

From Our Office to Yours...

Proper diagnosis is essential to effective treatment. This is especially true for the complex implant case.

*This current issue of **The PerioDontaLetter** reviews the multitude of factors which must be considered in successful treatment planning for the complex dental implant case.*

As always, we look forward to working with you in providing our mutual patients with the most functional and esthetic implant restorations possible and welcome your comments and suggestions.

Treatment Planning Considerations for the Complex Implant Case

From the first meeting, the clinician should obtain an overall appraisal of the patient. As is the case for patients in need of any dental treatment, a thorough medical history is required. Patients should be made aware of the role that smoking, systemic diseases such as diabetes and ath-

erosclerosis, and medications such as steroids and bisphosphonates may play in the success or failure of dental implants.

The health history should be reviewed for any condition that might put the patient at risk for adverse reactions or complications. Any disorder



Figure 1. A diagnostic wax-up is completed at the beginning of treatment planning to assess potential sites for dental implants and fabricate a surgical stent to guide the implant placement.

that may impair the normal wound-healing process, especially as it relates to bone metabolism, should be carefully considered as a possible risk factor or contraindication to implant therapy.

Dental Factors

A review of the patient's dental history is an essential part of the overall evaluation, including previous surgeries and prosthetics, recurrent or frequent abscesses, the number of dental restorations, compliance with dental recommendations and current oral hygiene practices. If there is a history of dissatisfaction with past treatment, the patient may have similar difficulties with implant therapy or implant-supported restorations.

After a thorough intraoral examination, the clinician can evaluate potential implant sites. All sites should be clinically assessed to measure the availability of suf-

ficient bone for the placement of implants and adequate interarch space for prosthetic tooth replacement with proper size and shape. The mesial-distal and buccal-lingual dimensions of edentulous spaces can be approximated with a periodontal probe or other measuring instrument, or more accurately with 3D imaging.

Successful treatment planning begins with a thorough restorative evaluation.

Diagnostic Wax-Up: Properly articulated models with a wax representation of the proposed restorations allow both the restorative and surgical clinician to evaluate the available space and to determine potential limitations of the planned treatment. This is particularly useful when multiple teeth are to be replaced with implants or when dealing with a cosmetically sensitive restoration.

The amount of available bone is the next criteria to evaluate. A visual examination may identify deficient areas.

Manual palpation can reveal anatomic defects and variations in the anatomy of the jaws such as concavities and undercuts.

Radiographic Assessment: Ultimately, radiographic assessment of the quantity, quality, volume and location of available alveolar bone determines whether a patient is a candidate for implants and if a particular implant site needs hard or soft tissue augmentation. Appropriate radiographic procedures, including periapical radiographs and panoramic projections, can help identify vital structures such as the floor of the nasal cavity, maxillary sinus, mandibular canal and mental foramen.

Another way to evaluate the relationship of available alveolar bone to the proposed implant-supported tooth replacements is to image the patient with a diagnostically accurate scanning guide using radiopaque markers that accurately represent the proposed prosthetic contours. The fabrication of an accurate scanning appliance is facilitated by the diagnostic wax-up.

Cross-sectional imaging, such as conventional tomography or CT scanning, is often recommended before implant placement. The advent of Cone Beam CT (CBCT) scanning provides clinicians the advantage of another potentially more convenient option for obtaining a three-dimensional image of the patient's mouth and jaws. Anatomic structures can be seen in their entirety without



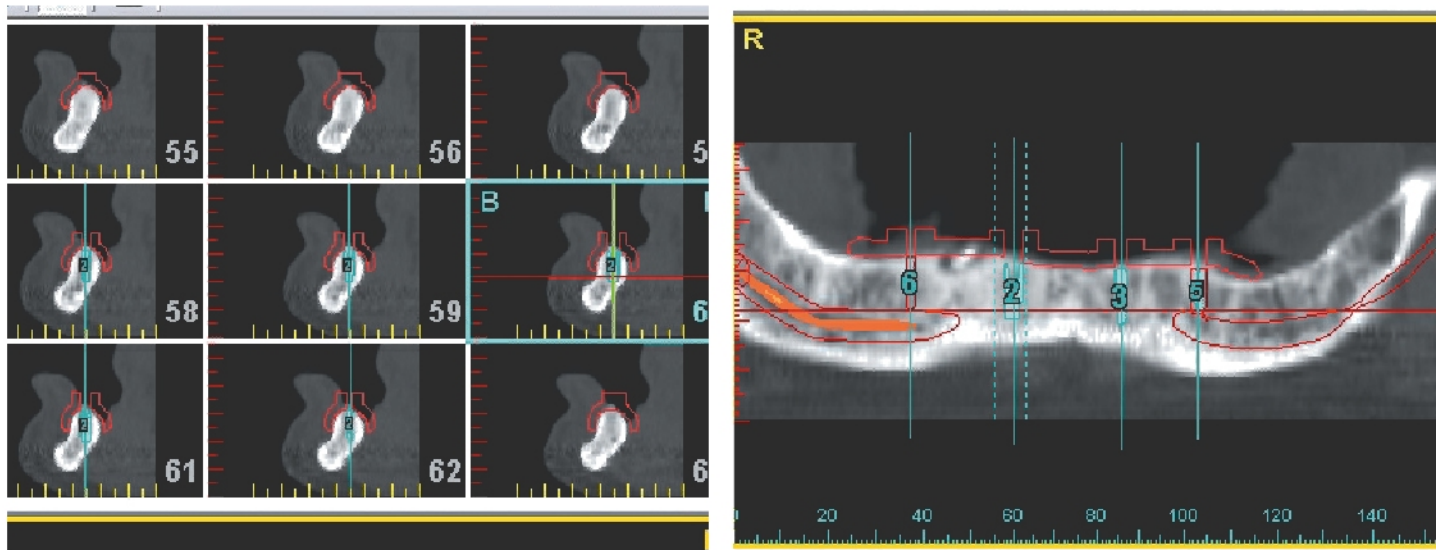
Figure 2. A metal tube helps in determining the correct angulation as well as the depth of the final implant.



Figure 3. A key element of the stent is the position of the cervical edge of the ideal crown.



Figure 4. Upon removal of the stent, it is clear the implant is located at the correct depth.



Figures 5 and 6. This cross-sectional view of the mandibular anterior ridge reveals a very severe lingual undercut due to angulation of the bone. With the information from this CBCT scan, the accurate implant length and angulation can be determined to prevent lingual perforation.

superimposition and with superior magnification, sharpness and significantly reduced distortion in relation to other radiographic techniques. When combined with a scanning guide, this provides the most accurate method of relating the bony anatomy to the position of the final restoration.

Films produced by the CBCT scanner can be viewed in three planes of space. Typical formatting of the CT data produces panoramic, axial, and cross-sectional oblique views. Research has shown that CT scans are extremely accurate to approximately 0.5 millimeters.

The Provisional Restoration: The provisional restoration provides both the prototype and “blueprint” for the final prosthesis. An often underestimated advantage of a well-conceived provisional restoration is the protection it provides the surgical site from occlusal forces during the healing process. Excessive forces or premature loading forces can result in failure of the implant to integrate and may also compromise the results of bone and soft tissue augmentation procedures.

The provisional restoration can also be used to shape the soft tissue during the maturation phase. This is particularly helpful in the management of the esthetic zone.

The most common forms of temporary restorations are fixed bridges supported by retained natural teeth, resin bonded bridges, and transitional removable prostheses.

Surgical Considerations

Extractions prior to implant treatment planning can result in ridge deformities caused by normal changes associated with socket healing and ridge resorption. This is most often problematic in the anterior region. It is essential to evaluate the timing of tooth extractions and consider bone grafting options for ridge preservation procedures **before** the teeth are removed. Treatment planning for these extractions can often avoid more involved ridge augmentation procedures after alveolar ridge resorption has occurred.

The Timing of Implant Placement relative to the time of extraction depends on the quantity, quality and volume of existing bone, as well as the preferences of the clinician and patient.

Immediate implant placement occurs simultaneously with the extraction. The advantages of immediate implant placement are the prevention of ridge collapse and the maintenance of soft tissue papilla, in addition to the reduction of total surgi-

cal healing time. Because the implant is placed at the time of extraction, the bone-to-implant healing begins immediately with extraction site healing.

Delayed implant placement is performed approximately 6-8 weeks after extraction to allow for soft tissue healing. The primary advantage of delayed implant placement is that by allowing for soft tissue healing and closure of the extraction site, mucogingival flap advancement is not necessary. This is especially true when bone grafting procedures are anticipated because it alleviates the need for additional surgeries to correct mucogingival discrepancies.

Staged implant placement allows for substantial bone healing within the extraction site, which typically requires four to six months or longer. It also allows for complete hard and soft tissue healing and permits the placement of implants into prosthetically favorable positions exhibiting adequate coverage by hard and soft tissues.

Maxillary-Sinus Elevation: When there is inadequate vertical height on the alveolus in the maxillary posterior region, it may be necessary to perform a sinus bone graft to elevate the inferior border of the sinus cavity. The newly-created space can then be filled with bone or a suitable

bone substitute material to increase the total vertical height of bone in the posterior maxilla.

The lateral window technique is probably the most effective and efficient way to elevate the sinus floor for multiple implants or when very limited crestal alveolar bone is present.

Occasionally implants can also be placed at the time of the lateral window technique if there is sufficient native bone in a vertical dimension to stabilize the implant.

If 4-6mm of alveolar bone height is available, an osteotome sinus lift technique can be utilized through the implant osteotomy site. The osteotome technique is usually performed simultaneously with implant placement.

Maxillary Ridge Width Defects: In cases where there are large horizontal deficiencies in the maxillary ridge which may result in significant exposure of implant threads beyond the confines of the alveolar bone, it may be advisable to reconstruct the bone before implant placement.

Horizontal alveolar deficiencies may be reconstructed with bone augmentation (onlay) grafts or ridge splitting techniques.

Fabrication of a Surgical Guide: Surgical guides are most often created from the diagnostic wax-up provided by the restorative dentist. However, advanced surgical guidance to guarantee

precise implant placement in complex implant cases is now possible using sophisticated computed tomography (CT). This is most effective if the scan has been taken with the patient wearing a radiographic surgical template.

Utilizing one of several software programs, the clinician can simulate the placement of implants on the computer screen.

These interactive planning programs provide the clinician the opportunity to perform "virtual surgery," placing implants in optimal positions. Furthermore, such advanced technology ensures that the sites chosen will provide sufficient surrounding bone for each implant and good positioning of the implants in relation to each other. The locations of the implants can readily be altered to ensure proper functional positioning. The clinician can also measure the quality (density) of alveolar bone surrounding each implant fixture.

Once a treatment plan has been carefully evaluated and designed, a customized surgical drill guide can be constructed. Built directly from the selected treatment plan and based on the patient's exact measurements, these guides ensure safe, predictable implant surgery.

Anatomical Factors Affecting Implant Placement: Familiarity with several important anatomic structures found close to desired areas of implant placement in the maxilla and mandible is important in treatment planning and

implant placement. In the maxilla, these include the floor and anterior wall of the maxillary sinus, incisive foramen, floor and lateral wall of the nasal cavity, and canine fossa. Important structures in the mandible are the mandibular canal, mental foramen, anterior loop of the mandibular canal and submandibular fossa.

3D imaging will aid surgical placement of the implant and prevent encroachment on these structures, thereby avoiding unwanted complication and unnecessary morbidity.

Soft Tissue Considerations: Evaluation of the quality, quantity and location of soft tissue in relation to the proposed implant site helps identify the type of tissue -- keratinized or nonkeratinized -- that will surround the implants after treatment is completed. Areas with minimal or nonexistent keratinized mucosa may be augmented with gingival or connective tissue grafts. Additionally, any mucogingival concerns, such as frenum attachments or pulls, should be thoroughly evaluated.

We trust this review of the factors to be considered in successfully treatment planning the complex implant case will be helpful to you. We are firm believers in the concept of "collaborative accountability." Working together as a team consistently produces the most favorable clinical results.

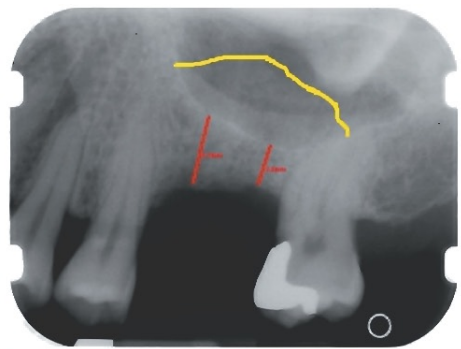


Figure 7. This radiograph shows a low sinus and insufficient bone for placement of an implant.

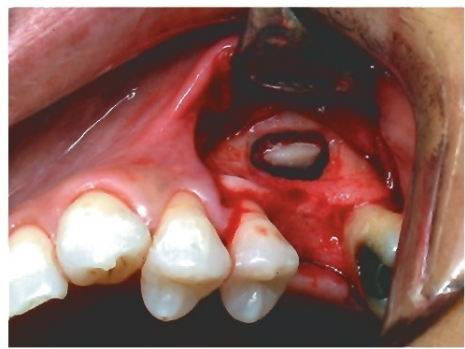


Figure 8. A lateral window sinus lift was performed to increase the height of bone.



Figure 9. The ideal length of the implant placement at seven months.