

Dental implants and the partially edentulous patient

Diagnosis and treatment planning

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This article will focus on developing a logical and sequential approach to treatment planning for the partially edentulous implant patient. In addition it will highlight some of the uses of radiographs as a diagnostic aid.

The demonstrated long-term clinical success with osseointegrated implants¹ now allows (dare I say obligates) dentists to inform their patients about implants in cases where the restorative results would be more idealized. Indeed now that many *partially* edentulous patients are expressing great interest in implants, there are factors which must be considered that do not apply to the completely edentulous patient. Firstly, the periodontal status of the remaining natural teeth must be incorporated into the overall periodontal – implant treatment plan. Secondly, the incorporation of implants into the treatment will sometimes modify the periodontal treatment plan. As an example, a questionable tooth that would otherwise be maintained (even if only for a few years) might be extracted if the anatomic area that the tooth occupied would be better served to allow placement of an osseointegrated implant. Readers interested in related periodontal guidelines are referred to the bibliography for information concerning: Periodontal Assessment Forms², Periodontal Examination³, Periodontal Prognosis⁴ Periodontal Treatment Planning⁵, and finally, Periodontal Considerations as pertaining to the tissue surrounding the implants themselves⁶.

Dentists who plan to incorporate implantology into their practice must be properly trained. Readers are referred to Table I, which stipulates

the R.C.D.S. guidelines for the utilization of dental implants as of June 1988.

This article will focus on developing a logical and sequential approach to treatment planning for the partially edentulous implant patient. In addition, this article will highlight some of the uses of radiographs as a diagnostic aid. Future articles will deal with several other aspects of treating the implant patient.

Getting organized

It is advisable to incorporate an implant charting system such as the one that can be purchased from The International Congress of Oral Implantologists developed by Dr. C.E. Misch⁷. You may decide to develop your own form which should function as a flow sheet. See Table II for an example of the chart designed by the author and Dr. Leonard Schwartz.

When the team approach is being used, the restorative dentist and surgical specialist must co-ordinate the diagnosis, treatment plan and maintenance phases to assure clinical success. Pre-surgically, the restorative dentist is responsible for the prosthodontic evaluation, management of the interim prostheses and

surgical stent fabrication. The surgical specialist is responsible pre-surgically for the medical, surgical evaluations, radiographs, tracings and implant type, number and position. Post-surgically, the restorative dentist is responsible for the interim prosthetic alterations, final prosthetic treatment and maintenance. The surgical specialist post-surgically is responsible for soft-tissue evaluation, bone – implant interface evaluation, radiographic follow-up and periodontal maintenance.

Initial appointment and consultation

The initial appointment and consultation should cover the following:

1. general discussion on implant restorative potential
2. patient expectations
3. rough cost estimate (cannot be specific at this point)

If the patient expresses an interest in knowing more about implants, then a thorough diagnosis (Table III) should be the next step. Once all the diagnostic data has been gathered and analysed, the dentist will formulate a treatment plan (Table IV). As mentioned in the beginning of this article, the dentist must formulate a comprehensive treatment plan incorporating the implant phases in proper sequence with the periodontal, prosthetic and maintenance phases. (Tables II & III).

Radiographic evaluation

As noted in Table III the radiograph

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We welcome this original article which was written for Oral Health.

Table 1
Guidelines for the utilization of dental implants
The Royal College of Dental Surgeons of Ontario

EDUCATIONAL REQUIREMENTS

It is recommended that, prior to performing any implant procedure, a dentist take a comprehensive course which adheres as closely as possible to the following criteria.

The course should be:

1. conducted by persons who have had formal training and experience in dental implants;
2. one that has a participation component;
3. one that teaches methods that have been shown to be successful as a result of investigative basic science and by longitudinal scientific studies;
4. one whose duration is equivalent to not less than one full day of instruction for each of the surgical and prosthodontic phases. The time for each phase should be divided equally between didactic and clinical teaching.

PROFESSIONAL RESPONSIBILITIES

Records should include:

1. documentation showing that "informed consent" was received after an adequate explanation of the treatment plan, prognosis and risks was provided;
2. radiographs which provide optimal imaging of the surgical site;
3. study casts and other diagnostic aids as indicated;
4. detailed clinical notes relative to surgical procedures, temporization, type, size, number and location of implants, including post operative notes;
5. documentation of ongoing clinical and radiographic monitoring.

Comprehensive training programs in the utilization of dental implants will serve to protect the public of Ontario as well as afford protection for the practitioner. Lack of adequate training may place a practitioner at risk in the courts if there are adverse results due to the treatment rendered. Dentists may also be subjected to a review by the College if unsatisfactory results or patients' complaints come to light.

hic examination is an indispensable diagnostic tool for the implant patient. Radiographs are needed to detect pathology, anatomical structures and bone quality, quantity and location.

The lateral cephalometric radiograph can be helpful for viewing the pre-maxilla and symphysis. However, it is limited and as such is utilized at times as an adjunctive view. Dr. D. Clepper⁸ describes an interesting technique whereby he utilized an extra-oral periapical film in the symphysis area that produces results similar to what the cephalometric film would yield. He places a #2 periapical film sagittally on the lateral aspect of the symphysis for the extraoral view.

The panoramic radiograph is valuable and commonly used to view the maxilla and mandible. This radiograph does however have several limitations including overlapping images and non-uniform magnification⁹. Different parts of the radiograph show different degrees of error and there is no single corrective factor. Additionally, one cannot make an accurate assessment of bone density or relative measurement from the panoramic radiograph. Clinically, we may apply a magnification factor of, e.g., 25% depending on the type of machine, however, at times adjunctive periapicals or tomography is indicated.

For the partially edentulous patient, most commonly a full mouth series of periapicals, bite-wings and a panoramic view are taken for periodontal and implant purposes. Tomography should be considered for the atrophic maxilla and posterior mandible where pneumatized sinuses exist and the surgical specialist anticipates a sinus elevation in conjunction with implant placement.

Tomography is a radiographic technique where a 'slice' of the structure is filmed. In the mandible or maxilla, this allows the dentist to view a coronal or sagittal 'slice' to assess the layer of cortical bone, trabecular bone, quality and quantity of bone, location and dimension of the anatomical structures. Tomography however should be prescribed judiciously due to the expense and amount of radiation involved¹⁰,

although one might also consider tomography in the maxilla and posterior mandible where the ridges seem clinically narrow. Alternatively, the width of the osseous ridge can be assessed at the time of surgery or via a pre-surgical exploratory flap. The obvious disadvantage with the flap approach is that the patient is subjected to a surgical procedure where implants may not be placed. Another diagnostic approach is bone sounding with a sharp-pointed bone caliper, however, in the opinion of the author, this technique has limited accuracy.

It may be worthwhile to consider fabricating a 'radiographic-surgical stent' prior to the panoramic radiograph. A stent (made out of acrylic material) is fabricated from the diagnostic cast. Holes are drilled into the stent at the previously marked ideal implant positions and a radiopaque object is secured in the holes. The patient then wears the stent while the radiograph is taken. This same stent can be modified and utilized as a guide for the surgical placement of the implants. The stent allows a more accurate assessment of the desired implant locations as they relate to the anatomic structures. ☞

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| Implant treatment sequence | Table II |
|--|---|
| Patient: _____ | <ul style="list-style-type: none"> necessary "other" pre-implant treatment <input type="checkbox"/> completed <input type="checkbox"/> _____ |
| Date of Birth: _____ | |
| Referring Dentist: _____ | |
| Restorative Dentist: _____ | |
| A) Preliminary Assessment | C) Surgical Phase I |
| <ul style="list-style-type: none"> general status evaluation: <input type="checkbox"/> medical <input type="checkbox"/> dental <input type="checkbox"/> psychological <input type="checkbox"/> patient expectations _____ overview of surgical & prosthetic phases and potential overview of costs: <input type="checkbox"/> surgical _____ <input type="checkbox"/> prosthetic _____ educational: <input type="checkbox"/> models <input type="checkbox"/> brochures <input type="checkbox"/> video tape <input type="checkbox"/> consent form to patient communication with: <input type="checkbox"/> referring dentist <input type="checkbox"/> restorative dentist _____ | <ul style="list-style-type: none"> pre-op. instructions followed fixture operation: _____ post-operative instructions given: _____ interim prosthesis modification: <input type="checkbox"/> not needed <input type="checkbox"/> immediate post-op. _____ suture removal (7-10 days) post-op. soft tissue evaluation <input type="checkbox"/> 1-2 weeks <input type="checkbox"/> _____ post-op. radiographic evaluation _____ |
| B) Pre-Surgical Phase | D) Surgical Phase II |
| <ul style="list-style-type: none"> comprehensive: <input type="checkbox"/> health assessment <input type="checkbox"/> clinical exam <input type="checkbox"/> treatment plan <input type="checkbox"/> estimate comprehensive radiological exam: <input type="checkbox"/> panorex <input type="checkbox"/> intraorals <input type="checkbox"/> analysis <input type="checkbox"/> tracing <input type="checkbox"/> ceph <input type="checkbox"/> tomo study models: <input type="checkbox"/> poured <input type="checkbox"/> trimmed <input type="checkbox"/> mounted <input type="checkbox"/> diagnostic wax-up _____ selection of tentative fixture sites: _____ verification of tentative prosthetic plan with restorative dentist _____ | <ul style="list-style-type: none"> fixture uncovering <input type="checkbox"/> verification of osseointegration <input type="checkbox"/> placement of healing caps/abutments <input type="checkbox"/> modification of interim prosthesis <input type="checkbox"/> not needed post-op. evaluation (1-2 weeks) _____ all necessary "other" dental treatment completed, or <input type="checkbox"/> _____ communication with restorative dentist about fixture details _____ |
| In-Depth Consult: Patient Agreement | E) Final Prosthetic Phase |
| <ul style="list-style-type: none"> comprehensive dental treatment plan (<input type="checkbox"/> estimate) _____ anticipated fixtures and cost (<input type="checkbox"/> estimate) _____ anticipated restorative plan and cost (<input type="checkbox"/> estimate from restorative dentist) estimate and consent forms signed and returned to dentist (<input type="checkbox"/> surgical <input type="checkbox"/> prosthetic) photographs (<input type="checkbox"/> extraoral <input type="checkbox"/> intraoral) _____ pre-op orders <input type="checkbox"/> Rx: _____ <input type="checkbox"/> surgical stent <input type="checkbox"/> correction template <input type="checkbox"/> received <input type="checkbox"/> not needed radiographs with template: <input type="checkbox"/> panorex <input type="checkbox"/> intraorals <input type="checkbox"/> not needed <input type="checkbox"/> completed _____ | _____ |
| | F) Maintenance Phase |
| | <ul style="list-style-type: none"> oral hygiene aids: <input type="checkbox"/> brush <input type="checkbox"/> chlorhexidine <input type="checkbox"/> post-care <input type="checkbox"/> proxa-brush <input type="checkbox"/> rubber tip <input type="checkbox"/> _____ co-ordination of appointments with: <input type="checkbox"/> restorative dentist <input type="checkbox"/> referring dentist maintenance plan: _____ |
| | G) Notes _____ |

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| Table III Diagnosis |
|---|
| A) Health Assessment |
| 1. Past medical history |
| (a) any metabolic diseases |
| (b) psychiatric or psychological problems |
| (c) allergies |
| 2. Present medical status |
| (a) infections present |
| (b) current medications |
| B) Clinical examination |
| 1. Partially edentulous |
| (a) oral cancer screen |
| (b) dental caries |
| (c) periodontal status |
| (d) occlusion/parafunction |
| (e) TMJ |
| 2. Totally edentulous |
| (a) oral cancer screen |
| (b) identify anatomical landmarks, e.g., mental foramen, sinus |
| C) Radiographic examination |
| 1. pathology present |
| 2. quantity of bone |
| 3. quality of bone |
| NOTE: periapicals, occlusals, panorex, lateral cephalometric, tomographs as indicated |
| D) Diagnostic Models |
| 1. assess ridge width |
| 2. may be mounted |
| 3. may be used for diagnostic wax up |
| 4. may be used for surgical and prosthetic stent fabrication |

| Table IV Treatment planning sequence (Refer also to Table II) |
|---|
| A) Initial Therapy |
| 1. periodontal |
| 2. eliminate other oral pathology |
| 1. tentative implant restorative treatment plan |
| B) Periodontal re-evaluation |
| C) Final periodontal treatment (in light of the tentative periodontal and restorative treatment plan) |
| 1. periodontal surgery |
| 2. strategic extractions |
| 3. periodontal maintenance |
| D) Implant evaluation and selection |
| 1. type, number, diameter and length dependent on: (a) bone quantity (b) bone quality (c) type of prosthesis desired |
| E) Implant surgery |
| F) Prosthetic treatment |
| G) Maintenance phase |