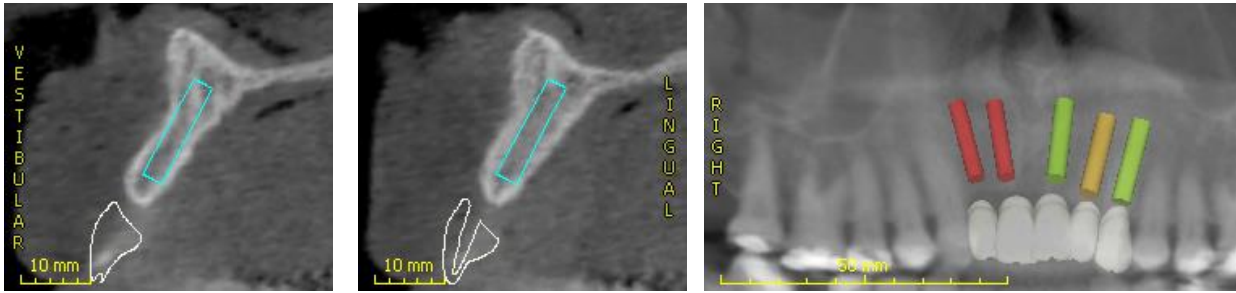


RED: 11 and 12 site (above: significant limitation for implant placement for 12 and site 11, Limited inter implant distance less than 3mm)

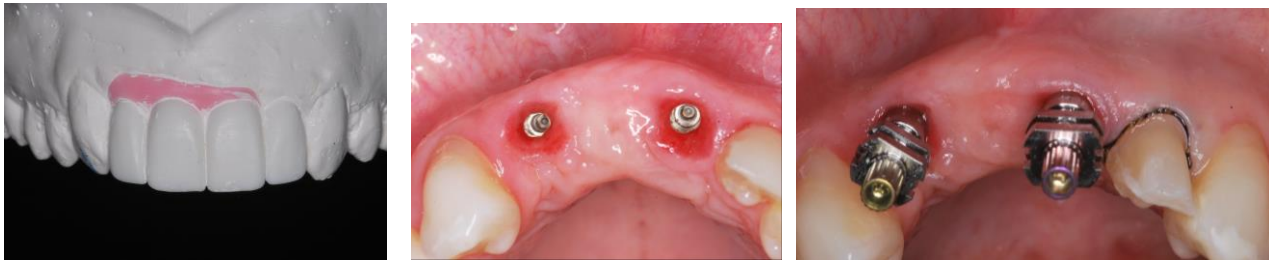
Site 11: Site Assessment for 3 X 10mm Implant:



Site 21: Site Assessment for 3 X 10mm Implant:



Green: 11 and 12 site (above: Adequate space for implant placement between implant site 21 and tooth 22)
Diagnostic waxup, Post Implant surgery follow up, Final impression for a 3 unit FPD 12-21 and single veneer 22:



Final Restoration: Smile view and retracted view: Lab: Novo Dental Studios Toronto.



4. What is the value of CBCT imaging for this patient and for this location?
5. Will the CBCT scan provide important diagnostic information that is not available with conventional imaging? YES
6. What are the risks to patients being imaged with this technology?
7. What resolution and field of view should be used?
8. The decision to use CBCT imaging must be based on individual patient needs following a thorough medical/dental history and clinical examination.
9. Ultimately, the clinician must decide whether the CBCT information is important and valuable enough to supplement the existing clinical and radiographic information and to justify the increased cost and radiation exposure.

SUMMARY ABOVE CASE SYNOPSIS: The above questions have been very clearly answered in my above case presentation, this patient has seen multiple specialists and was advised that he did not have enough bone to place dental implants and he was wearing an RPD for 6 yrs. CBCT has really helped us in this case to make a proper assessment and execute the proposed treatment plan and met the patient

satisfaction to the highest level. I am using this case today only in the context of the value of using CBCT, I will present this case in future news letter as a case presentation.

Continued in next editions; PURPOSE: B,C,D,E OF THIS NEWS LETTER.....

Acknowledgements: Dr. Alexis Ghanem, Dr. Herman Tang, Dr. Milan Madhavji, Novo Dental Studios.

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