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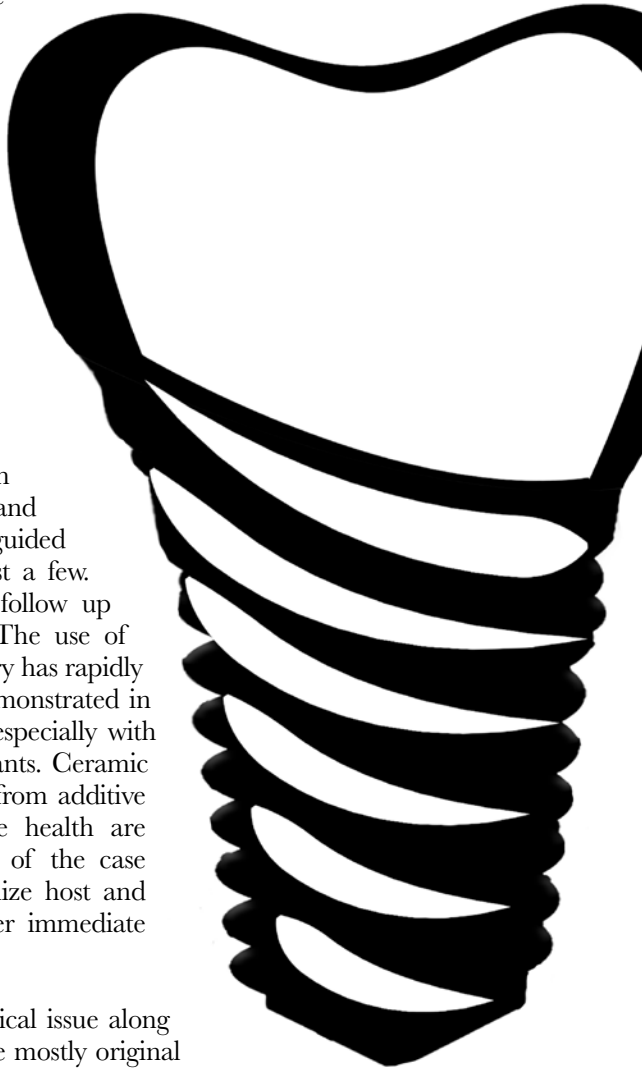
Sammy S. Noumbissi, DDS MS

Dear Colleagues,

The International Academy of Ceramic Implantology was created with the objective to provide and promote education and training in the unique and revolutionary field of metal free dental implantology. After almost 10 years of existence marked by multiple courses, workshops, meetings and congresses around the world, we have now taken the next step to start and launch the first ever journal focused on ceramic implants and metal free implantology. The path we are on today would not have been possible without the contributions and perseverance of some pioneers such as the late Sami Sandhaus and others who in the early seventies and through over three decades never stopped believing and working toward making ceramic implants a viable alternative to metal alloy implants.

During the last decade we have observed an exponential rise in the number of ceramic implant manufacturers and systems amid an explosion of the literature about ceramic implants and ceramic implant materials. I am proud to introduce you to the first issue of the Journal of Ceramic Implantology (JOCI) which is the journal of the International Academy of Ceramic Implantology. We aim to provide a platform where relevant research projects of clinical and laboratory nature would be fairly and expertly reviewed and published.



JOCI is going to be a bi-annual publication with the upcoming one to be a blend of clinical and scientific articles. This first issue contains clinical articles on ceramic implants used in different clinical situations along with a broad range of supporting technologies and treatment approaches such as digital workflow, guided surgery, immediate implant placement just to list a few. One of the clinical reports is a fourteen-year follow up clinical report of one-piece ceramic implants. The use of digital workflow for treatment planning and surgery has rapidly penetrated the ceramic implant world and as demonstrated in some of the articles play a very important role especially with regards to placement of one-piece ceramic implants. Ceramic implants are unique in that they do not benefit from additive surface modifications; therefore, host and bone health are paramount for successful osseointegration. One of the case reports in this issue demonstrates how to optimize host and bone health for successful osseointegration under immediate temporization.

Our ultimate goal is to have a yearly special clinical issue along with the two scientific issues which content will be mostly original research papers on ceramic implants and bioceramics. We therefore want to encourage and invite all that have implant-related clinical or laboratory scientific research projects with zirconia or other ceramic implant materials to submit their manuscripts. I hope you enjoy this first issue which is the beginning of an exciting journey toward making metal free ceramic implants better understood and accepted by the broader dental community.

Sincerely,

Sammy Noumbissi, DDS MS
Editor in Chief

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One-Piece Yttrium-Stabilized Zirconia Implant in Premolar Region:
14 years follow-up

Andrea Enrico Borgonovo[1], Rachele Censi[2], Luigi Parazzoli[3], Dino Re[4]

ABSTRACT

Introduction. The aim of this article is to present a clinical case of a one-piece yttrium-stabilized zirconia implant positioned in premolar area of jaw with a follow-up of 14 years.

Materials and Methods. The patient was treated with a post-extractive ceramic implant in premolar area (3.4). The implant received immediate temporary restoration and 6 months after surgery the definitive zirconia restoration was positioned. Clinical and radiographic evaluations were performed in order to estimate peri-implant tissues health.

Discussion. The implant-prosthetic rehabilitation shows an excellent esthetic and functional outcome thanks to the characteristic of this zirconia implant.

Conclusion. Ceramic implants could potentially be the alternative to titanium one for a non-metallic implant solution.

KEY WORDS

Dental Implants, Zirconia, Ceramic, One-piece, Metal Free Rehabilitation.

INTRODUCTION

The aim of this work is to present a clinical case of one-piece yttrium-stabilized zirconia implant immediately loaded with a temporary restoration with a long term follow-up of 14 years.

In last years implantology has expanded following the increasing demand of implant-prosthetic treatment to rehabilitate edentulous areas.

Additionally ad a response to the patients expectations of a rehabilitation finalized in the shortest possible time span, especially in the esthetic area of jaws, new works of research modified the original Brånemark protocol. Some researches developed in a change of the thread screw design to guarantee more stability to the fixture during the healing time in order to improve osseointegration and to make immediate load safe and predictable [1,2]. In addition was also observed that an enlarged implant surface roughness resulted in increased bone apposition [3] and reduced healing time [4].

Patients require functional and esthetic implants-prosthetic rehabilitations and specific attention is paid to the esthetic outcome. Furthermore patients often require metal-free restorations both for esthetic and for metal allergy or sensitivity.

An important role in achieving an esthetically optimal outcome is the morphology and aspect of peri-implant soft tissues combined with the fixture and the consequent esthetic of implant-supported restoration [5]. There are no significant differences between osseointegration of zirconia and titanium implants [6,7]. In addition zirconia implants show excellent peri-implant soft tissue translucency, and have a lower risk of esthetics defects. Differently titanium implants have, especially in cases of thin biotype and high smile line, high risk of a metallic gray tint visible through soft tissues [8].

Mono-component implants allow a behavior similar to natural teeth and the lack of micro-gap prevents bacteria infiltration in the space between fixture and abutment.

Immediate loading guarantee predictable results similar to delayed loading [9].

The use of ceramic implants together with metal-free restorations constitutes nowadays an alternative solution to titanium implants for a metal-free rehabilitations [10].

Material and Methods

This clinical case shows of a post-extractive one-piece yttrium-stabilized zirconia dental implant (White-SKY, Bredent, Senden, Germany) with a follow-up period of 14 years.

Fig. 1a: Pre-operative clinical view

Fig. 1b: Pre-operative clinical view

Fig. 2: Dental extraction

A 68-year-old male patient, in good health condition and non-smoker, came to our observation at the Department of Aesthetic Dentistry, Istituto Stomatologico Italiano, University of Milan.

The patient presented the fracture of the element 3.4, which was largely extended below the gingival margin, extraction was the only option. The patient agreed signing a consent form, after having been informed about zirconia implants and other possible options.

The crown of element 3.5 was removed, the tooth was prepared and covered with a temporary crown before the surgery.

Seven days before the surgery, the patient underwent a professional oral hygiene.

One hour before the surgery the patient took 2 gr of Amoxicillin and Clavulanic Acid (Laboratori Eurogenerici, Milan, Italy) as antibiotic prophylaxis and rinsed with Chlorhexidine 0.2% (Corsodyl, Glaxo, UK) immediately before the surgery.

The surgical protocol started after the application of local anesthesia with 1:200.000 Articaine (Molteni, Florence, Italy) around the fractured tooth. The fractured tooth was then extracted taking care to not damage the vestibular plate bone.

Fig. 3: Post-extractive one-piece implant

Fig. 4: Peri-implant tissues after 1 month

Fig. 5: Peri-implant tissues after 6 moths

Fig. 6: Definitive crowns for 3.4 and 3.5

Fig. 7a: Clinical control after 1 year

FIG. 7b: Radiographic control after 1 year

An intrasulcular lingual incision with preservation of papillae was performed and a flap was elevated folding over the vestibular side and so the alveolar ridge was exposed.

Drilling sequence was performed following the protocol suggested by Bredent Medical, which is close to the standard surgical protocol for titanium implants.

White-Sky implant (4,5 x 10 mm) was inserted by a surgical microengine (W&H® Implantmed, W&H Dentalwerk Bürmoos, Austria) achieving 32N/cm of torque safely permitting immediate loading [1,2].

Regenerative procedures were performed using heterologous bone substitutes (Bio- Oss® GeistlichPharma AG Wolhusen, Switzerland) and reasorbable membrane (Bio-Gide® GeistlichPharma AG, Wolhusen, Switzerland), flap was released before suturing through periosteal incisions to accomplish primary wound closure. Flap was sutured with a 4/0 silk suture (Ethicon®, Johnson and Johnson, Rome, Italy).

The fixture was positioned in order to leave implant abutment with the smooth neck healing through soft tissues, whereas the rough surface of the mono-component implant was left completely inside the bone.

After implant insertion a radiographic control was executed to evaluate the correct positioning of the fixture.

Patient was instructed not to chew or eat at implant site until complete healing. He continues antibiotic therapy, rinses with Chlorhexidine 0.2% for 7 days, and, if necessary, Paracetamol 500mg (Tachipirina, Angelini, Rome, Italy) as analgesic.

The immediate temporary restoration, obtained from diagnostic wax-up, was relined with acrylic resin on temporary prosthetic caps positioned on implant abutments; thus preventing gingival tissue from growing over implant abutment and allowing a greater precision of temporary restoration margins on abutment finishing-line shoulder.

The provisional was luted with temporary cement (TEMPBOND®, Kerr, West Collins, Orange, CA, USA) after occlusal controls in order to leave restoration without functional load and to avoid lateral contacts.

The temporary restoration was connected to neighboring teeth by resin wings splinted with composite resin, in order to reduce the risk of implant mobility or extra-occlusal load (tongue and lips movements) [11].

Sutures were removed in a control appointment after 1 week and follow-up controls were established after 2 weeks, once a month for the following 6 months, and after 1 year in order to control implant stability, peri-implant soft tissues health and restorations integrity.

Six months after the surgery, impressions (IMPREGUM®, 3M, ESPE, St Paul, MN USA) were realized using an impression cap to register implant abutment shoulder margin (White Sky® impression cap, Bredent) and retraction cord to register the natural tooth 3.5.

The definitive zirconia crown for the implant (3.4) and the tooth (3.5) were produced with CAD-CAM system (LAVA®, 3M ESPE) and fixed with a glass ionomer cement (GC Fuji CEM®, GC America, Alsip, IL, USA) after one week.


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Fig. 8: Clinical control after 5 year

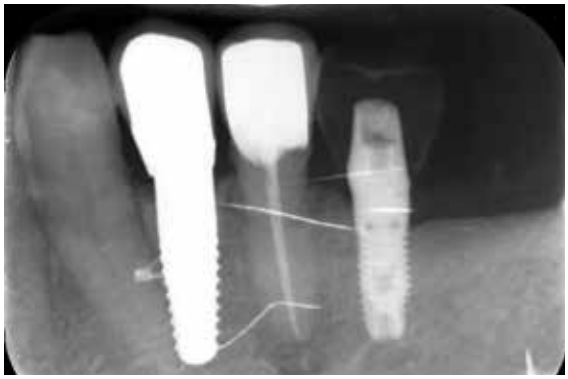

Fig. 9: Radiographic control after 10 years

Fig. 10a: Clinical control after 14 years

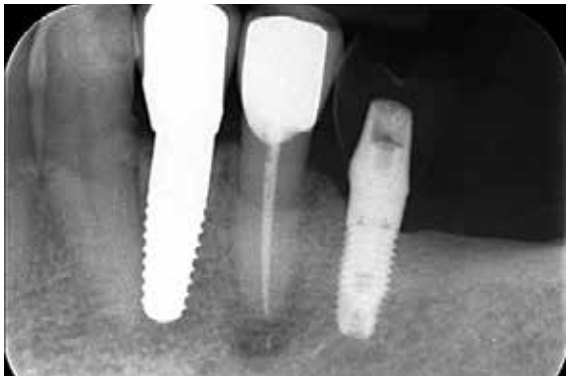

Fig. 10b: Radiographic control after 14 years

The patient nowadays is 82-year-old, not regular in controls, and not able to perform properly daily domiciliary oral hygiene because of his limited motor skills due to his age.

Even if the patient has some difficulty maintaining a good level of personal oral hygiene, peri-implant soft tissues have the same stability of soft tissues of the adjacent tooth (3.5).

After this long follow-up period (14 years) zirconia implant displays the absence of inflammation, peri-implant soft tissue retraction, peri-implant bone loss. These elements demonstrate the long term stability of this treatment and the similar behavior of zirconia implant to the natural tooth, thanks to the lack of micro-gap, high biocompatibility, and low plaque adhesion [12,13].

DISCUSSION

White-SKY is a one-piece yttrium-stabilized zirconia implant, characterized by a conical body with double cilindrical threads and rounded apex. The endosteal portion has a sandblasted surface, whereas, coronally the implant includes a machined neck with a height of 2 mm and it continues in the abutment.

The connection between bone tissue and implant surface has an essential role in clinical success of implant rehabilitation. Several studies demonstrated successful osseointegration of zirconia dental implants in animal models [16]. Implants result osseointegrated without signs of inflammation or mobility, with a bone-to-implant contact (BIC) ratio similar between zirconia and titanium implants [13,15].

The bone-to-implant contact is the result of bone formation and it is related to the characteristic of implant surface. Zirconia implants BIC is similar to titanium implants BIC and thus able to reach stability in bone [16].

Moreover zirconia dental implants showed a good preservation of the marginal bone level (MBL) due to the excellent characteristics of zirconia high biocompatibility and low plaque adhesion [13,17].

The implant-prosthetic rehabilitation (3.4) shows stable soft and hard tissues without recession similar to those of the element 3.5.

In fact, is important to consider that plaque accumulation on implant or abutment surfaces provokes a tissue inflammatory reaction and consequently a progressive bone loss[18]. Yttrium-stabilized zirconia presents a significant reduction of the presence of bacteria[19] and its surface accumulates significantly fewer bacteria then titanium[20]. The limited presence of bacteria promotes the early formation of the biologic width and therefore the formation of a mucosal seal that protects marginal bone from resorption [21,22].

Zirconia, thanks to its high biocompatibility, can be an alternative solution to titanium in people with sensitivity or

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allergies to metals. One-piece implants provide a behavior similar to the natural tooth and can influence marginal bone loss. The micro-gap of two-piece implants allows bacteria infiltration and the consequent bone remodeling. Differently the specific morphology of one-piece implants avoids such microbial contamination which results in a reduced marginal bone loss [21].

In addition the one-piece morphology guarantees mechanical strength, low fracture rates, and no movements between prosthetic component in screwing and unscrewing [18,24].

Zirconia dental implants seems to provide a safekeepings solution for missing teeth, indeed they achieve survival rates at same level of titanium implants [25,26].

More than 90% of implant failure take place during the first year, probably caused by mobilization and overload in the healing phase. Especially in single implants, is useful to connect them with adjacent teeth in the early osseointegration phases to prevent overloading and avoid lateral forces, produced by parafuncions and tongue movements [27].

The composite splint of the temporary crown has a fundamental role to reduce marginal bone loss because stability and reduction of micro-movements help the healing of the bone.

In this case, after the healing period, osseointegration was deemed successful and no complication occurred in 14 years of follow-up. The implant reaches success rate thanks to a limited marginal bone loss verified in radiographic controls, according to Albrektsson criteria [12].

This type of implant is suggested for anterior areas of the jaws to overcome the esthetic requirement of patient.

An important role in achieving a satisfactory esthetic outcome is the morphology of peri-implant soft tissues with an excellent peri-implant soft tissue translucency and and the resulting esthetics of the implant-supported restoration [28].

In addition the immediate loading solution increase patient comfort: no second-stage surgery is necessary, and immediate provisional crown give to the patients a satisfaction thanks to the contextual esthetic result.

Moreover the zirconia definitive crown permits the creation of a totally metal-free rehabilitation.

CONCLUSION

This clinical case of a one-piece yttrium-stabilized zirconia dental implant in the premolar area of the jaw aims to show the encouraging long term esthetic and functional success of this rehabilitation.

The implant-prosthetic rehabilitation exhibits a satisfying esthetic outcome and a behavior similar to that of a tooth after 14 years follow-up. ■

- **Conflict of Interests -** All the authors declare that they do not have any conflict of interests regarding the publication of the current work.

The Authors

Andrea Borgonovo, Assistant Professor , Department of Aesthetic Dentistry, Istituto Stomatologico Italiano, University of Milan Italy. He graduated in Medicine and postgraduated in Oral and Maxillo–facial Surgery with honors at the University of Milan. He started his Academic Career in 2005 as Clinical Assistant Professor at the School of Oral Surgery, at the University of Milan. Recently he obtained the national Abilitation for Associate Professor and was admitted at University of Murcia as visiting professor. Actually he is the surgery coordinator at the Department of Aesthetic Dentistry of University of Milan and focuses his practice on reconstructive surgery, Orthognathic surgery and oral implantology with specific interest in metal free rehabilitation. He is author of a great number of international pubblications, and speaker at more than 150 national and international conferences. He is author of 2 surgery's books

Rachele Censi, Clinical Ass . Professor , Department of Periodontology and Implantology III, Istituto Stomatologico Italiano

Luigi Parazzoli, Clinical Ass . Professor , Department of Aesthetic Dentistry,, Istituto Stomatologico Italiano University of Milan Italy

Dino Re, Associate Professor & Head of Department of Aesthetic Dentistry,, Istituto Stomatologico Italiano University of Milan Italy

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Digital workflow for the replacement of a hopeless central incisor with a 2-piece zirconia implant

Pi-Anfruns, Joan; Bahadurji, Shirin; Lim, Ryan; Brisebois, Phil; Whiteman, Yair

Introduction

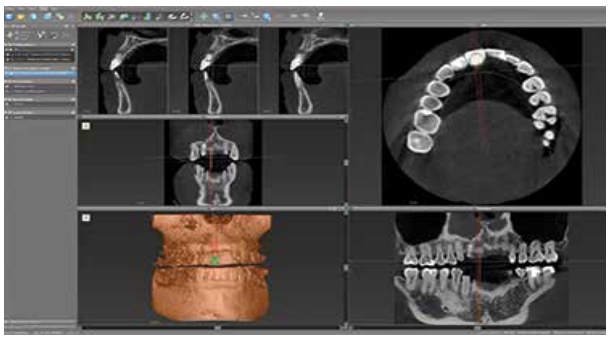
Titanium has long been considered the material of choice and the standard of care for tooth replacement, with success and survival rates well above 90% after 10 years[1,2]. Despite the excellent results and biocompatibility reported for titanium implants, the demand for metal-free alternatives has increased. Patients are seeking alternatives to titanium for 2 main reasons: 1) the belief that they suffer from a metal allergy or 2) they are seeking a holistic approach to their treatment. Although the incidence of titanium allergy is low (0.6%), it can provoke type I and IV hypersensitivity reactions that will resolve only with the removal of the implant[3]. Zirconium Dioxide (Zirconia, ZrO2) is a ceramic obtained from a reduction-chlorination reaction of Zirconium, a metal. At the end of this process, one can obtain Zirconium Dioxide powder (ZrO2). This material is now a ceramic, and has lost all of the metallic properties of the raw material. Zirconia has been shown to have equal capacity for osseointegration when compared to titanium4, and ability to withstand occlusal forces[5,6]. Investigation periods of up to 5 years have reported survival and success rates of more than 95% in humans[7,8], making them a viable alternative for tooth replacement. Commercially available Zirconia implants can be one or two-piece. One-piece zirconia implants with an integrated abutment and pre-determined restorative margin have limitations due to their inability to allow for angle correction, require a high degree of surgical precision and only accept a cementable restoration. Advances in manufacturing have allowed for the development of two-piece systems with either cement or screw-retained abutments. These systems have allowed clinicians to broaden their prosthetic options, including angle correction via angled abutments, the ability to deliver screw-retained restorations as well as improved options for soft tissue management. This case report describes the replacement of a hopeless maxillary central incisor with a two-piece, screw-retained zirconia implant.

Material and Methods

1. Diagnosis

A 34-year-old male with a non-contributory medical history presented to the UCLA Center for Esthetic Dentistry with a hopeless tooth #9 due to endodontic failure. The patient had undergone previous orthodontic treatment, leading to root resorption and root canal therapy. The tooth was symptomatic, presented with Grade II mobility and was treatment planned for extraction. The patient was presented with two options to replace his missing tooth: 1) a fixed partial denture prosthesis and 2) a dental implant. The patient did not want to follow through with option 1, and elected to have the tooth replaced with a dental implant. He further requested a zirconia implant due to concerns with titanium particle release.


Fig. 1



Figs. 1 & 2: Pre-operative clinical view and digital planning

1. Treatment Plan

The case was treatment planned for extraction of tooth #9, immediate implant placement and immediate provisionalization.

A CBCT (Accuitomo, J Morita USA, Irvine, CA) was obtained to assess the site and in preparation for a digital workflow approach. Although the coronal 1/3 of the buccal plate was intact, the CBCT analysis revealed a fenestration on the facial apical ½ of the tooth. The DICOM files were uploaded to a digital planning software (CoDiagnostix®, Dental Wings GmbH, Chemnitz, Germany) and the case was planned for guided surgery. An intraoral scan was

obtained prior to the extraction (Trios 3, 3shape A/S, Copenhagen, Denmark) and the existing tooth was used as a reference in the planning software for proper positioning of the implant. A PMMA provisional was designed and fabricated in preparation for the immediate provisionalization. A digital surgical guide was also generated and produced in a desktop 3D printer (Form 2, Formlabs, Somerville, MA)

2. Surgery

After obtaining informed consent, the patient was given a pre-operative dose of 2 grams of Amoxicillin and 600mg of Ibuprofen. Local anesthesia was applied via local infiltration utilizing Lidocaine 2% at 1:100.000 Epinephrine. 2 vials of 10cc blood were drawn and prepared following the i-PRF sticky bone protocol. The blood was spun at 700 RPM for 3 minutes. The i-PRF was extracted and mixed with a Xenograft (Bio-Oss®, Geistlich Pharma North America, Princeton, NJ), generating a sticky bone block. A circumdental incision was made, followed by luxation with periotomes and the tooth was extracted. The socket was thoroughly debrided, removing all granulation tissue and copiously irrigated with normal saline. The buccal plate was evaluated and the findings of the CBCT were confirmed, revealing a facial fenestration of 3.5mm. The surgical guide was seated and drilling protocol was followed as per manufacturers recommendations following a guided protocol. A 4.1 x 12 mm RD PURE 2-piece Zirconia implant (Straumann®, Basel, Switzerland) was placed with an insertion torque of 35Ncm. The PMMA provisional shell was picked up intra-orally with flowable composite utilizing a customized Vita-CAD Temp® abutment. The temporary restoration was shaped and polished extraorally. A tunnel approach from the gingival margin was utilized and a resorbable collagen membrane (conForm, ACE Surgical Supply Co. Brockton, MA) was inserted. The i-PRF sticky bone was placed to reconstruct the buccal plate and augment the buccal contour. Next, the PMMA provisional restoration that was prepared ahead of time was primed using a universal adhesive primer (All-Bond Universal Bisco) and picked up intra-orally using


Fig. 3


Fig. 4


Fig. 5


Fig. 6


Fig. 7

Figs. 3-7: Following tooth extraction and debridement, a resorbable collagen membrane is placed via tunnel approach, followed by augmentation of the buccal contour and defect with sticky bone. The PURE 2-piece implant is placed following a semi-guided approach and an immediate temporary restoration is delivered.

a tooth colored flowable composite over the temporary metal abutment. The provisional restoration was designed with palatal orientation wings, which are seated in intimate contact with the palatal aspect of the adjacent teeth to ensure ideal positioning of the restoration. The provisional restoration was then unscrewed and shaped accordingly to facilitate ideal soft tissue contouring in the healing and osseointegration phase. The orientation wings were removed and the provisional restoration was polished and delivered out of occlusion and torqued to 15 Ncm.

A post-operative peri-apical x-ray taken to verify seating of the provisional restoration. Post-operative care included Amoxicillin 500mg TID for 7 days and Ibuprofen 600mg q6h as needed. Immediate temporization post-op instructions included soft foods for 8 weeks and no function with the anterior maxillary teeth to avoid undesired loading of the implant.

1. Restorative Phase

12 weeks after implant placement, soft tissue esthetics, including volume and gingival architecture was evaluated. The final impression for a single central and of highly esthetic indirect restorative cases is taken in two phases: 1) a digital scan is taken to outsource manufacturing of the zirconia framework and 2) an analogue impression is taken to produce a more detailed model, allowing the ceramist to duplicate details of the adjacent central incisor.

The digital scanning process is done in three steps; first, the provisional restoration is scanned in a "pre-preparation" mode, this will serve as the reference by which the zirconia framework will be designed. Second, scanning of the transmucosal aspect of the restoration. This scan has to be done immediately after removing the provisional restoration, capturing the soft tissue contours before the tissue flattens, as well as contact areas of


Fig. 8


Fig. 9


Fig. 10


Fig. 11

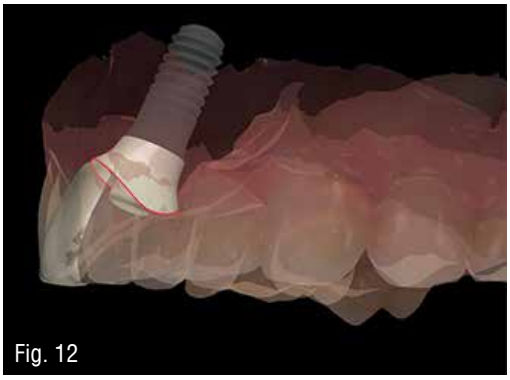


Fig. 12

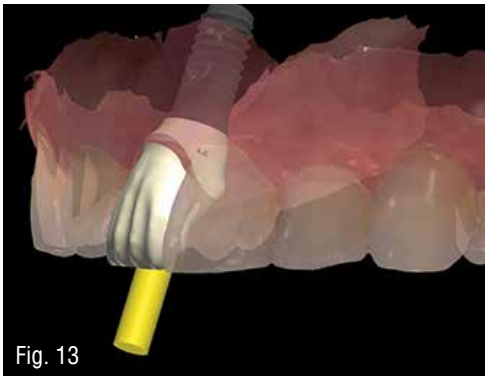


Fig. 13


Fig. 14

Figures 8-12: Soft tissue contours achieved after 3 months of healing. Dual impressions were taken via analog and digital approach.

Figures 13-14: Digital design of restoration with cutback and final restoration ready for cementation and delivery

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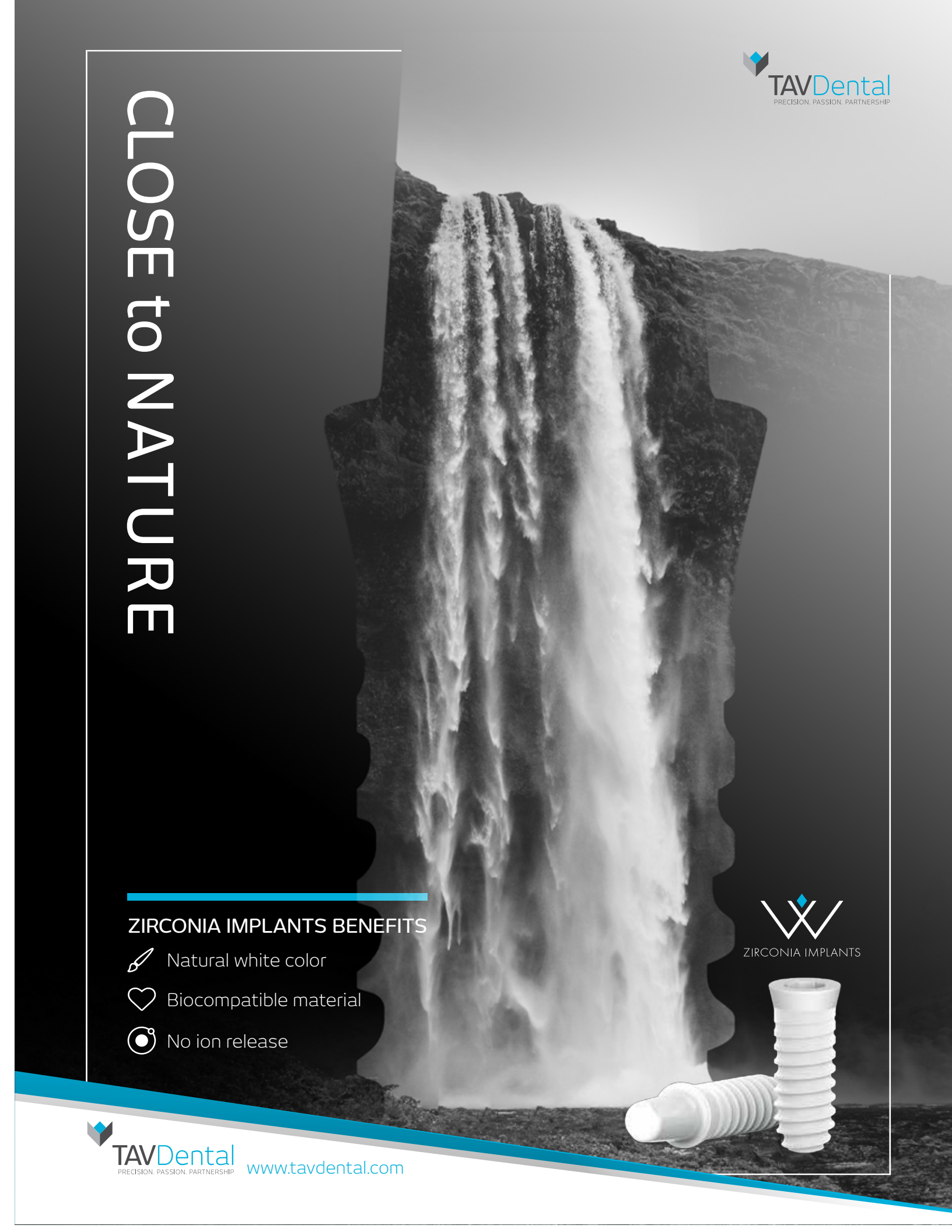

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Fig. 15


Fig. 16


Fig. 17

Figures 15-17: Final restoration in place

adjacent teeth. The last scan is completed by use of a scan-body (Trios 3, 3shape A/S, Copenhagen, Denmark).

For the analogue impression, a custom impression coping was made by duplicating the transmucosal aspect of the provisional restoration. This was then transferred to a stock impression coping bench-side by investing and duplicating the provisional restoration, using self-adhesive dual cure resin cement.

A Zirconia framework with facial cutback was designed using the 3Shape Dental Manager software, duplicating the provisional restoration's transmucosal profile, as well as the coronal aspects, to fabricate a screw-retained layered zirconia restoration on the Straumann PUREbase abutment. The restoration was tried in for contacts, occlusion, shape and shade and prepared for final cementation and delivery. To ensure an accurate and reliable connection between the PUREbase and the Zirconia restoration, an MDP-containing resin cement (Panavia V5, Kuraray America Inc, NY) was utilized, starting with a pre-treatment phase. This first step increases bond strength and includes air-abrasion of the Zirconia bonded surface using Aluminum Oxide (50µm particles) in a pressure not exceeding 2 bars, followed by thorough cleaning and application of a phosphate monomer containing ceramic primer on both PUREbase and the zirconia restoration (Clearfil Ceramic Primer Plus, Kuraray America Inc, NY). At this point the PUREbase was screwed on a lab analogue, and the access hole was plugged using Teflon-tape to prevent unintentional blocking. The dual-cure resin cement was applied on the PUREbase abutment, the restoration was seated and excess cement was removed. Special attention was taken to ensure that the restoration was fully seated prior to curing it. Once seating was verified, it was light cured for 20 seconds, post cure for an additional 60 seconds and it was allowed to fully set for an additional 5 minutes. A scalpel was utilized to remove the excess cement from the restoration. The restoration was then torqued to 35Ncm and the screw access hole was plugged with Teflon tape and sealed with composite.

Discussion

In this case report, a two-piece zirconia implant (Straumann® PURE 2-piece Ceramic Implant, Institut Straumann AG, Basel, Switzerland) was utilized for the replacement of a hopeless maxillary central incisor. These implants are manufactured from Zirconium Dioxide and have a micro-roughened surface produced by large-grit sand blasting and acid etching. In vivo studies investigating the osseointegration capacity of this surface have suggested that the healing pattern of zirconium dioxide implants does not differ from their titanium counterparts[4, 9]. Zirconia has also shown been shown to be a more tissue-friendly material, demonstrating less bacterial adhesion, less inflammatory infiltrate, and increased micro-circulation compared to titanium[10,11,12] Furthermore, survival and success rates with zirconia implants have been reported to be comparable to those of titanium implants in investigation periods of up to 5 years[7, 8]. Two-piece zirconia implants offer advantages over a one-piece system. As a screw-retained two-piece design, it eliminates issues of cementation and excess cement. A screw-retained system offers more prosthetic flexibility and allows for better manipulation of the soft tissues during the provisional phase. Overall, a two-piece

system provides better surgical and prosthetic flexibility. As clinicians, we have seen a steady increase in the demand for metal-free alternatives for tooth replacement. This has been accompanied by a response from industry leaders in developing zirconia implant systems. In our clinical experience, zirconia implants can be a viable alternative to titanium. ■

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The Author

Dr. Joan Pi–Anfruns was born and raised in Barcelona, Spain. He earned his degree as a Doctor of Dental Medicine in 2004 from the Universitat Internacional de Catalunya, Barcelona, Spain. He is an alumnus of the Advanced Implant Program, Department of Periodontics and Implant Dentistry, New York University (2005–2007). He joined the UCLA School of Dentistry in 2007 where he completed a Fellowship in Surgical Implant Dentistry. Currently, Dr. Pi–Anfruns is a full time Assistant Clinical Professor at the UCLA School of Dentistry, Divisions of Diagnostic and Surgical Sciences and Restorative Dentistry and a Visiting Professor at the Universitat Internacional de Catalunya, Barcelona, Spain.

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Fully guided placement of a monobloc Zircon implant in a milk tooth with a patented sleeveless open-frame surgical guide

Drs. Laurens Wiggers co-writer; Phillippe de Moyer; Inventor, founder and CEO of 2INGIS

Today guided surgery is used more and more as a standard in our daily practice in order to facilitate drilling during the surgery and to minimize complications during prosthetic healing.

With monobloc implants the risk of complications is even higher than in case of two-piece implants because the correction of angles is not possible and milling of the abutment part is mainly forbidden or needs to be limited as much as possible.

Therefore, a precise and accurate surgical guide is certainly no luxury.

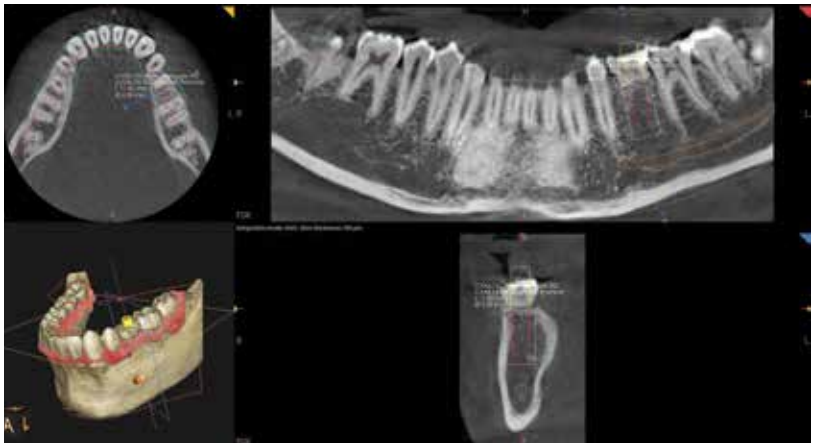
Different studies like Younes and Schnutenhaus show that freehand and sleeve-guide surgery can entail risks of implant misplacement.

See a table from Dr Schnutenhaus study

Implant length	2INGIS guide 2.86°	Sleeve guide 5.8°	Sleeve guide 14.6°	Free hand 21.1°
8 mm	0.4 mm	0.8 mm	2.0 mm	2.9 mm
10 mm	0.5 mm	1.0 mm	2.5 mm	3.7mm
12 mm	0.6 mm	1.2 mm	3.1 mm	4.4 mm
14 mm	0.7 mm	1.4 mm	3.6 mm	5.1 mm

For this reason, to perform this surgery we chose the 2INGIS surgical guide which has a high accuracy as showed in the clinical study from Dr. Schnutenhaus.

What are the different steps of the process?



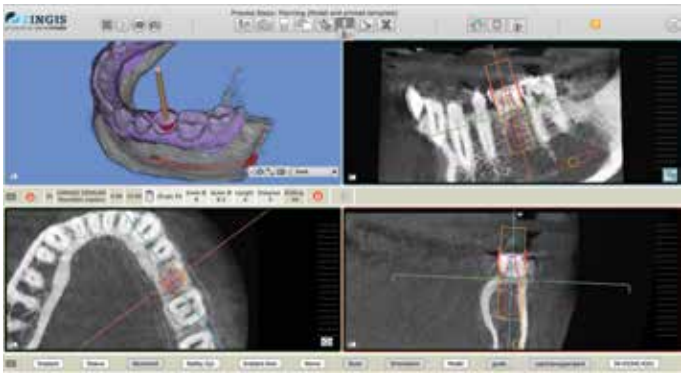
CBCT and intra-oral scan:

We started with a CBCT scan using a Carestream CBCT model 81003D in combination with a Carestream CS3600 intra oral scanner. The Dicom files from the CBCT and the STL file from the intraoral scan where fitted together in the Carestream program for the pre-operative planning.

In the Carestream set-up a SMOP planning is integrated and the pre-planning can be automatically integrated.

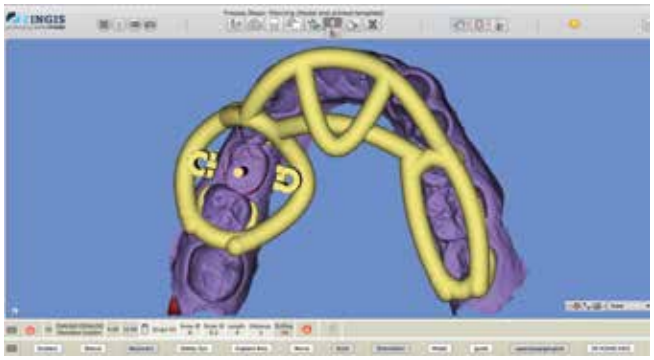
The planning of this case was done by using a CERALOG® Monobloc implant (manufactured by CAMLOG Biotechnologies GmbH) ø 4.0 Length 10 mm.

After validation of the implant planning the information was shared with 2INGIS in Brussels.



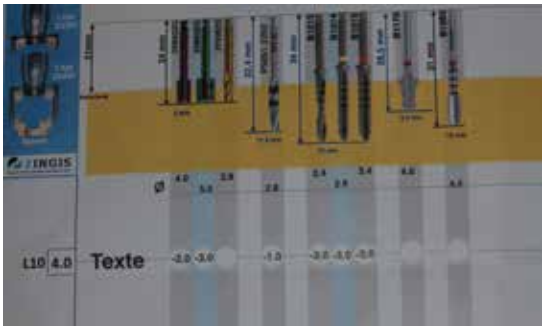
Surgical guide design and surgical protocol:

The surgical guide was designed in Brussels (Belgium) by the 2INGIS team on the 2INGIS CAD software. The guide was then printed on the Nextdent printer 5100 from 3D systems with Nextdent Tri-in resine. After printing and finishing the guide was shipped to the dental office with the patient individual surgical protocol.



Surgery:

In this system, one of the big advantages is the use of only standard drills and implant drivers (as delivered by the implants' manufacturers). No special guided surgery drills or drivers are needed.



The 2INGIS guiding system fits on a W&H contra-angle WI75EKM, which fits in the patient individual open frame guide.

The depth of drilling is limited by the guide and additional stoppers (spacers) are used to limit the drill depth in the bone.

This guide has a lot of advantages such as full view on the surgery, full irrigation, no contamination of the implant site or implant surface during the fully guided implant surgery and implant placement.

The surgery is following the same step-by-step process as defined by the implant manufacturer: drilling, tapping and implant placement.

The implant is placed with the guide and contra-angle handpiece to the final implant position.

The surgery was performed fast and the CERALOG® Monobloc implant was placed perfectly as planned.

CERALOG® Monobloc System:

The CERALOG® implants are made of yttria stabilized tetragonal zirconia (Y-TZP) [2], which is a ceramic widely used in the dental industry and other highly demanding fields. Zirconia is a chemically inert material, which makes it especially suitable as an implant material. CERALOG implants are produced by Ceramic Injection Molding (CIM). This technology makes it possible to manufacture complex shapes with various surface textures without using any posttreatment.

The CERALOG® Monobloc implant are one-piece implants for the direct cementation of restorations. The implants are available in three lengths (8, 10 and 12 mm) and one diameter (4 mm).

The CERALOG® Monobloc implant is placed supracrestally.

Overview of the implant bed preparation with the CERALOG® Monobloc implant:

Conclusion:

Thank the 2INGIS surgical guide, unique tool, the CERALOG® Monobloc implant was placed using the standard drills or implant drivers during a quick surgery without any risk of contamination of the site or implant surface. ■

• References will be provided upon request.

The Author

Dr. Laurens Wiggers, in 1990 he graduated as a dental technician from the IVT specialized in crown and bridge work, with a diploma in Business Management for Dental Laboratory,. In 1996 he obtained his dentist exam at the ACTA. In 1997 Laurens started his own dental practice with an emphasis on the restorative dentistry.In 2005 he founded CIET, a referring Center for Implantology and Aesthetic Dentistry, and in 2008 Laurens became a registered certified Implantologist (NVOI). Laurens Wiggers is a clinical advisor for the Ceralog Ceramic implant system (Camlog) and for Carestream Dental, an opinion leader.

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A case report: A path towards health trough multi unit immediate implantation using the Swiss Biohealth All IN ONE concept

Dr. Corbin Popp, Dr. Ulrich Volz, Dr. Josephine Tietje,
Dr. Rebekka Hueber, Paul Kilanowski

Immediateimplantation vs. late implantation

Today, implants are usually placed as late implants in healed extraction sockets three to six months after tooth removal. In order to shorten these long therapy and healing phases and to reduce the number of surgical interventions, immediate implant placement has been tested in addition to this procedure[1]. The first trials of immediate implant placement with implants made of aluminum oxide (Tübingen immediate implant) were conducted by Prof. Dr. Wilfried Schulte at the University of Tübingen as early as 1978 [2].

According to the ITI Consensus Conference in 2009, a distinction is made between immediate implant placement (immediately after extraction), early implant placement (4 to 8 weeks), delayed implant placement (12 to 16 weeks) and late implant placement (6 months after extraction)[3]. Studies show a slightly higher survival rate for late implantation (4-6). Implants placed in fresh extraction sockets appear to have slightly higher loss rates than late implants [4,7,8].

Immediate implant placement has advantages and disadvantages over the other procedure. It is particularly advantageous in the anterior region to preserve the soft and hard tissue profile after extraction of the tooth (9). Bone augmentation or the use of bone replacement materials is often not necessary (10, 11). Long waiting times for the patient are also avoided and the patient is promptly helped to achieve a better oral quality of life (12). Patients with a thin gingival type, lack of keratinized mucosa, a thin buccal bone wall and periodontal or periapical pathological findings are disadvantaged and at higher risk [3,13].

Overall, it can be stated that immediate implants are now a proven procedure and show high survival rates [14-17]. The advantages of classic late implant placement are that the alveolus is completely healed in bone and the procedure can be planned with low risk. The implant can be placed in a primarily stable osseous position. The disadvantage is that vertical and horizontal resorption can occur during the healing phase of the bone without loading [18, 19].

Zirconium dioxide implants

Zirconium dioxide implants (ZrO2 implants) as an alternative to titanium implants are used more and more frequently. The ceramic implants made of aluminium oxide, which were introduced for the first time, could not establish themselves due to high fracture rates (20). However, through continuous development and introduction of ZrO2 implants, ceramic implantology is increasingly establishing itself in the dental market.

The material ZrO2 has many advantages. It is metal-free. The stable bonding of zirconium with oxygen as dioxide results in a material with high biocompatibility (21). The material is fully reacted and therefore shows a high resistance to corrosion [22]. In the case of titanium, which is highly reactive as a metallic material, on the other hand, many studies show corrosion on the surface with release of titanium oxide particles. These trigger an inflammatory reaction in the surrounding tissue and can promote the development of periimplantitis [23-25]. This particle release is also caused by mechanical friction during insertion or by micro-movements of the titanium implant under load [26]. In comparison, natural aging processes of ceramic implants do not appear to be associated with a loss of flexural or fatigue strength [27].

ZrO2 shows a low elasticity, but the bending strength is above 1000 MPa. Thus, the rather brittle material has a high flexural strength [28].

Studies prove many positive effects of ZrO2 in soft tissue behavior. For example, a high affinity for soft tissue and low affinity for plaque was shown[29,30]. Another important factor is the ivory color of ZrO2. It proves to be very advantageous and provides excellent esthetic results.

The survival and success rate of ZrO2 implants is now equal to that of titanium implants [30,31]. Prospective

long-term studies show survival rates for one-piece ceramic implants of over 95% [32-34].

Case presentation

PRESURGICAL CONSIDERATIONS:

This 57-year old female patient was referred to our clinic (SWISS BIOHELATH CLINIC) in Kreuzlingen Switzerland, after presenting to Dr. Corbin Popp, Denver, CO, USA. She had a long history of dental therapy and several dental and systemic symptoms including temporomandibular joint disorders (TMD), bite misalignment/disharmony after orthognathic surgery, multiple symptomatic titanium implants, and severe health issues. Years ago, she had a double jaw/bimaxillary surgery performed, that was supported with a fixed orthodontic treatment afterwards. The orthodontic devices had been removed one year prior to her introduction to the clinic, but the titanium plates from the orthognathic surgery remained in place. Since her first bimaxillary surgery, she had been suffering from chronic pain in her head and jaw, skin rashes, skin sores and a continual, intense feeling of pressure in her head.

A MELISA test revealed a sensitivity to Titanium and in addition her chronic facial skin reaction gave cause for concern that there was a metal allergy. At this point the patient was then referred to SWISS BIOHEALTH CLINIC, Kreuzlingen Switzerland, to treat her missing teeth and remove the metal of the bimaxillary surgery.

Prior to treatment at the SWISS BIOHEALTH CLINIC, TMD treatment with bMAGO (bioesthetic Maxillary Anterior guidance Orthotic) to reach stable condyle position (SCP) and dissolvement of TMD symptoms was performed by Dr. Popp.

At the start of surgical treatment her vitamin D3 level was at 91,2ng/l and her LDL at 1,4 g/l. In order to guarantee optimal bone metabolism, patients at the SWISS BIOEHALTH CLINIC are given a vitamin D level of at least 70 ng/ml. Studies have shown that an LDL value of less than 1.2 g/L has a positive effect on the healing rate of implants.

The intraoral and x-ray investigation (Figure 1-2) showed the placement of numerous metallic plates, five titanium implants, several tooth fragments and leftovers, insufficient metallic crowns and dental restorations. The vitality test of tooth 14 was negative and the tooth displayed a large cyst.

Surgical treatment

Following the concept of the SWISS BIOHEALTH CLINIC and the request of the patient, all metals were removed (metallic plates and titanium implants) and her missing teeth were replaced with metal-free, zirconia implants (SDS Swiss Dental Solutions).

The surgery was performed over two consecutive days.

Day 1: Under sedation of the patient, oral surgeon Dr. Josephine Tietje removed ten metallic osteosynthesis plates and forty-two screws. The access was chosen to follow the old scars in the vestibulum, partially removing and correcting the course and the thick scar tissue. In order not to restrict the blood supply to the gum tissue, minimally invasive incisions were made. Due to the long period of time that the osteosynthesis plates were in place, bone had already grown over them. (Figure 3). The plates were carefully uncovered using piezo-surgery and fine hand instruments (Figure 4). All wounds were disinfected with ozone,

Figure 1: Panoramic x-ray (from 3D scan) 11/2018

Figure 2: Intraoral situation at time of first introduction to our clinic

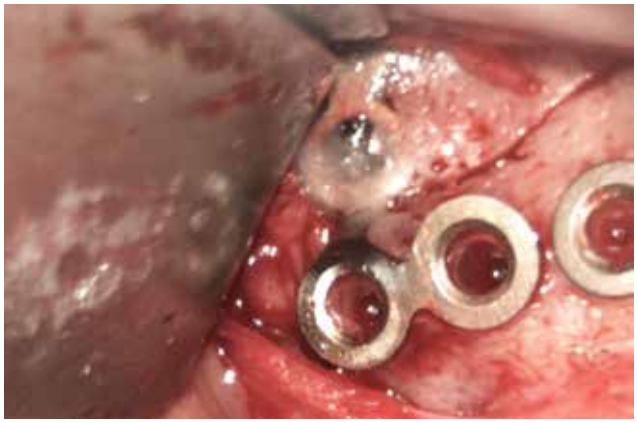

Figure 3: Intraoperative display of the metallic plates

Figure 4: Display of the removed metal

Figure 5: Implant placement of the upper jaw

Figure 6: Implant placement of the lower jaw

A-PRF membranes (Mectron Æ, Dr. Joseph Choukroun) were applied to support the healing and the incisions were closed with Atramat (mednaht Æ) suture material. At this point of time, the sedation was ended and the surgery was continued with the patient awake.

The titanium implants in the lower jaw (region 18, 19, 28) were removed using piezo-surgery and the "Implant Removal Kit" (Neobiotech Æ). In addition, a root fragment was removed in region of tooth 20. Five ceramic SDS-implants were placed in the lower jaw (region 18, 19, 20, 28, 30). The implants were immediately restored chairside with fixed temporaries made from Luxatemp (DMG Æ) and cemented with Durelon (3MTm Æ).

Day 2: On the second day of surgery, Dr. Ulrich Volz, specialist and pioneer of ceramic implantology, removed the titanium implants in the upper jaw (region 7 and 8). Since the previous implant positioning was not optimal prosthetically and surgically, bone grafting had to be performed to fill the former drill holes. Bone chips were collected and mixed with the solution of A-PRF in order to generate sticky bone that forms a flexible bone graft. Connective tissue was collected from the maxillary tubal area and placed in the front region to

Figure 7: Intraoral situation after placement of all temporaries

Figure 8: Postoperative panoramic x-ray

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enhance the aesthetic result. Tooth 14 was extracted, the cyst thoroughly cleaned with hand instruments and six ceramic SDS-implants were placed (regions 3, 7, 8, 11, 13 and 14).

The aggressive dynamic thread design of the SDS ceramic implant proved to be very useful in this case, as it allows individual positioning, allowing the anterior implants to be placed independently of the previous drilling. To place a long and stable implant in region 14, an internal sinus floor elevation was performed and the implant gained the necessary stability by anchoring in the sinus floor. Figures 5-8 show the situation after completion of the surgery.

Immediately after completion of the operation, the patient felt relieved from her persistent head pressure. Slight swelling developed, but it decreased continuously after the third day after the operation.

Prosthetic treatment

Temporary prosthetic restoration immediately after surgery:

In addition to the removal of the metal implants and their prosthetic parts, all remaining conservable teeth that had good vitality (teeth 2, 4, 12, 21, 29, 31) were consistently treated prior to surgery by replacing inadequate fillings and caries. After finishing the surgical intervention, chair-side long-term temporary restorations were made in blocks, connecting all neighboring teeth and one-piece implants with good primary stability (temporaries ##2-4, 7-8, 11-13, 18-21, 28-31). Luxatemp (DMG) was used as temporary material. The temporaries were fixed on natural teeth with highly biocompatible adhesive. Flow composite (Saremco) and Durelon (3M) were used simultaneously as cement on the ceramic implants. In addition, the temporaries on the teeth 7 and 8 were connected adhesively to the neighboring teeth.

The occlusion was adapted to the habitual bite, which was prepared beforehand by means of appliance therapy (see above). All occlusal and articulating contacts of the temporaries were removed in order to exclude harmful forces during the healing phase. The patient was advised to only chew on very soft food for eight weeks after surgery.

Post surgical considerations

Two months after the surgery at the SWISS BIOHEALTH CLINIC a new full time bMAGO (Eclipse, Dentsply Sirona) was applied to resolve reoccurring TMJ symptoms, balance occlusion, reach SCP and simulate the targeted Vertical Distance of Occlusion (VDO).

Final fixed prosthetic restoration with ceramic

After a healing phase of five months, all implants showed good osseointegration, shown by a positive percussion test and good periotest values (all between -4 and -6.5 indicating optimal integration). Thus, final prosthetic treatment for fixed prosthetics could be started, which was performed by Dr. Corbin Popp (Denver, CO, USA).

The functional and aesthetic rehabilitation presented several challenges that had to be addressed. The reduced anterior ridge in the upper anterior region, the large discrepancy in the patients upper and lower arches, achieving a balanced bite with proper anterior or group function guidance to protect her new implants, and to provide comfort to her TMJ as simulated in her well-adjusted bMAGO. The final challenge was matching her existing natural teeth to the new implant ceramic crowns considering the amount of reduction needed on otherwise healthy teeth.

Final restoration

An initial anterior wax up was completed by Andre's Dental Studio (Dana Point, CA) prior to the restorative treatment. Original temporaries were removed and the preparations were revised on the implants and natural teeth. The implant shoulder of all implants of Swiss Dental Solutions can be prepared with a diamond bur to adapt the preparation margin to gingival level.

New Luxatemp temporaries were fabricated chairside from the new waxed-up model and the lower anterior teeth were slightly enlarged chairside to ensure a balanced contact at a specific VDO for optimal restorations. After a few weeks the patient was very satisfied with the it.

A ceramic abutment on ceramic implant 16 was cemented, resulting in the same shape and functionality as a one-piece ceramic SDS implant.

We then replaced the posterior temporaries chairside based off the wax up at this same VDO. Afterwards new records at this VDO were taken for the next set of temporary anterior restorations.

A revised wax up with minor adjustments was performed by Andre's Dental Lab; Dana Point, CA. New laboratory-fabricated temporaries made of IPS e.max (lithium disilicate) were fabricated and placed to restore the bite and function and achieve appealing aesthetics. This was the final set of temporaries on the upper anterior implants and crowns to help determine proper shading of the implants 7 and 8 implants and the natural tooth crowns and 10 natural tooth crowns. The lower anterior teeth 22 - 27 and the upper right canine tooth no. 6 were restored with a direct composite injection molding technique RSVP based on the final wax-up.

In favor of a minimally invasive approach, no ceramic inlays or onlays were used at that time to preserve the tooth structure, as the history of devitalization of the patients teeth after restorative work is known.


Fig. 9


Fig. 10


Fig. 11


Fig. 12

After placing the temporary anterior crowns (IPS e.max), the final posterior crowns made of layered zirconium dioxide (region 3, 13, 14, 18, 28-31) were cemented and direct composite restorations were placed on the natural teeth (region 6, 2, 4, 12, 22-27) using the same techniques as described above. In the following restorative phase, the patient demonstrated her satisfaction with the function and esthetics of the anterior region, so that the IPS e.max temporary restorations on the SDS implants and natural teeth were replaced by layered ceramic zirconia crowns, except for implant 11, which remained in place due to satisfactory shading in IPS e.max Adjacent implants received connected crowns according to the SDS protocol and were cemented with Ketac Cem (3M). The connected crowns have several advantages without significant downsides. Since ceramic implants are highly osseointegrated and immobile, no individual crowning is necessary as with natural teeth, which have an individual movement within the natural alveolus. The bonded crowns result in higher stability, friction and less problematic areas in terms of periodontal hygiene.

Bite registration happened in centric relation after appliance therapy (bMAGO) to ensure SCP (Stable Condylar Position) per OBI (Ortognathic Bioesthetics International) bioesthetic therapy.

Occlusal and functional contacts where adjusted to axial loading forces and in a way to ensure maximum longevity and function. Implants where adjusted in slight infra-occlusion (~10µm) in soft occlusion


Fig. 13

Figures 9 – 13: Showing the final restoration


Figure 14: Panoramic x-ray after final prosthetic treatment

restorations with ceramic inlays or onlays and a veneer on tooth 6 in the future. She is very happy and feels much better.

Conclusion

In a written testimonial to the Swiss Biohealth Clinic the patient states after the procedures: "(…) Prior to my procedures I was losing energy, had trouble thinking straight, and couldn't relax; my coordination was poor and getting worse with time. Additionally, my eyes were sensitive to light, my ears were sensitive to sound, and my skin was very sensitive to touch. I was also emotionally sensitive and very anxious. I constantly felt like I had a metal rod running between my ears. If exposed to too much Wi-Fi, smart meters, smart-phones, or anything with EMFs, all my symptoms would get much worse. The "metal rod" would seem to get larger in diameter and throb, radiating throughout my entire head. After my first day of surgery I could feel the pressure in my head reduce and my body already start to relax for the first time in a very long time. The "metal rod" feeling in my head was gone by that night. About one or two days after my procedures, I noticed that my heart was no longer racing and I had my balance and coordination back when I wake up in the morning. (…) I am feeling much calmer and can relax, my energy is returning, I am sleeping much better and longer, my ears and eyes are losing their sensitivity. (…) At Swiss BioHealth I was very well taken care of. Every person at the clinic was very kind and competent. They all have a good understanding of what their patients are experiencing, and are there to help. I have no doubt going to Swiss BioHealth to have the metal in my mouth removed, non-reactive implants placed and cavitations cleaned out was the best decision for my health. I am so grateful to my dentists in the United States for being the kind of dentists who look deeply into the health of their patients´ mouth. (…) I am also very grateful to Dr. Volz for all the time and effort it must have taken to develop non-reactive implants as well as the careful attention to detail regarding pre- and post-surgical treatments to aid in healing. You are all amazing – Thank You So Much!" - J.H., Casper, WY, USA

The All in One Concept done at the Swiss Biohealth Clinic and the excellent final prosthetic restoration (in this case done by Dr. Corbin Popp, Denver CO, USA) not only rehabilitates the patients functionally and aesthetically in an optimal way and in the shortest possible time, but also restores their quality of life and health. ■

The Authors

Dr. Karl Ulrich Volz is founder and former President of the ISMI International Society of Metal–Free Implantology, and fo[illegible] of the dental clinics Bodensee Zahnklinik and Tagesklinik Konstanz. In 2001, he developed the first market–ready ceramic implant and was also the one who developed all of SDS Swiss Dental Solutions' implant designs for a wide range of indications. He went on to become the dentist to install the most ceramic implants in the world. Thanks to this pioneering achievement, he is arguably the most experienced and well–known biological dentist in Europe, and has developed unique treatment methods and surgery concepts which only became possible through the concurrent use of biological and immunological enhancement and accompaniment protocols. His treatment successes, publications, and interna–tional talks have sparked a new trend in dentistry and led to the fact that a large percentage of his patients are themselves dentists, doctors, and non–medical practitioners. He currently leads the biological dentistry department in the SWISS BIOHEALTH CLINIC in Kreuzlingen, Switzerland.

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DR. Corbin Popp was raised by a dentist in Lincoln, Nebraska where he attended the University of Nebraska and accepted the prestigious Fulbright Scholarship to Germany for a year of study. Returning to dental school –only after taking 10 years to peruse a professional dance and Broadway career, Corbin was Top of the Class, and the Resident of The Year from the Arizona School of Dentistry and Oral Health and CU Anschutz GPR. Dr. Popp is a strong advocate of the Swiss Biohealth Concept and ceramic implantology. Dr. Popp currently is practicing at Biodentist Denver.

Dr. Josephine Tietje, born in Hamburg, Germany, in 1991, has studied dentistry at the University of Muenster, achieving the best state examinations of her semester and has successfully specialized in oral surgery. She has treated patients in a renowned private practice, a large maxillofacial practice and the central oral– and maxillofacial clinic in Bremen. Since the beginning of 2018, Dr. Josephine Tietje has placed several hundred ceramic implants at the Swiss Biohealth Clinic. She is responsible for all surgical procedures – be it bone grafting, implant placement, sinus floor elevation, cavitation treatment or complex wisdom tooth and metal removal.

Paul Kilanowski, DMD. Since the beginning of his dentistry studies at university, Paul Kilanowski underwent additional education and training in Implantology. Later, he continuously took part in numerous trainings, among them a one year implantological curriculum (DGOI). Soon he will obtain his doctorate (Dr. med. dent.) at the Clinic of Oral and Maxillofacial Surgery of the FAU Erlangen–Nurnberg. Since 2017, Paul Kilanowski is trained in ceramic Implantology and biological dentistry by Dr. Volz personally at the SWISS BIOHEALTH CLINIC. He practices and continues learning this technique ever since. His focus is the head–neck area, the bite and the related detoxification. His therapeutical special field within biological dentistry covers total prosthetic rehabilitation regarding biological principles, the bite adjustment and aesthetic dentistry.

Dr. Rebekka Hueber, born in Germany, has completed her studies in dentistry at Ludwig–Maximilians–University in Munich with surgical top marks. Shortly thereafter, she obtained her doctorate in the surgical clinic, Klinikum rechts der Isar, at the Technical University in Munich. With great passion she completed the four–year specialization in well–known oral surgery practices in Munich and Rosenheim, Germany. She was also involved in dental aid in Peru, South America. Most recently, she successfully led the surgical department of a well–renowned private dental clinic as a specialist in oral surgery and implantology in Germany and implemented the concept of the Swiss Biohealth Clinic as a side department there.
With great enthusiasm and experience in the field of medicine, she devotes herself to biological dentistry and has already been able to deepen her knowledge through numerous advanced training courses. She has completed the educational program of the specialization of the SDS Curriculum and is trained in ceramic implantology, the use of PRF and iPRF, Neural therapy and recovery of heavy metal, prosthetics on SDS implants and the Swiss Biohealth Concept. Since beginning of 2019 she is an Oral surgeon in Dr. Volz Swiss Biohealth Clinic and scientific researcher, as well as member in the Swiss Biohealth Academy in Kreuzlingen. She has completed the educational program of the SDS Currciulum "Ceramic Implants and Biological Dentistry" and other programs of biological dentistry.

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Ceramic Implants for maxillary full arch rehabilitation with zirconia prosthesis

Saurabh Gupta, BDS MDS

Introduction

Full arch implant placement has proven to be a predictable modality for restorations with titanium dental implants. An increasing number of articles indicate that zirconia implants osseointegrate to a similar extent in this context [1,2]. Although the success of titanium is undisputable, the widespread use of implants has come with problems ranging from cosmetic concerns to systemic effects on the recipient [3,4]. Ceramic implants are today not only an alternative to titanium implants but the future in implantology. The demand of more and more patients for esthetic and functional implant rehabilitations based on ceramic implants is getting bigger and the industry and more and more colleagues have responded to that. There is an alternative to using titanium implants. The all on 4 or all on 6 dental implants can be done using four or six ceramic zirconia dental implants [5,6].

The clinical situation presented here is one where patient lost all his maxillary teeth due to chronic periodontistis and although the patient never experienced dental implants in the past, there was concern on his part in having metal alloy implants in his jaws and wanted to replace his upper teeth with metal free option. This 1–year case report describes an outpatient maxillary restoration with zirconia implants. At the 1–year follow–up, all implants were still well osseointegrated clinically and radiologically. No major bone loss or peri–implantitis had occurred. More research and studies are needed to confirm these results.

Keywords: Zirconia dental implant, Ceramic dental implant, Full arch reconstruction, Metal free, zirconia bridge.


Fig. 1

Clinical Case

A 65 years old male presented partially edentulous with significant collapse in the vertical dimension of occlusion. Most of the teeth were periodontally involved and teeth had mobility type II with mild to moderate bone loss and gingival recession. (Figure 1) Only seven maxillary teeth were present (Figure 2a,b).

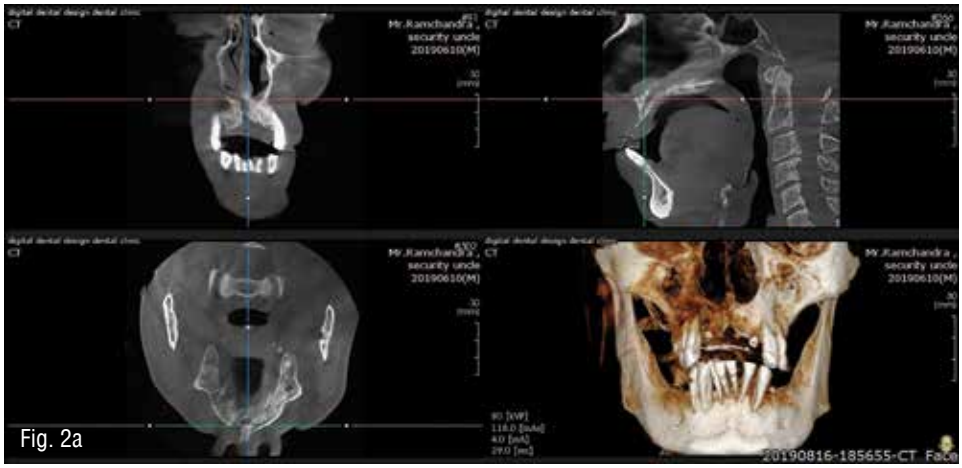
Fig. 2a


Fig. 2b

A cone beam CT scan was obtained and reviewed to assess bone levels, anatomy as well as critical anatomical structures in the areas of planned implant placement. The patient had difficulty wearing removable appliances, has a severe gag reflex and requested a metal free fixed solution to replace his teeth. Alternative treatment options were presented including overdentures on four ceramic implants. The patient opted for maxillary fixed full arch screw–retained prosthetics

ZIBONE

Zirconia Medical Device

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Fig. 3a

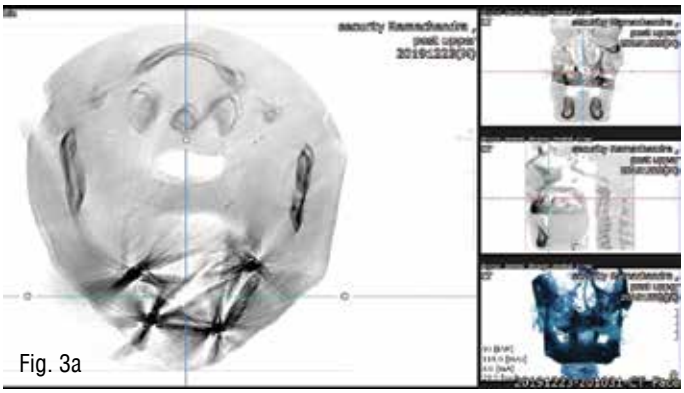
Fig. 3a

using zirconia implants (Zibone, COHO). A two–phased treatment plan consisting initially of full arch extractions, immediate implant placement in maxillary arch.

Before surgery, consents were obtained, local anaesthesia was administered across the maxillary arch by infiltration and bilateral posterior superior alveolar blocks. Extractions of all remaining maxillary teeth was done as minimally atraumatic as possible using manual periotomes all the while taking care to preserve the buccal plate.

Four monobloc zibone zirconia implants were placed in the maxilla at canine and first molar region. The manufacturer surgical kit and protocol was closely followed. Insertion torque value for all implants was 45 Ncm and all implants showed good initial primary stability (Figures 3a,b). A provisional restoration was given to the patient after 10 days of healing and patient was asked to follow the strict instructions (Figures 4a,b).

16 weeks post–surgery the implants were uncovered by removing the soft tissue above the platform of the implant using a diode laser where needed (Figure 5).


Fig. 4a


Fig. 5


Fig. 7

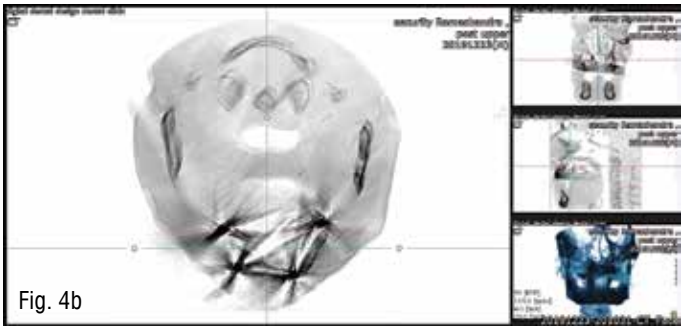
Fig. 4b


Fig. 6


Fig. 8

Fig. 9

Optical impressions were made using optical scanner (3shape, Denmark) (Figure 6). Multiple clinical photographs and optical registration were taken for effective transfer of information to the dental laboratory. The zirconia prosthesis framework was manufactured with CAD/CAM technology after scanning of the temporary prosthesis. A try–in of the framework was done to verify and confirm passive fit to the implants on both arches. The frameworks were returned to the laboratory for overlay of pressed ceramic (Figure 7). Patient requested for whiter teeth and light pink colour of the gingiva.

The zirconia bridge was cemented to the implants with resin bond cement (3M), occlusion checked and adjusted where needed. The patient was satisfied with aesthetics of the prostheses (Figure 8). The patient has been followed up periodically for one year and there have been no complications to date (Figure 9).

Conclusion

Full arch rehabilitation with zirconia implants is difficult but with proper case selection and detailed treatment planning it is possible. Ceramic implants do not have the prosthetic flexibility and options their titanium counterpart have, therefore biomechanically and prosthetically driven treatment is important. Additional clinical studies are required to identify all relevant technical and biological factors affecting implant success and patients' satisfaction in such cases. However, the evidence for a final verdict is, at present, still incomplete. ■

The Author

Saurabh Gupta, BDS MDS, Oral and Maxillofacial Surgeon, India. Education Director, IAOCI, USA Ambassador, Clean Implant Foundation, Germany

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The Time is Right for Ceramic Implants Part 1

For some time now, one-piece and even two-piece ceramic implant systems have been discussed in the media and at dental conventions. Wolfgang Weisser has been focusing on "metal-free" dental restorations for five years. In a two-part article, he describes how to use ceramic implants successfully.

Wolfgang Weisser, MDT

The demand for metal-free restorations is increasing constantly. It is, therefore, not surprising that a "white future" in implantology has been a hot topic during this year's ITI congress in Bonn. I have been focusing on "metal-free" implant restorations for five years, inspired by the long-time intercommunication with my mentor Klaus Pettinger (Zeramex) who has undoubtedly helped me to prosper in this field. During the sixth Zeramex congress in Hamburg, I presented the following patient case which focuses on prosthetic finishing of a restoration. Planning included a prosthetic restoration with ceramic veneering onto a zirconia abutment, or alternatively, a composite veneered prosthesis onto a zirconia abutment.

Generally, a metal screw is the core component of ceramic implant systems. However, I believe that a metal-free restoration option should be completely free of metal

Fig. 1 — Panoramic X-ray.

Fig. 2a - 2b — Zeramex P6 Surgical Kit.

elements. Furthermore, for me, as a well-trained and skilled technician, combining metal screws with zirconium abutments is questionable in guaranteeing long-term success.

I consulted with oral surgeons and dentists and they concurred that they prefer composite veneering for prosthetic restorations.

They mentioned the following favorable arguments:

- Composite is a material that can be easily corrected and modified.
- My dental team is familiar and comfortable with handling composite materials.
- Since the hardness of composite material is similar to that of dental enamel, composite material has a shock-absorbing effect which protects the implant system.

Fig. 3 — Initial situation.

Fig. 4 — Implant site exposure.

Fig. 5 - 7 — Pilot drilling: ø 2.2 mm.

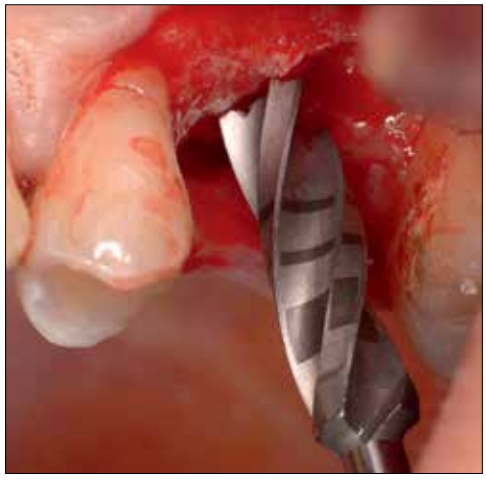

Fig. 8 — Final drilling: 4.2 mm.

Fig. 9 — Depth verification with a Depth Gauge.

Fig. 10 - 11 — Screw Tap and Depth Gauge reinserted.

Professor Gerwin Arnetzl from Graz has mentioned previously the above arguments in his seminars which often led to discussions about his favorite alternative material, Enamic, by Vita. Since the described procedure is a test approach, a consultation with the manufacturer, the dentist and the patient prior to starting was mandatory, as carrying out an empirical assessment is certainly worthwhile.

At the dental clinic

The patient presented herself at the dental clinic with the request to close the gap in region 16 in the maxilla. She insisted on a ceramic implant once again as she was very satisfied with the zit-varion-z implant by Ziterion (Figure 1) we inserted in 2010.

The Zeramex P6 (4.8mm X 10mm) (Figures 4 to 7) was inserted without complications by the Maxillofacial Surgeon. The Zeramex P6 system Screw is made of a carbon-fibre reinforced high-quality plastic and is 100% metal-free. Insertion of the Zeramex P6 implant follows a surgical procedure similar to the insertion of the Straumann Standard Plus implant. For the implant bed preparation, first the desired implant position is punch-marked with a Round Bur, and then the depth and axis orientation defined with a Pilot Drill. Once drilling is complete, depth and axis orientation are checked with a Paralleling Pin. Various sized form drills are used to enlarge the diameter. The depth is always verified with a Depth Gauge. For the present case, we used a screw tap. The implant is then screwed in, the healing cap is placed into the implant, and then the gingiva is sutured.

Fig. 12

The ZERAMEX Healing Cap, the Gingiva Former (comes in 2 sizes) and the temporary restoration all aid with the shaping of the peri-implant soft tissue during the healing phase. The abutment, made of PEEK, then has an individualized temporary restoration made onto it. Sandblasting and etching of the hydrophilic implant surface ZERAFIL promotes osteoblast proliferation around the implant which enables decisive osseointegration.


Fig. 13

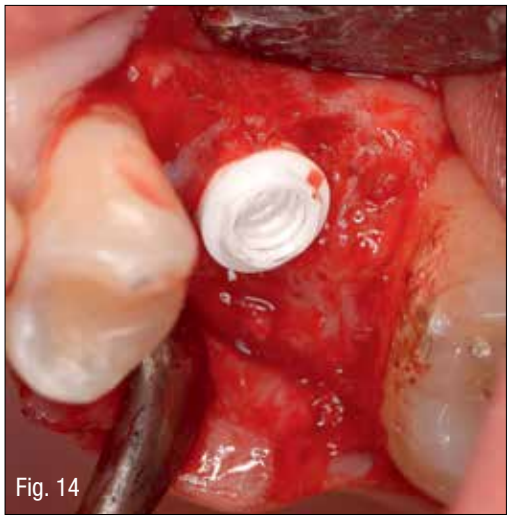
Fig. 14

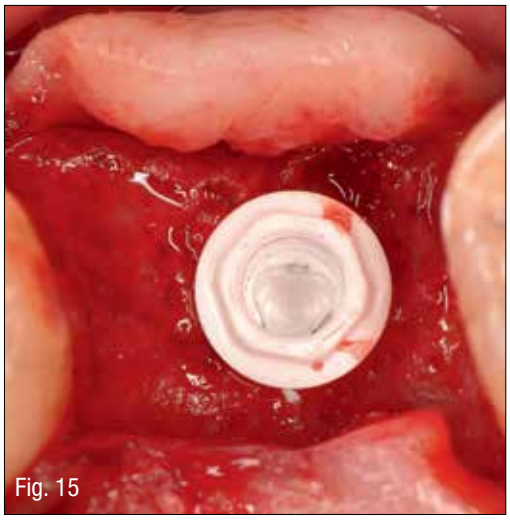
Fig. 15

Fig. 12 - 15 — Inserting the Zeramex P6 4.8 mm X 10 mm RN.

Fig. 16


Fig. 17a

Fig. 16 - 17a — P36500 RN Healing Cap made of PEEK material applied to the implant.

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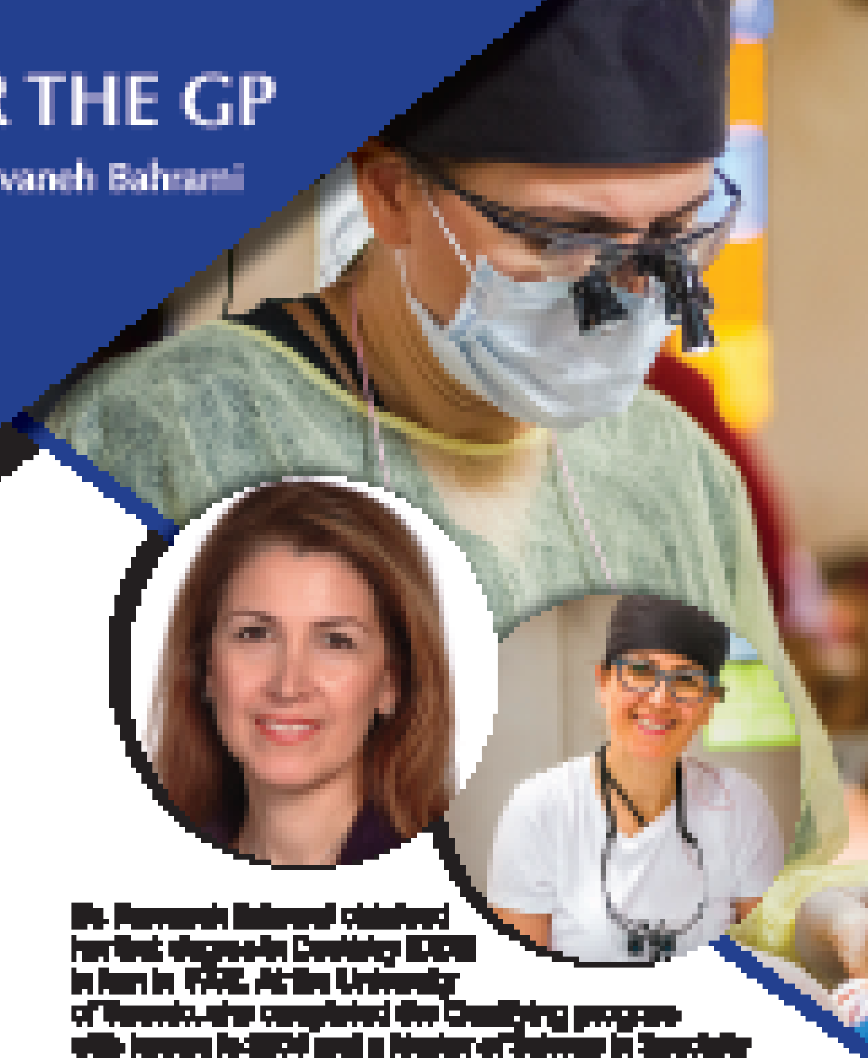

MODULE 1

Periodontal disease

- Diagnosis of periodontal diseases and conditions using the new classification system
- Treatment planning
- Non-surgical and surgical treatment options
- Periodontal maintenance program

Hands-On components:

- Suturing techniques
- Sutures Open Flap debridement and distal wedge
- Crown lengthening

MODULE 2

Soft tissue grafting

- Biologic principles and classifications
- Classification, Goals and Objectives
- Indications and Risk Factors
- Instrumentation and materials
- Complications

Hands-On components:

- Free gingival grafting
- Connective tissue grafting
- Tissue guided regeneration for soft tissue grafting

MODULE 3

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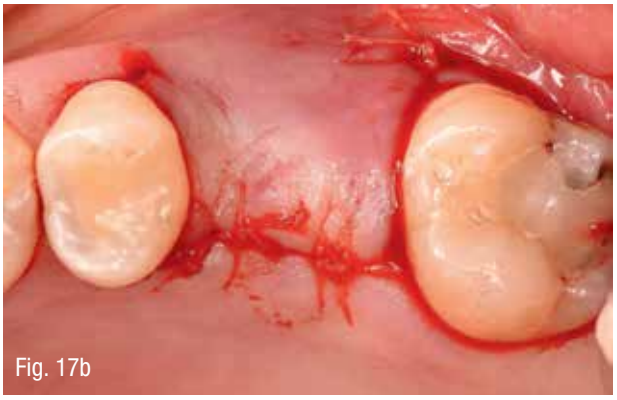

Fig. 17b — Tension-free suturing.

Fig. 18 — After a six-month healing period.

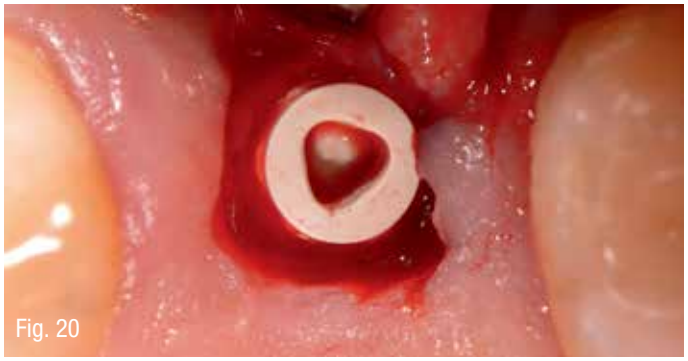

Fig. 19 - 20 — Exposure of the implant.

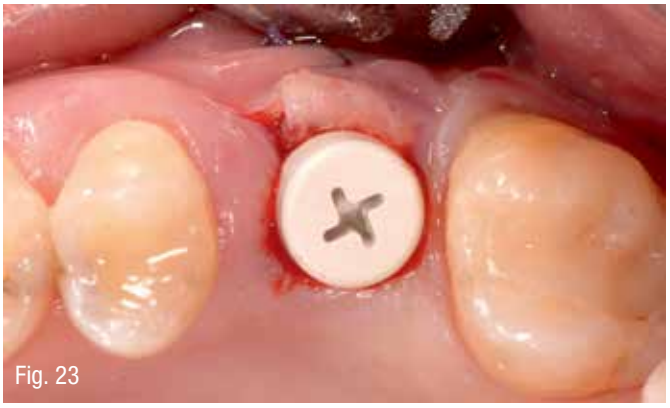

Fig. 21 - 23 — P36504 Gingiva Former, rolled flap with sutures.

Fig. 24 — Two weeks later.

Fig. 25 - 26 — Taking the impression with the Zeramex P36510 Transfer Open Tray RN transfer coping.

The Microplastic Regenerative Surgery course with Microscopes* or Loupes for GPs

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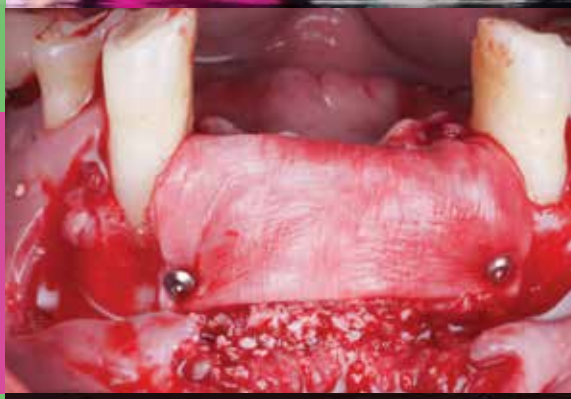

Objectives:

- Create a solid theoretical basis according to scientific literature for the diagnosis and treatment of complex cases.
- Learn, handle and practice different techniques employing different magnifications and suture diameters to achieve the proper tissue healing.
- Practice of different soft tissue surgery techniques advocated to improve Microsurgical Treatment in the fields of Plastic Surgery and **Guided Bone Regeneration** using magnification.

DAY 1

1.Theory. The present, the past and the future of Periodontal Plastic Surgery over the roots of teeth. Tunnel vs Coronally Advanced Flap techniques.

2.Hands-on: Suturing. Various techniques from simple knot to continuous suture.

3.The Coronally Advanced Flap. Incision. Dissection. Retromolar area for the harvesting of connective tissue graft.

4.The advancement, suturing and fixation of the **CTG**.

DAY 2

1. Theory. Bone Regeneration Lecture. Horizontal and vertical **GBR** over tooth roots and dental implants. Connective tissue graft vs membranes. When to do **GBR** and when Lower jaw matrix.

2.Microsurgical practice. The tunnel technique. Incision. Dissection. Tuberosity harvesting for **CTG**.

3.The introduction of the **CTG** inside the tunnel. Fixation. Suturing. The V reverse suture.

4.Membrane fixation. Compartment creation. Total and partial thickness flaps. Suture fixation. Wound closure techniques.

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Fig. 27

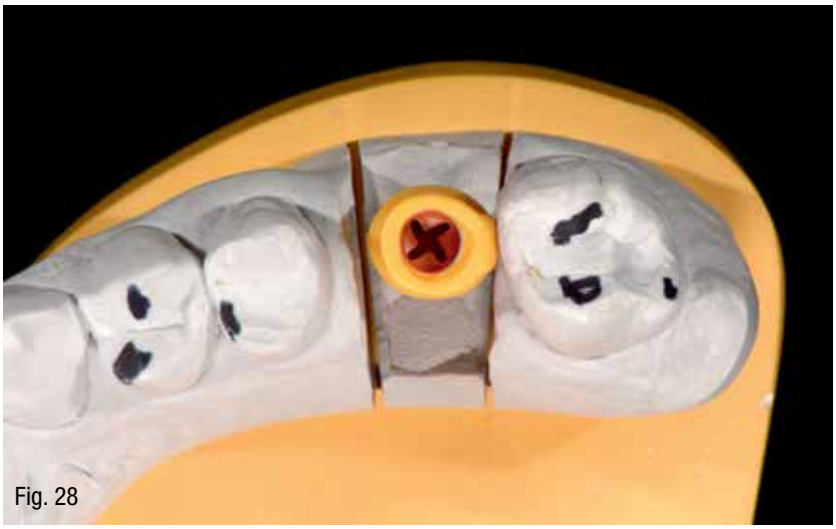


Fig. 28

Fig. 27 - 28 — In the laboratory: The individual abutment. Analogous preparation work on the master model is very important to obtain a three-dimensional perspective.

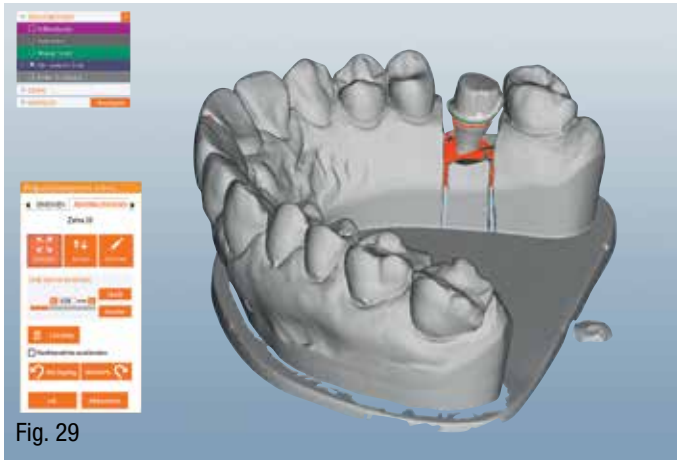


Fig. 29

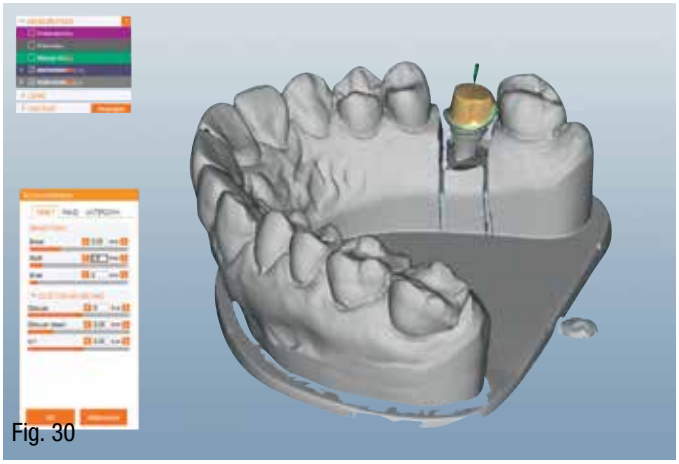


Fig. 30

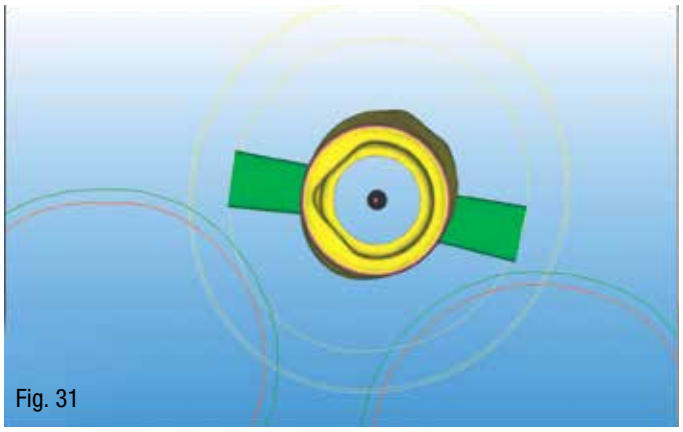


Fig. 31

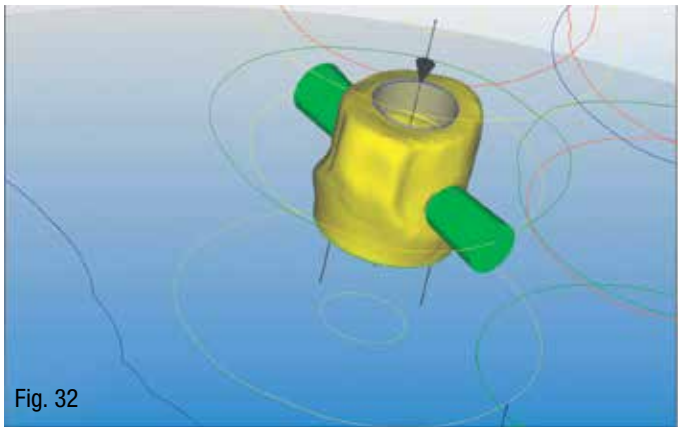


Fig. 32

Fig. 29 - 32 — After dual scanning, the next step includes a digital workflow in order to fabricate the individual abutment.

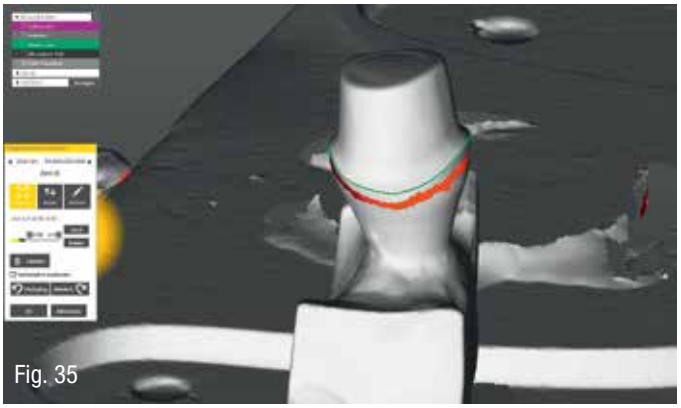
Drill sequences for the implant bed preparation

Preparing the implant bed:

- Punch-mark the desired implant position with a ZERAMEX P Rose Drill (ø 2.2mm) or with a pointed bur.
- Use a Pilot Drill (ø 2.2mm) for depth drilling following the direction of the prosthetic implant axis.
- Verify the depth with a Paralleling Pin with depth markings.
- Use different form drills for form drilling.
- Verify the depth with a Depth Gauge with depth markings.
- Probe the implant bed drilling hole to determine where the bone margin is.

Fig. 33 — The preparation work is done in wax to ensure that proper stress breaking for ceramic and composite veneers is ensured. This step is important for the long-term success of the restoration.

Fig. 34 — The correct positioning of the cusps is another important step because one must ensure there is enough free space for functional movement and at the same time one must strive to achieve a precise and uniform ceramic and composite layer thickness of 1.5 mm which prevents fracture.



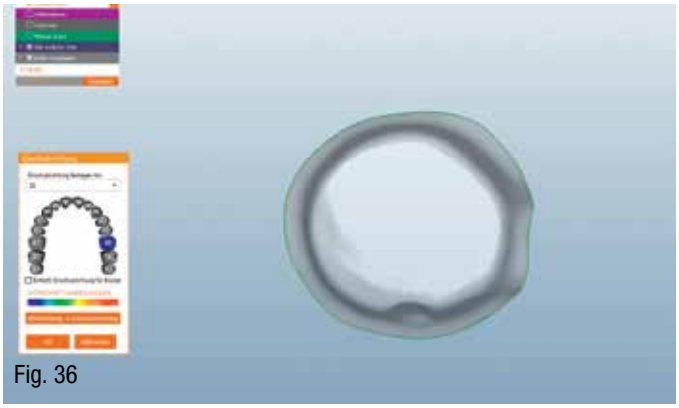


Fig. 35 - 36 — Scanned abutment.

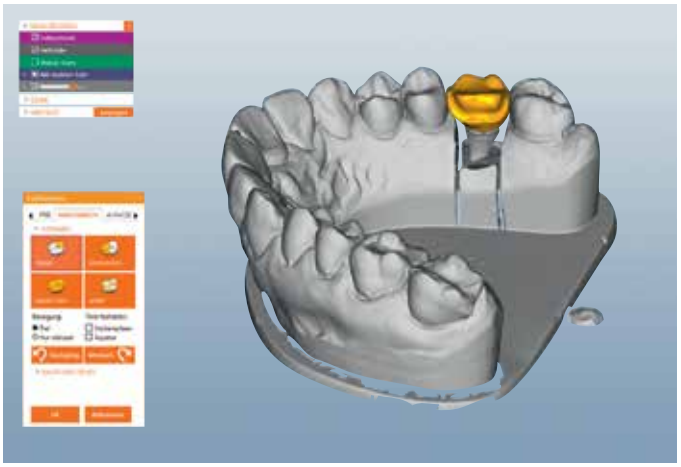


Fig. 37 — Dual scan of the analogous contoured abutment.

- Depending on the implant position, a bone Profile Drill may be used to shape the bone area that matches the implant neck area.
- Use a Thread Tap.

Depth verification

After drilling, the depth of the implant site must be verified with the Depth Gauge. If the drill hole has been pretapped, the position of the threads in the cortical bone must match those of the implant. It is recommended to manually turn the Implant Driver attached to the implant carefully to the left until the thread attachment grooves are detectable, and then the implant is screwed in clockwise.

Submerged healing

During the healing phase, either the Healing Cap or the Gingiva Former is inserted. This is followed by suturing of the gingiva over the Healing Cap. After there is evidence of successful osseointegration of the implant and after successful peri-implant soft tissue healing, we proceed to take the impression for the final restoration.

Implant exposure with soft tissue thickening

To ensure a successful implant restoration result, we paid

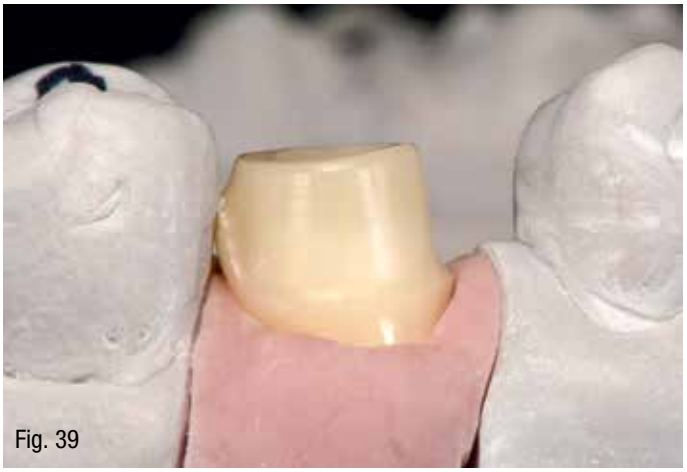


Fig. 38 - 39 — On the master model.

Fig. 40 — Verification of the contact point on the master model which is important due to the implant's distal angulation. This facilitates adaptation of the crown by the dentist.

Fig. 41 — Verification of the contact with articulating foil.

Fig. 42 — Shortened Zerabase.

Fig. 43 - 44 — Bonding of the Zerabase onto the individual multicolour abutment.

Fig. 45 — Veneering (signum/Kulzer) with zirconia bond II bonding agent by Zircon.

particular attention to soft tissue management during implant exposure. We used the modified roll flap technique for soft tissue thickening, whereby the rolled flap was folded and gently pushed into the prepared opening. After removing the Healing Cap, we inserted a 4mm Gingiva Former into the implant.

After scanning and digitalizing the master model of the maxilla, the patient's data in the software was used to design the abutment. The design data was then transferred to the BEGO production centre for fabrication of the individual abutment.

We scanned the master model and the set-up with the LabScan UHD scanner by BEGO (Figures 29 to 32). The individual abutment design ensured a parallel insertion path.

Fig. 46 — We had agreed to utilize two veneering options for the occlusal surfaces — one composite and one ceramic. In this image, composite dentine A3 is applied.

Fig. 47

Fig. 48

Fig. 47 - 48 — Occlusal application of matrix mamelon dentine flow.

Fig. 49 — Applying a finishing layer of matrix opal transparent flowable material.

Fig. 50 — Finished occlusal surface with signum/Kulzer.

Fig. 51 — Close-up of the individual abutment.

Fig. 52 — Finished occlusal surface with signum/Kulzer.

In the laboratory – Preparing the individual abutment

Analogous preparation work on the master model is very important in order to gain a three-dimensional perspective. After dual scanning, the next step is a digital workflow process to produce the abutment. The preparation work is done in wax to ensure that proper stress breaking for ceramic and composite veneers is ensured. This step is important for the long-term success of the restoration. The correct positioning of the cusps is another important step because one must ensure that there is enough free space for functional movement. It should also be noted that a ceramic and composite layer minimum thickness of 1.5 mm is necessary to prevent ceramic fracture. ■

In memoriam of Professor Dr. Gerwin Arnetzl:
I dedicate this article to my friend, Professor Dr. Gerwin Arnetzl from Graz who passed away March 12, 2018.

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MINIMALLY INVASIVE SOFT TISSUE GRAFTING TECHNIQUE (MIST Technique)

June 26, 2020

Time: 8:30am -5:30pm (8 CE)
AGD Subject code: 490

This interactive limited attendance course is intended for periodontists and general dentists with or without surgical experience who wish to learn more about minimally invasive periodontal esthetic periodontal plastic surgery procedures for treatment of soft tissue defects at teeth. All aspects of treatment planning and step–by–step surgical procedures and suturing techniques will be presented and discussed. Case presentations, practical hands–on exercises and live surgical demonstrations provide in–depth knowledge about the use of soft tissue grafting techniques to achieve predictable coverage of single and multiple recessions, increase in tissue thickness, and extension of the vestibule.

Keys for successful soft tissue surgery

- Microsurgical instrumentation and specialized suturing techniques
- Classification of recession defects Anatomical factors affecting grafting outcome
- Critical evaluation of allografts and xenografts used in soft tissue grafting
- Detailed surgical technique for tunnel procedure for treatment of single and multiple gingival recession using Alloderm
- Modifications of the tunnel technique for deep recession sites
- Presentation of long-term results following soft tissue grafting
- Critical review of outcome parameters
- Evidence-based selection of the optimal grafting method Treatment planning and case presentations Interdisciplinary management of cervical lesions
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Dr. Boeriu is a certified periodontist in Canada and the USA. The scope of his practice includes dental implantology, the non-surgical and surgical treatment of periodontal diseases, periodontal tissue regeneration and periodontal soft tissue grafting. He has extensive experience in the surgical placement of dental implants, including immediate implants and computer-guided implant surgery, hard tissue grafting (including guided bone regeneration and maxillary sinus augmentation), complicated extractions, and soft tissue grafting.

Dr. Boeriu completed his Doctorate of Dental Surgery in 1997 at CWRU School of Dental Medicine in Cleveland, USA. Dr. Boeriu subsequently completed the Misch International Implant Institute in Toronto, Canada in 2001. In 2016 he completed a Graduate Periodontal Program at CWRU School of Dental Medicine Cleveland USA . Dr. Boeriu also holds a PhD degree in medical sciences. Throughout his education, Dr. Boeriu received a number of awards and has continued to receive professional recognition throughout his career. Furthermore, Dr. Boeriu is actively involved in dental research, as well as lecturing at national and international dental meetings.

He has been inducted as a Fellow of the American Academy of Implant Dentistry and of Misch International Implant Institute and as a Diplomate of the International Congress of Oral Implantology.

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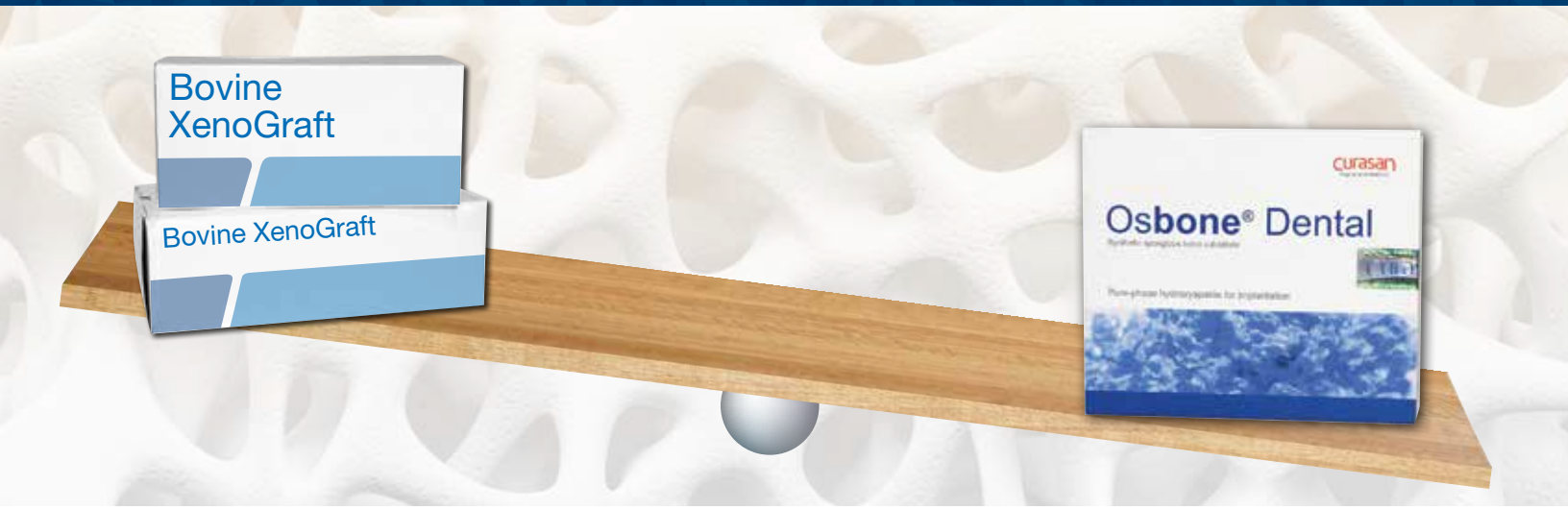

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