A time shift link
How implant planning affects periimplant diseases

By Rainer Buchmann1,2, Daniel Torres-Lagares3, Guillermo Machuca-Portillo1
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 advocate evident, comprehensible and durable solutions.

Planning

Early Decision Making

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 muscels (M. temporalis, M. masseter) and the temporomandibular joints (M. pterygoïdes medialis und lateralis) with focus of tension, induration and pain pressure. 2. Osteopathic examination of craniosendral dysfunctions: initiated by body states (inclined position), (mks) posture, walk (activity) etc. should exclude somatic sources. If applicable supportive therapy. If applicable, manual orthostatic 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 protrusive contacts (front) and side biting (Figs. 5)

Safeguarding implant treatment commences with careful tooth re- movement, pre-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 intraradicular root dissection.
3. Accuracy of implant diagnosis and implant placement by 3-D visualization (IVT) 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 equilibrium a group side shift emerges with further bite reduction as result of age and misusage.

C/O: 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 downgrade this strategy.

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

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Fig. 1: Severe periodontitis, residual inflammation and bacteraemia. Poor hygiene capability, comfort and esthetics with function carries. — Fig. 2: Drawn-out expectation period in advanced periodontal disease at 45-55. If horizontal alveolar bone resorption at assigned implant site.— Fig. 3: Surgical access to deep intrabony periodontal pockets securing the residual dentition and safeguarding inflammation prior to implant placement following completion of non-surgical periodontal therapy.— Fig. 4: Microsurgical revision using a vascular pedicle flap to maintain interdental papillae and augment restenting periodontal pockets with autogenous bone. Usage of Or齿 (antiinflammatory) or Emdogain, if applicable.— Fig. 5: Relaxation appliance in the maxilla with a frontal plate to decompress age and use related bite reduction prior to final implant planning.— Fig. 6: Advanced horizontal alveolar bone atrophy in the mandible with small ridge, vestibular sloping plates, proximity to n. alveolaris and small keratinized gingiva.— Fig. 7: Securing implant planning (implant length, positioning, diameter and surgery) by IVT review (Cranium Bonn, Germany, 2014).— Fig. 8: Interimplant distances of 7 mm at front and premolar sites with n mm in molars to safeguard vasoculation and periimplant damage, assigned from periodontics. Surgery, Dr. G. Kochhan.— Fig. 9: Inadequate implant bone support with vestibular being defect following tooth loss due to traumatic crossbite relationship in the left upper maxilla.— Fig. 10: Promotion of perfusion and healing by micro-invasive implant surgery with implant abutment insertion into vascularized blood-supplied alveolar bone.— Fig. 11: Sinus elevation N 16 with implant placement prior to periimplant enlargement.— Fig. 12: Free gingival graft in situ prior to curation.— Fig. 13: Unstable perimplant gingiva with poor hygiene capability, persistent inflammation # 34 and chronic sensitivity.— Fig. 14: Unistrueive healing for 8 weeks posttherapy with functional relief by enlargement and periimplant stabilization.— Fig. 15: Long-cone implantoplastic aesthetic abductions undergo no self-healing frequently initiating perimplant sensitivity.

Digital imaging 3-D

Digitization means information and softness. The generation of a 3-D in early implant planning barbers threeantages

• 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

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Periimplant Therapy

Table II: Periimplant Therapy

<table>
<thead>
<tr>
<th>Step</th>
<th>Defect (PD in mm)</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>≤ 3 mm</td>
<td>Oral Hygiene + I/M Cleaning</td>
</tr>
<tr>
<td>B</td>
<td>≤ 4–5 mm</td>
<td>CTK ≥ 0, 6 %, E + YAG</td>
</tr>
<tr>
<td>C</td>
<td>≥ 6 mm</td>
<td>Systemic Antibiotics</td>
</tr>
<tr>
<td>D</td>
<td>≥ 8 mm</td>
<td>Implant Removal/Regenerative Therapy</td>
</tr>
</tbody>
</table>

Table 3: Key treatment issues to combat periimplant disease, to a large extent being prevented by early and careful implant planning.

Surgical Reentry

1. Removal of suprastructure (screw-fixed).
2. Horizontal alveolar ridge incision with vertical mucoperiosteal flap reflection.
3. Intact biopsy curettage.
4. 0.2 % CHX irrigation, Er:YAG-decontamination.
5. Stimulation of spongious bleeding plus autogenous bone grafts for defect fill and reconstruction.
7. Systemic antibiotics.

Mucositis
- Defect depths ≥ 3 mm: Oral Hygiene and implant cleaning (hygienist).
- Defect depths ≥ 5 mm: Additional ≥ 0.2 % CHX, Er:YAG decontamination, if applicable (dentist).
- Defect depths ≥ 6 mm: Periimplant plus periodontal cleaning, systemic antibiotics: amoxicillin 500 mg 20 T and Clindamycin 400 mg 2 T, i.d. for 7 days.

Mucosa
1. Advanced alveolar bone loss in pre-molars and molars (numerous).
2. Proximity to N. alveolaris.
3. Close anatomical relationship to sinus maxillaris.
4. Atriphed or edentulous maxilla following longterm appliance of removable dentures.

Horizontal alveolar bone defects, as result of periodontal disease, are compensated surgically during implant placement to avoid extrusion of the implant. Treatment of these defects needs to be individual and dependent on the patients’ requirements. During healing and 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 surgery. Implant treatment is declining and confined to cases during surgery. Implant enlargement is scheduled during implant healing, either by free gingival graft or pedicle graft. Premolar and molar implant restoration are screw-fixed axially to be handled in case of periimplant disease.

Periimplantitis
- Advanced periimplant disease with circumferential angular bone loss encompasses:
  - Defect depths > 8 mm: Exploitation, surgical revision (if applicable).

In these clinical settings, implant removal with repeated insertion, augmentation (where appropriate) and prosthetic restoration following healing is advocated, if the client approves the treatment. In periimplant damage, the benefit of rapid implant bone healing prior to implant placement, short and diameter-reduced implants becomes obvious in individual, strategically important implant sites, i.e. canine implant area in edentulous mandible, augmentation is emphasized with the following surgical protocol (Tab. B):
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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 surgeries owing to several factors, including the late presentation of patients with advanced dental diseases, 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 comorbidities 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 morbidity 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 around the IDC 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 margins, significant soft-tissue laceration and potentially an oroantral fistula. If such risk factors are identified, tooth sectioning should be considered (IDC to the mandibular foramen) before attempting a full extraction.

The surgery should be planned according to the information obtained during 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

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 fleshy 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 anesthetics have lower concentrations. Others associate the damage with the neurotoxicity potential of 4% articaine and 3.5% 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 minimal episodes of injection with minimal doses of anesthetic agent.

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.

Full buccal impactions Apices of the LM3 located inferior to the lower border of the IDC
Horizontal impactions Darkening of the root
Use of burs for extraction Abrupt narrowing of the root
Radiographic risk markers Interruption and loss of the white line representing the IDC
Clinical observation of the bundle during surgery Displacement of the IDC by the roots
Excessive bleeding into the socket during surgery Patient’s age
Abrupt narrowing of one or both of the white lines representing the IDC, most of dentists and surgeons

Table 1: Risk factors for IDN injury during extraction.

Overall risk factors for IDN injury Radiographic signs of increased risk of IDN injury
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Horizontal impactions Darkening of the root
Use of burs for extraction Abrupt narrowing of the root
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Excessive bleeding into the socket during surgery Patient’s age
Abrupt narrowing of one or both of the white lines representing the IDC, most of dentists and surgeons

Table 2: Risk factors for IDN injury during LM3 extraction.

The surgery should be planned according to the information obtained during 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 coronectomy. This involves the removal of the crown of a tooth, leaving the root in situ. It is primarily adopted to avoid or minimise damage to the IDN. The rate of complications after coronectomy is comparable to that observed following full extraction, 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,
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 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 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 teeth 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 proportional 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 resorption and shrinkage in the alveolar ridge and hence greater resorption and shrinkage are seen after the classical surgical extraction of teeth.

The preservation of alveolar bone for future implant placement may be achieved by avoiding unnecessary bone removal and stripping of the periodontium 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 periotomes and luxatomes to gently strip the periodontal 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 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 auto-geneous, 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.

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“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 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 intrabony 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 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 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?

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 break-through 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?

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In the scientific literature, including case reports in both medical orthopedics and dental implantology, it was clear that bioceramics in the last 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.

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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 implants 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 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 implants comparable with that of titanium implants? In the early days, there were challenges. The materials were monocristalline with very highly polished and glassy 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 Invisalign braces 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 on 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 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 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 tooth replacement situations.

Dentists may have concerns about 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 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 15 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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