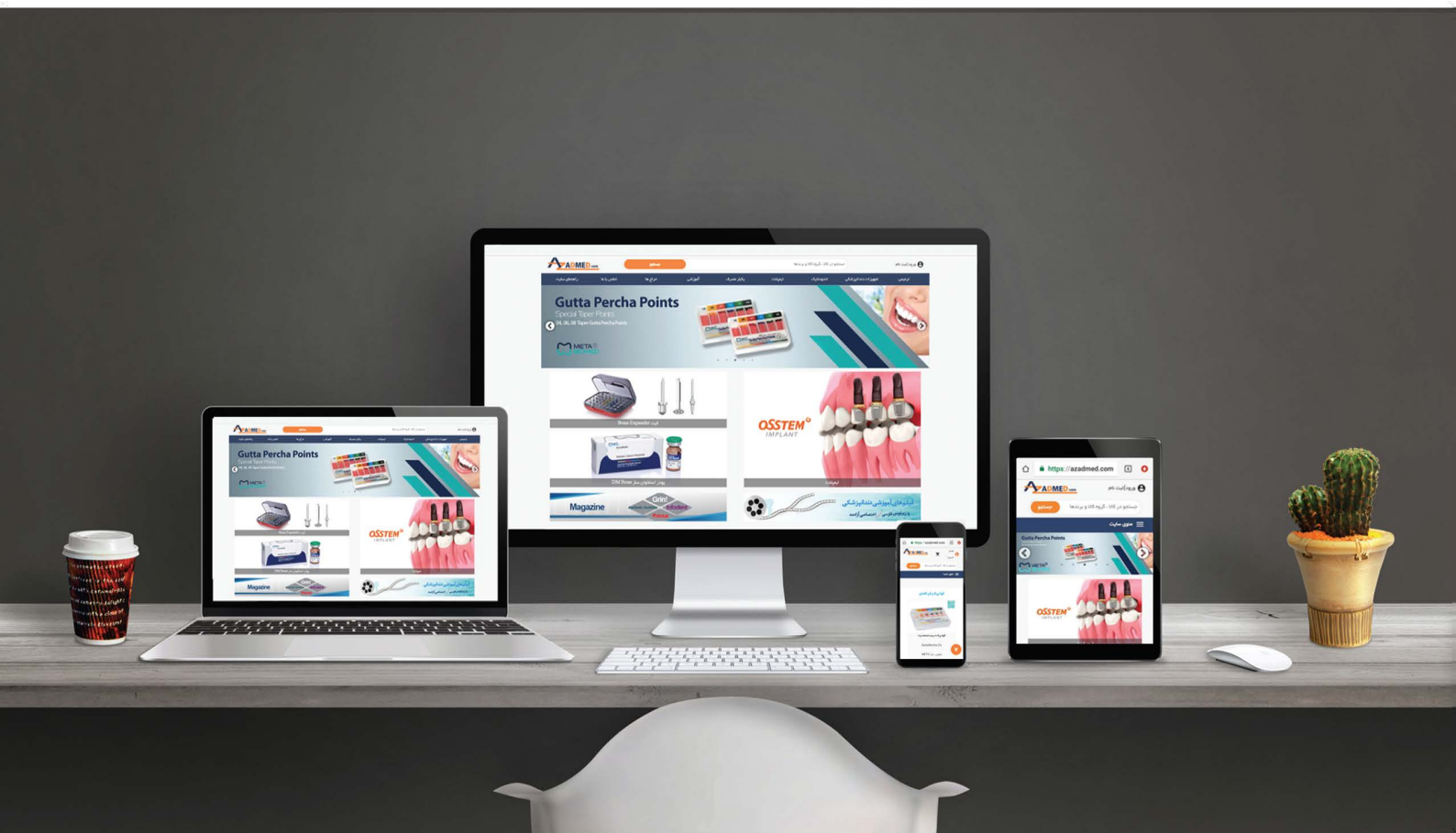




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| **research**
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Implantology & Education



Dr Rolf Vollmer

As 2015, an eventful year of implantology, is coming to a close, a review on the DGZI's activities shows its great dedication to implantology. The German Association for Dental Implantology (DGZI) has been active both in Germany and abroad and its cooperative partners, its various resources and concepts will make sure that the DGZI continues to be a significant influence on implantological education around the world.

A special concern of the DGZI's activities this year was the promotion of dental technologies with regard to a successful implant therapy. This year's 45th International Annual Congress, which was visited by more than 350 participants, was therefore dedicated to the interface between dental technology and implantology. International attendees were able to participate in all specialist discussions and to present their own key topics with the help of interpreters and special international podiums.

We already look forward to welcoming the participants at next year's workshops and our International Annual Congress, which will take place in Munich from 30 September to 1 October 2016. Thus, you can expect a special Octoberfest Congress on the last weekend of the "Wiesn".

In addition, I would like to thank you all for the provision of various specialist articles this year and ask you to continue your expert work for **implants international magazine of oral implantology**. Like in the previous years, all articles will be reviewed by our scientific committee.

Moreover, **implants international magazine of oral implantology** is distinguished from other publications by presenting controversial topics. A lively discussion and even occasional topic-related disputes among colleagues form an important part of striving for the best-possible therapeutic approaches in implantology.

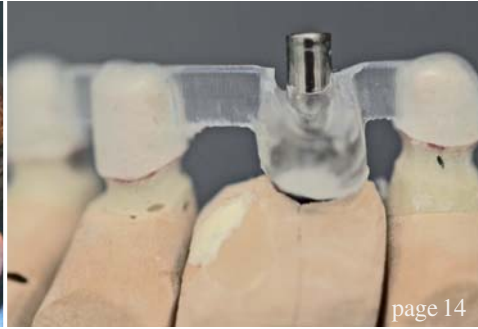
The members of the DGZI board hope you will enjoy reading this year's final edition of **implants international magazine of oral implantology** and wish you a happy and peaceful Christmas as well as a good start to 2016.

Dr Rolf Vollmer

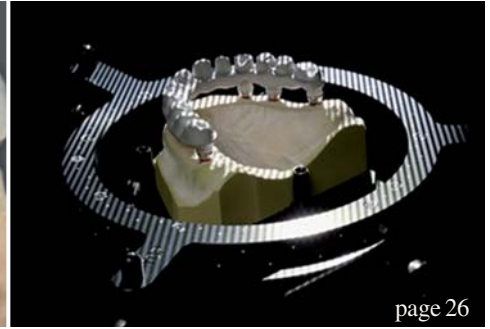
First Vice-President and Treasurer of the German Association of Dental Implantology



page 6



page 14



page 26

| editorial

03 **Implantology & Education**

| Dr Rolf Vollmer

| research

06 Incidence of **postoperative infections** in dental procedures

| Prof. Mauro Labanca

| case report

14 **Abutment fracture** in a bridge supported by **natural teeth and implants**

| Dr Gregory-George Zafropoulos *et al.*

20 **Minimally invasive implant placement without the use of biomaterials** — The bone expansion technique

| Dr Gilles Chaumanet

26 **CAD/CAM custom-milled titanium bar** for rehabilitation of an atrophic upper jaw

| Dr Richard Marcelat

| industry

32 **Complete reconstruction** for a patient with **chronic tooth decay** — The **damage undone**

| Dr Ara Nazarian

38 **Digital precision** for all indications

| Nobel Biocare

| events

42 “Our members profit from a **wealth of international experience**” — 45th Annual International Congress of the DGZI

| DGZI

46 **50 Years of clinical osseointegration**

| Georg Isbaner

| news

40 **Manufacturer News**

48 **News**

| about the publisher

50 | imprint



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page 32



page 42



page 46

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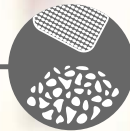
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Incidence of postoperative infections in dental procedures

Author Prof. Mauro Labanca, Italy

The risk of post-surgical infections in dental surgery and the management of the same has been widely studied and referenced in medical literature.¹

Actually, it is known that in order for any surgical wound to heal properly and in a predictable manner, two conditions that I would define as "milestones" must be met: the wound should be protected from any trauma and prevent superinfection of the same. These two conditions can hardly be met in the oral cavity. It is well known that the oral cavity, which is the first section of the digestive system, is an intrinsically contaminated environment and the risk of infection during intra-oral surgery is increased compared to other types of surgeries and comparable to surgery on the intestine. In fact, it is practically impossible to en-

sure an aseptic environment due to the large number of microorganisms present in the oral cavity; as we all know, bacteria, fungi and protozoa live in the soft tissues creating a biofilm. The life cycle of the biofilm depends on the attack, the colonisation and the proliferation of these micro-organisms.

Common bacterial flora in the oral cavity is variable and consists of aerobic and anaerobic bacteria with pathogenic potential.² Temporary reduction of the amount of such bacteria may reduce the risk of post-surgical infection.³

Therefore, before performing a surgical procedure, it is essential to consider that the wound is never sterile and when subjected to an infection, the latter is due to perioral skin microflora.

Moreover, surgical wounds caused by dental surgery are continuously subjected to trauma: mastication, dental prosthesis, movement of the tongue or perioral muscles. In fact, this involuntary and persistent trauma cannot be eliminated in any way and, obviously, affects significantly the wound healing time.

Speaking with my youngest colleagues as well, they usually pay a great deal of attention to the operating sequence ignoring the key factor that conditions the outcome of the intervention: the proper healing of the wound. In fact, if there is a superinfection of the wound with consequent dehiscence of the flap, the intervention itself and/or the grafted material are likely to turn into failure or unsuccessful operation. Therefore, it is critical to set wound healing as the main goal

Fig. 1 Severe facial infection after mandibular third molar extraction.



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Fig. 2

Fig. 2_ Adequately prepared surgical table.

and make sure the wound is protected against superinfection and trauma, although it is located in a dynamic and contaminated environment.

But how can a post-surgical infection be prevented?

Based on medical literature and my extensive experience as an ER surgeon and dental surgeon, I think that there are different parameters to take into consideration when performing a dental surgery: the experience of the surgeon, the duration of the surgery itself, the concomitant risk factors, the aseptic conditions of the operating field and the careful selection of the materials used.

It is also essential to keep in mind that oral surgery is not just about implants or various regenerative techniques. Even a seemingly common avulsion can be fully considered a surgical intervention, hence subject to infection with more or less serious side effects for the patient (Fig.1).

Fig. 3_ Incorrect preparation of a surgical table.

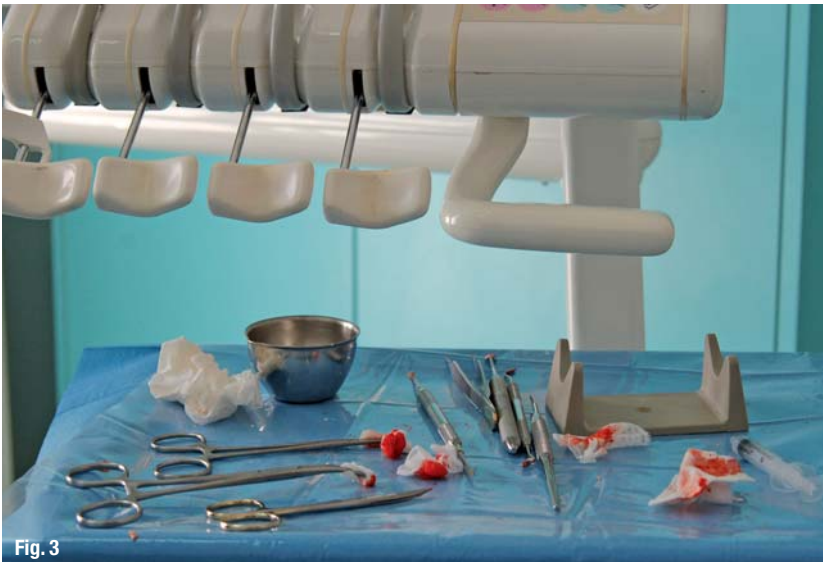


Fig. 3

We will now review the above risk factors for an in-depth examination of every single situation.

_Experience

Experience proves to be the most important factor in a successful outcome of a surgical intervention. It has been reported that the risk of infection in the case of less experienced surgeons is four times higher compared to that of more experienced surgeons.⁴ Nevertheless, experience is definitely not a parameter that can be changed (unless by aging and through hard work!) but it is necessary to take note of it, and then young colleagues who face surgery should pay more attention to their work aware of this aspect.

_Duration

In defining the duration of the intervention, there are two factors that must be considered: the duration, in a relative sense and in an absolute sense. The absolute value indicates the time required for the execution of the surgical procedure in optimum conditions by a surgeon with adequate experience. Virtually, the right execution time, with no rush but also without unnecessary expenditure of time. On the other hand, when lack of experience or insecurity lead to extended duration, we talk about relative value: basically, it is the time actually spent but that could have been reduced. It has been reported that a duration of the intervention below one hour poses a risk of superinfection of 1.3 %, while such risk is increased to 4% if the intervention lasts for about three hours. Every additional hour doubles the risk of superinfection⁵. Once again, it should be mentioned that these values refer to the correct duration of the intervention. To clear this up, if an intervention executed correctly lasts one hour, the risk is 1.3 %, if it lasts three hours, the risk rises to 4 %. But if the relative intervention can be done in one hour, but it takes three hours due to surgeon's lack of experience, the risk of infection increases considerably beyond the above said 1.3 %.

_Systemic factors

There are systemic factors that promote superinfection of the blood clot including uncompensated diabetes (which also prolongs healing time much more than usual), autoimmune and systemic disorders, and smoking.^{6,7,8} Concomitant use of drugs should also be carefully considered to avoid that some of them could heavily interfere with the healing process (just think of the bisphosphonates, a problem that is more and more present in our clinical activity). The age of the patient should also be carefully evaluated; during the avulsion procedure of a third molar, the risk of post-surgery complications is of 10% in twenty-years-of-age patients and 30% in a 40-year-old patient.⁹ Actually, age involves very often the use of medicines and impaired

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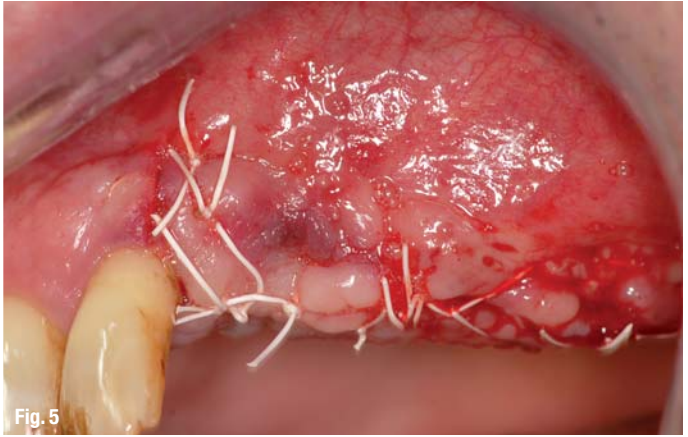
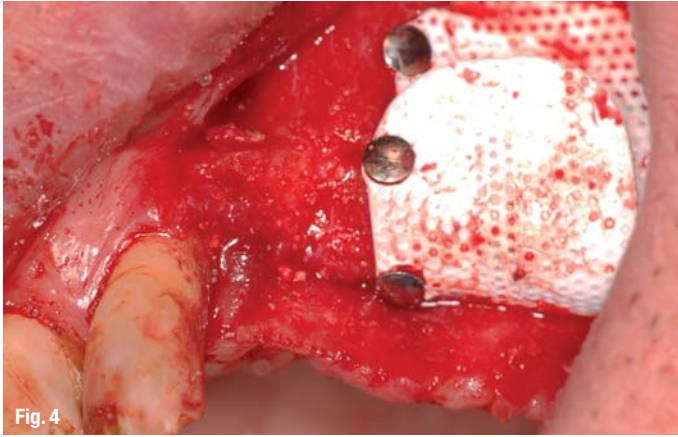


Fig. 4 Bone regeneration surgery.

Fig. 5 The importance of proper closure as the first priority, without tension on the flap.

immune system, in addition to the presence of concomitant syndromes.

Antisepsis

Several studies have highlighted how in oral and implant surgery the proper preparation of a so-called clean operating room is sufficient to achieve a success rate comparable to that obtainable in a sterile room (Fig. 2).^{10, 11}

The above data can and should be interpreted in two different manners. On the one hand, it means that it is not therefore necessary to prepare our operating room as if it were a veritable operating theatre each time we perform a surgery; on the other hand, if minimum procedures for the preparation of the operating room and the operating field, that require little time and modest investment, are not ensured, this could lead to unnecessary and significant increase in the risk of failure or infection of the wound (Fig. 3). The prescription of a systemic antibiotic therapy provided by the majority of existing guidelines, is certainly an important and useful additional procedure aimed to reduce the bacterial load usually present in the oral cavity, but however insufficient to prevent or to exclude the risk of infection. Therefore, although prescribed, such therapy must not be considered as a substitute

for the application of all the necessary antisepsis rules. Since it has a preventive purpose, the antibiotic therapy must be started from the day before the surgery. The same applies to topical antibiotics (very often useless). The use of mouthwashes before surgery and in the following days, although common and appropriate, has no influence whatsoever over the reduction of the risk of infection.

Presence of foreign bodies

Very often, it is not considered that the insertion into the tissue of a material or a device such as an implant, a biomaterial or a membrane, can induce a foreign-body reaction (Figs. 4–5). Surgeons' way of thinking is completely opposite to the biological response; their goal is to improve the health condition of the patient, focusing on what kind of materials to insert, materials that act from a biological point of view as foreign bodies, causing a biological response and inflammation (sometimes even an immune response). Finally, in order to close the wound properly, we use sutures which are also perceived by the body as a foreign body that triggers a consequent reaction (Figs. 6–7). For this reason we are facing a conceptual antagonism: the professional chooses a material to heal the patient, but the same triggers a foreign-body reaction. The choice and use of the materials is therefore crucial in our effort to minimise the for-

Tab. 1 Risk factors in oral surgery.

Risk factors	
Experience	Level of experience of the surgeon
Duration	Relative and absolute duration of the intervention
Systemic factors	Age, diabetes, autoimmune and systemic disorders, smoking, medication
Antisepsis	Operating room set-up and equipment, use of local and systemic antibiotics
Materials used and grafted	Implant, biomaterials, membrane, sutures

Natural sutures	Indications
Non-absorbable silk suture	Extractive surgery with low risk of superinfection
Synthetic sutures	
Absorbable multifilament coated suture (e.g. VICRYL, Ethicon)	In all specialties in which the sutures used cannot be removed (e.g. mucogingival surgery)
Monofilament absorbable suture (e.g. MONOCRYL, Ethicon)	Gingival surgery; very useful to use as continuous suture
Non-absorbable multifilament coated suture (e.g. ETHIBOND EXCEL, Ethicon)	It replaces silk in complex cases of extractive surgery (e.g. regenerative surgery); maintenance of haemostatic products on the sites of extraction
Non-absorbable monofilament suture (e.g. PROLENE, Ethicon)	Ideal for continuous sutures, elongation of clinical crown, apicectomy

Tab. 2_Types of sutures for different clinical indications.

eign-body response. The use of sutures, for example, does not directly cause infection, but may promote the development thereof. Often I am asked what type of suture I prefer: it is a question that I definitely do not like because it assumes that you have only one type of patient, only one type of surgery and only one type of situation. The surgeon must assess each case individually and select the material that can best promote healing by reducing the risk of infection. The main purpose of the suture must obviously be to achieve a first intention

wound healing, as top priority. To get a second intention healing is always a failure, which involves serious likelihood of dehiscence of the wound and high probability of failure. For this reason, both the knowledge of adequate suturing and knotting techniques (a topic that is so extensive that we cannot cover it in this work) and the selection of the most suitable suture material are of fundamental importance. There are different types of suture threads, which for the sake of simplicity are summarised in the following table. Sutures can be classified

Fig. 6_Apicectomy and application of biomaterial.

Fig. 7_A monofilament suture.

Fig. 8_A post-extraction monofilament suture.

Fig. 9_Excellent healing of tissue in only six days after extraction.

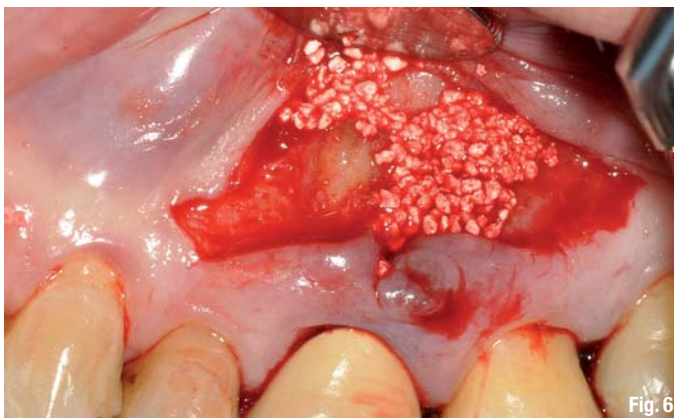


Fig. 6



Fig. 7



Fig. 8



Fig. 9



Fig. 10



Fig. 11

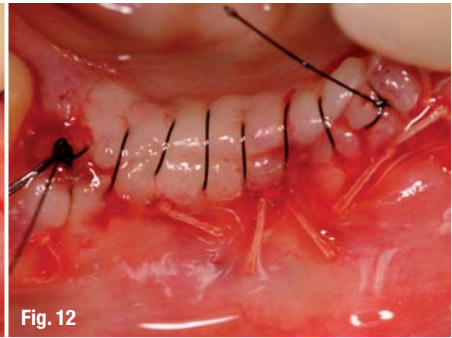


Fig. 12

Fig. 10_Post-extraction site after suture removal with no inflammatory reaction.

Fig. 11_Suturing deep-layer stitches using the horizontal mattress technique with an absorbable suture.

Fig. 12_A continuous suture with an absorbable monofilament.

according to their origin in natural or synthetic, or based on their stay in the tissues in absorbable or non-absorbable and yet according to their structure in monofilament or multifilament. Synthetic sutures have considerable advantages with respect to natural sutures such as silk. Synthetic sutures output lower tissue reaction and greater tensile strength that allows hence the use of thinner threads (Figs. 8–10).

The absorbable sutures allow a temporary sealing of the flaps because they are broken down by the body through a hydrolytic process. This process could be more rapid where there is no homeostasis of the subject, as in the presence of fever, infections or protein deficiencies, and this could lead to an acceleration in the process of absorption of the suture with an inadequate seal of the suture in the wound for the time required (and of course, this aspect must be carefully considered by the surgeon during the surgery and when choosing the type of suture). Absorbable threads are often preferred for suturing the deeper layers of the wounds, where blood clot stability is absolutely necessary (Fig. 11). Non-absorbable sutures that should be removed by the surgeon are used in the superficial layers of the wounds or in the case of overt infections and immunodepressed patients. Multifilament sutures are composed of several filaments which ensure greater tensile strength and flexibility. Monofilament sutures on the other hand, are more inert, but less easy to manage at the time of their use due to their fragility and the difficulty upon knotting because of their extreme smoothness (Fig. 12). There are also suture threads, recently introduced on the market, coated with bacteriostatic agents that can play an active role in the prevention and protection against the risk of bacterial post-surgery superinfection. It is obvious, however, that the choice of the suture is a key factor in predicting the outcome of our surgery and, therefore, it is the most important phase of the intervention.^{12,13} We should, therefore, pay due attention to this moment, at least equal to that paid when we choose the implant or the biomaterial. Instead, I often see that this step is regarded as an unnecessary loss of time, therefore a step treated with superficiality and negligence. To face later problems like a dehiscence of the flap for which we have no rea-

sonable explanation and, even worst, no adequate solution.

Conclusion

Dentistry is among the other medical disciplines, the one that evolved the most significantly over the past few years, from the practice of barber surgeons to a real and veritable medical work, worthy of all the consequent attention and due respect. The dental surgery, likewise, has experienced a major acceleration in these years, making interventions that 50 years ago were almost unthinkable routine and predictable procedures. But perhaps, surgical culture has not kept pace with this evolution, as if dental surgery were a minor surgery and therefore not deserving an adequate and serious approach. Too many times I had to assist to improperly managed interventions, although important, with little or no attention to room sterility, the preparation of the auxiliary staff, the setup of the surgical table. And choosing for the suture the first (or only!) suture found in the drawer. Actually, a failure or a preventable infection as a result of dental surgery, and such may still be responsible for a significant morbidity and a certain risk of mortality. I therefore hope that surgeons will act with an ever-increasing "surgical" approach, not only with regard to surgery itself but also in the preparation and management of the intervention, applying the medical procedures and preventive measures that will not only provide for a better understanding of the biological processes that promote healing but also prevent dangerous and avoidable post-surgery infection which should not burden our surgery.

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Abutment fracture in a bridge supported by natural teeth and implants

Authors Dr Gregory-George Zafiropoulos, Dr Giorgio Deli & Dr Rainer Valentin, Germany/Italy

Introduction

Implant treatment has evolved into a reliable modality for the replacement of missing teeth. Although rare, complications may occur, and some uncertainty surrounds the treatment of some of these events, especially when restorations are supported by a combination of natural teeth and implants.¹ Often the fabrication of an entirely new restoration is necessary if one or several of the natural teeth need to be removed. Here, we report two cases in which a natural tooth abutment of a restoration supported by implants and natural teeth fractured. We describe the

technique used to replace the fractured tooth with an implant, which allowed the re-use of the existing restoration.

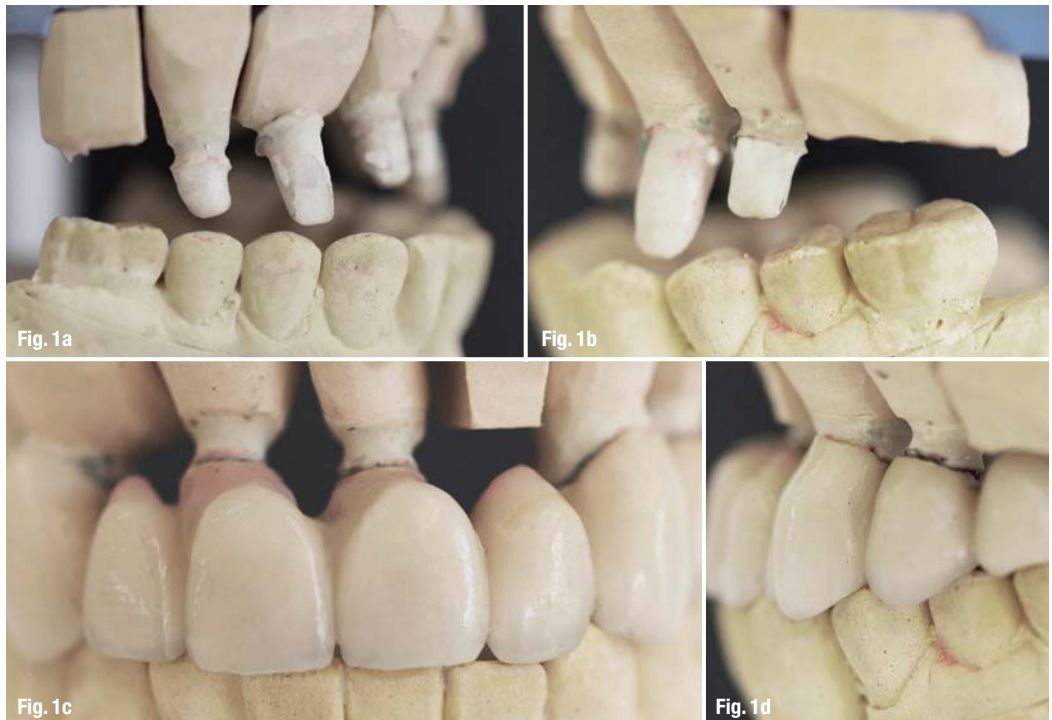
Cases

Case 1

The patient was a 62-year-old male non-smoker in good general health, who was taking no medication and had received implant treatment at the author's office six years before developing the complications described in this article. The mandible was restored with fixed crowns and implant retained bridges. The maxilla

Figs. 1a-d Casts placed in the articulator;

- a) right side, restoration not in place;
- b) left side, restoration not in place;
- c) anterior view, restoration in place;
- d) left side with restoration in place.



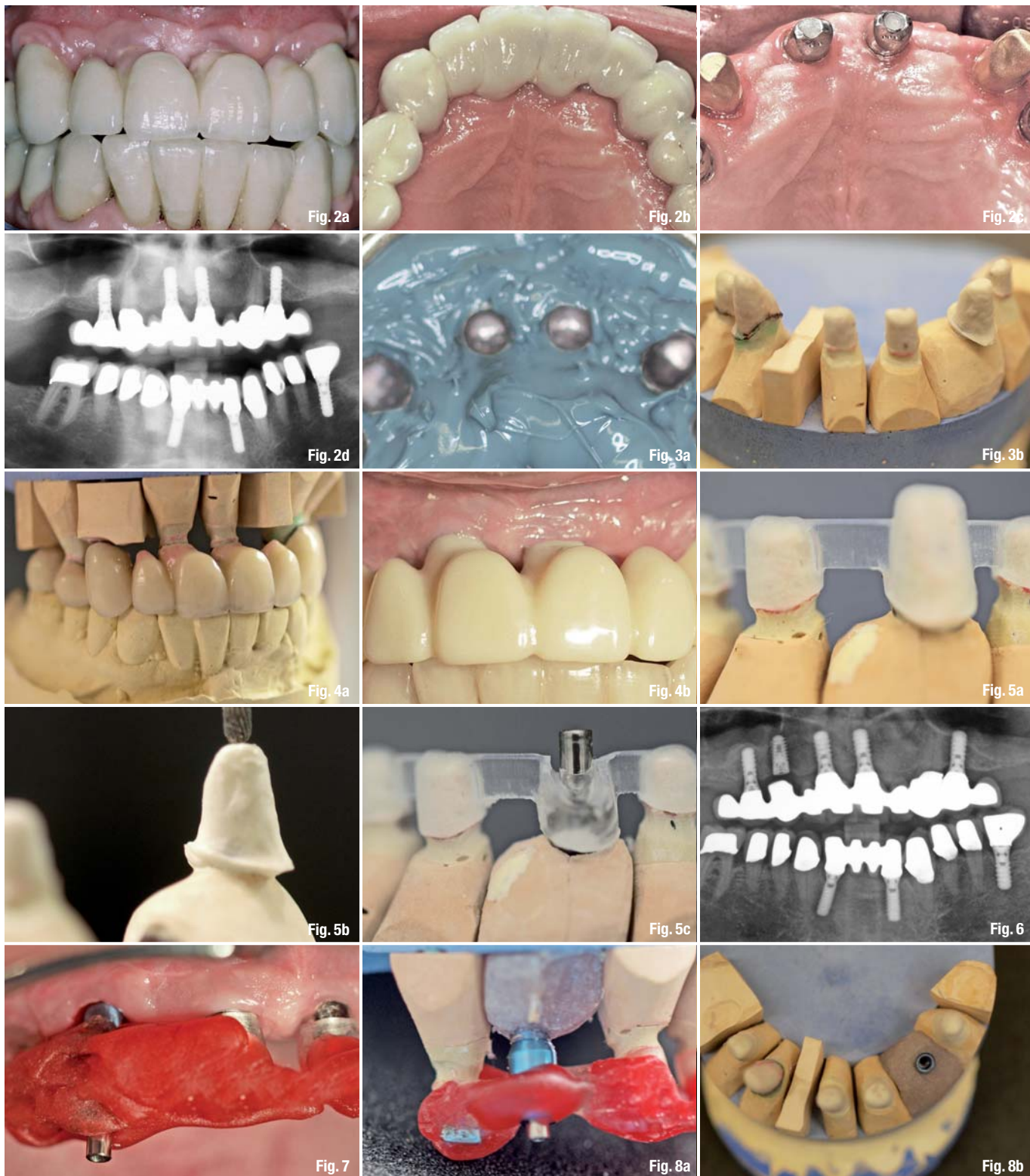


Fig. 2_ Restauration after initial treatment, before the accident; a) anterior view; b) intraoral view; c) implants with abutments and teeth #13 and #23 with gold copings in place; d) panoramic radiograph.

Figs. 3a & b_ a) Impression with the maxillary restoration; b) fabricated cast.

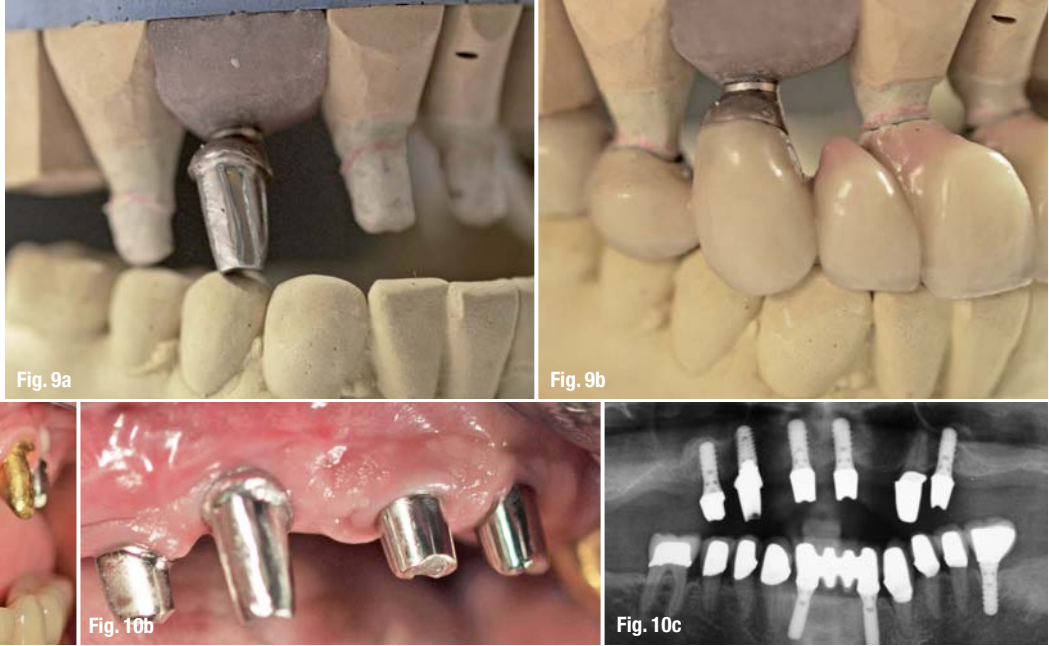
Figs. 4a & b_ a) Cast articulated using the maxilla restoration as a guide; b) provisional FPD in place.

Figs. 5a–c_ a) Surgical stent; b) determination of the axial direction; c) drill sleeve was placed into the surgical stent.

Fig. 6_ Panoramic radiograph obtained after implant insertion at position #6.

Fig. 7_ Impression post in the surgical guide.

Figs. 8a & b_ a) Transfer of the implant position to mounted cast; b) implant analog in cast.



Figs. 9a & b a) Fabricated customised abutment; b) try-in of the abutment in the restoration.

Figs. 10a–c a & b) Abutment mounted on the implant; c) panoramic radiograph of custom-made abutment #13 in place.

was restored with a removable teeth-implant supported, palatal free bridge (Figs. 1a–d) using double crowns as attachments, as previously described.^{2–4}

No implants were placed in regio #16 and #26, since the patient decided against performing sinus lift procedures and the remaining bone height was inadequate to allow implant placement. Furthermore, the patient did not agree to extraction of teeth #13 and #23. Therefore, the final restoration had to be supported by four implants (#14, #11, #21, #24; 4.1 × 10 mm, RN, Straumann, Basel, Switzerland) and two natural teeth (#13, #23) with cantilevers in the areas #15–16 and #25–26 (Figs. 2a–d). Customised implant abutments (torqued to 35 Ncm) and gold copings placed on natural teeth #13 and #23 served as primary telescopes (Fig. 2c). Electroformed pure gold copings with a thickness of 0.25 mm (AGC Galvanogold, Wieland, Pforzheim, Germany), fixated in the superstructure with a self-curing copolymer cement (AGC Cem, Wieland, Pforzheim, Germany), as previously described were used as secondary telescopes.^{5,6} The metal framework was milled from a titan 5 alloy (ZENOTECTi Disc; Wieland) and covered with micro-ceramic com-

posite (Ceramage, SHOFU, Ratingen, Germany). The patient was put on a three-months maintenance schedule. Six years after implant and prosthetic treatment, the patient reported to the office. Tooth #13 had been fractured in a car accident. He refused any new restoration and insisted on keeping the existing one. Thus, implant placement in position #13 was planned. The fractured tooth #13 was extracted. The maxillary denture was inserted and a bite registration in central occlusion was performed using self-curing acrylic resin (pattern resin; GC, Alsip, USA). An impression (Impregum; 3M ESPE, Neuss, Germany) of the maxilla was taken with the denture in place. The denture was removed from the patient's mouth together with the impression (Fig. 3a). This allowed for the fabrication of a cast with an exact duplication of the abutments (Fig. 3b).

The casts were placed in an articulator using the denture as a guide to achieve correct occlusion (Fig. 4a). A temporary fixed partial denture (from #14 to #24 with #15 and #25 cantilevers) from coloured polymethyl methacrylate (PMMA; Zenotec; Wieland, Pforzheim, Germany) was milled based on a scan of the maxilla cast, and was adhered on the abutments using

Figs. 11a & b Denture in place; a) close-up; b) anterior view.



provisional cement (TempBond, Kerr Co., Orange, USA; Fig. 4b). In addition, a surgical stent fitting onto the abutments was milled from clear PMMA (Zenotec; Wieland, Pforzheim, Germany, Fig. 5a). The planned axis of implant #13 was determined using a dental parallelometer (Fig. 5b), and a drill sleeve was placed into the surgical stent (Fig. 5c). An implant (4.5 x 10 mm, SB line; Dentegris, Duisburg, Germany) was inserted with a torque of 35 Ncm using a two-phase protocol (Fig. 6). Three months after implant placement, an impression post was positioned on the implant and the surgical stent was placed in the patient's mouth after the drill sleeve had been removed. The impression post was attached to the surgical stent using modeling resin (pattern resin, GC, Alsip, USA; Fig. 7). After this, the implant analog was attached to the impression post (Fig. 8a) and fixed in the cast using acrylic resin (Fig. 8b). A customised abutment fitting crown #13 was fabricated (Figs. 9a and b), positioned on the implant #13 and torqued to 35 Ncm (Figs. 10a-c). Subsequently, the denture was inserted (Figs. 11a and b).

was restored with single-fix crowns retained on natural teeth and implants (Fig. 12). The maxilla was restored (in the same way described above for the first case with a removable palatal free metal-ceramic bridge using double crowns, e.g. telescopic crowns, as attachments, retained on seven natural teeth (#14,13-23) and three implants (#13, 24, 25; RN, 10 x 4.1 mm, Straumann, Basel, Switzerland). Because the patient did not consent to a sinus augmentation, no implants were placed in regio #16 and #26. Tooth #14 was treated endodontically and was used as the last abutment (Fig. 12).

Thirteen years after prosthetic rehabilitation, the patient reported to the office with a root fracture in tooth #15. The tooth was extracted, the secondary telescopic crown in regio #15 was removed, and the supraconstruction was temporarily filled with a photo-cured, highly elastic temporary material (Fermit, Ivoclar Vivadent, Ellwangen, Germany). The patient again refused a sinus lift and therefore the immediate implant placement regio #15 was scheduled. The axis of the tooth #15, the fabrication of the transfer key and the implant placement, were performed as previously described in case 1. A short implant (Endopore 4.1 x 9 mm, Sybron Implant Solutions, Bremen, Germany) was inserted into area #15 (Fig. 13). Four months after implant placement, impressions were taken and a cus-

Case 2

The patient (male, 61-years-old and in very good general health) had a foul-mouth periodontal-implant and prosthodontic rehabilitation in 1998. After combined periodontal and implant treatment the mandible

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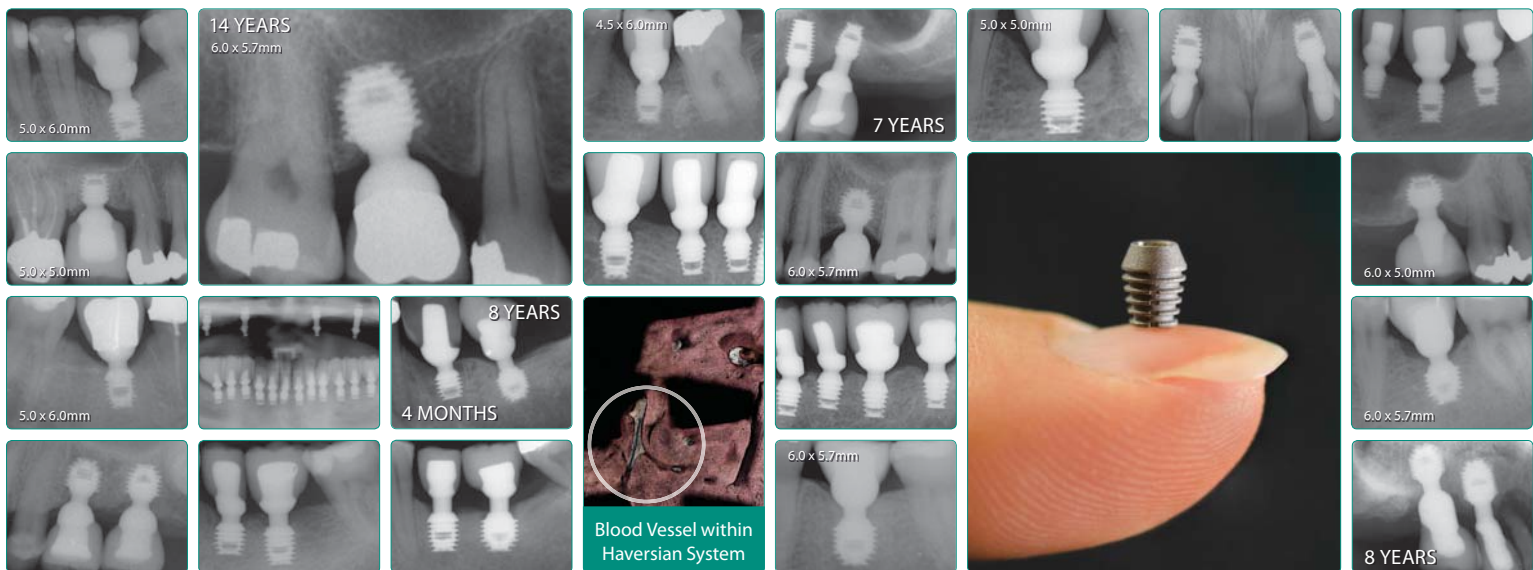




Fig. 12



Fig. 13a

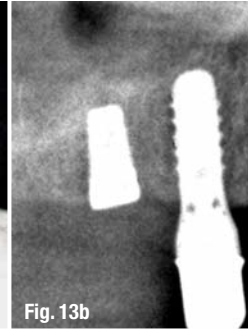


Fig. 13b

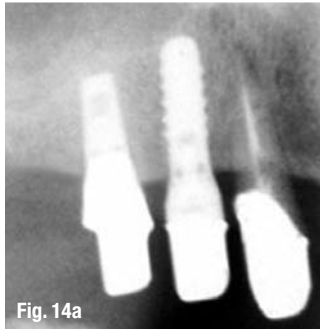


Fig. 14a



Fig. 14b

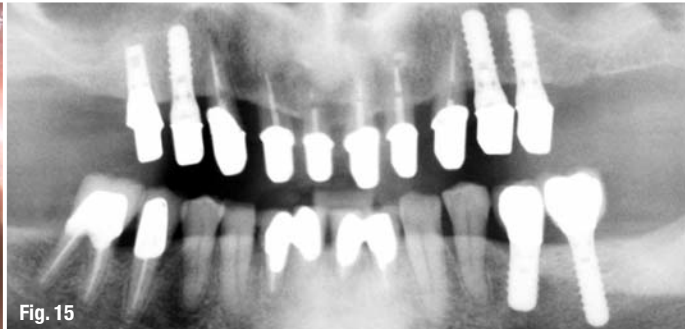


Fig. 15

Fig. 12_Orthopantomograph taken at the completion of the perio-implant-prosthetic treatment.

Figs. 13a & b_a) Surgical guide for implant placement #15; b) X-ray after implant placement.

Figs. 14a & b_Customised gold implant abutment #15 in place; a) X-ray; b) clinical view.

Fig. 15_Orthopantomograph taken at the completion of treatment.

tomised gold implant abutment and new secondary telescopic crown were fabricated and integrated into the same position as tooth #15 (Figs. 14 and 15). During a healing period as well as after the integration of the new abutment and the new secondary telescope in the bridge, the patient further used his telescopic maxillary restoration (Figs. 16a–d).

Discussion

The use of natural teeth and implants to support dentures incurs risks that may lead to loss of an abutment and, subsequently, the whole restoration. Recent reports have demonstrated a high long-term success rate of removable restorations supported by natural teeth and implants when double crowns, e.g. telescopic crowns, are used as attachments.^{7–9} However, the use of the combination, e.g. connection, of natural teeth and implants to support fixed dentures is not advisable due to the higher risk of complications.^{1,10} Cause for the loss of the abutment in case 1 was trauma from a car accident and not mechanical failure or periodontal infection or bone defects. Nevertheless, the resulting complications are similar to the ones described in the

literature for cases where the above-mentioned causes lead to loss of an implant.¹

In case 2, the natural abutment was lost due to mechanical reasons 13 years after loading. This kind of complications, e.g. fractures, have been reported in the long-term maintenance of fixed or telescopic reconstructions, when endodontically treated teeth were used as abutments.^{11,12} The complication discussed above could be avoided if the endodontically treated last natural tooth abutment #15 was extracted and replaced by an implant.

In cases of full-arch restorations retained on both implants and natural teeth, when a fracture of a natural abutment occurs, removal of the restoration is often necessary, regardless of the type of restoration (removable or fixed). This can cause not only conflicts between patient and dentist, but also high financial and technical efforts. The technique described above allows the successful replacement of the failed abutment by an implant, enabling the continuous use of the existing restoration.

Editorial note: A list of references is available from the publisher.

Fig. 16_Clinical view.



Fig. 16

contact

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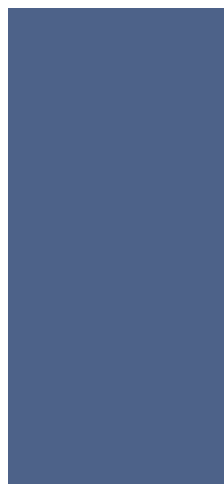


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Minimally invasive implant placement without the use of biomaterials

The bone expansion technique

Author_Dr Gilles Chaumanet, MSc, France/Italy

The success rate in implantology is close to 96 per cent. Thanks to well-established implant placement protocols, with a few differences according to the implant system used, the predictability of the result under optimum tissue conditions is quite significant. It is very different when these conditions do not meet the recognised standards in terms of volume and quality for reproducibility in implantology. Thin ridges, for example, which are frequent occurrences, will require a long and costly process for patients, because they entail bone augmentation or possibly just soft tissue grafts.

these problems? One line of thinking is to stop the systematic practice of implantology as subtractive at the tissue level, but rather to transfer these volumes and thereby ensure a minimally invasive procedure. This implies reviewing all the biomechanical principles of implantology, not only in terms of the implant structure and design but also in relation to peri-implant tissue. The general surgical principle of modern implantology since Brånemark has been bone preparation, called osteotomy, as close as possible to the dimensions of the implant that will be placed. This principle is still widely prevalent. However, soft tissue management has evolved and the trend over the past few years has been to manage soft tissue from the first surgical step. With the arrival of self-tapping conical implants, a new technique was developed that enables lateral as well as vertical bone compressing, condensing or expanding. In addition, in 1994 Summers, practising his crestal sinus lift technique with careful choice of conical taps, was the first to demonstrate the capacity of cancellous bone to be modelled (Fig.1).¹

Fig. 1_Original explanatory sketch of Summers' technique.

Is there a minimally invasive alternative for these patients, which allows them to be treated without



In two clinical cases we will see that it is possible to be minimally invasive, precise and also avoid the use of biomaterials simply by exploiting the biomechanical properties of bone tissue and its capacity to regenerate. Respecting guided regeneration principles, which means the implementation of physical barriers to isolate the epithelial and connective tissue cells from the operating site, enables regeneration of the different tissues. These principles are (Fig. 2):

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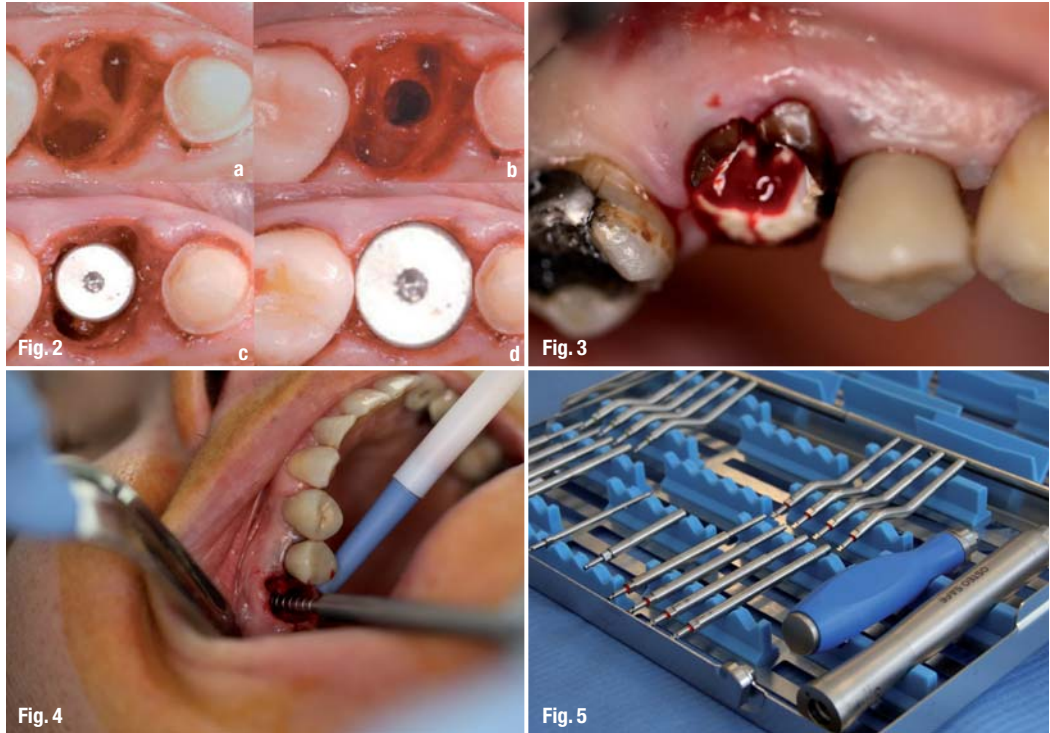
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Figs. 2a-d_a & b) Bone expansion through the septum with the use of osteotomes; c & d) choice of healing screw that enables primary closure of the soft tissue.

Fig. 3_Preoperative clinical view: 16 fractured, infected.

Fig. 4_Use of OsteoSafe®.

Fig. 5_Complete OsteoSafe Kit.



- Primary closure of the surgical site to enable undisturbed and uninterrupted healing.
- Completion of the best possible angiogenesis to provide the required vascularisation and undifferentiated mesenchymal cells.
- Creation and maintenance of a space to facilitate bone formation inside this space.
- Stabilisation of the surgical site to induce blood clot formation and facilitate healing.
- Thanks to the careful choice of the healing screw or the implant abutment/temporary crown pair, these two entities with different regeneration potentials can be hermetically sealed, thereby avoiding cell competition, which we know contributes to the growth of epithelial cells which develop more rapidly.

Case 1

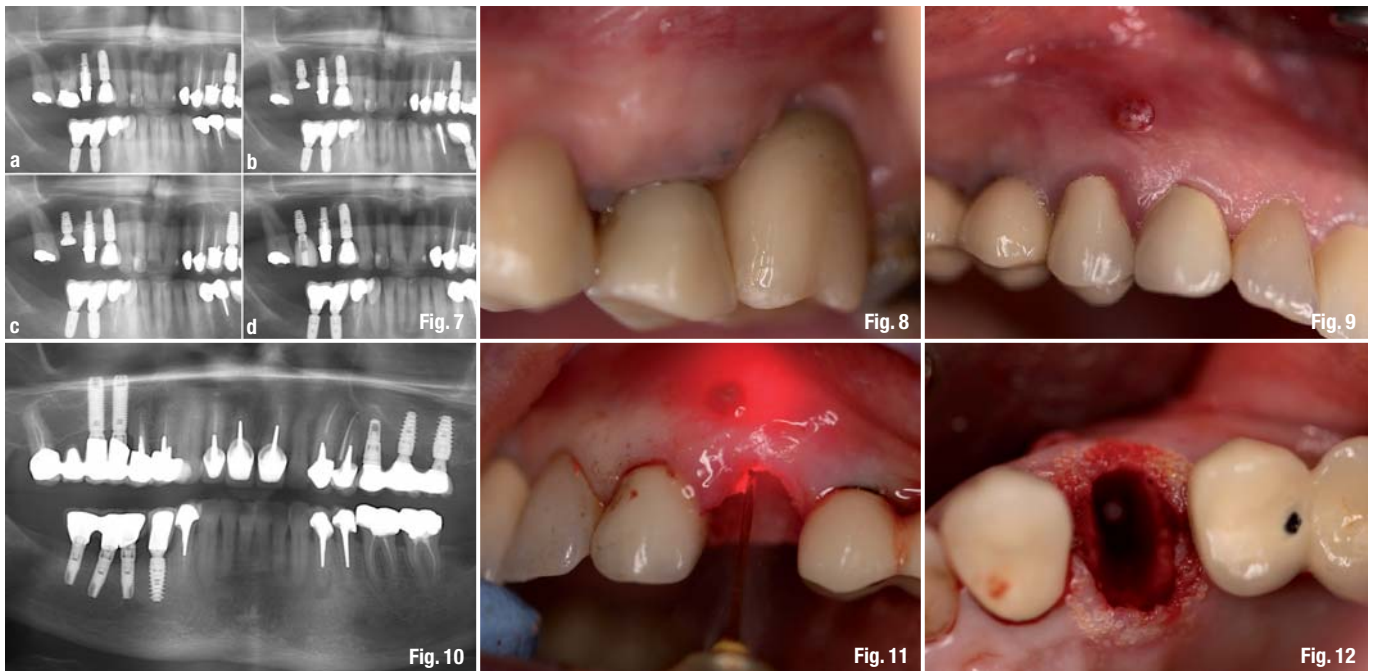
The patient presented with a fracture of number 16 (Fig. 3) and periapical cysts. With the patient's consent, the decision was made to perform an extraction,

debridement, socket decontamination and immediate placement of a non-submerged implant (implant + healing screw) using Summers' method (crestal sinus lift). The patient was on standard premedication with amoxicillin and corticosteroids. Tooth number 16 was carefully extracted by radicular separation to avoid bone fracture especially in the vestibule, where the cortical bone is very thin. The lamina dura, which enables the attachment of collagen and Sharpey's fibres, presents a high potential for contamination. Consequently, a light manual curettage of the socket was carried out, followed by a superficial debridement (vaporisation) of the entire "lamina dura", with an Erbium laser (2,870 nm) followed by decontamination with a diode laser (940 nm). This was a flapless surgery.

Expansion osteotomy was performed through the inter-radicular septum. It was initiated with a very thin manual bone tap (pointed) and then an automatic mechanical osteotome (Figs. 4-5, Osteo Safe®, Anthogyr) was used. The use of convex inserts in the beginning enables lateral expansion of the native or

Figs. 6a-c_a) Bone expansion; b) positioning of the implant; c) choice of the healing screw.





healed bone. In addition, concave inserts during the breaking of the last sub-sinus millimetre enable lateral bone recovery of this "bone socket" while projecting it apically. During sinus progression PRF membranes (or native collagen membranes) are placed in the osteotomy opening to fill the intra-sinus space that is thereby gained (they also provide protection of the sinus membrane).

The Erbium laser is again passed through the osteotomy socket to vaporise the bone debris and sludge along the walls of this osteotomy. The implant is placed according to the manufacturer's recommendations, but with an even slightly higher torque if the titanium grade allows doing so. A healing screw that fits the diameter and height of the residual gap to be closed is carefully chosen (Fig. 6).

If the healing screw does not enable primary closure of soft tissue, PRF membranes are used to fill the gap. If this gap is too big, a mucoperiosteal detachment of 6 to 10 mm and then a horizontal incision of the periosteum of 6 to 8 mm are made. This technique serves to pull the gum around the healing screw by maintaining it with two sutures. The control X-rays clearly showed good osseointegration of the implant, significant filling and regeneration in only three months, and then perfect filling and regeneration four months after surgery.

The bone remodelling around and above the implant neck also seemed to be well executed. The cone-beam 3-D imaging in the first place showed a healthy sinus without inflammation or infection as well as bone remodelling at the apex and around the implant (Figs. 7-8).

In the case of a trans-alveolar sinus lift combined with the placement of an implant by bone expansion, convex-tipped inserts should be used first to enable lateral expansion, and then concave inserts for scraping of the bones of the lateral walls of the osteotomy to enable apical projection after breaking the last millimetre under the sinus floor. If a maxillary implant is to be placed completely in native bone, convex inserts suffice. The last insert that is placed is smaller in diameter than the implant that is chosen. The advantage of this technique was noted starting in 1996 by Summers himself with the use of conical osteotomes as opposed to cylindrical osteotomes, which were the only ones available up until then. The idea was actually to enable lateral peri-implant bone condensing in order to increase notably, primary stability and compensate for the lack of vertical dimension of the sub-sinus native bone. The objective of this technique is to maintain, if possible, the entire maxillary bone by laterally pushing back the bone with minimum trauma while creating a precise osteotomy that breaks the last millimetre of the sinus floor while protecting the sinus membrane. The consequence is the notable increase in peri-implant bone density with a high elevation of BIC (Bone Implant Contact) and therefore, bone stability.

Case 2

The patient presented with a fracture of tooth number 24 with significant periapical infection (Figs. 9 and 10.) It was decided that an extraction would be performed with immediate placement and loading of an implant after complete decontamination of the extraction socket using lasers (Figs. 11 and 12). Next, Osteo Safe® was used (Fig. 13) to enable gentle trabec-

Figs. 7a-d Panoramic views: a) Pre-op.; b) Per-op.; c) at three months, d) follow-up at one year.
Fig. 8 Control at six months.
Fig. 9 Preoperative view—fistula on 24.
Fig. 10 Panoramic view with gutta-percha cone inserted in the fistula that reaches the apex.
Fig. 11 Laser decontamination.
Fig. 12 Laser degranulation.



Fig. 13



Fig. 14

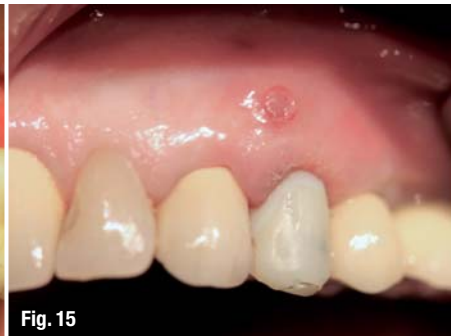


Fig. 15

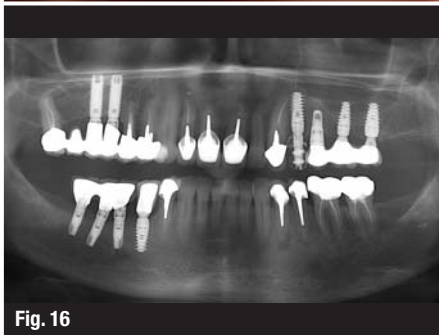


Fig. 16



Fig. 17

Fig. 13_Use of OsteoSafe® in the extraction socket after debridement and decontamination.

Fig. 14_Positioning of the implant.

Fig. 15_Immediate implant placement with temporary crown.

Fig. 16_Control panoramic view at two months.

Fig. 17_Permanent crown at three months.

ular expansion and placement of a self-tapping conical implant (Axiom PX®, Anthogyr). In this case, in which bone recovery along the osteotomy walls was not necessary, only convex inserts were used. The palatal and subcrestal position of the implant was respected (Fig. 14). The gap between the implant and the vestibular cortical bone is not filled. Careful choice of the implant abutment enables an ideal emergence both in terms of hard tissue and soft tissue. The temporary crown is thereby shaped in such a way that it closes the gap by slightly compressing the marginal gum (Fig. 15).

It was mounted out of functional occlusion. Of course, the patient was advised to avoid voluntary chewing on this implant as well as local cleaning with cotton soaked in Chlorhexidine. Following verification of the osseointegration (Fig. 16), the impression was made eight to ten weeks after surgery, followed by placement of the permanent prosthesis (Fig. 17).

Conclusion

The implant placement technique with the use of osteotomes is not a new concept. On the other hand, using an automatic osteotome provides a better view of the site, makes it possible to practice flapless surgery, to position more precisely and obtain more homogeneous progression, in comparison to using bone taps with a surgical mallet. From the patient's perspective, surgical comfort is significant and very noticeable.

It should be borne in mind that if you want to avoid using filling materials, tissue must be conditioned to enable its regeneration. For immediate post-extraction implant placement, lasers are of unrivalled use-

fulness, because they enable socket decontamination and induce bone regeneration. If the basic principles of this bone regeneration are respected, the conditions are adequate enough to enable bone growth without the use of biomaterials. These advantages are decisive during preparations such as alveolar sinus lift as well as "split crest" where the buccal cortical bone is generally very fragile.

Vital importance is attributed to the closure of soft tissue during implant placement; either by carefully choosing the healing screw (the height and diameter) or the implant abutment, enabling slight compression of soft tissue and providing the implant/prosthetic connection system with a 'barrier' that enables the regeneration of the two families of tissues.

These minimally invasive techniques still require many improvements and more wide-spread validation. However, for ethical and safety reasons, the practitioner should always suggest the least invasive technique that contributes to, guides and induces this tissue regeneration for which most of the times we have the matrix around these traumatised zones.

Editorial note: A list of references is available from the publisher.

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Practise Stamp

CAD/CAM custom-milled titanium bar for rehabilitation of an atrophic upper jaw

Author_ Dr Richard Marcelat, France

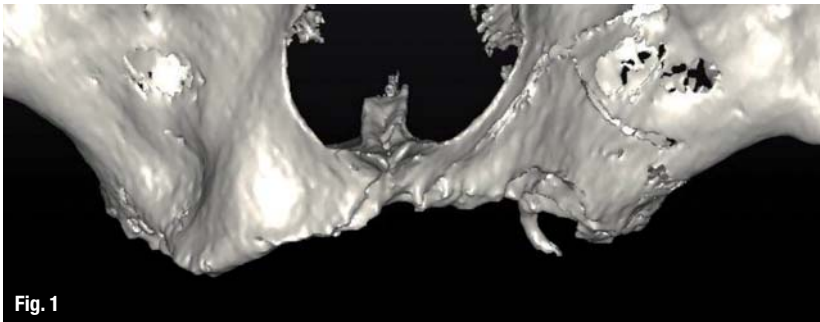


Fig. 1

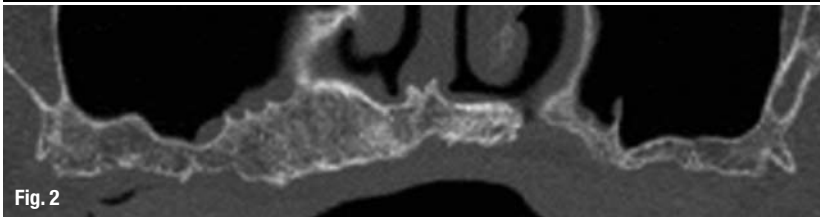


Fig. 2

Figs. 1 & 2_ Scans showing severe bone resorption and atrophy of the upper jaw.

_CAD/CAM is playing an increasing role in the production of implant-retained prostheses. These digital technologies constitute a major advancement in terms of fit accuracy of the superstructure.^{1,2} Rehabilitating a fully edentulous upper jaw with an implant-retained overdenture may require delicate treatment because of the biomechanical and anatomical considerations associated with severe bone resorption. This article describes the contribution of these new digital technologies to the construction of milled bars for rehabilitation in such cases.

_Case presentation

A 75-year-old non-smoking female patient, whose rheumatoid polyarthritis has been treated with methotrexate for seven years, presented. This patient has been fully edentulous in the upper jaw for 30 years. She wore a removable partial denture in the lower jaw and a removable complete denture in the upper jaw. Stability of the latter was very precarious owing to severe crestal bone resorption. The patient's motivations were mostly function orientated; she was eager to regain chewing comfort.

There are centrifugal forces in the lower and centripetal forces in the upper jaw, and bone resorption reduces the volume of the latter, causing an offset between the upper and lower jaws. This offset, which was to be compensated for by the overdenture, must be taken into account at implant placement.

Pre-implantation surgery

DentaScan (GE Healthcare) allows the evaluation, as a complement to the initial panoramic radiograph, of the residual bone volume available for implant-retained rehabilitation. In the present case, this examination confirmed that the upper jaw was atrophic (Figs. 1 & 2). Therefore, bone reconstruction was necessary prior to implant treatment. A bilateral sinus lift with lateral access was performed. The space under

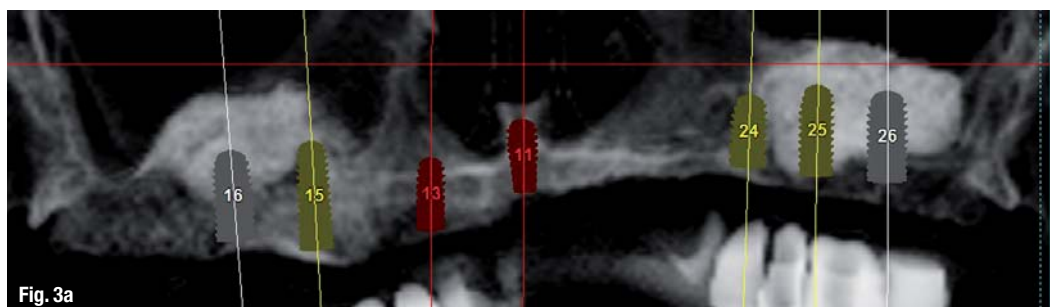
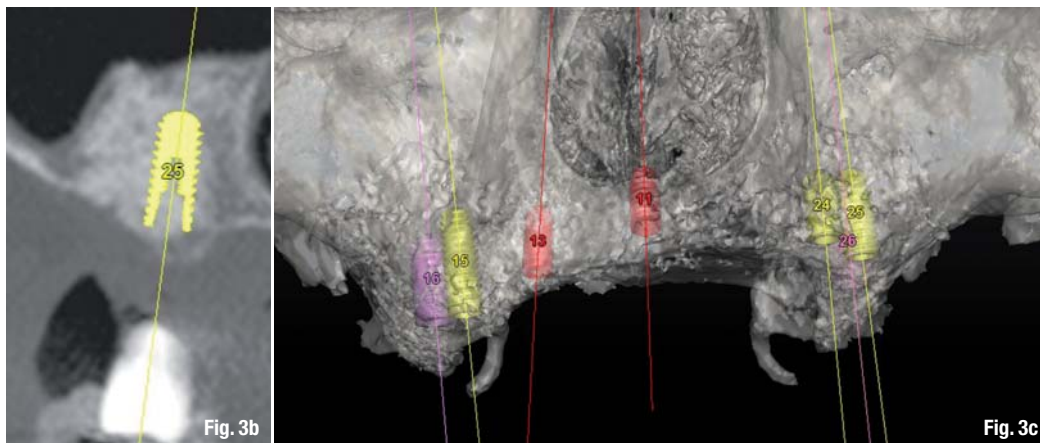


Fig. 3a



Figs. 3a–c_ Implant planning with SIMPLANT after a bilateral sinus lift.

the sinus floor was filled with allogeneic bone (max-graft, botiss biomaterials) mixed beforehand with the venous coagulum collected at the beginning of surgery. The following step entailed covering the allogeneic bone with a collagen membrane (Bio-Gide, Geistlich) and a platelet-rich fibrin membrane. The complete denture was then hollowed out and relined periodically with a soft resin.

Implantation planning

The case was planned using the SIMPLANT (DENTSPLY) treatment planning software. The radiographic guide, which is a duplicate of the existing prosthesis, allows the prediction of the positioning and orientation of the implants to anticipate the dimensions, locations and axes of the implants and abutments. It also allows maximal exploitation of the available bone volume (Figs. 3a–c).

Implant surgery

In order to test the mechanical resistance of the grafted areas on probing, osteogenic stimulation of the sinus filling material was performed with bone matrix Osteotensors (Victory), using the technique described by G. Scortecchi and C. Misch.³ The bone matrix Osteotensors are used in a trans-parietal technique (flapless procedure). This endosteal stimulation also activates the cells. This easy and minimally invasive technique enables the assessment of the quality of the intended implant sites. These techniques have been successfully used in orthopaedic surgery for a decade. Given the good response to osteogenic stimulation, the implantation was planned after 45 days.

Six months postoperatively, seven Axiom PX implants (Anthogyr) were placed in the upper jaw using the radiographic guide. Self-drilling, self-tapping and featuring a reverse conical neck, the conical, double-threaded implants selected for this rehabilitation

(Fig. 4a) allowed us to obtain excellent primary anchoring, as they, along with the drilling protocol, encourage bone condensation in areas with low bone density. Moreover, the osteoconductive potential of their BCP (biphasic calcium phosphate) grit-blasted surfaces promotes osteoblast differentiation in the early stages of osseointegration.

Restorative phase

Four months after implantation, preparation for the final restoration began (Fig. 4b). A percussion test on the implants was carried out, and a control radiograph was taken. Straight multi-unit abutments were then placed and definitively torqued to 25 Ncm. Next, a pop-in impression was taken using a polyether impression material (Impregum, 3M ESPE) in a custom tray made by the laboratory technician. For full impressions on multiple implants, we usually prefer to take a pick-up impression, with joined impression transfers, but this technique could not be used here because of limited mouth opening.



Fig. 4a_ Axiom PX implant.
Fig. 4b_ Occlusal view showing the multi-unit abutments and protective caps in place.



Figs. 5a & b_Master cast with silicone gingiva.

Fig. 6_Plaster index for approval.

Fig. 7_The wax pattern fabricated by the laboratory technician.

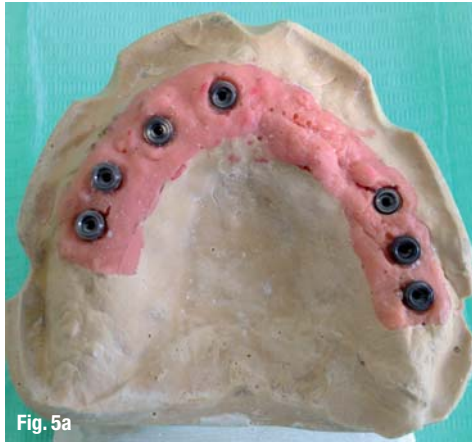


Fig. 5a

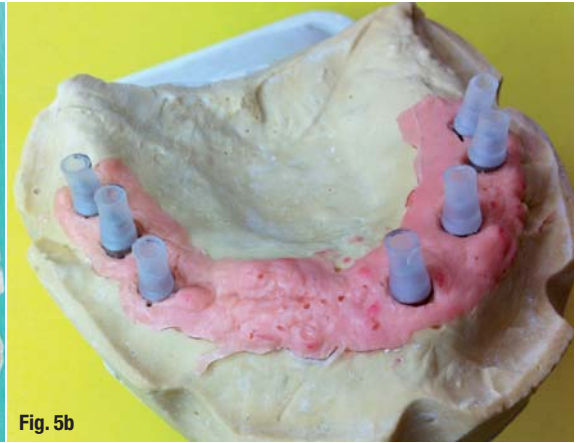


Fig. 5b

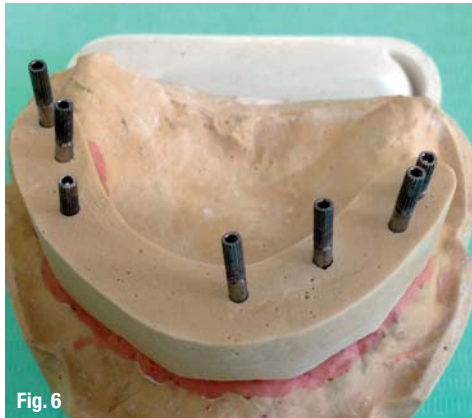


Fig. 6

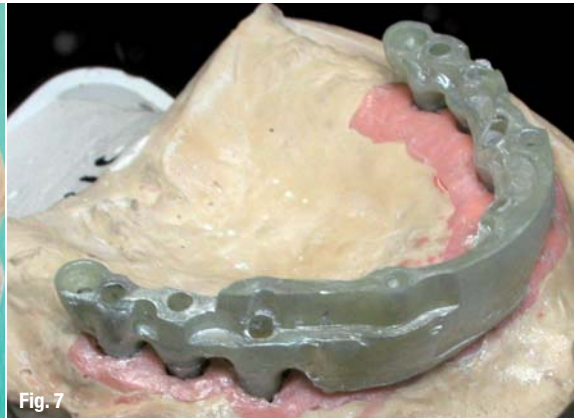


Fig. 7

The master cast with abutment analogues and silicone gingiva was fabricated at the laboratory (Figs. 5a & b) and then checked in the dental office using an index made of non-expanding stone in order to ensure absolute precision (Fig. 6). This step is essential to ensure that the master model is perfectly accurate.⁴ The maxillomandibular relationship is then transferred to the articulator by relining the existing prosthesis on conical caps of abutments (a bite wax on a hard basis—a technique considered more accurate by some—can be used instead). The interpupillary line was registered by means of an inclinometer (AmannGirrbach). The aesthetic set-up, maxillomandibular relationship and occlusion were then checked on the patient by means of a denture

set-up placed on a thermoformed hard basis. This set-up reflected the patient's wishes regarding aesthetics too.

The laboratory produced a resin pattern of the substructure (Fig. 7), namely a milled bar as a true anchoring beam, screwed on to the abutments. After approval, the master model and wax-up were sent to Simea (Anthogy). This fabrication centre scans the master model and virtually designs the component to be produced (Figs. 8a & b). After approval of this virtual model at the laboratory by means of a 3-D PDF document (Figs. 9a & b), the bar was milled from a block of titanium, using a five-axis CNC milling machine (Fig. 10).⁵

Fig. 8a_Simea scan.

Fig. 8b_Scanning.



Fig. 8a

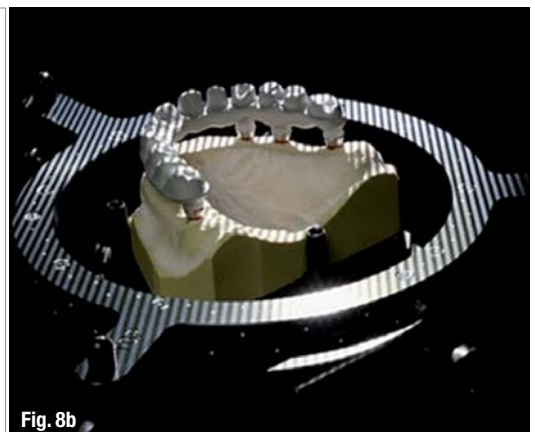


Fig. 8b

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Figs. 9a & b_3-D CAD model.
Fig. 10_Milling.

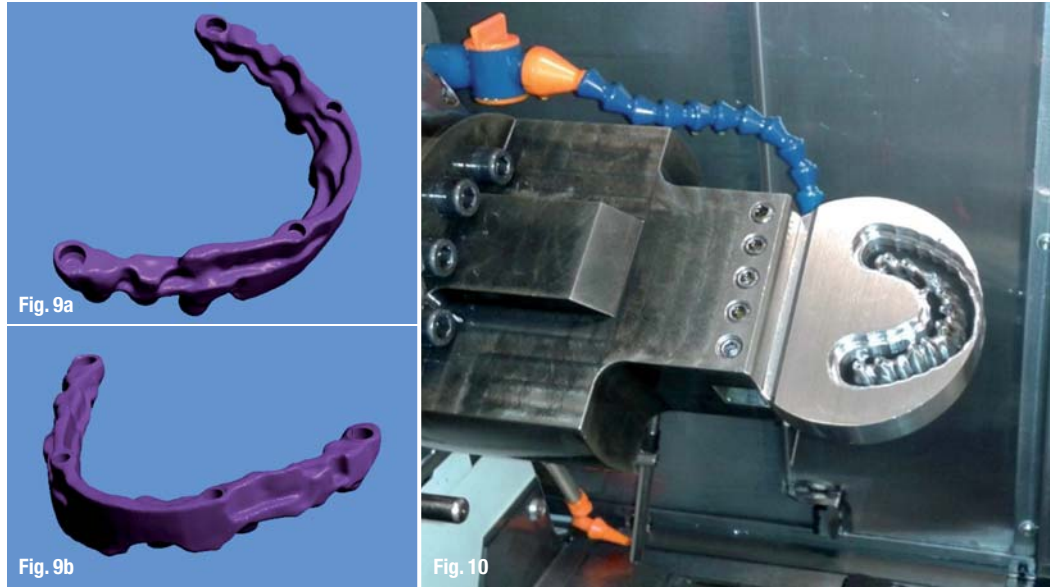


Fig. 9a

Fig. 9b

Fig. 10

Titanium—four times lighter than semi-precious alloys—is the lightest metal used in dentistry. It offers excellent biocompatibility and very good mechanical properties.⁶ The metal is highly reactive to oxygen: when the metal is exposed to air, a protective film, the passivation layer, builds up on its surface and makes it extremely resistant to corrosion and chemical attacks. Titanium offers additional advantages in oral implantology. The density of the materials used is crucial. The weight of a prosthesis

for an upper jaw appears to be a key factor for treatment success.

A few days later, the bar was tried in the patient's mouth. It was perfectly adjusted and seated passively (Figs. 11a–d). Milled bars exhibit a precision fit better than 10 μ . The substructure was sent back to the laboratory technician, who then produced the framework using the silicone indices of the approved functional and aesthetic set-up.

Figs. 11a & b_Simeda milled titanium bar.
Fig. 11c_The titanium bar in situ.
Fig. 11d_Panoramic radiography for fit control of the bar.



Fig. 11a

Fig. 11b

Fig. 11c

Fig. 11d



Fig. 12a



Fig. 12b



Fig. 13

The restoration consisted of two distinct parts:

- the milled bar screwed on to the multi-unit abutments; and
- the removable telescopic part: the prosthesis, friction-retained on the bar (Figs. 12a & b).^{7,8}

As the seven implants were well distributed over the entire arch, no palatal coverage was needed, meaning enhanced comfort for the patient. Retention of the prosthesis by the bar was enhanced by four CEKA attachments (ALPHADENT; Fig. 13).

A milled bar-retained removable prosthesis can be considered an attractive option for patients presenting with an atrophic upper jaw and/or bruxism because it efficiently compensates for the tissue loss, ensuring a good aesthetic outcome, in addition to excellent stability and retention of the prosthesis.⁹ For this reason, this option is classified by some as falling in the category of removable bridges.⁹⁻¹² The prosthesis is nevertheless resilient enough to withstand high mechanical stress, reducing the risk of fracture, especially that of the veneering layer.^{13,14}

Discussion

With conventional casting techniques, producing a substructure for an implant-retained prosthesis remains technically difficult.^{15,16} The difficulty of achieving passive fit is proportional to the number of elements and volume of the substructure. Despite the advances in casting technology, in the case of large-span substructures, primary or secondary brazing is often needed to compensate for the dimension variations in order to achieve an absolutely passive fit.^{17,18} Such an accurate, passive fit of the substructure is essential for the bone physiology of implants and long-term reliability of implant-retained rehabilitations.^{19,20} Owing to its high precision, CAD/CAM is an invaluable tool for evolving the prosthetic workflow technologically.^{1,21} The restoration is designed based on a 3-D CAD image created from the scanned data.²²⁻²⁴

CAD software allows modelling of the prosthesis, taking into account the material selected (such as zirconia; titanium; cobalt–chromium; IPS e.max, Ivoclar Vivadent; and PMMA).

As the subtractive fabrication technique (milling) associated with this CAD ensures that the material structure will not be altered, a metal substructure featuring optimal density and homogeneity is obtained. In addition, the computerized configuration of this process ensures reproducible results and irreplaceable passive insertion of these substructures.

Conclusion

Today's laboratory scanners can digitize the model, wax-up and implant index. CAD/CAM technology offers unmatched work quality, precision and reproducibility compared with conventional procedures. It is certainly the most appropriate technology for producing implant-retained superstructures. This technology also allows improved passive fit of substructures and facilitates the work of the laboratory technician.

Passive fit as a prerequisite for successful implant-retained prostheses ensures long-term reliability of rehabilitation work.²⁵ Moreover, the fabrication centres can machine biocompatible materials such as titanium and zirconia.

These CAD/CAM techniques, which are already well established in dental laboratories, constitute a major contribution to our daily practice, and will soon be essential in all practices.

The author declares no conflict of interest.

Editorial note: A complete list of references is available from the publisher.

about the author

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Figs. 12a & b The telescopic denture on a milled bar.

Fig. 13 CEKA attachments as additional retention devices.

Complete reconstruction for a patient with chronic tooth decay

The damage undone

Author_Dr Ara Nazarian, USA

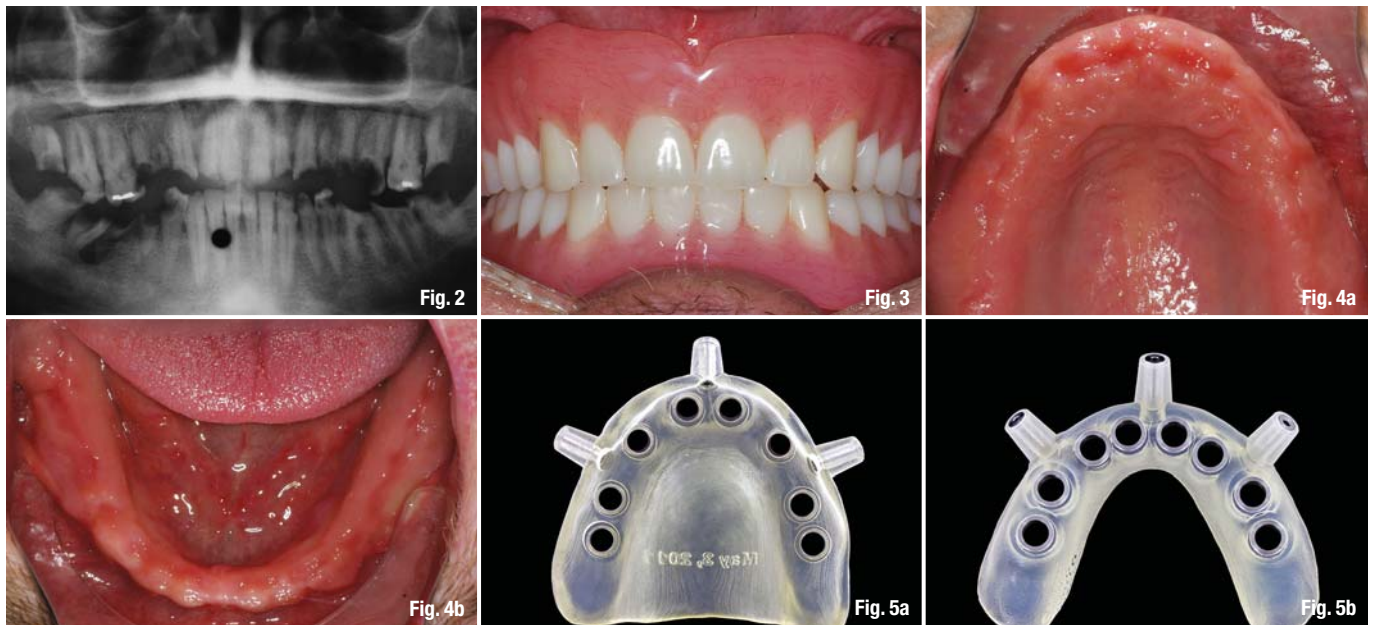
When oral health is neglected for extensive periods of time, dental conditions like tooth decay and periodontal disease can advance to a point that, prior to the advent of implant therapy, was considered hopeless. If a patient presented with extensive caries and a non-restorable set of dentition, practitioners had no choice but to extract the teeth and provide the patient with a complete denture. Although beneficial to patients as a fundamental replacement of their teeth, many patients have found the fit, comfort and retention of such appliances to be problematic.¹ Without any anchorage to hold it in place, the traditional denture has a tendency to move around in the patient's mouth, compromising speech and chewing capabilities. This problem is exacerbated by the recession of the edentulous arch that occurs following tooth loss or extraction. After decades of advancements in implant design, restorative materials, and digital dentistry, we can today provide patients with a higher level of care. Root-form dental implants can be placed predictably to hold a full-arch prosthesis in place, providing greatly improved comfort, function, and quality of life compared to traditional complete dentures.^{2,3} Further,

osseointegrated implants serve to mitigate bone resorption.⁴ This means that in addition to providing the aesthetics of natural dentition, implant-supported restorations also help to preserve the edentulous ridge and the essential support it provides for the mouth and face. The positive impact this can have on personal confidence, emotional health, and social interactions is substantial.⁵

Thus, patients who present with the most acute dental conditions can now be brought back from the brink and become fully restored via implant therapy. If the patient's teeth have deteriorated to the point where they can no longer be saved, they can be extracted, implants are placed, and a full-arch restoration is delivered that closely emulates the form and function of natural dentition. This alternative should be presented to all patients for whom implant therapy is indicated, as individuals who at first may not appear to have the means for high-quality treatment may in fact have the wherewithal after being apprised of their options. Additionally, all patients should be made fully aware of the long-term costs and benefits of tradi-

Figs. 1a–c Retracted frontal, occlusal maxillary and occlusal mandibular views exhibit the non-restorable preoperative state of the patient's dentition.





tional complete dentures vs. implant-supported restorations before making a decision with such life-changing potential. The presentation that follows documents a case in which a patient with severely decayed dentition undergoes a complete oral reconstruction. A treatment plan is developed that harnesses the classic principles of implant placement, the versatility of modern restorative materials, and the precision of digital diagnostics and CAD/CAM fabrication to achieve a predictable, aesthetic restoration for a case that would seem hopeless to many. The case illustrates how implant therapy can afford patients even in the most extreme of dental circumstances an excellent long-term prognosis, restoring not just the teeth, but also the bone, soft tissue, self-esteem, and quality of life.

Case Report

A 36-year-old male patient presented for treatment with advanced, extensive caries and localized periodontal disease (Figs. 1a–c). In addition to not having seen a dentist in more than 20 years, the patient was recovering from an addiction to methamphetamine, which had caused excessive clenching and grinding that had substantially worn down the patient's teeth. The many years of dental neglect combined with these parafunctional habits to render the patient's severely decayed dentition untreatable (Fig. 2). Further, the deterioration of the patient's teeth was accompanied by significant soft-tissue recession and bone resorption.

Although the patient had been quite apprehensive about seeking treatment, pain and discomfort eventually compelled him to take action. The patient had sought treatment from a practice where he could receive all of the necessary treatment from a single provider in the fewest appointments possible. After lo-

osing my practice, the patient found the courage to present for evaluation. It was apparent from the initial visit that he was ashamed of his condition.

The goal was to offer him the best treatment available in order to restore the patient's smile, form and function. Without presuming the appropriate standard of care for the patient based on his condition, it was explained to the patient that his natural teeth could not be saved and a full range of treatment alternatives was presented, from complete dentures to fixed full-arch implant restorations. Before-and-after photos of similar cases were shown to the patient to assist his evaluation of the restorative options. The patient chose full-mouth reconstruction consisting of fixed prostheses delivered over dental implants. A treatment plan was developed that included extraction of the patient's non-restorable dentition, the placement of eight implants in each arch, delivery of Inclusive® Titanium Custom Abutments and BioTemps® restorations (Glidewell Europe GmbH; Frankfurt/Main, Germany), and final restoration with fixed PFM prostheses. The latest tools in digital dentistry would be utilized to maximize the precision of both implant placement and prosthetic fabrication.

Because of the patient's relatively youthful age and his continued bruxing habit, eight implants were proposed for each arch in order to maximize the distribution of occlusal load, the preservation of his ridges, and the long-term prognosis of the restoration. The resorbed state of the patient's maxillary and mandibular ridges necessitated a grafting procedure to create the foundation needed for implant placement. Custom abutments would be used to position the prostheses for optimal aesthetics. Although BruxZir® Solid Zirconia Full-Arch Implant Prostheses (Glidewell Europe

Fig. 2 Panoramic radiograph further illustrates the extensive tooth decay the patient had suffered, which had caused a major infection as evidenced by the radiolucent lesions visible at the tips of several roots. Also note the periodontal lesions visible in the lower arch.

Fig. 3 Following extraction of the patient's dentition, immediate dentures were delivered to provide the patient with a minimum level of function and aesthetics during the healing phase.

Figs. 4a & b Occlusal views of patient's maxillary and mandibular ridges exhibit healthy tissue at the extraction sites.

Figs. 5a & b Surgical guides were 3-D printed to help ensure placement of the implants in accordance with the digital treatment plan.

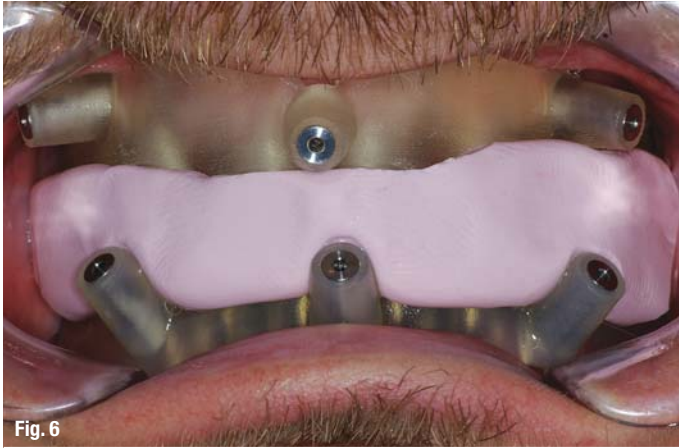


Fig. 6



Fig. 7



Fig. 8a



Fig. 8b



Fig. 9

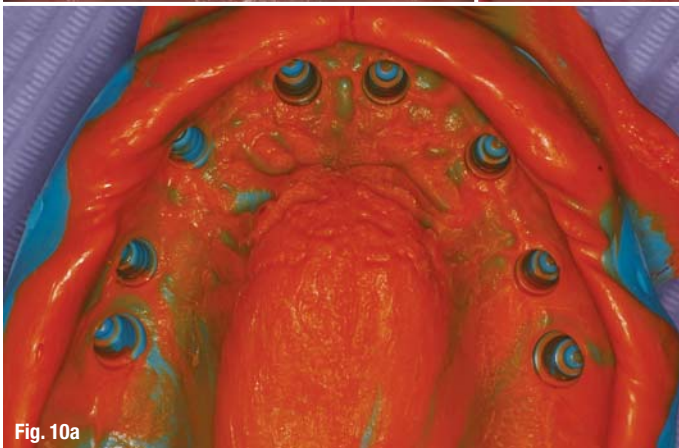


Fig. 10a

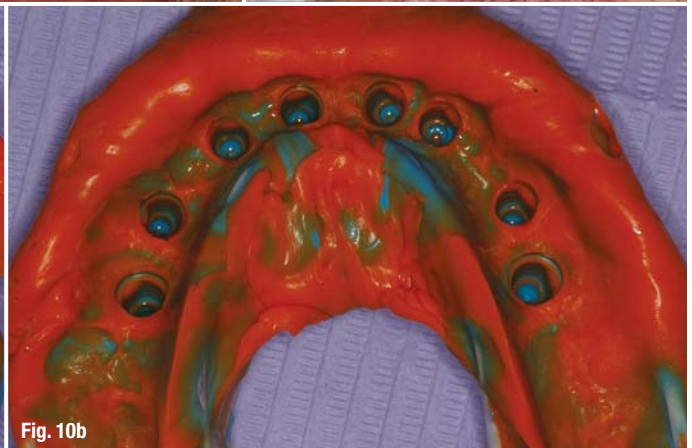


Fig. 10b



Fig. 11



Fig. 12



Fig. 13

Fig. 6 The surgical guides were seated in the patient's mouth and secured using the fixation pins and positioning index.

Fig. 7 The surgical guides controlled the positioning of the osteotomies during drilling.

Figs. 8a & b Occlusal views of maxillary and mandibular implants illustrate excellent healing of the soft tissue four months after surgery.

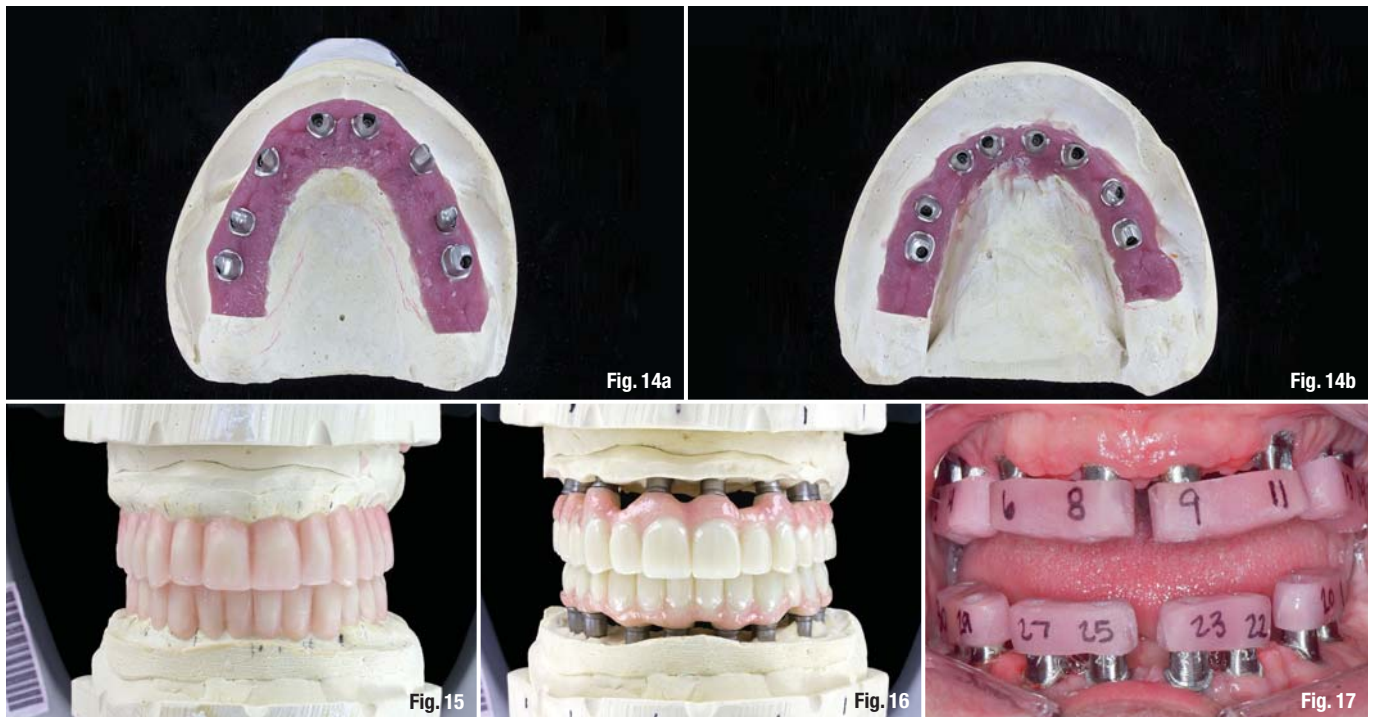
Fig. 9 The impression copings were tightened into place using the ball-top screws.

Figs. 10a & b Upper and lower closed-tray impressions were taken and sent to the lab so working casts could be fabricated.

Fig. 11 Impressions of the patient's immediate dentures were taken along with a bite registration to help guide the design of the definitive prostheses.

Fig. 12 Wax rims were produced by the lab so the patient's interocclusal relationship could be determined.

Fig. 13 The patient's jaw relationship was recorded with the wax rims in place.



GmbH; Frankfurt/Main, Germany) would have been the ideal restorations given the need for long-term durability in this case, the product was not yet available at the time of treatment. Thus, PFM prostheses were chosen in order to avoid acrylic and its susceptibility to staining, wear and fracture. The proposed PFM restorations included layered pink porcelain to recreate the patient's natural gingival contours. All aspects of treatment were explained to and accepted by the patient. The first phase of treatment began by atraumatically extracting the patient's entire dentition using Physics Forceps (Golden Dental Solutions Inc.; Detroit, USA), which allowed for removal of the teeth without causing any damage to the surrounding bone. The extraction sockets were filled with grafting material in order to preserve the sockets and rebuild the maxillary and mandibular ridges for ideal implant placement. The patient was provided with immediate dentures, which were prefabricated based on impressions that were taken at a previous appointment (Fig. 3).

After approximately five months of healing, the patient was called in so cone-beam computed tomography (CBCT) scanning could be performed. The soft tissue of the patient's now-edentulous arches exhibited excellent health (Figs. 4a & b). CBCT scanning confirmed that the grafting procedure was successful in increasing the bone volume available to accommodate the planned implants. The CBCT scanning data was used to devise a virtual treatment plan that would place the eight implants for each edentulous ridge in the maximum amount of bone while adhering to the key implant positions as taught by Dr. Carl Misch.⁶ Surgical guides were fabricated to ensure placement of

the implants in the precise positions called for by the treatment plan (Figs. 5a & b).

At the next appointment, the tissue-supported surgical guides were tried in and found to be well-fitting. The fixation pins of each surgical guide were tightened with a surgical index in place to ensure complete, secure seating of the appliances (Fig. 6). A tissue punch was used to provide access to the implant sites, facilitating a flapless surgical procedure that would minimise gingival trauma. The osteotomies were created through metal inserts placed in the surgical guides, which precisely controlled drilling depth and orientation according to the digital treatment plan (Fig. 7).

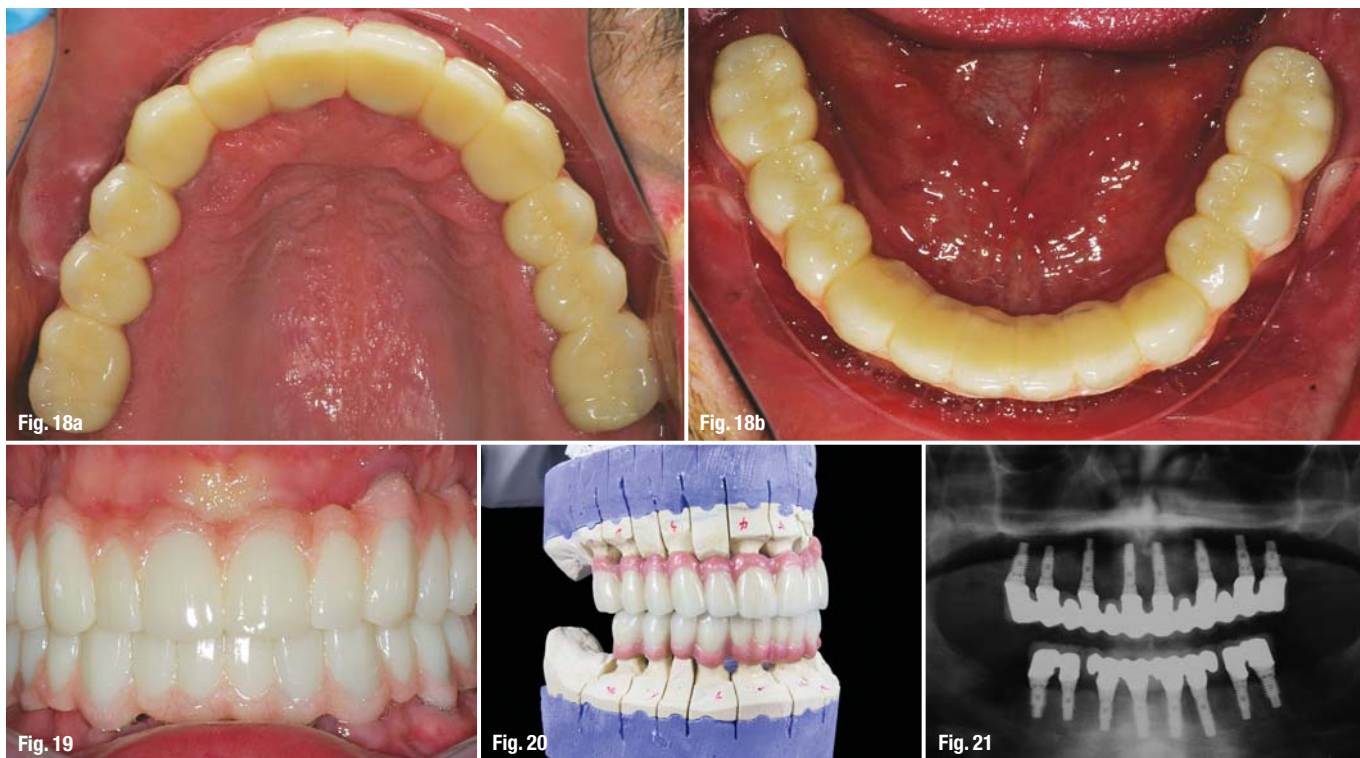
Eight BioHorizons[®] Laser-Lok[®] dental implants (BioHorizons; Birmingham, USA) were placed in each ridge, including 5.7 mm implants in the two distal-most locations of each arch, and 4.5 mm implants in the remaining sites. After placing healing abutments in the implants, a soft reline was performed on the patient's temporary dentures so they could continue to serve as interim prostheses for the duration of healing and osseointegration. Four months after surgery, the patient returned to the office so impressions could be taken. Removal of the healing abutments revealed optimal tissue health surrounding the implant sites (Figs. 8a & b). Transfer posts were seated to capture the position of the implants (Fig. 9). Closed-tray impressions were taken of the upper and lower arches using Take 1[®] Advanced[™] vinyl polysiloxane material (Kerr Corp.; Orange, USA, Figs. 10a & b). At the same appointment, thermoformed suck-down impressions were made and a bite registration taken with the

Figs. 14a & b The lab digitally produced the custom abutments and verified the design on the soft-tissue models.

Fig. 15 A diagnostic wax-up was created to assist in the development of the full-arch reconstructions.

Fig. 16 The BioTemps prostheses were fabricated, and the interocclusal relationship was verified on the articulator prior to patient try-in.

Fig. 17 Acrylic positioning jigs were used to seat the custom abutments in the patient's mouth.



Figs. 18a & b_The BioTemps prostheses were tried in and fit the patient well.

Fig. 19_The interim BioTemps restorations were evaluated for proper occlusion, function and esthetics.

Fig. 20_Based on the final-approved BioTemps prostheses, the final PFM restorations were fabricated on the master casts.

Fig. 21_Final panoramic radiograph illustrates proper placement and orientation of the dental implants.

patient's immediate dentures in place, providing the lab with a template for the definitive design of the PFM restorations (Fig. 11).

The lab poured working casts from the VPS impressions of the patient's edentulous arches and produced wax occlusal rims (Fig. 12). After seating the wax rims in the patient's mouth and tightening the temporary cylinder screws, the jaw relationship records were taken (Fig. 13). Note that the patient's vertical dimension had virtually collapsed due to the extensive wear to his teeth. After measuring the distance between the patient's nose and chin during maximum intercuspation, the lab was instructed to open the patient's bite by 2 mm. Next, the lab used CAD software to design Inclusive® Titanium Custom Abutments (Glidewell Europe GmbH; Frankfurt/Main, Germany) for both arches based on the scanned working models. The CAD/CAM-produced custom abutments were seated on the working models so their fit could be verified and they could be used in the development of the definitive prostheses (Figs. 14a & b). Based on the jaw relationship records and the impressions of the patient's immediate dentures, the lab prepared a diagnostic wax-up to help determine the initial design for the PFM restorations (Fig. 15). After finalising the initial design, BioTemps prostheses were fabricated from polymethyl methacrylate (PMMA) material, which is versatile enough to easily accommodate adjustments at the try-in appointment, yet durable enough for provisionalisation (Fig. 16). The working models were sent out along with the custom abutments and BioTemps interim restorations for patient evaluation. At the next

appointment, the titanium custom abutments were transferred to the patient's mouth using the acrylic delivery jigs provided by the lab (Fig. 17). The custom abutments achieved a precise fit and were thus tightened to the appropriate torque, establishing ideal soft-tissue margins and support. Complete seating was verified radiographically, and the screw access holes were covered.

Next, the BioTemps prostheses were tried in and exhibited an accurate fit (Figs. 18a & b). The provisional restorations were attached to the abutments using temporary cement, and the phonetics, aesthetics, bite and function were evaluated (Fig. 19). Minor modifications were made to the BioTemps prostheses, and the patient wore the BioTemps provisionals for an interim of four weeks. This trial period was essential in verifying that the patient was happy with the look, comfort and function of the prosthetic designs before the final PFM restorations were fabricated. After patient approval was provided, alginate impressions were made of the BioTemps prostheses. Models of the final-approved BioTemps restorations were fabricated from the impressions, and a new bite was taken so the definitive prosthetic designs could be adjusted accordingly. Crown & bridge impressions were taken of the final custom abutments in place and would be used by the lab to pour master models, upon which the final PFM prostheses would be produced. The gingival areas for the final PFMs were marked onto the models of the BioTemps restorations, and the case was returned to the lab along with instructions for final adjustments. The final PFM prostheses were fabricated by layering



Figs. 22a–22c Retracted frontal, occlusal maxillary and occlusal mandibular views exhibit the excellent esthetics achieved by the implants and fixed PFM prostheses, reconstructing the patient's dentition as well as the soft tissue.

Fig. 23 The patient was provided with a nightguard to protect his investment against the forces of bruxing.

porcelain over a cast metal framework. Pink porcelain was layered on to form the gingival areas according to the markings indicated on the models of the BioTemps restorations, thus replacing portions of the soft tissue as well as the teeth per Dr. Misch's FP3 (Fixed-Prosthesis-3) principles of prosthetic design.⁶ Because the final prostheses were designed using the models fabricated from the final crown and bridge impressions, a precise fit over the patient's custom abutments was ensured (Fig. 20).

At the final delivery appointment, the PFM restorations were delivered over the custom abutments without issue. A panoramic radiograph was taken to confirm complete seating (Fig. 21). The final prostheses achieved the exact fit, aesthetics and function that the patient had come to expect after six weeks of wearing the BioTemps provisionals, which ultimately served as the bases for the final restorations (Figs. 22a–c). The patient was ecstatic with the results, which reconstructed his teeth and gingiva, along with his confidence and quality of life. A nightguard was produced for the patient to mitigate the impact of his parafunctional habits (Fig. 23).

Conclusion

The predictability of implant treatment and the adaptability of restorative materials enable clinicians to provide patients in the most dire of dental circumstances a complete overhaul, reversing the damage that can result from many years of dental wear and neglect. This goes beyond the restoration of oral func-

tion by preserving the facial aesthetics that are so fundamental to the emotional state and social life of the patient. Provided its life-changing capacity, the fixed full-arch implant restoration should be offered to all patients who present with untreatable dentition, without prejudging a patient's situation and the form of treatment that they will ultimately accept. As the precision, cost-effectiveness and prosthetic versatility of implant therapy expands ever further, so does the patient population that is able to receive high-quality treatment.

Editorial note: Reprinted by permission of ©2015 Glidewell Laboratories, Inclusive magazine. The dental lab work in this case was performed by Glidewell Laboratories. A complete list of references is available from the publisher.

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Digital precision for all indications

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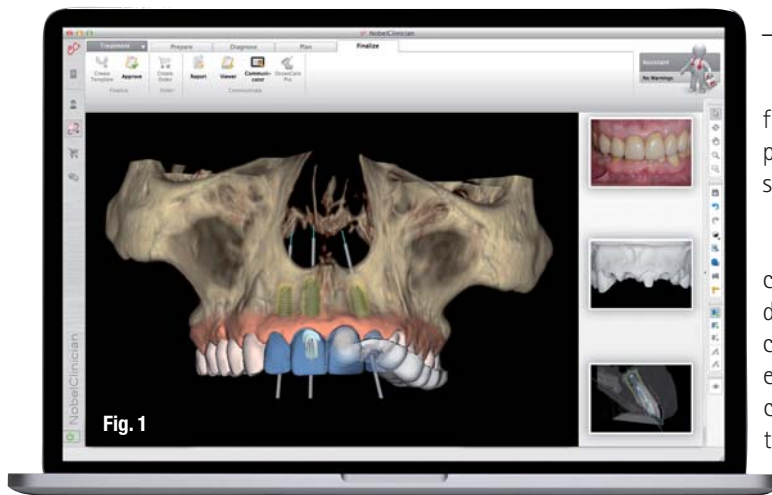


Fig. 1

Fig. 1 NobelClinician is a user-friendly software for diagnostics, treatment planning and patient communication. It uses state-of-the-art technologies to help dental professionals improve all aspects of dental implant treatment.

Fig. 2 The easy-to-use surgical templates help to ensure correct angulation, direction and depth from the very first drill. The custom-manufactured surgical templates help ensure accuracy by guiding the initial drill according to the digital treatment plan created in the user-friendly NobelClinician Software.

_Ten years since its launch the NobelGuide guided surgery concept has evolved from an ambitious idea to become a solution many clinicians find indispensable. NobelGuide is a complete treatment concept for diagnostics, treatment planning and guided implant surgery—from a single missing tooth to an edentulous jaw. It helps to diagnose, plan the treatment and place implants based on restorative needs and surgical requirements.

_Powerful diagnostics and treatment planning

Key to NobelGuide is the NobelClinician Software. It allows clinicians to plan dental implant treatment with precision and confidence by assessing detailed 3-D patientscans. Implant placement can be brought to life on screen and teeth can even be extracted virtually, meaning the surgeon can take into account important factors such as the availability of bone and prosthetic needs before actual tooth extraction. Precise measurements can be taken and the software even alerts the clinician when implants risk being placed too close to anatomical structures.

_Right from the start

NobelGuide offers a predictable solution—from start to finish. Clinicians can choose to complete the whole surgery fully guided, or to use a surgical template just for pilot drilling.

With the latter option the easy-to-use surgical templates help to ensure correct angulation, direction and depth from the very first drill. The custom-manufactured surgical templates help ensure accuracy by guiding the initial drill according to the digital treatment plan created in the user-friendly NobelClinician Software. The software provides safety margins and a warning system to help the clinician avoid critical anatomical structures, meaning implants can be placed in narrow spaces with greater confidence—even NobelActive 3.0. The clinician will then continue with freehand surgery once the initial drill has been used.

The range of surgical pilot drill templates has been extended to cover both partially edentulous and edentulous cases, allowing more patients to

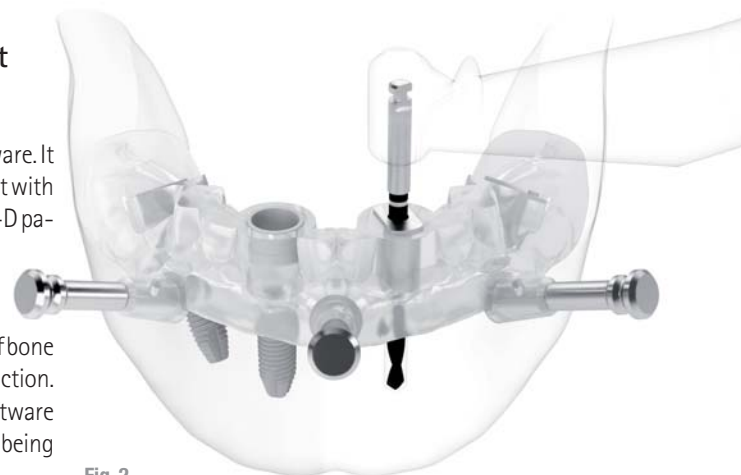
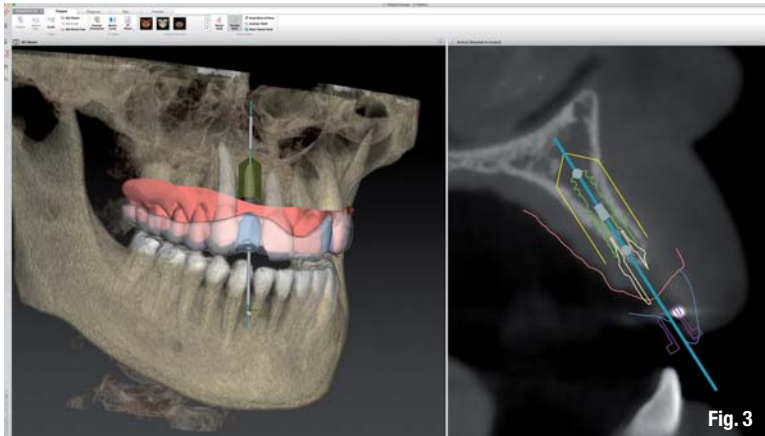


Fig. 2



benefit from this predictable treatment option that helps to provide an optimised aesthetic and functional outcome. This means the templates can now be used for the All-on-4® treatment concept, helping the clinician to overcome challenges such as bone resorption, avoid critical anatomical structures and place implants deeper when treating edentulous patients.

This is made possible by the sleeve-offset function. It supports bone reduction and the deep placement of implants such as NobelParallel Conical Connection which are increasingly placed subcrestally. It also allows for the initial treatment plan to remain unchanged.

A seamless workflow for every case

Every case is different. That is why NobelGuide offers a choice of treatment workflows—with and without the use of a radiographic guide.

Since partially edentulous patients do not need a radiographic guide, the clinician can save time with one less patient visit. They can also take advantage of the integrated treatment workflow. It connects Nobel Biocare's digital treatment planning software, 2G NobelProcera scanner, high-end production, guided implant surgery, Communicator iPad® app and OsseoCare Pro iPad®-operated drill unit to enable the treatment team to communicate, collaborate and perform with ease.

Once the clinician has marked the critical anatomical structures using the NobelClinician Software they collaborate with the lab technician to develop a precise model scan. The clinician can then confidently develop a treatment plan thanks to NobelClinician's SmartFusion technology, which provides the patient's (CB)CT data together with the intra-oral situation,

soft tissue information and diagnostic setup. At this point they can increase patient acceptance by using the Communicator iPad® app to explain the treatment plan to their patient. Finally, they have the freedom to choose between guided pilot drilling and fully guided implant insertion at any point during the workflow, using a custom-manufactured surgical template.

For edentulous patients the workflow includes the radiographic guide with a double-scan protocol. Once the clinician has made a clinical diagnosis, they fabricate and clinically validate the diagnostic tooth setup, transforming it into a radiographic guide—their prosthetic reference during treatment planning. After making a (CB)CT scan of the patient and the radiographic guide, they define the implant position, order a custom-manufactured surgical template and proceed with guided drilling and implant insertion.

A clinician's guide to success

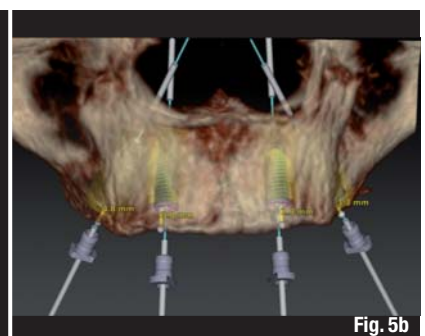
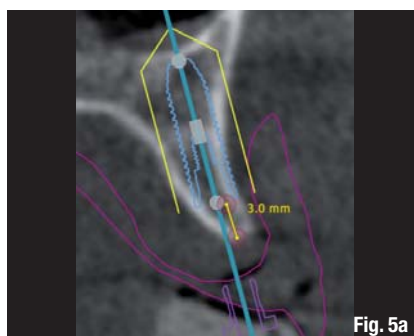
From the initial diagnosis to the first guided drill, from partially edentulous to edentulous workflows, NobelGuide supports the clinician from beginning to end. It is no wonder that ten years since its launch NobelGuide has gone from strength to strength, improving treatment predictability and providing peace of mind to an ever-increasing number of clinicians.

Find out more at nobelbiocare.com/nobelguide

Fig. 3 In narrow spaces the guided pilot drill helps to ensure precise implant placement, thanks to NobelClinician's safety margins and a warning system that helps the clinician avoid critical anatomical structures.

Fig. 4 The integrated treatment workflow connects NobelClinician, the NobelProcera 2G System, NobelGuide, the Communicator iPad app and OsseoCare Pro to provide the treatment team with a seamless process from diagnosis to restoration.

Fig. 5a & b The NobelClinician Software together with the guided pilot drill helps to avoid complications when treating edentulous patients. The clinician can make use of all available bone and if bone reduction is needed, they can use NobelClinician's sleeve-offset function.

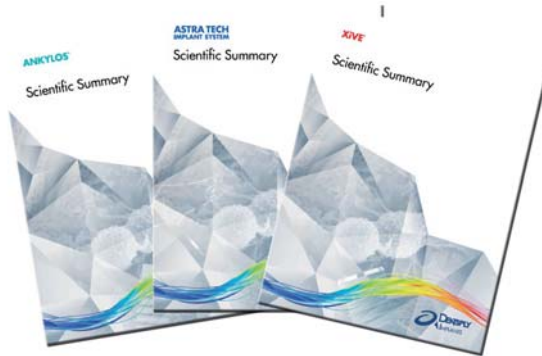


Manufacturer News

DENTSPLY Implants

Long-term documentation on all implant systems

Documented research is essential in the development of solutions and products. DENTSPLY Implants presents long-term clinical documentation on all three implant lines—ANKYLOS, ASTRA TECH Implant System and XIVE – in the portfolio. “I am very proud that we can present such solid long-term clinical results on all three implant systems, because it proves our commitment and dedication to science and clinical research,” says AnnaKarin Lundgren, Director Global Clinical Affairs at DENTSPLY Implants.



available, and for XIVE implant system, long-term results with up to 10 years of clinical follow-up are presented. To read more about the science behind DENTSPLY Implants’ products and solutions, please visit www.dentsplyimplants.com/science.

DENTSPLY IH GmbH

Steinzeugstr. 50
68229 Mannheim, Germany
Implants-de-info@dentsply.com

Long-term clinical documentation is one of the most important tools to show a product’s efficiency, reliability and safety. In the DENTSPLY Implants portfolio, the ANKYLOS implant system has been in clinical use for more than 25 years, showing excellent long-term results with up to 20 years of clinical follow-up. For ASTRA TECH Implant System, long-term clinical results up to 16 years are

MIS

Call for young clinicians clinical cases

MIS announces a clinical case/technique presentation opportunity for young clinicians (the main author should be up to 40 years of age), focusing on challenging situations in implantology. Top ranked cases will be presented on the first day of the conference. The third MIS Global Conference, 2016 MIS Global Conference: 360° IMPLANTOLOGY, will take place on May 26–29, 2016 in Barcelona, Spain. The conference has been carefully designed to expand knowledge and introduce real innovation under the title: "VCONCEPT: SET THE VOLUME OF BONE & SOFT TISSUE", and will include lectures, clinical case presentations and hands-on workshops. The main theme of the conference, the VCONCEPT, will be presented by experienced professionals who will provide a wide background on the current evidence-based therapeutic trends in implant dentistry, and will present the newest treatment modalities associated with MIS approach to MAKE IT SIMPLE, mainly with the V3 Implant System.

You are requested to submit a case documentation by February 15, 2016. Please e-mail michal@mis-implants.com. Please note that all cases must be in English.



Competition specifications and requirements

MIS GERMANY

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32423 Minden, Germany
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Bicon

30 years of clinical success and innovation

This year, Bicon Dental Implants celebrates 30 years of clinical success and innovation. Its implant design has offered dentists a time-proven solution for missing dentition by incorporating plateaus, sloping shoulders, and a bacterially-sealed, 1.5° locking taper implant to abutment connection.



With the plateau design, cortical like bone forms around and between each plateau. This Haversian bone allows for the routine use of 5.0 mm short implants. The sloping shoulder provides the necessary room for bone to support interdental papillae that are gingivally aesthetic.

These same features have made restorative advancements possible by allowing clinicians to capitalise on the aesthetic benefits of the implant design. Bicon’s 360° of universal abutment positioning, for example, provides for the cementless and screwless Integrated Abutment Crown™, which consistently provides for a non-metallic aesthetic gingival margin. Most recently, Bicon has introduced TRINIA—the next generation CAD/CAM material for metal free substructures.

Bicon Dental Implants

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Boston, MA 02130, USA
www.bicon.com

ULTRADENT

Treatment units at their best

The innovative multimedia system vision U has been developed further. Here are the innovations of the Premium class in detail:

All the current Premium models again feature interesting innovations and more extensive equipment. These include, in particular, vision U, the 2015 version of which contains new functions and features, a completely new assistant's unit with a full touch-screen operating panel, new design elements and many equipment options that can be integrated. The new version of vision U can also display external equipment via the HD mode with the appropriate HDMI connection. The integration of vision U into the existing practice networks has been optimised even further so that treatment can now proceed without having to make any changes to the usual workflow for dentists and their assistants. The assistant can now enjoy a workstation that matches the same high quality as that of the dentist.

The design has also been refined to reflect requests made by dentists. The entire unit is now in a single



color, i.e. everything is white in the basic version, including the floor element, thus giving the entire treatment unit even greater clarity and elegance. Equip your workstation for every treatment concept to suite your individual requirements.

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CAMLOG

6th International CAMLOG Congress

The 6th International CAMLOG Congress takes place in the beautiful city of Krakow, Poland. The congress will be held under the motto "Tackling everyday challenges" and will incorporate practical aspects coupled with science for immediate implementation into the workplace.

The scientific committee is proud to present an exciting, interactive congress where you can meet experts for a personal Q&A in the Network lounge or actively participate in the discussions taking place on stage through our app and by using mobile devices. Kick-off is Thursday with practical workshops and the first edition of the Digital Dentistry Pre-Congress. Speakers from the dentistry and dental technology field will pres-



ent an interdisciplinary overview and interesting approaches to the complete digital workflow. Friday starts completely practice-oriented and with interactive team discussions. Proven teams present and discuss their concepts. Saturday morning is dedicated to the science and the awards ceremonies but ends with a grand finale — the battle. Speakers with opposite views will discuss controversial topics. Much time will be dedicated to discussions and all attendees have the chance to actively participate through our interactive congress app. For more information check out www.camlogcongress.com



Straumann

The new standard for tapered implants

Introduced in spring 2015, the Straumann® Bone Level Tapered Implant (abbreviation: "BLT") is a substantial addition to the Straumann® Implant Dental System portfolio. The Straumann® Bone Level Tapered Implant offers excellent primary stability in soft bone and fresh extraction sockets. The tapered form adequately compresses the underprepared osteotomy. It also lets you effectively master your patient's limited anatomy such as facial undercut, converging root tips, concave jaw structure or narrow atrophied ridges. Building on the clinically proven features of the successful Straumann® Bone Level Implant line, it introduces the powerful combination of Roxolid®, SLActive®, Bone Control Design™, CrossFit® connection, and prosthetic diversity in an apically tapered implant body.

The BLT has been given a very favorable response by the clinicians using it, as demonstrated in numerous feedbacks. Some excerpts: Dr. Sergio Piano, Italy: "Thanks to the BLT, I can now provide ideal conditions for immediate loading in most patients." Dr. Jean-Louis Zadikian, France: "The BLT is a revolutionary product like no other." Dr. Bruno Schmid, Switzerland: "With the BLT system I appreciate the precise instruments, the great retention even in defect situations and the very good primary stability."

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“Our members profit from a wealth of international experience”

45th Annual International Congress of the DGZI

Source_DGZI



_Not a round anniversary and yet a significant milestone: The 45th Annual International Congress organised at the beginning of October by the DGZI in Wiesbaden, Germany, marked the 45th year of Europe’s oldest implantological expert association. With 4,000 members in Germany and 12,000 members worldwide, the DGZI can boast success at home as well as abroad.

The comprehensive review highlighted in particular the association’s close cooperation with the dental technology sector, a fact the DGZI is particularly proud of. Those special ties were also reflected in this year’s congress theme entitled “Dental Technology and Implantology—Interface to Success” and culminated in the first-time awarding of the newly

established qualification “Dental Technology and Implantology”. This year’s award went to Mr Oliver Beckmann, a dental technician from Freudenberg, Germany.

At the press conference in Wiesbaden, Prof. Dr Herbert Deppe (TU München), DGZI President and head of board, recounted the society’s many and varied activities of the last decades. A key point of the presentation was the association’s constant focus on practical applications. “As a society strongly focusing on the profession’s practical aspects, the DGZI considers itself to be a representative of practicing implantologists and dentists working in the field of implantology and as such it offers customised, practice-orientated concepts”. The DGZI’s



Fig. 1



Fig. 2



Fig. 3

various training programmes have always reflected the newest scientific findings and these have been provided for the benefits of its members who include dental technicians as well as highly engaged dentists. Against this backdrop, Prof. Deppe is convinced: "Our members profit from the wealth of scientific experience our association is keen and able to provide as Europe's oldest association of dental implantology".

However, having reached the 45th anniversary does not mean the DGZI will stand still: it has completely revised its curriculum and has included since 2014 E-learning modules as well as theoretical and practical training programs. Due to those improvements the membership has doubled. The successfully completed curriculum can also serve as a foundation for a subsequent master study programme (MSc). The DGZI's education programme offers information about all the activities available regarding dental and, in particular, implantological training opportunities. The programme is yearly updated in print and online and also available in the English language. Recognised by the consensus conference, the qualification "Implantology" is awarded by the DGZI after certain requirements have been fulfilled and the curriculum completed. Additionally, as Prof. Deppe pointed out, the DGZI also pays great attention to the importance of individual support and advice and offers special rates for students, young professionals and assistants.

Furthermore, the society's strengths include the publication of its specialised journals. Since its complete relaunch earlier in 2015, "Implantology Journal" is the most circulated specialist implantology

journal in the German-speaking market. With ten editions a year and a circulation of 15,000 copies, it also includes CME articles and webinars. In addition, the international magazine "implants" is published four times a year and presents practice-related articles in the English language.

As scientific head and Vice President of the DGZI, Prof. (CAI) Dr Roland Hille introduced the particularities of this year's congress. Dentists from more than ten different nations and three continents visited the Wiesbaden venue, most of them from partner societies in Japan, Georgia and Egypt. More than 30 speeches, 40 speakers and seven workshops comprised the programme of the two congress days. Forty companies presented their products at the dental exhibition. The focal point of this year's event, the close cooperation between implantologists and dental technicians, was illustrated by

Fig. 1 Jens Dexheimer (2nd from left), CEO of Silver Sponsor Straumann.

Fig. 2 Gold Sponsor OT medical: Sales manager Claudia Lindemann (2nd from left) with Speaker Dr Daniel Ferrari, MSc (right).

Fig. 3 Participants enjoyed scientific discussions on recent developments in implantology.

Fig. 4 International participants of the congress, among them Dr Mazen Tamimi (DGZI representative Jordan and Middle East), Prof. Nabil Barakat and Prof. Dr Amr Abdel Azim.



Fig. 4



Fig. 5

Fig. 5 DGZI executive board: Rabi Omari, Dr Marcus Quitzke, Dr Umut Baysal, Prof. (CAI) Dr Roland Hille, Dr Arzu Tuna, Prof. Dr Herbert Deppe, Dr Navid Salehi, Dr Rolf Vollmer, Dr Rainer Valentin, Dr Georg Bach (from left to right).

Fig. 6 Interpreters ensured communication between all attendees and speakers.

Fig. 7 Check-in of the 45th Annual International Congress.

many joint interdisciplinary speeches. "The symbiosis between dental diagnostics and therapy on the one hand and the creativity of dental technicians on the other, combined with enhanced techniques, creates success stories with regard to dental prostheses", states Prof. Hille, "In a nutshell, science fiction meets reality, and both of them have already entered the realm of our dental practices. Virtual digital technologies had only been an option in the past but have now become a fixed aspect of dental treatments in the present." Accordingly, the traditional discussion panel CONTROVERSIAL DGZI invited dentists and dental technicians to present

their respective rehabilitation approaches and problem-solving techniques under the headline "The edentulous upper jaw—How can the best possible solution be achieved".

As the new DGZI qualification "Dental Technology and Implantology" was awarded for the first time this year, Prof. Hille emphasised that dental technicians have played "a major role in the success story of implantology in Germany" while, more than ever before, they have to demonstrate and highlight their skills, qualifications and areas of expertise as competition grows. In cooperation with the training centre FUNDAMENTAL, DGZI fulfils this demand with its new quality label. Prof. Hille is convinced that graduates will excel at work due in their new, future-oriented qualifications. In order to achieve this qualification, graduates have to have gained a minimum of three years of experience in the field of implant prosthetics, including at least 150 prosthetic restorations of implants or 70 implant cases. Furthermore, an additional twelve cases differing in their respective indication must be accounted for. Curricula in implant prosthetics of all German dental societies are acknowledged. Moreover, Prof. Hille announced the new DGZI "Implant Dentistry Award" 2016, which carries a 10,000 Euro endowment.

As if taking the audience on a short road trip around the world, DGZI Vice President Prof. (CAI) Dr Rolf Vollmer expounded upon the society's various international relations and activities. In his position as visiting professor of the Cairo University (2008), he has built many international ties and relationships over the years and has also formed a concise European network with countries such as Croatia, Ireland or Georgia. Among the DGZI's most renowned partners are the US-based Academy of Osseointegration and the American Academy of Implant Dentistry. Moreover, DGZI has held speeches, congresses and workshops in Mexico and Japan, as well as the Middle East with countries such as Jordan, Syria, Egypt, Lebanon, Saudi-Arabia, Kuwait, Pakistan and Australia.



Fig. 6



Fig. 7

Membership Application Form

IM 4/15

I hereby to apply for membership of the DGZI – German Association of Dental Implantology (Deutschen Gesellschaft für Zahnärztliche Implantologie e.V.).
Please send this form via FAX to +49 211 16970-66.

Do you have experience in implantology? (mandatory)

Yes No

I hereby agree to have my personal data processed for all purposes of the DGZI.

Full membership (outside Germany) Assistant doctors (outside Germany) Students/auxiliaries (outside Germany)
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I have transferred the annual fee to the DGZI bank account c/o Dr Rolf Vollmer:
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Signature	Place, Date

Please complete this application form in block letters.

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50 Years of clinical osseointegration

Author Georg Isbaner

More than 2,500 participants attended the 24th EAO Annual Congress at Stockholm, Sweden, and were given an update on the state-of-the-art of clinical osseointegration by a wide range of symposia, workshops and poster presentations. This year's congress focused on the work of late Prof. Per-Ingvar Brånemark as well as other pioneers of dental implantology. The Swedish doctor and scientist was renowned for paving the way of modern implantology with his ground-breaking discovery of the integration of artificial materials such as titanium in human bone tissue.

50 years of experience with osseointegrated implants", states Prof. Björn Klinge, scientific leader of the congress committee. EAO has always been aiming at processing and communicating scientific data for practice-oriented implant therapy. That is why its organisers have asked more than 50 experts from Sweden and abroad to present their works and discuss the latest scientific findings and clinical concepts in implantology. In addition, new procedures and techniques were introduced at various parallel symposia, which were supported by the leading dental companies. The most up-to-date products, including new implants and solutions for an improved implant treatment, also formed a major focal point of the event. All in all, almost 100 dental companies took part in the Stockholm congress.

Fig. 1 More than 2,500 participants took part in this year's EAO Congress in Stockholm.

Fig. 2 Prof. emeritus Thomas Albrektsson, Sweden, gave a speech on the scientific works of Prof. Per-Ingvar Brånemark.

For this reason, a special session on the first congress day was dedicated to the topic "50 Years of Clinical Osseointegration". "Our daily working routine is based on





Fig. 3

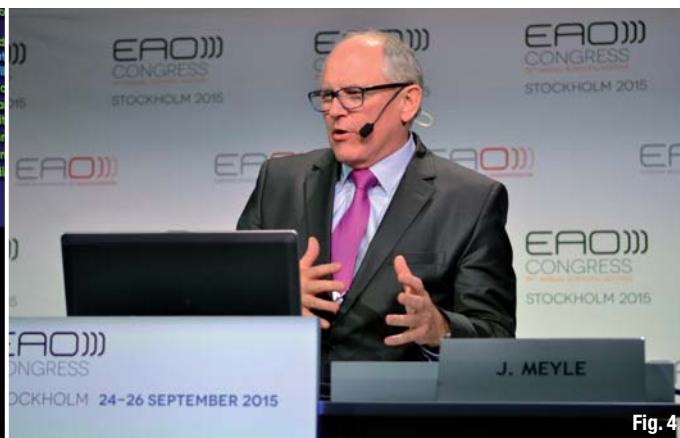


Fig. 4

Pioneers of modern implantology

None other than Prof. emeritus Tomas Albrektsson, long-time partner of Per-Ingvar Brånemark, talked about the Swedish implant pioneer's achievements. Already in 1969, Brånemark introduced his first publication on oral implantology.

However, his discovery of the osseous integration of titanium implants was dismissed to be a mere myth. Only as special cutting techniques were developed, Brånemark's osseointegration was proved irrefutably. Just like all other major scientific achievements, oral implantology was established by leading researchers independently from and unknowingly from another.

In this regard, Prof. Daniel Buser explained the Schroeder Concept, which was named after Prof. André Schroeder from Switzerland. Schroeder did intensive research on implant materials in the late 1960s and developed hollow cylinder implants as well as solid screws with a plasma-coated titanium surface (TPS) in close cooperation with Dr. Fritz Straumann. Schroeder and his colleagues were the first research team to present implants which were fully anchored in non-decalcified bone sections. Among others, his work led to the foundation of the International Team for Implantology (ITI) in 1980.

The third pioneer in implantology was acknowledged by Prof. Jörg Meyle: The German implantologist Prof. Willi Schulte established the Schulte Concept, which describes the immediate implantation of ceramic, polycrystalline aluminium oxide stepped-cylinder implants (Tübingen Implant). He was able to prove that immediate implantation to the extraction socket can be a successful and durable implant therapy.

EAO education programme for students

In addition to its activities regarding the annual congress, the EAO announced the launch of its prestigious

and highly anticipated EAO Education Programme during its 24th annual meeting. The programme launches in spring 2016 and offers students the chance to participate in live learning events taught by world-class implantology experts at some of Europe's most renowned universities*, along with a unique online learning platform (the EAO Classroom).

The EAO has a long-standing commitment to dental education. Its aim is 'to improve the quality of patient care by bridging the gap between science and clinical practice'. In 2010, the EAO launched its Certificate in Implant-based Therapy, which was the first and only Europe-wide standardised assessment of skills and expertise within implant-based therapy. The new Education Programme will complement the Certification Programme and provide an additional service to EAO members and the wider dental community.

The programme consists of six modules at three levels (straightforward, advanced and complex). Each module includes a three-day on-site training element, which combines hands-on sessions, lectures, practical exercises and live surgery. The breadth of training modules is much wider than what is offered by existing courses, and will enable candidates to gain the range of knowledge required to practice at the highest level of implant dentistry.

Attendees at the EAO congress in Stockholm: Interviews with the organiser of the Education Programme are available. Please contact oliver@publishingbureau.co.uk or alex.shedlock@publishingbureau.co.uk to organise an interview.

**The six centres where live learning events will take place are: University Hospital, Malmö, Faculty of Odontology; University Medical Center of Groningen, Dept. Oral Maxillofacial Surgery; University of Zurich, Clinic for Fixed and Removable Prosthodontics and the Unit for Oral Implantology; University Hospital Düsseldorf, Dept. Oral Surgery; Complutense University of Madrid, Department of Stomatology III; Lisbon University, School of Dental Medicine.*

Fig. 3 Prof. Dr Daniel Buser from Switzerland was among the Congress' speakers and honoured the scientific achievements of Swiss Prof. André Schroeder.

Fig. 4 Prof. Jörg Meyle, Germany, spoke about the German implantologist Prof. Willi Schulte.

Synthetic molecule prevents

Dangerous biofilms from forming



[PICTURE: ©FUJISEBULB]

Escherichia coli plays an important role in the digestive system and is present in every human. However, some variants of *E. coli* can become pathogenic when grouped together and form dangerous biofilms. As part of her doctoral thesis at the Faculty of Dentistry, Ingun Lund Witsø tested the impact of two synthetic molecules, Furanone F202 and Thiophenone TF101, on *E. coli*. Both were created at the Department of Chemistry at UiO. Her goal was to reduce the harmful potential of *E. coli*, mainly by disrupting the bacteria's way of communicating.

She found that Thiophenone molecules were able to disrupt communication between the bacteria, preventing them attaching to the cells of the intestine and forming a biofilm. Consequently, substances such as Thiophenone could be advantageous in the battle against antibiotic resistance, she concluded.

Although her research on *E. coli*'s communication patterns is still at a basic stage, Witsø believes that the results are promising for a multitude of future applications and may result in new methods for combating antibiotic resistance. For example, artificial molecules with the properties of Thiophenone could be added to mouthwash to help loosen dental plaque more efficiently, or the substance could be incorporated into certain prostheses to reduce and prevent the formation of biofilm, Witsø said.

Blueberry extract: A promising agent for

New periodontal therapy

In a laboratory test series, researchers at Université Laval in Quebec tested the effectiveness of *Vaccinium angustifolium Ait.*, an extract from the wild lowbush blueberry, against *Fusobacterium nucleatum*, one of the main species of bacteria associated with periodontitis.

They found that the polyphenol-rich extract successfully inhibited the growth of *F. nucleatum*, as well as its ability to form biofilms. This property may

result from the ability of blueberry polyphenols to chelate iron, the researchers said. In addition, the extract blocked a molecular pathway involved in inflammation.

"This dual antibacterial and anti-inflammatory action of lowbush blueberry polyphenols suggests that they may be promising candidates for novel therapeutic agents," the researchers concluded. They further stated that they are developing an oral device that could slowly release the extract after tooth scaling to help treat periodontitis.

The study, titled "Wild Blueberry (*Vaccinium angustifolium Ait.*) Polyphenols Target *Fusobacterium nucleatum* and the Host Inflammatory Response: Potential Innovative Molecules for Treating Periodontal Diseases," was published online on Sept. 4 in the *Journal of Agricultural and Food Chemistry*.



[PICTURE: ©MAKS NARODENKO]

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Computers Help Dental Implants Look Natural



An article in the current issue of the *Journal of Oral Implantology* describes a simple method to recreate what is known as the mouth's "emergence profile" with implants. It presents step-by-step procedures that the authors used successfully in the clinic and laboratory for 50 implants.

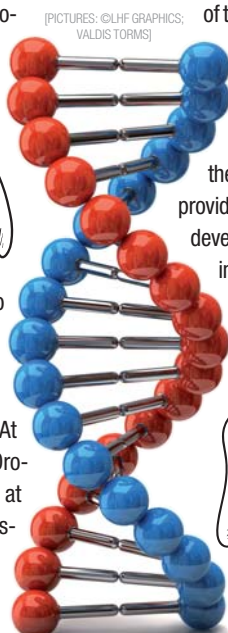
The current study looks at 50 cases of implants with custom abutments made of titanium and zirconia, two

commonly used materials. Abutments connect the replacement tooth to the body of the implant. Customising their design allows surgeons to create a more natural tooth-emergence profile for each patient.

The simple computerised technique provided a precise fit, and it was less expensive and had better accuracy than conventional techniques. To replicate their success, they noted that the process should be well planned before surgery and the implants should be placed accurately. In addition, the surgeon needs to be careful when working with the soft tissue in the patient's mouth and insert temporary crowns properly. All implants were in place and had healed well one year later, with no signs of irritation or inflammation. All patients were satisfied with how the implants looked. Full text of the article "Esthetic Considerations for Reconstructing Implant Emergence Profile Using Titanium and Zirconia Custom Implant Abutments: Fifty Case Series Report," is available in the October issue of the *Journal of Oral Implantology*.

UMC Utrecht discovers genetic cause of Disturbed dental development

Researchers at University Medical Center (UMC) Utrecht have identified a gene that may cause oligodontia, the agenesis of six or more teeth. The discovery of the so-called LRP6 gene makes it possible to diagnose patients more effectively, provide them with better information and develop customised treatment. Oligodontia is a rare but serious congenital anomaly defined by the absence of six or more permanent teeth. Children usually develop milk teeth at a young age, but when their permanent teeth start to erupt, it becomes clear that something is wrong. In several places, no adult teeth come in. In Europe, this condition affects 14 out of every 10,000 people. At the Center of Excellence in Congenital Orofacial and Dental Anomalies, housed at UMC Utrecht, dentists, oral surgeons, plastic surgeons and orthodontists collaborate in a multidisciplinary setting with clinical geneticists of the Department of



Medical Genetics. During a single visit, dental problems are assessed, the patient—and/or parents—are given an explanation of DNA research and are presented with the offer to use it. Based on the findings of the dentist and clinical geneticist, specific genetic research is possible. Van den Boogaard adds, "Most patients want to know the cause. Why does it develop? Will my children get it as well? And what is the risk of this happening? This new research provides better insight into the biology of tooth development. The LRP6 gene is now included in the DNA diagnostics of oligodontia, enabling us to give patients a better diagnosis, and to provide better information and to develop customized treatment."

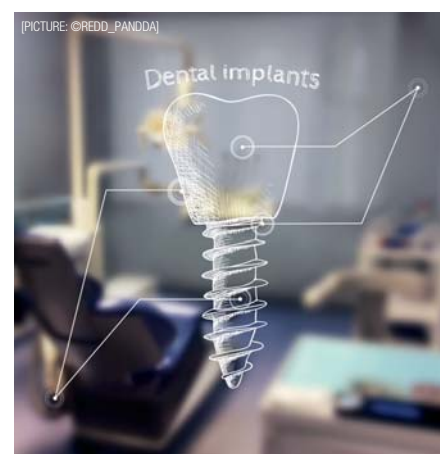


Reference: Massink MPG, Créton MA, Spanevello F, et al. Loss-of-Function Mutations in the WNT co-receptor LRP6 Cause Autosomal-Dominant Oligodontia, *The American Journal of Human Genetics*, in press 2015.

Study suggests many dental Implants may be prone to fracture

An examination of 100 biologically failed dental implants has found that more than 60 per cent of these implants showed signs of mechanical flaws, such as crack-like defects and full cracks.

In publicising these results, the researchers aim to encourage dental implant manufacturers and den-



tists to find ways to reduce the structural damage that occurs when a metal is subject to repeated applied loads.

In the study, the researchers examined 100 discarded dental implants, which had been extracted owing to peri-implantitis, made of a titanium alloy and commercially pure titanium using energy dispersive X-ray analysis and scanning electron microscopy.

They found mechanical defects in 62 per cent of the specimens. In addition, the inspection showed that the pure titanium implants had more cracks than did the titanium alloy implants. It was also found that the width and length of the different implants in this study were not correlated with the observed defects.

Shemtov-Yona is now aiming to conduct further studies to investigate the reasons for the development of cracks to determine whether the causes lie in manufacturing, use or both. The study, titled "On the mechanical integrity of retrieved dental implants", was published in the September issue *Journal of the Mechanical Behavior of Biomedical Materials*.

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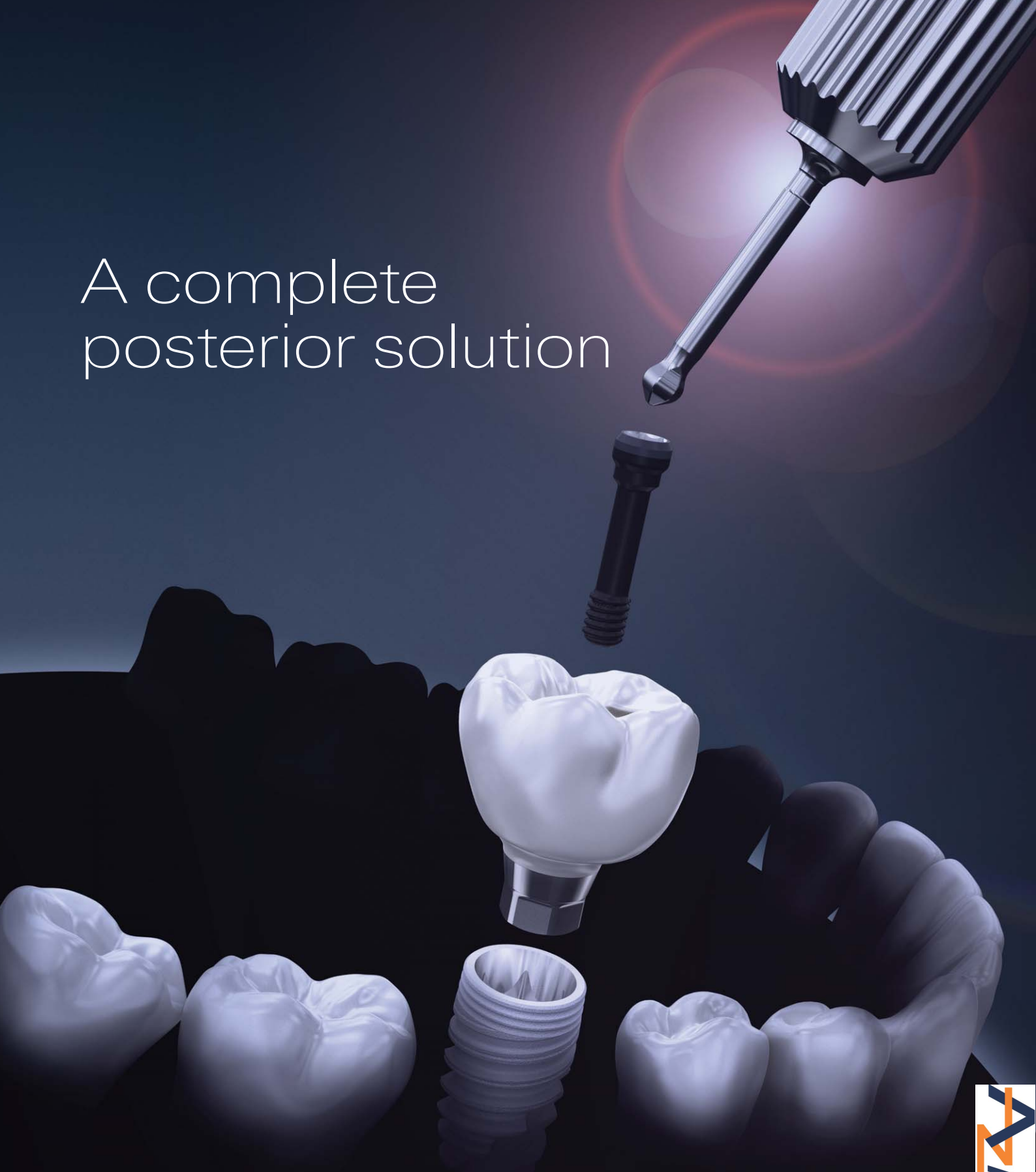
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