

Radiographic assessment checklist for implant placement

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Subject area: Short communication

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Abstract:

Dental implants are gaining immense popularity and wide acceptance because they not only replace lost teeth but also provide permanent restorations that do not interfere with oral function or speech or compromise the self-esteem of a patient. Appropriate treatment planning for replacement of lost teeth is required and imaging plays a pivotal role to ensure a satisfactory outcome. The development of pre-surgical imaging techniques and surgical templates helps the dentist place the implants with relative and accurate ease. In this article, authors have proposed a checklist for radiographic assessment for implant placement during various stages of the implant procedure.

Key words: Cone beam computed tomography, dental implants, orthopantomogram, periapical radiograph

Introduction:

Dental implantology has experienced explosive growth during the last few years. Treatment planning for implants includes a radiographic examination that provides information about the location of anatomical structures, the quality and quantity of available bone, the presence of infrabony lesions, the occlusal pattern and the number and size of implants as well as prosthesis design, all which are essential for successful implant treatment. ¹

The imaging objectives are to provide the clinician with cross-sectional views of the dental arch for visualization of spatial relationship of internal structures of the maxilla and mandible. Imaging studies should help to determine the optimum position of implant placement relative to occlusal loads. In addition, detection of the presence or absence of pathoses and which is assessable at a reasonable cost to the patient are the desirable features.²

The decision of when to prescribe imaging depends upon the integration of these factors and can be organized into three phases. They are: (1) Pre-surgical implant imaging, (2) surgical and interventional implant imaging, (3) post prosthetic implant imaging. Although several image diagnostic methods are available to evaluate proposed sites for implants, currently, not a single technique is considered ideal for pre, intra and post-operative analyses. Therefore, authors in this article have suggest checklist which is a combination of various radiographic techniques for radiographic assessment of implant during various phase of treatment planning, implant surgery and post-operative management of implant.

Radiographic assessment checklist for implant placement

Stage	Duration(MONTHS)	Radiographic procedures
Treatment planning (Pre-operative)	0 month (Baseline)	<ul style="list-style-type: none"> • Periapical (IOPA) to identify the presence of any pathology and location of anatomic structures in and around the implant site. • Orthopantomogram (OPG) for easy identification of adjacent and opposing landmarks, initial assessment of vertical height of bone, evaluation of gross anatomy of the jaws and any related pathologic findings in the oral cavity, assess crestal alveolar bone and cortical boundaries • Cone-Beam CT (CBCT) to determine vertical height, bucco-lingual and mesio- distal dimensions of the edentulous region, osseous architecture, bone quality and quantity, confirm the distance from adjacent vital anatomic structures. To evaluate bone density, bone width and height in cross section along with 3D planar images, to trace the

		<p>inferior alveolar nerve and calculate the exact distance from the nerve and maxillary sinus thus aiding in accuracy and precision in implant placement.</p> <ul style="list-style-type: none"> • CBCT with patients wearing temporary dentures fabricated with/or radiographic markers added in existing dentures to facilitate positioning of ideal prosthetically driven implants (radiographic template).
Intra – operative Surgery (placement)	0	<ul style="list-style-type: none"> • Periapical IOPA to evaluate the parallelism/angulation of parallel pin and direction of surgical drills to determine alignment and orientation of implant, the depth of drilling, distance of implant osteotomy from adjacent vital structures, to confirm implant not invading an adjacent tooth root or mandibular canal during the surgery.
Immediate Post-operative surgery		<ul style="list-style-type: none"> • IOPA to check the final position of the implant, cover screw and/or healing/ temporary abutment. • OPG to check the final position, especially in cases of multiple implant placement, to check for parallelism and angulation specially when placing multiple implants and to observe angulation and orientation of implant placement with respect to the adjacent landmarks.

Healing Phase	0 to 3 months	<ul style="list-style-type: none"> • Periapical IOPA to evaluate the healing of the implant site, bone levels around the implant and periodically evaluate for radiolucencies/ radiopacities around the healing implant.
Remodelling Phase	4 to 12 months	<ul style="list-style-type: none"> • Periapical to check for osseointegration. A post prosthetic radiograph ideally needs to be taken to act as a baseline for immediate and future evaluation of component fit verification and for marginal bone level evaluation, to check the fit of gingival former, impression post, abutment and crown and bridge prosthesis • OPG to verify osseointegration and bony integration/ non-integration around the implant surface. <p>CBCT could be used to confirm osseointegration, observe bone levels around the implant and evaluate the bone density and thickness around the healed implant.</p>
Routine Maintenance (without inflammatory signs/ complications)	After 1 year	<ul style="list-style-type: none"> • Periapical IOPA's to periodically assess the bone levels and for evaluation of implant success. Immobility and radiographic evidence of stable bone level adjacent to the implant body are the two most accurate diagnostic aids in evaluating success.
Complications	As soon as a potential complication is detected	<ul style="list-style-type: none"> • Periapical IOPA to evaluate for bone loss around the implant and observe fracture of implant screw /prosthesis and/or implant fixture. • OPG to assess for ailing/ failing/ failed implants and progressive/

		<p>stable bone levels. Also, to evaluate localized/ generalized bone loss around the implants.</p> <ul style="list-style-type: none">• CBCT may be indicated to confirm the actual bone levels around implants, existing bone width and height and pattern of bone destruction, especially in cases of peri-implantitis.
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Conclusion:

Although many modalities are available for imaging of the implant site, the correct and required technique should be adopted depending on the case and the clinician's judgment to interpret the image acquired. The choice of pre-implant imaging must be considered carefully due to the radiation dose, the cost of each examination and the anticipated information that may be provided by the imaging study. The risk-to-benefit ratio should be determined on an individual basis so as to maximize success.

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