

implants

international magazine of oral implantology

3²⁰¹⁵



| **research**

A time shift link:
Implant planning affects
periimplant diseases

| **case report**

Quality of implant surfaces and
poor osseointegration

| **events**

“Dental technology and implantology —
Interface to success”



Implant planning made easy

Planmeca PlanScan®

Planmeca ProMax® 3D

3x
3D

Planmeca Romexis® software offers a completely integrated and digital workflow for modern implantology. From intraoral scanning to easy prosthetic design and realistic implant libraries, the most sophisticated implant planning tools are just a few clicks away.

- All the scanned and design data for prosthetic works is immediately available and can be mapped with the patient's CBCT data
- Use the crown library or a patient-specific crown from a CAD system
- Verify the implant plan with a verification tool
- Order a surgical guide directly from the software
- Share data easily with partners through the **Planmeca Romexis® Cloud** image transfer service



Find more info and your local dealer
www.planmeca.com



Planmeca Oy Asentajankatu 6, 00880 Helsinki, Finland. Tel. +358 20 7795 500, fax +358 20 7795 555, sales@planmeca.com

PLANMECA



Dr Rolf Vollmer

Dear readers,

In this edition of implants we would like to welcome you back after the summer break and to take a look at our activities of the past weeks while also bringing to your attention this year's annual international DGZI congress.

As the oldest professional association in Europe, the DGZI's key concern has always been to communicate as well as further develop the scientific and user-orientated standards of modern implantology.

In addition to our partners in the US, Japan and the Middle East, our board members have established new contacts with Mexico as a gateway to the South American region. This region shows a great interest in the training opportunities provided by the DGZI.

However, our biggest event remains the annual international DGZI congress. For the 45th time running, the congress will take place on 2–3 October at the Dorint Hotel in Wiesbaden and is dedicated to the main topic of "Dental technology and implantology—Interface to success".

For years, the DGZI has been promoting the teamwork of dentists and dental technicians. This year's congress theme highlights once again the DGZI's emphasis on this particular team spirit. In numerous shared presentations, dentists and dental technicians have the opportunity to express their role in making the implantological teamwork a success. Furthermore, we hope not only to see consensus among the speakers but fruitful and stimulating discussions that will ultimately benefit the patients.

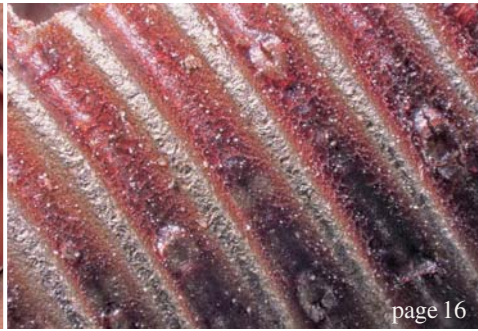
Hoping to have caught your professional interest in our association, I wish you an enjoyable read of the new edition.

Dr Rolf Vollmer

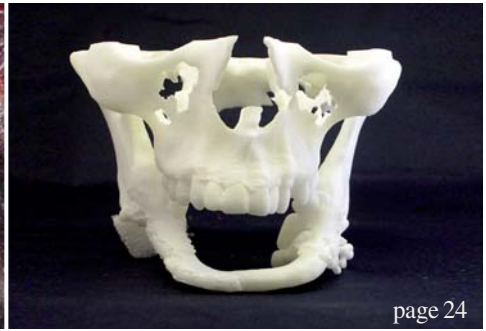
First Vice-President and Treasurer of the German Association of Dental Implantology



page 6



page 16



page 24

| editorial

03 **Dear readers**

| Dr Rolf Vollmer

| research

06 **Implant planning** affects periimplant diseases

| Rainer Buchmann *et al.*

| case report

16 **Quality of implant surfaces** and poor osseointegration—Part II

| Dr Nikolaos Papagiannoulis *et al.*

24 **Mandibular body reconstruction** with a 3-D printed implant

| Dr Saeid Kazemi *et al.*

28 **Simplifying implantation** in socket and ridge preservation

| Martin Keweloh *et al.*

34 **Immediate loading** with dynamic navigation implant surgery

| Dr Jan D'haese *et al.*

| industry

42 **Implant design** of the future

| Georg Isbaner

| events

44 **UNAM Congress opens in Mexico City**

46 **EuroPerio in London**

| Georg Isbaner

48 **“Dental technology and implantology—Interface to success”**

| DGZ

| news

38 **Manufacturer News**

49 **News**

| about the publisher

50 | imprint



Cover image courtesy of Straumann GmbH
www.straumann.de



page 34



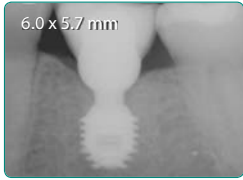
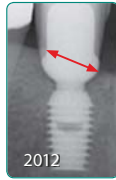
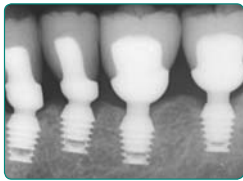
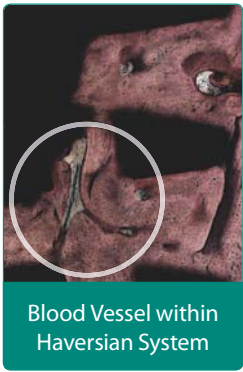
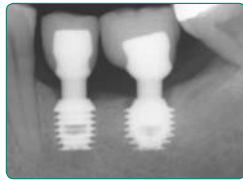
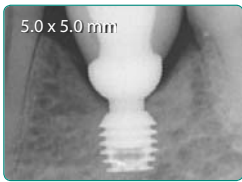
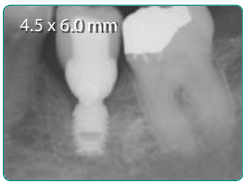
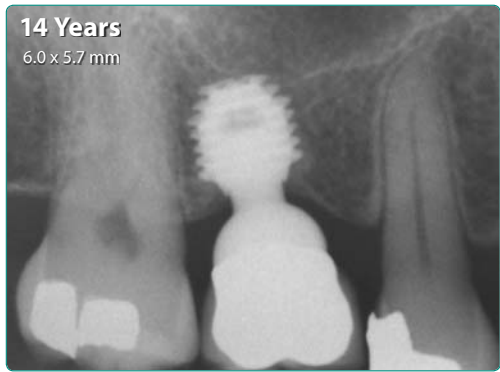
page 42



page 46



SHORT
IMPLANTS™



Implant planning affects periimplant diseases

A time shift link

Author Rainer Buchmann, Daniel Torres-Lagares & Guillermo Machuca-Portillo, Germany & Spain

Implants are becoming increasingly popular with low-cost offers promoting this development. The number of customers preferring implants to customary restorations is expanding. The variety of client demands, individual settings, treatment options and risks related to inflammation and bone damage following implant treatment advocate evident, comprehensible and durable solutions.

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

1. Early decision making to ensure implant bone support with limited number of implant placements.
2. Sound tooth removal to protect bone loss by intraalveolar root dissection.
3. Accuracy of implant diagnosis and implant placement by 3-D visualization (DVT) of implant surgical access.
4. Minimal surgical involvement with short and low diameter implants while restricting augmentation to prosthetic relevant settings.

Planning

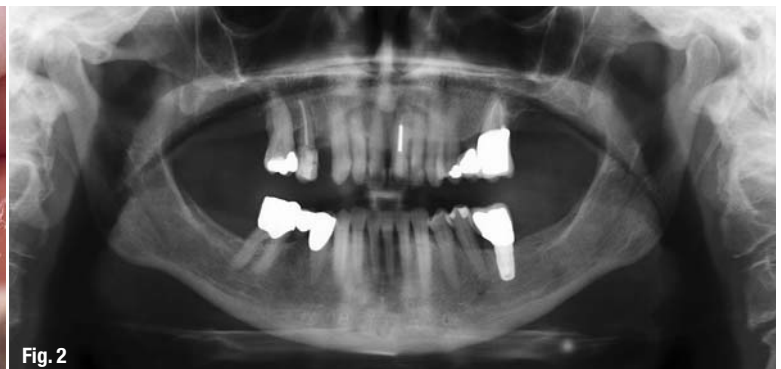
Early Decision Making

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

- a) Anatomy: Treated severe periodontitis usually displays clinical stability with further drawbacks around implant supported bone at buccal plates or interapproximal sites by inflammation (Figs. 1 & 2).¹
- b) Function: Following untreated periodontal diseases or tooth removal, shifting of single tooth initiates due to myofunctional imbalance. By loss of front-canine equilibration, a group side shift emerges with further bite reduction as result of age and misuse.²
- c) Dues: Periodontal therapy of severely compromised teeth with bone loss > 50% often results in a later date implant treatment that doubles dental efforts and bills. Economic issues should downregulate this strategy.
- d) Oral comfort: Stability, oral hygiene and esthetics become fostered by timely implant placement and optimized implant prosthetics.

Fig. 1 Severe periodontitis, residual inflammation and bacteremia. Poor hygienic capability, comfort and esthetics with furcation caries.

Fig. 2 Drawn-out expectation period in advanced periodontal disease at # 15, 16 with horizontal alveolar bone resorption at assigned implant site (see Fig. 14).



More than
primary stability.
The new tapered standard.



The perfect symbiosis of design, material and surface –
the Straumann® Bone Level Tapered Implant:

- Roxolid® material – Reducing invasiveness with smaller implants
- SLActive® surface – Designed to maximize your treatment success and predictability
- Apically tapered – Excellent primary stability even in compromised bone situations
- CrossFit® connection – Simplified handling, legacy of Bone Level System

In combination with:





Fig. 3 Surgical access to deep intrabony periodontal pockets securing the residual dentition and safeguarding inflammation prior to implant placement following completion of non-surgical periodontal therapy.

Fig. 4 Microsururgical revision using a vascular pedicle flap to maintain interdental papillae and augment resting periodontal pockets with autogenous bone. Usage of Osteora (antiinflammatory) or Emdogain, if applicable.

Fig. 5 Relaxation appliance in the maxilla with a frontal plateau to decompensate age and use related bite reduction prior to final implant planning.

Fig. 6 Temporary relief from damage resulting from use (wear) and habits by restoring a front-canine equilibration.

Fig. 7 Vertical release of 1 mm achieving premolar and molar relief to promote bone healing following treatment of periodontal compromised sites prior to implant surgery.

Clinical practice emphasizes a time-tested planning with (i) removal of severely compromised teeth, (ii) periodontal therapy securing the residual dentition, supplemented by (iii) microsurgical revision of deep intrabony pockets prior to implant placement to safeguard inflammation (Figs. 3 & 4). Implant planning resides tentatively. A final quotation will be drawn after completion of functional relief and 3-D digital evaluation of the implant bone anatomy.

Functional decompensation

Fully and partially edentulous patients frequently reveal a bite reduction by usage (wear) with loss of front-canine equilibration and a resulting left and right grouped premolar and molar sideshift.³ Dysfunction and habits (pressing, grinding etc.) promote further damage. In severe periodontitis, group sideshift accelerates disease progression, impedes post therapy healing and weakens alveolar bone assigned for later implant placement. Early implant planning includes following key issues:

1. Inspection of the oral cavity comprises evaluation of the mastication muscles (M. temporalis, M. masseter) and the temporomandibular joints (M. pterygoideus medialis und lateralis) with focus of tension, induration and pain pressure.
2. Osteopathic examination of craniocaudal dysfunctions: initiated by body statics (inclined position), (mis-)posture, walk (activity) etc. should exclude somatic sources. If applicable supportive therapy. If applicable, manual osteopathic treatment to improve physiologic function, i.e. body alignment, symmetry and support homeostasis that has been altered by somatic dysfunctions.⁴
3. Carefull reduction of prominent protrusive contacts (front) and sliding bars during laterotrusion on the operating side.
4. Placement of a relaxation appliance in the maxilla (overbite and deep bite in the mandible) for functional decompensation with a frontal plateau allowing a front-canine equilibration and temporary relief in molars by vertical release of 1 mm (Figs. 5–7).



MORE BONE Where it Matters Most...



Find out more about the new V3 Implant at: www.V3-implant.com

V3 By **MIS**



Fig. 8

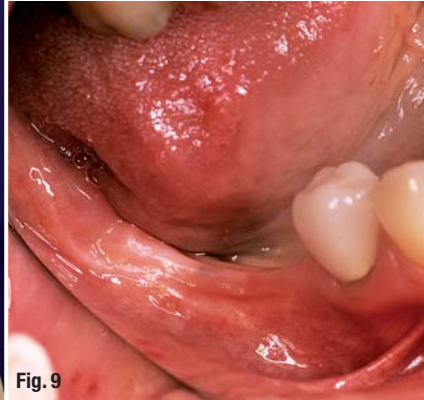


Fig. 9



Fig. 10

Fig. 8 Intraoral appliances are manufactured as strew splints in a dimension of 1.5 mm with extension to the first molars (complete dental arch).

Fig. 9 Advanced horizontal alveolar bone atrophy in the mandible with small ridge, vestibular sloping plateau, proximity to n. alveolaris and small keratinized gingiva.

Fig. 10 Securing implant planning (implant length, positioning, diameter and surgery) by DVT review (Cranium Bonn, Germany, 2014).

The primary objective is the decompensation of use-related dysfunctions to achieve relief, vascularization and mineralization of the alveolar bone prior to implant placement. Subsequent realization of the issues 1–4 ensures dispenses of the habitual use patterns after 4 to 6 weeks wearing. Due to hygiene and stabilization, the intraoral appliances are manufactured as strew splints in a dimension of 1.5 mm with extension limited to the first molars (Fig. 8).

Digital imaging 3-D

Digitization means information and safeness. The generation of a DVT in early implant planning harbors three vantages:

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

- Anatomy: Additional information about vicinity to N. alveolaris, extent of sinus maxillaris and anatomical septa, characteristics and mineralization of implant bone (following tooth removal) and implant positioning related to adjacent teeth (Figs. 9 & 10). However, inclined DVT readings result in measurement errors up to 1 mm.^{5,6}
- Precision: The benefit of a time-intense 3-D implant evaluation is a more precise, controlled and risk-reduced planning, and eases surgical implant placement. These advantages should be utilized by all dental health care providers, even those with long-term clinical expertise.

If you are not a DVT owner, oral surgeons (specialists) and diagnostic radiology clinics are appropriate contact addresses. Regard: For the intended 3-D image, always allocate the exact DVT area, details and viewer suitable for your PC software. The expenses both of the DVT and the digital analysis and evaluation are subjects to private cash.

Fig. 11 Interimplant distances of 7 mm at front and premolar sites with 11 mm in molars to safeguard vascularization and periimplant damage, assigned from prosthodontics. Surgery: Dr G. Kochhan.

Fig. 12 Inadequate implant bone support with vestibular bony defect following tooth loss due to traumatic crossbite relationship in the left upper maxilla.

Fig. 13 Initial setting (OPG) with combined vertical and lateral alveolar bone defect. Augmentation using sinus floor elevation (vertical) and BoneShield technique (lateral) with separate implant placement # 25, 26, 27.

Fig. 14 Vertical implant bone defect # 16 as result of long-term periodontal damage (see Fig. 2). Prevention of sinus elevation by 3-D analysis with implant placement close to sinus.

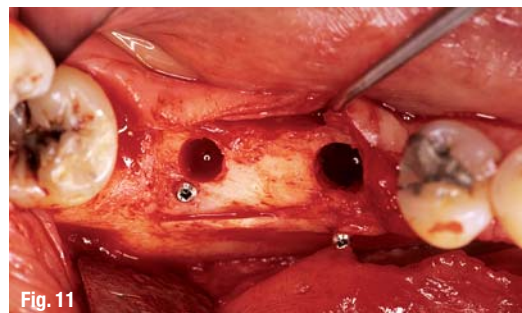


Fig. 11



Fig. 12



Fig. 13



Fig. 14

Interimplant distance

If an implant is placed adjacent to a tooth, the interdental papilla remains. If two implants are inserted side by side, the supracrestal biological width and the papilla as result disappear, independent of the implant type used.⁷ The effects of implants with platform switching, concave abutments, micromachined neck or implant abutment micro-movements onto the stability of crestal bone and soft tissues are limited to subclinical notice.^{8,9} The interimplant distances primarily follow prosthetic requirements of the residual dentition.¹⁰ From anatomy, the present rules occur:

1. Minimal distance between single-rooted teeth incl. premolars: 7 mm.
2. In molars interimplant distances of at least 11 mm (Fig. 11).

For appropriate implant placement according to prosthetics, the local bone anatomy is often inadequate, especially in patients with cross-bite or long-term periodontal damage etc. (Figs. 12–14). If the clinical setting implicates deficient implant bone support, 3-D digital imaging of alveolar bone including individualized implant positioning with diameter-reduced implants is allocated. Note: Prior to surgery, calculate additional efforts, extent and expenses of alternative augmentation, bone grafting or allogeneic bone grafts including pedicle flap surgery and infection due to soft tissue advancements.

_ Implant placement

Perfusion

Maintenance of vascularized implant bone is indispensable to avoid further periimplant damage as result of spongy bone tissue injury during implant surgery (early implant failures). Within implant insertion, bleeding of cortical bone following drilling is a necessary requirement for uneventful healing and integration of the implant into surrounding tissues (Fig. 15).¹¹ The following step by step procedure has been proven effective:

- a) Utilization of keen pilot und multi-use tapping drills (renew early, otherwise high drilling forces and danger of deviation from drilling axis occur).
- b) Intermitted implant bed preparation under permanent cooling with 0.9 % saline.
- c) Prior to implant placement, wait until implant bed has been replenished with blood.
- d) Wetting of implant surface with blood prior to implant insertion.
- e) Limited rotation speed < 800 r.p.m during implant bed preparation, hand implant placement with torque key, max. 10–30 Ncm, if applicable (Fig. 16).

A slight subcrestal position of the implant is advisable as drilling endpoint.¹² To ensure healing, a primary fixation of the implant is mandatory for all implant types (cylindrical, root-formed etc.), bone quality and anatomical localization. The authors strongly discourage from further „screwing“ to avoid ongoing tissue injury of the implant-bone-interface.¹³

Periimplant tissue (volumen)

Due to alveolar bone defects resulting from tooth removal, periodontitis or dysfunction, the conditions of periimplant keratinized gingiva around implants are not adequate.¹⁴ Safeguarding implant planning and surgery, the additional dues of soft tissue surgery to enlarge periimplant gingiva should be implemented into the quotation:

Enlargement:

Initially, implant planning (not to forget cast models) and implant placement. During implant in-

AD

Navident

Dynamic Navigation *Dental Implantation*

More Accurate
Less Complications
Simple Workflow

Meet us at our **Booth # S04** **EAO** CONGRESS

ClaroNav www.claronav.com info@claronav.com

Fig. 15 Promotion of perfusion and healing by micro-invasive implant surgery with implant abutment insertion into vascularized blood-supplied alveolar bone.

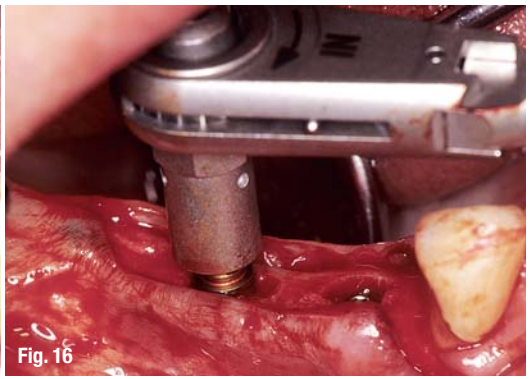
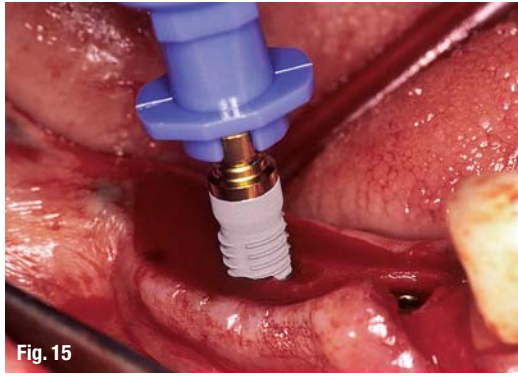


Fig. 16 Micro-invasive implant surgery to protect alveolar bone avoiding machined insertion and implant fixation with torque wrench.

Fig. 15

Fig. 16

Fig. 17 Sinus elevation # 26 with implant placement prior to periimplant enlargement.

sersion into local bone, enlargement of periimplant gingiva with a ridge incision 1–2 mm orally is usually adequate. In lateral augmentation in the maxilla, periimplant enlargement is frequently mandatory as result of flap advancement to cover the defect. During healing and prior to implant exposure, vestibuloplastic surgery with free autogenous gingival graft from palate at implant site in a separate visit (Figs. 17–19). In individual cases and edentulism in the mandible, periimplant enlargement with Edlan Mejchar-Vestibuloplastic surgery to create attached mucosa by a pedicle flap with adequate esthetics prior to implant placement. Also, to achieve soft tissue protection following implant insertion (Figs. 20–22).

individual patients with esthetic needs in the upper front of the maxilla. Shortcomings following healing, scar formation, normal biologic resorption and failing of long-term stability are usually compensated by individual prosthetic abutments and ceramic crowns with a wide periimplant shoulder.

Fig. 18 Periimplant soft tissue extension with apical fixation prior to free gingival grafting during implant healing.

Short and diameter-reduced implants

The usage of short implants < 9 mm demands minimalization of surgery. Implant placement and healing are customer-friendly. However, micro-incision surgery requires additional efforts by 3-D imaging (DVT) during planning and sensitiveness in clinical realization. Evidence-based clinical data for short and diameter-reduced implants are inconsistent and industry-driven. Biomechanical research underestimates the functional adaptive capacity of implant bone.^{15, 16} In clinical practice, horizontal alveolar bone loss is the most frequent demand:

Fig. 19 Free gingival graft in situ prior to suturing.

Fig. 20 Unstable periimplant gingiva with poor hygiene capability, persistent inflammation # 34 and chronic sensitivity.

Fig. 21 Plastic pedicle flap surgery (Edlan-Mejchar) to remodel free into attached periimplant mucosa. Lack of buccal implant bone with oversized implant diameter.

Thickening:

To safeguard implant placement and protect against periimplant diseases, an adequate periimplant width is more needed than soft tissue thickness. Following thickening by free autogenous soft tissue grafts from the palate or roll flap, loss of periimplant dimension is anticipated due to shrinkage and further scar formation. Periimplant thickening is limited to

Mandible:

1. Advanced alveolar bone loss in premolars and molars (numerous; Figs. 23–29).
2. Proximity to N. alveolaris.

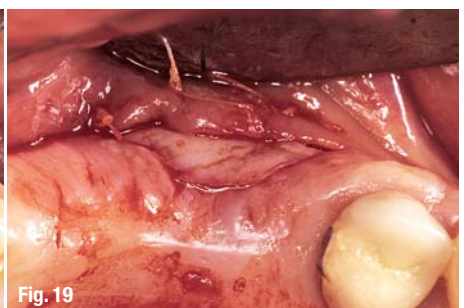
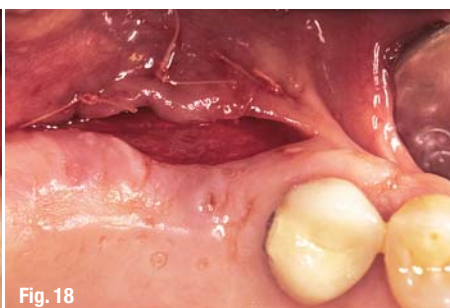


Fig. 17

Fig. 18

Fig. 19

Fig. 20

Fig. 21

Fig. 22

APPLY NOW FOR THE CAMLOG FOUNDATION RESEARCH AWARD 2014/2015



THE BEST RESEARCHER IS INVITED TO PRESENT HIS/HER WORK AT THE INTERNATIONAL CAMLOG CONGRESS 2016 IN KRAKOW, POLAND

The CAMLOG Foundation Research Award is presented at the International CAMLOG Congress and is open to all young, talented scientists, researchers and dedicated professionals from universities, hospitals and practices up to 40 years of age.

The expected scientific papers must be published in a recognized peer-reviewed journal and submitted in English. They should treat one of these topics in implant dentistry or related disciplines:

- Diagnostics and planning in implant dentistry
- Hard- and soft-tissue management in implant dentistry
- Sustainability of implant-supported prosthetics
- Physiological and pathophysiological aspects in implant dentistry
- Advances in digital procedures in implant dentistry

Registration deadline is November 30, 2015



Download entry conditions and the registration form on:



<http://www.camlogfoundation.org/awards/>

camlogfoundation

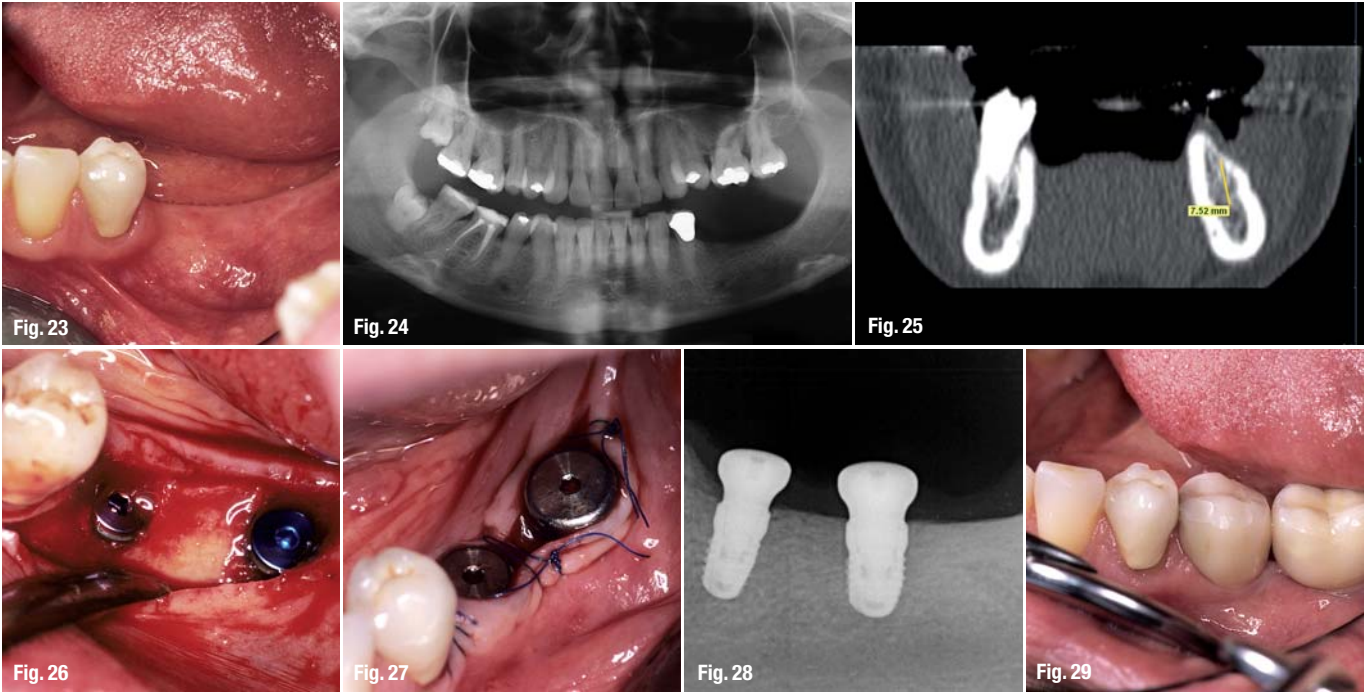


Fig. 23 Indication for short and diameter-reduced implants in the mandible with unilateral tooth loss and low vertical alveolar bone height.

Fig. 24 Initial OPG (pre-therapy) with demineralization and lateral alveolar bone atrophy # 35, 36.

Fig. 25 Securing the implant planning and surgery by 3-D visualization with reduced implant length of 7 mm. Ridge resorption and vicinity to n. alveolaris (Radiology: Fürther Freiheit, Germany, 2014).

Fig. 26 Intrasurgical setting following placement of short implant abutments (7 mm) with diameter of 4.3 und 5.0 mm.

Fig. 27 Vertical enlargement of resorption-related thin periimplant gingiva by 1 mm oral horizontal ridge incision during surgical implant exposure.

Fig. 28 Unobtrusive X-ray following surgical implant exposure with prevention of N. alveolaris avoiding augmentation.

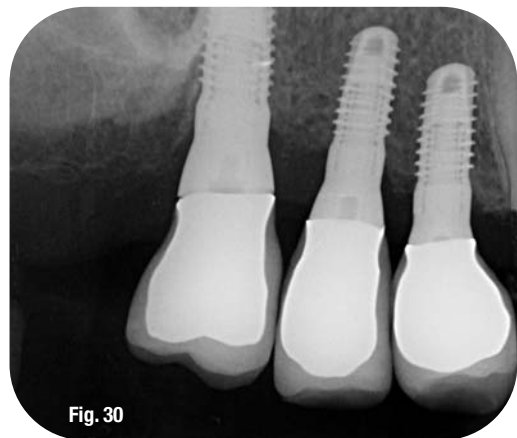
Fig. 29 Single implant crown restoration (unlocked) with implanto-prosthetic relationship of 1:1.

Fig. 30 Long-cone implanto-prosthetic abutments undergo no self-cleaning frequently initiating periimplant sensitivity.

Maxilla:

1. Close anatomical relationship to sinus maxillaris.
2. Atrophied or edentulous maxilla following long-term appliance of removable dentures.

Horizontal alveolar bone defects, as result i.e. of longstanding periodontitis, are compensated surgically during implant placement to avoid extended implanto-prosthetic abutments susceptible for recurrent soft tissue infection (Fig. 30). Fixed implanto-prosthetic restorations of the partially edentulous mandible are achieved with axially screwed, uncemented and unlocked crowns to improve hygiene and avoid further damage by cementing and periimplantitis. Integration in clinical practice is successful with focus on tissue biology and both renunciation from mechanical dentistry and interlocking theories. Diameter-reduced (<4 mm), small implants (minis) allowing transgingival healing. According to their material properties (fracture) and restricted implanto-pros-



thetic indications and compatibility, Minis are limited to individual applications in multi-morbid subjects with edentulous mandible, enhanced risk for surgery i.e. advanced diabetes mellitus or hematopoietic diseases and handicaps for oral hygiene.¹⁷

_Augmentation and revision

Except for sinus floor grafting, the number of augmentative implant surgery is declining and confined to reconstruction following trauma and tumor by vertical distraction or individual prosthetic esthetic settings.¹⁸ The indications for surgical augmentation during implant placement include:

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

The authors have recently reported about the use and implementation of autogenous bone and spongy bone chips and their synthetical alternatives in implant surgery in detail.¹⁹

The regressive developments of implant augmentation in clinical practice implicate direct recommendations for surgical revision of periimplant defects. The following procedure is advisable.²⁰ (Tab. 1):

- Mucositis:**
- Defect depths ≤ 3 mm: Oral hygiene and implant cleaning (hygienist).

- Defect depths $\leq 4-5$ mm: Additionally 0.2 % CHX, Er:YAG decontamination, if applicable (dentist).
- Defect depths ≥ 6 mm: Periimplant plus periodontal cleaning, systemic antibiotics: amoxicilline 500 mg 20 T and Clont 400 mg 20 T, t.i.d for 7 days.

Together with decompensation by occlusal appliances (mentioned above), safeguarding by front-canine equilibration and removal of implanto-prosthetic restoration, the clinical situation often improves. The procedure can be easily repeated. The recommendation to removably screwfix implant restorations axially (only premolars and molars) is becoming a strong relevance in the treatment of periimplant damage.

Periimplantitis:

Advanced periimplant damage with circumferential angular bone loss encompasses

- Defect depths ≥ 8 mm: Explantation, surgical revision (if applicable).

In these clinical settings, implant removal with repeated insertion, augmentation (where appropriate) and prosthetic restoration following healing is advocated, if the client approves the treatment. In periimplant damage, the benefit of rapid implant bone healing following insertion of short and diameter-reduced implants becomes obvious. In individual, strategically important implant sites, i.e. canine implant area in edentulism, revision is emphasized with the following surgical protocol (Tab. 2):²¹

- Removal of implanto-prosthetic restoration, if screw-fixed.
- Horizontal ridge incision with a mucoperiosteal flap and mesial vertical extension.
- Curettage of implant bone defect.
- Irrigation with 0.2% CHX, supplemented by Er:YAG-decontamination.
- Stimulation of bleeding plus autogenous bone grafts for defect fill and reconstruction, defect coverage with rotated pedicle soft tissue flap.
- Close, tension-free wound closure, no functional loading.
- Systemic antibiotics.

Summary

The prevention of periimplant diseases is based on a comprehensive analysis, evaluation and planning prior to implant placement. Securing the residual dentition from periodontal disease, on time removal of compromised teeth and functional decompensation with focus on front-canine equilibration are the key issues during implant planning. Prior to surgery, DVT diagnostic evaluation is required if proximity to anatomical structures is anticipated, and short and diameter-reduced implants are advocated to deter-

Periimplant Therapy

Step	Defect (PD in mm)	Treatment
A	≤ 3 mm	Oral Hygiene + IMP Cleaning
B	$\leq 4-5$ mm	CHX 0.2 %, Er:YAG
C	≥ 6 mm	Systemic Antibiotics
D	≥ 8 mm	Implant Removal/Regenerative Therapy

Surgical Reentry

1. Removal of suprastructure (screw-fixed).
2. Horizontal alveolar ridge incision with vertical mucoperiosteal flap reflection.
3. Intrabony defect curettage.
4. 0,2% CHX irrigation, Er:YAG-decontamination.
5. Stimulation of spongius bleeding plus autogenous bone grafts for defect fill and reconstruction.
6. Close, tension-free defect closure, no functional implant loading.
7. Systemic antibiotics.

mine interimplant distances and safeguard implant treatment. Implant placement succeeds with minimal mechanical loading of implant bone and implementation of perfusion during surgery. Periimplant enlargement is scheduled during implant healing, either by free gingival graft or pedicle flap. Premolar and molar implant restorations are screw-fixed axially to ease handling in case of periimplant damage. The concerted action of eliminating inflammation, stabilizing function while minimizing surgery secures implant success, prevents periimplant diseases and promotes the reputation of dental health care providers in the community.

Author's note: I appreciate the encouragement and support of Dr Gerhard Kochhan, Düsseldorf, in periimplant cooperation.

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

Table 1 Key treatment issues to combat periimplant damage, to a large extent being prevented by early and careful implant planning.

Table 2 Surgical revision of advanced periimplant bony defects is limited to single clinical settings due to the time and extent of surgery and additional patient expenses.

contact

Prof. Dr Rainer Buchmann
 Specialist Periodontics and Oral Preventive Medicine
 Königsallee 12
 40212 Düsseldorf, Germany
 Tel.: +49 211 8629120
 Fax: +49 211 8629129
 info@perioimplant.eu

Quality of implant surfaces and poor osseointegration

Part II: Irregular surface roughness suspected of causing deficient osseointegration

Authors Drs Nikolaos Papagiannoulis, Andreas Sakkas & Adrian Kasaj, Germany

Fig. 1 Implant #001 (SLAM-line) at 30× magnification: irregularities in the surface roughness are evident.

Fig. 2 Implant #001 (SLAM-line) at 100× magnification: there are parts on the crestal implant body with sanding marks and no surface treatment.

Fig. 3 Implant #001 (SLAM-line) at 300× magnification: structural defects due to blasting media and massive residue are evident.

Fig. 4 Implant #002 (SBAM-line) at 30× magnification.

Modern dental implants are made of a titanium alloy or a combination of titanium and ceramic. Pure titanium implants are also still manufactured. Titanium induces bone on-growth through a direct biochemical interaction with bone tissue. The biological response of the organism is related to the formation of a titanium dioxide layer, as discovered by Per-Ingvar Brånemark and widely applied to orthopaedic treatment.

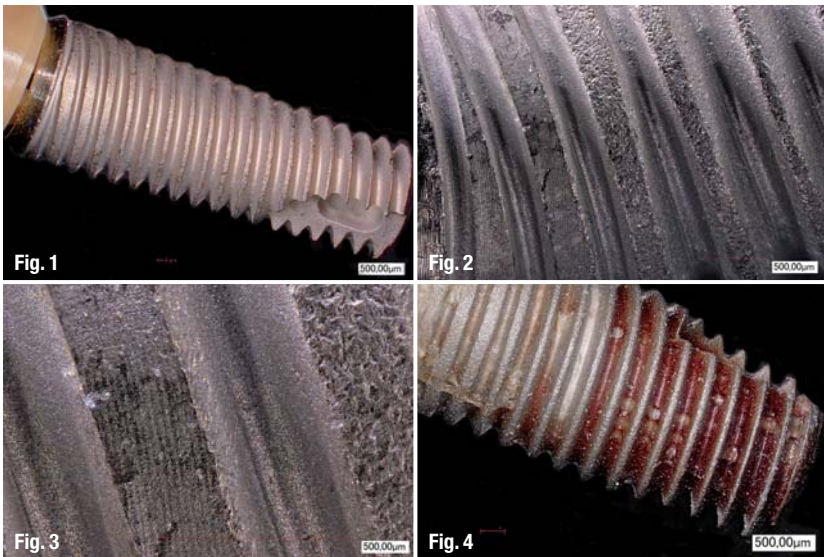
Besides this natural response to titanium, a series of other factors enhance bone tissue on-growth, even ingrowth, as in porous tantalum implant surfaces. Surface roughness, macro- and microstructure, as well as pores and specific laser configurations, increase bone-implant contact (BIC), offering more sur-

faces for osseointegration and stability under occlusion. All of these parameters are important characteristics of implant surfaces. The rate and speed of osseointegration, as well as the time of loading, correlate with the texture and quality structure of such surfaces.

Several studies claim, controversially, that in the first year after loading implants show a vertical bone loss of approximately 1 mm and another 0.2 mm for every year thereafter. Such claims, although they do not consider implant type and design, soft-tissue quality, operation protocol, abutment connection, etc., have been accepted as true nonetheless by the industry. Currently, operators consider such findings not critical.

The industry has had different responses to this problem. Some manufacturers focus on the abutment-implant connection, others on the crestal implant design or implant collar surface, and yet others on platform switching and crestal or sub-crestal implant placement. The elimination of microgaps, the improvement of peri-implant tissue quality and quantity through platform switching, the reduction of bone stress through reduced roughness crestally or specific laser-directed thread design partially solve the bone loss problem.

Hybrid implants are the most recent trend in oral implantology. Manufacturers claim reduced bone stress and pressure, better hygiene, long-term tissue stability through lack of inclined threads, a better tissue response, reduction of the risk of peri-implantitis, faster integration and many other all-in-one solutions.



CITO mini®

YES!



I WANT

THE CITO MINI®

MADE BY DENTAURUM.

20 years of expertise, reliability and innovation
in implantology – worldwide. Say yes!

2015
Years
Implantology.



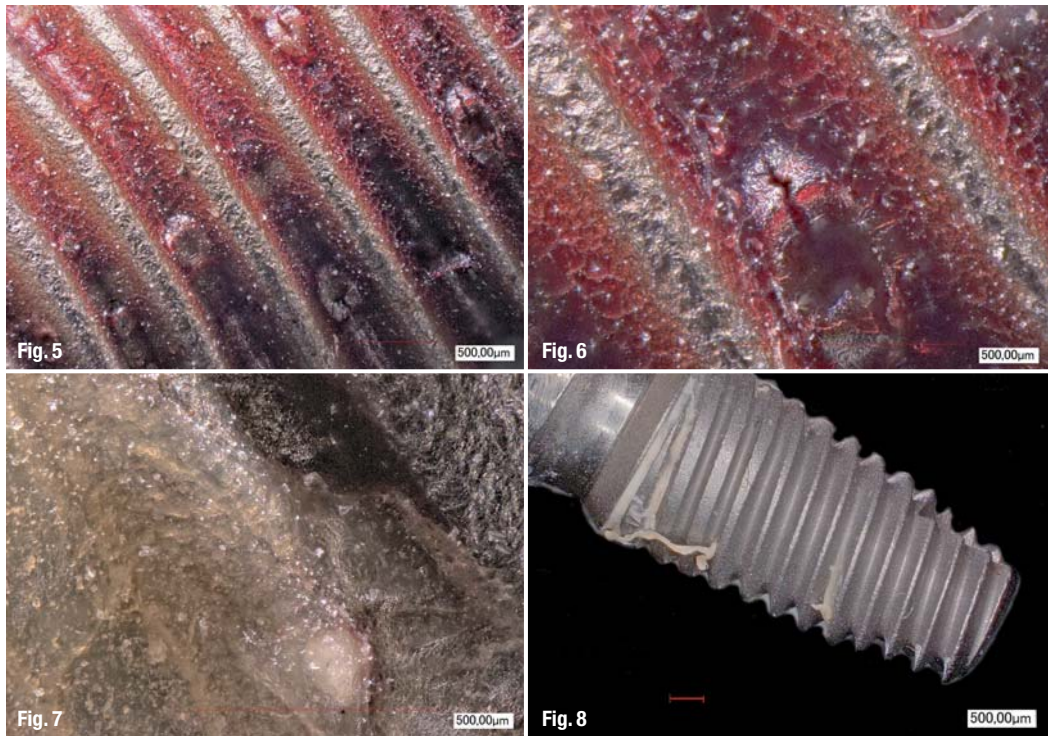
 **DENTAURUM**
IMPLANTS

Turnstr. 31 | 75228 Ispringen | Germany | Phone +497231/803-0 | Fax +497231/803-295
www.dentaurum-implants.de | info@dentaurum-implants.de

Fig. 5_Implant #002 (SBA M-line) at 100× magnification.

Figs. 6 & 7_Implant #002 (SBA M-line) at 300× magnification.

Fig. 8_Implant #007 (ZBM) at 30× magnification.



All of these features offer advantages and help eliminate some risks. Tissue response, however, cannot be influenced massively. Universal laws underlie the biological response; so structures smaller than 5 µm are not detectible from osteoblasts. Other studies have shown major advantages of a roughness depth exceeding 100 µm. However, roughness depths of less than that affect functional integration and cellular apposition negatively.

It is reasonable to deduce that implant design, thread design and all macrostructural features only increase primary stability and promote integration until the organism begins to form new bone, six weeks after bone trauma. The BIC ratio is an important guideline. Softened implant surfaces reduce the BIC ratio if not detected at the cellular level. The results are similar if the BIC ratio is reduced through irregular surface roughness, structural defects or debris on the implant surface.

Study presentation

In this study, we examined six failed implants (from 16 lost in total), comparing them with six identical sterile-packaged ones. The other ten failed implants were reclaimed. All of the examined implants were from the same manufacturer. The fabrication numbers of the failed implants correlated to that of the packaged ones. In this part of the series, we examined the implant macroscopically, up to 300× magnification under a light microscope. A similar or identical clinical finding was made for all of the failed implants.

The implants had two different surface types, one blasted with zirconium dioxide particles and one sand-blasted and acid etched. The implant body design was identical in all, with two different collars, one machined and one textured at bone level. The implants with a machined collar received at the crestal third only double etching.

The examination sought to answer the following questions:

1. Are there production faults or residue on the surface of the sterile implants?
2. Are there structural defects or irregularities on the surface of the sterile implants?
3. Are the specifications and labelling of the manufacturer correct and detectable?
4. Are there defects, irregularities, residue or other abnormalities on the surface of the explanted implants?

After the implants had been placed following standard protocol, re-entry occurred after four to five months postoperatively. Screwing in the impression post (implant #005) or the abutment (implants #002 and 005; Figs. 4–7) led to complaints. The patients described it feeling as if the implants had been placed deeper into the bone osteotomy. In the case of implant #005, the impression was nonetheless successful. Implant #002 was loaded as planned. Implants #006 and 008 received prostheses as planned (see Part I of this series in implants 2/15). All of the failed implants were removed within two weeks of loading. The reverse torque needed did not exceed 5 Ncm.

No	Region	Surface	Bone density, Misch CE, 1990	bone volume Misch CE, 1990	Exposure, Tal H., 1999	Surgery	GBR	Prosthetics planed, Misch CE, 1991
1	16	machined collar	D2	A	0	Conventional	none	FP-2
2	45	machined collar	D3	A	1	Conventional	none	FP-1
3	16	textured collar	D3	C-h	0	Guided	ext. sinuslift	FP-2
4	44	textured collar	D2	A	0	Guided	none	FP-2
5	33	textured collar	D2	A	0	Conventional	none	RP-5
6	15	bone level zikronia blasted	D3	C-w	0	Conventional	lateral	FP-1
7	43	machined collar	D2	A	0	Conventional	none	RP-5
8	15	bone level zikronia blasted	D3	C-h	0	Conventional	int. sinuslift	FP-1
9a	46	bone level zikronia blasted	D2	A	1	Conventional	none	FP-1
9b	36	bone level zikronia blasted	D2	A	0	Conventional	none	FP-2
9c	34	bone level zikronia blasted	D3	C-h	0	Guided	gap to buccal plate	RP-5
9d	32	bone level zikronia blasted	D3	C-w	0	Guided	none	RP-5
9e	42	bone level zikronia blasted	D3	C-w	1	Guided	none	RP-5
9f	15	bone level zikronia blasted	D3	B	0	Conventional	none	RP-4
9g	11	bone level zikronia blasted	D3	C-w	0	Conventional	gap to buccal plate	RP-4
9h	21	bone level zikronia blasted	D3	C-w	1	Conventional	gap to buccal plate	RP-4
10	–	machined collar	–			–	–	
11	–	bone level zikronia blasted	–			–	–	
12	–	textured collar	Sterile packages, controll group			–	–	
13	–	bone level zikronia blasted	–			–	–	
14	–	machined collar	–			–	–	

All of the implants had shown similar radiographic findings: lack of osseointegration at the crestal third and crater-like vertical bone resorption in some cases. These findings were unexpected, taking into consideration that no complications had occurred during treatment. In some cases, patients had received implants from other manufacturers on the contralateral side and these were functioning as expected. After explantation, none of the osteotomies

showed soft-tissue ingrowth. Also, regions that had been augmented showed no bone loss or wall defects. Based on these findings, we decided to replace all of the explanted implants but #006 and 008 (the first two failed implants) immediately with implants from different manufacturers. In all of the cases, the patients received prostheses after three to four months and the surgical and prosthetic treatments were successful.

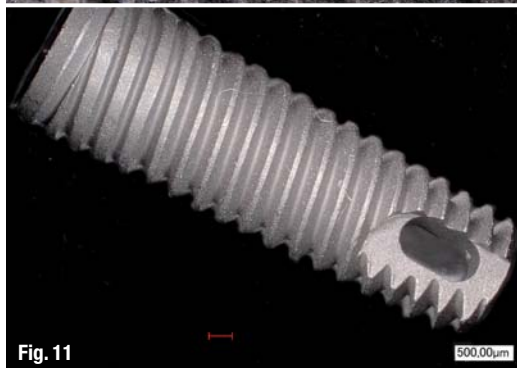
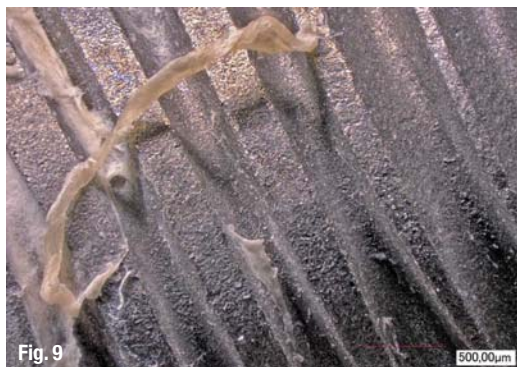
Tab. 1 Specimen classification of surgical and prosthetic planning.

Fig. 9_Implant #007 (ZBM) at 100× magnification.

Fig. 10_Implant #007 (ZBM) at 400× magnification.

Fig. 11_Implant #0011 (ZBM Kontr.) at 30× magnification: bone-level implant, blasted and not etched.

Fig. 12_Implant #0011 (ZBM Kontr.) at 100× magnification: the surface appears rather metallic.



Materials and methods

All of the patients in this study received more than one implant. Some of them lost more than one, and implants with the same fabrication numbers failed in all of these patients. While ten implants were reclaimed, six explanted implants were compared with six sterile-packaged ones of the same fabrication number. All of the examined implants were analysed under a light microscope at a magnification of 30× to 300×. The packaged implants were thoroughly checked in terms of accuracy of the information on the packaging.

The following implant regions were examined under the microscope:

- implant collar, swift to threads
- middle of implant body with trapezoidal thread, swift to triangular threads
- apical of implant body, sharp triangular cutting threads
- suspicious regions on the explanted implants
- regions showing evident defect under minimal magnification
- regions with no evident bone on-growth
- regions with tissue residue.

Results

Implants #001, 0014, 0015, 002 and 007

Implant #001, correlating to #002, showed massive surface defects, especially on the thread crest. At 30× magnification, irregularities in the surface roughness were evident. A hybridity of the roughness was not de-

tectible. At 100×, parts on the crestal implant body with sanding marks and no surface treatment were observed. At 300×, structural defects due to blasting media and massive residue could be seen. Besides production faults, there was a reduced and irregular roughness. We also made findings that could not be specified, but that included artificial and faulty defects (Figs. 1–10).

Implants #0011, 0013 and 006

Implant #0011 was only blasted and not etched. It was a bone-level implant. Apart from blasting media residue covering the whole implant body, we detected metal cuttings. The presence of such cuttings could be explained as being due to deficient cleaning procedures and poor quality control, since such contamination was apparently not detected. Generally, the surface appeared rather metallic. Reflection electron microscopy would help determine micro-roughness (Figs. 11–13).

Implants #0012, 003, 004 and 005, correlating to #17, 18 and 19

These implants exhibited a more precise thread design and surface treatment. The metallic lustre of the surface and the major blasting media defects on the crest of the threads were prominent. The thread flanks showed no macrostructure, so we found also in these implants an irregular surface roughness. The most serious issue in this group was the labelling of the implants as bone level although the implants had a machined collar inside (Figs. 14–16).

Bone-level implants with platform switching are placed differently to implants with a machined collar.

No	Region	Surface	Re-entry months post OP	Failure manifestation	Symptoms	Explantation socket	Follow treatment
1	16	machined collar	4	By cover screw removal implant rotated	Pain by unscrewing cover screw	No soft tissue ingrowth, no inflammation symptoms	immediate implantation, different manufacturer, similar diameter
2	45	machined collar	4	Crown rotation 2 weeks after loading	Pain on function	No soft tissue ingrowth, no inflammation symptoms	late implantation, different manufacturer, similar diameter
3	16	textured collar	5.5	Reverse torque 5 Ncm	Pain by unscrewing cover screw	No soft tissue ingrowth, no inflammation symptoms	late implantation, different manufacturer, similar diameter
4	44	textured collar	5.5	Reverse torque 5 Ncm	Pain by unscrewing cover screw	No soft tissue ingrowth, no inflammation symptoms	late implantation, different manufacturer, similar diameter
5	33	textured collar	4	Crown rotation 2 weeks after loading	Pain on function	No soft tissue ingrowth, no inflammation symptoms	immediate implantation, different manufacturer, similar diameter
6	15	bone level zirkonia blasted	4	Crown rotation 2 weeks after loading	Implant rotation after removing neighbour implant	No soft tissue ingrowth, no inflammation symptoms	late implantation, different manufacturer, similar diameter
7	43	machined collar	4.5	Reverse torque 5 Ncm	Pain on function	No soft tissue ingrowth, no inflammation symptoms	immediate implantation, different manufacturer, similar diameter
8	15	bone level zirkonia blasted	4	Crown rotation 2 weeks after loading	Implant rotation, occlusion	No soft tissue ingrowth, no inflammation symptoms	late implantation, different manufacturer, similar diameter
9a	46	bone level zirkonia blasted	3.5	By cover screw removal implant rotated	Pain by unscrewing cover screw	No soft tissue ingrowth, no inflammation symptoms	immediate implantation, different manufacturer, similar diameter
9b	36						
9c	34						
9d	32						
9e	42						
9f	15	bone level zirkonia blasted	4	Abutment rotation 2 weeks after loading	Pain on function 2 weeks after loading	No soft tissue ingrowth, no inflammation symptoms	late implantation, different manufacturer, similar diameter
9g	11						
9h	21						
10	–	machined collar	–			–	–
11	–	bone level zirkonia blasted		Sterile packages, control group		–	–
12	–	textured collar	–			–	–
13	–	bone level zirkonia blasted	–			–	–
14	–	machined collar	–			–	–

They are placed sub-crestally, while implants with a machined collar are always placed above crestal bone. Proper quality control would have prevented such an error. Of course, erroneous labelling is not necessarily problematic regarding osseointegration; it is irritating.

Discussion

The clinical and radiographic findings did not explain the deficient osseointegration adequately. Inaccuracies and irregularities of implants cannot promote integration. Combined with residue, impurities

Tab. 2_Clinical findings.

No	Region	Surface	irregular roughness	irregular surface, partly no surface treatment	blast defects	blast media residuals, massiv	metal cuttings	undefined structural defects	compromised tissue ongrowth	dokumentation fault
1	16	machined collar	yes	no	yes	yes, massiv	–	yes	apical third, only thread flanks	no
2	45	machined collar	yes	no	yes	yes, massiv	–	yes	apical third, only thread flanks	no
3	16	textured collar	yes	no	yes	yes, massiv	–	no	crestal third	no
4	44	textured collar	yes	no	yes	yes, massiv	–	no	crestal third	no
5	33	textured collar	manufacturer	manufacturer	manufacturer	manufacturer	manufac-turer	manufacturer	manufacturer	manufacturer
6	15	bone level zikronia blasted	no	yes	yes	yes, massiv	–	yes	barely, only thread flanks	no
7	43	machined collar	yes	no	yes	yes, massiv	–	no	crestal third	no
8	15	bone level zikronia blasted	manufacturer	manufacturer	manufacturer	manufacturer	manufac-turer	manufacturer	manufacturer	manufacturer
9a	46									
9b	36									
9c	34									
9d	32	bone level zikronia blasted	manufacturer	manufacturer	manufacturer	manufacturer	manufac-turer	manufacturer	manufacturer	manufacturer
9e	42									
9f	15									
9g	11									
9h	21									
10	–	machined collar	yes	yes	yes, major	yes, massiv	no	no	–	no
11	–	bone level zikronia blasted	no	no	yes	yes, massiv	yes	no	–	no
12	–	textured collar	yes	no	yes, great	yes, few	no	no	–	M-Line inside
13	–	bone level zikronia blasted	yes	no	yes	yes	–	no	–	no
14	–	machined collar	yes	no	yes	yes	–	no	–	no

Tab. 3 Findings light microscopy.

and production faults, this results in the deficient performance of such workpieces and under certain circumstances in a poor tissue response, such as isolation or encapsulation. Most important are the reduction of BIC and increase in the time tissue needs to overcome obstacles, if possible. The microscopy findings confirmed our initial suspicions (see Part I of this series). They determined a number of factors that

influence tissue response and osseointegration. The findings were as follows:

- blasting media residue
- surface defects
- lack of surface treatment
- lack of thread precision
- production procedure residue
- metal cuttings

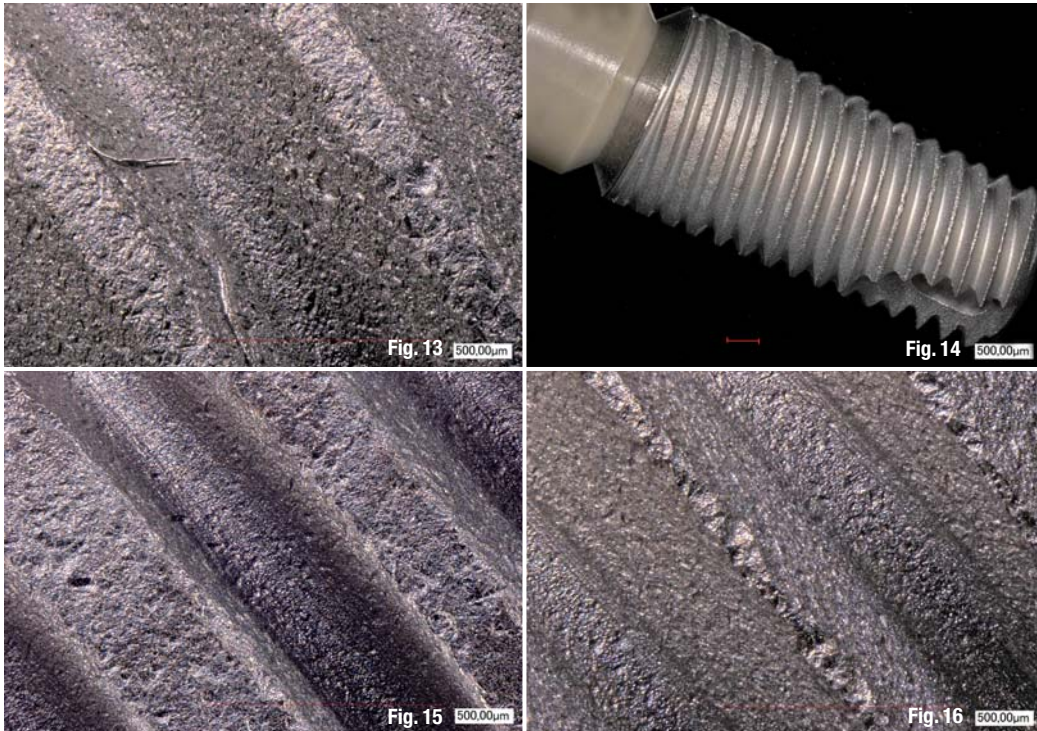


Fig. 13 Implant #0011 (ZBM Kontr.) at 300× magnification.

Fig. 14 Implant #0012 (SBA B-line) at 30× magnification.

Fig. 15 Implant #0012 (SBA B-line) at 100× magnification.

Fig. 16 Implant #0012 (SBA B-line) at 300× magnification.

- irregularity in surface roughness
- faulty labelling
- deficient quality control.

For patients who had lost more than one implant, only one implant was analysed by the authors. The other failed implants were sent to the manufacturer for further analysis. At the time of writing, we had received no feedback from the manufacturer.

Conclusion

Today, we understand the mechanism of osseointegration. The implant design ensures primary stability. After the tissue response has been initiated, new bone formation takes place after six weeks. From this point, the implant design is irrelevant. Only the implant surface, microstructure, porosity, texture and cleanliness influence further biological processes. A great thread pitch placed in D1 or D2 bone quality and great augmentation volumes demand longer healing periods.

Other design features are only important for long-term stability and can be an issue after loading the implants (emergence profile, platform switching, soft-tissue quality and quantity). Morphology, alignment and texture of crestal options, abutment connection and platform switching complete the scaffold for successful hard and soft-tissue stability. Bone formation and remodelling cannot be accelerated, and underlying natural biological processes are completed after six months postoperatively.

Users expect the perfect performance of the products with which they treat their patients. In the third part of the series, we will examine the current specimens under an electron microscope. Additionally, we will examine failed and sterile-packaged implants from another two manufacturers, comparing the precision of thread design, production residue, tissue on-growth on the surface and surface defects.

Editorial note: Editorial note: The authors receive no financial incentive from the manufacturer. All of the implants were purchased. The failed and sterile-packaged implants originated from three different private practices.

The implant fabrication numbers and literature can be requested from the publisher.

contact

Dr Nikolaos Papagiannoulis

Dental Esthetics

Hans-Boeckler Str. 2a

69115 Heidelberg, Germany

info@fsde.com.gr

Mandibular body reconstruction with a 3-D printed implant



Authors Dr Saeid Kazemi, Reza Kazemi, Sita Rami Reddy Jonnala, Dr Ramin S. Khanjani, Dr Amir Jalal Abbasi, Dr Abbas Azari & Mehdi Abaddar, Sweden

_Nowadays, no aspect of human life seems to have been left untouched by the ever-expanding digital technology. Particularly in scientific fields, digitalisation has working wonders during the past few years, to the degree that it is even difficult to imagine going back to the ordeal of analogue methods and putting up with their vagaries. A remarkable blessing of digital technology, among others, is the exceptional precision and high control over the measurements, never possible to obtain through any of the preceding methods. There is no surprise then that it has the strongest appeal to the fields of knowledge and practice wherein precision is amongst the most critical element of success.

_Hot spot for digital technology

With a lot of technical sensitivity at its heart, the dentistry can easily be viewed as a hot spot for implementing digital technology to achieve the most-wished precision. Indeed, the digital technology has already gained a stable foothold in dentistry and there is an ongoing shift towards embracing digital systems into the dental practice. Predictably, the majority of the advertised technologies and services are geared towards routine dental procedures. On the other hand, the most significant advancements have been wit-

nessed in an area which falls only within the experience of specialists; it is the domain of maxillofacial surgery where tailoring the treatment plan to the unique conditions of the patient is the key to success. Here the state-of-art digital technology comes in handy to fully customise the treatment by taking the slightest details into consideration and reflecting that into the surgical and restorative solutions.

Though the successful reconstruction of any human structure is justifiably a challenge, the stakes are even higher when the oral and maxillofacial area is affected. In this latter case, care must be taken to retrieve function in conjunction with restoring aesthetics. Oftentimes, even the second objective might take precedence. As such, the significance of precision and adaptability to the existing structures for the maxillofacial implants cannot be overemphasised. Fortunately, with the advent of 3-D digital designing and additive manufacturing a fully satisfactory treatment is no more a remote possibility.

The virtual environment of 3-D software accommodates full inspection of the surgical area from multiple angles. It also facilitates designing and adjustment of the form of the future implant with much ease and with respect to topography of the surrounding structures. Thanks to the available technology and material, now it is possible to 3-D print such intricate designs with above-standard accuracy and minimum technical glitch. The result is the highest fit of precision always craved for by maxillofacial surgeons to complement their skilful incisions.

_Case presentation

Since its inception, DRSK Company has been committed to explore potentials for incorporation of the digital and computer science into the dental field by

Fig. 1 One-of-a-kind mandibular implant as reconstruction for the missing mandible body.

Fig. 2 Replica of the patient's skeleton. Missing mandible body replaced with a fibula graft.



Fig. 1



Fig. 2

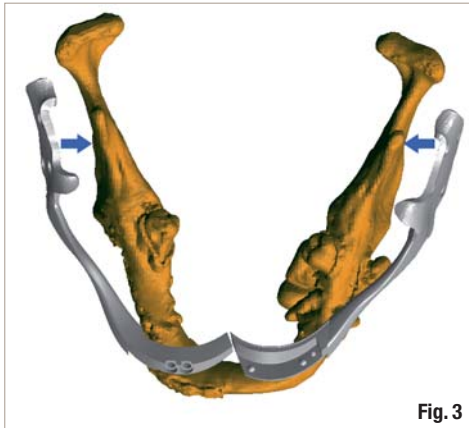


Fig. 3



Fig. 4

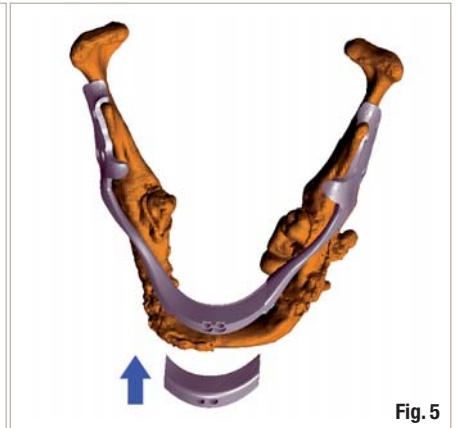


Fig. 5

devising innovative solutions. With 3-D services being a major activity of DRSK, the company has been approached for 3-D designing the maxillofacial implants of different kinds and successfully accomplished them. All these 3-D designed implants are highly customised and feature great accuracy and therefore satisfy both surgical and mechanical standards.

Patient case

One such recently carried out project that merits further elaboration is the design and manufacture of one-of-a-kind mandibular implant (Fig. 1) for recon-

structing the missing mandible body (Fig. 2). The patient, a young man, had lost the entire mandible except for the rami after being severely injured in a blast. Over the years, the patient had undergone several surgeries with little improvements achieved. In point of fact, one consequence of those surgeries was the formation of fibrous scar tissues which, as will be explained in the following, exacerbated the situation and restricted the chance for an effective treatment.

At the time the surgical team contacted DRSK, the patient had already received a graft taken from his

Fig. 3 Left and right segments of the implant were designed to be placed and screwed over the corresponding ramus.

Fig. 4 At the front, left and right segments of the implant met and dovetailed into each other.

Fig. 5 A temporary or surgical middle piece was designed to be placed over the left and right sections at the surgical session.

AD

RatioPlant®
dental implant systems - the advanced way to care!



HumanTech
Medical Devices



Distributors are welcome, please contact us under the address below:



Made in Germany

www.humantech-solutions.de

HumanTech Germany GmbH
Gewerbestr. 5
D-71144 Steinbronn, Germany
email: sales@humantech-solutions.de
phone: +49.7157.5246.71

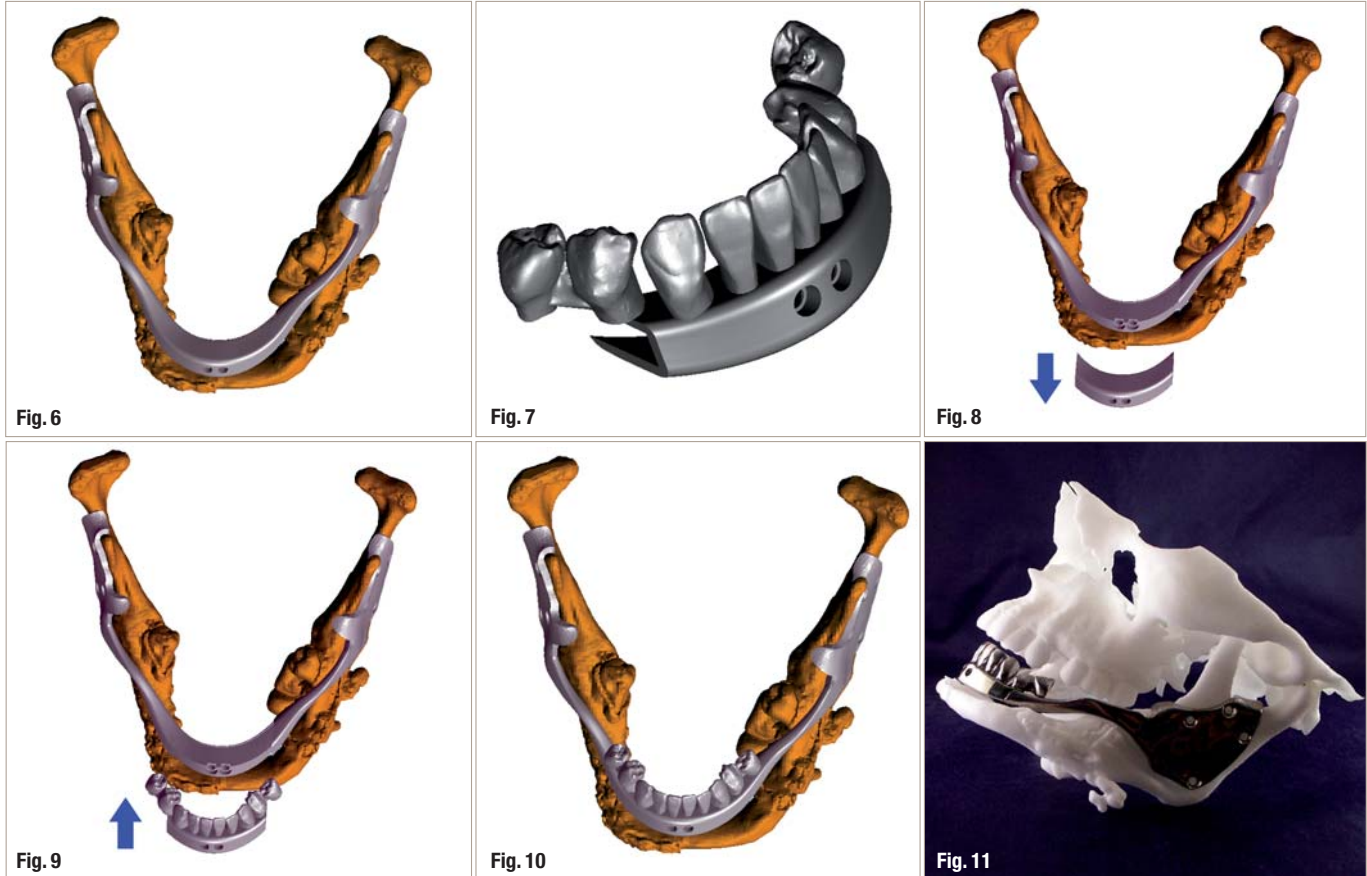


Fig. 6 The middle piece should hold two pieces in place at the front.

Fig. 7 The prosthetic, permanent middle section.

Fig. 8 After the healing period: Insertion of the prosthetic component with unscrewing and removing of the surgical middle part.

Fig. 9 Insertion of the prosthetic middle section, carrying the teeth.

Fig. 10 Fixation of the prosthetic middle section.

Fig. 11 Final prosthesis shown over the patient's model.

fibula. Owing to the extent of structure loss, the graft alone failed to yield the anticipated results. Needless to say, the ultimate goal of the treatment was to improve the aesthetics and retrieve the function of the reconstructed jaw by a prosthetic treatment and giving the patient a chance to experience an almost normal mastication once more. However, the form and size of the grafted bone could not provide the required support for prosthetic structures such as dental fixtures.

Eventually, the surgical team decided to seek assistance from DRSK and use its 3-D services expertise to design and manufacture an ad hoc mandibular implant that fully complies with the patient's unfavourable conditions and enables the complementary prosthodontics treatment. The overall shape of the implant and its relation with other anatomic structures, including the grafted bone and the soft tissue were all fleshed out and requested by the surgical team. One stipulation of the surgical team was to keep the previously grafted fibula. They considered it as a safety measure in event of implant's failure.

The design solution

One big challenge to carry out this particular project was to design the implant in such a way that it can be easily seated in the correct position. There were two major impediments to a one-piece implant solu-

tion. First of all, the implant was intended to be mounted over the remaining parts of the patient's jaw, i.e. his two rami. To achieve the maximum anchorage from the rami, those parts of the implant connecting them were supposed to adapt to their external anatomy. Since the rami converge to the front, the same was expected from the corresponding implant design.

However, such designing choice would have made the matters complicated for surgical placement of the implant. What's more, the fibrous tissues resulting from the previous surgeries have dramatically reduced the patient's ability to open his mouth. Therefore, DRSK 3-D design team had to cross out the one-piece implant solution. Eventually by taking different limitations into account and after consulting with the surgical team and receiving their endorsement, it was decided to make the prosthesis in three pieces.

Each of the two larger left and right segments of the implant was designed to be placed and screwed individually over the corresponding ramus (Fig. 3), while at the front they met and dovetailed into each other (Fig. 4). A third part then had to be placed over the two pieces at their interface, embrace both and hold them together securely (Figs. 5 & 6). This way the whole thing turned into a unified structure.

Excellent fit with 3-D designing

The success of the proposed design was to a large extent reliant on obtaining an excellent fit for each piece. This is the reason why the role of 3-D design and manufacture was so essential in this procedure. The parts of the right and left sections that meet the rami had to be exactly adapted to the form of their corresponding anatomic structures. Each of them had to be formed in such a way that can fold over the edges of the ramus and embrace it enough for a proper support. Using 3-D design as well guaranteed the perfect contacts between three pieces which otherwise might have been an area of concern for a design of this nature.

Given the necessity for including a prosthetic solution and considering the patient's limited mouth opening, the most feasible solution was to incorporate the artificial teeth into the structure of the mandibular implant. As described above, during the surgical procedure and after screwing left and right pieces over the rami, the two overlapping front ends of left and right parts were fully fixed in place by adding the middle segment. The idea for the final design was to include the artificial teeth as part of this middle section.

However to eliminate the risk of any force or pressure that would have compromised the success of the surgery, a temporary or surgical middle piece was designed to be placed over the left and right section at the surgical session (Fig. 5). The function of this piece was simply to hold two pieces in place at the front (Fig. 6) before being replaced with the prosthetic, permanent middle sections (Fig. 7).

The prosthodontic component

On the surgical team's recommendation, the mandibular dentition included in the design of the middle section only comprised ten teeth including incisors, canines and premolars on both sides (Fig. 7). Due to the size of third surgical piece and its function of uniting the other two sections, only incisors and canines are in contact with the interconnecting surface of the middle part. So when the middle prosthetic piece is seen independently, the premolars look unsupported in the manner of a cantilever bridge.

However, after insertion of this enfolding middle part over the overlapped arms of left and right pieces, the premolars become tightly in contact with left and right sections; this prevents any destructive lever function from taking place. Again such close contact has only been enabled by the accuracy of 3-D designing and the following 3-D print procedure.

The particular design of arms of left and right pieces, which collectively form the body of the mandible, is also worthy of note. These arms feature a

90 degree twist in the approximate area of molars. In this way they can adopt to both the thinner posterior part which is anchored over the ramus and the frontal part that required a broader width for carrying the teeth. Such twist also offered a solution for the relative lack of space in the posterior part of the mouth. This curve can as well bolster the physical resistance of the mandibular implant to the mechanical pressures.

3-D printing

As the designing procedure finished, the designed implant had to be manufactured and delivered to the surgical team. All three pieces were 3-D printed in Titanium Grade 5 using EBM technology. Also before installing the implant, patient's facial skeleton needed to be reproduced in a plastic material. It was 3-D printed by means of SLS technology. This replica was produced in order to give the surgeon a better idea of the surgical site and therefore facilitate the surgical process.

After the healing period, the time comes for insertion of the prosthetic component. At this stage the surgical middle part will be unscrewed and removed (Fig. 8) and the prosthetic middle section, carrying the teeth, will be inserted (Fig. 9) and fixed in place (Fig. 10 & 11). After checking the occlusion the patient's bite is to be registered. The sizes of the teeth have to be adjusted accordingly. As the next step, a layer of porcelain should be added to the teeth to finalise the prosthetic phase and thereby the treatment process.

Summary

In brief, the 3-D design has paved the way for devising unorthodox, novel surgical and prosthodontics solutions, as exemplified by the case presented in this article. Such alternative solutions could not be achieved through traditional technology with the same level of accuracy, which is essential for achieving the desired outcome.

The 3-D designing and 3-D printing therefore have infinitely widened the scope of maxillofacial surgeries by expanding and improving the potentials for customisation. Hence, it is now of utmost importance for maxillofacial surgeons to get further familiar with areas of application of these empowering tools and learn about opportunities for enlisting its assistance.

contact

Dr Saeid Kazemi
DRSK Group AB
Kasernvagen 2, SE-281 35
Hassleholm, Sweden
Tel.: +46 705 129909
www.drsk.com

Simplifying implantation in socket and ridge preservation

Authors Martin Keweloh MD, DDS, MSc, Julian Riedasch DDS & Konrad Joisten MD

Introduction

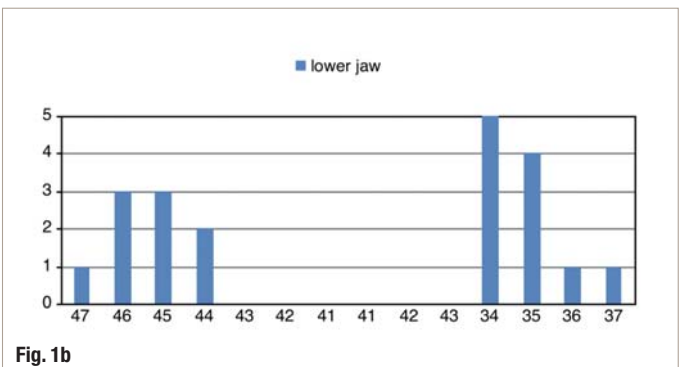
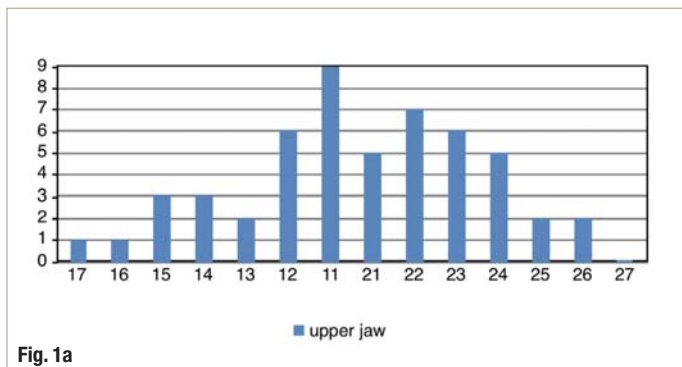
An adequate amount of bone in both the horizontal and vertical directions is required for successful oral rehabilitation with dental implants. Preservation of the alveolar bone structure after tooth extraction is a critical factor regarding the outcome of this procedure. Bundle bone, which depends on the periodontal tissue, is inevitably lost after tooth extraction.^{1,2} As the buccal wall is often very thin and mainly composed of bundle bone, tooth extractions commonly result in a reduction of the alveolar process in the vertical and horizontal directions.^{1,3} Such resorption is typically observed in the buccal walls of the upper jaw.^{1,4}

A 50 % reduction in the width of the buccal wall was observed after the extraction of molars and premolars in 46 patients at 12 months after extraction, with the atrophy being most severe within the first three months after extraction.⁵

By augmenting the socket with artificial bone, its shape can be conserved and predictable regeneration of bone can be achieved.^{1,6} Notably, in the anterior upper jaw, effective maintenance of the ridge is possible. The larger the osseous defect, the more complicated is the augmentation procedure for implant placement. Therefore, it is obvious that preserving the alveolar ridge after tooth extraction is of great importance. This procedure is termed socket preservation (SP) if the bony walls are sound and ridge preservation (RP) in case of defect or absence of the bony walls of the socket. Further treatment options for the extraction site include socket seal surgery and ridge augmentation. The aim of such surgeries is to preserve the osseous dimensions and to limit resorption. This technique is applied more often in the upper jaw than in the lower jaw.

The primary importance of SP in the maxillary molar region is to optimise the hard tissue facing

Figs. 1a & b Number of sockets treated by SP or RP by region.



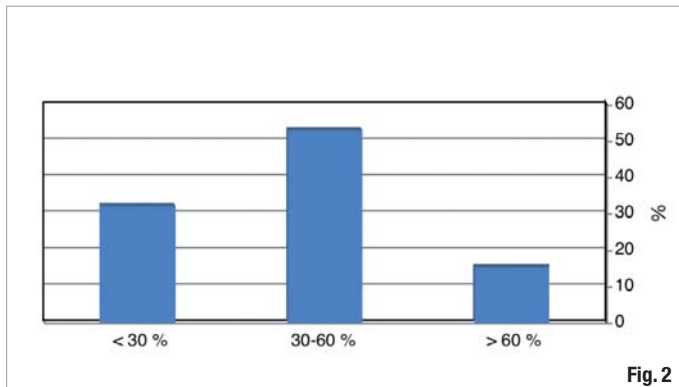


Fig. 2

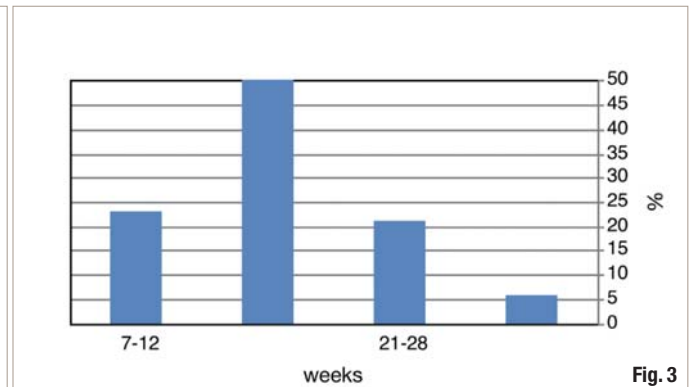


Fig. 3

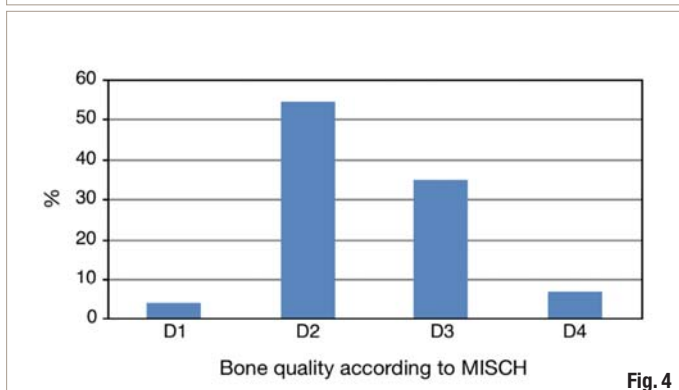


Fig. 4

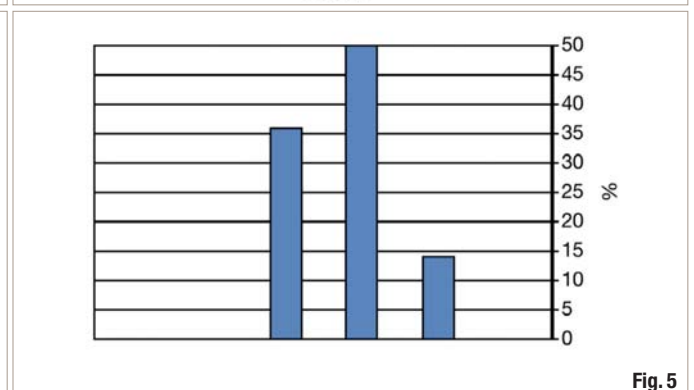


Fig. 5

the sinus elevation.⁷ A bone height of 4 mm at the sinus floor enables simultaneous augmentation and implantation. The greater the amount of remaining bone, the better the possibility for simultaneous augmentation and implantation is, and the greater the amount of remaining hard tissue, the better the prospect for a once-off procedure is, with decreased morbidity. The goals of SP are conserving hard and soft tissue, as well as expanding the tissue. This is not a bone augmentation procedure in the classical sense.

The present analysis assessed a series of consecutive cases treated with SP and RP in a private maxillofacial practice with day surgery. In particular, the need for further augmentation procedures after complete healing of the socket was evaluated.

Biology of healing of the human dental socket

Immediately after tooth extraction, a coagulum is formed at the extraction site. After seven days, the socket is filled with granulation tissue; at 20 days, this is replaced with fibrous tissue. Remodelling leads to osteoid formation after seven days, which will ossify two-thirds of the alveolus within 38 days. Within four days, the epithelium germinates. Complete epithelisation requires at least 24 days.⁸

Canine studies have shown that the loss of bundle bone, vascularisation, and ingrowth of woven bone occurs at 14 days after tooth extraction. Early-

phase remodelling with a high degree of mineralisation combined with osteoclastic deterioration has been shown from Day 30 onwards. At Week 8, bone covers the coronal part of the socket and marrow develops in the central part.¹ Between Days 60 and 180, the woven bone is replaced by bone marrow.⁶

Maintenance of the bone level by SP and RP after tooth extraction occurs as follows: in the augmented alveolus, Geistlich Bio-Oss Collagen stabilises the mineralised bone matrix. The natural resorption of bone is compensated for by the newly formed bone, and the profile of the ridge remains steady to a large extent. The loss of bundle bone cannot be eliminated completely.⁹

Materials and methods

From March 2006 to October 2009, 52 patients (19 males and 33 females) were treated by SP or RP with a planned approach for implant surgery in 72 cases. Informed consent was obtained from each patient. Clinical and radiographic data on the degree of bone resorption, the quantity and quality of the hard and soft tissue, and the augmentation procedure needed was collected from the time of extraction until the uncovering of the fixtures and the patient's release for prosthetic therapy. All the cases were photographed, and the same physician performed all of the implant surgeries. The median age of the patients was 49.0 ± 15.9 years at the time

Fig. 2 Degree of resorption of the buccal wall immediately after tooth extraction.

Fig. 3 Time of second-stage surgery after complete healing of the sockets.

Fig. 4 Bone quality according to Misch's classification after complete socket healing at the time of second-stage surgery.

Fig. 5 Bone quantity according to Cawood's classification after complete socket healing at the time of second-stage surgery.

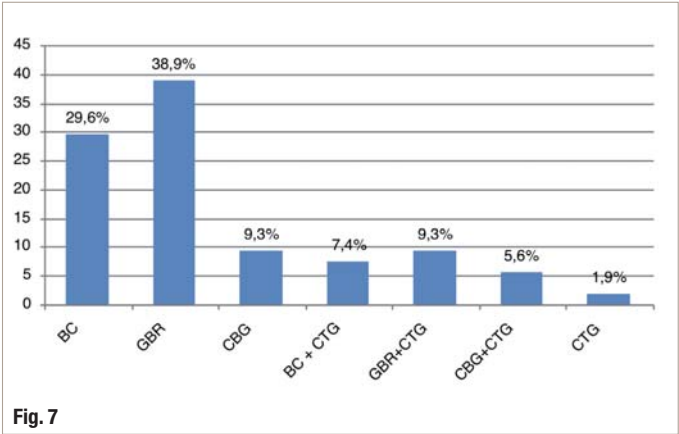
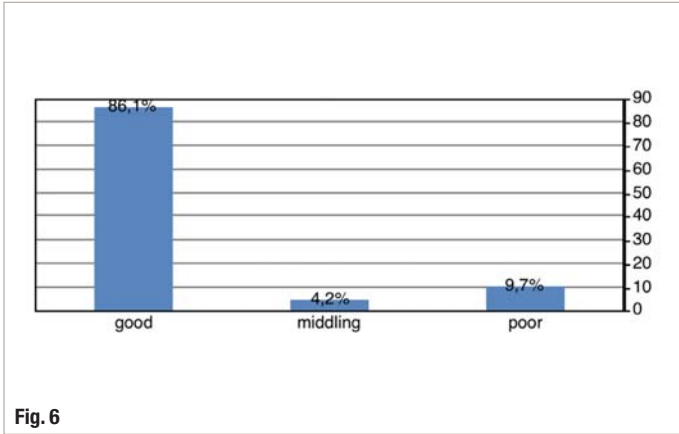


Fig. 6

Fig. 7

Fig. 6 Soft-tissue quality after complete socket healing at the time of second-stage surgery.

Fig. 7 Additional augmentation procedures after complete healing of the socket (BC = bone collector; GBR = guided bone regeneration; CBG = cortical bone graft; CTG = connective tissue graft).

of the first surgery. Statistical analysis included the description of the percentage distribution of the above-mentioned data in comparison with the necessary augmentation steps in consideration of the region and progress.

Surgical procedure

The extremely thin buccal bone in the anterior region of the upper jaw most often undergoes resorption after tooth extraction. In order to minimise the resorptive processes, atraumatic extraction techniques with SP are essential. A significant reduction in alveolar ridge resorption has been noted with the aid of SP techniques.¹⁰

All of the teeth were extracted using special periostomes and luxators (KLACK-Periotome, Wegmann Dental). The periodontal tissue was exposed by straight slide-in movements, and the tooth was elevated. If extraction was not possible (post-endodontic treatment or ankylosis), further efforts with luxators were attempted. A flap was prepared without damaging the papillae and the tooth extracted by gentle osteotomy. In total, 72 teeth, which were not conservable, were extracted.

After the sockets had been cleaned thoroughly, they were filled with Geistlich Bio-Oss Collagen (Geistlich Pharma). The moistened combination of collagen and bone material can be easily shaped. Depending on the size of the osseous defect, 100

or 250 mg Bio-Oss blocks were used, with 100 mg being suitable for single-rooted sockets and 250 mg being suitable for the molar region. Bio-Oss Collagen was placed at the height of the crestal bone. Wound closure was performed by single sutures.

The quality of the hard tissue according to Misch and the biotype of the soft tissue were documented after wound closure. The biotype was determined by probing the gingival margin with a WHO dental probe. The biotype was considered to be thin if the probe appeared to show through; if not, the biotype was recorded as thick (concept by Dr Markus Schlee, Germany).

The sockets healed by secondary intention. Wound healing lasted for a minimum of seven weeks. On the day of second-stage surgery, the quality^{11, 12} and quantity¹³ of the bone were documented to clarify the condition of the soft tissue. Depending on the structure of the bone bed, either the implant was inserted or augmentation to optimise the bone range in the horizontal and vertical directions was performed beforehand.

The implants (RatioPlant Implants, HumanTech Germany) were placed according to the manufacturer's protocol. In cases of minor bone loss, such as filtering through of the thread, bone particles from a bone collector (BoneTrap, DENTSPLY) were used to augment the defect. In the event of a larger osseous defect (uncovered thread size of 2–4 mm), a modified guided bone regeneration (GBR) procedure entailing the application of Geistlich Bio-Oss granules (Geistlich Pharma) mixed with autologous bone particles covered by a membrane (Geistlich Bio-Gide, Geistlich Pharma) was performed. Very large osseous defects required a two-stage procedure: first, a block graft from the angle of the mandible was fixed in the affected area, and the implants were then placed in the lower and upper jaws after three and four months, respectively. If required, a

Table 1 Bone quantity according to Cawood's classification at the time of second-stage surgery in sound bony walls (SP) and sockets with osseous defects (RP) at the time of tooth extraction.

Cawood classification	SP (%)	RP (%)
I	0	0
II	0	0
III	60,9	24,5
IV	34,8	57,1
V	4,3	18,4
VI	0	0

connective tissue graft from the palate was transplanted to the buccal site of the fixture.

The referring dentists fabricated the prostheses. Once the fixture exhibited good osseointegration both radiographically and clinically, the surgical implant therapy was deemed completed.

Results

Overall, 72 % of the extraction sockets were localised in the upper jaw, with 63 % being in the anterior regions of teeth # 14 to 24 (Figs. 1a & b). One extraction socket was treated in 37 patients, two in 11, and three in three patients. A thin biotype was present in 60.9% of the patients treated with SP and 87.8% of the patients treated with RP. In the majority of the patients, the buccal bone height was reduced by more than 30% owing to pre-existing defects or extraction trauma (Fig. 2).

The buccal bone was considered satisfactory in 32 % of the patients (resorption of < 30%). Antibiotics were administered postoperatively in 28.9% of the cases. The second stage of surgery was performed at 13–20 weeks in approximately 50% of the patients (Fig. 3). One patient became pregnant shortly after SP; therefore, the implant surgery was extremely delayed.

The handling of the collagen blocks was rated "easy" by the surgeon and the amount of bone substitute for the size of the sockets was always sufficient. Healing was uneventful in all of the patients. The sockets had healed completely at the time of the second surgical procedure, and 88.9% of the treated sockets exhibited a bone quality of D2 or D3 according to Misch (Fig. 4).

No significant differences were observed between the SP (D2 or D3 in 91.3 %) and RP (D2 or D3 in 87.8%) groups. The bone quantity according to Cawood's classification was III or IV in 86.6% in the SP group (Fig. 5), whereas the RP group included a lower number of patients at the III and IV levels (Table 1).

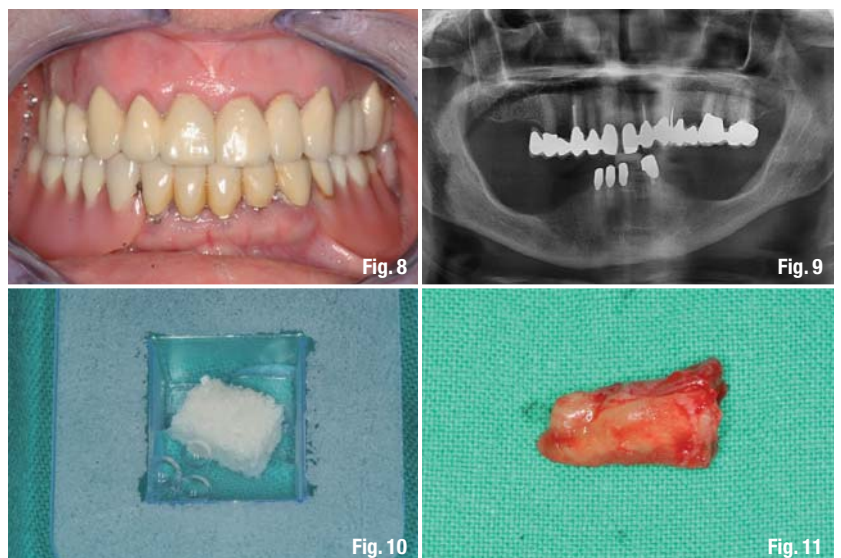
The texture of the soft tissue was rated as "good" in the majority of cases (Fig. 6). The criteria for this rating included the absence of inflammation and a broad band of keratinised and stippled gingiva. The criterion for "fair quality" was a narrow band of keratinised gingiva with a lack of stippling. The criterion for "poor quality" was a thin biotype with partial superficial redness that was sometimes caused by coverage with a temporary prosthesis (i.e. contact mucositis). Implant placement was not hindered in any of the cases.

In 75 % of the sockets, complementary measures were undertaken to augment the hard or soft tissue (Fig. 7). Mainly, hard-tissue augmentations were required (76.4%). However, block grafts (with or without soft-tissue augmentation) had to be carried out in 14.8 % of the cases, and all of these sockets featured bone defects (RP group). In five of eight sockets, resorption was distinct with percentages of ≥ 70 %. In most cases, augmentation using bone particles from the collector or performing GBR with Bio-Oss and a Bio-Gide Membrane was sufficient for treating the existing defects. Combined augmentations of hard and soft tissue were undertaken in 20.4% of the sockets. In the RP group, augmentation of the hard and soft tissue had to be performed more often than in the SP group (28.2% compared with 6.3%; Table 2).

In 77.8% of the treated sockets, implants could be placed immediately, whereas a bone block had to be grafted beforehand in 15.3 % of the sockets. No dental fixtures were placed in 6.9 % of the sockets. In sockets without relevant bone defects (SP), implants were inserted in almost all the cases (95.7%) during the second-stage surgery. In contrast, only 69.4% of the sockets preserved by RP could undergo immediate implantation during the second-stage surgery.

One of the patients underwent partial resection of the tongue and floor of the mouth with adjuvant radiotherapy owing to squamous cell carcinoma. Although surgical preparation and wound closure were difficult owing to fibrosis, the patient successfully received implants. The prosthesis has been in place for more than six years without trouble. The clinical progress and prosthetic outcomes are shown in Figures 8–18.

Fig. 8 Planned SP in region #13 in a 70-year-old patient.
Fig. 9 Radiograph of the non-conservable tooth #13.
Fig. 10 Moistening of the Bio-Oss Collagen block (100 mg).
Fig. 11 Gentle extraction of the fractured tooth.



	SP (%)	RP (%)
Only hard tissue augmentation	87,5	71,8
Only soft tissue augmentation	6,25	0
Hard and soft tissue augmentation	6,25	28,2

Table 2 Augmentation procedures at the time of second-stage surgery in sound bony walls (SP) and sockets with osseous defects (RP) at the time of tooth extraction.

Discussion

In the present analysis, SP and RP were successfully carried out in 52 patients in order to improve the hard- and soft-tissue beds before implant placement. In these treated alveoli, dental fixtures could be inserted as planned in a one-step procedure without prior bone grafting. Existing bone defects were mostly of minor or moderate classification and could be augmented simultaneously by placing bone particles or through GBR. Only a few patients required additional connective tissue grafts. In patients with pre-existing defects of the bony socket walls (RP), implantation had to be delayed, compared with patients with intact bony walls (SP). In addition, a greater number of augmentations using bone particles and/or an artificial bone source were required in the RP group.

The main region of treatment was the upper anterior jaw. In addition to the functional aspects of implant treatment, the aesthetic perspective is just as crucial. In order to achieve optimal functional and aesthetic results with implant therapy, the buccal wall should be 2 mm wide.^{14,15} However, the buccal wall is often less than 1 mm wide.¹⁶ Moreover, 52% of the width and 2–4 mm of the height of the

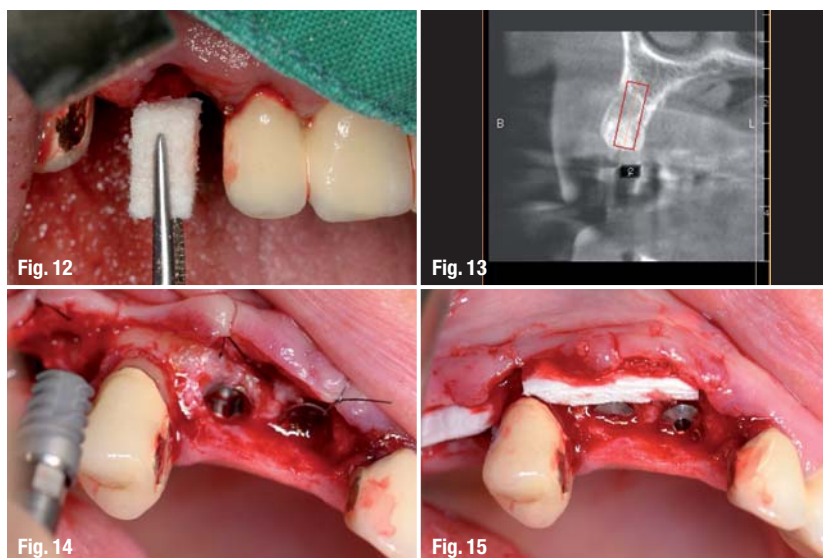
buccal wall are lost in the first year after tooth extraction. The majority of such resorptions are known to occur in the first three months.⁵ If such an occasion arises, extensive augmentation measures are inevitably required. Elevation of the periosteum has been previously noted to lead to a median of 0.7 mm resorption at the buccal site. In the present study, SP achieved better results than RP, although resorption of the vestibular bone could not be eliminated completely.

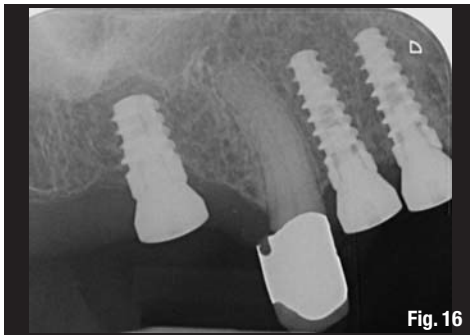
Currently, the focus is on preserving the bone volume and optimising soft-tissue conditions.⁶ In order to reduce or avoid the loss of bone volume after extraction, tooth extraction should be performed very carefully; the alveolus can be further treated by SP or RP with Bio-Oss Collagen.^{17,18} Subsequently, hard- and soft-tissue volumes can be preserved to a large extent, and losses can be reduced to simplify implantation. It should be noted that the process of resorption after extraction occurs in the crestal part of the tissue.¹ It is not necessary to fill the socket completely to the apex with Bio-Oss Collagen. However, the apical void was confirmed to be well ossified by imaging using CBCT in this case series.

Aesthetic outcomes were not assessed in this study, since many different referring dentists performed the prosthetic treatments. In addition, after the incorporation of the crown or bridge, patients were not compliant regarding the time frame for prosthetic treatments. Therefore, patients were documented during standard treatment in our clinic. Consequently, no comparison with a group of patients without SP or RP was planned. Therefore, data analysis was performed on the basis of the quantity and method of augmentation needed to perform the standard procedure of tissue augmentation as described below:

1. If the primary stability of an implant has been achieved and the threads show through, bone particles gathered by a collector are used to widen the lateral wall by up to 2 mm.
2. If the primary stability of the implant has been achieved, but the vertical bone defect of the buccal wall measures 2–4 mm, GBR with Geistlich Bio-Oss granules mixed with bone particles is performed and covered with a Geistlich Bio-Gide Membrane.
3. In the case of a larger bone defect in the vertical and horizontal directions (Cawood IV–V), a two-stage procedure must be performed, with bone blocks from the angle of the mandible being used for augmentation. The lower and upper jaw implants are placed after three and four months, respectively.

Fig. 12 Placement of a moistened Bio-Oss Collagen block (100 mg).
Fig. 13 Pre-op radiograph (cone beam) after four months of healing. The former Bio-Oss Collagen block that supported the hard and soft tissue, averting the collapse of the tissue, is marked out.
Fig. 14 Placement of three RatioPlant Avantgarde (HumanTech Germany) fixtures.
Fig. 15 Placement of a Geistlich Mucograft matrix (Geistlich Pharma) to support the soft-tissue biotype.





The results of the analysis suggest that after SP in most cases, a one-stage procedure (Type 1 or 2 in the list shown above) could be chosen to provide a sufficient amount of hard tissue for the implant. In sockets with sound bony walls (SP), this rate was higher than that in sockets with a defect in the vestibular wall (RP).

Similar results were obtained by Shakibaie in a prospective clinical study with 32 patients and 142 recently extracted sockets.¹⁹ On comparing the degree of preservation in three dimensions after three to five months of healing without (control group) and with SP or RP (test group), the control group exhibited a significantly higher rate of resorption (65%) than did the test group.

Combining our subjective grading and the above-mentioned comparison with previous results from our practice, we consider that the bone bed is improved by SP or RP, thereby decreasing the number of cases that require block grafts. Bio-switching of the soft tissue after SP or RP with Bio-Oss Collagen is feasible. Connective tissue grafts were only required in a few cases in our study, resembling the results by Ackermann, who described comparable outcomes concerning soft tissue.¹⁷

SP and RP have certain advantages: these are straightforward procedures with little risk, involve no shift of the mucogingival junction, and lead to minimal trauma and shortened treatment time compared with cortical bone grafts, which may be considered avoidable.¹⁹ Curettage of the alveolus must be carried out diligently, since the obturation of the socket with Bio-Oss Collagen poses a greater risk of the development of a residual cyst.

Conclusion

In this consecutive case series, fresh extraction sockets were treated with SP or RP to improve the hard and soft tissue of the implantation bed in order to render the proposed implant placement easier to perform. In larger augmentation procedures that require intricate surgical techniques and long

treatment times, with higher risks of complications and morbidity, SP or RP could positively influence the need for such complex augmentations, enabling simpler procedures. This aim was well achieved in our patient population—more so in patients with intact bony walls (SP) than in patients with osseous defects (RP). Most of our patients required only small bone augmentations, which could be performed simultaneously with the implantation. This one-stage procedure represented a substantial clinical improvement compared with bone block transplantations.

The probability of successful RP decreases with increasing loss of the lateral bony wall. In cases of high resorption of the buccal wall (70–100%), Bio-Oss Collagen acts like an expander for the soft tissue, but cannot help avoid a two-stage augmentation procedure.

Bio-Oss Collagen is very well suited for SP or RP, since it supports hard and soft tissue, is easy to handle, and presents only a minor risk of complications. SP or RP reduces the necessity of complex augmentations and is an ideal preconditioning regimen for guided surgery cases.

Based on our findings in these cases of SP or RP, the use of Bio-Oss Collagen is a reliable approach for simplifying and optimising implant therapy.

contact

Praxisklinik-MKG
Wetzgauer Str. 62
73557 Mutlangen
Germany

sg-implant@praxisklinik-mkg.de

Fig. 16 Radiograph of the osseointegrated RatioPlant fixtures at four months after implantation.

Figs. 17 & 18 Prosthetic crowns (upper jaw) and removable partial dentures (lower jaw) completed by Dr Katharina Dietz-Epple (Aalen, Germany).

Immediate loading with dynamic navigation implant surgery

Authors_Dr Jan D'haese, Dr Johan Ackhurst & Prof. Hugo De Bruyn

Although osseointegration of dental implants is predictable, thorough preoperative planning is a prerequisite for a successful treatment outcome.^{1,2} Anatomic limitations and prosthetic considerations encourage the surgeon to obtain a very precise positioning of the implants. Historically, standard radiographic imaging techniques (intra-oral and panoramic) were available for investigation of potential implant sites.

Nowadays, it is well known that 3-D CT scans allow for more reliable treatment planning than when only 2-D data is available.³ Transforming the CT scan images into a 3-D virtual image can be achieved using computer software packages, allowing for a 3-D view using CAD technology.³ For years, stereolithographic guided surgery appeared to be the gold standard in computer-guided implant surgery. This technique has been well developed in recent years and several scientific reports have been published regarding accuracy, complications, survival and success.⁴ However, stereolithographic guided surgery has some major disadvantages compared with conventional implant sur-

gery. The surgeon has to rely on a predesigned trajectory planned in the software, without being able to make intra-operative adjustments. In addition, the loss of tactile feeling during preparation and implant placement is a major drawback.

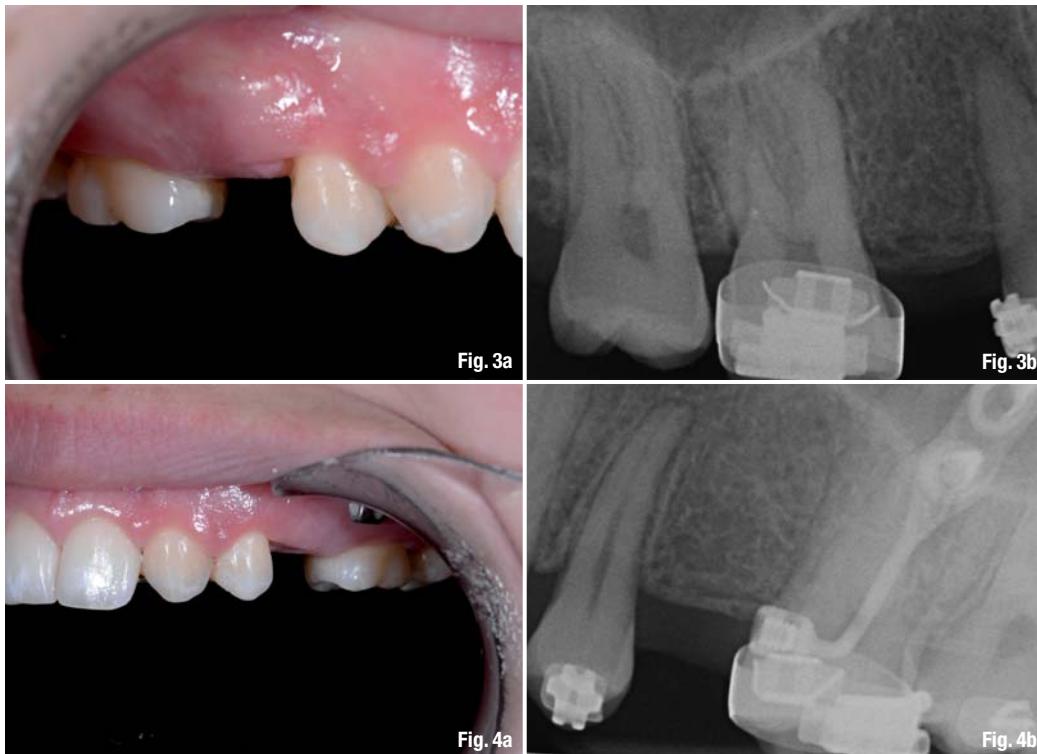
Real-time navigation appears to be a valuable alternative to stereolithographic (static) guided surgery, as it offers the clinician some advantages over the former technique. Using real-time (dynamic) navigation, one can avoid the fabrication of a stereolithographic template, resulting in a less expensive treatment. As navigation is considered a dynamic guided surgery system, changes to the treatment planning (location and size of implants, number of implants, flap or flapless, etc.) can easily be made intra-operatively. Also, the tactile feeling during the drilling procedure, as well as manual control over the implant stability, is still present when using navigation surgery.

Over the last decade, there has been a shift in surgical and prosthetic protocols, resulting in significant reduction in the integration time of a dental implant. This is a logical consequence of the constant improvement of implant characteristics and components simplifying dental implant treatment. Guided surgery using implant simulation software can contribute to better treatment planning, as it provides a preoperative view of the anatomical structures related to the future prosthodontics.⁵ This fact could make immediate loading procedures easier, and allows the clinician to know in advance the potential location and dimension of the future restoration(s). Many guided surgery procedures re-

Figs. 1a & b_The NaviStent surgical stent.

Fig. 2_Pre-op panoramic image.





Figs. 3a & b_Pre-op image of region #15 and a lateral photograph.

Figs. 4a & b_Pre-op image of region #25 and a lateral photograph.

sult in the absence of a flap design. Minimising the surgical flap can have advantages for soft-tissue healing and patient comfort.⁶ However, it has been shown that flapless free-hand surgery, regardless of surgical experience, leads to malpositioning of implants and consequently to bone perforations and dehiscences.⁷ This finding suggests that when using free-hand flapless surgery additional guidance during preparation of the implant bed and during implant placement is required. For this reason, navigation surgery can become an important tool in dental implantology, as it benefits from the advantages of using stereolithographic guided surgery and overcomes some important drawbacks of stereolithographic-involved procedures.

Case presentation

The patient treated was a 21-year-old female consulting the dental office for replacement of both second premolars in the maxilla, at regions #15 and 25. The patient was in good general condition and a non-smoker. She had been treated before at the orthodontic department at Ghent University Hospital because of multiple dental agenesis. Intra-oral examination revealed the absence of both lateral incisors and second premolars in the maxilla and both second premolars in the mandible. Periodontal screening showed no signs of pathology. The bone anchors used during the orthodontic treatment were still present in the second and fourth quadrants. Treatment involved placement of two dental implants in the edentulous regions of

the maxilla. Both implants were to be restored with two provisional crowns within 12 hours of implant placement (immediate loading).

Preoperatively, an impression of the dental arch was taken using an irreversible hydrocolloid (Cavex CA37, fast set, Cavex Holland) to fabricate a diagnostic cast. This cast was used as a model for the moulding of the surgical stent; hereafter called NaviStent (Figs. 1a & b). The NaviStent served as a scanning template and was also worn by the patient during the surgery. Afterwards, the patient was sent for a CBCT scan with the NaviStent in place (Figs. 2, 3a & b, 4a & b).

Planning procedure

A standard CBCT scan was performed according to the procedure outlined in the Navident scanning protocol from ClaroNav. Cone-beam images were taken with a Planmeca ProMax 3D Max (Planmeca) with a flat-panel detector and isotropic voxels. The field of view used for this case was 50 mm × 100 mm and a voxel size of 200 μm. The exposition parameters were 96 kV and 10 mA. Care was taken to align the field of view with the jaw and the radiographic tracker, which was situated anterior of the jaw.

All images were carefully reviewed and subsequently the CBCT images were converted into DICOM files and transformed into a 3-D virtual model using the Navident software system. The clinician who placed the virtual implants in the virtual

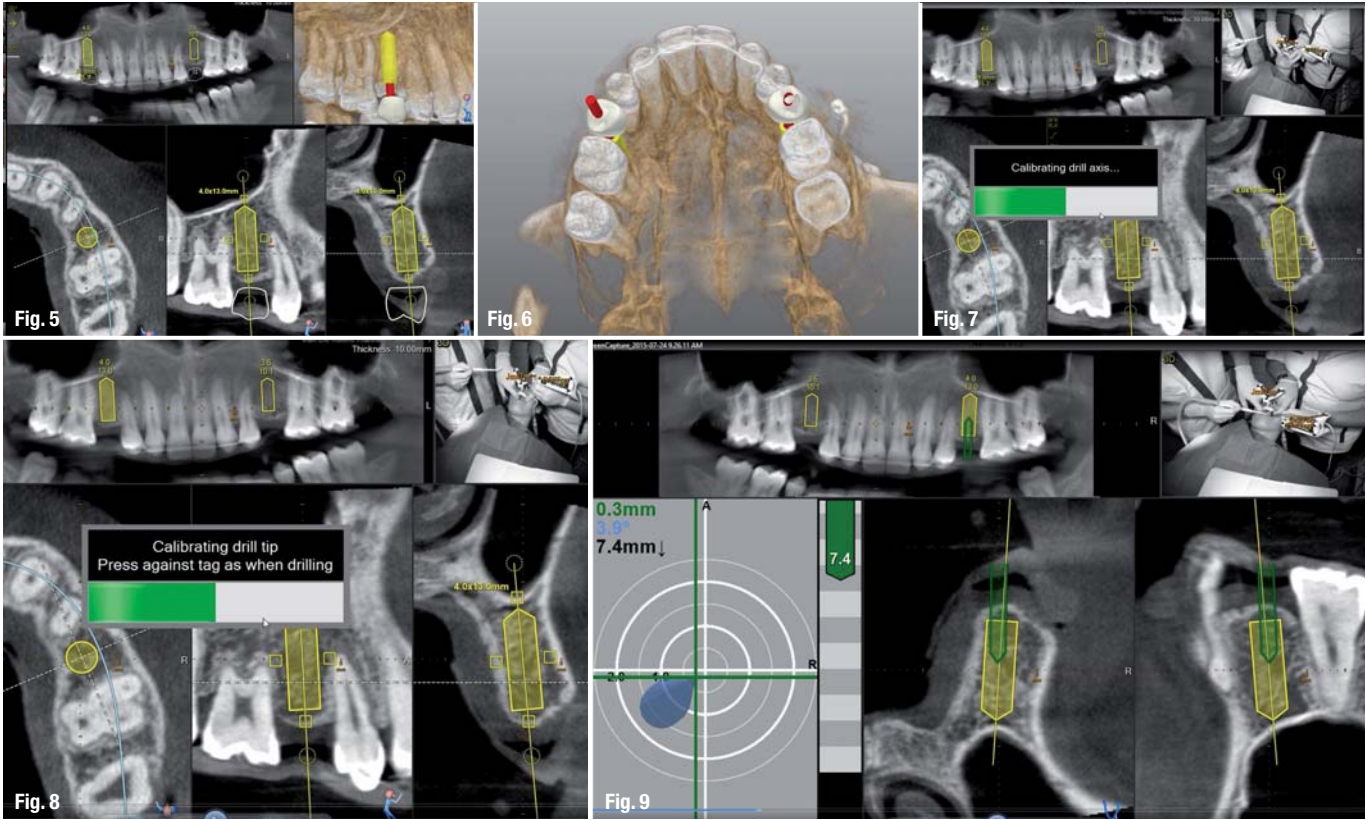


Fig. 5_ Planning in Navident.
Fig. 6_ Planning in Navident.
Fig. 7_ Calibration of the drill axis.
Fig. 8_ Calibration of the drill tip.
Fig. 9_ Surgical guidance using Navident.

3-D model also performed the actual surgeries. The potential locations for implant placement and corresponding implant lengths and widths were planned in a prosthetically driven manner. A distance of at least 3 mm from the neck of the implant to the gingival zenith was applied, allowing the biological width to create a connective tissue contour around the abutments (Figs. 5 & 6).

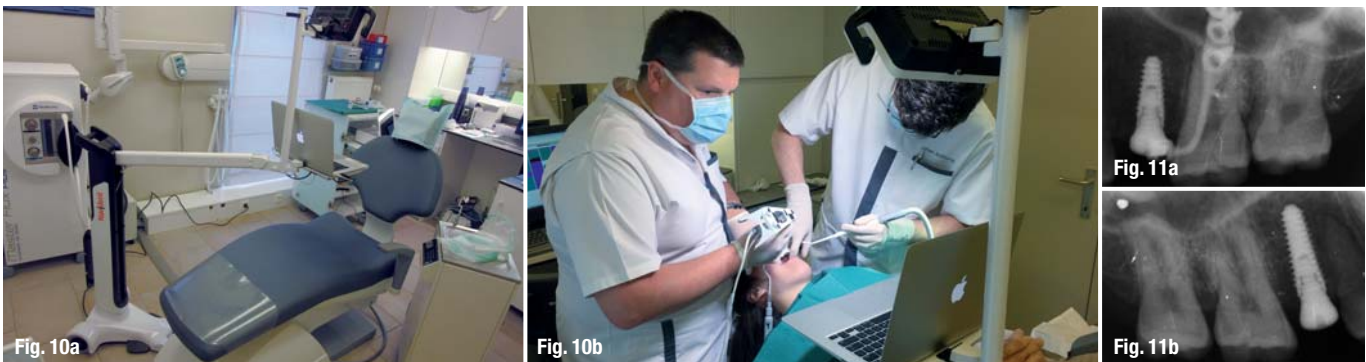
_Surgical procedure

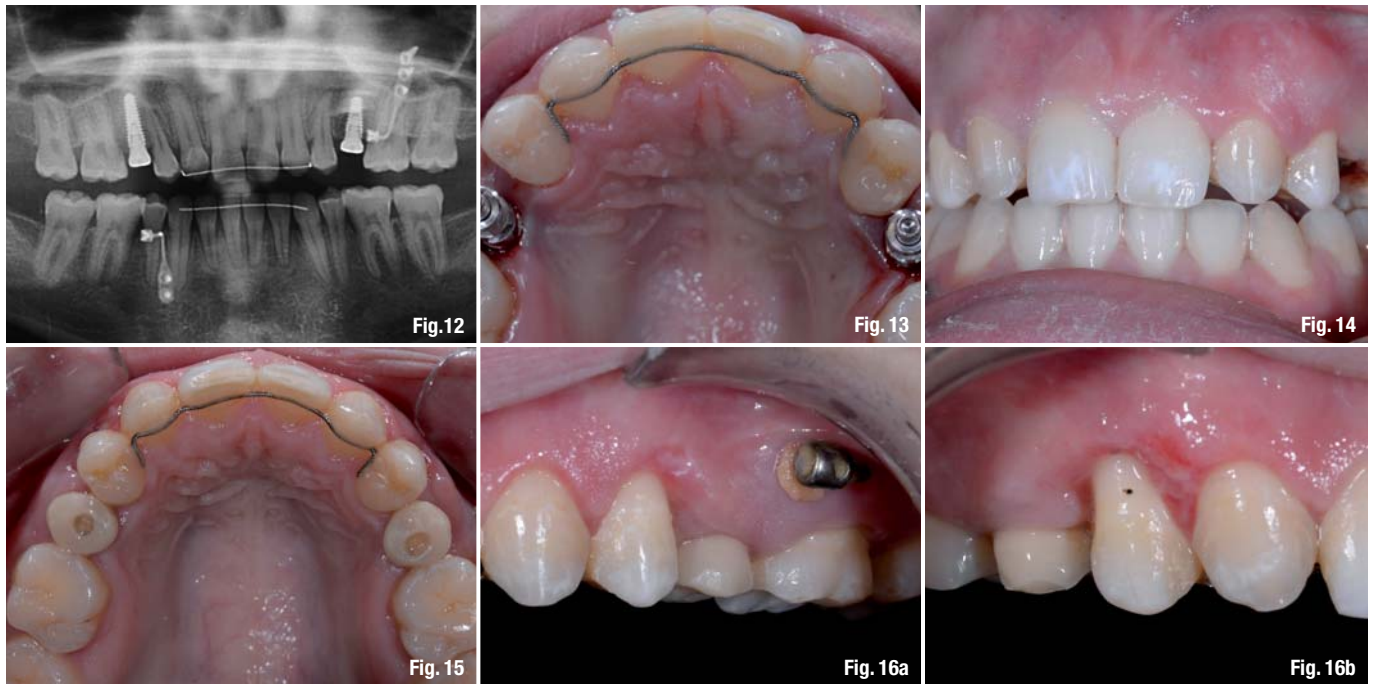
The surgery was performed under local and regional anaesthesia. Appropriate aseptic and sterile conditions were established to prevent postoperative infections. Before the start of the intervention, the NaviStent was placed over the remaining teeth. It was primarily fixated using the undercuts of the remaining teeth and additionally by application of

a denture adhesive (Corega, GlaxoSmithKline Consumer Healthcare).

Before starting the osteotomies, the drilling axis of the handpiece used during the surgical procedure was calibrated. The osteotomies were prepared at a maximum of 500 rpm using the Navident navigation system to guide the drilling procedure in real time by indicating the desired drilling pathway on the computer screen. Prior to the use of each new drill, a calibration process was performed (Figs. 7-9) in order to determine the exact location of the drilling tip. No punching of the gingival tissue was performed prior to the preparation of the implant sites. Before placement of each implant, an extra calibration procedure was performed in order to be able to track the implant itself also in real time during insertion. This means that both the osteotomy

Figs. 10a & b_ Surgical guidance using Navident.
Figs. 11a & b_ Post-op image of regions #15 and 25.





preparation and the implant placement process are tracked in real time. The Navident tracking system uses an on-screen visual representation of the surgical area and auditory cues to aid the clinician (Figs. 10a & b).

Two XPEED AnyRidge implants (Megagen) were installed. At region #15, an implant of 4 mm in length and 13 mm in diameter was placed, whereas at region #25 an implant of 10 mm in length and 3.5 mm in diameter was placed (Figs. 11a & b & 12).

After completion of the dental implant placement, a crown-lengthening procedure was performed in the anterior maxillary region in order to ameliorate the aesthetic outcome. It is beyond the purpose of this report to provide any detail regarding this procedure.

Prosthetic procedure

Immediately after implant placement, impression copings (Megagen) for an open-tray impression were screwed on to the implants and hand torqued (Fig. 13). An impression was taken at implant level using a silicone material (Permadyne Penta H, 3M ESPE Dental) in a plastic Position Tray (3M ESPE Dental). Within 8 hours, two temporary screw-retained acrylic teeth were delivered to the patient and connected to each of the implants. The acrylic teeth were designed based on temporary titanium abutments. Occlusion and articulation were checked and corrected wherever necessary. All superstructures were hand torqued to a maximum of 15 Ncm. No cantilevers were allowed on the

provisional structures in order to avoid extensive non-axial forces. Postoperatively, the patient received a prescription for antibiotics (amoxicillin 1,000 mg, b.i.d., four days), non-steroidal anti-inflammatory drugs (ibuprofen 600 mg, t.i.d.) and a mouthwash (chlorhexidine 0.12 %, b.i.d.). After one week, a postoperative visit was scheduled. No signs of infection or inflammation were present and healing was uneventful (Figs. 14 & 15).

Conclusion

With a two-week postoperative follow-up, this was the first immediate loading procedure based on the Navident navigation surgery system. The patient reported no pain or swelling associated with the dental implant procedure. Further postoperative results are being tracked and reported as part of a pilot study being conducted at Ghent University (Figs. 16a & b).

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

contact

Dr Jan D'haese
Ghent University Hospital
De Pintelaan 185
9000 Gent
Belgium

Jan.dhaese@ugent.be

Fig. 12_Post-op panoramic image.
Fig. 13_Post-op photograph of the maxillary occlusal surfaces.
Fig. 14_Post-op frontal photograph.
Fig. 15_Post-op photograph of the maxillary occlusal surfaces (post-loading).
Figs. 16a & b_Post-op lateral photographs of the restorations in regions #15 and 25.

Manufacturer News

CAMLOG

Novelties in the Implant System create even more options

As from now on, the prosthetic portfolio of the iSy Implant System will be extended by several prefabricated abutments. The new iSy Esthomic® Abutments allow esthetically cemented reconstructions. Screw-retained healing caps adapted to the emergence profiles of the Esthomic® Abutments will become available in a variety of profile diameters and heights. Final restoration directly on the implant base will become possible and offers the clinician a cost-effective restoration option and even greater flexibility in the course of treatment. In addition to the existing impression taking method from the implant base with the multi-function caps, the new impression posts can be used for impression taking directly from the implant shoulder with an open or closed tray. Scanning can be performed either from the implant shoulder with screw-retained scan-bodies or from the implant base with the multi-function caps which are included in the Implant Set. The iSy standard range with so far three implant diameters and lengths will be extended by a short implant (7.3 mm). A major advantage of this short implant is that it can also be used if limited bone is available. This can avoid bone grafts, for example, in



sinus floor elevation. The short implant will be available as from now on and will be supplied at first in the single implant set, including a healing cap, a single patient form drill and two multi-function caps.

CAMLOG Biotechnologies AG

Margarethenstr. 38
4053 Basel, Switzerland
www.camlog.com

Dentaurum

New implant line—three steps to success

Dentaurum Implants GmbH, a Dentaurum Group affiliate, expands its product range for implantology with the new CITO mini® line. It is a system of one-piece implants, which allows minimal invasive insertion in only three steps. As many implant cases can be loaded immediately, patients can enjoy their new quality of life a lot sooner. The one-piece CITO mini® ball head implants are available in three diameters (1.8 mm/2.2 mm/2.5 mm) and two lengths (11.0 mm/13.0 mm). The implants allow transgingival and minimal invasive insertion. In many cases, depending on the initial situation, augmentative measures can be avoided using these one-piece ball head implants. This will significantly reduce patient stress, an advantage that will convince more patients to choose this treatment. Please contact our Dentaurum Implants Hotline for further information on CITO mini®.

CITO mini®



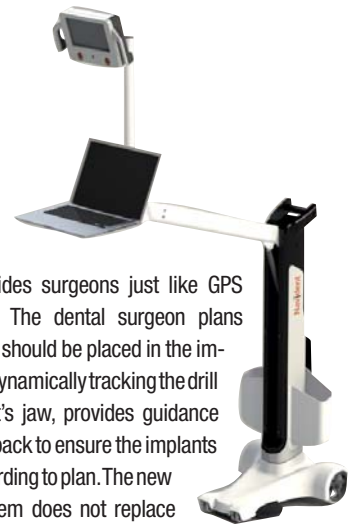
Dentaurum Implants GmbH

Turnstr. 31
75228 Ispringen, Germany
www.dentaurum-implants.de

ClaroNav Inc.

Dynamic Navigation for Dental Implantation

ClaroNav introduces Navident—a practical image-guided navigation system for dental implantology, bringing real-time dynamic guidance to free-hand implantation procedures. Navident is easier, faster, more economical and flexible than other workflows (no static guides!) Using the CBCT image as a map,



the system guides surgeons just like GPS guides drivers. The dental surgeon plans where implants should be placed in the image. Navident, dynamically tracking the drill and the patient's jaw, provides guidance and visual feedback to ensure the implants are placed according to plan. The new navigation system does not replace the surgeon's skills, it enhances them, allowing them access to information about their surgical process that has been unavailable until now.

Implants are placed more accurately than freehand, providing improved safety and esthetics. More accuracy means less bone augmentation and associated costs and challenges. When the doctor has more information that he can trust and react to during surgery both he/she and their patient can rest assured that they are doing everything they can to assure a successful surgical result. More flapless surgeries means less chair time, less patient discomfort and less recovery time. The ability to avoid delicate anatomical structures due to the real-time surgical feedback makes this possible. Navident demonstrates a clear and visible competitive advantage to you and your practice. For more information, please contact ClaroNav: info@claronav.com.

ClaroNav Inc.

1140 Sheppard Avenue West, Unit 10
Toronto, Ontario, Canada
www.claronav.com

New profile for improved soft tissue aesthetics



OsseoSpeed Profile EV is a great implant specifically designed to follow existing bone in sloped situations. EV stands for ‚Evolution‘ and thus for the concept of continuous development and improvement of the ASTRA TECH Implant System. The uniquely shaped design follows the alveolar ridge in sloped ridge situations and makes it possible to achieve 360° bone preservation around the implant, which also optimizes soft tissue aesthetics.

A bone augmentation therefore becomes expendable in many cases. The indexed components seat into the implant in one-position-only, aligning the components with the slope of the implant. The restorative procedure is further simplified by the self-guiding impression components that engage into the implant only when correctly seated. First results of several ongoing studies are impressive, just as the feedback of pilot users. Further information about the new OsseoSpeed Profile EV are available online: www.jointheev.com, implants-de-info@dentsply.com or call +49 621 4302-010 (Customer Service DENTSPLY Implants).

DENTSPLY IH GmbH

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

20th anniversary of a biologically active gel at EuroPerio8



Straumann invited leading dental professionals from around the world to celebrate the 20th anniversary of its cornerstone regenerative product Emdogain, at EuroPerio8 in London. First marketed in Sweden in 1995, the gel is still the standard treatment for the regeneration of periodontal hard and soft tissue that is lost due to periodontitis. Improving patient comfort and treatment safety are priorities in periodontology and are reflected in the increasing trend toward minimally invasive procedures. It is particularly advantageous in this regard, as it is associated with less pain and swelling and fewer complications than treatment with membranes after surgery. While products such as membranes work on a mechanical principle, the product is a biologi-

cally active, protein-based gel that induces periodontal regeneration, reinitiating processes in adults that occur naturally in the human body during tooth development. This mechanism of action enables periodontists to maintain soft tissues and, more importantly, to regenerate lost periodontal tissues, aiding in the prevention of tooth loss. Even after 20 years on the market, it has not been surpassed by any other technologies and it still remains the gold standard in periodontal tissue regeneration.

Institut Straumann AG

Peter Merian-Weg 12
4002 Basel, Switzerland
www.straumann.com

Take the next step in patient treatment satisfaction

Implants designed for Immediate Function, original Multi-unit Abutments and easy-to-handle, precision-milled NobelProcera restorations are just the products behind the All-on-4® treatment concept.



Only in the hands of a team of well-trained professionals do they genuinely become a solution. Nobel Biocare offers courses ranging from the fundamentals of implant treatment to the most complex procedures, all taught by industry-leading experts from around the globe.

The first implant you place is the beginning of an exciting professional journey, and T&E will help you develop long after that. With our unique products and solutions, the treatment possibilities available to you are virtually unlimited—and so are your learning opportunities. When it comes to the All-on-4® treatment concept, our course offering is unmatched, quite simply because we are the only company offering this original solution. Many have tried to mirror this ground-breaking concept, but only we have the scientifically documented success to back it up.

Nobel Biocare Deutschland GmbH

Stolberger Str. 200
50933 Köln
www.nobelbiocare.com

MIS

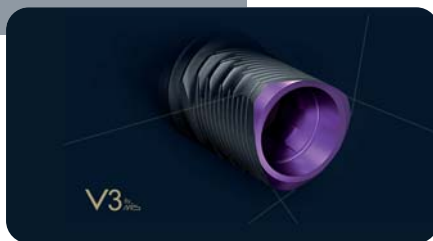
New V-Concept delivers true innovation to implant dentistry



V3 IMPLANT SYSTEM BY MIS

MIS Implants Technologies recently launched the new V3, a multi-use implant suitable for a wide range of surgical scenarios that is part of the company's V-Concept. "MIS Implants is now a frontrunner of innovation in implant dentistry"—this was the powerful message at the product launch at EuroPerio8 in London.

"The V3 is set to change the future by offering unprecedented biological advancements not previously known in the dental implants industry—specifically, the significant gain of bone- and soft-tissue volume where it matters most," said Elad Ginat, Product Manager at MIS Implants Technologies. He pointed out that this claim is supported by the placement of over 2,000 V3 implants in clinical cases performed and reported by some of implant dentistry's most highly respected experts. The cases date back to 2012 and were treated in collaboration with numerous well-respected research institutes and universities around the world.



New Invention

"The triangular coronal portion of the V3 is completely new in concept," said Ginat. Its unique shape allows the formation of gaps between the sides of the implant and the osteotomy, creating open, compression-free zones that immediately fill with blood to form a stable blood clot and accelerating osseointegration for more rapid bone regeneration, he explained. The triangular shape further allows secure anchorage at three points and provides doctors with more flexibility in positioning the implant, either facing the flat side buccally or towards an adjacent implant as needed, to gain more bone. It is important to note that a wider implant can be used in clinical

situations in which a traditional circular implant would require a smaller diameter.

Three-point universal approach

"It's all part of the V-Concept, as a three-point universal approach to implant dentistry," stated Ginat. The first point is the V3 implant itself that comes with a single-use final drill for an exact osteotomy, shaped to provide optimal primary stability in all bone types. The triangular head of the implant reduces cortical bone compression without compromising crestal anchorage.

The second point is aesthetics. The extra bone volume affects soft-tissue volume, which is further enhanced by the tulip-shaped prosthetic components, realising sustainable and healthy results. With more bone and soft tissue to work with from the start, clinicians can attain much higher aesthetic outcomes and reduce healing times. The third point is simplicity, part of the MIS "Make it Simple" philosophy. Doctors can enjoy all the V-Concept benefits of greater bone- and soft-tissue volume without learning new protocols or procedures. In addition, a dedicated V3 surgical kit makes procedures simple, safe and accurate.

"The V-Concept is an innovation MIS is very proud of, especially since it directly benefits our customers. It helps dental professionals all over the world simplify procedures, improve success rates, reduce chair time and achieve better aesthetic results," he concluded.

MIS GERMANY

Simeons carré 2
32423 Minden, Germany
www.mis-implants.com/de

AD

Become an author for implants—international magazine of oral implantology

Please contact:
Georg Isbaner
Editorial manager
g.isbaner@oemus-media.de

45TH

DGZI INTERNATIONAL ANNUAL CONGRESS

**SAVE
THE DATE**
October 2–3,
2015

October 2–3, 2015

Wiesbaden, Germany | Dorint Hotel Pallas

Scientific Director: Prof. (CAI) Dr Roland Hille/DE

Dental technology and implantology–
Interface to reach success

Online
Congress Programme



www.dgzi-jahreskongress.de

Gold Sponsor



Silver Sponsor



Bronze Sponsor



FAX REPLY // +49 341 48474-290

I would like to receive further information on the
45TH DGZI INTERNATIONAL ANNUAL CONGRESS
on October 2–3, 2015, in Wiesbaden, Germany.

Practice Stamp



Implant design of the future

Author_Georg Isbaner

In 1981 Thomas Diskrell developed the Titanodont-implant, which was perfected and patented under the name DB Precision four years later. Today it is known under Bicon Dental Implant System. On the occasion of the 30th anniversary Georg Isbaner, editor of the *implants magazine*, spoke with Prof. Mauro Marincola about the history of the special implant-design, the importance of the German market for Bicon and the future of the dental market.

_Prof. Marincola, this year Bicon is celebrating its 30th year on the market. How important is this anniversary for the company?

It is not only a special anniversary, but also a 30-year history of an implant design that has prevailed without substantial changes and fulfils modern implantology standards: double platform switching, bevelled implant shoulder, healing chambers and bacterial seal.

_How is your company celebrating the anniversary?

Since New Year's Eve, we have been celebrating this event with our loyal customers. The festivities are taking place in all of the countries in which we are represented. Additionally, we arranged some special events. Particularly noteworthy are an exciting boat party on the Rhine during the International Dental Show and recently a three-day programme of exclusive parties, dinners and presentations in Rome for our closest members and customers. The celebratory tour will continue in June in Rome, after the Giornate Romane congress organised jointly by OEMUS MEDIA and Bicon (19 and 20 June), and be brought to a triumphant conclusion at our headquarters in Boston in the US after a trip to South America.

_When did you start working with this system, which is unlike other implant systems?

I placed my first Bicon implants in 1992, when they were still named Stryker Precision. Even then, short implants for non-interlocking single crowns in the posterior area were available to clinicians. In

comparison with standard implants, they offered a great clinical advantage, because with the standard implants at the time substantial bone structures were necessary to implant in atrophic bone. The Aha moment came with the initial uncovering and prosthetic restoration: seeing the implant completely surrounded by bone and without any bone damage after loading was a great experience. Furthermore, I was impressed by the simplicity and speed of the prosthetic procedures, because Bicon's conical connection does not need a horizontal index.

—Bicon has contributed significantly to the establishment of short implants. From a surgical perspective, what distinguishes working with Bicon implants?

Specific training is necessary to perform the system's surgical procedure, because it is not a conventional screw implant but a press-fit implant. The osteotomies are performed without water-cooling and at only 50 rpm with special titanium drills, allowing for a substantial amount of autologous bone to be harvested. This slow, clear and minimally invasive technique allows for excellent control of surgery, so that short implants can be placed in challenging bone conditions and augmentative procedures can be avoided.

—Bicon products are in keeping with the current trend regarding minimally invasive treatment techniques.

Currently, patients set the trend because they are much better informed than even ten or 20 years ago owing to the Internet. Most patients want to avoid augmentation for various reasons and increasingly opt for minimally invasive care through short implants, which are used in the native bone. We dentists have to learn that the term "short implant" is not always a guarantee of long-term preservation. Therefore, the design of short implants should fulfil strict criteria.

—How important is the German market for Bicon?

In my view, the German market is the most important worldwide—a showcase for all manufacturers. In recent years, we have achieved clinical and commercial recognition, also owing to the close cooperation with OEMUS MEDIA.

—At the International Dental Show, you presented the CAD/CAM framework material TRINIA. What is it and what distinguishes it?

The TRINIA CAD/CAM discs and blocks are made of a multidirectional interlacing of fibreglass and resin. For dental technicians and dentists, TRINIA is suitable for the fabrication of copings, substructures of permanent or provisional anterior or posterior crowns, bridgework and telescoping restora-



tions. Substructures can be cemented or not cemented. TRINIA is metal-free, lightweight, durable and elastic, biocompatible and adaptable. During processing, no firing is required and it offers unique mechanical properties with high flexural and compressive strength.

—What is on for the second half of the year?

As already indicated, we are continuing our anniversary celebrations in the various countries, as well as attending several congresses. In Germany, we are pleased to be involved in the events being organised by OEMUS MEDIA.

Thank you very much for your time and the conversation.

contact

Bicon Europe Ltd.

Hauptstr. 1
55491 Büchenbeuren
Germany

germany@bicon.com
www.bicon.de



UNAM congress opens in Mexico City

DGZI extends relationship to the university

Professionals, students, academics and researchers from different universities had been invited to the International Congress of the Dental Faculty of the UNAM. The focus of the event lied on the public health and private sectors, as well as the general dental community in Mexico. The German Association of Dental Implantology (DGZI) joined the congress, represented by Dr Rolf Vollmer as only representative from Germany (Fig. 1). DGZI speakers significantly influenced the implantological programme.

More than 7,000 colleagues visited the International Congress of the Odontological Faculty (Congreso Internacional de la Facultad de Odontología) of the UNAM (Universidad Nacional Autónoma de México) at the World Trade Centre in Mexico City (Fig. 3) from 7 to 9 May 2015. Amongst the guests was the German

Association of Dental Implantology (DGZI e.V.), which was represented by Dr Ralf Vollmer, first Vice President and Treasurer of the DGZI, as well as the representatives of the United States Dr Suheil Boutros and Dr Mazen Tamimi from Jordan (Fig. 2).

After Mario Rodrigues (Fig. 2, second from right), an exponent of the Dental Faculty of the UNAM, had spoken at the international podium of the DGZI Congress in Düsseldorf last year, the implantological programme was largely dominated by DGZI speakers. The breaks during the congress were used for more intensive talks on possible future cooperation between the DGZI and the National University of Mexico.

From Mexican side, there has been interest in the existing training programmes of the DGZI. Both sides are open to further enhance their relationship. The

event presented more than 20 national speakers, hands-on-courses and clinical procedures in various lecture halls, which were simultaneously translated. In addition, the largest trade fair of the country took place with more than 200 exhibitors: the 63rd Expo Dental AMIC International.

UNAM School of Dentistry Dean, Mr. José Arturo Fernández Pedrero, thanked AMIC for the support received and encouraged all institutions to work together for a better dentistry that benefits all Mexicans. Shortly before his speech an interesting video by Dr Enrique Edwards entitled "A Day at UNAM Faculty of Dentistry" was screened. It showed vignettes of events at the school, from classes to practices, from free dental care offered to the public to students engaged in recreational activities in the large campus of the university.

The National Autonomous University of Mexico is one of the oldest and biggest universities of the American continent. According to the annual "World University Ranking" of the British consulting company QS in 2010, it is the best Latin-American University but ranked in the 222nd place worldwide.

With the expansion of its activities in Latin America, the DGZI shows courage and innovation in the implantological training scene.

www.dgzi.de



Fig. 1



Fig. 2

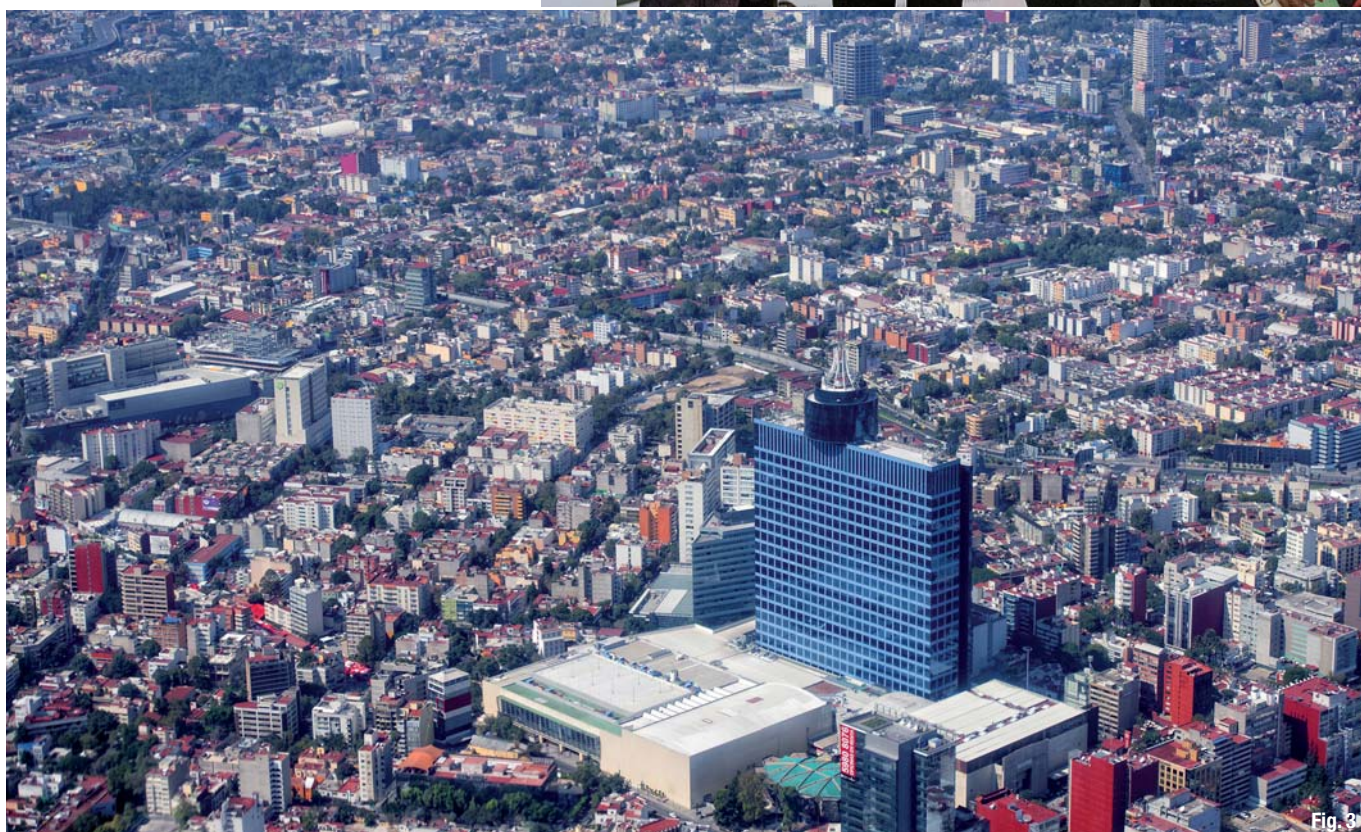


Fig. 3



EuroPerio in London

Periodontology and implantology

Author Georg Isbaner, Germany

Every three years, the European Federation of Periodontology (EFP) offers dental professionals from various countries the opportunity for exchange through its EuroPerio Congress. This year, the EFP welcomed numerous representatives in the areas of dentistry and dental hygiene to the conference in the UK capital. After the successful EuroPerio7 in Vienna in 2012 with 7,800 participants, the organisers had hoped for increased attendance and, indeed, there were about 10,000 visitors to the London event, which was held from 3 to 6 June (Fig. 1).

The organising committee under Chairman Prof. Francis Hughes (Fig. 2) spent three years in planning the extensive programme with high-quality presentations by speakers from all over the world. EuroPerio is aimed at not only experts in the fields of periodontology and implantology, but also general dentists and dental hygienists. Much of the programme was taken up by scientific lectures and discussions addressing topics in periodontology and implantology. Through these, participants were given an overview of the current state of periodontal and implant therapy, as well as insights into the concepts and views of their inter-

national colleagues. Furthermore, attendees had the opportunity to learn about the latest trends in science. Lecture topics included application techniques, findings in the area of biofilm research, and peri-implantitis. Exclusive workshops organised by well-known companies, such as Oral-B, Straumann and DENTSPLY Implants, were also part of the event.

Congress opening

Before the start of the full programme, which ran from Thursday to Saturday, participants could attend the opening ceremony on Wednesday evening. Prof. Hughes cordially welcomed the numerous guests, who were entertained with musical performances by the London Marching Band, among others. The new EFP President, Prof. Søren Jepsen (Fig. 5), also greeted the audience: "I would like to especially thank the students of the London dental faculties who agreed to voluntarily and actively support this event."



PICTURE: ©NEWGENE

Subsequently, visitors entered the large dental exhibition area with more than 80 sponsors, who in the following three days offered them information regarding their product and service offering concerning periodontology and the treatment of peri-implantitis.

Increasing awareness

The organising committee agreed that there is still much to do in order to increase the awareness of patients and dentists regarding periodontal and peri-implant diseases. Many patients delay seeking treatment of their periodontal problems and thus increase the risk of a more invasive therapy being required to treat their disease. Of course, there is no universal remedy, Prof. Andrea Mombelli (Fig. 4) said. Although the treating periodontologist individually

adapts the choice of therapy to each patient, the patient has to maintain optimal oral hygiene. Nevertheless, dentistry has had increased cases requiring restoration to an oral condition free of inflammation, said Mombelli. The importance of a well-coordinated therapy in the case of periodontal and peri-implantitis patients was demonstrated by a film presented during EuroPerio. In the film, patients with a long history of periodontal disease give an account of their ongoing treatment for the disease and how this has brought them new confidence. "It is fully recognised



Fig. 4

that, besides the physical impairments caused by periodontitis, patients are affected psychologically," Prof. Ian Needleman, UCL Eastman Dental Institute in London, said at the EuroPerio press conference.

Determining the causes

There seem to be various reasons that patients contract periodontitis. Because of this, for some years now, there have been increasing research efforts to determine genetic and microbiological associations and mechanisms leading to the disease patterns. In a dedicated forum, Dr Panos N. Papapanou, from New York in the US, presented the possibilities of genetic studies, specifically searching for regulation of gene expression in periodontal disease. Dr Hourri-Haddad Yael discussed the thesis that genetic experimentation in mice could be helpful in detecting possible genetic similarities to humans in the case of periodontal disease. "The systemic analysis of protein compounds (proteomics) appears to be promising as well," remarked Dr Nagihan Bostanci, from Zurich in Switzerland, on the work in this area. These and similar approaches aim to develop methods for early identification of patients most at risk of developing periodontal disease. This is because the earlier therapy is started, the better the possibility of a gingiva largely free of inflammation and of less invasive treatment.

Outlook for EuroPerio in 2018

This year's EuroPerio was the largest conference on periodontology to date. The geographical scope of the meeting was underpinned by the presence of all 29 member associations of the EFP, with representatives from 110 countries (Fig. 3). The next EuroPerio will take place in Amsterdam in 2018. "Whether we are going to achieve another record attendance is not important to me," Prof. Hughes said. "We rather have to concentrate on maintaining the high quality of the triennial congress."



Fig. 5



www.efp.org/europerio8



PICTURE: ©LJORG HACKEMANN

“Dental technology and implantology—Interface to success”



Source_DGZI

Never before has a society placed the focus on the—not always stress-free—collaboration between dentists and dental technicians as the German Association of Dental Implantology (DGZI) has in its theme for the 45th annual congress, which is to be held on 2 and 3 October 2015 in Wiesbaden, Germany. The conference theme is “Dental technology and implantology—Interface to success” and this forward-looking claim is reflected in the programme content. At the Dorint Pallas Wiesbaden hotel, prominent German and international speakers will present an ambitious programme, featuring joint papers by implantologists and dental technicians. “This is going to be one of the congress highlights and will take place at the main podium on Saturday morning,” according the chairperson of the programme committee and Second Vice President of the DGZI, Prof. Roland Hille, who emphasised that the participation of dental technicians brings a refreshing element to the DGZI and the composition of its membership. In the near future, more DGZI projects with dental technicians are planned. DGZI president Prof. Herbert Deppe also pointed out the particular value of collaboration be-

tween dentists and dental technicians, which is expressed in the congress programme. “Different points of view about implant positioning and prosthetic fabrication from multiple angles are conveyed in the programme. Sometimes, it is only possible to make a realistic assessment of the patient as a team.” For him, such cooperation is essential for successful treatment. For conference chairman Prof. Hille, it is clear that the DGZI is entering completely new territory. The highlight of this year’s event: for the first time in its 45-year history, the DGZI is hosting a congress that places not only implantologists but also dental technicians at the centre of the programme. Implantologists and dental technicians will come together in the specialist debate, CONTROVERSIAL DGZI, too. This year’s theme is “The edentulous upper jaw—How can the best possible solution be achieved? A challenge to dentists and dental technicians”. Together with DGZI First Vice President and Treasurer Prof. Rolf Vollmer, Prof. Hille has again secured the participation of well-known Japanese speakers. They will be presenting on Friday afternoon as part of the international podium. Prof. Deppe has given particular acknowledgement to this: “We should be aware that our colleagues from the Far East have to travel half-way around the globe to be present at the DGZI annual congress. Anyone familiar with the Japanese mentality will understand the extent of regard that this expresses towards the DGZI.” Furthermore, the names of the speakers from Germany, such as Prof. Hendrik Terheyden and Prof. Gerhard Wahl, are indicative of the high esteem the DGZI annual congress holds in scientific circles. More information about the 45th international annual meeting of the DGZI with the complete conference programme and list of workshops can be obtained from the DGZI website (www.dgzi.de).



ClaroNav Inc. granted CE Mark for Navident

ClaroNav Inc. announced recently that it has received CE Mark approval for the commercial sale of its Navident dental navigation system. Over the coming months the company will launch the product in dental clinics, hospitals and universities placing implants throughout Europe. Navident is a class IIa medical device and indicated for image-guided navigation of dental surgery.

“This is a major milestone for our company and for dental implant patients and practitioners”, stated Doron Dekel, CEO of ClaroNav Inc. “For patients the potential for minimally invasive (flapless) surgeries will greatly reduce their pain, swelling and overall recovery time after dental surgery. For the dental practitioner, using the CT scan information to navigate surgery in real time provides the opportunity to avoid critical structures and ensure an extremely accurate placement of an implant for an ideal patient outcome. We are eager to begin our commercial launch in Europe.”

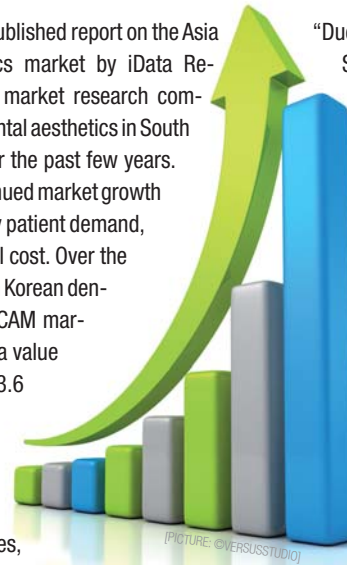


Navident employs proprietary stereoscopic optical position sensor technology to detect special patterns from the dental hand piece and the patient's jaw and constantly report their relative position to a small fraction of a millimeter, to the Navident software. This sub millimeter precision is critical in dentistry where a millimeter can be the difference between the success and failure of a dental implant procedure or the avoidance of the mandibular nerve (paresthesia) or the lingual artery (hemorrhagic event).

Source: ClaroNav

Increasing demand boosts dental CAD/CAM system market in Asia Pacific

According to a recently published report on the Asia Pacific dental prosthetics market by iData Research, an international market research company, the emphasis on dental aesthetics in South Korea has increased over the past few years. This has resulted in continued market growth at a steady rate, driven by patient demand, as well as low procedural cost. Over the forecast period, the South Korean dental prosthetics and CAD/CAM market is projected to reach a value of nearly 4 billion Dollars (3.6 billion Euros). The South Korean market has relied on traditional methods and materials for the fabrication of prostheses, like porcelain-fused-to-metal crowns. Consequently, there has been little investment in CAD/CAM systems compared with more developed markets, such as the US and parts of Europe.



“Due to the emphasis on dental aesthetics in South Korea, many CAD/CAM companies have seen a potential market and promoted their systems with substantial discounts,” explained Dr Kamran Zamanian, President and CEO of iData. “Therefore, the in-lab system market is approaching saturation, with a small percentage of dental labs remaining that can afford the systems.”

Prices for CAD/CAM systems and CAD/CAM blocks are expected to decrease gradually throughout the forecast period. As scanners and milling units become increasingly affordable, more dental laboratories and clinics will be able to invest in the technology. The increasing use of CAD/CAM systems in conjunction with decreasing block prices will drive growth in the CAD/CAM prosthetics market.

EuroPerio sees launch of International Association for Halitosis Research

Halitosis affects a vast number of people worldwide. However, sound epidemiologic data on halitosis is rare. In order to address this lack of scientific data on the condition, the International Association for Halitosis Research (IAHR) was officially formed on 5 June at a meeting of leading halitosis researchers during EuroPerio8 in London. As new insights into the problem of bad breath are rapidly expanding, the IAHR aims to promote research on all aspects of halitosis and its related issues and to distribute and publicise the research.

“The field of halitosis research has an enormous impact,” said IAHR President, Dr. Edwin Winkel. “Halitosis has always been a problem but we are responding to a huge increase in research activity and these findings translate into guidelines for dental professionals and medical practitioners. Not only do we need to create awareness among the public, but we should also enhance the information and treatment advice for professionals,” he explained. According to Belgian Professor, Marc Quirynen from the Department of Pe-

riodontology at KU Leuven University near Brussels, oral healthcare professionals have a crucial role to play in diagnosing, informing and treating patients who are often not even aware that they suffer from bad breath. During a lecture at the EuroPerio congress, which was held in London last week, he pointed out that 9 in 10 cases of halitosis are attributable to tongue coating, gingivitis, periodontitis and other conditions in the oral cavity. He further said that the minority of cases are caused by systemic diseases or conditions.



implants
international magazine of oral implantology



Publisher

Torsten R. Oemus
oemus@oemus-media.de

CEO

Ingolf Döbbecke
doebbecke@oemus-media.de

Members of the Board

Jürgen Isbaner
isbaner@oemus-media.de

Lutz V. Hiller

hiller@oemus-media.de

Chief Editorial Manager

Dr Torsten Hartmann (V. i. S. d. P.)
hartmann@dentalnet.de

Editorial Council

Dr Ralf Vollmer
info.vollmer@t-online.de

Prof. Dr Dr Kurt Vinzenz
kurt.vinzenz@aon.at

Dr Torsten Hartmann
hartmann@dentalnet.de

Dr Suheil Boutros
SMBoutros@aol.com

Editorial Office

Georg Isbaner
g.isbaner@oemus-media.de

Olivia Jasmin Czok
o.czok@oemus-media.de

Product Manager

Timo Krause
t.krause@oemus-media.de

Executive Producer

Gernot Meyer
meyer@oemus-media.de

Designer

Sarah Fuhrmann
s.fuhrmann@oemus-media.de

Customer Service

Marius Mezger
m.mezger@oemus-media.de

Published by

OEMUS MEDIA AG
Holbeinstraße 29
04229 Leipzig, Germany
Tel.: +49 341 48474-0
Fax: +49 341 48474-290
kontakt@oemus-media.de

Printed by

Silber Druck oHG
Am Waldstrauch 1
34266 Niestetal, Germany

implants

international magazine of oral implantology
is published in cooperation with the German
Association of Dental Implantology (DGZI).

DGZI

Prof. Dr Herbert Deppe
DGZI Central Office
Paulusstraße 1, 40237 Düsseldorf, Germany
Tel.: +49 211 16970-77
Fax: +49 211 16970-66
office@dgzi-info.de

www.dgzi.de
www.oemus.com
www.implants.de

Copyright Regulations

implants international magazine of oral implantology is published by OEMUS MEDIA AG and will appear in 2015 with one issue every quarter. The magazine and all articles and illustrations therein are protected by copyright. Any utilization without the prior consent of editor and publisher is inadmissible and liable to prosecution. This applies in particular to duplicate copies, translations, microfilms, and storage and processing in electronic systems.

Reproductions, including extracts, may only be made with the permission of the publisher. Given no statement to the contrary, any submissions to the editorial department are understood to be in agreement with a full or partial publishing of said submission. The editorial department reserves the right to check all submitted articles for formal errors and factual authority, and to make amendments if necessary. No responsibility shall be taken for unsolicited books and manuscripts. Articles bearing symbols other than that of the editorial department, or which are distinguished by the name of the author, represent the opinion of the afore-mentioned, and do not have to comply with the views of OEMUS MEDIA AG. Responsibility for such articles shall be borne by the author. Responsibility for advertisements and other specially labeled items shall not be borne by the editorial department. Likewise, no responsibility shall be assumed for information published about associations, companies and commercial markets. All cases of consequential liability arising from inaccurate or faulty representation are excluded. General terms and conditions apply, legal venue is Leipzig, Germany.

Restoring happiness

Patients rely on you in order to eat, speak, and smile with confidence. It can be said, you are actually restoring quality of life and happiness.

To succeed, you need technology that is well founded and documented in science. That is why we only deliver premium solutions for all phases of implant therapy, which have been extensively tested and clinically proven to provide lifelong function and esthetics.

Moreover, with an open-minded approach, we partner with our customers and offer services that go beyond products, such as educational opportunities and practice development programs so you can rest assured that you have the support you need.

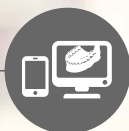
Reliable solutions and partnership for restoring happiness—because it matters.

Comprehensive solutions for all phases of implant dentistry



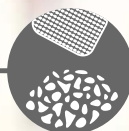
Professional and practice development

STEPPS™



Digital planning

SIMPLANT™



Regenerative solutions

SYMBIOS™



Implants

ANKYLOS™


**ASTRA TECH
IMPLANT SYSTEM**

XiVE™



Restorations

ATLANTIS™



Cement belongs to yesterday

A complete posterior solution

To keep pushing forward, we're bringing innovation to the back. Connect with your entire treatment team and achieve shorter time to teeth with Nobel Biocare's complete posterior solution. It offers new ways to overcome the challenges of working in the posterior region while reducing complexity and risks.

Choose from new wide implants designed for Immediate Function. Add a monolithic implant crown with an angulated screw channel for a solution that's stronger than ever and 100% cement free. Start treating more patients better.



Discover the complete posterior solution:
tiny.cc/bringinginnovationback

