A time shift link

How implant planning affects periimplant diseases

By Rainer Buchmann1, Daniel Torres-Lagares2, Guillermo Machuca-Portillo2
1 University of Düsseldorf, Germany; 2 University of Seville, Spain

Implants are becoming increasingly popular with low-cost offers promoting this development. The number of customers preferring implants to customary restorations is expanding.

The variety of client demands, individual settings, treatment options and risks related to inflammation and bone damage following implant treatment advocates evident, comprehensible and durable solutions.

Planning

Early Decision Making

Early implant decision making comprises anatomical, functional and economic issues:

a) Anatomy: Treated severe periodontitis usually displays clinical stability with further drawbacks around implant supported bone at buccal plates or interproximal sites by inflammation (Figs. 1 & 2).

b) Function: Following untreated periodontal diseases or tooth removal, shifting of single tooth initiates due to myofunctional imbalance by loss of front-canine equilibration, a group side shift emerges with further bite reduction as result of age and musculature.

c) Idee: Periodontal therapy of severely compromised teeth with bone loss >50% often results in a later date implant treatment that defies dental efforts and bills. Economic issues should downregulate this strategy.

d) Oral comfort: Stability, oral hygiene and esthetics become fostered by timely implant placement and optimized implant prosthetics.

Clinical practice emphasizes a time-tested planning with (i) removal of severely compromised teeth, (ii) perioperative therapy securing the residual dentition, supplemented by (iii) microsurgical revision of deep intraosseous pockets prior to implant planning to safeguard inflammation (Figs. 3 & 4). Implant planning results tentatively. A final quotation will be drawn after completion of muscles (M. temporalis, M. mas- seter) and the temporomandibular joints (M. pterygoideus medialis und lateralis) with focus of tension, indentation and pain pressure.

2. Osteopathic examination of craniofacial dysfunctions initiated by body states (inclined position), (mus.) posture, walk (activity) etc. should exclude somatic sources.

If applicable, manual osteopathic treatment to improve physiological function, i.e. body alignment, symmetry and support homeostasis that has been altered by somatic dysfunctions.

3. Careful reduction of prominent vestibular contacts (front) and (sid).

Safeguarding implant treatment commences with careful tooth removal, peri-implant treatment and implant planning respecting four key issues:

1. Early decision making to ensure implant bone support with limited number of implant placements.

2. Sound tooth removal to protect bone loss by intraosseal root dissection.

3. Accuracy of implant diagnosis and implant placement by 3D visualization (DVT) of implant surgical access.

4. Minimal surgical involvement with short and low diameter implants while restricting augmentation to prosthetic relevant settings.

Plates or interproximal sites by inflammation (Figs. 1 & 2).

Function: Following untreated periodontal diseases or tooth removal, shifting of single tooth initiates due to myofunctional imbalance by loss of front-canine equilibration, a group side shift emerges with further bite reduction as result of age and musculature.

Idea: Periodontal therapy of severely compromised teeth with bone loss >50% often results in a later date implant treatment that defies dental efforts and bills. Economic issues should downregulate this strategy.

Oral comfort: Stability, oral hygiene and esthetics become fostered by timely implant placement and optimized implant prosthetics.

Functional relief and 3D digital evaluation of the implant bone anatomy.

Functional decompensation

Fully and partially edentulous patients frequently reveal a bite reduction by usage (wear) with loss of front-canine equilibration and a resulting left and right grouped premolar and molar side shift. Dysfunction and habits (pressing, grinding etc.) promote further damage. In severe periodontitis, group side shift accelerates disease progression, impedes post therapy healing and weakens alveolar bone assigned for later implant placement. Early implant planning includes following key issues:

1. Inspection of the oral cavity comprises evaluation of the maxil- lary bar during laterotrusion on the operating side.

2. Placement of a relaxation appliance in the maxilla (overbite and deep bite in the mandible) for functional decompensation with frontal platform allowing a front-canine equilibration and temporary relief in molar by vertical base of -7 mm (Fig. 5).

The primary objective is the decompensation of use-related dysfunctions to achieve relief, vascularization and mineralization of the alveolar bone prior to implant placement. Subsequent realization of the issues 1-4 ensures dispenses of the treatment plan.

Placement of a DVT (digitization means information acquisition) reading in the maxilla (overbite and deep bite in the mandible) for functional decompensation with a frontal platform allowing a front-canine equilibration and temporary relief in molar by vertical base of -7 mm (Fig. 5).

Precision: The benefit of a time-intense 3D implant evaluation is a more precise, controlled and risk-reduced planning, and easing surgical implant placement. These advantages should be utilized by all dental health care providers, even with long-term clinical expertise even though with long-term clinical expertise.
If you are not a DVT owner, oral switching, concave abutments, micro-pedicled flap surgery and infection due to allogeneic bone grafts including alternative augmentation, bone grafting efforts, extent and expenses of bone support, 3-D digital imaging of setting implicates deficient implant dependent of the implant type used.7 If two implants are inserted side by side, cross-bite or long-term periodontal adequate, especially in patients with local bone anatomy is often inadequate.8 The micro-movements onto the stability machined neck or implant abutment to private cash. The exact DVT area, details and viewer suitability for your PC software. The exchange of implants with platform switching, concave abutments, macromachined neck or implant abutment micro-movement or the ability of crestal bone and soft tissues are limited to subclinical notice.4 The interdental distances primarily fall into low prosthetic requirements of the residual dentition.10 From anatomy, the present rules occur:1

1. Minimal distance between single-rooted teeth incl. premolar: 7 mm. 1.5 mm in interdental distances of at least 1 mm (Fig.8).2

For appropriate implant placement according to prosthodontics, the local bone anatomy is often inadequate, especially in patients with cross-bite or long-term periodontal damage etc. (Fig. 9). If the clinical setting implicates deficient implant bone support, 3-D digital imaging of alveolar bone including individualized implant positioning with diameter-reduced implants is allocated. Note: Prior to surgery, calculate additional efforts, extent and expenses of alternative augmentation bone grafting or autogenous bone grafting including pedicle flap surgery and infection due to soft tissue advancements.

**Implant placement**

**Perfusion**

**Maintenance of vascularized implant bone is indispensable to avoid further periimplant damage as result of compromised bone tissue injury during implant surgery (early implant failures).** Within implant insertion, bleeding of cortical bone following drilling is a necessary requirement for uneventful healing and integration of the implant into surrounding tissues (Fig. 10). The following step by step procedure has been proven effective:

1. Utilization of keen pilot and multi-use tapping drills (renew early, otherwise high drilling forces and danger of deviation from drilling axis occur).
2. Interim implant bed preparation under permanent cooling with 0% saline.
3. Prior to implant placement, wait until implant bed has been replenished with blood.
4. Wetting of implant surface with blood prior to implant insertion.
5. Extended rotation speed < 800 r.p.m during implant bed preparation, hand or implant placement with torque key, max. 10–30 Nm, if applicable.

A slight submental position of the implant is advisable as drilling endpoint.1 To ensure healing, a primary fixation of the implant is mandatory for all implant types (cylindrical, non-machined) and machined quality and anatomical localization. The authors strongly discourage from further ‘screwing’ to avoid ongoing tissue injury of the implant bone interface.6

**Periimplant tissue (volume)**

The usage of short implants < 6 mm demands minimalization of implant surgery placement and healing and are customer-friendly. However, micro-incision surgery requires additional efforts by 2-D imaging (DVT) during planning and sensitiveness of clinical realization. Evidence-based practice is successful with focus on tissue biology and both renunciation from mechanical dentistry and inter-locking theories.

**Diameter-reduced (> 4 mm), small implants (minis) allowing transingulal healing. According to their material properties (fracture) and limited implant-prosthetic indications and compatibility, Minis are limited to individual applications in multidisciplinary subjects with endo-talus mandible, enhanced risk for surgery i.e. advanced diabetes mellitus or hereditary diseases and handicaps for oral hygiene.2**

**Augmentation and revision**

Except for sinus floor grafting, the number of augmentative implant surgery is decreasing and confined to reconstruction following trauma and tumor by vertical or horizontal bone distraction or allogeneic bone grafts including the additional dues of soft tissue surgery i.e. advanced diabetes mellitus or hereditary diseases and handicaps for oral hygiene.2

**Summary**

The prevention of periimplant diseases is based on a comprehensive analysis, evaluation and planning prior to implant placement. Securing the residual dentition from periodontal disease, on time removal of compromised teeth and functional compensation with focus on front canine equilibration are the key issues during initial planning prior to implant surgery. DVT diagnostic evaluation is required if proximity to anatomical structures is anticipated and short and diameter-reduced implants are advocated to determine interdental distances and safeguard implant placement. Implant denture succeeds with minimal mechanical loading of implant bone and implant integration of perforation during surgery. Periimplant enlargement is scheduled during implant healing, either by free gingival graft or pedicle flap. Premolar and molar implant restorations are screw-fixed axially to ease handling in case of periimplant damage. The concerted action of eliminating inflammation, stabilizing function while minimizing surgery secures implant success, prevents periimplant diseases and promotes the reputation of dental health care providers in the community.

The authors appreciate the encouragement and support of Dr. Carola Schleicher, Diisseldorf for implant corrosion. Professor Rainer Buchmann is a specialist in prosthodontics and periodontics. He works at a private practice in Diisseldorf Germany and teaches at the periodontics and prosthodontics courses at Heinrich Heine University of Dusseldorf and University of Seville in Spain. He can be contacted at info@perioimplant.eu.
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Avoiding common problems in tooth extractions

By Dr Kamis Gaballah, UAE

The last two decades have seen significant advances in restorative techniques and materials for dentistry. The latter, along with community-based preventive measures that aim to reduce the incidence of caries, have resulted in many patients living with functional teeth for a longer period. Yet, extraction of teeth forms the considerable bulk of the workload in oral surgery owing to several factors, including the late presentation of patients with advanced dental disease, the presence of symptomatic impacted teeth, such as third molars, and the need to extract teeth for orthodontic or orthognathic treatment.

The extraction of teeth varies greatly based on the type of patient who is undergoing the procedure. For example, elderly patients with significant co-morbidities and on a complex combination of medications as compared with young healthy individuals render the procedure complicated and require much more preparation with modifications during and after patient management. Additionally, extractions can range from a single, fully erupted tooth with favourable morphology to multiple misaligned, impacted teeth or teeth with challenging morphology. Local anatomy, such as tooth proximity to the nerve, maxillary sinus and tuberosity, also plays a significant role. These variations usually dictate who is to perform the extraction, as many general practitioners deal with less complicated cases of dental extraction in individuals regarded as healthy patients and may not feel comfortable operating on medically complex patients.

Complex extraction cases have been linked to a higher rate of postoperative complications, therefore, a cautious and systematic approach should be adopted that includes a detailed preoperative assessment to predict the potential difficulties that might arise during extraction. The documentation of all complicating risk factors along with their potential postoperative morbidities is crucial and should be included in the informed consent. In the following article, other useful tips will be provided that are not usually included in traditional textbooks or lecture notes to help general practitioners to perform safer extractions.

During clinical examination, it has been proven useful to observe the patient’s build. Tall and muscular individuals tend to have a long ramus with a higher mandibular foramen, and this increases the possibility of failure of the inferior dental nerve block procedure if the former is not taken into account when determining the height of the injection site. This can be aided by tracing the inferior dental canal (IDC) to the mandibular foramen in the preoperative panoramic radiograph. The teeth of such individuals may also have longer and more curved roots and be embedded in highly dense, compact alveolar bone, and thus sectioning of the teeth may be required to ease the resistance. Racial differences should also be taken into account, as extractions of teeth from individuals of Afro-Caribbean descent tend to be more challenging owing to the hardness of their bone and divergence of roots in their molars.

The resistance of hard tissue should be expected, particularly if maxillary second and third molars are being extracted, as the potential for fracture of both the buccal plate and the tuberosity is relatively common when excessive force is applied with dental forceps. Fracture of the tuberosity may produce irregular sharp bony borders, significant soft-tissue laceration and potentially an orofacial fistula. If such risk factors are identified, the dental nerve (IDN) is a well-known complication of surgical extraction of deeply impacted LMs. It should be acknowledged that this is not simply a loss of sensation; the damaged nerve can be responsible for a number of abnormal sensations, including sharp pain and abnormal response to stimuli, such as the perception of a light touch as a sharp stab. This can have a significant impact on quality of life for many patients.

Injury to the IDN may occur from compression of the nerve, either indirectly by forces transmitted by the root and surrounding bone during elevation or directly by surgical instruments, such as elevators. The nerve may also become transected by rotary instruments or during extraction of a tooth whose roots are notched or perforated by the IDN. The risk factors for IDN injury during extraction of LMs are shown in Table I.

Preoperative radiographic investigations may include intraradicular images, such as occlusal radiographs, panoramic views of the jaws, and conventional CT or CBCT scans. It should be noted that not predicting signs in radiographs only indicate that there is an increased risk of nerve damage associated with the extraction of the corresponding third molar. However, they cannot actually prevent the nerve injury if the tooth is to be extracted. The effective strategies that may avoid or minimise the risk of injury to the IDN include:

- Performing comprehensive preoperative investigations and coronectomy can be performed with a shorter incision, whole tooth may carry an unavoidable risk of injury to the nerve, therefore intentional retention of parts of the tooth was proposed via a planned procedure introduced around 20 years ago called cortoconectomy. This is the removal of the crown of a tooth, leaving the root in situ. It is mostly avoided to reduce the risk of nerve extrusion, except with a significantly low incidence of injury to the IDN.

It should be noted that both sectioning and coronectomy can be performed with a shorter incision,

The indications for the extraction of impacted lower third molars (LMs) have been the subject of long-standing debate. Surgical procedures for the extraction of unerupted LMs are associated with significant morbidity. This includes pain, swelling and the possibility of temporary or permanent nerve damage, resulting in altered sensation of the lip, chin, gingiva or tongue. Damage to the inferior dental nerve (IDN) is a well-known complication of surgical extraction of deeply impacted LMs. It should be acknowledged that this is not simply a loss of sensation; the damaged nerve can be responsible for a number of abnormal sensations, including sharp pain and abnormal response to stimuli, such as the perception of a light touch as a sharp stab. This can have a significant impact on quality of life for many patients.

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It should be noted that both sectioning and coronectomy can be performed with a shorter incision,
as the amount of bone removal required is minimal, thus minimising the postoperative morbidity. However, it cannot be performed in all cases in which the LM is close to the IDC and is certainly contraindicated when the LM is decayed or its roots are associated with a pathology and should be considered with caution in severely inclined mesio-angular and horizontal impaction cases. The author does not recommend distal bone removal or retraction of the lingual flap with the intention of protecting the lingual nerve, as these may increase the risk of damaging the lingual nerve. It should be emphasised that incision may not extend beyond the distobuccal aspect of the tooth.

The other important aspect of the dental extraction procedure is the future replacement of the tooth to be extracted. The current trend of tooth replacement for both functional and aesthetic reasons is the placement of dental implants. The success of this treatment largely depends on the availability of healthy bone in sufficient volume. Therefore, it is crucial for the dental practitioner not to compromise the alveolar bone during extraction of the teeth. Changes in the alveolar bone ridge after an extraction are inevitable. After all dental extractions, bone height and width always undergo dimensional changes. Bone does not regenerate above the level of the alveolar crest, that is, its height will not increase during healing. The buccal plate tends to shrink, shifting the crest of the alveolar ridge lingually, and often forms a concavity. Such changes are predictable and bone does not regenerate in the extraction socket owing to lack of functional stimulation. The presence of poorly remodelled alveolar bone may compromise the stability and function of the future implant. Furthermore, studies show that the stripping and elevation of bone to provide sufficient alveolar bone for implant placement may be achieved by avoiding unnecessary bone removal and stripping of the periosteum during surgery as well as performing a surgical alveolar bone preservation procedure. Bone removal can be largely avoided or minimised through modification of the traditional extraction technique. The first such modification is the use of dental forceps or the bulky elevators. The use of such gentle instruments also eliminates the need for elevation of mucoperiosteal tissue. However, it should be noted that the safe use of these instruments requires adequate training and should be encouraged during undergraduate clinics. Clot stabilisation through light packing of the socket with collagen sponges may help to minimise clot dislodgement, as well as accelerate the healing process and bone regeneration.

The second strategy is the alveolar bone preservation procedure. This includes packing the extraction socket with different fillers, such as osteoinductive or osteoconductive materials, like autogenous, natural or synthetic bone grafting materials that support the alveolar socket walls, thus preventing their collapse and shrinkage. It should be noted that this intervention can only slow down the post-extraction changes to improve the success of the dental implant, but cannot stop them altogether.

Finally, post-extraction care should include an explanation of the healing process and potential symptoms encountered after such procedures. The prescription of medications should be limited to non-steroidal anti-inflammatory drugs in most cases and imprudent use of antibiotics or socket dressing should be avoided.
“Consumers are pushing dentists toward metal-free implantology”
An interview with Dr Sammy Noumbissi, founder of the International Academy of Ceramic Implantology

“A great deal of progress has been made in terms of materials, techniques and design of dental implants since the beginnings of modern implantology over 50 years ago. While titanium and titanium alloys have always been in use, the search for metal-free implantable materials began in the late 1960s and early 1970s, and during the last decade, zirconia has emerged as the most reliable implantable bioceramic. The International Academy of Ceramic Implantology (IAOCI) is an organisation entirely dedicated to ceramic and metal-free alternatives to metal implants. It was founded in 2011 by Dr Sammy Noumbissi, with whom Dental Tribune had the opportunity to speak about the mission and vision of the IAOCI, as well as the state of ceramic implantology today.

**Dental Tribune:** Dr Noumbissi, could you provide some background information on the development of ceramic implants?

**Dr. Sammy Noumbissi:** The use of dental implants to replace teeth has increased very rapidly in the last 15 or more years. With this increase in dental implant procedures, the number of manufacturers has increased too. Also, we have witnessed the introduction of various alloys of titanium over time.

Now, just like with any pharmaceutical or medical product, the increase in demand and changes in production methods come with problems and challenges. Although initially anecdotal, reports of titanium and titanium alloy intolerance have increased and are increasingly being investigated and demonstrated in the scientific dental literature.

“In the late 1960s, pioneers in ceramic implantology and notably Professor Sami Sandhaus began the search for non-metal implantable ceramic materials. However, many of the early ceramic implants were monocrystalline in their structure and could not survive the demands of the oral environment. Then came the use of polycrystals and in the early 2000s yttria-stabilized zirconia bioceramic emerged as the material of choice for metal-free intrabony implantation in dental implantology.”

**How did you become involved in research on ceramic dental implants?**

“...reports of titanium and titanium alloy intolerance have increased and are increasingly being investigated and demonstrated in the scientific dental literature.”

**Dr Sammy Noumbissi**

In your opinion, what are the dangers of metal implants?

Metal and most particularly titanium implants have been very successful. Their use has grown exponentially and with that manufacturers have multiplied, as well as manufacturing protocols. As a result, we have observed a steady increase in the alloy elements mixed with titanium during the manufacturing process. The problems begin when the metal implant highly alloyed or not, once placed is subjected to functional stresses, galvanism, body fluids and the harsh oral environment. The combination of mechanical, chemical and electrical events induces cracks and pitting of the metal, as well as breaches in the oxide layer, and the implant undergoes corrosion attack. The corrosion attack, which is essentially an oxidation process, leads to the release of metal ions that studies have shown to be found in the surrounding bone, lymphatics, spleen, liver and in some cases crossing the blood-brain barrier.

What alternatives to metal dental implants are currently available on the market?

In 2011, two colleagues and I decided to create the IAOCI.

What is the primary aim of the IAOCI?

Associations and academies exist around various types of trades and industries. The common purpose of such groups is to organise and create a supportive environment for those involved in the respective area. The IAOCI was created with the same spirit, not only to organise metal-free implantology but also to provide the profession as a whole with quality and high-level continuing implant education on bioceramics as implantable materials. The IAOCI is also a resource for the public seeking practitioners who have experience with ceramic implants.

In your opinion, what are the dangers of metal implants?

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What alternatives to metal dental implants are currently available on the market?
Today, the well-researched and proven alternative material to metal for dental implantation is zirconium dioxide, also known as zirconia. This is also a well-proven fact in medical orthopedics. Zirconia is the crystal phase of zirconium and as such it is not a metal. There are different manufacturing protocols for zirconia for dental implantation and they all lead to a variety of polycrystal bioceramics, such as zirconia-toughened alumina, hot isostatic-pressed zirconia and yttria-stabilized zirconia. The common and most important properties of these bioceramics are inerterness in the bone and oral environment, structural stability, absence of electrical activity, extremely low plaque retention and superior aesthetics.

Is the success rate of metal-free implants comparable with that of titanium implants?

In the early days, there were challenges. The materials were monocrystalline with very highly polished and glossy surfaces, which made the early implants prone to fracture, poor attachment of bone-forming cells and low bone-implant contact. The manufacturing protocols, design, surface modification techniques and technologies of zirconia implants have evolved to a point where bone integration is ensured and comparable results are obtained.

Are ceramic alternatives the future of dental implantology?

Every industry projection one sees about implants signals good news for the future. Implants are now and will continue to be widely accepted by patients and the profession. Both groups agree that this is state-of-the-art treatment. However, owing to technology, the public is much more informed about health issues and therapies. We are in a similar situation today to that of orthodontics a few years back, in that consumers are pushing dentists toward metal-free implantology for the most part. In five years’ time, I believe that the number of ceramic implants being placed will double.

Bio-inert materials are the future of any type of implantable device. I believe bioceramics have taken off and will be around for a long time because there has been a strong shift toward providing health care with the minimum risk and invasiveness over the last few years, as well as in a way that is more integrated, natural and biological. Furthermore, manufacturers have rapidly evolved and adapted to the material and implant designs to clinical needs and demands. We now have a wide variety of implant designs, surface microstructures, components and prosthetic connections, making ceramic implants applicable to an extensive range of both replacement situations.

Dentists may have concerns about the reliability of ceramic implants. How does your organization address this?

Even within specialties, there is a need for organized groups because in today’s world research and application of discoveries are moving at lightning speed compared with 20 years ago. Therefore, once one has an environment in which much of the time and energy is spent tracking, learning and sharing innovative techniques and materials, members have a forum where they can obtain the information, training and skills to deliver the best of care to their patients in an evidence-based and organized manner.

As a matter of fact, our membership has doubled in the last two years and when prospective or new members are asked why they want to join or joined the academy, the most common response is that they are seeking a forum where they can obtain structured information and training.

Another frequent reason is that dentists have had patients challenge or inform them on the use and occasionally the existence of ceramic implants. Through technology and the ease of access to information, the public obtains information faster than we busy clinicians.

The AAOI will be hosting its fifth annual Winter Congress in Montego Bay, Jamaica. What can people expect from the event?

The theme in 2016 will be the last decade in ceramic implantology. We will have 14 speakers from seven different countries who will share their experiences with a variety of ceramic implant systems over the last ten years. One of our guest speakers has over 35 years of documented experience with zirconia implants. We will also have workshops on different implant systems, ceramic regenerative products and revolutionary soft-tissue- and hard-tissue-enhancing protocols proven to optimize implant integration and long-term stability.

Thank you very much for the interview.
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