

GUIDELINES FOR THE PROVISION OF DENTAL IMPLANTS

Dental implants have become an accepted method for tooth replacement and should be presented by dentists to patients as an alternative to replacing missing teeth. Patients in need of tooth replacement should be informed about dental implants, including the potential benefits, long-term survival statistics, risks, and potential complications. In addition, they should be informed about the importance of maintenance and long-term follow-up, including their specific responsibilities regarding the same. Fortunately, there is a wealth of evidenced-based research available that dental professionals may utilize to inform their patients. In addition, dental professionals may find answers to critical questions regarding implant therapy in the following guidelines developed by the Academy of Osseointegration (AO) based on recognized standards of care and the results of AO's 2006 Consensus Conference on the State of the Science on Implant Dentistry.

DEFINITION

Definition of dental implant (adapted from *The Glossary of Prosthodontics Terms*): A prosthetic device made of alloplastic material(s) implanted into the oral tissues beneath the mucosa and within the bone to provide retention and support for a fixed or removable dental prosthesis.

THERAPEUTIC GOAL

The therapeutic goal of dental implants is to support restorations that replace a missing tooth or teeth so as to provide patient comfort, function, and esthetics and to assist in the ongoing maintenance of the remaining intra-oral and perioral structures.

PRETREATMENT CONSIDERATIONS

Patients must be evaluated by dentists prior to initiation of treatment to ensure the appropriateness of care. When dental implants are considered, it is often advantageous to involve one or more dental specialists in the evaluation process. A systematic and coordinated plan delineating the responsibilities of each member of the team should be developed and followed. An evaluation of implant patients should include the following steps:

- Elicit and record a comprehensive medical and dental history and understand the relevance of that information to the individual case.
- Complete a thorough extraoral and intraoral examination, including detailed assessment of the teeth, restorations, periodontal tissues, oral mucosa, residual alveolar ridges, and esthetic requirements.
- Assess the occlusion and its relevance in relation to the proposed treatment.
- Identify the need for appropriate further evaluations, be able to request and interpret them and write a report of the findings.
- Collate and interpret the information gathered in the history and examination process and arrive at the correct diagnosis.
- Arrive at a prognosis for the remaining dentition and oral structures.
- Communicate clearly to the patient, verbally and/or in writing, the findings of the examination, the diagnosis, and treatment options.
- Be aware of the evidence base relating to the patient's options, including dental implants.
- Produce a treatment plan considering options for tooth replacement and the patient's preventive, functional, esthetic, psychological, and financial requirements.
- Understand the interface between implant dentistry and other clinical disciplines.
- Understand the difference between fixed and removable prostheses and be able to evaluate these treatment options.
- Understand the current evidence relating to the different types of implant placement techniques.
- Consider and recommend the timing of implant placement and restoration.
- Obtain the patient's informed consent for the proposed treatment.
- Provide or refer patient for appropriate allied treatment and re-evaluate prior to implant therapy.
- Recognize complex cases, ensure members of the team have adequate education, training, experience, and proven ability with respect to the contemplated treatment, and refer patient to the appropriate specialists.

Patients who are on intravenous bisphosphonates have been shown to be at risk to develop osteonecrotic jaw disease (ONJ) following oral surgical procedures. At present, many organizations, including the American Association of Oral and Maxillofacial Surgeons, have recommended against any elective surgery involving oral osseous structures for patients who have been on intravenous bisphosphonates for any period of time. Since there is no agreed upon half-life of these medications, cessation does not reduce or eliminate the risk of ONJ. Oral bisphosphonates carry a much smaller risk than intravenous bisphosphonates, especially if used less than 3 years. However, the development of ONJ has been reported by patients on short-duration, low-dose oral bisphosphonates. Patients on oral bisphosphonates should be advised of the potential risks of developing ONJ, although there is apparently no contraindication to treatment at present. The potential risks to develop ONJ have been outlined by the American Dental Association.

With regard to potential risk factors, the results of the AO 2006 Consensus Conference on the State of the Science on Implant Dentistry demonstrated that smoking has an adverse effect on implant survival and success. The effect of smoking on implant survival appears to be more pronounced in areas of loose trabecular bone. Type 2 diabetes may also have an adverse effect on implant survival rates, but the limited number of studies included in the review for the Consensus Conference did not permit a definitive conclusion. A history of treated periodontitis does not appear to adversely affect implant survival rates, but periodontitis may have a negative influence on implant success rates, particularly over longer periods. It is therefore recommended that a periodontal evaluation and appropriate treatment be provided prior to implant placement.

The following aids may be utilized in presurgical considerations to assist in determining the number, location, type, and angulation of the implants and abutments:

- Diagnostic casts, mounted or mountable
- Imaging techniques
- Radiographic guides

With regard to diagnostic radiographs, the use of serial or cone beam CAT scan imaging techniques is recommended when there is concern regarding the quality and quantity of available bone at the potential implant site and proximity to vital structures including, but not limited to, the maxillary sinuses, inferior alveolar nerve, and teeth.

Several grafting procedures have proven successful in providing adequate bone quantity and quality for implant placement in patients who have bone loss. The AO 2006 Consensus Conference on the State of the Science on Implant Dentistry reported that the maxillary sinus augmentation procedure has been well documented, and the long-term clinical success/survival (> 5 years) of placed implants, regardless of graft material(s) used, compares favorably to implants placed conventionally, with no grafting procedure, as reported in other systematic reviews. Alveolar ridge augmentation techniques do not have detailed documentation or long-term follow-up studies, with the exception of guided bone regeneration. However, studies that met the inclusion criteria were comparable and yielded favorable results supporting dental implants. The alveolar ridge augmentation procedures may be more technique-sensitive, and implant survival may be a function of residual bone supporting the dental implant rather than grafted bone. More in-depth, long-term, multi-center studies are required to provide further insight into augmentation procedures to support dental implant survival.

IMPLANT PLACEMENT

Prosthetic considerations for patients requiring implant placement should include evaluation of the pre-existing condition of teeth adjacent to partially edentulous bases, and the condition of the soft tissue may be critical to the anticipated results of intervention using endosseous

implants. For example, if a patient presents with a distinct lack of interdental papilla, it is unlikely implant intervention will recreate something the patient has already lost. The evaluation should also include

- Number and location of missing teeth
- Interarch distance
- Number, type, and location of implants to be placed
- Existing and proposed occlusal scheme
- Design and type of planned restoration

The surgical technique is based on the pretreatment evaluation and the type of implant to be utilized. The following should be considered:

- Aseptic technique
- Appropriate use of surgical templates
- Surgical template utilized
- Appropriate postoperative instructions

A staged approach has been most often used to place dental implants. However, implants may be placed at the time of dental extraction and loaded at the time of placement. The results of the AO 2006 Consensus Conference on the State of the Science on Implant Dentistry indicated that due to the heterogeneity of studies published to date, it was not possible to compare the outcomes of immediately placed implants with implants placed in healed sites. Most studies reported high survival rates for immediate implant placement. Immediate implant placement offers shorter treatment time and fewer surgical procedures. However, there is some concern about the potential for soft and hard tissue complications after immediate implant placement. Clinicians must consider and understand the potential beneficial or adverse impact that anatomic factors may have on the functional and esthetic outcomes of immediate implant placement. Despite a tendency favoring the longest time-to-loading protocols, no generalized clinical recommendations can be made because potential influencing factors on outcomes were under-represented. Existing limited data suggest that the immediate/early loading of implants placed in the interforaminal area can be considered as a reasonable treatment alternative to delayed loading. However, the applicability of immediate or early loading protocols to a given clinical situation must be considered in the context of the unique anatomic, biomechanical, and host factors and the competency of the clinician.

POSTPLACEMENT PROCEDURES

The following considerations should be reviewed prior to the restorative phase:

- Quantity, quality, and health of soft and hard tissues
- Implant stability
- Implant position and abutment selection
- Occlusal analysis
- Oral hygiene assessment

Decisions regarding the time to restore a dental implant are based upon a variety of factors. Clinicians must understand: the effects of bone quality on healing; the effects of micromovement on potential osseointegration; differences in force application relative to location within the dental arch; risks and benefits associated with grafting; general healing times; and other factors that influence short and long-term prognosis.

Once implants are deemed ready for restoration, the clinician must consider the following: the appropriate method for implant uncovering; time to loading; method of loading; magnitude of force application; material choices; occlusal scheme; prosthesis retention; and the need for protective occlusal guards. Philosophical decisions may influence the type of retentive mechanism utilized. Whether prostheses are retained by transocclusal screws or cement, provisional or definitive, there is always a risk that the connection between implant and restoration could loosen over time.

IMPLANT MANAGEMENT

Periodic evaluation of implants, surrounding tissues, and oral hygiene is vital to the long-term success of the dental implant. Considerations in the evaluation of the implant are:

- Oral hygiene status
- Clinical appearance of peri-implant tissues
- Radiographic appearances of implant and peri-implant structures
- Occlusal status, stability of prostheses and implants
- Probing depths and alveolar bone level
- Presence of exudate or bleeding on probing
- Appropriate maintenance intervals
- Patient comfort and function

OUTCOMES ASSESSMENT

The desired outcome of successful implant therapy is maintenance of a stable, functional, esthetically acceptable tooth replacement for the patient. Variations from the desired outcome of implant placement include:

- Implant mobility or implant loss
- Persistent pain and/or loss of function
- Progressive bone loss
- Persistent peri-implant radiolucency
- Neuropathy/paresthesia
- Persistent uncontrolled inflammation/infection
- Increased probing depths
- Inability to restore the implant
- Fractured or loosened prosthetic components
- Fractured occlusal materials
- Prosthesis instability
- Implant fracture

The etiology of implant complications can be multifactorial, involving both structural components and tissue considerations. Routine evaluation may reveal the need for procedures to prevent and treat complications. Clinicians must be familiar with interventions and approaches to manage the complications listed.

DISCLAIMER

These guidelines provide information to consider regarding the provision of dental implants. The guidelines are not intended to be all-inclusive or otherwise limit the inquiry and consideration applicable to the provision of dental implants. The guidelines neither endorse nor make any representation regarding the qualifications, capabilities, skill or competence of any individual dentist. The guidelines present general information for educational purposes only and are not intended nor should be used as a substitute for research and/or professional medical advice. The Academy of Osseointegration expressly disclaims all responsibility and liability arising from the use of or reliance on the guidelines, and assumes no responsibility or liability for any claims that may result directly or indirectly from the use of the information.

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SELECTED RESOURCES

- Proceedings of the 2006 AO Consensus Conference on the State of the Science on Implant Dentistry. *Int J Oral Maxillofac Implants* 2007;22(suppl):1-226.
- Royal College of Surgeons (United Kingdom). Learning objectives from the requirements for the diploma in implant dentistry.
- Laney WR. Glossary of Oral and Maxillofacial Implants. Berlin: Quintessence, 2007.
- Additional information may be obtained from the scientific literature at www.pubmed.gov.