A time shift link
How implant planning affects periimplant diseases

By Rainer Buchmann1,*, Daniel Torres-Lagares2, Guillermo Machuca-Portillo3
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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) Anatomical: Treated severe periodontal tissue 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 misusage preferentially.

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

Ocular 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) periodontal therapy securing the residual dentition, supplemented by (iii) microsurgical revision of deep intrabony pockets prior to implant placement to safeguard inflammation (Figs. 3 & 4). Implant planning resolves tentatively. A final quotation will be drawn after completion of mucosal (M. temporalis, M. masseter) and the temporomandibular joints (M. pterygoideus medialis und lateralis) with focus of tension, induration and pain pressure.

Osteopathic examination of cranio-cerebral dysfunctions: initiated by body states (inclined position), (mis) posture, walk (activity) etc. should exclude somatic sources. If applicable supportive therapy.

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

3. Careful reduction of prominent protrusive contacts (front) and sides are manufactured as stern spilins in dimensions of 1.5 mm with extension limited to the first molar.

Digital imaging 3-D
Digitization means information and safeness. The generation of a 3-D in early implant planning barthes three vantages:

• Commitment: The expenses of 120–180 euro depending to extent, area of analysis and institute display a motivational factor ensuring consent with the treatment plan. Young patients and IT employees ask for the benefit of 3-D imaging during the first or second visit of implant

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. Sound tooth removal to protect bone loss by intradental root resorption.

2. Accuracy of implant diagnosis and implant placement by 3-D visualiztion (IVT) of implant surgical access.

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

4. 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 misusage preferentially.

If applicable supportive therapy.

If applicable manual osteopathic therapy. If applicable supportive therapy.

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If you are not a DVT owner, oral surgeons (specialists) and diagnostic radiology (CT, MRI) are appropriate contact addresses. For the intended 3D image, always allocate the expenses to the DVT diagnostic, which is very viewer suitable for your PC software. The expenses both of the DVT and the digital analysis and evaluation are subjects to private cash.

**Periimplant Therapy**

Periimplant disease of the adjacent tooth, the interdental papilla remains. If two implants are inserted side by side the supragingival biological width and the papilla as result disapper, independent of the implant type used. The effects of implants with platform switching, connective abutments, micro-machined neck or implant abutment micromovement is the ability of crestal bone and soft tissues are limited to subclinical.

The periimplant disturbances primarily influence the prosthetic requirements of the residual dentition.

For appropriate implant placement according to prosthetics, the local bone anatomy is inadequate, especially in patients with cross-bite and long-term periodontal damage etc. If the clinical setting implicates deficient implant bone support, 3D 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 allogeneic bone grafting including pedicle flap surgery and infection due to soft tissue advancements.

**Implant placement**

**Perfusion**

Need of vasculature of the implant bone is indispensable to avoid further periimplant damage as result of bone regeneration 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.

The following step by step procedure has been proven effective:

- Utilization of keen pilot und multi tapering drills (new early, otherwise drilling forces and danger of deviation from drilling axis occur)
- Immediate implant bed preparation under permanent cooling with 0.9% saline.
- Prior to implant placement, wait until implant bed has been replenished with blood.
- Wetting of implant surface with blood prior to implant insertion.
- Limited rotation speed < 800 p.m during implant bed preparation, hand or implant placement with torque key; max. 10-30 Nm, if applicable.

A slight subcrestal position of the implant is advisable as drilling end. To ensure healing, a primary fixation of the implant is mandatory for all implant types (cylindrical, non-tapered implants). Bone quality and anatomical localization. The authors strongly discourage from further "screwing" to avoid ongoing tissue injury of the implant bone interface.

**Periimplant tissue (volumen)**

In molars interimplant distances to soft tissue advancements pedicle flap surgery and infection due to allogeneic bone grafts including additional efforts, extent and expenses of setting implicates deficient implant shoulder.

**Short and diameter-reduced implants**

The usage of short implants ≤ 8 mm demands minimization of implant surgery and implant placement healing are customer-friendly. However, micro-incision surgery requires additional efforts by 0.1 imaging (DVT) during planning and sensitiveness of the clinician realization. Evidence-based practice is successful with focus on tissue biology and both renunciation of mechanical delivery as well as interlocking theories.

- Diameter-reduced < 4 mm, small implants (minis) allowing transgingival healing. According to their material properties (fracture) and restricted implant-prosthetic indications and compatibility. Minis are limited to individual applications in multimod al alveolar bone defects with edentulous mandible, enhanced risk for surgery i.e. advanced diabetes mellitus or hemodialysis and handicaps for oral hygiene.

**Augmentation and revision**

Excerpt for sinus floor grafting, the number of augmentative implant surgery is decreasing and converting to reconstruction following trauma and tumor by vertical or horizontal distraction or prosthetic set-tings.

The indication for surgical augmentation during implant place ment include:

- Tooth loss in cross bite settings.
- Lateral alveolar bone defects (pre-molars and molars).
- Modelling of periimplant bone in esthetically demanding situations at incisors and canines (emergence profile)

The authors have recently reported about the use and implementation of autogenous bone and spongy bone chips and their clinical and esthetical alternatives in implant surgery in detail.

The regressive developments of implant augmentation in clinical practice implicate direct recommenda tions for surgical revision of periimplant defects. The following procedure is advisable (Tab. 1).

<table>
<thead>
<tr>
<th>Defect depths</th>
<th>Treatment</th>
</tr>
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<tbody>
<tr>
<td>≤ 2 mm</td>
<td>Oral hygiene + I HPV Cleaning</td>
</tr>
<tr>
<td>2 – 4 mm</td>
<td>CHX 0.2 %, EY m imaging</td>
</tr>
<tr>
<td>≥ 4 mm</td>
<td>Systemic Antibiotics</td>
</tr>
<tr>
<td>≥ 8 mm</td>
<td>Implant Removal/Regenerative Therapy</td>
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**Surgical Reentry**

- 1. Removal of suprastructure (screw-fixed).
- 2. Horizontal alveolar ridge incision with vertical mucoperiosteal flap reflection.
- 3. Intrabony defect curettage.
- 4. 0.2 % CHX irrigation, EY m imaging.

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<tr>
<td>≤ 2 mm</td>
<td>Close, tension-free wound closure, no functional implant loading.</td>
</tr>
<tr>
<td>≥ 3 mm</td>
<td>Systemic Antibiotics</td>
</tr>
</tbody>
</table>

**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 the entire course till prior to surgery. DVT diagnostic evaluation is required if proximity to anatomical structures is anticipated and short and diameter-reduced implants are advocated to determine periimplant distances and safeguard implant treatment. Implant placement succeeds with minimal mechanical loading of implant bone and implementation of perfusion during surgery. Periimplant enlargement is scheduled during implant healing, either by free gingival graft or pedicle flap. Premolar and molar implant restoration are screw-fixed axially to handle in case of periimplant damage. The concerted action of eliminating inflammation, stabilizing function while minimizing surgery secures implants success, prevents periimplant diseases and promotes the reputation of dental health care providers in the community.

**Mucositis**

- Defect depths ≤ 3 mm Oral hygiene and implant cleaning (hygienist).
- Defect depths > 3 mm. Addition ally 0.2 % CHX, EY m imaging, if applicable (dentist)
- Defect depths > 6 mm. Periimplant plus periodontal cleaning, systemic antibiotics: amoxicilline 500 mg 20 T and chloride 400 mg 2 T 1.i.d for 7 days.

<table>
<thead>
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| ≤ 3 mm | Close anatomical treatment of sinuses maxillaris.
| 3-6 mm | Close anatomical treatment of sinuses maxillaris.
| > 6 mm | Close anatomical treatment of sinuses maxillaris.

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<td>&gt; 6 mm</td>
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Together with decomposition by occlusal appliances (mentioned above), safeguarding by front-canine equilibration and removal of imp-iant-prosthetic conflicts the clinical situation often improves. The procedure can be easily repeated. The recommendation to removeonally screwfix implant restorations axially (only pre-molars and molars) is be coming a strong relevance in the treatment of periimplant damage.

**Periimplantitis**

Advanced periimplant damage with circumferential angular bone loss encompasses:

- Defect depths > 8 mm. Explanta tion, surgical revision (if applicable)

In these clinical settings, implant removal with repeated insertion, aug-
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Avoiding common problems in tooth extractions

By Dr Kamis Gaballah, UAE

Complex extraction cases have been linked to a higher rate of post-operative 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.

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 tooth eruption, 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.

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 margins, significant soft-tissue laceration and potentially an oroantral fistula. If such risk factors are identified, tooth sectioning should be followed by elevation of roots 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 tooth eruption, 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.

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 surgeries 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.

Tooth sectioning should be followed by elevation of roots with dental luxators instead of traditional elevators or forceps, which are known to deliver much higher force to the alveolar bone. The indications for the extraction of impacted lower third molars (LM3) have been the subject of long-standing debate. Surgical procedures for the extraction of unerupted LM3 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 LM3. 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 force 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 LM3 are shown in Table 1.

Proper preoperative radiographic investigations may include intraoral images, such as occlusal radiographs, panoramic views of the jaws, and conventional CT or CBCT scans. It should be noted that mispredicting 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 a detailed preoperative assessment of the surgical procedure and the injection technique, modification of the surgical procedure and measures to reduce the degree of potential injury to the nerve.

The surgery should be planned according to the information obtained from the preoperative assessment process. The procedure itself should aim to minimise the manipulation around the IDC. Both should include the carefully planned access, tooth sectioning and elevation techniques. In many scenarios, the extraction of the 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 coronoectomy. This involves transecting the crown of a tooth, leaving the root in situ. It is primarily adopted to avoid or minimise damage to the IDC. The rate of complications after coronectomy is comparable to that observed after tooth extraction, except with a significantly low incidence of injury to the IDC.

It should be noted that both sectioning and coronectomy can be performed with a shorter incision, as the perception of a light touch as a sharp stab. This can have a significant impact on quality of life for many patients.

<table>
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<tr>
<th>Overall risk factors for IDN injury</th>
<th>Radiographic signs of Increased risk of IDN injury</th>
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<tr>
<td>Full bony impactions</td>
<td>Apices of the LM3 located inferior to the lower border of the IDC</td>
</tr>
<tr>
<td>Horizontal impactions</td>
<td>Darkening of the root</td>
</tr>
<tr>
<td>Use of bars for extraction</td>
<td>Abrupt narrowing of the root</td>
</tr>
<tr>
<td>Radiographic risk markers</td>
<td>Interruption and loss of the white line representing the IDC</td>
</tr>
<tr>
<td>Clinical observation of the bundle during surgery</td>
<td>Displacement of the IDC by the roots</td>
</tr>
<tr>
<td>Excessive bleeding into the socket during surgery</td>
<td>Abrupt narrowing of one or both of the white lines representing the IDC, root dentists and surgeons</td>
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Table 1: Risk factors for IDN injury during LM3 extraction.

Most literature published in the last decade has given us sufficient evidence to suggest a significant risk of damage to both the inferior dental and the lingual nerve owing to the nerve block procedure. This injury may be related to the pharmacological properties of the agent itself or the injection technique. Studies have shown that the lingual nerve is affected approximately twice as often as the IDN, and one reason for this may be the faszicular pattern in the region where the injection is given. It also appears that about half of patients feel an electric shock sensation during injection.

There is a higher incidence of reports of nerve injury after the use of articaine and prilocaine. Although the reason for this remains unknown, it has been suggested that this may be because they are 4% solutions, whereas the other commonly used local anaesthetics have lower concentrations. Others associate the damage with the neurotoxicity potential of 4% articaine and 3-4% prilocaine. Hence, it is recommended that the use of such agents be limited to local infiltration. It has been claimed that needle contact with a nerve felt by the patient as an electric shock is related to injection injury. An obvious explanation is that the possibility of mechanical injury to the nerve is more likely in the case of multiple repeated attempts at the inferior dental nerve block procedure. Therefore, it is crucial that the operator achieve optimal control of the injection episodes of injection with minimal doses of anaesthetic agent.

The surgery should be planned according to the information obtained from the preoperative assessment process. The procedure itself should aim to minimise the manipulation around the IDC. Both should include the carefully planned access, tooth sectioning and elevation techniques. In many scenarios, the extraction of the 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 coronoectomy. This involves transecting the crown of a tooth, leaving the root in situ. It is primarily adopted to avoid or minimise damage to the IDC. The rate of complications after coronectomy is comparable to that observed after tooth extraction, except with a significantly low incidence of injury to the IDC.

It should be noted that both sectioning and coronectomy can be performed with a shorter incision, as the perception of a light touch as a sharp stab. This can have a significant impact on quality of life for many patients.
as the amount of bone removal re-
quired is minimal, thus minimis-
ing the postoperative morbidity. However, it cannot be performed in all cases in which the LM3 is close to the IDC and is certainly contra-
indicated when the LM3 is decayed or its roots are associated with a pathology and should be con-
sidered with caution in severely inclined mesio-angular and hori-
zontal impaction cases. The author does not recommend distal bone
removal or retraction of the lingual flap with the intention of protect-
ing the lingual nerve, as these may increase the risk of damaging the
lingual nerve. It should be empha-
sised 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 rea-
sons is the placement of dental implants. The success of this treat-
ment largely depends on the avail-
ability of healthy bone in sufficient volume. Therefore, it is crucial for the dental practitioner not to com-
promise 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 dimen-
sional 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 pro-
portional to the amount of trauma to the soft and hard tissue during the extraction.

An additional unfavourable change that may take place is the slow remodelling of the bone formed to fill up 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 mucoperiosteal tissue produce a greater number of osteoclasts within the alveolar ridge and hence greater resorption and shrinkage are seen after the classical surgical or the traumatic extraction of teeth.

The preservation of alveolar bone for future implant placement may be achieved by avoiding unecessarily bone removal and stripping of the periodontal tissue as well as performing a surgical alveolar bone preserva-
tion procedure. Bone removal can be largely avoided or minimised through modification of the tra-
ditional extraction technique. The first such modification is the use of dental periotomes and luxatomes to gently strip the peri-
odontal ligament fibres and widen the socket without causing cracks or fracture of the cortical plates, as commonly encountered when using dental forceps or the bulky elevators. The use of such gentle instruments also eliminates the need for elevation of mucoperi-
osteal tissue. However, it should be noted that the safe use of these instru-
ments requires adequate train-
ing and should be encouraged during undergraduate clinics. Clot stabili-
sation 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 alveo-
lar bone preservation procedure. This includes packing the extrac-
tion socket with different fillers, such as osteoinductive or osteo-
conductive materials, like auto-
genous, natural or synthetic bone grafting materials that support the alveolar socket walls, thus pre-
venting their collapse and shrink-
age. 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 po-
tential symptoms encountered after such procedures. The pre-
scription of medications should be limited to non-steroidal anti-
flammatory drugs in most cases and imprudent use of antibiotics or socket dressing should be avoided.

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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 organization 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 please 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. Based on the body of research available today, this intolerance of implant alloys can in great part be attributed to the release of metal ions in the host bone and surrounding tissue as a result of the breakdown and corrosion of metal alloys in the presence of body fluids and the oral environment in particular. Such facts have been established and widely recognized in orthopedics.

In the late 1960s, pioneers in ceramic implantology and notably Professor Sami Sandhaus began the search for modern 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 intraosseous implantation in dental implantology.

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

My interest in ceramic implants came about in two ways. First, on a personal level, when I discovered that the metal fillings and implant I had in my own mouth were determined to be the source of some of the health problems I had experienced. Second, on a professional level, where a few of the patients to whom I had provided metal implants returned for check-ups or more implants, and upon reviewing their medical and dental history, it was also determined that the implants were at least in part responsible for the health problems they were experiencing. I then began to actively look for alternatives and at studies and developments in the scientific literature, including case reports in both medical orthopedics and dental implantology. It was clear that bioceramics is the last "...reports of titanium and titanium alloy intolerance have increased and are increasingly being investigated and demonstrated in the scientific dental literature." two decades had established themselves in both medicine and implant dentistry as the most bio-inert implantable material available. 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 organize and create a supportive environment for those involved in the respective area. The IAOCI was created with the same spirit, not only to organize 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?**

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, is placed and 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 erathex 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?**
Today, the well-researched and proven alternative material to metal for dental implants is zirconia 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 bioce- ramic materials, such as zirconia-toughened alumina, hot isostatic-pressed zir- conia and yttria-stabilized zirconia.

The common and most important properties of these bioceramics are inertness 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 im- plants comparable with that of tita- nium implants?

In the early days, there were chal- lenges. 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, de- sign, surface modification tech- niques and technologies of zirconia implants have evolved to a point where bone integration is ensured and comparable results are ob- tained.

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 pro- fession. Both groups agree that this is state-of-the-art treatment. How- ever, owing to technology, the market 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 implan- tology 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 hold and will be around for a long time because there has been a strong shift toward providing health care with the minimum risk and in- vasiveness over the last few years, as well as in a way that is more in- tegrated, natural and biological. Furthermore, manufacturers have rapidly evolved and adapted the ma- terial 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 replace- ment 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 ap- plication 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 inno- tative techniques and materi- als, 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 member- ship has doubled in the last two years and when prospective or new mem- bers 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 ob- tain structured information and training.

Another frequent reason is that dentists have had patients challenge or inform them on the use and oc- casionally 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 55 years of docu- mented experience with zirconia implants. We will also have work- shops 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 inter- view.

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