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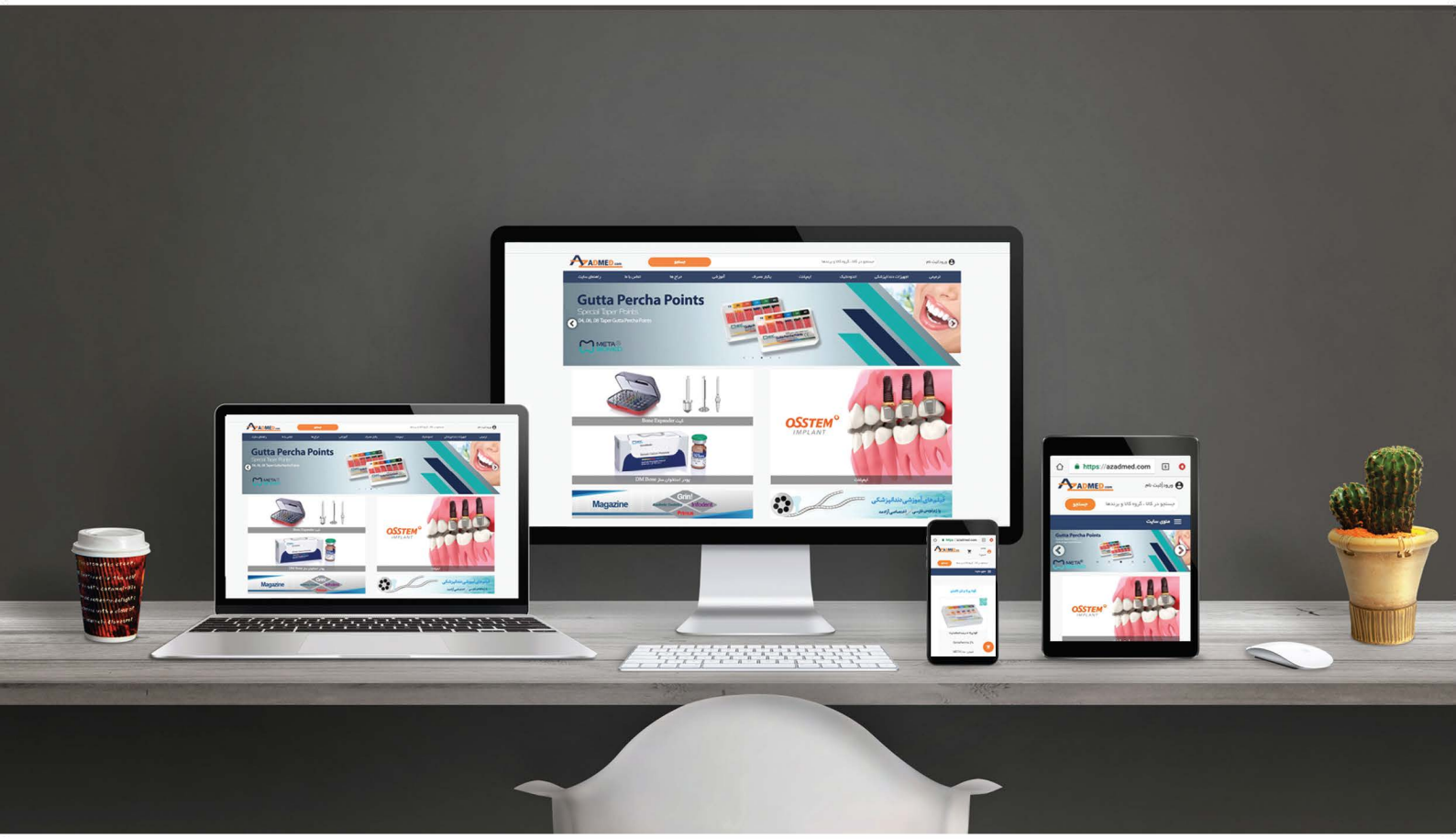

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Exploring new grounds

Dear colleagues,

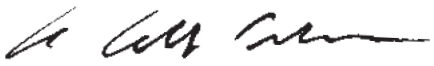
for more than 46 years, further education has been a topic dear to the hearts of DGZI's editorial board. Already since its foundation in 1970, DGZI has contributed considerably to the education of our colleagues, especially by founding the DGZI study groups in 1990. These are small learning groups in which new techniques and case presentations are practiced.

Three years ago, our Young-Generation study group was founded, bringing a breath of fresh air to our learning groups. Starting in Cologne, Germany, and featuring another branch in Hamburg under the leadership of Dr Navid Salehi, who has since become a member of our extended board, the study groups have enriched the DGZI's field of activities. The heads of our study groups, Dr Umut Baysal and Dr Navid Salehi, have been supported by Dr Markus Quitzke in 2015. Their next step will be the foundation of another study group in Germany's capital Berlin, which is going to be led by Rabi Omari.

The foundation of the Berlin study group on 19 March 2016 at the Westin Grand Berlin Hotel surely is a highlight in 2016. Around 100 colleagues attended the founding assembly, illustrating the growing interest of our young colleagues in peer learning. Participants of this event received four further education points and the corresponding certificate.

Wishing you a both exciting and enlightening reading experience of this issue of implants: international magazine of oral implantology!_

Warm regards,



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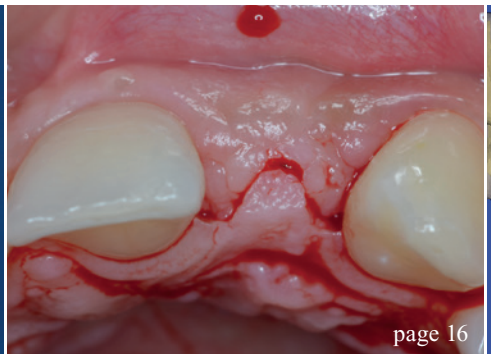
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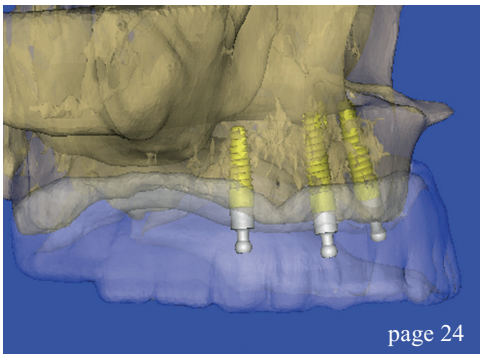
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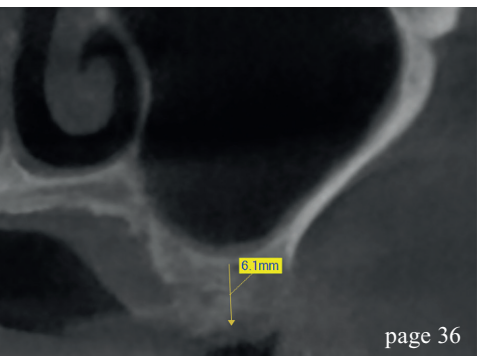

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Basic evaluation of an antimicrobial gel for peri-implantitis treatment

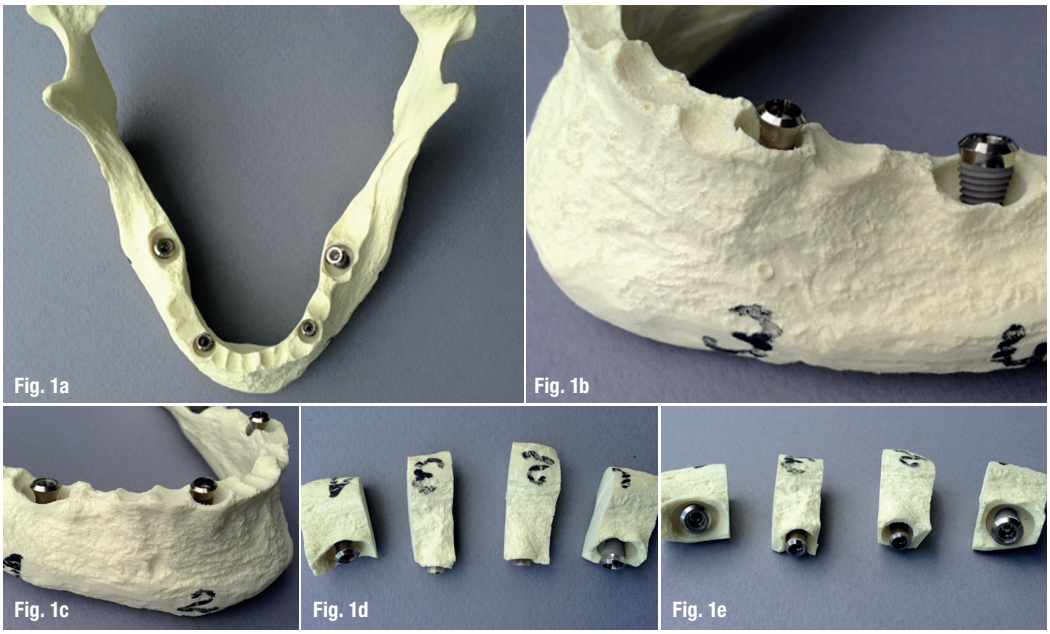
Authors: Dr Georg Bach & Christian Müller, Germany

Introduction

Early complications, which have been regarded as the major dread in the initial phase of oral implantology, have become a rare phenomenon for a fairly long time. Reasons for this positive development can be found in significant improvements of the implant surfaces, improved insertion techniques as well as in new ways to improve the prospective implant site.

Nevertheless, with the enormously increased number of inserted implants, a significant increase of late complications has meanwhile been recorded.[1,4,12] These complications typically manifest themselves many years after installation of the superstructure by means of peri-implant bone loss around artificial tooth pillars.[17,20,21,25] Often associated with an insufficient or declining oral hygiene of the patient, these peri-implant lesions lead to the loss of the artificial tooth pillar and the corresponding suprastructure in case they are not treated.[5,11,13,14] Many authors regard the development of peri-implantitis therapies as one of the current key challenges of implantology.[15,18-20,26]

Cleaning and disinfection of the exposed implant areas represents an undeniable requirement. For the latter step the term "decontamination" has been generally established.[3,16] For decontamination, various methods are indicated for their suitability.[3,6,8,16,21-24] The aim of this study was to evaluate the suitability of using an antimicrobial gel for peri-implantitis treatment in an *in-vitro* experiment.



Figs. 1a–e: Peri-implant defect—Simulated model: Crater-shaped defects were prepared in plastic jaws typically used for insertion exercises. Brand-new implants were placed in the middle of these defects in a way that at least three threads were exposed **(a–c)**. The jaws were divided into smaller units **(d & e)** and autoclaved before conducting phase II examinations (bacterial cultivation —Perisolv application—Microbiological diagnostics etc.) in order to allow better fit into the furnace as well as in vials containing culture medium.

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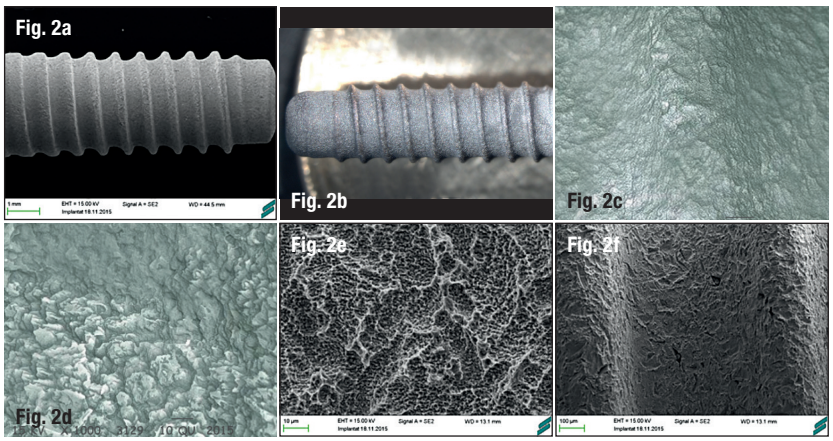

Figs. 2a–f: SEM analysis: Brand-new, sterile implants were inoculated and incubated with a microbial suspension. **Figure 2a** shows a scanning electron micrograph of this starting material. **Figure 2b** shows the bacterial turf on an implant thus processed. After Perisolv application, many areas showed a detached bacterial coating, the implant surface is virtually free from bacterial turf **(c & d)**. These "exposed spots" feature an unchanged implant structure **(e & f)**, therefore Perisolv application does not alter the implant surface per se.

Material and Methods

Two test phases were performed:

a) Phase I: Decontamination procedure of brand-new sterile implants, which have been inoculated with bacteria and subsequently coated with antimicrobial gel.

b) Phase II: Decontamination procedure of brand-new sterile implants placed in a plastic jaw with simulated bone defects after subsequent inoculation with bacteria and final exposure to antimicrobial gel.

Phase I: Decontamination procedure to implants inoculated with bacteria

To evaluate general suitability of the decontamination process, brand-new ITI implants (Institut Straumann AG, Basel, Switzerland) were microbiologically processed and analysed at the Institute for Medical Diagnostics Bioscientia (Freiburg, Germany).

Implant contamination—microbial procedure:

The implants were exposed and inoculated with a bacterial suspension (overnight cultures of *MRSA ATCC 33591*):

By means of sterile forceps, the implants were placed in 10 ml peptone yeast extract broth each. The tubes were incubated for 48 h at 36 °C and 5–10 % CO_2. After 48 h of incubation, the liquid was removed by means of vacuum filtration and the implant was transferred back to the initial container with sterile forceps for immediate further processing. Exclusively, implants with a medium bacterial growth were used for further examinations, implants with low or very low bacterial growth were excluded. Two test series were conducted with four implants each.

Decontamination procedure with contaminated whole implant bodies:

After completion of the microbiological work, three out of four implants were confronted with antimicrobial gel for two min in the sense of a decontamination procedure and immediately transferred to the Institute for microbiological analysis. One implant served as positive control, without conduction of the decontamination procedure.

- Antimicrobial Gel: An antimicrobial gel known for its application in periodontology was used (PERISOLV, REGEDENT AG, Zurich, Switzerland). It is typically used for adjuvant cleaning and decontamination of the outer tooth root area and the surrounding tissue.[10] Furthermore, in the literature the gel is described to feature a softening effect towards degenerative tissue before debridement of periodontal pockets.[9] According to the manufacturer, the gel does not affect healthy tissue[9] and, however, features an antimicrobial effect.[2,7]
- Gel composition: The gel contains amino acids (glutamic acid, leucine and lysine), carboxymethyl cellulose, titanium dioxide as well as ultra pure water and features a pH value below 10. The transparent liquid represents a 0.95 % sodium hypochlorite solution and is admixed immediately before the application. After mixing hypochlorite and amino acids, so-called Chloramines (NCA), a short-lived active substance class, are formed. These substances are part of the body's own immune system.[9]
- Gel Preparation: The set (gel and liquid) is stored in the refrigerator. One hour prior to planned application, the set is removed from the refrigerator to allow the contents of the kit to warm up to room temperature. Both components (gel and liquid) are arranged in separate syringes and are connected by means of screwing (Luer-lock connection). Both components were thoroughly mixed by moving the stamps back and forth 10–15 times. The activated and operational gel was finally left in the transparent syringe. A non-invasive/blunt application tip is attached and the implants are coated with the gel.

Table 1: Results of Phase I.

	Bacterial growth on implant	Implant 1	Implant 2	Implant 3	Implant 4 control
A:	MRSA	–	–	–	+ + +
B:	MRSA	–	+	–	+ + +

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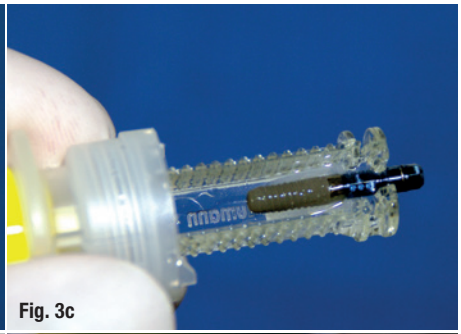

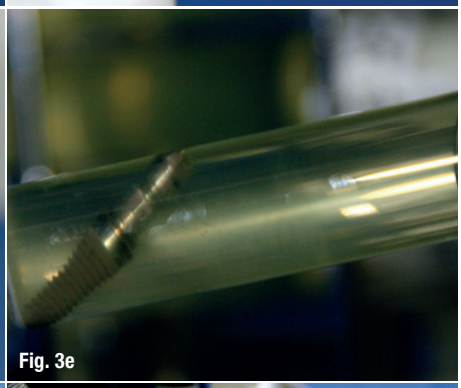

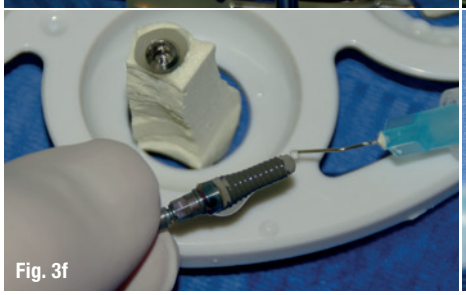

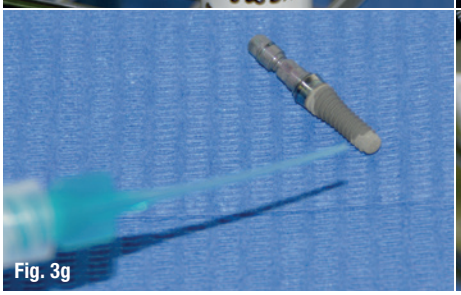

Figs. 3a–h: Phase I: Brand-new, sterile implants were used for the study. Implants supposed for SEM evaluation were initially kept in their original containers. The MRSA bacterial suspension was drawn in a sterile, disposable syringe **(a)** and applied directly on the respective implant in its original container **(b & c)**. Subsequently, the shipment for immediate SEM analysis was carried out. Implants supposed for microbiological testing were removed from their containers and placed directly into the MRSA bacterial suspension **(d & e)**. After a one-minute inoculation period, the implants were removed and coated with Perisolv gel **(f & g)**. After the exposure time specified by the manufacturer, the implants were introduced into the tube containing the nutrient medium and sent to the microbiological examination **(h)**.

Implant preparation for microbial investigations

Immediately after application of the gel, the implants were introduced into tubes with a sterile nutrient solution and sent to the Institute for microbiological analysis. The samples were processed in the Microbiological Institute by means of conventional (plate) cultivation.

Scanning electron microscopic studies of the implants

Some of the implants were investigated by scanning electron microscopy (Institut Straumann AG).

Results of Phase I—Decontamination procedure with contaminated whole implant bodies (Tab. 1)

Scanning electron microscopic studies

In some areas, where Perisolv had been applied, the "bacterial turf" on the implants was interrupted or rather dissolved/removed. Underlying areas, freed from bacterial turf, displayed an intact, unaltered implant structure. For implants only confronted with Perisolv without previous inoculation, no gel-induced change of the implant surface were observed.

In summary, SEM analysis after treatment with the gel revealed no change of implant surface as and a partial dissolution of the inoculated bacterial layer.

Microbiology

Phase I investigations revealed bacterial inactivation in the highest degree, remaining MRSA bacteria were detected in one test item of series B1 only.

Summary of Phase I—Decontamination procedure with contaminated whole implant bodies

The investigated gel is capable to induce a pronounced destruction of pathological bacteria present on implant surfaces without altering this implant surface structure.

Phase II: Testing the effect of the antimicrobial gel on contaminated implants placed in a plastic jaw with a simulated peri-implant tissue defect

After the first test phase to evaluate the principle suitability of the gel application, a second test phase was conducted.

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Table 2: Results of Phase II.

	Bacterial DNA in simulated bone defect	Unit 1	Unit 2	Unit 3	Unit 4 Control
A:	MRSA	++	+	++	+++
B:	MRSA	–	++	+	+++

Preparation of simulated peri-implant defects

Implants (Institut Straumann AG) were placed in a plastic jaw, which was prepared with standardised crater-shaped (peri-implant) defects prior to implant placement. The implants were placed in the centre of these defects by means of allowing the upper three threads not to be sunk into the plastic. Thus, a defect situation simulating a typical manifested peri-implantitis was generated. For better further processing, the jaws were sawed into small implant/plastic jaw units. These implant/plastic jaw units were steam sterilised (autoclaved).

Implant contamination

Afterwards, the exposed implant surfaces were contaminated with a bacterial suspension. The circumferential defects were completely filled with the bacterial suspension as well. Two test series were conducted with four implant/plastic jaw units each.

Microbiological procedure:

The bacterial suspension (*MRSA ATCC 33591*–ATCP strain) was prepared and suspended in BHI broth. The bacterial count of this "stock suspension" represented approx. 10^8–10^9 bacteria/mL. To inoculate the implant/plastic jaw units, each 100 µl of the cultured MRSA stock suspension were pipetted into one simulated bone defect. This corresponds to approx. 10^7–10^8 bacteria/100 µl respectively.

Decontamination procedure with simulated peri-implant defects

Perisolv gel was administered into three of four simulated bone defects (details s. Chapter "Phase I"). The gel was allowed to operate for two minutes. One implant/plastic jaw unit served as a positive control, where no decontamination was performed.

Implant preparation for microbial investigations

The units were subsequently placed into 10 mL of BHI broth (Brain Heart Infusion Glucose), each by means of a sterile forceps. The implant/plastic jaw units were placed in a culture oven. To establish a humid environment, a small Erlenmeyer flask filled with sterile distilled water was added into the pot. The units were incubated under aerobic conditions at 36 °C.

After two days of incubation, the simulated bone defect of unit 1 was dry, whereas bone defects of units 2–6 were still slightly humid. The remaining liquid from these units was removed by means of a pipet.

The implant/plastic jaw units were introduced in tubes with a sterile nutrient solution and forwarded to the Institute Bioscentia for microbiological analysis. The samples were processed by means of conventional (plate) cultivation.

Results of Phase II (table 2)

Remaining MRSA bacteria were detected in five of six decontaminated implant/plastic jaw units as well as in the control unit. This finding can be categorised as "significant" in three out of five units and as "distinct" in the other two out of five units. In addition, a bacillus species was detected in one unit. This can be regarded as an environmental contaminant.

Figs. 4a–i: Phase II: Brand-new, sterile implants were placed in simulated bone defects in a plastic jaw. These implant/plastic jaw units were autoclaved. Afterwards, a MRSA solution was introduced into the simulated peri-implantitis defects **(a–c)**. Afterwards, the units were incubated in a special oven and a proof for the presence of "massive" MRSA bacteria was performed. At this time, the Perisolv gel was applied **(d–f)**. After the exposure time specified by the manufacturer, the samples were placed directly into a BHI broth **(g & h)** and the samples were passed for further microbiological examination **(i)**.

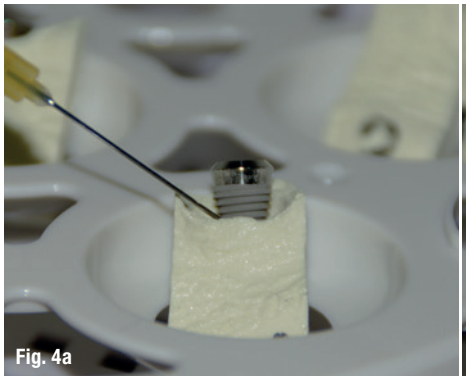
Fig. 4a

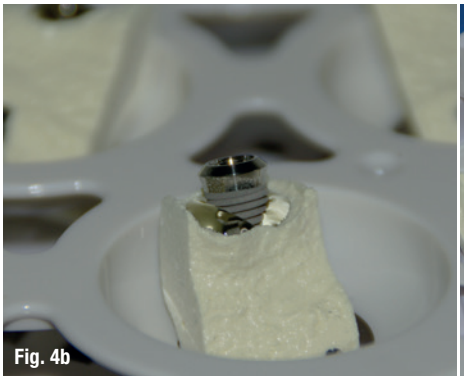
Fig. 4b

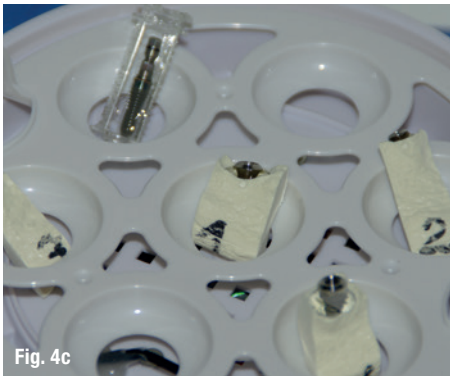
Fig. 4c

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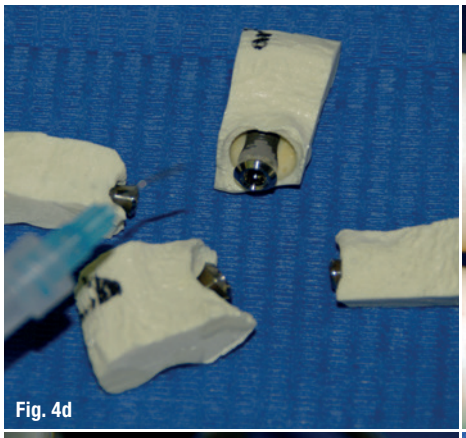
Fig. 4d

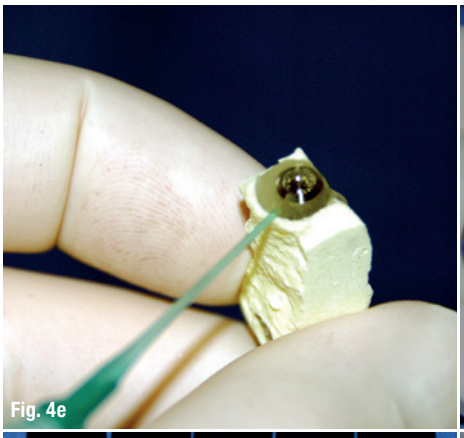
Fig. 4e

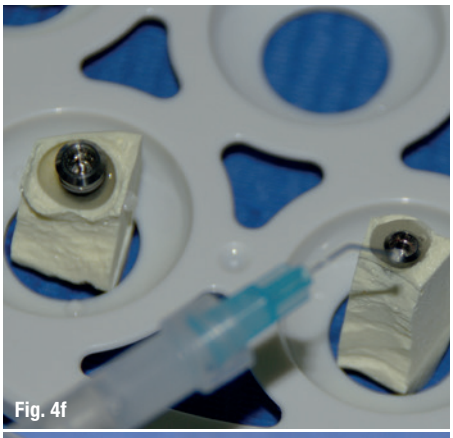
Fig. 4f

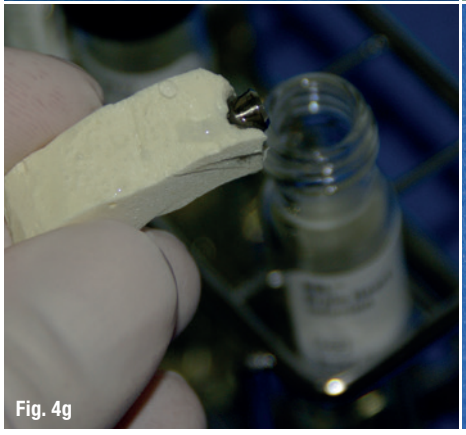
Fig. 4g


Fig. 4h

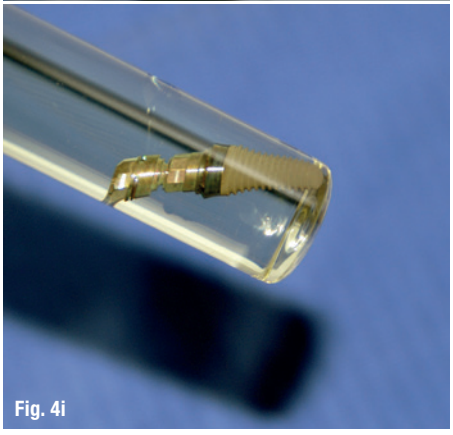
Fig. 4i

Breeding trial after decontamination

It was possible to recultivate bacteria sporadically after decontamination and simple drying.

Preliminary Summary

Compared to other decontamination procedures, the application of the antimicrobial gel Perisolv achieved satisfactory decontamination results from a microbiological point of view in both *in-vitro* study phases. In all samples, a significant reduction of the bacterial count was observed. However, a bacterial elimination only was achieved in the first study phase, but not in the second phase.

SEM images of the implants that have undergone the procedure described above, pointed out that the antimicrobial gel did not induce any changes to the implant surface and that it has certain potency for dissolving the (inoculated) bacterial turf.

As a limitation to the evaluated results, it should be clearly stated that the presented investigation was performed in an *in-vitro* environment with a "non-human milieu" and without a real inflammatory component. Thus, our results about the basic applicability of the presented method can be regarded as a first approach, but in no case a clear statement about the definitive decontamination efficacy of the tested methods can be done.

Acknowledgement

In particular, we want to thank Dr Brodner (Institute Bioscientia, Freiburg, Germany) and Institut Straumann AG (Basel, Switzerland) for their valuable support in the microbiological testing phase and in the preparation of scanning electron images. We want to thank Straumann Germany GmbH for providing the plastic jaws and the implants. Without their elaborate and valuable work, this study would not have been possible._

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Lateral maxillary incisor implant–Key issues for aesthetic success

Authors: Drs Philippe Russe & Patrick Limbour, France

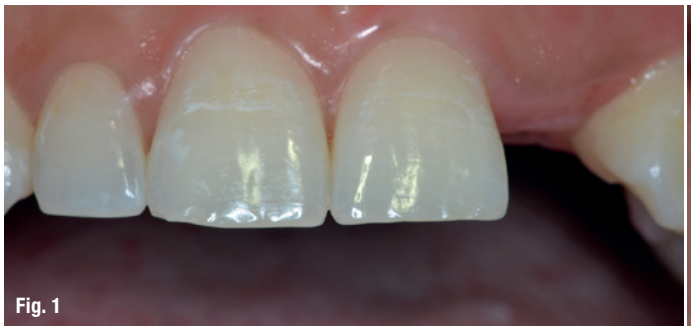


Fig. 1

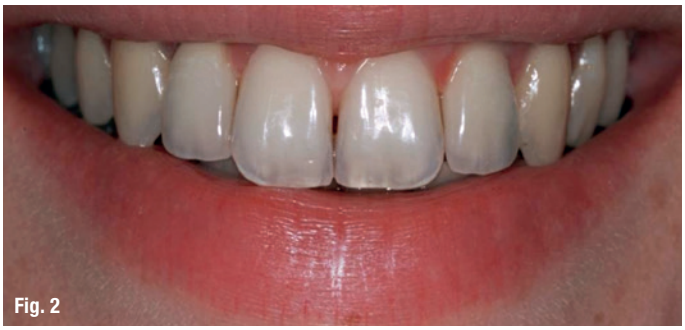


Fig. 2

Fig. 1: Agenesis of 22, opening of orthodontic space.
Fig. 2: Line of intermediate smile. The smile uncovers the papillae and reaches the collar of the incisors (12 and 22 are supported by implants).

Introduction

Faced by a missing lateral incisor, practitioners often consider a wide range of issues and are also faced by numerous treatment options:

- in a young patient, faced with a unilateral or bilateral agenesis, he has to choose between an orthodontic treatment that either opens up the spaces or closes them. This decision, when taken early in the overall treatment, will affect both the patient and their caregiver for a long time (Fig. 1);
- in an adult patient, this is a consequence of bone, physiological, traumatic or infectious resorption, which will result in a decision whether or not to recommend a bone reconstruction or a gingival augmentation.

In every situation, the results will be judged by the patient and those around him. Since the lateral maxillary incisor is an integral part of the smile, aesthetic expectations are generally very high and, if the results do not meet the expectations, disappointment can be powerfully felt.

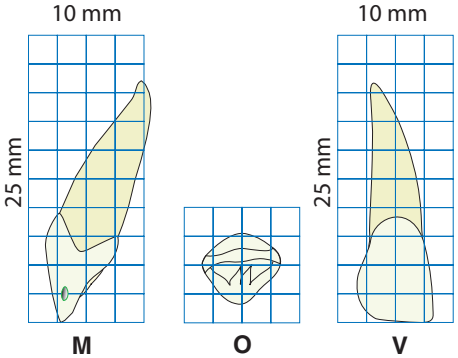


Fig. 3a

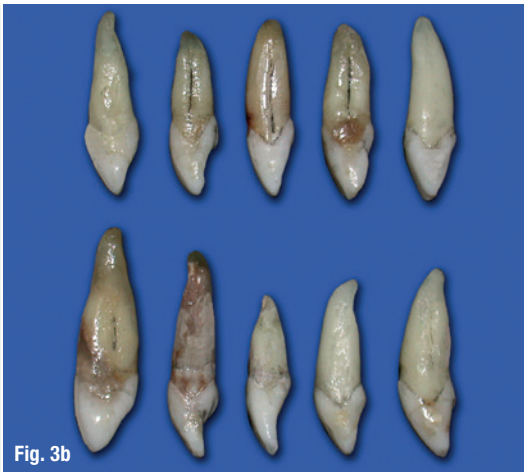


Fig. 3b

Fig. 3a: Average forms, types and dimensions of the lateral incisor according to Papathanassiou.[6] Overall height: 21 mm, coronal height: 9 mm, radical height: 12 mm, mesiodistal cervical diameter: 5 mm, mesiodistal coronal diameter: 6.5 mm, vestibular-lingual cervical diameter: 5 mm, vestibular-lingual coronal diameter: 6.5 mm.
Fig. 3b: Proximal view photographs showing ten anatomical variants of lateral maxillary incisors described by the author.[6]

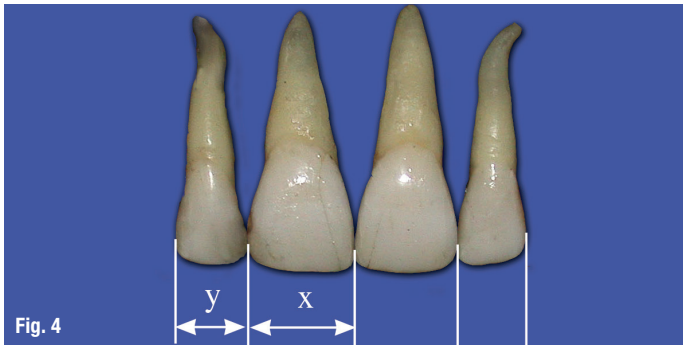


Fig. 4

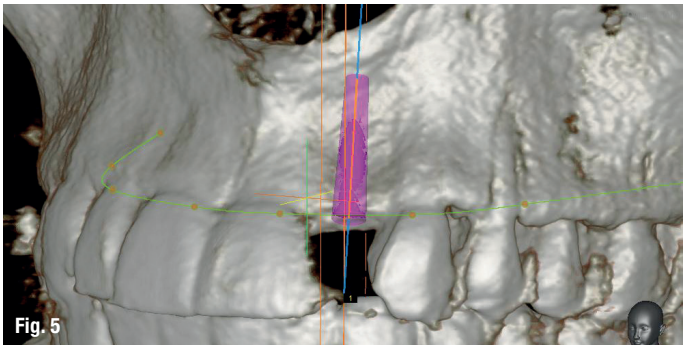


Fig. 5

When describing the different treatment stages, a number of pitfalls and difficulties will be highlighted and advice and clinical protocols will be given, in order to ensure that the results of this implant/prosthetic treatment are predictable and as aesthetically attractive as possible. This first article is concerned with these issues as regards the pre-prosthetic stages; the second will consider the most important aspects of the prosthetic stages as well as aesthetic outcomes and their evolution over the long term.

Anamnesis

Once the usual contraindications for oral and implant surgery have been eliminated, particular attention should be given to the patient's answers concerning their smoking habits. Indeed, meta-analysis give an accurate picture of the consequences of smoking, with increases of:

- peri-implantitis[1,2] and bone loss[2];
- failure rates.[3]

The conclusions of Snider et al.[4] can provide recommendations for the practitioner faced with a patient who is a smoker:

- the best is to ask the patient to stop smoking...;
- if this approach is not acted on, then the patient must be warned of the increased risk of failure and of postoperative complications.

This last issue is important, as smoking can be considered a lost opportunity as far as implant treatment is concerned.

> "It is preferable to avoid patients that are smokers."

Clinical examination

The smile line

When replacing a tooth in an aesthetic region, understanding the location of the smile line is one of the determining issues during the clinical examination. There are two factors to consider: the exposure of papillae and visibility of the collar of the lateral incisor, and there is one significant problem: any aesthetic deficit experienced by the patient tends to make them change their smile line, which can happen more or less as a conscious process and this can be a source of significant errors. Analysis of gingival composition is also a determining issue in positioning the collar of the lateral incisors in a location that is aesthetically optimal. The gull-wing profile, where the collar of the lateral incisors is slightly more coronal than that of the front teeth or the canine teeth, is considered to be more attractive according to Chiche[5] (Fig. 2).

Dental aesthetics

As regards dental aesthetics, the proportions of the proposed implant supported tooth can reflect two different scenarios:

Fig. 4: According to Levin, following the golden ratio, the width of the lateral incisor y = 0.62 x and, for Preston, it is 0.66 x (images from Papathanassiou).[6]
Fig. 5: Evidence of bone deficit at 22 (case shown in Fig.1).[6]

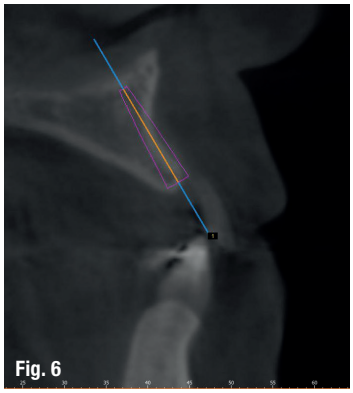


Fig. 6

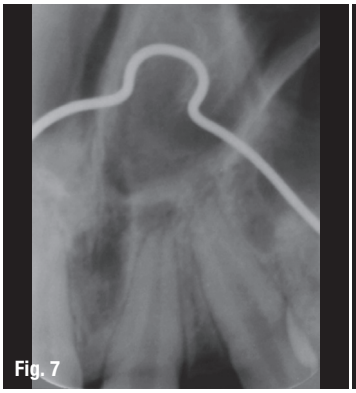


Fig. 7

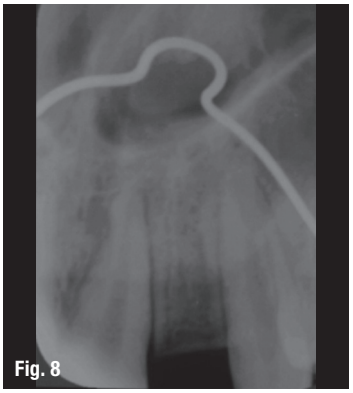


Fig. 8

Fig. 6: Simulation of location of 3 mm[6] implant in cross section (case shown in Fig.1).[6]
Fig. 7: Evidence of radicular convergence.
Fig. 8: Orthodontic layout of implant corridor.

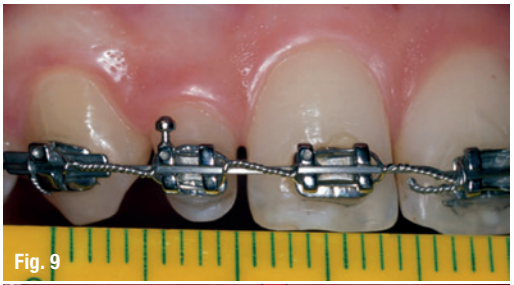


Fig. 9

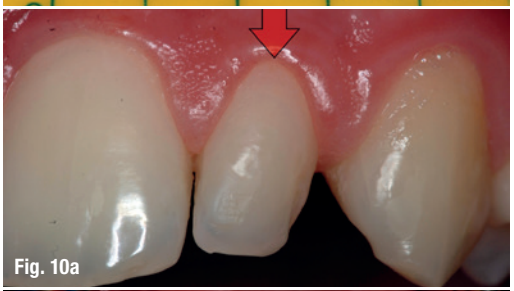


Fig. 10a

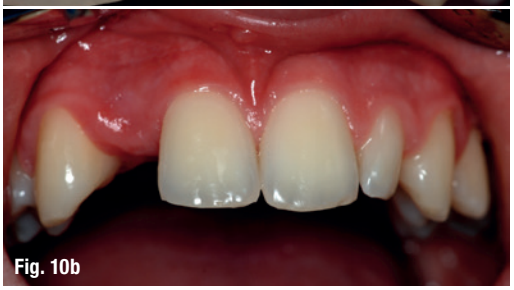


Fig. 10b

Fig. 9: Diastemas created around a riziform tooth to obtain a space of 6 mm.
Figs. 10a & b: Centered location of zenith of 22 **(a)** (arrow) to be taken into account when making the crown 12 **(b)**.

- there is a unilateral missing tooth and the controlateral incisor has normal and aesthetically pleasing proportions. The objective will be to create a lateral incisor implant that is a mirror image;
- with the same situation but where the controlateral incisor is small; this is a situation that occurs frequently in unilateral agenesis where the incisor that is present is riziform or, if there is agenesis of both lateral incisors, the clinical examination should gather the information required to decide on the dimensions and coronal axes of the proposed lateral incisors. An analysis of the occlusion and the dimensions of the central incisors are the clinical parameters that make it possible to establish the characteristics of the planned prosthetic teeth.

The anatomy of the lateral incisor has been the subject of various publications, including, notably, by Papathanassiou[6] who defined average dimensions and a typical form (Fig. 3a) and also presented numerous morphological variants affecting these dimensions and also other characteristics such as the crown/root ratio and the coronal and root axes (Fig. 3b). These morphological criteria, which can now be found using 3-D imaging, have had a significant influence on the location of implants in all spatial planes in order to achieve the goal of harmony of form and dimension. Other publications, such as those by Levin[7] and Preston,[8] make it possible to estimate the width of absent lateral incisors on the basis of the central incisors (Fig. 4).

"Establish the ideal width and orientation of the planned prosthetic crown."

Implant location

A clinically significant deficit signals the need for reconstruction of hard tissue but, conversely, a site without a tooth with no loss of volume should be subjected to a three-dimensional X-ray, as thick soft tissue can hide a lack of hard tissue (Fig. 5). A thin tissue biotype or a lack of attached gingiva can be a sign that gingival augmentation surgery will be required, particularly if a bone graft needs to be performed.

Occlusion

For orthodontic treatments, the anterior guidance should be analyzed carefully. It can be tempting to increase the perimeter of the maxillary arcade in order to obtain, at the least, implant corridors that are sufficiently wide at the level of 12 or 22. However, an overjet will make it very likely that the natural teeth will move in relation to the implant prosthesis with highly negative consequences for the sustainability of the cosmetic outcome.

Documentation

Taking photographs at the start of the treatment will make it possible to maintain a record of the initial condition, which is always useful if there are medical/legal problems at the end of the treatment. In addition, the images often make it possible to see problems relating to width, axis or asymmetry that sometimes go unnoticed during a clinical examination.

"Check anterior guidance and absence of overjet."

Complementary tests

2-D imaging

Panoramic X-rays or retroalveolar radiography make it possible to check the depth of implantable

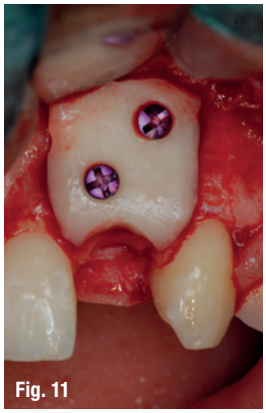


Fig. 11

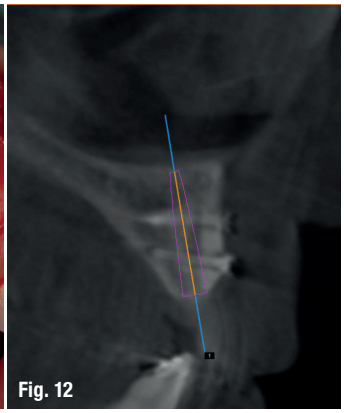


Fig. 12

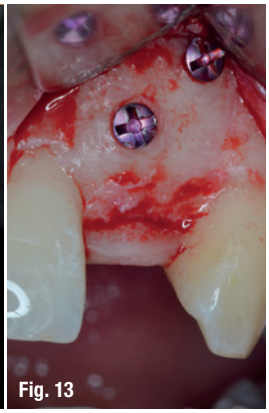


Fig. 13

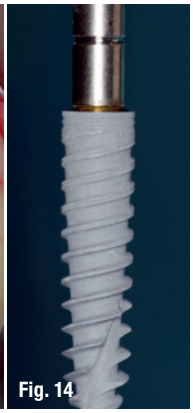


Fig. 14

Fig. 11: Cortical graft in place, shaped to support future papillae (case as shown in Fig. 1).
Fig. 12: X-ray result, compare with Fig. 6.
Fig. 13: Clinical outcome five months after the graft. Compare with Fig. 11.
Fig. 14: 3 mm diameter NobelActive implant.

bone in relation to the floor of the nasal cavity, the bone level in relation to that of adjacent teeth and the parallelism of the central incisor and canine.

3-D imaging

3-D imaging is required to check the vestibular palatal dimensions of the bone crest. There are three possibilities:

- the crest is sufficiently wide to take an implant without any bone augmentation;
- the crest is narrow, bone augmentation is required prior to siting the implant (Fig. 6);
- intermediate situations where the siting of the implant will be accompanied either by bone splitting or by guided bone regeneration.
- Orthodontic preparation

When the adjacent teeth present apical convergence, the orthodontic preparation should create a mesio-distal dimension at the level of the root that allows the implant to pass with a margin of at least 1 mm of bone (Figs. 7 & 8). Where there is a controlateral incisor of a normal size, the rule for the orthodontist is to measure the width of that tooth carefully and to recreate the same width in the crown of the planned implant. Where the controlateral incisor is riziform, the orthodontist should plan the future face of the tooth in order to achieve two laterals with the same shape.

Diastemas around the riziform tooth make it possible to achieve a smile that, in the end, is almost symmetrical (Fig. 9). The riziform incisor does not have to be in the centre of the space but should be positioned in such a way that the papillae and the future zenith of the tooth are optimized. The zenith should be located 0.4 mm distal from the centre of the tooth for a lateral incisor, according to Chu et al.[9] (Figs. 10a & b). Sometimes, a zenith situated more than 1 mm from a line between the collars of the central incisor and the canine should be surgically altered by coronal lengthening as a lateral incisor that is too short can also be aesthetically unacceptable.

> "The orthodontist should anticipate the future prosthetic morphology of the riziform incisor."

Hard tissue augmentation

Where a bone reconstruction is indicated, this should take into account one of the key factors for the overall cosmetic outcome: restoration of papillary support in order to avoid any unsightly black triangles between the lateral incisor and the adjacent teeth or any concave area above the implant crown that would create an ugly shadow.

The cortical graft, taken from the chin or the external oblique, should be formed in such a way as to provide support for the gingival papillae (Fig. 11). Gaps under and around the graft should be filled with cortical bone particles, crushed from the chin block or lateral mandibular area using a bone mill.

The attachment must be reliable. This is done using two 1.6 mm diameter osteosynthesis screws (Fig. 12). Autografts take about 5 months to heal.

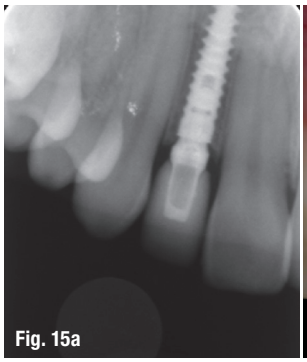


Fig. 15a

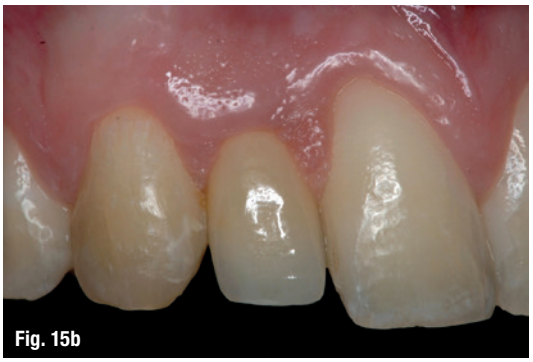


Fig. 15b

Figs. 15a & b: Papillary view **(b)**, X-ray view **(a)**, two years after the insertion of the implant.

Fig. 16

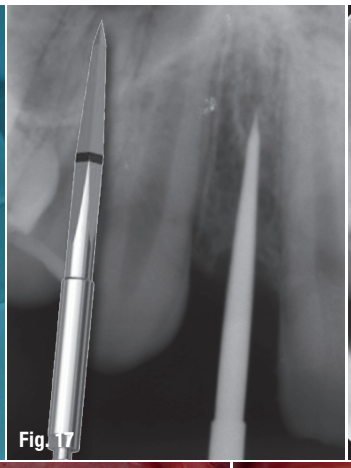


Fig. 17

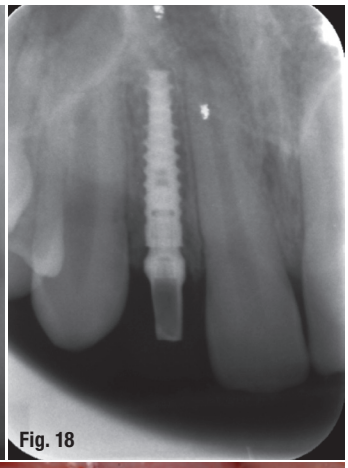


Fig. 18

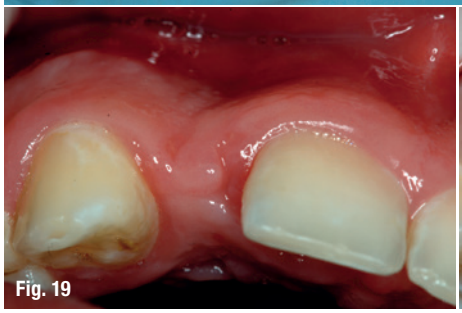


Fig. 19

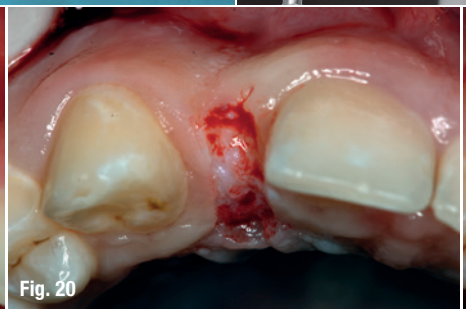


Fig. 20

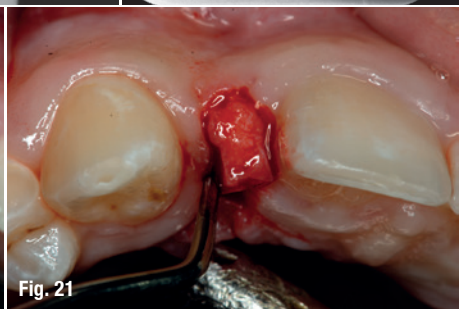


Fig. 21

Fig. 16: Mobile Anyray 2 (VATECH) X-ray generator.
Fig. 17: Intraoperative X-ray, Precision Drill inlay (left on picture) and in situ (right on picture).
Fig. 18: Clinical outcome five months after the graft. Postoperative X-ray NobelActive 3/0 implant and 15° abutment in place.
Fig. 19: Initial situation.
Fig. 20: De-epithelialisation of a palatal flap into a diamond shape.
Fig. 21: Unfoldment of palatal flap, vestibular edge.

Ideally, the implant should be inserted between 4.5 and 5.5 months after the graft (Fig. 13).

> "Fully reconstruct papillary support."

Insertion of implant

Choice of implant

The mesio-distal dimension of the gap will determine the choice of the implant. When this is close to or less than the average size of 6.5 mm, the bone and papillary volume around standard size implants will be limited. According to Hasan et al.[10] and Bourauel et al.,[11] the disadvantage of small diameter implants is that they transmit higher stresses to the crestal bone than do standard implants. When replacing a lateral maxillary incisor, it is possible to arrange both the anterior guidance and the deduction in such a way as to make them largely affect the natural teeth, in the absence of any significant malpositioning, and in this way reduce the stresses applied to the implants. Under these conditions, small diameter implants have the advantage of increasing surrounding residual bone volume as well as space available for papillary healing.

In a forthcoming study of 120 NobelActive 3 mm diameter implants, one of the conclusions confirmed the importance of these small diameter implants as regards the additional height of the papillae, resulting in an improvement in the Fürhauser pink aesthetic score[12] (Figs. 14, 15a & b).

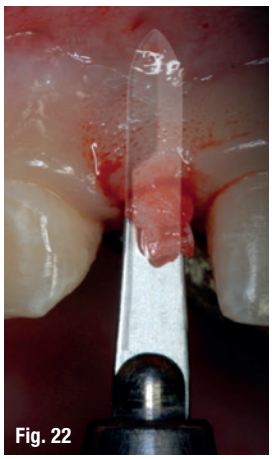


Fig. 22

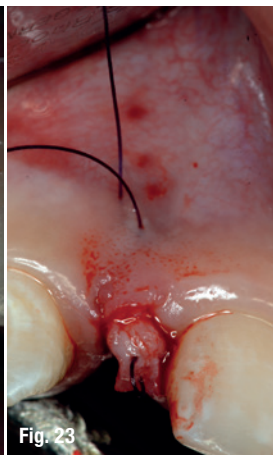


Fig. 23

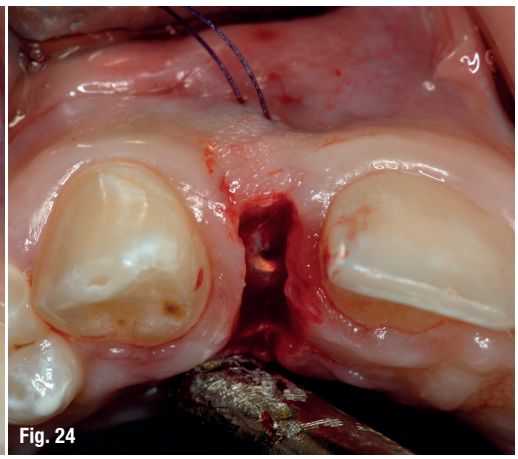


Fig. 24

Fig. 22: Creation of flap envelope, Swann-Morton blade through the envelope. SM 63, inlaid with transparency.
Fig. 23: Passage of suture through the envelope.
Fig. 24: The palatal flap is folded into the vestibular envelope using a suture thread.

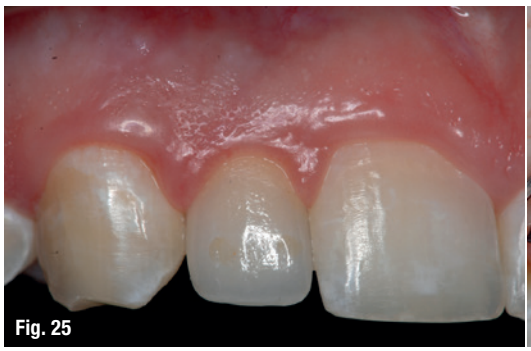


Fig. 25

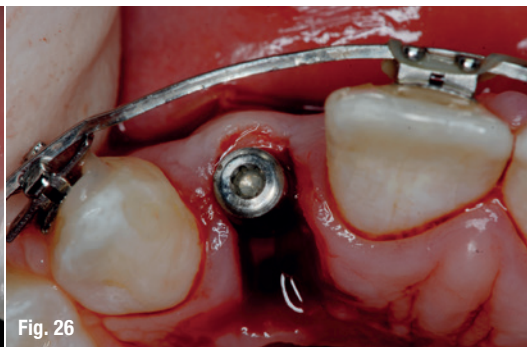


Fig. 26

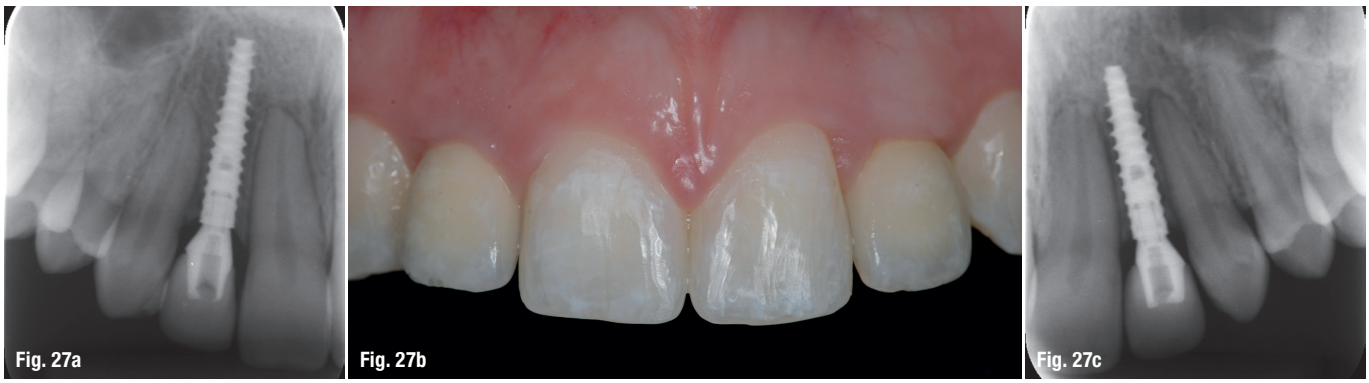
Fig. 25: Tissue integration with ceramic crown.
Fig. 26: Vestibular bulge obtained with modified flap.

"Favor small diameter implants."

3-D positioning

As regards replacement of a lateral maxillary incisor, the tolerances for the location of the implant are very small because of the narrow width of the implant corridor. Two recent meta-analysis[13,14] concerning the precision of surgical guides resulting from 3-D imagery, even if these do not apply specifically to the lateral incisor replacement, has found a deviation in the order of a millimetre at the point the implant emerges and 4 to 5 degrees as regards the drilling axis. For Van Assche et al.,[14] the average imprecision at the apex of the implant is 1.24 mm.

Since these measurements are incompatible with a 12 or 22 implant corridor, it is important to check the first drill hole(s) during the operation, whether the surgery is guided or being carried out freehand. If the implant clinic does not have retroalveolar X-ray equipment, portable generators such as the AnyRay II (VATECH) are available on the market, which allow you to produce intraoperative images (Fig. 16).

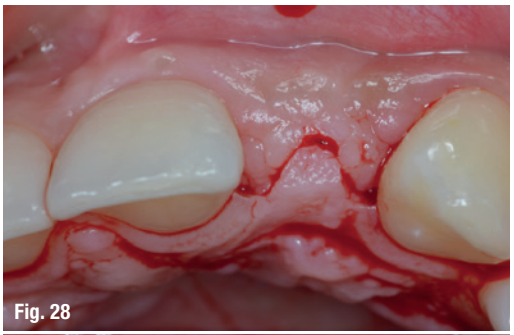


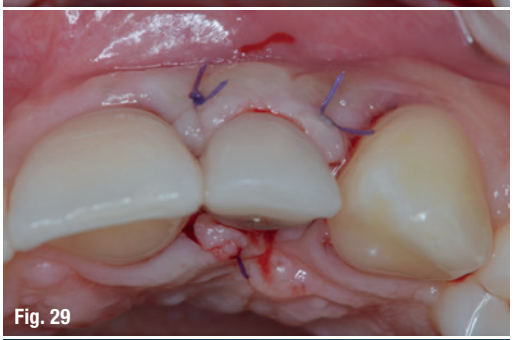
Figs. 27a–c: Clinical and X-ray views, vitroceramic in place.

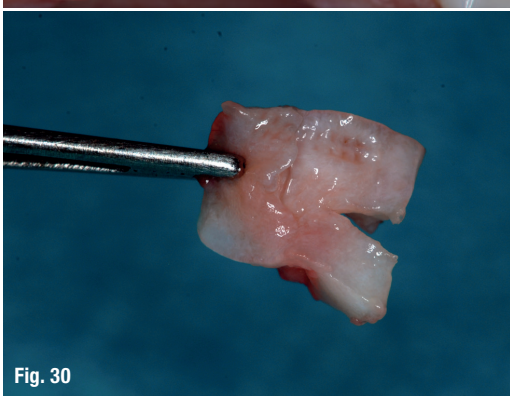
In this context the Precision Drill from the Nobel Biocare kits is particularly helpful. Its sharp point provides considerable precision at the point of entry and its small dimensions make it possible to correct any deviations from the ideal axis occurring during the first drilling (Fig. 17).

In the vestibular palatal plane, it is essential to prepare a prosthetic treatment plan before inserting the implant because the positioning requirements differ:

Fig. 28: Initial incision creating two vestibular half papillae.
Fig. 29: Suture of half papillae (situation in Fig. 1).
Fig. 30: De-epithelialisation tuberosity graft.







- for a screwed prosthesis, the axis of the implant is very strictly determined by the point in the cingulum where the screw emerges;
- with a cemented prosthesis, the tolerance is slightly greater as it is possible to make a correction to the axis by an abutment angled up to 15 degrees or by a Procera type individualized abutment (Fig. 18).

"Position the implant under X-ray monitoring."

Soft tissue management

Whether the soft tissue management is carried out at the time the implant is put in place or when it is exposed, the choice of surgical technique depends on an examination of the initial situation:
- horizontal deficit of soft tissue that could result in the underlying titanium being visible;
- vertical deficit in the papillae that could result in unsightly black triangles.

Different surgical techniques can be used, depending on these deficits, which are taken from three publications: the roll flap developed by Abrams,[15] the envelope technique of Peter Raetzke[16] and Carl Misch's split-finger:[17]
- if there is just a horizontal deficit, a modified rolled flap[6] can be carried out, without separation of papillae and without vestibular incisions, the palatal flap being folded into an envelope flap (Figs. 19 to 25). The attraction of this technique for the patient is that a second operation site to take a graft is not required. In addition, it makes it possible to recreate a root eminence, considered already 20 years ago by Silverstein and Lefkove[18] to be an important factor for the aesthetic outcome (Figs. 26 & 27a to c);
- where there is a vertical deficit, a crestal W-shaped incision as described by Carl Misch[17] is indicated. This makes it possible to recreate

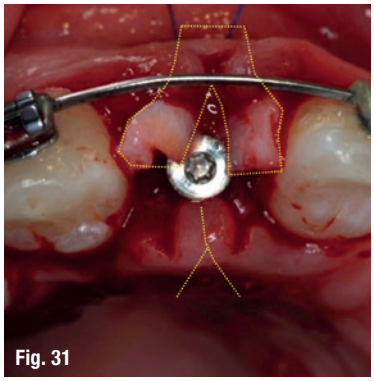


Fig. 31

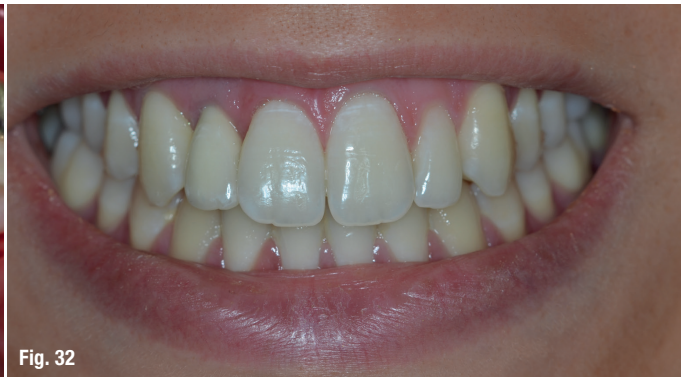


Fig. 32

Fig. 31: Insertion of connective graft buried under the papillae.
Fig. 32: Clinical outcome in a case of gummy smile.

an anatomical gingival architecture while, as a first step, creating two vestibular neo-papillae (Fig. 28). After separating the sections, the palatal tissue (finger) is divided into two to make two palatal half-papillae, joined one on one with their vestibular counterparts (Fig. 29);

- where there is a combined deficit, the same incisions are combined with a buried connective vestibular graft. Provided that there is sufficient volume, the graft is taken from the maxillary tuberosity, since this area has the advantage of providing graft tissue that is more dense, opaque and less adipose than the palate and, in addition, results in less postoperative pain. If the graft is transferred in a V- or Y-shape, it can support the newly formed papillae. The shape of the palatal incision can be modified to a Y-shape to assist rotation of the palatal half-papillae (Fig. 31).

If the thickness of the buccal gingival tissues has not been augmented or if collagen substitutes are used that do not have the opacity characteristics of tuberosity connective tissue, the aesthetic outcome can be compromised. If there is recession of the external table or the titanium abutment under thin connective tissue, the grey titanium colour can be seen through the gum as a grey halo above the crown collar, which is detrimental to the aesthetic appearance (Figs. 32 & 33).

"Systematically augment the thickness of buccal connective tissue."

Conclusion

The aesthetic fundamentals for an implant are in the preprosthetic surgical stages of the treatment. Any approximation in the location of the implant in such a narrow implant corridor, any lack of support for papillae or any deficiency in the thickness of hard or soft tissues, will result in aesthetic problems. The prosthetic stages allow optimisation of the result as regards the gingival context but any error in the surgical stage will often be impossible to correct during the prosthetic stages. For this reason it is vital to approach this first part of the implant treatment for a lateral incisor with thoroughness and precision._

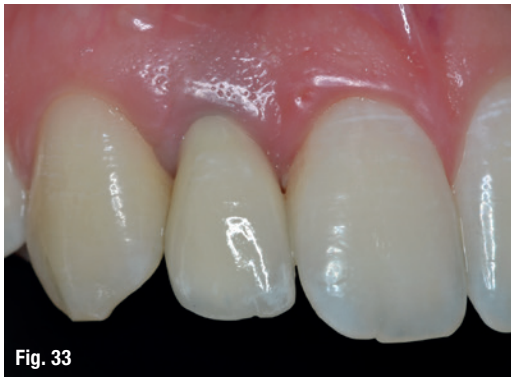


Fig. 33

Fig. 33: Insufficient soft tissue thickness alters the chromatic outcome.

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

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Maxillary implant supported removable or fixed prostheses

Author: Dr Scott D. Ganz, USA

Fig. 1: The axial view provides insight into the global topography of the maxilla.
Fig. 2: The volumetric rendering aids in the inspection of the bone but does not the desired restorative position.
Figs. 3a & b: A radiopaque scanning appliance fabricated from a duplicate of a patient's existing well-fitting denture **(a)** allows inspection of tooth position in relation to the underlying bone **(b)**.

"Pre-surgical prosthetic planning" can be defined as the process of accumulating diagnostic information to determine which course of treatment should be considered for the fully edentate patient. The first step in patient evaluation should include conventional periapical radiographs, panoramic radiographs, oral examination, and mounted, articulated study casts. In the completely edentulous patient it is essential for the clinician to assess several important aspects of the individual anatomical presentation including vertical dimension of occlusion, lip support, phonetics, smile line, over-jet, overbite, ridge contours, and a basic understanding of the underlying bone structures. The accumulation of preliminary data afforded by conventional diagnostics provides a foundation to prepare a course of treatment for the patient. However, if the review of findings is based upon a two-dimensional panoramic radiograph, it may not be accurate in appreciating the true spatial positioning of vital structures such as the incisal canal, the floor of the nose, or the maxillary sinus. To fully understand each individual patient's actual bone anatomy, it is essential that clinicians adopt an innovative set of virtual, three-dimensional tools. Through the use of advanced imaging modalities new paradigms have been established that in the author's opinion will continue to redefine the process of diagnosis and treatment planning dental implant procedures for years to come. Without the application of computed tomography (CT) or lower radiation dosage cone beam computed tomography (CBCT), an understanding of the three-dimensional anatomic reality cannot be accurately determined, potentially increasing surgical and restorative complications.

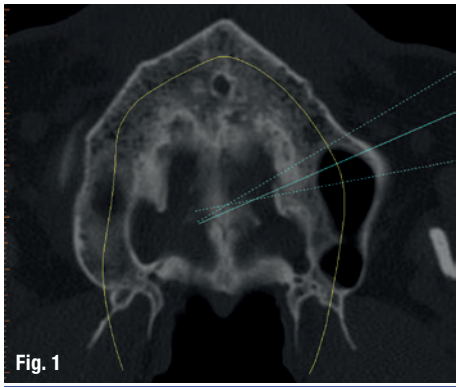


Fig. 1

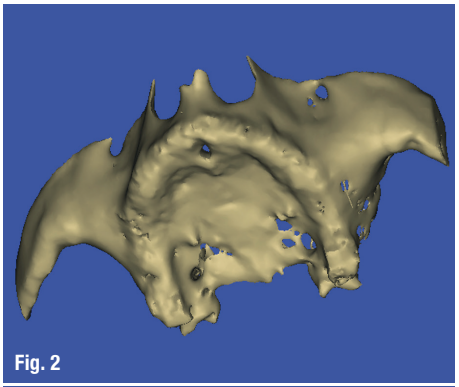


Fig. 2

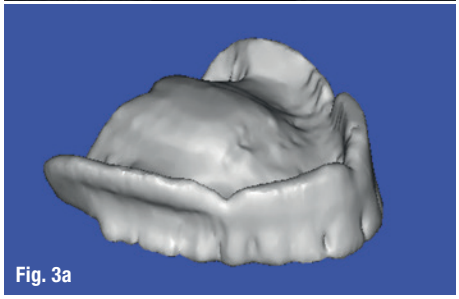


Fig. 3a

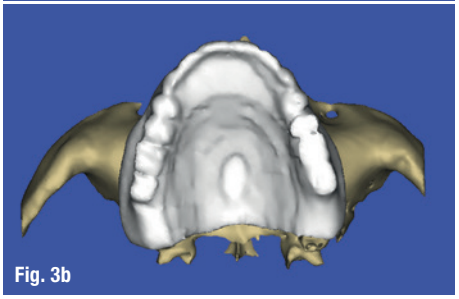


Fig. 3b

The utilization of 3-D imaging modalities as part of pre-surgical prosthetic planning can take several paths. The first involves acquiring a three-dimensional scan directly, without any prior planning or ancillary appliances. The scan process can be accomplished at a local radiology centre, mobile imaging company, or via an in-office CBCT device. The scan itself can be completed within several minutes. Once the data is processed, it can be viewed on the native software of the CBCT machine itself, evaluated for potential implant receptor sites, followed by the surgical intervention, or with a third party interactive treatment planning software. A second path requires the fabrication of a radiopaque "scannographic" appliance that incorporates vital restorative infor-

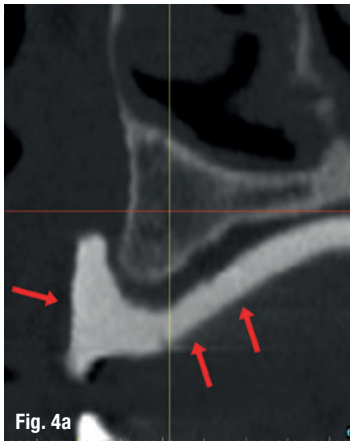


Fig. 4a

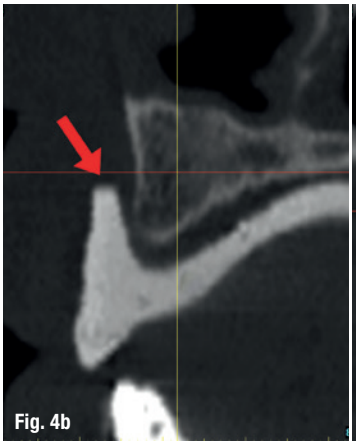


Fig. 4b

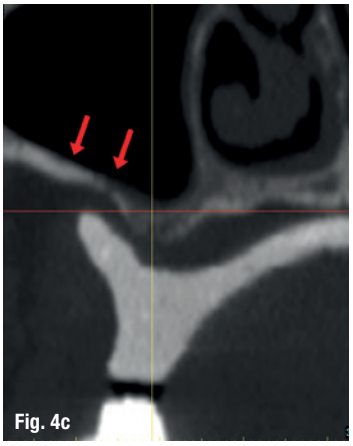


Fig. 4c

Figs. 4a–c: Cross-sectional slice reveals tooth position in relationship to the bone **(a)** and the extension of the labial vestibule (red arrow) **(b)**. The relationship to the maxillary sinus is essential for planning in the posterior region, where thin cortical plate can be clearly visualized (arrow) **(c)**.

mation that will be worn by the patient during the acquisition of the scan. In this manner, the desired tooth position can be evaluated in relation to the underlying bone and other important anatomic structures such as the maxillary sinus or the inferior alveolar nerve. Certain proprietary methods incorporate the use of fiducial markers to help with the registration process for planning based directly upon the restorative needs for the patient.

The use of interactive treatment planning has expanded dramatically in the past ten years as computing power has increased exponentially. As defined by the author, guided surgery can be divided into three distinct categories once a "virtual" plan has been established based on 3-D scan diagnosis (Ganz-Rinaldi Classification of Guided Implant Surgery Protocols). The first allows the information to be assessed, providing important information to the clinician who will perform the surgical intervention free-hand based upon the software plan, termed "Diagnostic-Freehand". The second category involves the fabrication of a surgical guide or template that is remotely constructed from the digital plan usually through rapid prototyping or stereolithography, CAD/CAM, or laboratory fabricated, termed CT-derived "Template-Assisted". The drilling process is started and can be completed within the template helping to control trajectory and depth with the proper instrumentation. The third category requires a specific template design that allows for accurate drilling and osteotomy preparation, and with the proper manufacturer-specific carriers the implants can then be accurately delivered through the template, termed, "Full Template Guidance". The use of advanced imaging modalities for pre-surgical prosthetic planning is essential for any type of implant surgical and restorative intervention, from the single tooth, multiple tooth restoration, full arch fixed and removable over-denture reconstruction. However, it is the correct use of three-dimensional tools that provides clinicians with the power to diagnose and treatment plan with the highest degree of acuity and accuracy.

3-D Planning Concepts: Full Arch Maxillary Overdenture

Due to anatomical variations related to the maxillary sinus, the floor of the nose, the incisal canal, the facial trajectory of the anterior segment, thin cortical plates, and diminished overall bone density when compared to the mandible, the completely edentate maxilla offers additional diagnostic challenges for clinicians. The axial view provides insight into the global topography of the maxilla (Fig. 1). The position of the incisal canal can be visualized, along with thin facial and palatal cortical plates. The volumetric rendering aids in the inspection of the bone, but does not offer any information regarding tooth or ultimate restorative position (Fig. 2). In order to achieve the concept of "true restoratively driven implant dentistry" pre-surgical

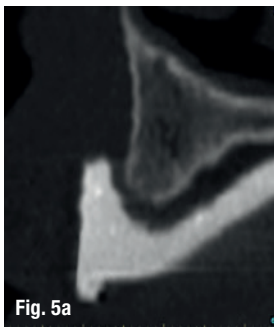


Fig. 5a

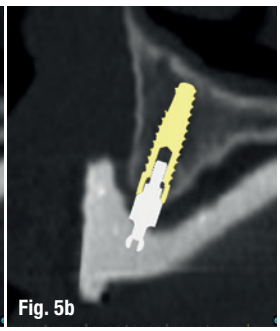


Fig. 5b

Figs. 5a & b: Evaluating a potential receptor site within the cross-sectional view (Slice 63) **(a)**. The positioning of the implant(s) need to fall within the envelope of the teeth **(b)**.

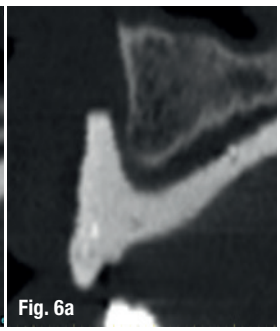


Fig. 6a

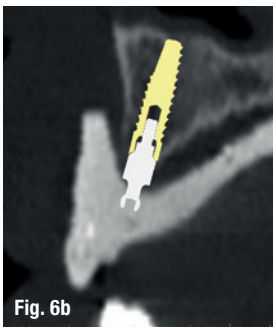


Fig. 6b

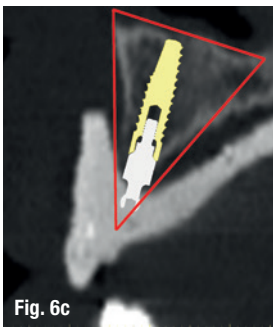


Fig. 6c

Figs. 6a–c: The cross-sectional image reveals a potential receptor site **(a)**; the realistic implant and abutment simulation **(b)**; the author's preference places the implant within a defined zone of available bone defined as the "Triangle of Bone" (TOB) that also acts to relate implant position to the restorative outcome **(c)**.

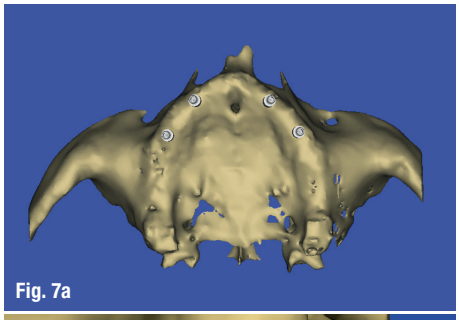


Fig. 7a

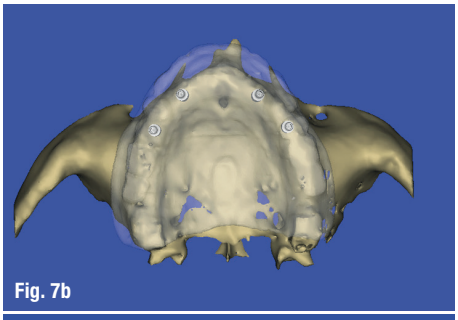


Fig. 7b

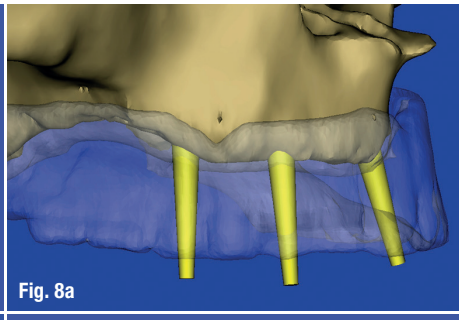


Fig. 8a

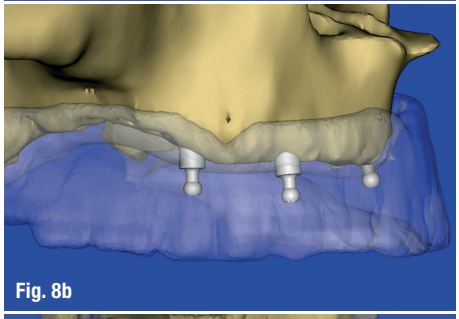


Fig. 8b

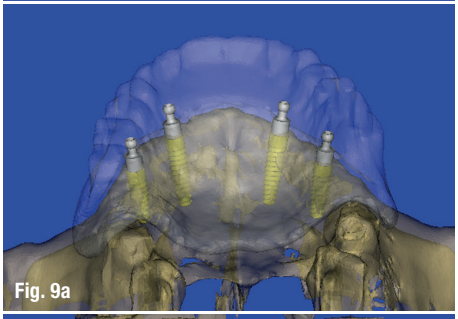


Fig. 9a

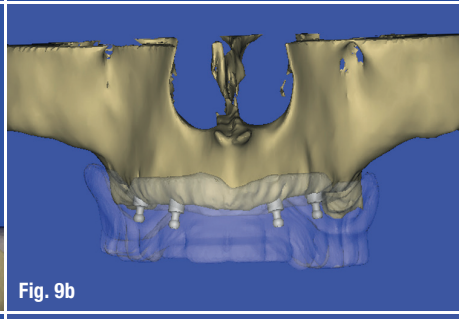


Fig. 9b

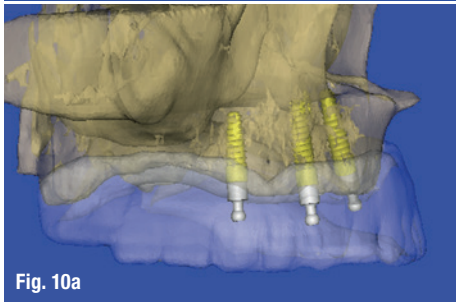


Fig. 10a

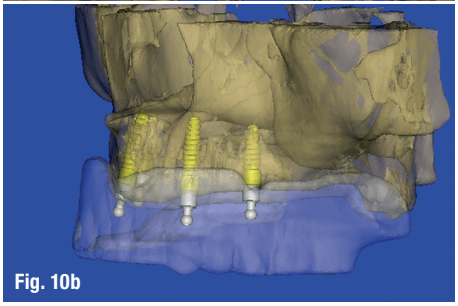


Fig. 10b

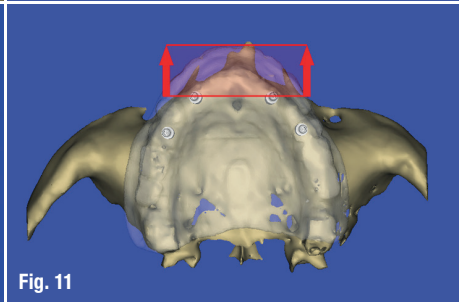


Fig. 11

Figs. 7a & b: The occlusal view of the volumetric rendering aids in the implant-to-implant positioning within the bone **(a)**. Superimposing a translucent scannographic template over the maxilla provides the information to position implants within the restorative envelope **(b)**.

Figs. 8a & b: Use of "selective transparency" with abutment extensions above the occlusal plane **(a)**. Ball abutments positioned at the proper tissue cuff height **(b)**.

Figs. 9a & b: Rotating the views help position implants where they will best support the removable prosthesis.

Figs. 10a & b: Selective transparency allows the realistic implants and ball abutments to be seen through the prosthesis and the maxillary bone.

Fig. 11: The distance between the two anterior implants and the maxillary incisor teeth (red arrows) represents a cantilever that could result in tipping of the denture.

prosthetic planning should start prior to any scan being taken. A scanning appliance can be fabricated from a duplicate of a patient's existing well-fitting denture, or a new diagnostic set-up which positions the teeth at the ideal vertical dimension of occlusion, centric relation, and functional/aesthetic components (Fig. 3a). The patient wears the scannographic appliance during the scan, ideally held in place with a pre-determined bite registration to minimize movement. The scan reconstruction will then contain both the tooth position and the underlying bone (Fig. 3b).

The combination of the anatomical scan data with the radiopaque template allows unprecedented diagnostic potential. The template reveals the tooth position (red arrows) in relationship to the underlying bone in the cross-sectional slice (Fig. 4a). The thin cortical plates can be clearly visualized, along with the extension of the labial vestibule (red arrow, Fig. 4b). The relationship to the maxillary sinus is important when deciding if implants might be an option in the posterior region (Fig. 4c). In this example the pneumatisation of the sinus has resulted in extremely thin lateral cortical plate (see red arrows). The radiopaque template is helpful when evaluating other receptor sites, and positioning a simulated implant within the cross-sectional view (Slice 63, Fig. 5a). For an over-denture application the positioning of implants need to fall within the envelope of the teeth, and it is even more practical to visualize the abutments that might be utilized (Fig. 5b). For this example a realistic stock "ball type" abutment was utilized on the virtual realistic implant. In order to provide some guidance, it is the author's preference to place the implant within a defined zone of available bone (Figs. 6a & b). This zone has been previously defined as the "Triangle of Bone" (TOB) that also acts as a decision tree to connect the implant placement to the restorative outcome (Fig. 6c). Positioning the implant within the zone of the TOB, or actually bisecting the triangle, allows for the most bone volume to surround the implant. Following this formula, the implant and abutment will be positioned in a favourable restorative position.

Further inspection through the utilization of additional views can be extremely enlightening with regard to the final positioning of the implants. The occlusal view of the volumetric reconstruction aids in the implant-to-implant positioning within the bone (Fig. 7a). However, without a complete understanding of the tooth position, the implants may not be ideally located based upon the prosthetic plan.

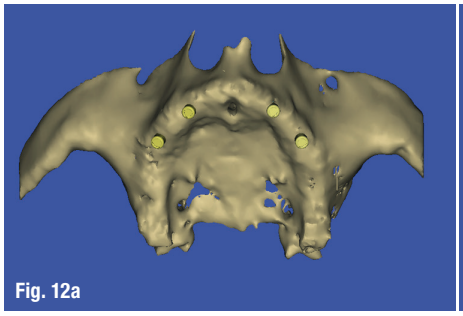


Fig. 12a

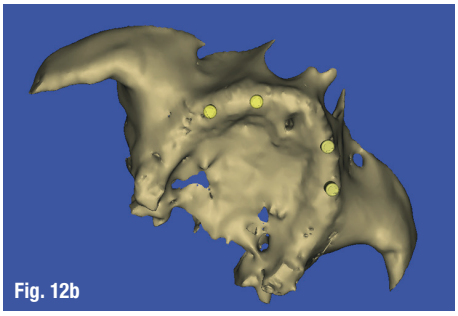


Fig. 12b

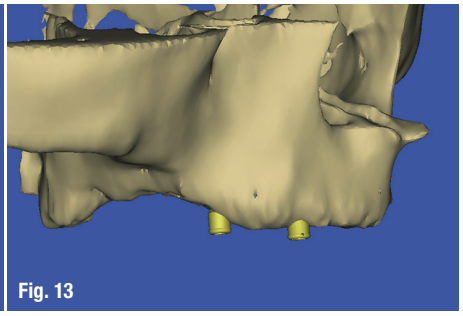


Fig. 13

Superimposing a translucent scannographic template over the maxilla provides the important information to position the implants within the restorative envelope (Fig. 7b). The prosthesis design can be evaluated to determine whether to fabricate a complete denture that would extend to incorporate a conventional post-palatal seal, or an open-palate horseshoe type prosthesis. To aid in the final positioning, it is helpful to visualize the outline of the occlusion using the author's concept of "selective transparency", and extend the abutments above the occlusal plane (Fig. 8a). "Selective transparency" is a software tool which can help separate one anatomical structure from another by adjusting the opacity of the various objects. Once the implants are placed, the ball abutments can then be positioned at the proper tissue cuff height (Fig. 8b). Rotating the views can substantiate the plan to place the implants where they will be support the removable prosthesis (Figs. 9a & b).

It is important to assess the clearance within the denture to allow for sufficient thickness of acrylic within the over-denture abutment housing avoiding potential fracture of the prosthesis. This "prosthetic space" requirement may be different depending upon the type of attachment used. Using the power of digital technology and selective transparency, the realistic implant and ball abutment can be seen through the prosthesis and the underlying bone (Figs. 10a & b). These illustrations reveal that the two right implants are parallel, while the left implants are seen to follow the natural trajectory of the maxillary alveolus (a), and the reverse is true after rotating the maxillary volumetric reconstruction to view the left side (b). Finally, when considering the mechanical forces of mastication and movement of the prosthesis, a line can be drawn between the two most anterior implants that establishes the potential for rotation in the occlusal plane (Fig. 11). A second line can be drawn at the most anterior aspect of the maxillary teeth. The distance between the two anterior implants and the maxillary incisor teeth (red arrows) represents a cantilever that could result in tipping of the denture when the patient bites into an apple.

The ball-abutment is only one potential stock abutment choice for an over-denture application. Another widely used abutment is the Locator attachment (Zest Anchors). The use of realistic Locator attachments allows for a precise understanding of the implant-to-implant relationship, and spacing around the arch which is necessary to gain maximum retention of the prosthesis to resist dislodgement during mastication (Figs. 12a & b). In addition, the utilization of virtual abutments aids in determining the correct tissue cuff heights of the abutments above the bone, and through the soft tissue (Fig. 13). The vertical distance can be evaluated within the framework of the prosthetic design (Fig. 14a). The new digital tools allow for new paradigms to be established assessing the relationship of the implant position, abutment position, and prosthesis prior to the scalpel ever touching the patient. Crown-to-root ratios and the trajectory of the implant-abutment complex can be visualized within the virtual plan, providing valuable surgical and restorative information during the planning phase (Fig. 14b).

Figs. 12a & b: The use of realistic attachments allows for implant-to-implant positioning around the arch necessary to gain maximum retention and resistance of the prosthesis to dislodgement during mastication.
Fig. 13: Utilization of virtual abutments aids in determining the correct tissue cuff heights of the abutments above the bone, and through the soft tissue.
Figs. 14a & b: The vertical distance can be evaluated within the prosthetic design **(a)**, crown-to-root ratios, and the trajectory of the implant-abutment complex can be visualized within the virtual plan.
Figs. 15a & b: The top of the implant (red line) serves as the foundation for the abutment at a specific tissue cuff height (green line) **(a)**; the metal housing represented in gold also has a vertical component (yellow line) **(b)**.
Fig. 16: Once the implant position has been confirmed, the software will generate the virtual design of the template.

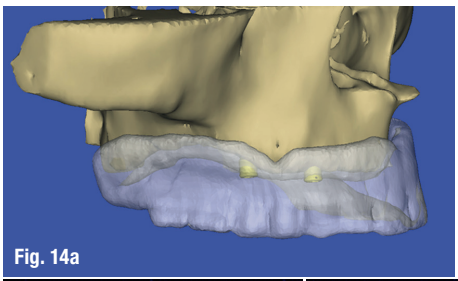


Fig. 14a

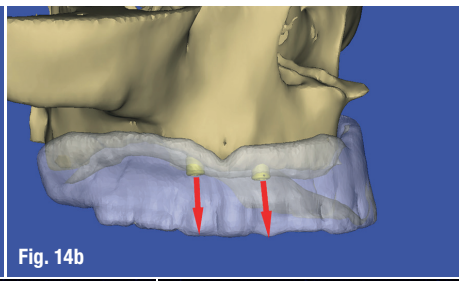


Fig. 14b

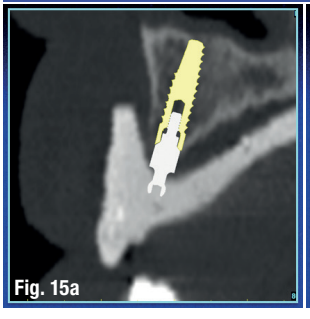


Fig. 15a

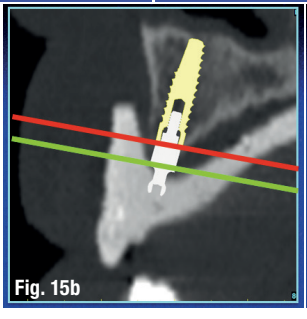


Fig. 15b

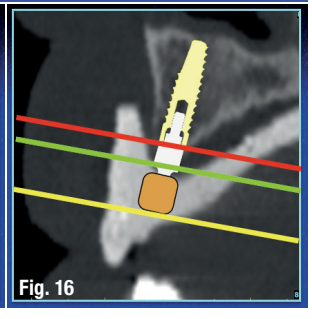
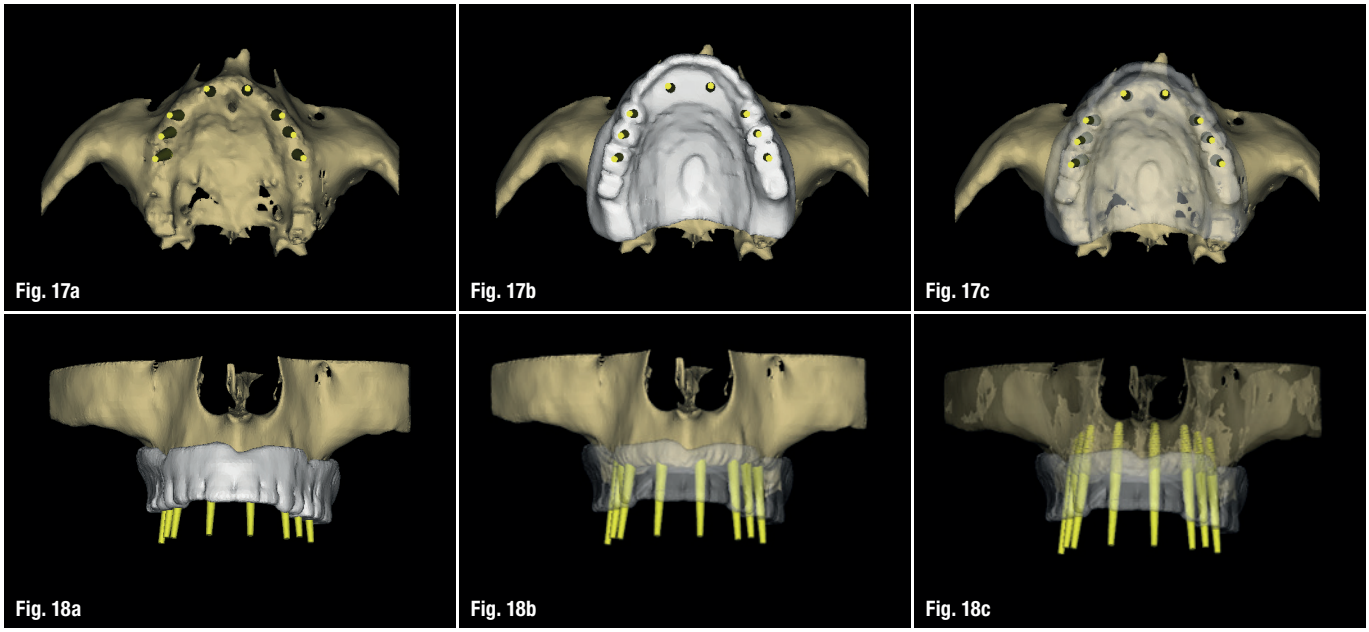


Fig. 16



Figs. 17a–c: Eight implants positioned to support a fixed restoration **(a)** to fit within the framework of the desired tooth position **(b)**; using "selective transparency" the underlying bone can be visualized **(c)**.

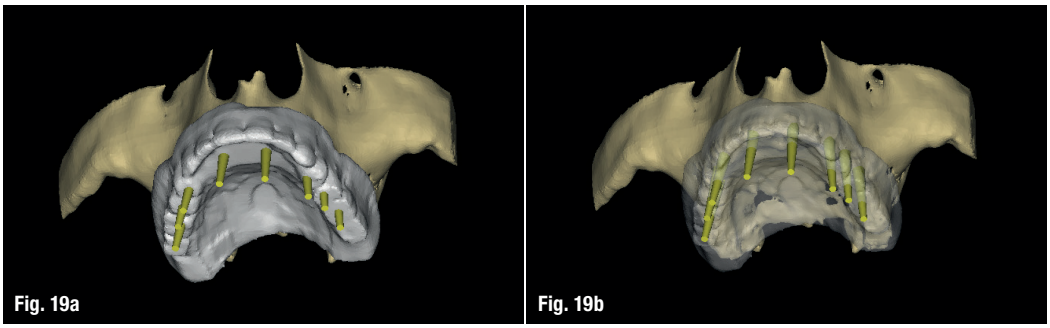
Figs. 18a–c: Frontal view of the scanning template with yellow abutment projections seen above the occlusal plane **(a)**; semi-transparent scanning template **(b)**; and all three objects translucent to visualize the position of the implants within the bone **(c)**.

In addition to the axial, panoramic, and three-dimensional reconstructed volume, the importance of the cross-sectional image is critical to fully appreciate the relationship between the implant position within the bone, and the emergence through the tooth. One area that has not been emphasized however, is the ability to determine the prosthetic space required for the abutment as it relates to the thickness of soft tissue supporting the overdenture (Fig. 15a). The realistic ball abutment can be clearly visualized sitting on the coronal aspect of the implant (red line), and the tissue cuff height of the abutment (green line). One component that is not easy to determine is the metal housing that will be processed within the denture. This component part is not yet available within the software libraries to the author's present knowledge. Therefore an approximation was digitally represented (gold), so that the extra height can be visualized (yellow line), revealing the thin palatal aspect of the overdenture (Fig. 15b). Once the virtual plan has been established a surgical template can be designed by the software and then fabricated through 3-D printing, stereolithography, or a CAD/CAM process to assist in the placement of the implants within the anticipated restorative needs of the patient (Fig. 16).

3-D Planning Concepts: Full Arch Maxillary Fixed Prosthesis

There are few differences between 3-D planning concepts for an overdenture prosthetic design, or a fixed prosthetic rehabilitation supported by implants. All aspects of the patient's bone and soft tissue anatomy must be carefully evaluated. After a proper assessment of the available bone, key implant positions are identified, and simulated within the 3-D reconstructed volume as seen in Figure 17a. However, it is important to once again evaluate the potential implant receptor sites based upon the envelope of the occlusion (Fig. 17b). Using "selective transparency" helps to provide an enhanced perspective of how the implant abutment projections (yellow) are spaced within the desired restoration (Fig. 17c). The frontal view clearly illustrates the importance of the implant abutment projections, revealing for this example a nearly parallel placement of the implants (Figs. 18a & b). "Selective transparency" can be applied to multiple structures, to help visualize the entire complex of the implant, abutment projection, radiopaque template, and the underlying bone (Fig. 18c). By rotating the 3-D reconstructed volumes, it is apparent

Fig. 19a & b: Another 3-D view showing the emergence of the abutment projections through the scanning template.



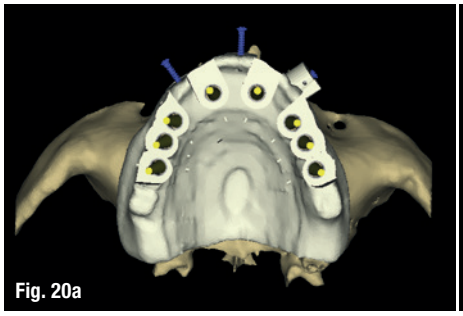


Fig. 20a

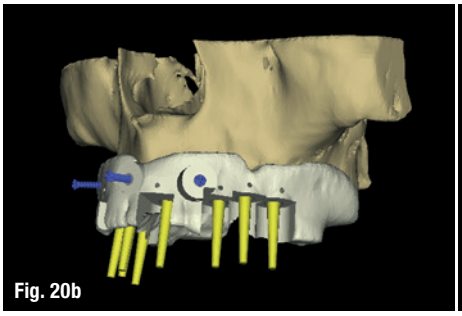


Fig. 20b

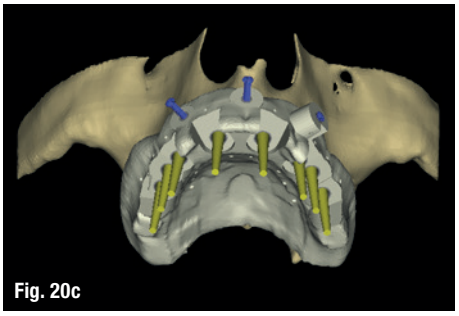


Fig. 20c

Figs. 20a–c: The template design revealing the guide tubes **(a)**; three blue fixation pins **(b)**; and the entire complex on the 3-D reconstructed volume **(c)**.

how powerful these interactive software tools can be (Figs. 19a & b). Once the final positions of the implants are confirmed for the edentulous presentation, a mucosal-supported template can be designed and fabricated through 3-D printing, stereolithography, or a CAD/CAM process. The mucosal-supported template should be fixated to the bone, to insure accuracy of the drilling sequence. The template with the blue screws can be visualized in Figures 20a–c.

Conclusion

The advent of complete denture fabrication evolved into the adoption of over-denture concepts for both natural and implant supported restorations. Conventional prosthodontic protocols were developed to aid in the diagnosis, treatment planning, and laboratory phase of the reconstruction. These included conventional periapical radiographs, panoramic radiographs, oral examination, and mounted, articulated study casts. The clinician was then expected to assess several important aspects of the patient's anatomical presentation including vertical dimension of occlusion, lip support, phonetics, smile line, overjet, overbite, ridge contours, and a basic understanding of the underlying bone structures. The accumulation of preliminary data afforded by conventional diagnostics provided a foundation to prepare a course of treatment for the patient. However, the conventional review of findings was based upon a two-dimensional assessment of the actual patient's bone anatomy. To fully understand each individual patient's presentation, this article provided clinicians with an appreciation of various innovative virtual, three-dimensional tools based upon the use of advanced three dimensional imaging modalities for both removable and fixed prosthetic treatment alternatives.

The application of CBCT and interactive treatment planning software, empowers clinicians with an accurate understanding of the three-dimensional anatomic reality for our patients as an aid in providing state-of-the-art treatment. Implants will be better positioned, with fewer surgical and restorative complications, and reduced laboratory remakes based upon these improved diagnostic tools. The benefits will enable clinicians to better understand the relationship between patient anatomy and the desired restorative outcomes, in the process of achieving true restorative driven implant reconstruction. The ability to utilize digital imaging and treatment planning technology is now within the reach of most clinicians through the various software products that are on the market. In addition there are many third party outlets through internet portals that enable clinicians to upload their DICOM data for evaluation, processing, treatment planning, and even surgical template fabrication without actually owning the planning software. New paradigms have been established that in the author's opinion will continue to redefine the process of diagnosis and treatment planning dental implant procedures, both removable and fixed alternatives for years to come. Please remember though that the "template is only as good as the plan".

About the author

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Dr Ganz delivers presentations worldwide on both the surgical and restorative phases of implant dentistry, and has published extensively on these topics. He is considered one of America's leading experts in the evolution of computer utilisation and interactive software for diagnostic and treatment planning applications using CT and newer-generation CBCT imaging modalities.

The indispensable use of CBCT in the posterior mandible

Author: Souheil Hussaini, Dubai

The submandibular fossa (SF) is an important anatomic landmark of the mandible, where the submandibular gland resides. During dental practice, particular attention is paid to SF when conducting the placement of dental implants and other surgical procedures. Any procedure undertaken has to be carried out with great care and attention in order to avoid perforation of this area. Anatomical variations of SF can occur, such as a deeply prominent and flat area with no depression. On very rare occasions, the mylohyoid ridge cannot be detected radiographically or bimanually as the observation of this variation is not always possible using a conventional radiograph. However, as a modern imaging resource, cone beam computed tomography (CBCT) allows an accurate three-dimensional assessment of SF as well as the identification of its degree of concavity.

The aim of this article is to discuss the successful circumvention of SF as a result of CBCT images taken during the treatment of a 65-year-old non-smoking, healthy male. Primary implant stability required an implant length longer than the previously failed implant. A stable insertion of the implant between SF and the inferior alveolar nerve (IAN) was made possible by utilising CBCT. The patient presented no sensorial disturbance in the region and the treatment was considered successful 14 months after restoration.

Furthermore, this clinical case demonstrates the importance of 3-D imaging and its clinical necessity, as it enables the practitioner to reach a definitive diagnosis during treatment planning in spite of the patient's misleading complaint.

The submandibular fovea (or submandibular fossa or submaxillary fovea) is an impression on the medial side of the body of the mandible below the mylohyoid line. It is the location for the submandibular gland.[1] Mandibles with lingual concavity pose a potentially increased risk of lingual cortical perforation during surgery, particularly with an endosseous implant placement. Cross-sectional imaging provides excellent delineation of mandibular anatomy and gives important information on the depth of the submandibular gland fossa during preoperative assessment of the posterior mandible for dental implant fixture placement and other surgical procedures.[2,3] Radiographically, SF can be seen as an undefined ovoid radiolucent area in both the right and left sides of the mandible. Conventional radiographs widely used in dental practice, such as periapical and panoramic, provide a two-dimensional (2-D) image of a three-dimensional (3-D) structure.[4,5] For this reason, SF may not be clearly visible in most cases, due to the superimposition of anatomic landmarks;[5-8] the pattern of trabecular bone,[9] the thinning of the mandible as well as the location below the mylohyoid line.[5-7]

Nowadays, CBCT represents an advanced technology in dental practice. This technology allows an accurate three-dimensional (3-D) evaluation of osseous structures in the maxillofacial region and makes it possible to assess SF in sagittal, axial, and coronal slices and to obtain detailed information concerning this anatomic landmark.[5,7,8,10] The importance of SF in dental practice, especially for dental implant placements and other surgical procedures in mandibular molar regions, is highlighted by the literature on this subject.[2,3] The detection of SF location and depth is important in order to avoid perforation, haemorrhage or asphyxia due to difficulty in breathing following suffocation.[11] In addition, an effective diagnostic radiographic technique of SF enables the practitioner to place an

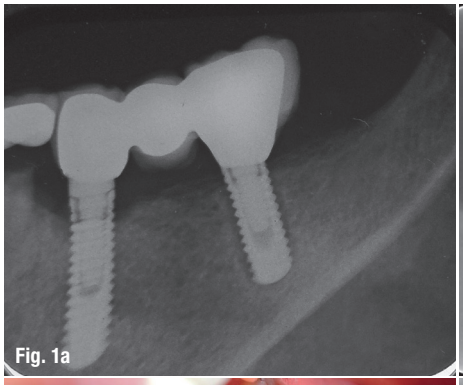


Fig. 1a

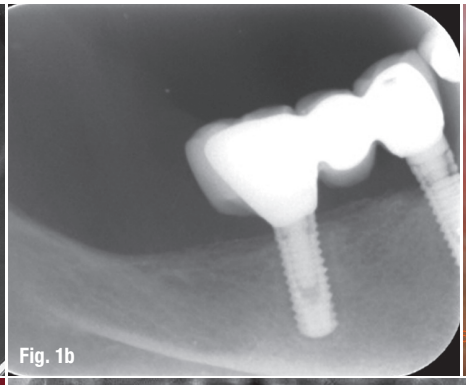


Fig. 1b

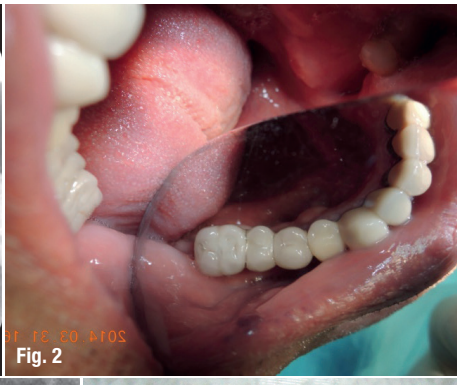


Fig. 2

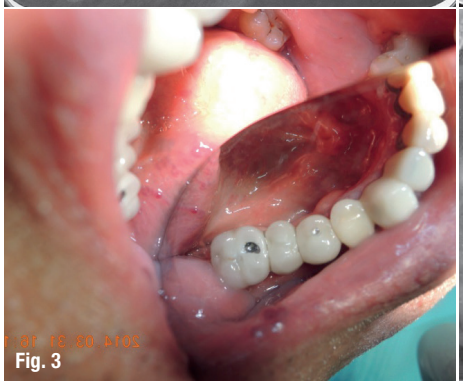


Fig. 3

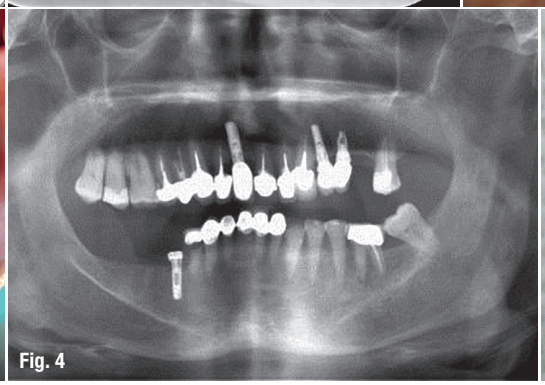


Fig. 4

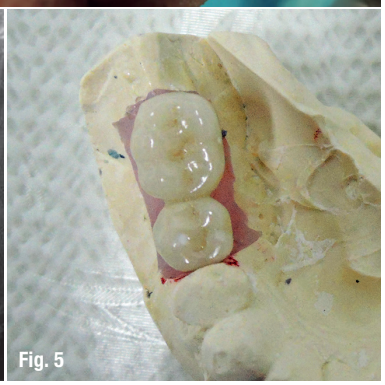


Fig. 5

implant between SF and the inferior alveolar nerve (IAN).[2,3,5–7,9,10]

Case

This article discusses the unexpected findings that continuously emerged throughout the treatment process due to the absence of CBCT imaging in the initial phase of diagnosis, as well as the insufficiency of panoramic radiographic images in that clinical situation.

The patient's initial situation was characterised by a lose three-unit fixed partial denture, 45 implant supported, 46 pontic and 47 implant supported. Initially, the patient opposed the use of a radiograph and, as a consequence, the need for implant extraction was misdiagnosed. Eventually, in order to complete the extraction, all three types of common radiography techniques—periapical, panoramic and CBCT5—were needed and applied.[5,7,10]

The main complaint of the 65-year-old non-smoking male with no medical history or use of medication was "my bridge is moving and requires re-cementing". During an emergency appointment, the patient enquired about the costs for the re-cementing of a three-unit bridge. The patient presented a six-month-old periapical radiograph (Figs. 1a) while declining to take any further X-rays for a simple bridge re-cementing procedure. According to the patient, the implants were placed five years ago and without incision by a now-retired dentist who could no longer be contacted. After analysing the radiograph and making a clinical assessment, the provisional diagnosis showed that the bridge was moving due to an abutment screw loosening (Fig. 2). The resulting treatment plan called for the removal of the three-unit bridge and the re-tightening of the abutment screw to the manufacturers recommended preload as well as the re-cementing of the bridge (plan A).

The patient approved the suggested procedures and signed the treatment plan. The bridge was found to be firmly attached to the anterior implant and loosely connected to the posterior one. The existing bridge had to be cut out and replaced by a new three-unit bridge (plan B). A small opening of the screw access hole was attempted on both implant restorations 45 and 47 (Fig. 3). Although the access hole did not lead to the abutment screw, the bridge mobility was increased. A periapical radiograph was obtained to evaluate the peri-implant status of the posterior implant (Fig. 1b). The radiolucency observed around the fixture indicated implant failure and the crown in the anterior implant had to be sacrificed in order to get to its abutment safely. At this stage (plan C), the procedures were set out as follows: removal of the posterior implant followed by a re-implant, a new temporary crown on tooth 45 and, after two months, fitting of a two-unit bridge instead of the previous three-unit bridge restoration. This deci-

Fig. 1a: Periapical radiograph.
Fig. 1b: Digital periapical radiograph.
Fig. 2: Occlusal view of the bridge.
Fig. 3: Occlusal view after attempting to get to the abutment.
Fig. 4: Panoramic radiograph, diagnosis.
Fig. 5: Occlusal view of PFM bridge.

Fig. 6: Re-implant placed flapless.
Fig. 7: Panoramic radiograph, restoration

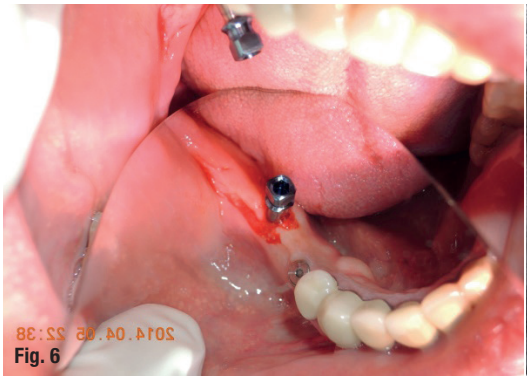


Fig. 6

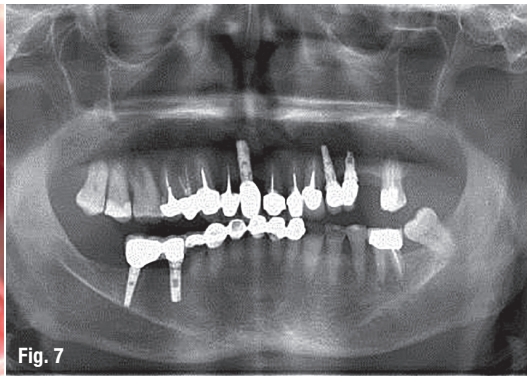


Fig. 7

sion resulted from the fact that the mesio-distal length of the bridge required to accommodate three teeth was 18 mm and not 21 mm.

The height of the extracted implant and the available bone was 8 mm when the panoramic image was evaluated (Fig. 4). As the available diagnosis information did not provide data regarding the desired diameter and angulation of the implant to be placed, the patient's consent for CBCT (plan D) was obtained and added to the contractual treatment plan. Only then, the radiograph of the molar region of the right mandible was performed. CBCT (Planmeca ProMax 3D s, Planmeca Oy, Helsinki, Finland, Table 1) and the measurements in millimeters of the bone height and angulation using tools of the Planmeca software (Romexis 2.5.1.R), in the most representative CBCT transversal slice demonstrated the possibility of placing a 13 mm implant (853213 – 3.2mmD, 13mmL Implant Direct Legacy3, Implant Direct, CA, USA) with 35 degree lingual angulation to avoid SF (Fig. 5).

Treatment timeline

The timeline detailing the entire treatment was as follows:

- 31 March 2014 Diagnosis and treatment planning
- 2 April 2014 quality control (QC) phone call with no patient response, possibly due to disappointment over many changes in treatment plan
- 6 April 2014 implant placement 3.2 x 13 mm implant direct (Fig. 6),
- 15 April 2014 QC with positive response,
- 14 June 2014 uncovering and impression using open tray technique,
- 17 June 2014 QC with positive response,
- 21 June 2014 prosthesis 2 unit bridge PFM cemented with Temp Bond (Fig. 7),
- post-operative one-year maintenance visit on 10 August 2015 showed healthy functional results as recorded (Fig. 8).

Table 1: Technical data.

Anode voltage	60–90 kV
Anode current	1–14 mA
Focal spot	0.5 mm, fixed anode
Image detector	Flat panel
Image acquisition	Single 200 degree rotation
Scan time	7.5–27 s
Reconstruction time	2–25 s

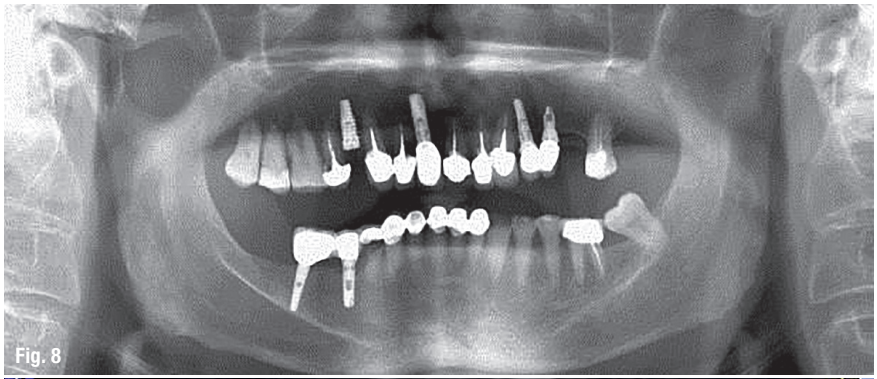
Analysis of patient images

1. Axial CBCT slice in which the angle required (35 degree) to bypass SF corresponding to longest necessary length (13 mm) and diameter (3.2 mm) was measured (Fig. 9).
2. Coronal CBCT slice in which the openings corresponding to the lingual 1.9 mm and buccal 2.5 mm bone thickness, was measured respectively (Fig. 10).
3. Transversal CBCT image from lingual wall demonstrating the severe SF depression (Fig. 11).
4. Axial CBCT slice shows the height of the extraction socket as 8 mm (Fig. 12).

Panoramic radiography, in which images of the right and the left inferior alveolar nerves are clearly seen below the opaque mylohyoid line, demonstrate that the right and the left SFs are seen as clear radiolucent areas, with the IAN giving the illusion of sufficient length to place a regular size implant.

Discussion

The use of a wider diameter implant with the same height was the alternative solution if CBCT was not available. CBCT occlusal images (Fig. 10) indicated that a wider implant diameter would have destroyed the lingual plate of the bone in that area.[12] The surgery was performed without raising



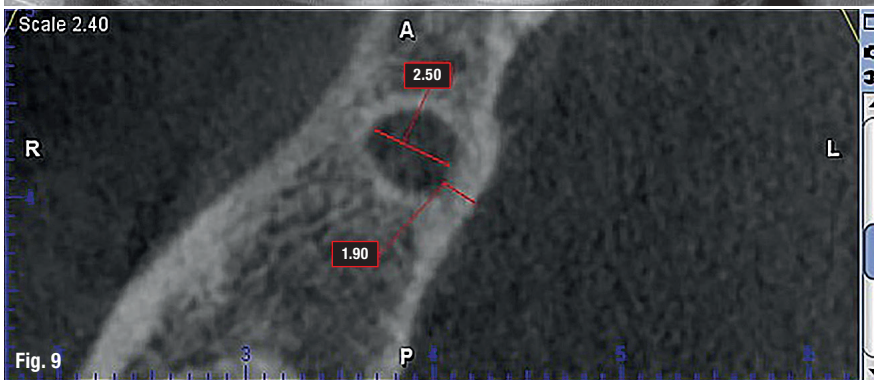


Fig. 8: Panoramic radiograph, one-year post-op.
Fig. 9: Bone width lingual wall 1.9 mm and buccal 2.5 mm.

a flap for better post-operative healing.[13] Traditionally, we do not require CBCT images for a single implant placement.[14] However, this case signifies the importance of 3-D imaging in certain situations like deep SF (Fig. 11).

When the bone width is narrow, periosteal elevation is recommended to be able to safely observe the osteotomic drills as they reach to the final depth. This procedure is only advised when a panoramic image is the only diagnostic tool we have as it adversely causes further bone loss during the healing phase.[13] In the present case, no periosteal elevation was performed (Fig. 6) and the patient did not have post-operative pain and swelling.

CBCT is a modern technology, which allows the three-dimensional evaluation (sagittal, axial and coronal) of maxillofacial structures. Among its many advantages are the absence of superimposition of structures in obtained slices, acquisition of a 3-D reconstruction (spatial vision for illustrative purpose), as well as the use of lower radiation doses in comparison to medical CT.[15–17] SF location, size, shape and its possible variations can be fully assessed by CBCT.[2,3,18–22] Due to the limitations of periapical and panoramic techniques, the radiographic assessment of SF is not always available. Jacobs et al. reported that SF was detected in 94% of their assessed panoramic radiographs, but only 49% of those were clearly visible.[23–25] Therefore, it can be reasonably concluded that the lack of observation of SF in conventional radiograph does not prove its actual absence.

In our reported case, we were able to evaluate the mandible of the patients in 3-D and here SFs were actually deeply prominent and hypoplastic. Also, it was impossible to perform the surgery without 3-D imaging. A preoperative imaging study is important prior to any surgical procedure in the posterior mandibular region.[2,8] CBCT can be very helpful for the detection of SF variations that could be otherwise missed using conventional radiographic examination techniques.[2,5,7,10] In the present case, the diagnosis of the anatomic limitation was possible to be visualised due to CBCT examination. Furthermore, the accurate measurements of SF and the vision of 3-D spatial reconstructions, which are exclusive tools of

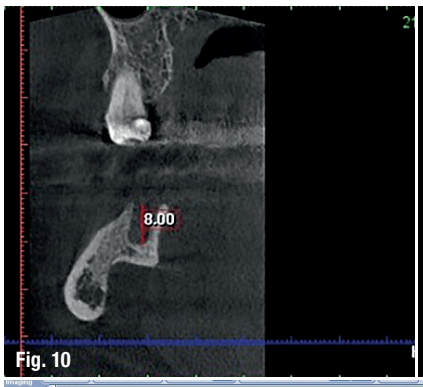


Fig. 10

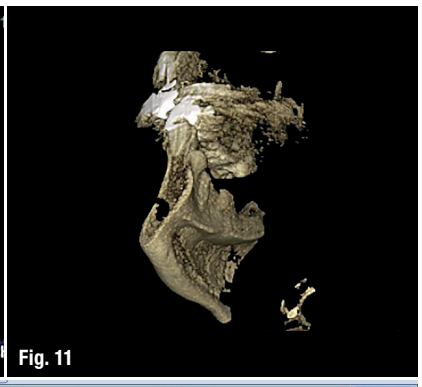


Fig. 11

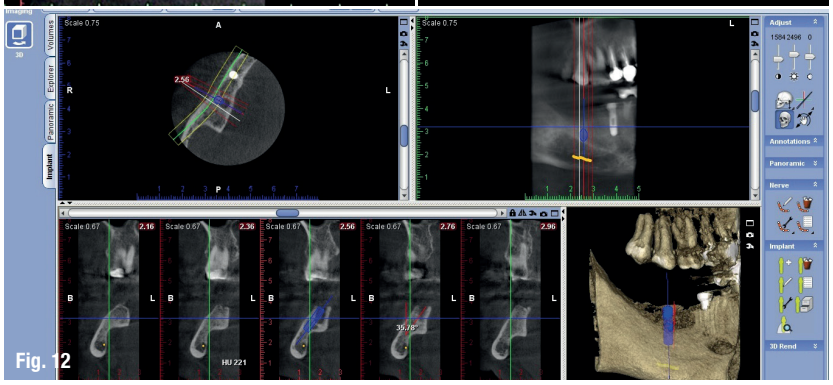


Fig. 12

Fig. 10: Axial CBCT slice demonstrates the height of the extraction socket is 8 mm
Fig. 11: Deep SF.
Fig. 12: CBCT images providing a virtual implant position and angulation.

computed tomography technology, bring advances to the study of the anatomic landmarks. Several authors emphasise how implant placement has been improved by using preoperative CTs for the success of surgical treatments. Precise 3-D visualisation of the edentulous area and consequently the insertion of the implant can be obtained through the use of CBCT imaging, facilitating computer-assisted planning of oral implant surgery.[6,10,21,26]

Even though, the technology of cone beam computed tomography is rapidly improving, the benefits of a CBCT investigation must outweigh any potential risks.[4,5,27,28]

Based on one hundred spiral computed tomographic (CT) preoperative examinations of patients requiring assessment of the lower jaw, before implant placement samples, Parnia F et al. classified the depth of the submandibular gland fossa as a function of the lingual concavity depth over a range of up to a maximum value of 6.6 mm.[2] Mandibular lingual concavity depth was divided into three groups. A lingual concavity (depth ≥ 2 mm) was observed in 80 % of the jaws. In 20 % of the cases, there were flat depressions less than 2 mm in depth (Type I) and in 52 % of the cases the concavities were two to three mm deep (Type II). About 28 % of the examined regions showed significant concavities of more than three mm (Type III). The obtained distribution did not reveal any dependence on age and gender of the patients examined in this study (P > .05). Kobayashi et al. found that measurement errors ranged from 0 to 1.11 mm (0 % to 6.9 %) on CT and from 0.01 to 0.65 mm (0.1 % to 5.2 %) on CBCT, with measurement errors of 2.2 % and 1.4 %, respectively (P .0001).[29] Based on those results, this study suggests that distance can be measured accurately by using CBCT. Lascala et al. concluded in their study that, although CBCT image underestimates the actual distances between skull sites, differences are only significant for the skull base and therefore it is reliable for linear evaluation measurements of other structures more closely associated with dentomaxillofacial imaging.[30]

According to Chan HL et al. the incidence of lingual plate perforation during implant placement is predicted to be 1.1 % to 1.2 % and will most likely happen in type-U ridge.[3]

Conclusion

Images acquired using two-dimension (height and width) radiography cannot reveal valuable information in third-dimension (depth). This fact limits its use. In certain situations, for example deep SF for implant selection, three-dimensional visualisation of the anatomical limitation is desirable. In those circumstances, three-dimensional imaging provided by CBCT is extremely valuable. In comparison to panoramic radiograph, the use of CBCT can greatly improve the visualisation leading to a more definitive diagnosis and the best possible treatment plan._

The author declares no conflict of interest.

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

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PRIME MOVER IN IMPLANTOLOGY

Automatic crestal sinus lift by motorised impaction device

Authors: Dr Georges Khoury & Dr Marc Revise, France

Introduction

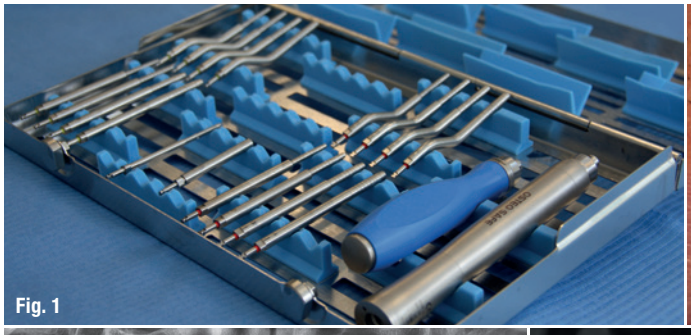
Implant placement on the upper jaw is often confronted with insufficient bone linked to the physiological pneumatisation of the maxillary sinuses at molar sites. Sinus lift is frequent, which may or may not be linked to the contribution of biomaterials. In this clinical case we consider the use of a new automatic device: Osteo Safe® (Anthogyr). It is an instrument that facilitates axial lifting by means of a motorised handpiece, associated with straight impaction inserts or bayonets (Fig. 1).

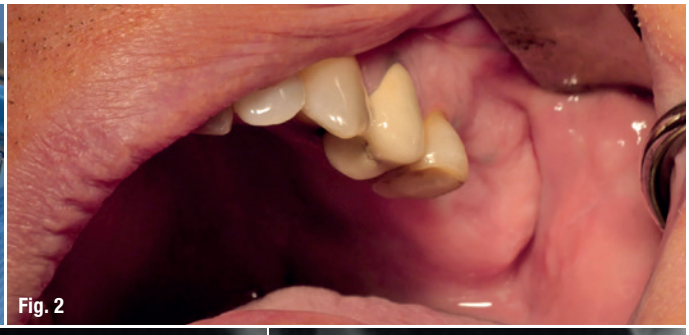
Case report

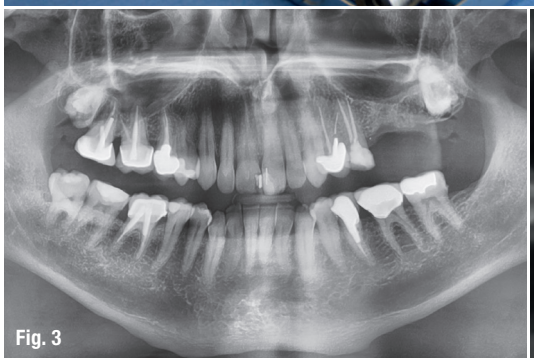
The patient undergoing treatment is 56 years of age. He presents with hypercholesterolemia that is being treated with statins, as well as an allergy to penicillin. The treatment site in section 2 (Fig. 2) presents (Fig. 3) an additional wisdom tooth on radiological examination, ankylosed with a resorption process of its structure. No symptomatology is observed and there is no communication with the buccal environment. Its intrasinusal emergence could potentially be at risk during an extensive filling by lateral means. Owing to the crestal approach and the limited and localised increase at the apex of implants, it was decided to leave it *in situ*.

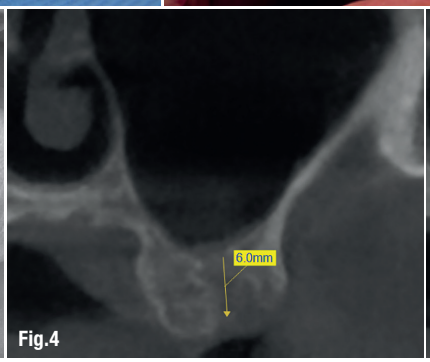
The cone beam shows a bone height of 6 mm measured at sites 26 and 27 (Figs. 4 & 5). Conventional premedication is prescribed (antibiotic therapy + corticotherapy flash + level-one anal-

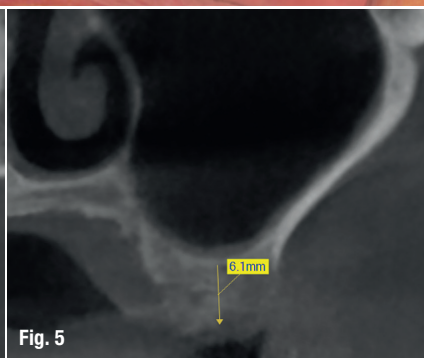
Fig. 1: Osteo Safe® Kit.
Fig. 2: Preoperative clinical view.
Fig. 3: Preoperative panoramic view.
Figs. 4 & 5: Preoperative subsinus height at 26–27.

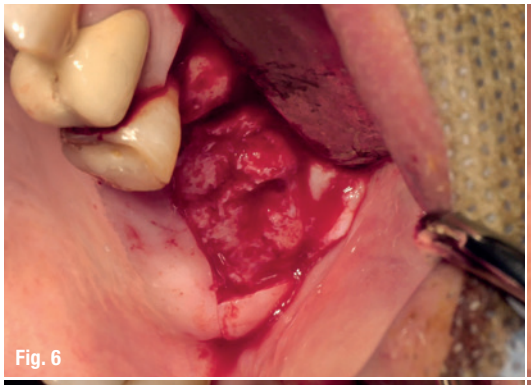








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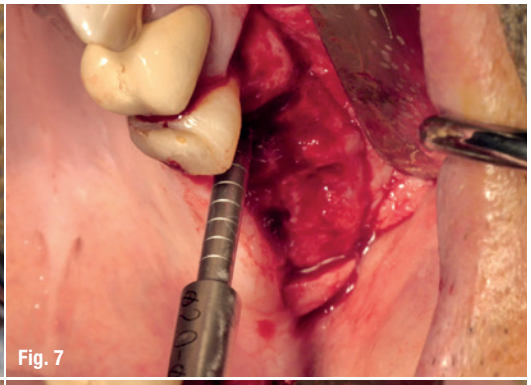
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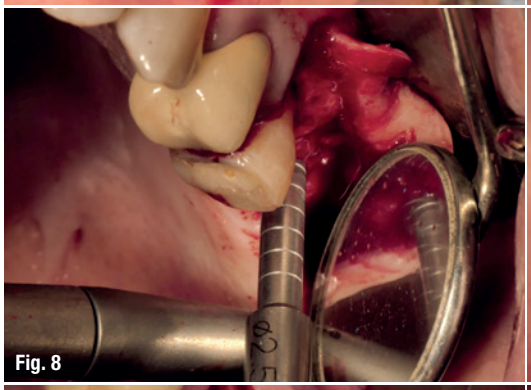
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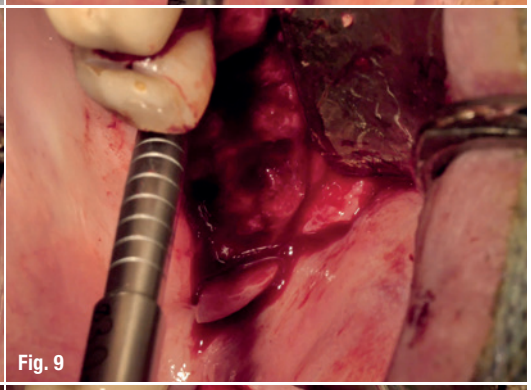
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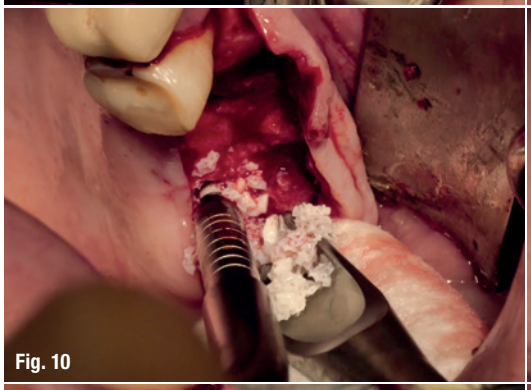
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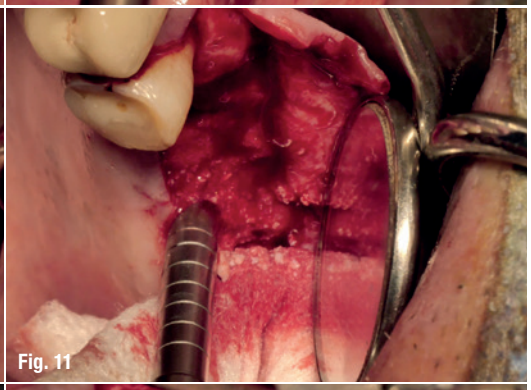
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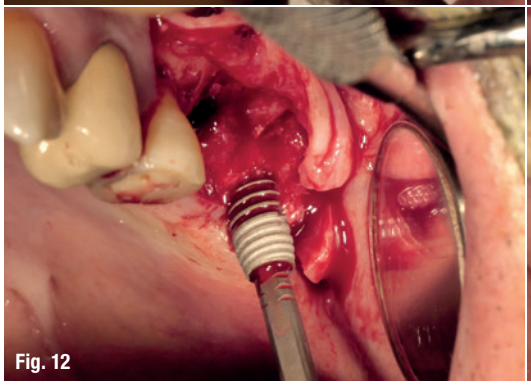
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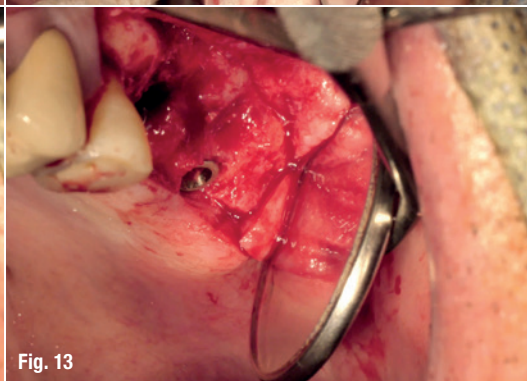


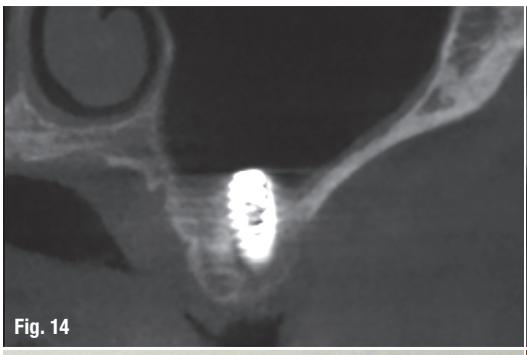
Fig. 13

Fig. 6: Open-flap view.
Fig. 7: 1st Osteo Safe® insert (diameter 2.0–2.8 mm).
Fig. 8: 2nd Osteo Safe® insert (diameter 2.5–3.3 mm).
Fig. 9: 3rd Osteo Safe® insert (diameter 3.0–3.9 mm).
Fig. 10: Biomaterial filler.
Fig. 11: Lifting the membrane by condensation.
Fig. 12: Implant placement.
Fig. 13: Implant in place.

gesic + mouthwash). A thick skin flap is indicated (Fig. 6). The molar sites are indexed and mechanised osteotomes of increasing diameters are used to widen the sites and the fracture of the sinusal floor (Figs. 7, 8 & 9). A biomaterial is used in order to lift the membrane by condensation (Figs. 10 & 11).

The osteotomies must not penetrate the sinusal cavity and in this case must not exceed 5 mm of insertion. This dimension corresponds to 6 mm measured initially, minus 1 mm for safety. The volume of material inserted depends on the gain that is required, namely for a gain of 4 mm, around 0.5 cc per implant site in this particular case. Implants with dimensions of 4.6/10 mm are inserted at sites 26 and 27, while maintaining the bleeding on contact with the implant (Figs. 12 & 13). Hydrophilia of the implant surface must be noted.

Figs. 14 & 15: Stable bone volume at the implant apex in 26–27.
Fig. 16: Simeda customised abutments.
Fig. 17: Customised abutments in the patient mouth.
Fig. 18: X-ray control of the customised abutments.
Fig. 19: Ceramo-metallic crowns.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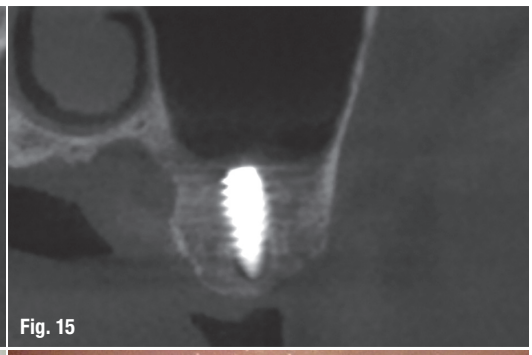


Fig. 15


Fig. 16

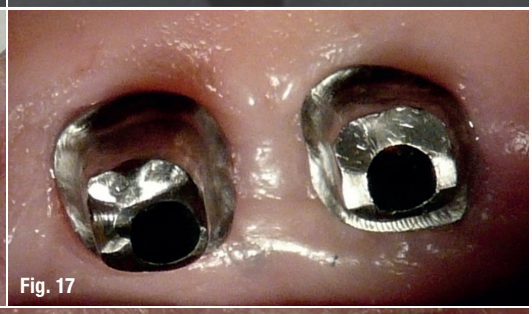
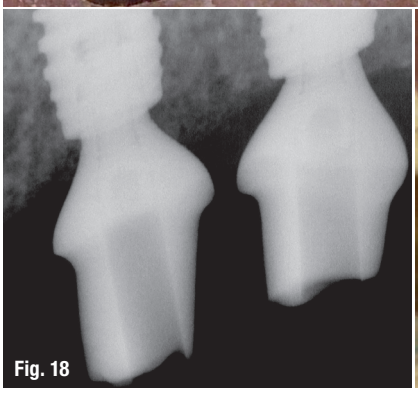


Fig. 17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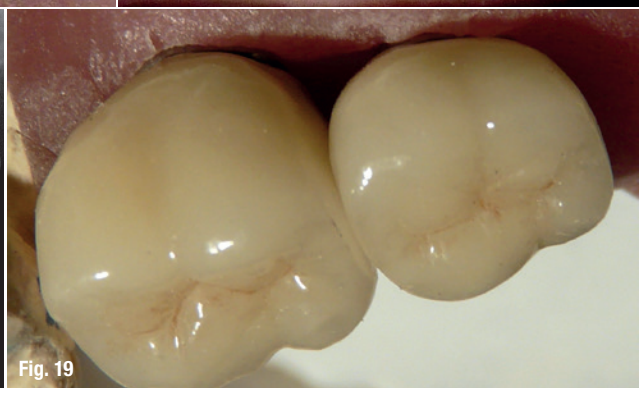
Fig. 19

Postoperative effects are moderate and the pain is contained by level-one analgesics (Paracetamol); the symptoms abated within 48 hours. The X-ray controls every four months show stabilised bone volume at the apexes of the implants (Figs. 14 & 15).

The patient is then given an appointment to take impressions. Two short pop-in transfers and a closed impression holder were used, with the aim of inserting two separate crowns. A retroalveolar control X-ray was taken, although there was no doubt about the correct positioning of the transfers.

Two customised abutments (made by Simeda, Anthogyr) with a juxtagingival homothetic preparation (Fig. 16) were ordered. The prosthodontist, Christophe Gigandet, made two single ceramo-metallic crowns with non-precious metal frameworks (Fig. 19). The abutments were placed in the patient's mouth and adjusted with strict adherence to the gingival contour (Fig. 17).

An X-ray was taken to check how well the structures had adapted (Fig. 18). The points of contact and the occlusion were examined. After filling the access cavities of the abutments, the crowns were sealed with glass ionomer cement (GC FujiCEM 2). The juxtagingival limits facilitate an easy and complete cleaning of the cement excess.

Conclusion

The Osteo Safe® mechanised procedure enables better control of the power of impacts in these crestal sinus lift indications. This system significantly reduces the learning curve as a result of the regularity of the impacts at constant power (non-operator dependent).

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46TH DGZI INTERNATIONAL ANNUAL CONGRESS
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For a healthy start, always use a new healing abutment

Authors: Dr Chandur Wadhwani & Steve Hurson, USA

Material in contact with the soft tissues affects the quality of the mucosal attachment. Healing of the soft tissue in the oral cavity has been under thoughtful study recently. In the article below, the authors explain the significant influence the healing abutment has on that process.

The healing cap protects the internal aspects of the implant from debris accumulations and serves as the initial transmucosal connection between the external environment and the inner parts of the human body. As a bacteriological barrier with a tight connection between the epithelium and implant component, it helps to prevent infection, crestal bone loss and soft tissue recession, all of which are crucial for long-term success.

Two-zone barrier

The soft tissue barrier that contacts the standard titanium healing abutment consists of two zones: a marginal zone consisting of junctional epithelium and a deeper apical zone comprised of a fibre-rich connective tissue. It has been shown that the properties of the material placed in contact with the soft tissues have a decisive influence on the quality of the mucosal attachment. Chemical composition and surface topography of the abutment material


Fig. 1


Fig. 2

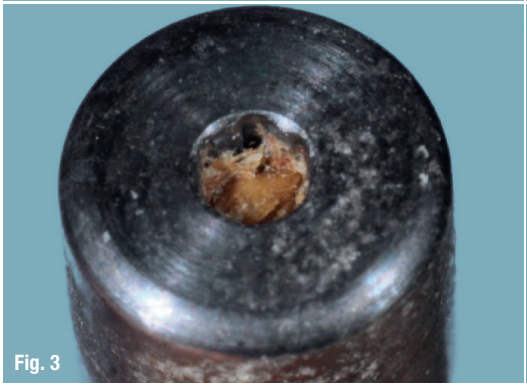


Fig. 3

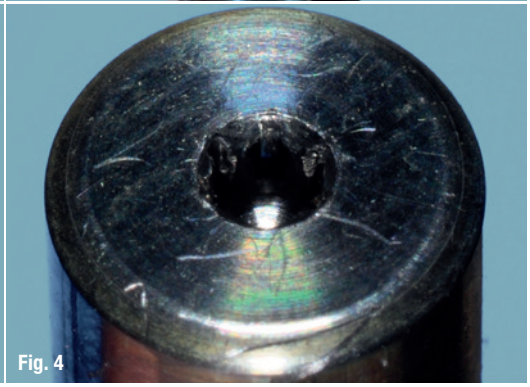
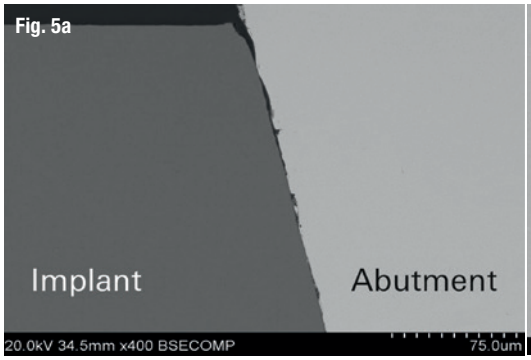


Fig. 4

Fig. 1: Healing abutment (left) was placed in an ultrasonic bath for ten minutes, then autoclaved. However, since proper cleaning was not achieved, sterilisation was not possible. A new healing abutment can be seen on the right.
Fig. 2: The screw thread may contain bio-burden after it has been removed.
Fig. 3: Debris often packs very tightly into the area of the screw head. Physical removal is often achieved at the expense of damage to the site.
Fig. 4: Repeated use of the star driver has rounded the engaging part of the screw.



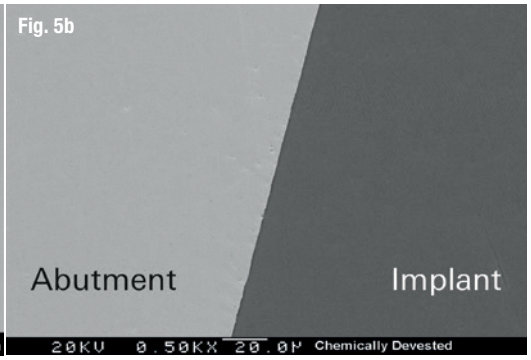


Fig. 5: Scanning electron microscopy images of conical connection at 500x magnification (**a**–to the left). The effect of air particle abrasion cleaning on the fitting surface of an implant abutment is clearly evident (**b**–to the right). The implant-abutment interface with a new, clean abutment surface for comparison.

play a role in tissue recession and prevention of crestal bone loss. The ability of the cells to attach and spread is dependent upon surface hydrophilicity (wettability) and "lack" of surface contamination. Although designed and labelled for single use, some clinicians advocate re-using—or "recycling"—healing abutments from one patient to the next for purely economic reasons. A breach of manufacturer guidelines, this is not a wise choice.

Five reasons why healing abutments are for single use only

1. According to Nobel Biocare guidelines, the company's healing abutments should each only be used once. The argument against re-using a healing abutment is evident in the images above (Fig. 1). No matter the method used—steam or chemical autoclave, ultra-violet light, or ethylene oxide—sterilisation can never completely recreate the pristine surface of the original abutment.
2. Re-using a healing abutment labelled for single use may seriously degrade the performance of the product. Sterilisation with a steam autoclave, chemical autoclave, lasers or ethylene oxide may alter the composition of the titanium surface, negatively affecting cells. Physical surface topography changes the titanium wettability, which interferes with the epithelium and fibroblast cells' ability to attach and spread. This effect is quite different from that of a new (i.e. not previously used) healing abutment.
3. New screw threads are vital for consistently favourable results. The screw thread component of the healing abutment may also contain bio-burden after it has been removed, and a screw thread is by far the most difficult part of the healing abutment to clean (Fig. 2). Although not in direct contact with healing tissue, studies have confirmed contamination and wear affect the screw thread and may result in damage within the implant. Contamination can also lead to healing abutments "locking" onto the implant. This is an extreme issue and has been known to result in the implant being reverse-torqued out of the bone in attempts to unscrew the abutment.
4. The screwdriver may not properly engage a re-used healing abutment. Very difficult-to-remove debris (Fig. 3) may clog the screwdriver insertion site. It should be noted that ultrasonic baths are not likely to get rid of this tightly packed material. Also, with repeated use, the screw head itself can become mechanically damaged. Case reports in the literature report that such damage—unnecessary if you follow the manufacturer's single-use guidelines—makes healing abutment retrieval problematic (Fig. 4).
5. Mechanical cleaning of a previously used abutment—especially via air particle abrasion—can damage the abutment/implant connection, thus reducing its sealing capacity and altering the component connection (Figs. 5a & b). Studies have also reported abrasive impregnation into the softer titanium, resulting in metal contamination.

A potentially costly risk

Take these five points under careful consideration and you will find that the potential monetary savings of re-using a healing abutment a second time do not outweigh the known and potential health risks to the patient. In short: in order to provide patients with the greatest chance of soft tissue attachment, minimised inflammation and the prevention of possible recession—and to give the bone a healthy start—always use a clean new healing abutment!

Editorial note: Full references for this article are available online at nobelbiocare.com/news.

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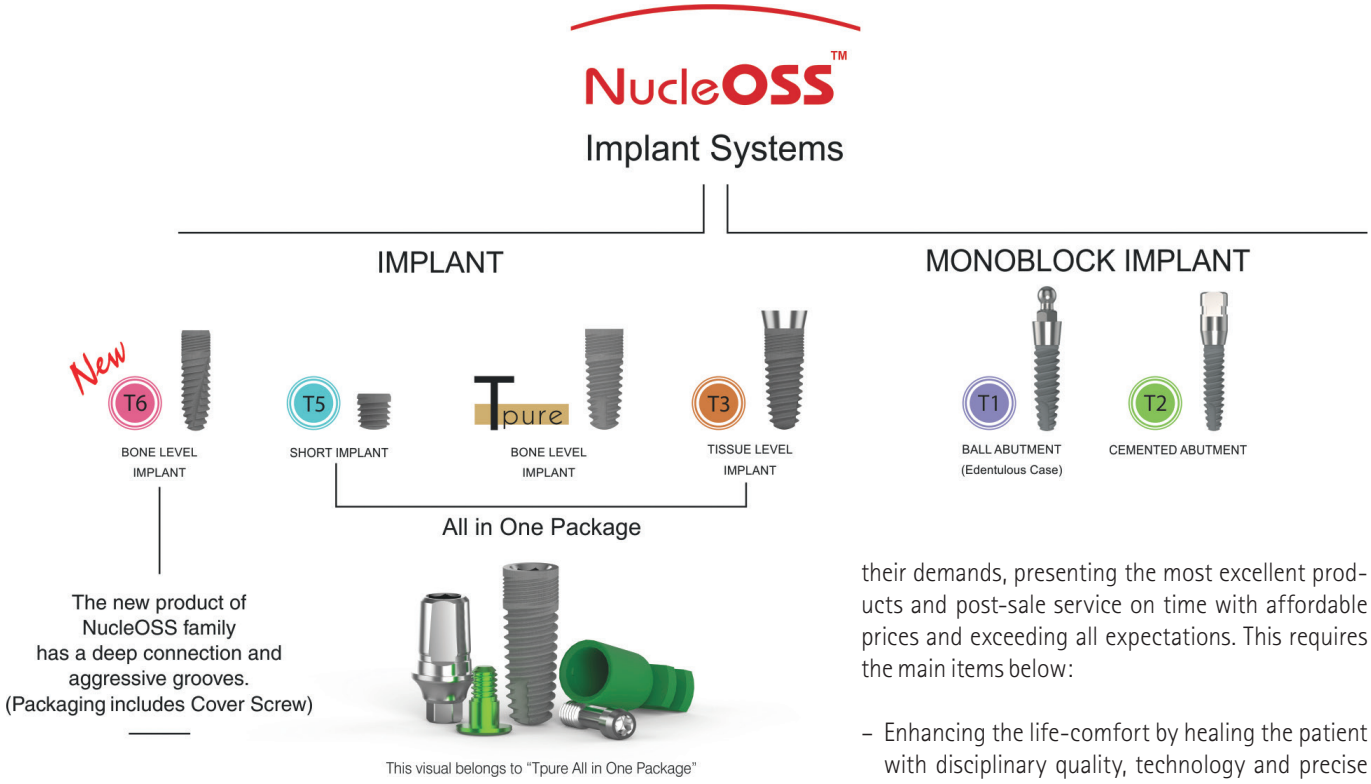
Introducing NucleOSS



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On the purpose of improving the quality of the surgery and providing more comfortable treatments, we design, develop and present well-qualified and innovative products. We share knowledge, experiments and researches with practitioners and academicians through TFI Academy in order to lift effectiveness of ongoing R&D studies.

As NucleOSS, we embrace a well-qualified, confidential and customer-oriented production with a visible, ethical and principled management. In the light of this, we work more and more as the primary requirement of progression and development within the scope of our innovative and open-minded approach.

By means of our management perspective, which primarily values the human, we design new products, change continuously and develop.

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- Being a pioneer company which brings innovations to the country by following the sector and technological developments
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manufacturer news

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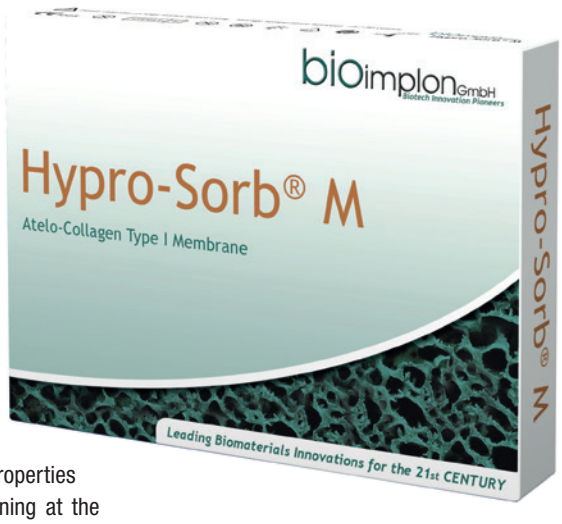

Bioimplon's research team and global opinion leaders in the dental field have collaborated in designing a semi-rigid membrane with excellent material properties and perfect handling characteristics. The 0.3 mm thick membrane with its rough and smooth sides is tear resistant and hydrophilic. These properties allow perfect adherence and positioning at the wound site. The membrane has a sufficiently long barrier function and is naturally bioresorbed within six months.

Hypro-Sorb® M is made of 99.9 per cent Atelo-Collagen Type I, a modified collagen where immunogenic telopeptides have been biochemically eliminated. The Atelo-Collagen ensures highest degree of biocompatibility, a mild bacteriostatic effect and good tolerance by human tissue.

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MIS Implants

3rd Global Conference announced

MIS Implants, a leading global manufacturer of dental implant technology, will host its third global conference on May 26–28, 2016 in Barcelona, Spain. This year's theme is "VCONCEPT: Set the Volume of Bone & Soft Tissue", focussing around MIS's newly released V3 Implant System, which is an innovative design that minimises bone loss, accelerates new bone growth and quickens implant integration.

Calling Young Dentists

Also, the conference will host a special Young Clinician Session, where young dentists (up to 40 years of age) will present clinical cases focusing on "Challenging Situations in Implantology". The top two ranked cases will be awarded a Master Clinic Session with Dr Eric Van Doreen or Professor Stefen Koubi along with airfare and accommodations to the conference in Barcelona. The conference isn't all work and no play. MIS is known for its top class entertainment and hospitality. To learn more about the event and what it has to offer, visit www.mis-events.com/Barcelona.

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The main advantage of Exo Safe is the preservation of bone integrity. It thus allows the practitioner to avoid reconstructions and/or grafts, and facilitates the placement of a post-extraction implant. Exo Safe helps the mobilisation of the tooth as the periotome makes it easy to search for root the fulcrum for elevation and then extraction.
This ergonomic instrument is held in one hand, which makes the handling in the mouth easier and improves intra-operative visibility. Constant impactions with regular intensity facilitate the gradual enlargement of the desmodontal space. They create less trauma than the traditional manual technique. Thus, Exo Safe improves the practitioner's dexterity and leads to greater acceptance of the treatment by the patient.

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COMFOUR™ is CAMLOG's new system for occlusally screw-retained restorations in edentulous or partially edentulous jaws. In addition to occlusally screw-retained bridges for immediate and delayed restorations, the multi-optional system also permits bar and single-tooth restorations on straight and angled bar abutments. All components are of delicate and compact design, which simplifies prosthetic restorations considerably for dentists and dental technicians and increases the wear comfort for patients. COMFOUR™ is time-saving and flexible in use. With its versatility, the system extends the prosthetic options at abutment level and has a number of technical advantages such as its antirotational mechanism and the Guide-compatible aligning tool. The M1.6 prosthetic screw of the COMFOUR™ System offers extra stability. Useful additional components are the titanium caps for both temporary and definitive restorations. The scan caps for bar abutments create an interface in digital fabrication. This allows frameworks and bars to be fabricated via CAD/CAM solutions.

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Where innovation comes to life

Source: Nobel Biocare

World-class speakers, hands-on instruction, master classes, forums and social networking opportunities, all in the heart of one of the greatest cities in the world. Between 23 and 26 June 2016, the fabled Waldorf Astoria in Manhattan will be hosting the Nobel Biocare Global Symposium under the banner "Where innovation comes to life."

Four days of learning

The symposium's four-day program will be based on three main themes: refining and enhancing treatment, digital dentistry and achieving clinical excellence in challenging situations. Each theme has a complete schedule of its own, including lectures, master classes and practical sessions. Should attendees choose to follow only one theme, the symposium schedule allows them to be a part of every related session. If, on the other hand, delegates would like to pick and choose between the different themes and attend individual sessions of special interest in several (or all) of the themes, Nobel Biocare gives them the opportunity to design their own learning program.

In addition to a theme-related agenda intertwined with independent study opportunities, the company is arranging a compelling array of forums, including an innovation assembly and a full-day compromised patient forum. Other forums will cover the company's Partnering for Life program, through which Nobel Biocare helps dental professionals achieve their goals, the All-on-4 treatment concept and the dental laboratory workflow. A new generation of dental professionals will also have their own platform at the event's NEXT GEN forum.

Getting to know each other

After a busy first day of lectures, master classes and hands-on sessions, a welcome cocktail on 23 June will provide the perfect opportunity to unwind and network with colleagues from around the world. Attendees will be able to raise a glass, enjoy some food and see a display of innovative Nobel Biocare products in the beautiful, historical setting of the Waldorf Astoria. On the evening of 24 June, Nobel Biocare will be hosting the symposium's reception off-site at an exciting venue, yet to be revealed. It is set to be an evening to remember with an inspiring blend of diversion and education.

By popular demand

The Scientific Chairmen for the Nobel Biocare Global Symposium are Drs. Peter Wöhrle from the U.S. and Bertil Friberg from Sweden. They recently announced that—for the first time at a Nobel Biocare dental event—registered attendees will be able to have a direct impact on the program by voting for various topics and speakers on the event's website. The results will be revealed a few weeks before the symposium.

With world-class lecturers and thousands of dental professionals from around the world exploring the future of dental implants together, the 2016 Nobel Biocare Global Symposium promises to be an incomparable experience for everyone involved. Registration for the symposium is open at www.nobelbiocare.com/global-symposium-2016_

Membership Application Form

IM 1/16

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) ⇨ 125 Euro p.a.
○ **Assistant doctors** (outside Germany) ⇨ 60 Euro p.a.
○ **Students/auxiliaries** (outside Germany) ⇨ 60 Euro p.a.

○ I have transferred the annual fee to the DGZI bank account c/o Dr Rolf Vollmer:
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Please complete this application form in block letters.

FOR FURTHER INFORMATION PLEASE CONTACT

DGZI Deutsche Gesellschaft für Zahnärztliche Implantologie e.V.

Deutsche Gesellschaft für Zahnärztliche Implantologie e.V.
Central Office: Paulusstraße 1, 40237 Düsseldorf, Germany
Phone: +49 211 16970-77 | FAX: +49 211 16970-66 | office@dgzi-info.de | www.dgzi.de

Further Education at the

DGZI International Annual Congress in Munich

As the most traditional European society for dental implantology, DGZI is going to hold its 46th Annual Congress in Munich, Germany. Renowned speakers from Germany and abroad, representatives of associated societies and, of course, participants from Europe, the USA, Asia and the Arabic countries will once more contribute to and profit from an exceptional further-education event. This year, the congress will take place parallel to the annual congress of the German Society for Laser Dentistry (DGL), the Munich Forum of Innovative Implantolgy and the Oral Hygiene Day, resulting in additional pools of information for our participants.

The congress aims at providing first-rank, practice-oriented further education and building a bridge to the latest scientific findings via introducing industrial innovations and their implementation in the daily practice. Lectures will cover the complete spectrum of modern implantology, furthermore illustrating significant interfaces with other relevant areas of expertise. The congress programme is completed by workshops by manufacturers of implants, membranes and bone substitutes as well as separate topics on the dental assistance in implantology.
As the congress will be held on the Octoberfest's final weekend, all interested colleagues are encouraged to plan their participation in time.

Source: DGZI e.V.

Hans Geiselhöringer appointed

President of Nobel Biocare

As of January 1, Hans Geiselhöringer has taken over as President of Nobel Biocare. The appointment was made to strengthen the organisation around its strategic goals. Since 2011 Hans Geiselhöringer has served as Executive Vice President of Global Research, Products and Development, shaping a highly competitive product and innovation pipeline. Prior to that he was Executive Vice President Global Marketing and Products from 2010–2011 and Head of NobelProcera and Guided Surgery from 2009–2010.

Hans Geiselhöringer is a trained Dental Technician and possesses great technical knowledge of the implant and CAD/CAM industries, as well as deep customer understanding and insights, enabling continuity of innovation at Nobel Biocare. As a renowned expert on dental technologies and materials, he has published/co-published various clinical and research articles. He is also a member of numerous international dental associations and a recognised lecturer at dental conventions throughout the world.

Source: Nobel Biocare

Merger Creates

The Dental Solutions Company™

Dentsply Sirona Inc. (NASDAQ: XRAY) today announced that it has successfully completed the merger of equals between DENTSPLY International Inc. ("Dentsply") and Sirona Dental Systems, Inc. ("Sirona"). The merger of DENTSPLY, the market leader in dental consumables and Sirona, the market leader in dental technology and equipment, creates the world's largest and most diversified manufacturer of professional dental products and technologies. Dentsply Sirona will have leading positions and some of the most well-established brands across consumables, equipment, technology, and specialty products to address the needs of dental professionals, specialists and dental labs. Each day, approximately 600,000 dental professionals will use a Dentsply Sirona product. With the largest R&D platform in the industry, Dentsply Sirona will develop and support innovative end-to-end clinical solutions that advance patient care.

Source: Dentsply Sirona

Hello from

The Dentist's side

[Picture: © Kostenko Maxim]

Hardly ever is a visit at the dentist's seen as a fun event. While many are aware of the patient's side, only few take into account the dentist's view. A dental clinic from Houston, Texas, now endeavors to overcome this bias by a very special music video: they have adapted Adele's super hit "Hello" in favour of dentists worldwide.

Friendly reminders remaining unheard, missed check-up appointments and the omnipresent danger of being bitten—as most people are usually seated on rather than in front of the dental chair, taking the dentist's perspective is difficult. The dental clinics New Teeth Dental Side has now turned the tables by recording a new version of Adele's "Hello", which features all aspects of the daily dental practice. The result is a funny parody which illuminates the special relationship between dentist and patient.

The following video recently went viral as it illustrates how dental fear impacts both patient and dentist:

Big Data tool to

Test new medicines

Australian scientists have developed a tool to map the effects of new medicines already on the market, potentially saving millions of health practitioners from prescribing medicines with lesser-known yet serious side effects. Lead researcher Dr Nicole Pratt, a senior research fellow at the University of South Australia's School of Pharmacy and Medical Sciences, has been working with the Asian Pharmacoepidemiology Network (AsPEN) to develop a mathematical algorithm that charts the temporal relationship between a new medicine and reports of adverse side effects around the globe. The rapid detection tool is able to quickly analyse large population datasets of up to 200 million people, containing information about the time a patient is prescribed a new medicine (captured at the point of purchase) and recorded hospitalisation events. "We look at the link between starting a new medicine and a hospitalisation event and determine whether there is an association between those two events", said Pratt. At the time a new medicine is first released onto the market less than 50 per cent of the side effects are known.

Source:
www.theleadsouthaustralia.com.au

[Picture: © 3dfoto]

New coating to

Improve implants

Prebiotic compounds, whose origin can be traced back billions of years, have been studied intensively since their discovery several years ago. Now, a team of researchers in Australia has found that these prehistoric molecules can be used to modify surfaces of medical implants, reducing the risk of infection and rejection. The new coating method was developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in collaboration with microbiologists at Monash University.

They found that this polymerisation, carried out in buffered aqueous solutions, can be used to coat a wide range of organic and inorganic substrate materials. The coating is biofriendly and cells readily grow on and colonise it and could therefore be applied to medical devices, such as dental implants, catheters and pacemakers to improve their performance and acceptance by the body, according to the researchers.

"The non-toxic coating is adhesive and will coat almost all material, making its potential biomedical applications really broad," said lead research Dr Richard Evans. "This research opens the door to a host of new biomedical possibilities that are yet to be explored." As the coating process is very simple and uses methods and substances that are already available, biomedical manufacturers can produce improved results more cost effectively compared with existing techniques.

The study, titled "Prebiotic-chemistry inspired polymer coatings for biomedical and material science applications", was published online on 13 November in the NPG Asia Materials journal.

Congresses, courses and symposia

International symposium Osteology Monaco

21–23 April 2016
Venue: Monaco
www.osteology-monaco.org

Third MIS Global Conference: 360° Implantology

26–28 May 2016
Venue: Barcelona, Spain
www.mis-implants.com

2nd Annual Meeting of ISMI

10–11 June 2016
Venue: Berlin, Germany
www.ismi.me

Nobel Biocare Global Symposium 2016

23–25 June 2016
Venue: New York, USA
www.nobelbiocare.com

46th International Annual DGZI Congress

30 September–1 October 2016
Venue: Munich, Germany
www.dgzi.de

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