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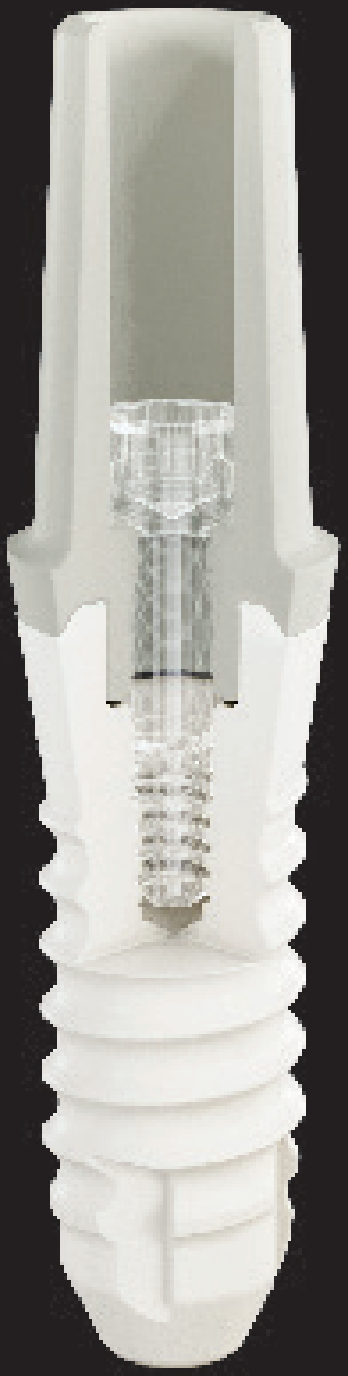
ceramic implants

international magazine of ceramic implant technology



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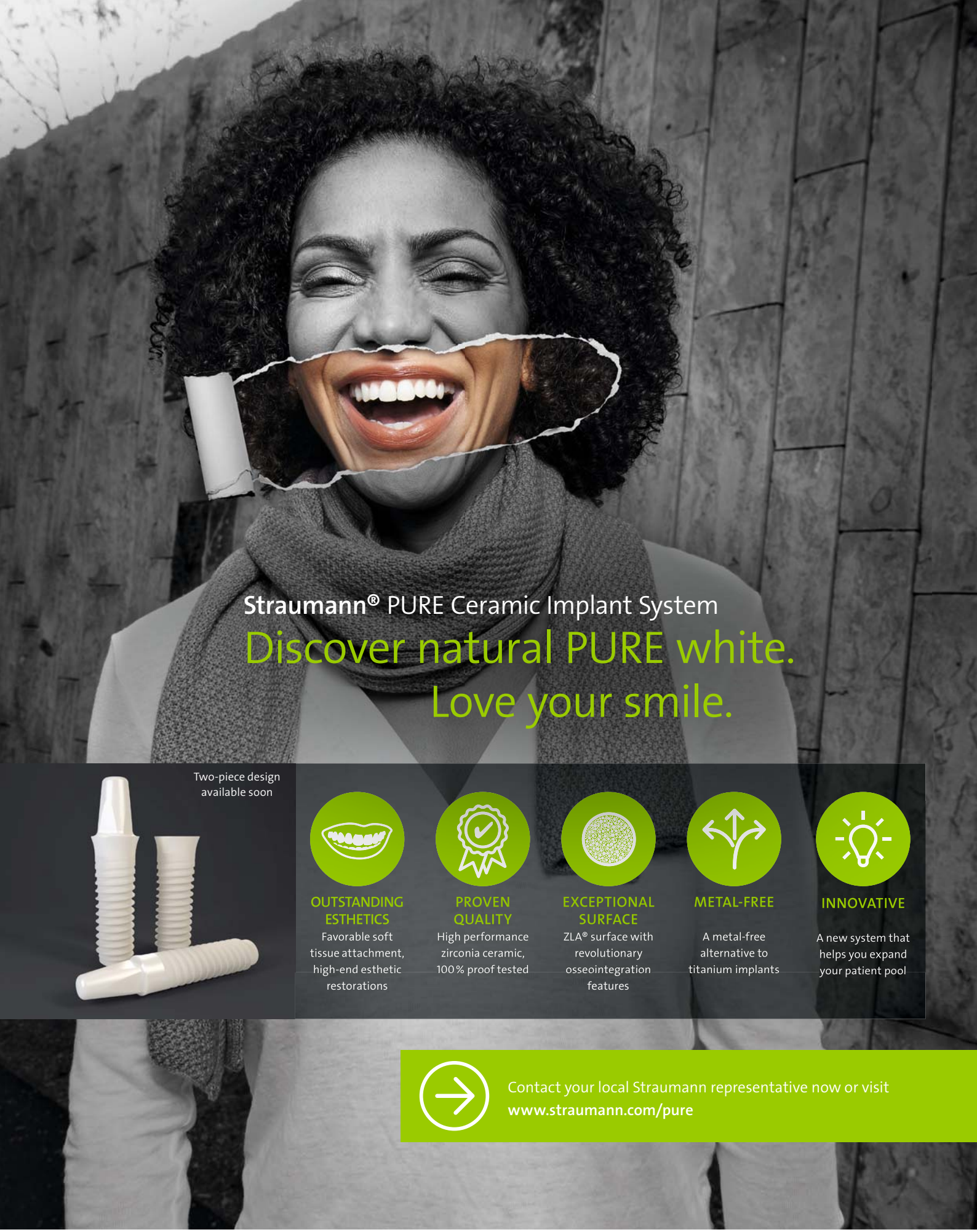

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Georg Isbaner

Editorial Manager

Ceramic Implants—We need to talk!

The number of initiatives surrounding ceramic implants has increased significantly lately. New expert associations dealing solely with this subject are taking the stage. In Europe alone, three major congresses on ceramic implantology will take place this year. And in the US, the IAOCI and its cooperation partners are also quite active.

It therefore seems fair to say: there is a lot to talk about, when it comes to ceramic implants.

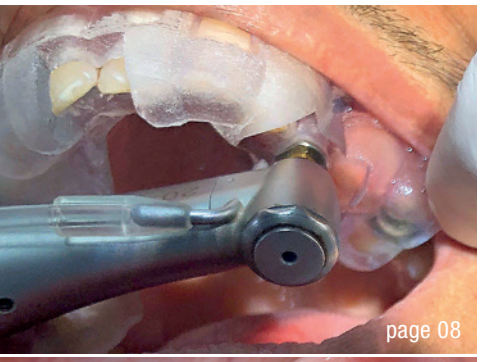
The fact that there is a strong need for communication is reflected in this issue of *ceramic implants—international magazine of ceramic implant technology*: Never before have we received so many specialist articles and information as for this issue. And never before did we print so many pages—and still were not able to take everything into account.

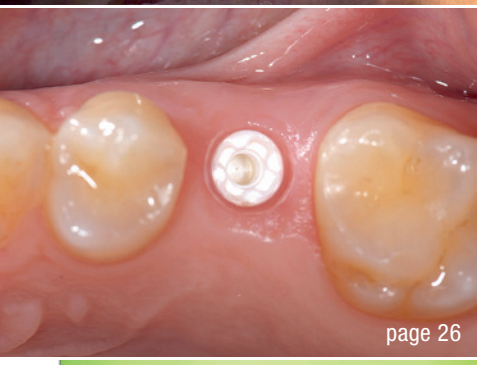
During IDS 2019 in Cologne, we've had the opportunity to talk to numerous ceramics specialists. For a start, we spoke to Ric Donaca, CEO and Head of Development of the Germany-based manufacturer Argon Medical, about his new ceramic implant system, which is made with a synthetic content, giving the material the elasticity that is necessary to deal with high loading forces (pages 42 and 43). An interview with Frank Hemm, Head of Marketing & Education at Straumann, and Rubino Di Girolamo, CEO of Z-Systems, about the new partnership between the two companies (pages 44–46) was equally informative as a conversation with Philip Bolleter (Head of the Technical Department at Dentalpoint) and Adrian Hunn (Head of Marketing and Sales at Dentalpoint) about the overall market situation and the digital workflow for ceramic implants (pages 40 and 41). Last but not least, we've quizzed Dr Jens Tartsch about future research tasks ceramic implantology has yet to address. Founded in 2018, his expert association is also dedicated to fostering this still rather young field of oral implantology.

Ultimately, however, this issue is a platform for those who are in direct therapeutic contact with patients: implantologists and prosthodontists who specialise in ceramic implant restorations. The most experienced and globally renowned clinicians share insights into their exceptional work with patients—without them, none of this would be possible.

I hope you enjoy the read.

Yours, Georg Isbaner





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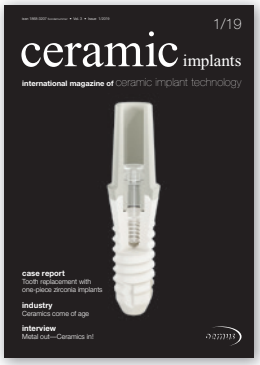

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Zirconia implants and digital workflow: A case report

Drs Saurabh Gupta, India & Sammy Noumbissi, USA

Introduction

Advancements made in the dental zirconia industry have given rise to new and alternative treatment options for implantology. When compared with other ceramic oxides, zirconia exhibits outstanding biochemical properties. Since its introduction to dentistry, it has been utilised as a material suitable for fixed dental prosthesis, ceramic crowns, metal-free implant abutments and prosthetic frameworks. Zirconia is highly suitable for dental implants owing to its tooth-like colour, structure, material properties and biological response. Additionally, human studies indicate minimised adhesion of bacteria to zirconia compared with titanium. Zirconia also exhibits fewer inflammatory cells within the peri-implant soft tissue.

A recently conducted systematic review showed a 95 per cent survival rate of one- and two-piece zirconia implants after one year of successful functioning.[1] According to this article, the marginal bone loss and survival values of one- and two-piece zirconia implants after a year is acceptable. Also, it must be highlighted that there is a lack of data specifying the performance of zirconia implants in long-term studies, and thus, it has become increasingly important to further research these implants and to obtain more data. In the following, a clinical case is depicted in which a maxillary premolar is replaced using a one-piece ceramic implant following a digital workflow from treatment planning to prosthetic rehabilitation.

Initial situation

A 44-year-old patient attended the scheduled dental maintenance appointment complaining of a fractured tooth (Fig. 1), which had been treated endodontically and restored with a crown five years prior. The patient was a non-smoker and had an otherwise unremarkable medical history. Clinical assessments revealed little pain during percussion. A periapical radiograph confirmed the clinical findings and revealed the fracture line to be at the

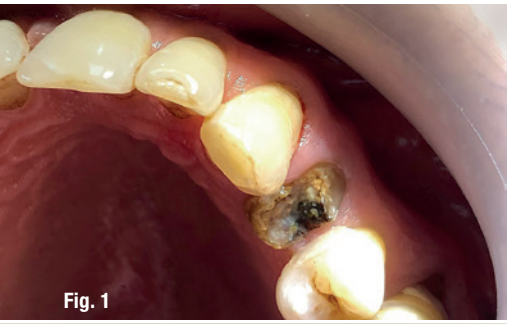
Fig. 1

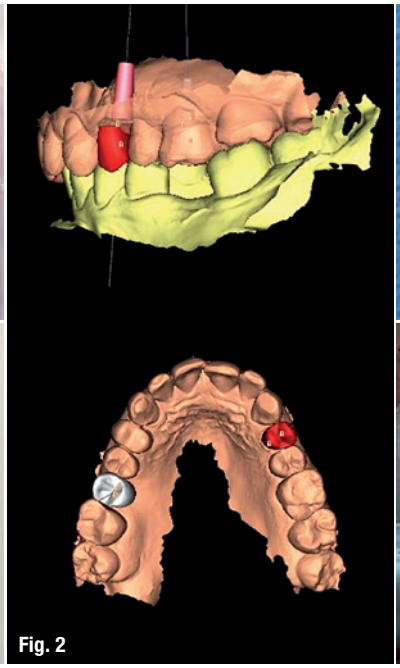
Fig. 2


Fig. 3

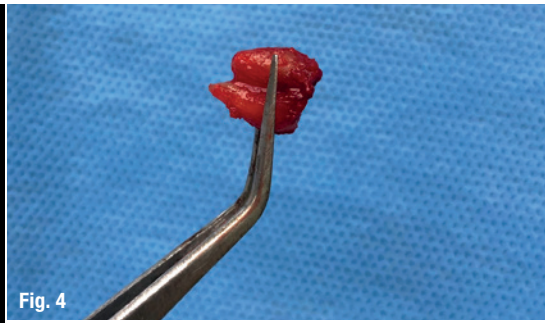
Fig. 4

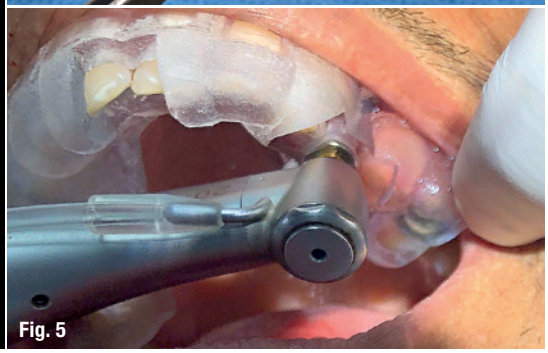
Fig. 5

Fig. 1: Initial clinical situation. **Fig. 2:** Digital pre-planning of the surgery. **Fig. 3:** The final surgical guide. **Fig. 4:** The extracted tooth #24. **Fig. 5:** During the guided surgery treatment.

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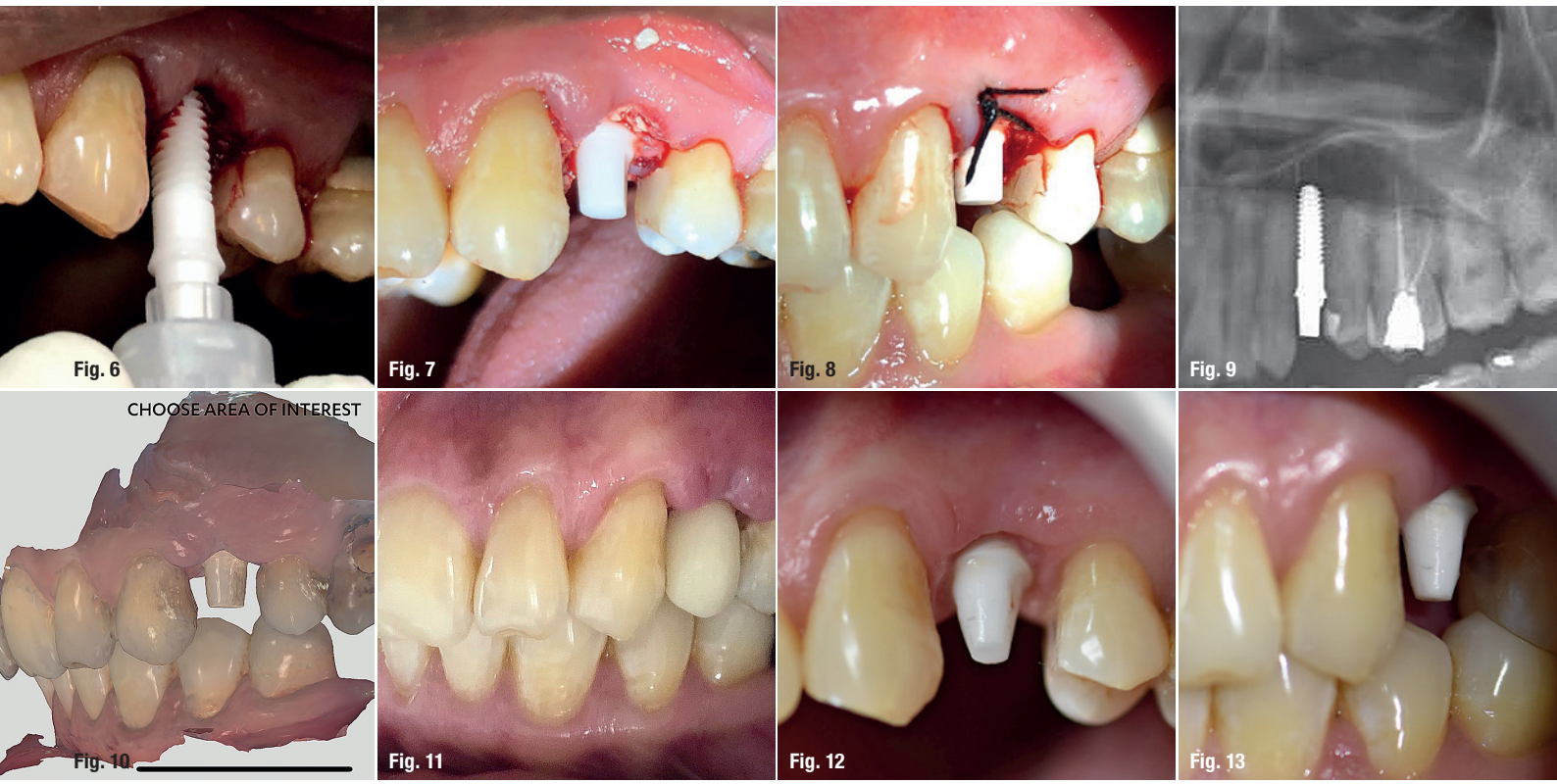

Fig. 6: Placement of the implant. **Fig. 7:** Bone grafting material placed around the implant body. **Fig. 8:** The horizontal mattress suture. **Fig. 9:** Radiograph taken immediately after surgery. **Fig. 10:** The optical scan after surgery. **Fig. 11:** The provisional restoration. **Figs. 12 & 13:** Tooth preparation.

cervical margin of tooth #24. A horizontal root fracture was diagnosed and the patient agreed to his tooth being replaced with a metal-free ceramic implant.

Digital planning

A digital design software programme was used for designing the surgical guide and for implant planning. CBCT scans were combined with an open-format surface in the planning software for gaining a comprehensive clinical insight (Fig. 2). The benefits of prosthetic-based implant planning for achieving optimal function and aesthetics were considered while accounting for the current clinical situation, including bone density, soft-tissue type and anatomy, and projected prosthesis. A customised surgical guide was designed based on the planned position of the implant (Fig. 3). The provisional restoration was digitally designed and fabricated by the laboratory technician for immediate restoration.

Surgical procedure

On the day of surgery, a pre-surgical dose of 600 mg of ibuprofen and 750 mg of amoxicillin was administered to the patient. Atraumatic extraction was carried out to remove the root tip (Fig. 4). The manufacturer's instructions were followed for placing the conventional surgical guide and preparing the implant bed. Implant indicators were used for preparing and maintaining an accurate vertical position for placing the monotype zirconia implant. A ZiBone zirconia implant (COHO Biomedical Technology) with a diameter of 4.0 mm, a body length of 11.5 mm and an abutment height of 4.0 mm was surgically placed by means of guided surgery without the need for a flap (Fig. 6). After being placed at a torque of 35 Ncm, the implant showed good primary stability. The minor buccal bone defect was corrected using bone cement (Augma Biomaterials) to enhance the vestibular ridge contour and to give the crown a natural appearance (Fig. 7). A horizontal mattress silk suture was placed for closure (Fig. 8). Also, the acrylic provisional restoration fabricated prior to the surgery using the implant design software was inserted immediately after the surgical procedure (Figs. 9–13). A chlorhexidine mouthrinse, an anti-inflammatory and antibiotics were prescribed. The suture was removed seven days after the implant placement.

Prosthetic phase

The osseointegration was successful and it was planned to restore the implant using a zirconia crown after four months. The abutment portion was prepared using Magic Touch burs (Strauss & Co.), and an intraoral optical scan (TRIOS 3 Wireless, 3Shape) was taken of the abutment portion of the monobloc zirconia implant (Figs. 14 & 15). Self-adhesive resin cement (3M ESPE) was used after cleaning and air-drying the zirconia surfaces. Excess

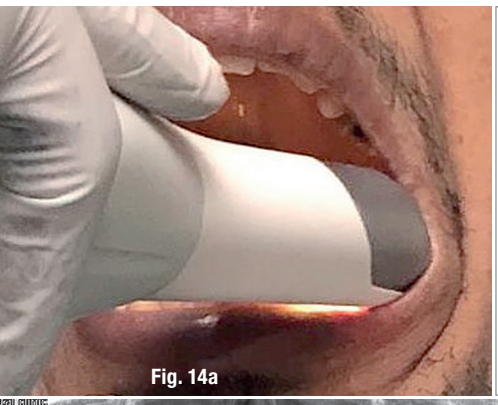
Fig. 14a

Fig. 14b


Fig. 15

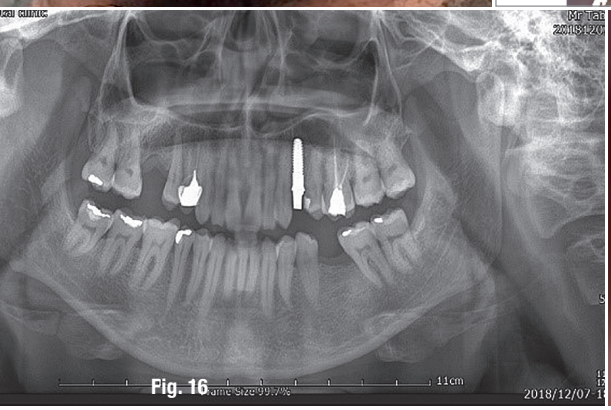

Fig. 16

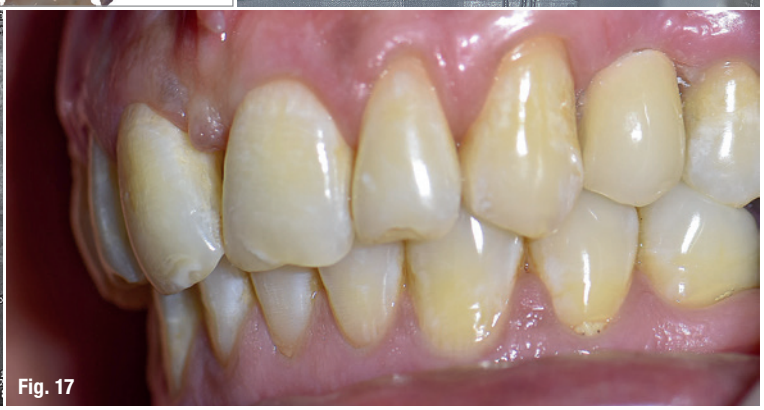
Fig. 17

Fig. 14a: Intraoral scanning. **Fig. 14b:** Optical scan for final restoration. **Fig. 15:** The final crown. **Fig. 16:** Radiograph taken four months after surgery. **Fig. 17:** Situation one year after surgery.

cement was removed carefully using dental floss after cementation of the final crown.

Control and maintenance appointments were scheduled six months and one year after placement of the implant (Figs. 16 & 17). The implant crown was still functional and no technical complications were observed at either appointment. The soft tissue surrounding the implant with respect to site #24 was quite healthy. A periapical radiograph was taken at the one-year follow-up. Bone remodelling around the implant was normal and the level of bone surrounding the border had fully stabilised. The patient was satisfied with the treatment outcome, in terms of both aesthetics and function.

Conclusion

No technical or biological complications were recorded after one year of implant functioning. Thus, the use of a zirconia implant in this case turned out to be a suitable alternative to a titanium implant. The soft tissue surrounding the implant was stable and exhibited outstanding biocompatibility. The vertical implant position is an important factor for success of such implants, as the soft-tissue collar of the implant needs to be apically positioned at a depth that allows for soft-tissue apposition and attachment up to the restorative platform. For such a one-piece implant, the process of restoration requires cementation, which bears the risk of excess cement being retained subgingivally, leading to complications ranging from bone loss to implant failure.

Literature

contact

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Tooth replacement with one-piece zirconia implants

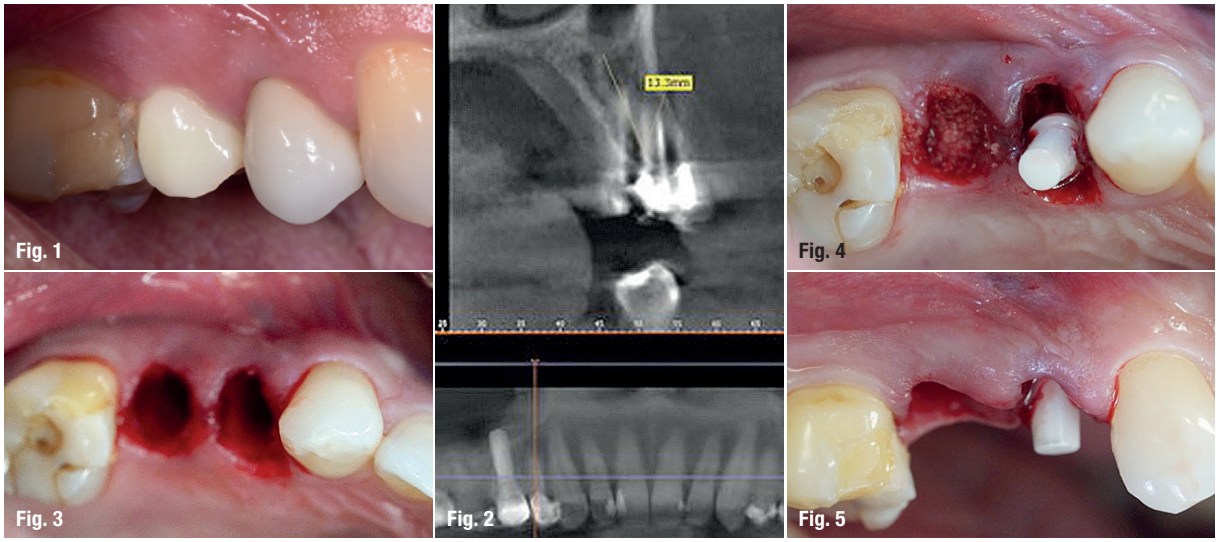
Laying the foundation for soft-tissue aesthetics

Dr Paul S. Petrungaro, USA

The use of dental implants to replace the failing natural tooth system has become a popular treatment planning choice over the last several decades. Modifications to the conventional multistep protocols initially introduced by Per-Ingvar Brånemark have allowed for treatment times to be shortened and for patients to receive immediate aesthetic provisional restorations in only one surgical appointment. Positive long-term success rates have been demonstrated in the literature. However, owing to the rising incidence of peri-implant mucositis and peri-implantitis being observed in clinical practice and reported on in the literature, titanium as a base material, along with various surface alterations, has undergone scrutiny. Zirconia as an alternative material for the implant–abutment complex has shown to be safe and successful. This article will demonstrate the immediate restoration procedure of one-piece zirconia tapered implants in the maxillary anterior and maxillary premolar regions, and outline the benefits of zirconia as an alternative to titanium in the dental implant discipline.

The use of dental implants to replace the natural tooth system, from single-tooth replacement to full-arch reconstruction, has become commonplace in the contemporary reconstructive and surgical practice.[1–4] The conventional, multistep approach to implant placement and restoration has been a staple procedure for over 40 years and continues to enjoy high success rates.[1,2] However, based on advancements in implant design and surgical and restorative protocols, treatment times have been observed to be shortened, procedures have become less invasive, and single-stage, immediate provisionalisation procedures have become more commonplace.[3–10] High success rates have been reported in the literature regarding these procedures. Additionally, patients can enjoy immediate, stable, functional dentition at the time of implant placement.[3–10]

Numerous variables can affect the success rates of dental implants in the short and long term.[11–13] The amount of attached gingival tissue, the depth of implant placement in relation to another implant and/or adjacent teeth, the implant surface design and alterations, and the volume and quality of bone are all important aspects that can contribute positively or adversely to the

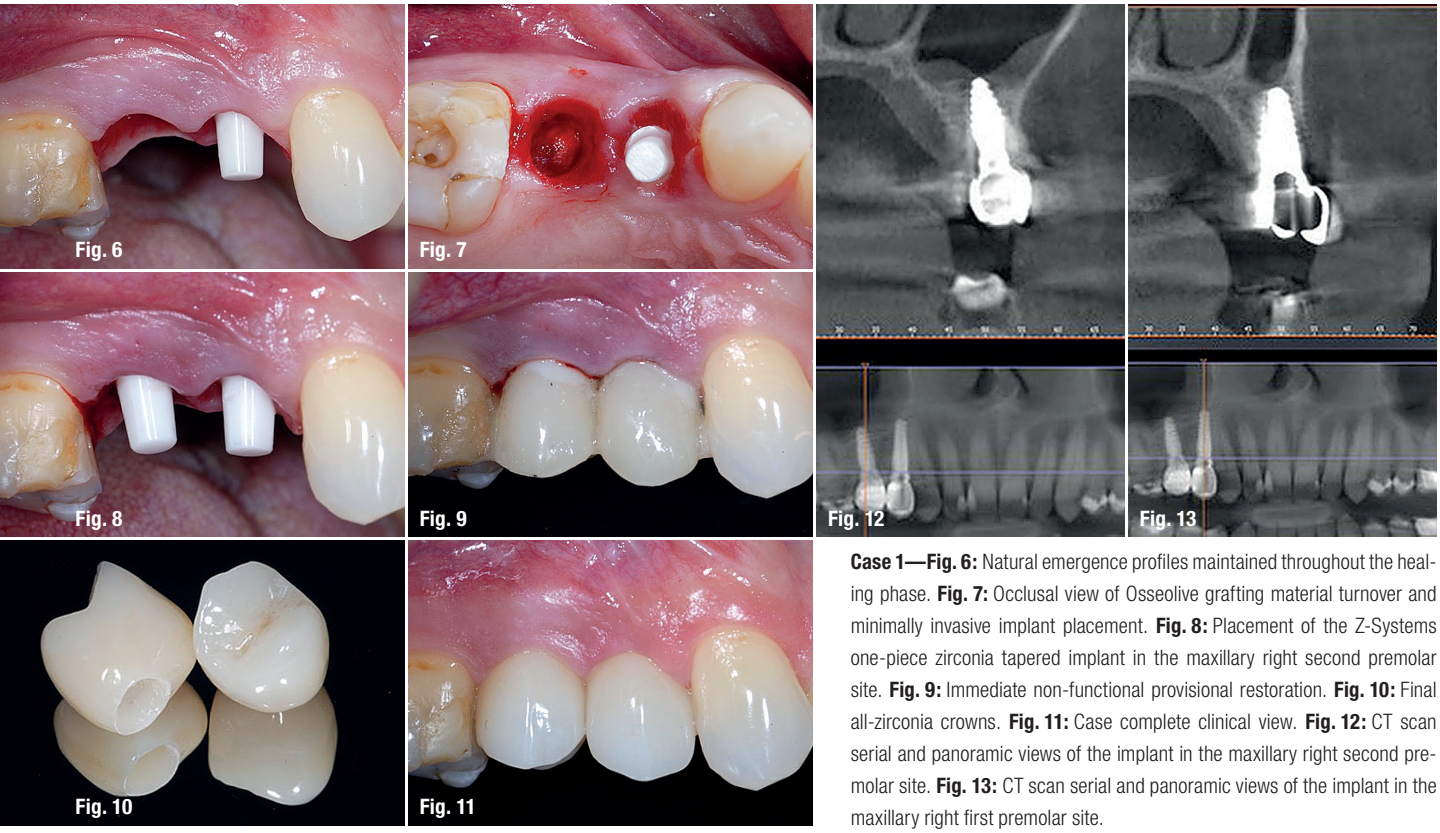


Case 1—Fig. 1: Pre-op clinical view. **Fig. 2:** CT scan serial view of maxillary right first premolar. **Fig. 3:** Implant and tooth removal and debridement. **Fig. 4:** Z-Systems one-piece tapered screw implant placement and Osseolive (curasan) graft complex. **Fig. 5:** Facial view after minimally invasive implant and graft placement.

short- and long-term success of conventional titanium implants.[14–17] In recent years, the growing prevalence of peri-implant mucositis and peri-implantitis has been reported on in the dental literature and become more of a problem in surgical and reconstructive practices.[18–20] The peri-implant mucositis and peri-implantitis disease state is generally caused by bacterial plaque, which, as seen with natural teeth, can accumulate on implant surfaces.[21,22] Additionally, the following factors can all contribute to peri-implantitis disease: lack of proper hygiene;[23,24] lack of attached gingival tissue around dental implants;[25] tobacco use and its effects;[26] and genetic factors and their role in the development of peri-implantitis (similar to periodontitis around natural teeth) have all been shown to lead to inflammation and bone loss around titanium dental implants.[27,28]

Surgical techniques, complications in wound healing and inappropriate placement of dental implants, regarding both depth of placement and spatial arrangement, can also lead to premature bone loss and initiation of peri-implant disease.[29] Additionally, corrosion of the base metal of a titanium implant can cause the destruction of osseous tissue, resulting in peri-implantitis.[30–33] In the aesthetic zone, complications associated with the lack of attached gingival tissue around the final implant-supported restoration can also lead to premature development of peri-implantitis as previously outlined.[34–37] More significantly, however, compromised aesthetics both in natural soft-tissue emergence profiles and in the appearance of dark colours from the implant–abutment complex cause patient dissatisfaction.[38]

Zirconia as an alternative implantable material has been well documented in the dental literature.[34–36] Its use prevents the discoloration of the peri-implant gingival tissue, which in many situations is associated with titanium implants. Additionally, zirconia provides a high level of biocompatibility and fracture toughness.[34–36] Zirconia dental implants have been shown to cause minimal inflammation in the peri-implant area owing to a decrease in the affinity for the formation of a biofilm and reduction in associated plaque levels compared with titanium.[37–39] This results in a reduction in bone loss and inflammatory response in situations where titanium would result in an increase in these destructive situations, leading to increases in peri-implantitis and premature implant loss.[37–39] Blaschke and Volz demonstrated that the soft-tissue response around zirconia implants is superior to that around titanium.[40] Petrungaro demonstrated that peri-implant bone replacement procedures in minimally invasive protocols, with the incorporation of autologous platelet-rich fibrin and Osseolive, a bioactive bone grafting material, have produced similar bone replacement results to the same procedures around titanium implants, in both one-stage immediate restoration protocols.[41]



Case 1—Fig. 6: Natural emergence profiles maintained throughout the healing phase. **Fig. 7:** Occlusal view of Osseolive grafting material turnover and minimally invasive implant placement. **Fig. 8:** Placement of the Z-Systems one-piece zirconia tapered implant in the maxillary right second premolar site. **Fig. 9:** Immediate non-functional provisional restoration. **Fig. 10:** Final all-zirconia crowns. **Fig. 11:** Case complete clinical view. **Fig. 12:** CT scan serial and panoramic views of the implant in the maxillary right second premolar site. **Fig. 13:** CT scan serial and panoramic views of the implant in the maxillary right first premolar site.

The aesthetic zone offers multiple challenges. One challenge is the use of one-piece implants, as the positioning, trajectory and depth of placement can all limit the proportions of the final restoration. In a one-piece titanium implant, the ability to prepare the abutment can help to lessen critical placement errors in the aforementioned parameters; however, preparation on the implant itself is not recommended and can lead to aesthetic failure and premature development of peri-implant mucositis and or peri-implantitis.

One-piece zirconia implants offer a more flexible option for the aesthetic zone.[41] Their positioning closer to the critical buccal soft-tissue emergence profile avoids a dark hue at the soft-tissue margin, and depending on the one-piece zirconia implant selected, preparation on the abutment and collar and body of the implant itself allows for a level of flexibility in order to manage any placement complications regarding depth, spatial arrangement and trajectory. This article will present two cases in order to demonstrate the use of the Z-Systems one-piece zirconia tapered screw design in an immediate tooth replacement and provisionalisation procedure in the aesthetic zone.

Case 1

A 48-year-old non-smoking male patient presented for replacement of a failing zirconia implant, placed one year before, in the maxillary right second premolar position and of an endodontically compromised first premolar (Fig. 1). Figure 2 shows the serial view of the failing first premolar and the panoramic view of the zirconia implant in the second premolar region and of the first premolar. After administration of an appropriate local anaesthetic, both the natural tooth and implant were removed atraumatically and the sites debrided of any granulation tissue and remaining periodontal ligament (Fig. 3).

After site evaluation, the decision was made to graft the second premolar site, along with an internal socket and crestal repair, and place a one-piece tapered screw implant of 4 mm in diameter and 12 mm in length (Z-Systems ceramic implant system) in the first premolar site. At placement, an initial torque of 45 Ncm was achieved (Fig. 4). The second premolar site was grafted with 1 cc of Osseolive grafting material (curasan), combined with autologous platelet-rich fibrin (Fig. 4). Figure 5 shows the facial view post-implant placement and grafting of the treatment area. Provisionalisation was then performed using the first premolar implant as an abutment for a cantilevering ovate pontic in the second premolar region to sculpt the soft-tissue contours. The provisional was cemented with a strong temporary cement, with additional bonding to the first molar and canine for added support. The site was allowed to heal for 4.5 months.

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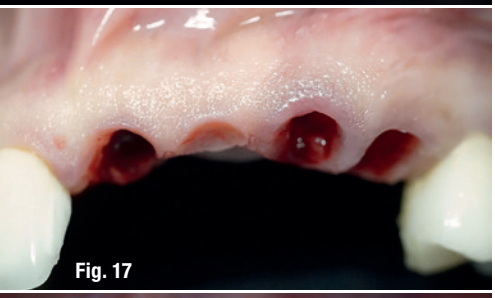

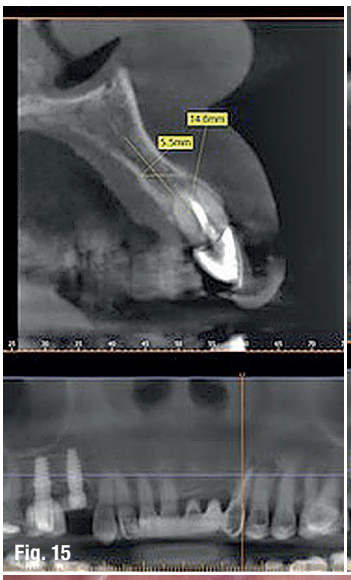

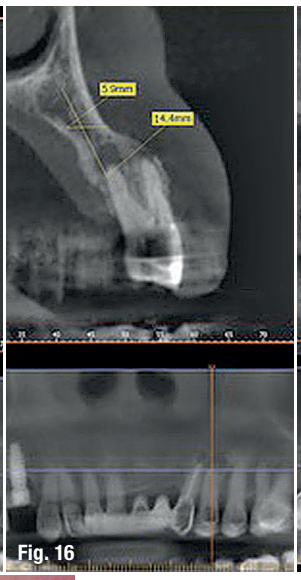

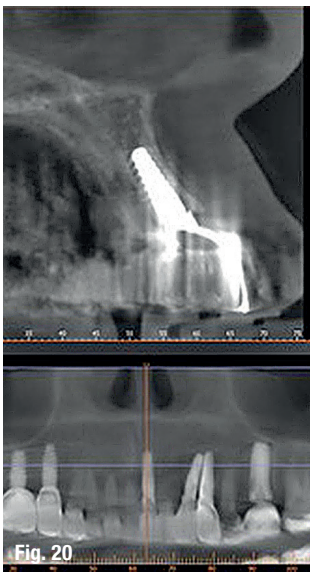

Case 2—Fig. 14: Pre-op clinical view. **Fig. 15:** Pre-op CT scan serial and panoramic views of the maxillary left canine. **Fig. 16:** Pre-op CT scan serial and panoramic views of the maxillary left premolar. **Fig. 17:** Creating sculpted soft-tissue contours prior to minimally invasive implant placement. **Fig. 18:** Z-Systems one-piece zirconia tapered screw implants placed according to minimally invasive protocols. **Fig. 19:** Case complete clinical view. **Fig. 20:** Case complete CT scan serial view of the implant in the maxillary left central incisor site and a panoramic view of the maxillary restorations.

After the prescribed healing phase, the patient was again scheduled for surgery. After administration of an appropriate local anaesthetic, the provisional restoration was removed. Figure 6 shows the natural soft-tissue emergence profiles created by the provisional restoration. Note the quality and quantity of attached gingival tissue maintained and sculpted.

Figure 7 shows the one-piece zirconia implant placed in the second premolar site. Note the remodelling of the Osseolive graft complex at the crest of the ridge. A one-piece zirconia tapered implant of 4 mm in diameter and 12 mm in length (Z-Systems ceramic implant system) was then placed in the second premolar site (Fig. 8), achieving an initial torque of 40 Ncm. A new, non-functional, provisional was then fabricated and cemented with a strong temporary cement, again with additional bonding to the adjacent natural teeth for support throughout the healing phase (Fig. 9). After four months of a prescribed, uneventful healing phase, abutment level impressions were taken and the final all-zirconia restorations fabricated (Fig. 10). Figure 11 shows the one-month post-seating clinical view. Note the natural soft-tissue contours maintained throughout the entire treatment process and in the final aesthetic result. Figures 12 and 13 show the case complete CT scan serial and panoramic views.

Case 2

A 39-year-old non-smoking female patient presented for treatment of a failing bridge in the maxillary anterior region (Fig. 14). Figures 15 and 16 demonstrate the CT scan serial and panoramic views of the maxillary left canine and premolar. Note the thin buccal–palatal dimensions apical to the infected and failing dentition. The patient also had titanium implants in the maxillary right posterior region, and had already undergone treatment for peri-implantitis and refused additional titanium implant placement. After administration of an appropriate local anaesthetic, the anterior bridge was sectioned between the central incisors, and the affected teeth removed and sites debrided. Additionally, a sculpted site at the left central incisor, mimicking an extraction site, was created for minimally invasive implant placement in the left central incisor, canine and first premolar sites (Fig. 17). After site preparation according to minimally invasive protocols, three one-piece zirconia tapered screw implants of 4 mm in diameter and 12 mm in length (Z-Systems ceramic implant system) were placed, achieving an initial torque of 45 Ncm each (Fig. 18).

After the prescribed healing phase of five months post-initial implant placement, abutment level impressions were taken and the final all-zirconia restorations fabri-

cated. Figure 19 shows the clinical view of the final restorations at three months post-seating. Note the natural soft-tissue contours and superior gingival health demonstrated around the final restorations and surrounding peri-implant tissue. Figure 20 shows the serial view of the one-piece tapered screw implant in the left central incisor site, along with a panoramic view of the maxillary restorations.

Discussion

Over the past several decades, dental implant designs have been updated and enhanced to provide for more rapid integration rates, bone level maintenance and enhancement of implant aesthetics. Additionally, as a result of complications observed with titanium as a base metal for implants, zirconia implants were developed and introduced. They offer superior soft-tissue aesthetics to that of titanium in compromised soft-tissue circumstances. Additionally, they have been shown to have less of an affinity for biofilm adhesion and formation, a very important characteristic, as the incidence of peri-implant mucositis and peri-implantitis continues to rise in the clinical practice of implant dentistry in both short- and long-term maintenance programmes. The use of a one-piece zirconia implant, especially one that can be adjusted and prepared to fit a particular situation after placement, offers an additional benefit, as the elimination of the micro-gap, often present with two-piece implant designs, is eliminated. The author recommends that additional studies be performed to further validate the effectiveness of zirconia as an alternative to titanium as an implantable device in the oral cavity and to additionally validate the procedures demonstrated in this clinical article.

Literature

contact

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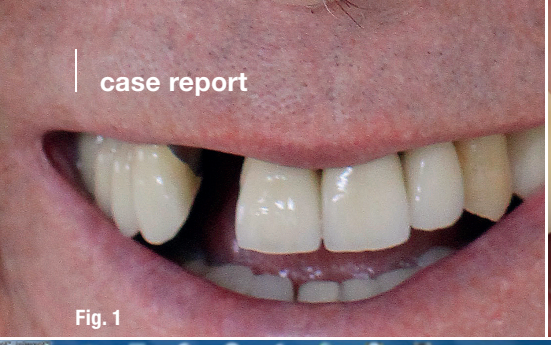
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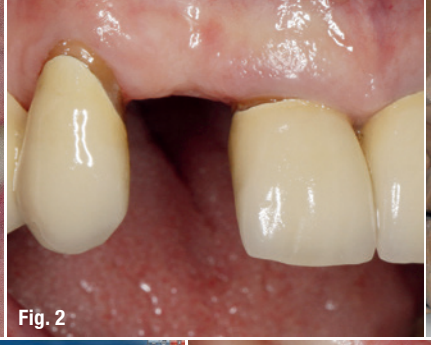
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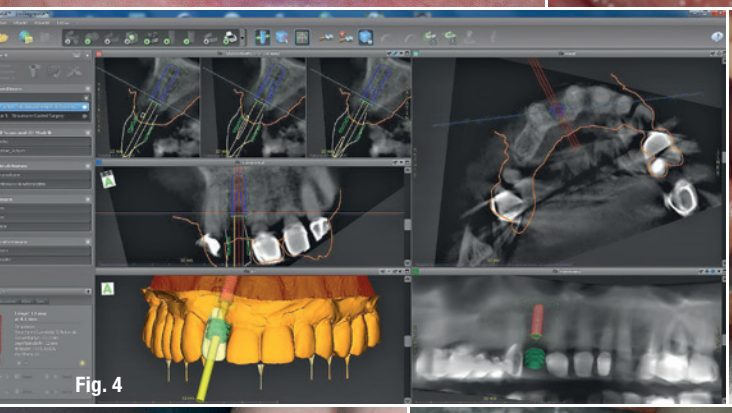
Fig. 3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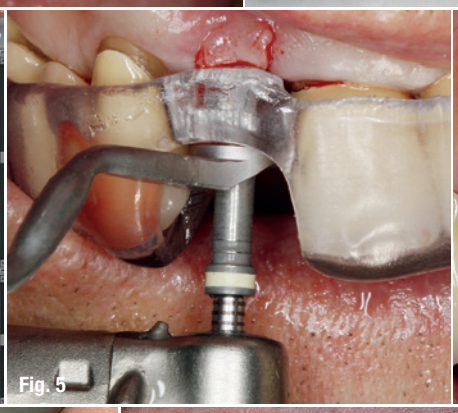
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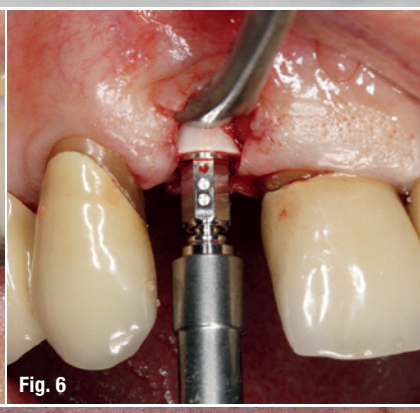
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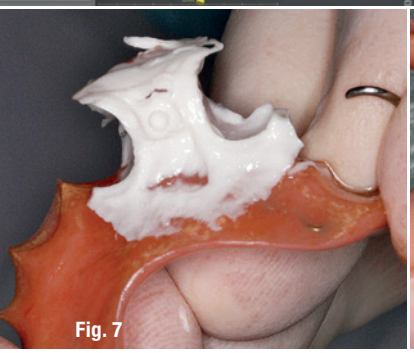
Fig. 7


Fig. 8

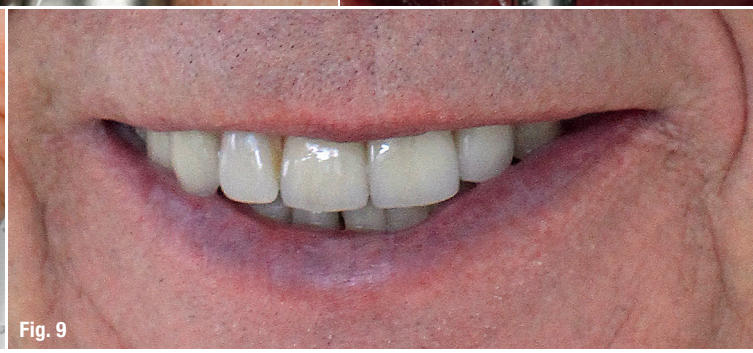
Fig. 9

Figs. 1 & 2: Initial clinical situation. **Figs. 3 & 4:** Pre-planning of the surgery. **Figs. 5 & 6:** Placement of the implant. **Figs. 7 & 8:** A temporary removable denture relined with silicone. **Fig. 9:** The patient with inserted temporary removable denture.

Single-tooth restoration in the aesthetic zone

Dr med. dent. Franz-Jochen Mellinghoff, M.Sc., PhD, Germany

The following clinical case report describes a successful single tooth restoration of an aesthetically compromised dentition using Straumann® PURE Ceramic Implant. The natural-looking ivory colour of this implant allowed us to meet the expectations of patients who are seeking to achieve better aesthetic outcomes.

Initial situation

In our practice, we particularly emphasise the importance of an informative first conversation with new patients. The purpose of this conversation is to discuss the expectations about treatment goals and enable patients to make informed decisions. Patients currently desire a very good function, outstanding aesthetic results, well-tolerated materials and longevity. A healthy male patient came to our practice requesting a replacement of his missing right maxillary lateral incisor with an aesthetic restoration. He had lost tooth #12 four years ago due a traumatic accident (Fig. 1). He presented good oral hygiene with healthy gingival tissues (Fig. 2).

Treatment planning

The treatment plan involved a detailed explanation of the intended therapy, including a series of extraoral and

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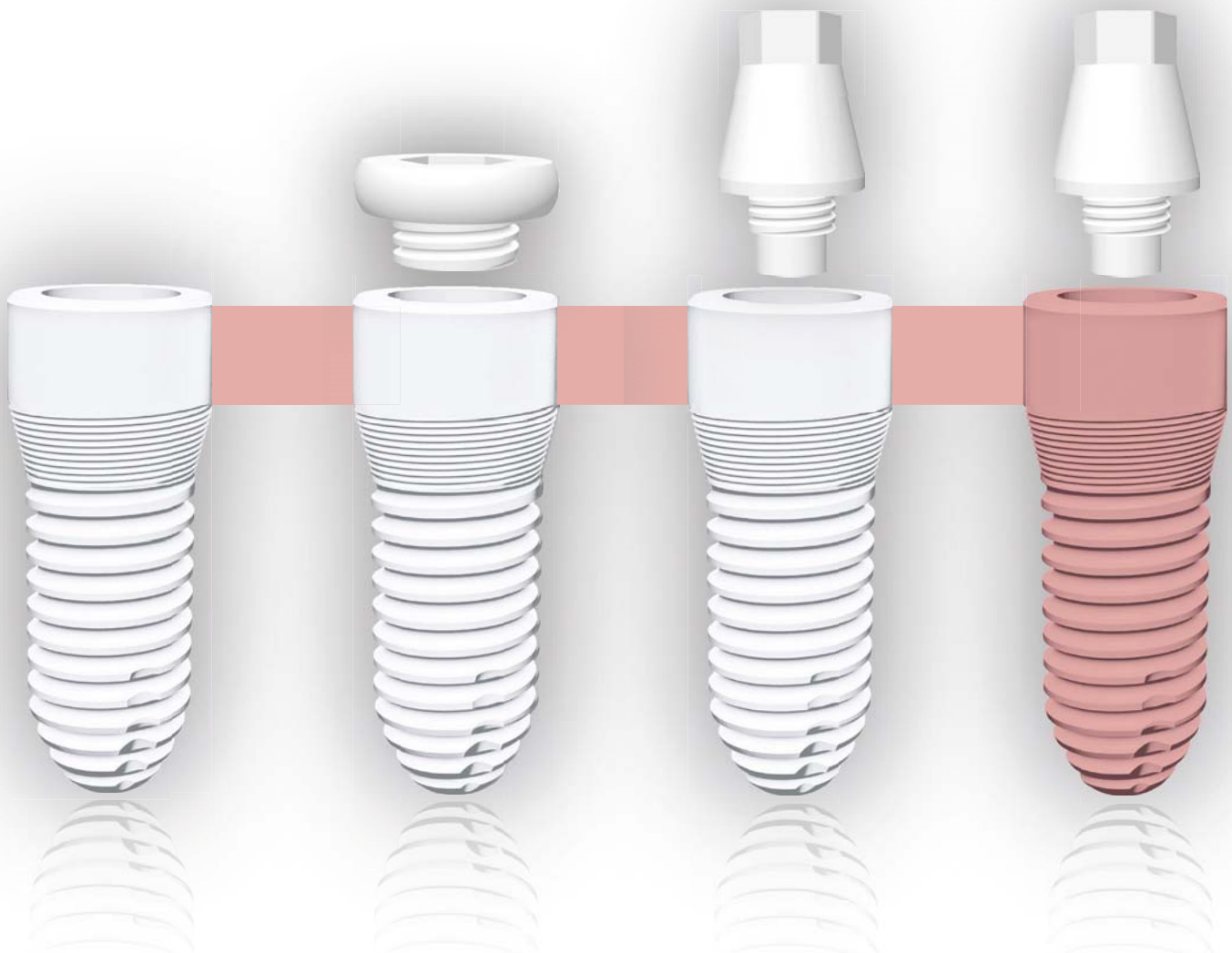

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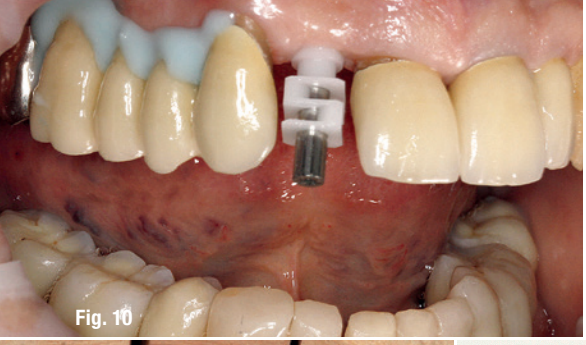
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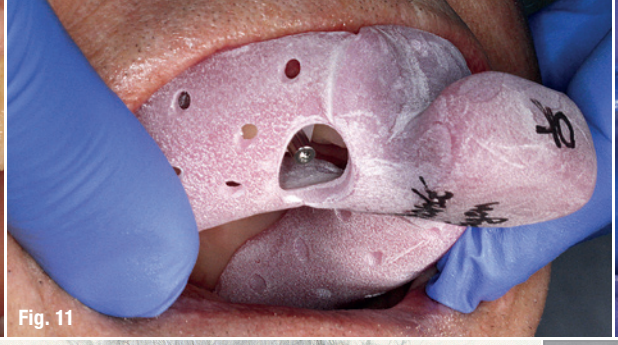
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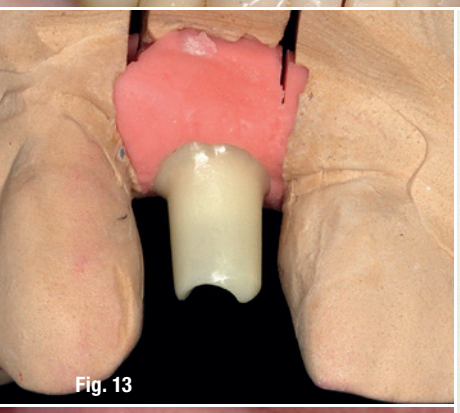
Fig. 12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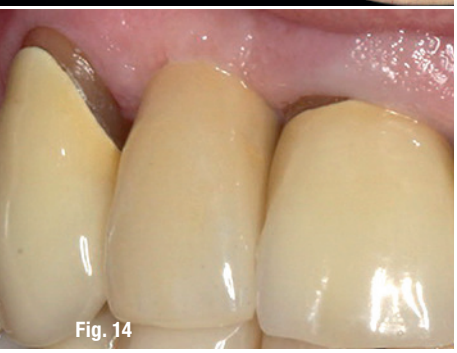
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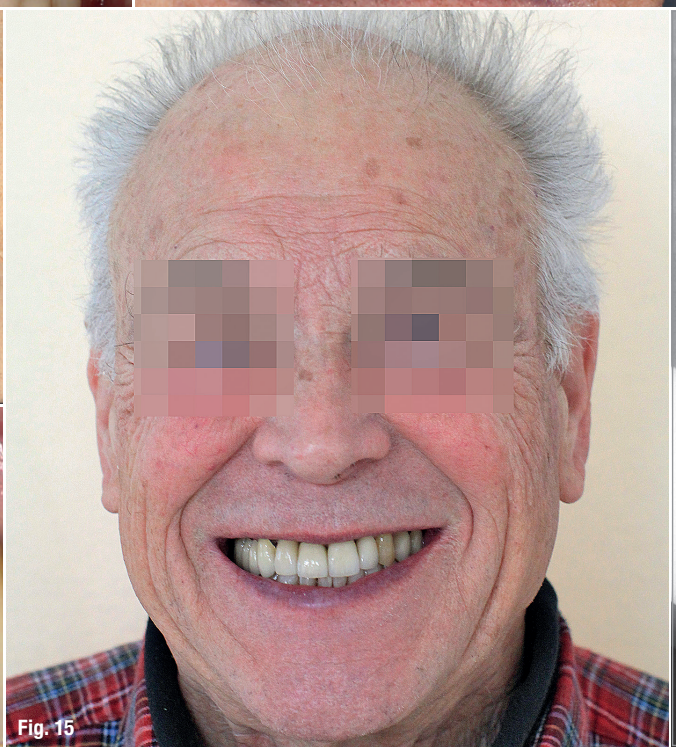
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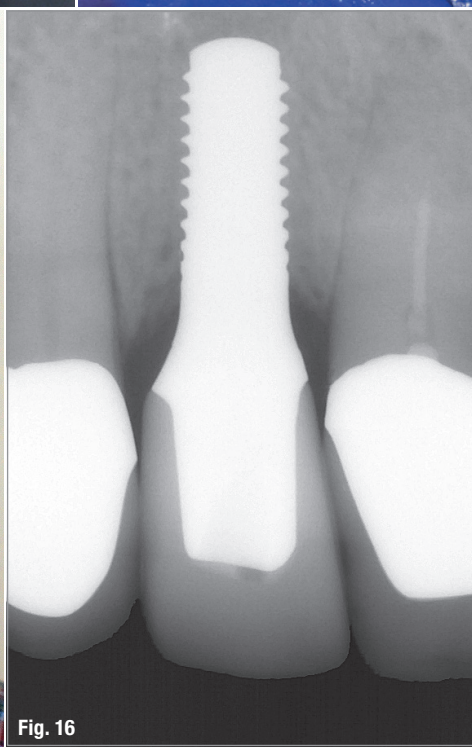
Fig. 16

Figs. 10–12: Impression for the definitive crown was made. **Fig. 13:** The crown made from disilicate ceramic. **Figs. 14 & 15:** Clinical situation after the surgery. **Fig. 16:** Radiograph after the surgery.

intraoral photographs, models and digital volume tomography (Figs. 3 & 4). To replace a missing tooth in region 12, we opted for a late implant placement. Given our positive experience with this method, we were able to offer the patient a safe, well-proven procedure and a good prognosis for an aesthetically high-quality treatment result. After evaluating all the diagnostic records, we were able to meet the patient's request for a ceramic implant.

Surgical procedure

The implant surgery was carried out under local anaesthesia. The surgical procedure was performed using a drilling template according to the protocol for the Straumann® PURE Ceramic Implant System. The ceramic implant was placed in the prepared osteotomy with a torque of 35 Ncm (Figs. 5 & 6). During the osseointegration period the patient wore an existing temporary removable denture, which was relined with silicone and checked for pressure points to avoid any possible loading (Figs. 7 & 8). The slightly reduced temporary removable denture was used until the end of the healing phase and before the implant loading, and thus, the patient did not have to compromise on aesthetics during that period.

Prosthetic procedure

The patient was able to continue with his committed public life with the temporary removable denture and was also unrestricted in his ability to communicate (Fig. 9). After the healing period, the impression for the definitive crown was made using an individual tray with polyether and a coping for open tray impressions (Figs. 10–12). The implant crown (disilicate ceramic) was made on a titanium base (CI RD Straumann® PUREbase, Fig. 13). The crown was cemented with elastomeric resin cement. Adhesive cementation gives us a reliable result. Finally, refining occlusion was performed. The patient was satisfied with the result both in terms of aesthetics and functionality (Figs. 14 & 15).

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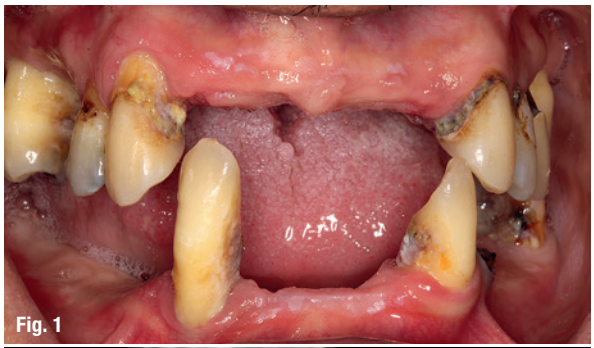
Rehabilitation of an edentulous mandible

Restoration with one-piece zirconia implants

Prof. Ziv Mazor, Israel

Case presentation

A 37-year-old patient presented suffering from aggressive periodontitis which resulted in almost total edentulism in the lower jaw (Fig. 1). For that reason, the patient asked for fixed restorations. The treatment plan involved the extraction and grinding of the remaining teeth, the use of an autogenous dentine graft to fill up the alveolar defects and the subsequent insertion of one-piece zirconia implants (TAV Dental) utilising immediate loading. A bone-supported guide had been fabricated by means of the Simplant software to ensure optimal implant positioning (Figs. 2 & 3).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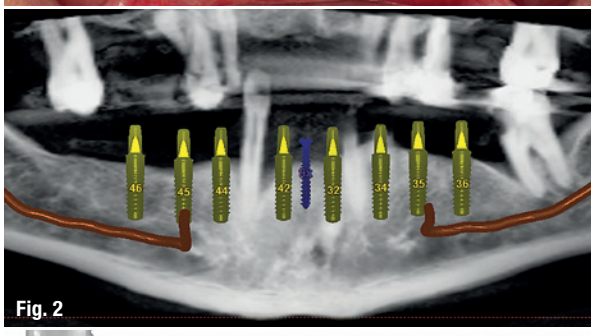

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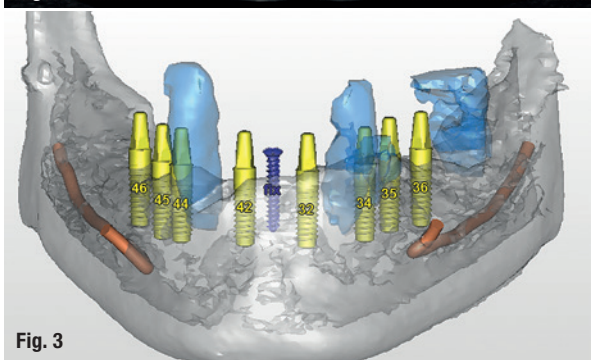

Fig. 3

Fig. 1: Frontal view of the patient's mandible. **Figs. 2 & 3:** Implant positioning using the planning software Simplant.

Surgical procedure

The remaining teeth were extracted and prepared for grinding (Figs. 4 & 5). The osteotomy was prepared utilising osseodensification burs (Figs. 6–9). Eight one-piece zirconia implants (TAV Dental; 10 mm in length and 4.1 mm in diameter) were placed (Figs. 10–12). The impression was taken in order to fabricate a CAD/CAM-created PMMA temporary bridge for immediate loading (Figs. 13–15). The bridge was constructed and placed in the patient's mandible within 24 hours (Figs. 16–19).

About the author

Prof. Ziv Mazor is a leading Israeli periodontist. Since 1993 Prof. Mazor is engaged in clinical research in the field of Bone Augmentation and Sinus Floor Elevation. He is a well published author on these subjects and has lectured extensively internationally. Prof. Mazor conducts and moderates advanced implant courses and workshops. He is an associate professor at the Titu Maiorescu University in Bucharest Romania and part of the faculty of NYU continuing education in Implantology.

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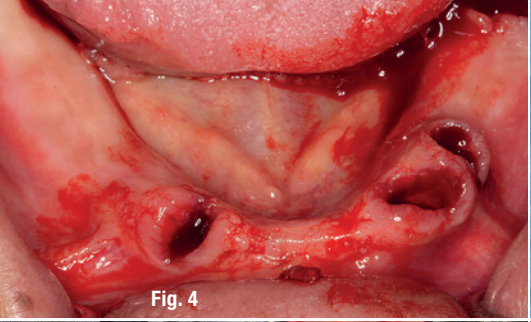
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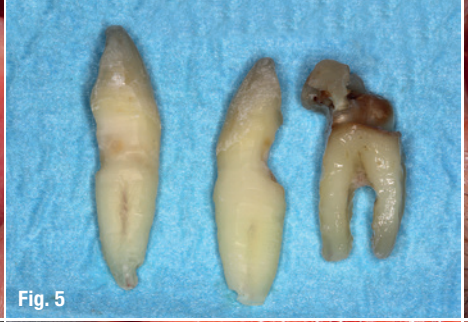
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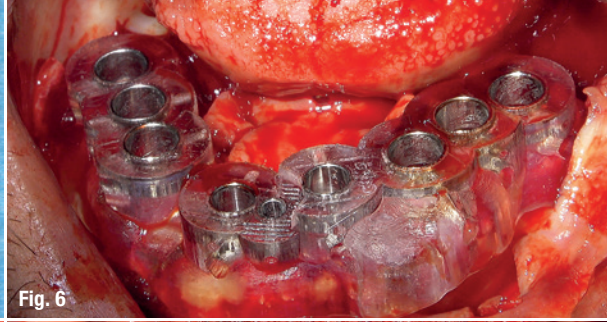
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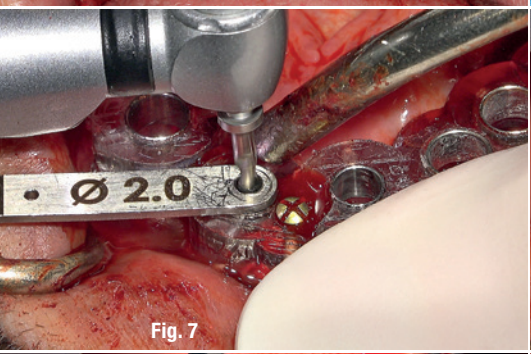

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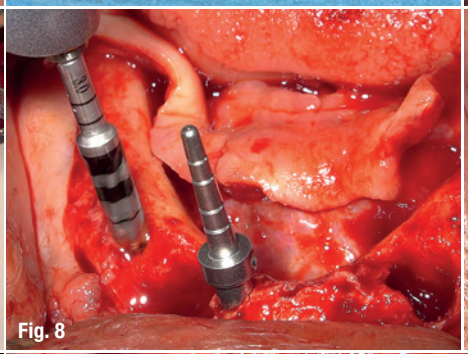
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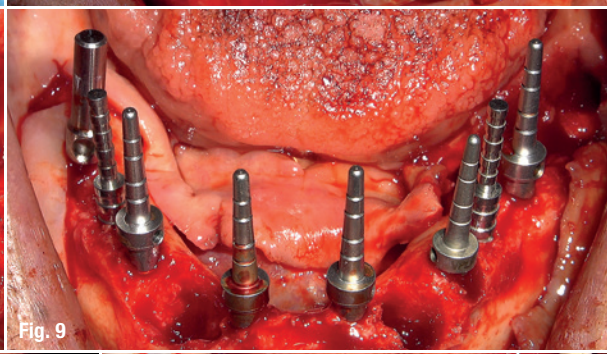
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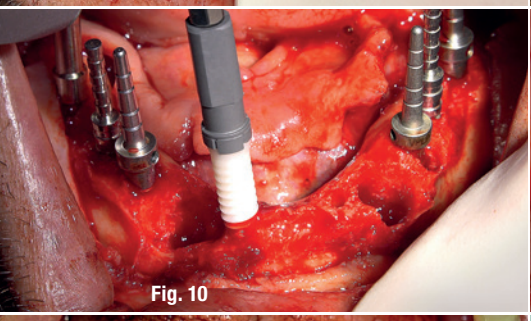
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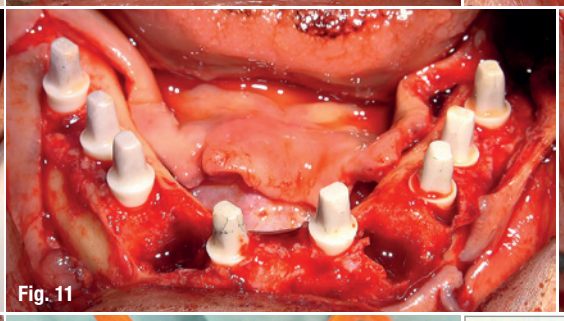
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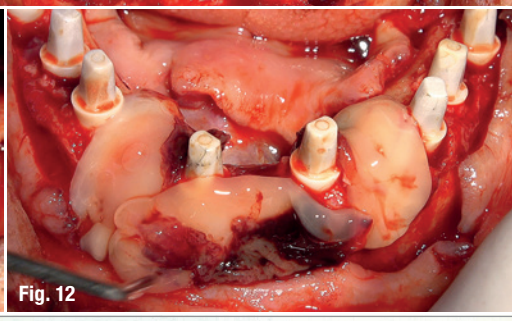
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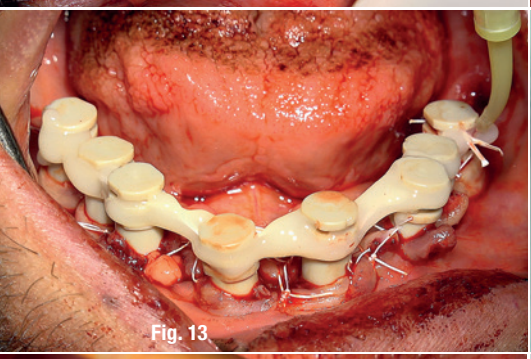
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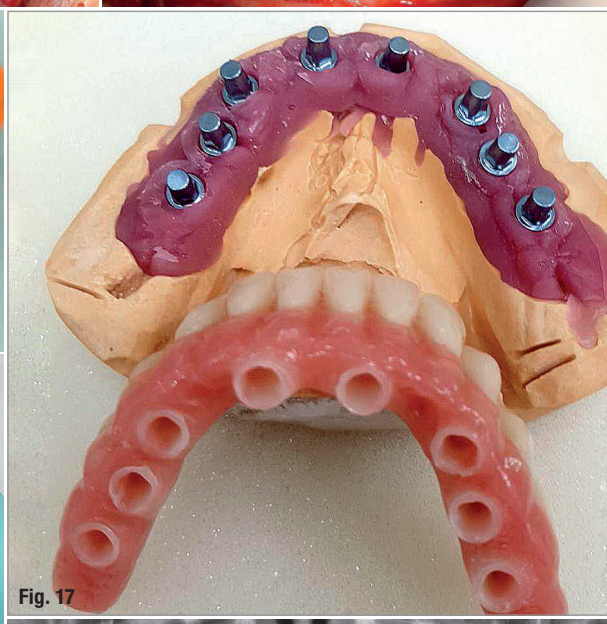
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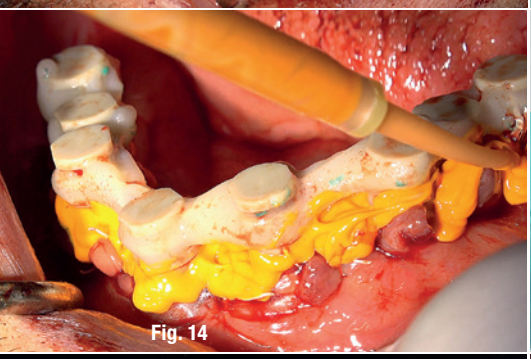
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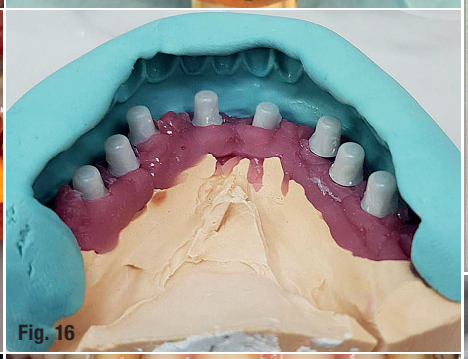
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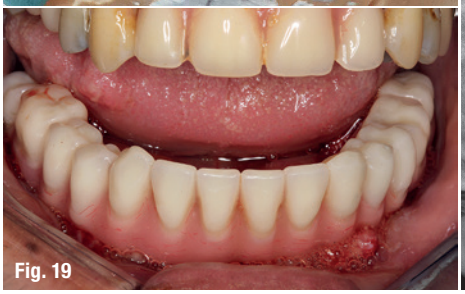
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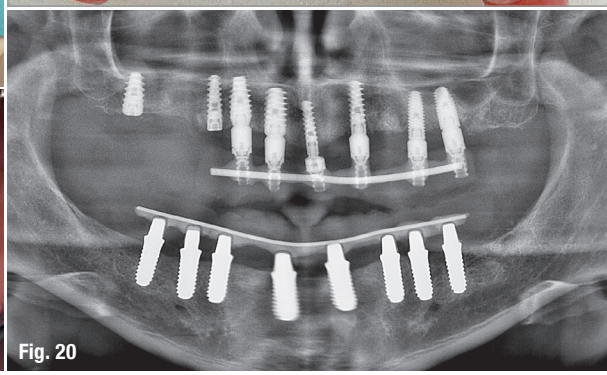


Fig. 20

Fig. 4: After extraction of the teeth. **Fig. 5:** The extracted teeth. **Figs. 6–9:** Preparation of the osteotomy site. **Figs. 10–12:** Placement of the one-piece zirconia implants (TAV Dental). **Figs. 13–15:** Taking of the impression for the temporary bridge. **Figs. 16–19:** Constructing the bridge. **Fig. 20:** Radiograph three months after the surgery.

The key to lasting aesthetics

One-piece implants and an ideal implant position

Dr Robert Bauder, Austria

Introduction

Throughout the past five to ten years, the number of different ceramic implants offered by the industry has increased significantly. There are tissue level and bone level implants and two-piece and one-piece systems—the definition of the last of which is up for debate. If a two-piece SDS2.0 implant (SDS Swiss Dental Solutions), for example, is placed at tissue level, as recommended by the manufacturer, it is basically a pseudo one-piece, because the abutment forms one piece with the implant body and, after the healing period, the implant is only extended by cementing the abutment extension before it is then, as a whole, individually ground to gingival level.

Clinical procedure

Owing to the aggressive thread in the apical region, one-piece SDS1.1 implants (SDS Swiss Dental Solutions) are ideally suited for immediate implant placement with cemented long-term provisional immediate restoration. In my private practice, the SDS Short Cut Con-

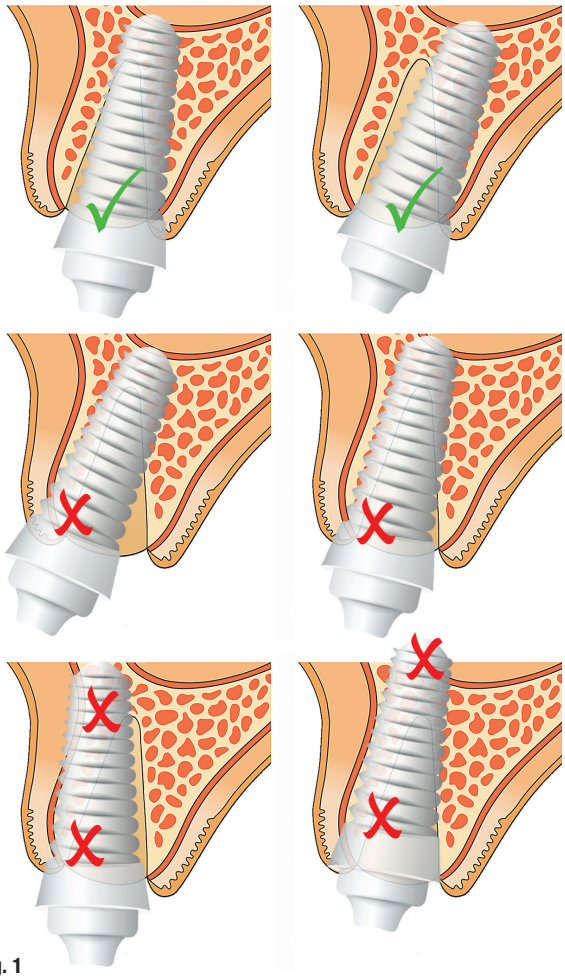
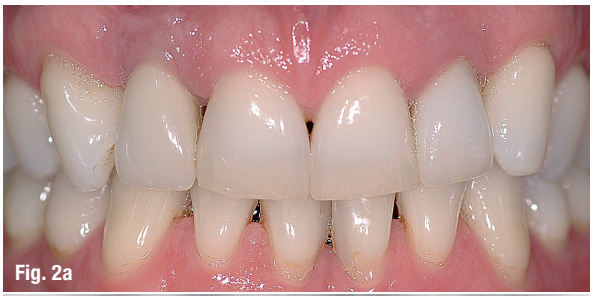


Fig. 1

Fig. 1: The ideal implant position can only be found, when there is no pressure on buccal hard- and soft-tissue.



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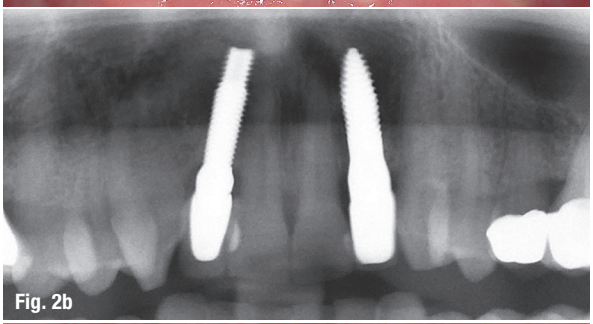


Fig. 2b

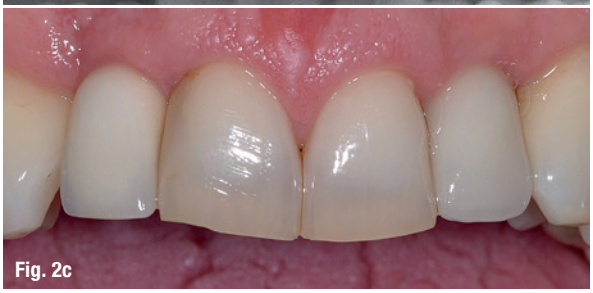
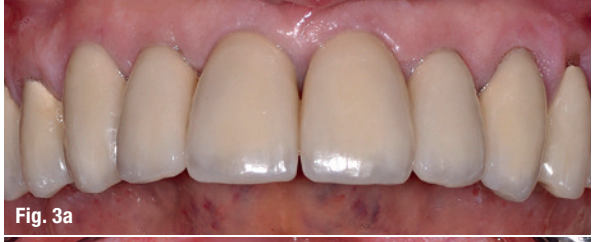
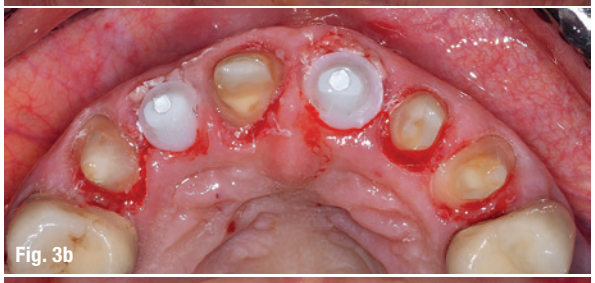
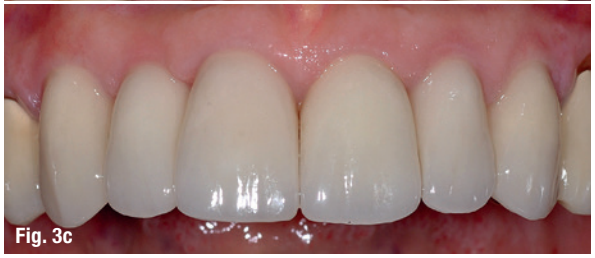


Fig. 2c

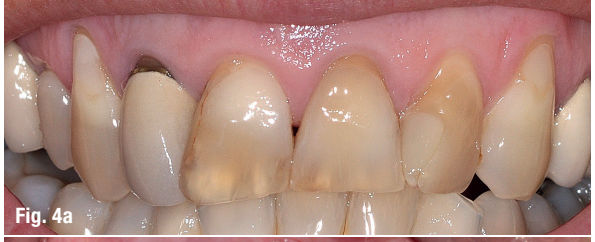
Case 1—Fig. 2: A stable result after 13 years: before treatment in 2005 **(a)**, radiograph after treatment: one-piece implant from Z-Systems in region #12 without immediate restoration and a SDS2.0 pseudo one-piece implant with immediate restoration, placed in 2014, in region #22 **(b)**, after treatment at follow-up in 2018 **(c)**.

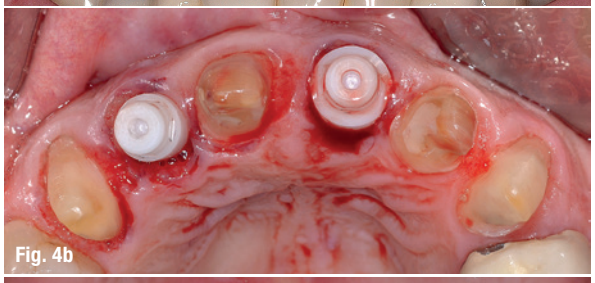


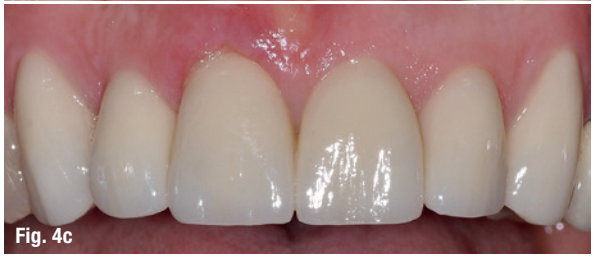




Case 2—Fig. 3: Before treatment **(a)**, preparation of the one-piece implants **(b)**, after treatment **(c)**.





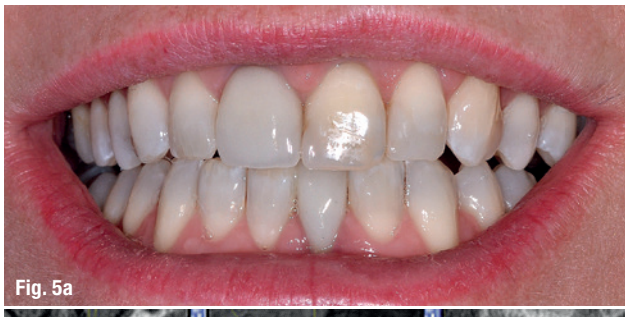


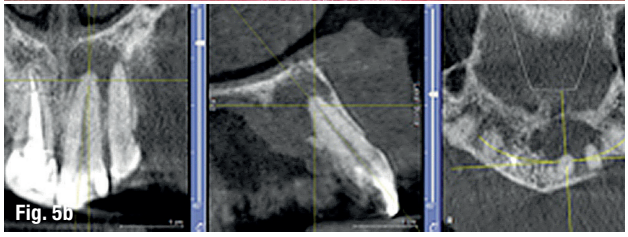
Case 3—Fig. 4: Before treatment **(a)**, situation during surgery after implant positioning **(b)**, after treatment **(c)**.

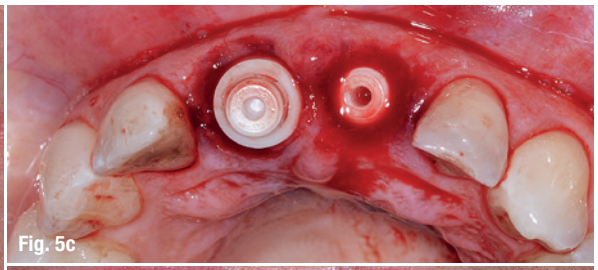
cept for immediate care (only three treatment appointments to achieve the final result) is routinely applied in the aesthetic zone. Of the nearly 300 ceramic implants that are placed annually in the practice, approximately 70 per cent are immediate implants. With a success rate of approximately 97 per cent in the aesthetic zone, the SDS Short Cut Concept has proven to be very effective. In the posterior region, however, the success rate in my practice is only around 95 per cent. To be fair, it has to be stated that the initial situations in these cases are extremely unfavourable.

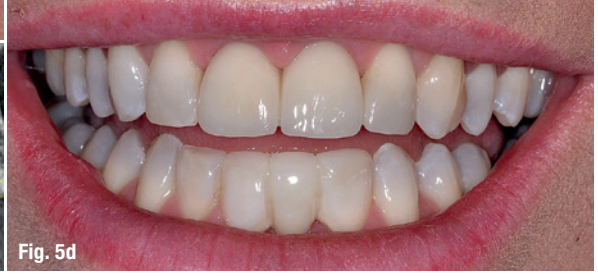
In addition to a holistic approach to the overall concept and orthomolecular optimisation around the implant surgery, for instance high-dose vitamin C infusion, or procaine base infusion, several surgical and prosthetic rules are followed in order to achieve a high success rate and a good aesthetic result:

1. Thoroughly clean the alveolus.
2. Find the ideal implant position: never put pressure on buccal hard- and soft-tissue. It should be aimed for a torque of approximately 30–40 Ncm (Fig. 1).
3. Grind the implant to gingival level for the temporary restoration. It is preferred to stay on a slightly supragingival level in order to avoid subgingival cement residue and to ensure good integration of the zirconia implant with the gingiva.
4. Avoid operational contact of the long-term provisional, except with full-arch or half-arch restorations.
5. Utilise platelet-rich fibrin as a turbo coagulum for lining tissue defects, as it helps regeneration and minimises risks during temporary restoration.









Case 4—Fig. 5: Before treatment **(a)**, diagnosis of a cyst **(b)**, implant positioning **(c)** after treatment **(d)**.

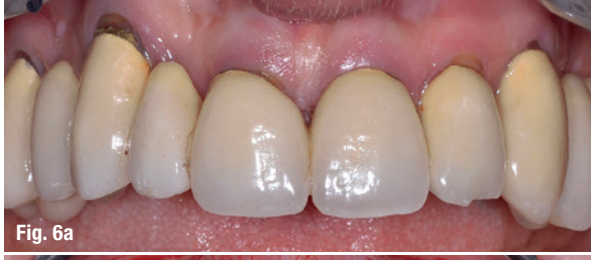


Fig. 6a

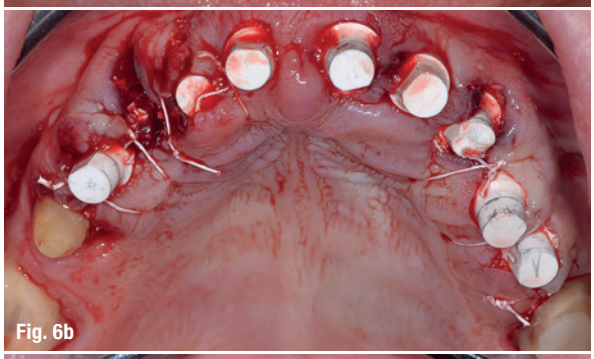


Fig. 6b

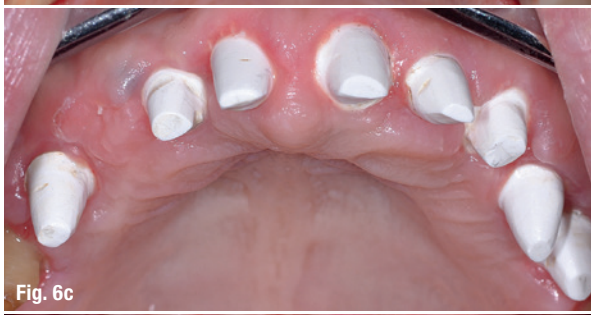


Fig. 6c


Fig. 6d

Case 5—Fig. 6: Before treatment **(a)**, implant positioning before preparation and long-term temporary restoration **(b)**, situation after the three-month healing period **(c)**, after treatment **(d)**.

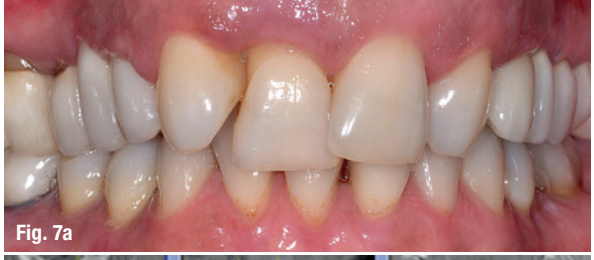


Fig. 7a

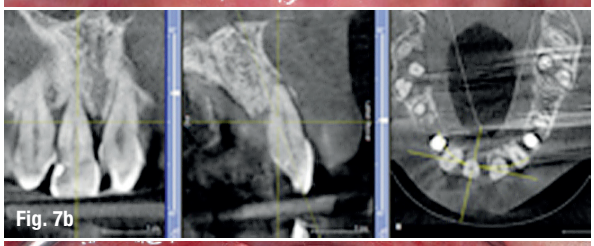


Fig. 7b

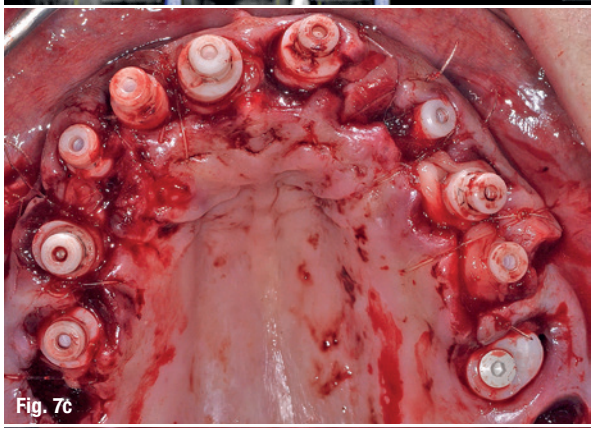


Fig. 7c

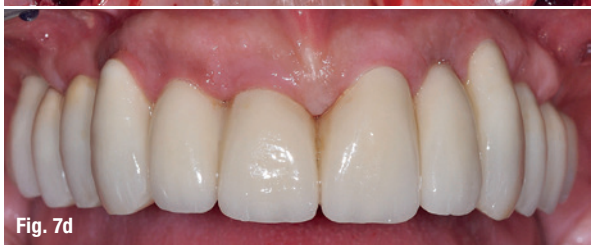


Fig. 7d

Case 6—Fig. 7: Before treatment **(a)**, radiographic images of initial situation showing dramatic bone loss **(b)**, situation during surgery after extractions and implantations, but before implant preparation **(c)**, after treatment **(d)**.

Cases

The six cases depicted in this article show that, in accordance with the aforementioned rules, a highly aesthetic and lasting result can be achieved in only three treatment sessions with the immediate care concept (Figs. 2–7). However, it is medically much more relevant that the essential dental problem areas can be addressed in one appointment, as this usually has a significant overall health benefit for the patient. The appointment sequence of all cases routinely includes only the following actual treatment appointments:

1. First appointment: Teeth are extracted and inflammatory tissue is entirely removed. Immediate implants are placed and implants and teeth are prepared. Fixed temporary long-term restorations on implants (and teeth if necessary) are manufactured chairside. Provisional cementations are done.
2. Second appointment after three to five months: Definitive preparation of implants (and teeth if necessary) is done at equi-gingival or subgingival (0.5 mm) level.
3. Third appointment, one week later: Cementation of the final ceramic crowns is done.

Conclusion

To summarise, it can be stated that today immediate implant placement with long-term provisional immediate restoration in the aesthetic zone using SDS implants and applying the SDS Short Cut Concept for immediate care is an extremely effective and practical method.

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Fig. 1

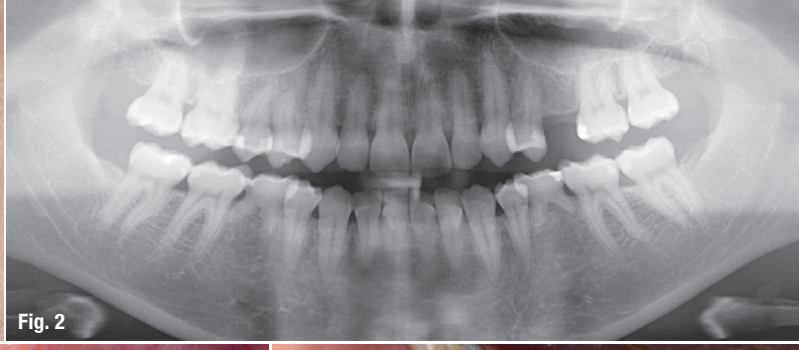
Fig. 2

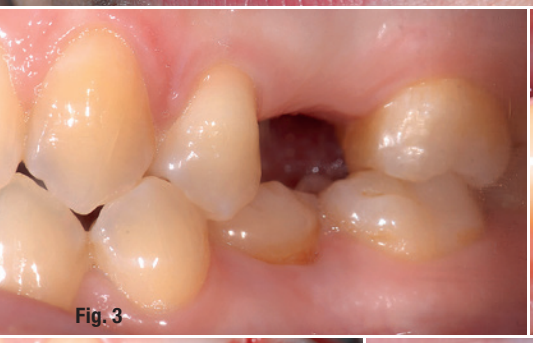
Fig. 3

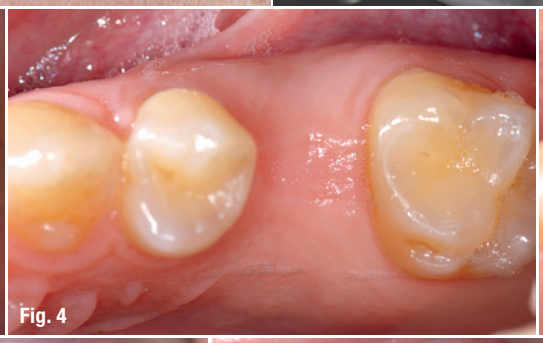
Fig. 4

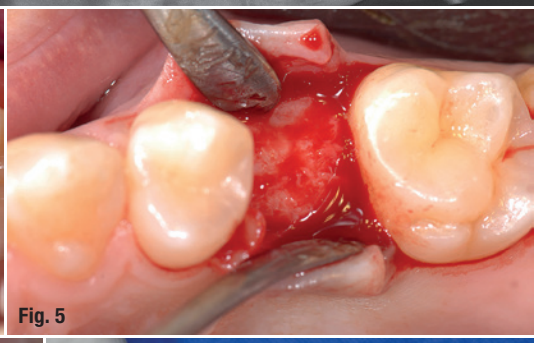
Fig. 5

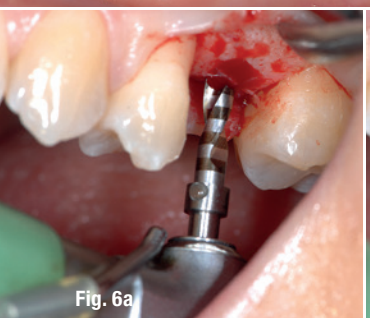
Fig. 6a

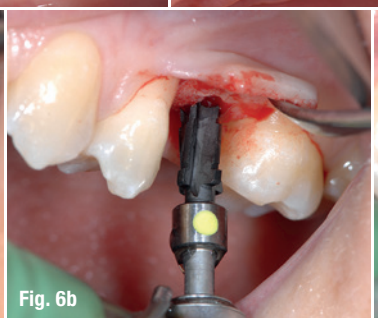
Fig. 6b

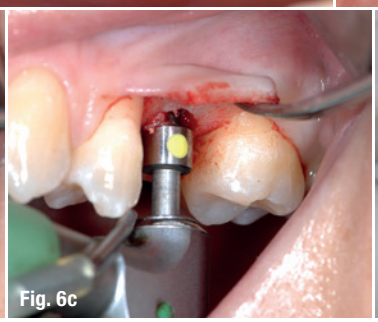
Fig. 6c

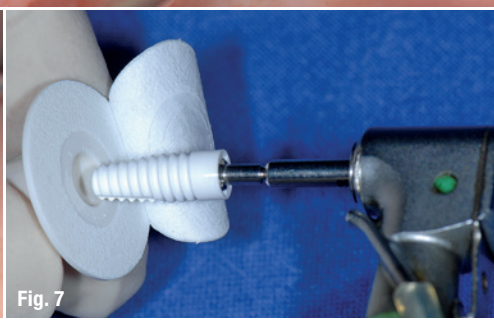
Fig. 7

Fig. 1: Initial clinical situation. **Fig. 2:** Radiograph prior to the surgery. **Fig. 3:** Frontal view of tooth gap. **Fig. 4:** Occlusal view of tooth gap. **Fig. 5:** A flap was created for easy access to surgical site. **Figs. 6a–c:** A surgical drill is used to prepare the implant bed. **Fig. 7:** The implant body of the NobelPearl ceramic system.

Single-tooth restoration with an all-ceramic implant solution

Prof. Dr med. dent. Michael Gahlert, Germany

In this case report, a single tooth restoration with the NobelPearl implant system is presented in detail by Prof. Dr Michael Gahlert. NobelPearl is an all-ceramic implant solution from the Zurich-based company Nobel Biocare. It was developed in collaboration with Zeramex.

Case presentation

A 35-year-old female patient with a tooth gap (#25) came to my outpatient consultation. She wanted to be informed about single tooth restoration options in the area of tooth gap. The patient had informed herself beforehand about all-ceramic implant solutions and stated explicitly that she did not want to have a titanium implant placed. After clinical and radiographic diagnostics, the patient was informed about the possibility of an implantation with a two-part ceramic implant. The anatomical conditions were optimal so that the implantation could be carried out without any problems. The NobelPearl ceramic implant was chosen as medical device (Nobel Biocare, Switzerland), as the full carbon screw guaranteed secure fixation of the abutment, as well as a complete metal-free restoration.

The postoperative healing period proceeded without complications and the definitive prosthetic restoration could be completed after a successful osseointegration period of three months. A conventional analogue impression was taken by means of an impression post that was screwed to the implant, which created the prerequisites for the all-ceramic crown. In the case presented here, the all-ceramic abutment was screw-retained and the ceramic crown cemented with glass ionomer cement (Ketac Cem, 3M). The

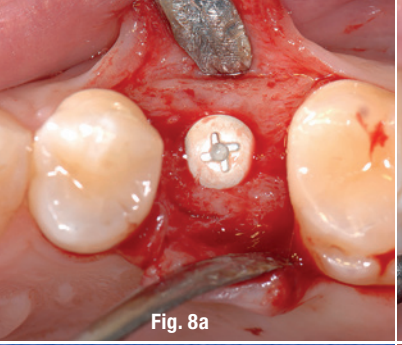
Fig. 8a

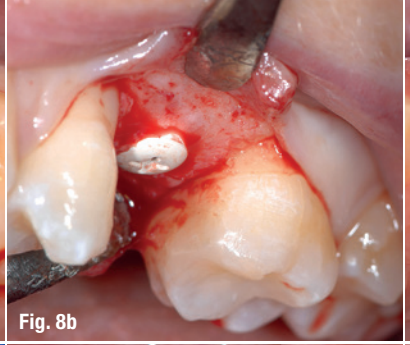
Fig. 8b

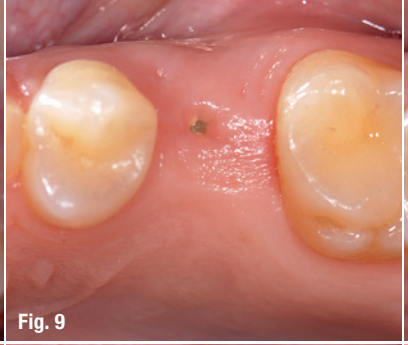
Fig. 9

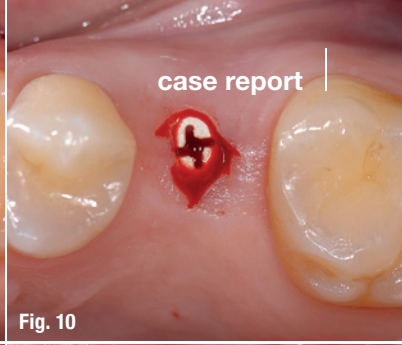
Fig. 10

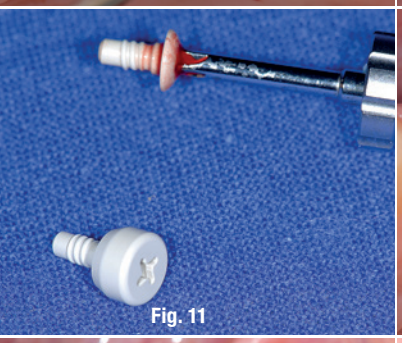
Fig. 11

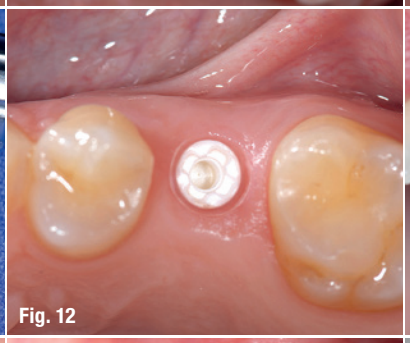
Fig. 12


Fig. 13a


Fig. 13b

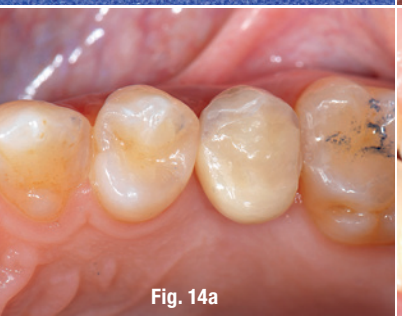
Fig. 14a

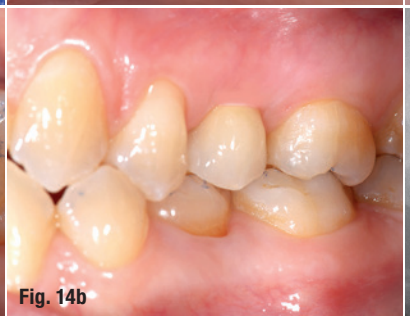
Fig. 14b

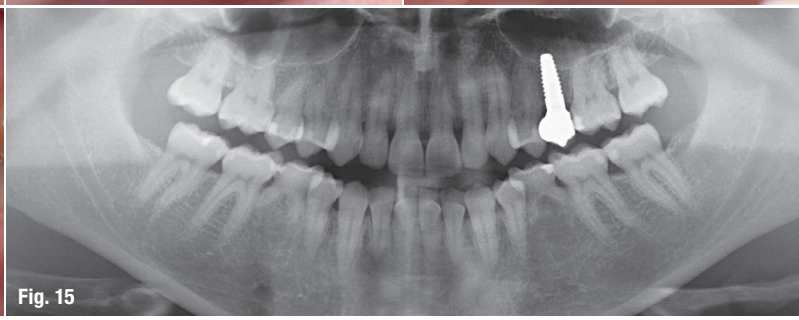
Fig. 15

Figs. 8a & b: View of the healing cap after the immediate implant placement. **Fig. 9:** Occlusal view after healing period of three months. **Fig. 10:** Incision was made to gain access to healing cap. **Fig. 11:** The healing cap was removed. **Fig. 12:** Occlusal view of the implant body. **Fig. 13a:** Impression post was screwed to the implant and fixated in order to take an impression. **Fig. 13b:** The abutment was fixed with the carbon screw with a torque of only 25 Ncm. **Figs. 14a & b:** The final restoration with the all-ceramic crown. **Fig. 15:** Radiograph after the surgery.

result was beautiful and highly aesthetic. There were no irritations of the gingiva and the papillary structure in the interdental space was quite pronounced.

Conclusion

The NobelPearl implant system made of high-strength alumina toughened zirconia (ATZ) represents the current state-of-the-art when it comes to two-piece ceramic implant systems with microrough surfaces. Different all-ceramic abutments can be chosen, which guarantees prosthetic flexibility. The fixing of the abutment parts with a carbon screw has been clinically tested and is, thus, safe for use. Owing to this unique feature, NobelPearl ceramic implants allow for completely metal-free restorations and should be considered as a serious future alternative to established two-piece titanium implants.

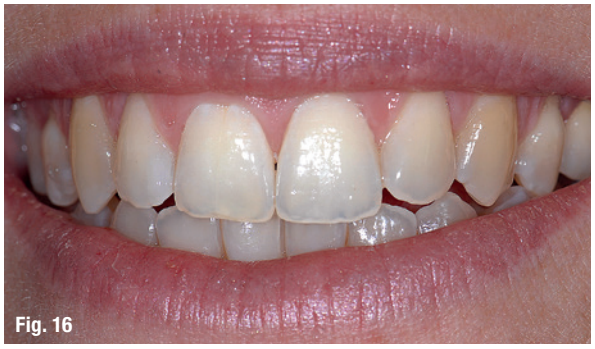
Fig. 16

Fig. 16: Clinical situation after the surgery.

about the author

Prof. Dr med. dent. Michael Gahlert is a fellow of the International Team for Implantology (ITI) and has been specialising on the development and placement of ceramic implants. He works as dentist for oral surgery in a private practice in Munich, Germany. In addition, he is a researcher at the department of Biomedical Engineering of the University of Basel.

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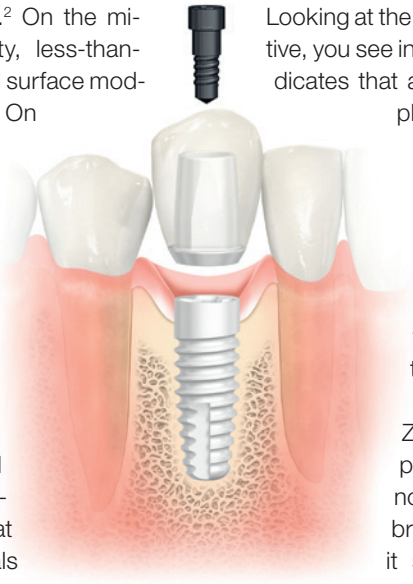
Ceramics come of age

Prof. Stefan Holst, Switzerland

Zirconia has been used in dental applications for decades—sometimes successfully, sometimes less so. The first zirconia implants were introduced on an experimental basis well before the turn of the century.[1] Systems have come and gone. Review the literature or visit a clinic today, and you'll find that most of the early-phase implants are associated with complications. We've seen a range of problems, including fractures during surgery, fractures after loading, mobility, infection, pain, bone loss, and a lack of osseointegration.[2] On the microlevel, inconsistent material quality, less-than-optimal manufacturing processes and surface modifications may bear part of the blame. On the macro level, design flaws have led to unfavourable loading conditions.



At the heart of this apparent conundrum lies a simple fact, well worth remembering: Zirconia is not a metal. Zirconia is a ceramic; and we need to respect the unique properties of this material. Because manufacturing flaws—even minute imperfections—in the production and surface treatment of the zirconia implant may compromise strength, great care must be taken with the materials to ensure clinical predictably and favourable long-term results.[2] Consequently, when processing zirconia, it is essential to select the appropriate zirconia powder, the proper powder particles, how to best compact these powders, the ideal postprocessing methods, and so on. Choosing the wrong mix of variables can easily lead to early degradation and failure over time. Flaws may not manifest themselves immediately, but micro- and macro-flaws with lag times of three to five years have led to the failure of many zirconia implants.

In short, directly applying what we have learned from over 40 years of experience with titanium implants to zirconia does not provide a suitable path forward. In the development of NobelPearl, we have discovered, for instance, that the implant connection design of a zirconia implant cannot be copied one-to-one from existing titanium implants. We've also learned a great deal more about the material over recent years. More than ten years ago, Nobel Biocare sponsored clinical trials of a potential product that was not brought to market. Those trials generated neither the data nor the clinical outcomes we require.[3] But over the interceding decade our body of knowledge has grown substantially and researchers with whom we collaborate have now reached the point where we can provide a zirconia implant that is designed to work reliably.

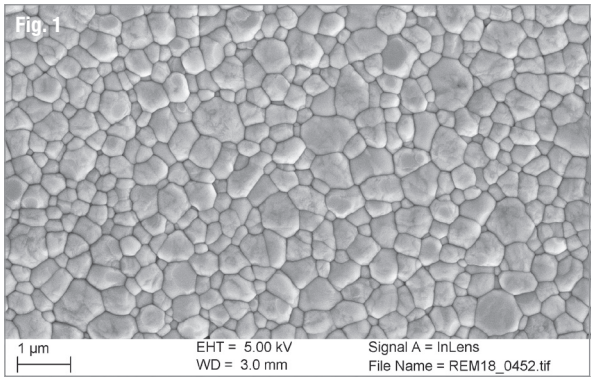
Serious challenges to meeting patient demand

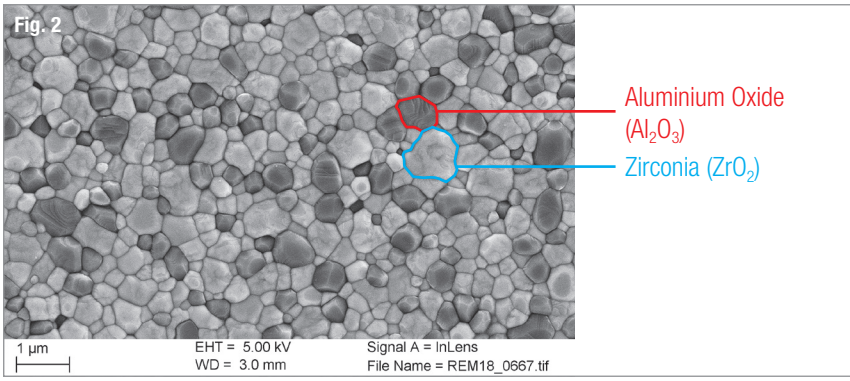
Looking at the zirconia market from a patient perspective, you see increasing demand. Projected growth indicates that although zirconia is very unlikely to replace titanium as the base material for implants anytime soon—if ever—it is already becoming an alternative worthy of attention in certain clinical situations. The intrinsic aesthetic attributes of this material are well known. Perhaps less well-known is the fact that this material manifests beneficial soft-tissue-friendly biological properties.[4]

Zirconia, as an implant material, has provided some serious challenges to innovators over the years. Because it is a brittle material, early attempts to make it stronger involved increasing the volume of the product. As a result, early zirconia implants were predominantly one-piece designs. Unfortunately, such designs have an untoward impact on restorability, placement and intraoral adjustment. No one wants to face these issues on a day-to-day basis with their patients. Development consequently began on two-piece zirconia implants. They were not easy to handle and attempts at intraoral cementation of the abutment at bone level did not provide the predictable, long-term solution patients deserve. At least one drawback, however, has been associated with the use of the alternate choice for retention, screws. When patients ask for a metal-free solution, for instance, and you offer them a two-piece zirconia product, can you in good conscience connect the two pieces with a titanium screw? We at Nobel Biocare don't think so.

Science first

Nobel Biocare has invested in fundamentally understanding the material properties of zirconia and the de-





Figs. 1 & 2: Picture showing crystalline structure of zirconia (left) and alumina-toughened zirconia (right). Developments in material science has improved hardness, strength and fracture toughness of the zirconia used for NobelPearl.

sign limitations these properties impose. In the process, we've discovered that there is more to learn from failure than from success. Thus, we studied material science to make the most of the aesthetic advantages—while minimising the mechanical drawbacks—of zirconia. When you have an implant that's going into the bone, you want strength, stability, and long-term durability to withstand occlusal forces. Research has shown us that certain alumina-toughened zirconia (ATZ) compounds, properly prepared, are suitable for this application. In short, ATZ provides the kind of toughness and bending strength we need to facilitate the long-term performance of the implant, especially at the joint interface, where the peak stress forces are concentrated.[5]

Quality manufacturing

While some manufacturers may be tempted to pursue low-cost injection moulding rather than machining—with a relatively high degree of material flaws as a result—NobelPearl instead follows the precise process pathway of cold isostatic pressing, followed by machining, post-compaction and additional grinding. These manufacturing methodologies have been refined over the past few years in order to ensure the high reliability of the NobelPearl implant. Altogether, it's a complicated process, yet one that's dictated by the properties of the material. To reiterate: For the sake of long-term performance, NobelPearl implants are made out of a fully sintered material via hard machining.

Why do we think that these processes provide significant benefits? To start with, we already know that zirconia osseointegrates properly, just like titanium.[6,7] Thanks to many years of experience with zirconia abutments, it has been possible to develop the right surface roughness and structure for the NobelPearl implant, with the intention of ensuring excellent hard- and soft-tissue integration around this new product.[8] Also, when it comes to inflammatory responses around these materials, zirconia demonstrates very promising potential.[4]

The screw joint

The two-piece solution that characterises NobelPearl, designed with an internal screw-joint connection for restorative flexibility, also eliminates the risks associated with excess cement. NobelPearl consists of high precision manufactured components. In order to ensure that these materials work long-term it might seem natural to choose an existing titanium screw. However, because titanium is a metal, with very different properties than ceramics, a titanium screw would have an adverse impact on the ceramic interface, which would, in turn, detrimentally affect long-term fatigue strength.

This is why this new system includes a carbon-fibre-reinforced polyether ether ketone (PEEK) screw. Carbon-fibre-reinforced polymer is used extensively in the aero-

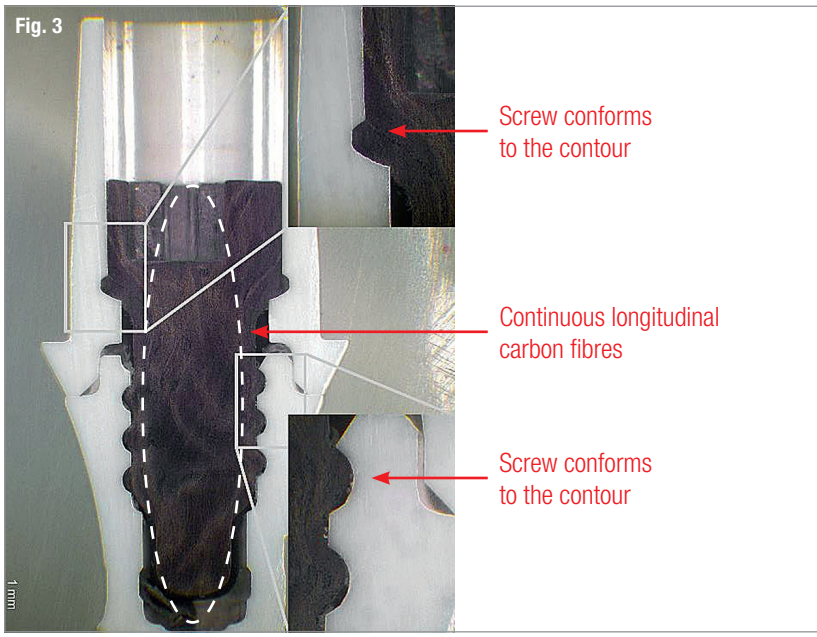


Fig. 3: The VICARBO® screw, when tightened, conforms to the contour of the internal thread of the implant.

	Prosthetic flexibility	Reversable	Metal-free	Cement-free connection	No intraoral grinding	Submerged healing
Nobel Pearl	✓	✓	✓	✓	✓	✓
Two-piece screw-retained abutment to implant	✓	✓	✓*	✓	✓	✓
Two-piece cemented abutment to implant	✓		✓		✓	✓
One-piece implant			✓			

*May include metal screw or metal insert

Fig. 4: NobelPearl checks all the boxes. What's more, an internal connection offers restorative flexibility and minimises risks associate with excess cement.

space industry; it's lightweight, bio-inert, and displays good friction and wear properties. The contour of a screw made of carbon-fibre-reinforced PEEK adapts to the threads inside the implant, and it does not display the stress concentration typical of metal in contact with zirconia. Simply put, you have more surface contact between PEEK screws and zirconia compared to titanium screws in the same situation. Not only is this to ensure that even with high tensile forces, the abutment will continue to be retrievable, it concomitantly produces a stable concretion joint between the implant and the abutment.

A complement—not a replacement

NobelPearl has not been designed and developed to replace titanium implants in general, but to provide the clinician with a treatment option in a variety of specific situations. Patients sometimes request alternatives to titanium, for example, for reasons ranging from aesthetic considerations to an aversion towards biologically integrated metals. Whatever the reason may be for choosing a zirconia-based solution, NobelPearl provides a response to these concerns in a clinical context.

What more is there to say? As you would expect, long-term clinical studies are in progress. Although we have yet to present five-year data, our experience with zirconia in general, and this design in particular, is so extensive that we are very confident that NobelPearl will prove its long-term reliability for the kinds of cases where a zirconia-based solution is preferred. This implant system has undergone exactly the same test setup as all our titanium implants (ISO 14801) and has achieved excellent results. Its internal connection offers a great deal of restorative flexibility and minimises the risks associated with excess cement that you can face with conventional one-piece zirconia implants.

Over and above that, NobelPearl provides the significant benefits of submerged healing while being reversible and metal-free—and its protocol calls for no intraoral grinding. Last but not least, the two-piece nature of the NobelPearl system means that clinicians can treat patients with a zirconia implant using protocols similar (although not identical) to those with which they are familiar from previous training and practice.

Author details

about the author

In this article, Professor Holst explores the development of ceramic implants, and how Nobel Biocare now offers a unique solution that can give clinicians peace of mind in this niche, yet growing market. **Prof. Stefan Holst** serves as Vice President Global Research, Products and Marketing at Nobel Biocare headquarters in Zurich, Switzerland. Both an experienced clinician and a teacher, he is an adjunct professor at the University of Pennsylvania and an associate professor at the University of Frankfurt on the Main.

contact

Nobel Biocare Services AG
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8058 Zurich-Airport, Switzerland
www.nobelbiocare.com

Literature

The craft makes nature perfect.

ZIBONE

ZIBONE
Zirconia Dental Implant

COHO BIOMEDICAL TECHNOLOGY CO., LTD.
Tel: 886-3-311-2203 Fax: 886-3-312-5626
www.zibone.com

Staying ahead of the competition

Luc Trevisan, France

Fig. 1: Luc Trevisan, Chief Strategy Officer of TBR Dental Group.

Research has revealed that the status of our dental health, as well as the appearance of our teeth play an important role in how we are perceived by other people and what first impression we make on them. Certainly, dental aesthetics and treatments that improve the smile are associated with higher levels of patient satisfaction regarding appearance, quality of life and psychological condition[1], which may explain why comprehensive restorative and cosmetic dentistry are experiencing rapid and ongoing growth.[2]

Of course, providing a remarkable patient experience can set a practice apart, but one must remember that patients are now more knowledgeable about dental treatments and understand what certain procedures can do for their appearance.[3] They are also more aware of their oral health and demand a high level of care with approaches that do not cause excessive damage or discomfort, and they want them quickly.[4] Patients are seeking faster, better treatment so it is important to promote the benefits of advanced technology and distinguish the practice as a high-tech establishment. Only then can practices and professionals hope to meet patients' ever-growing expectations and ensure that they stay ahead of the competition.

TBR is an international company with its headquarters in Toulouse, France, the European capital of astronautics. For over 30 years, TBR has been specialised in the design, manufacturing and marketing of unique dental solutions. The company offers implant solutions, aesthetic solutions and equipment solutions. We at TBR strive to become an irreplaceable partner for dental professionals around the globe, as we share their ambitions, which is to offer patients the best possible restorations—both in terms of functionality and aesthetics. We are here to support your services with high quality products. In response to both professional and patient demands, we concentrate our effort in dental manufacturing, technologies and materials, which have made it possible to improve overall case management. Dental professionals are now able to perform high quality aesthetic dental treatments with increased accuracy and speed, and of course, in a more cost-effective manner.

Let's have a look at our Z1 dental implants: With high long-term survival rates and a wide variety of application possibilities, they are considered to be a safe and effective way for replacing both the appearance and the function of missing teeth. Most clinicians will be familiar with bone-level implant systems. Yet, after considerable research and using advanced but well-proven technology, there is now a tissue-level implant that combines zirconia and pure titanium in one seamless system which aims to improve treatment procedures and create highly aesthetic results.

The Z1 implant system features a unique zirconia collar which protects the crestal bone and the gingiva with an antibacterial shield for optimal soft-tissue management, great primary stability and successful osseointegration. The tissue-level implant has a success rate of 98.6 per cent[5] and offers clinicians good visibility and accessibility to the single implant components while being more cost-effective, both short-term and in the long run, compared to conventional bone-level implants.[6]

contact

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31500 Toulouse, France
Phone: +33 562 167100
www.tbr.dental

Literature

CBCT WORLD PREMIERE

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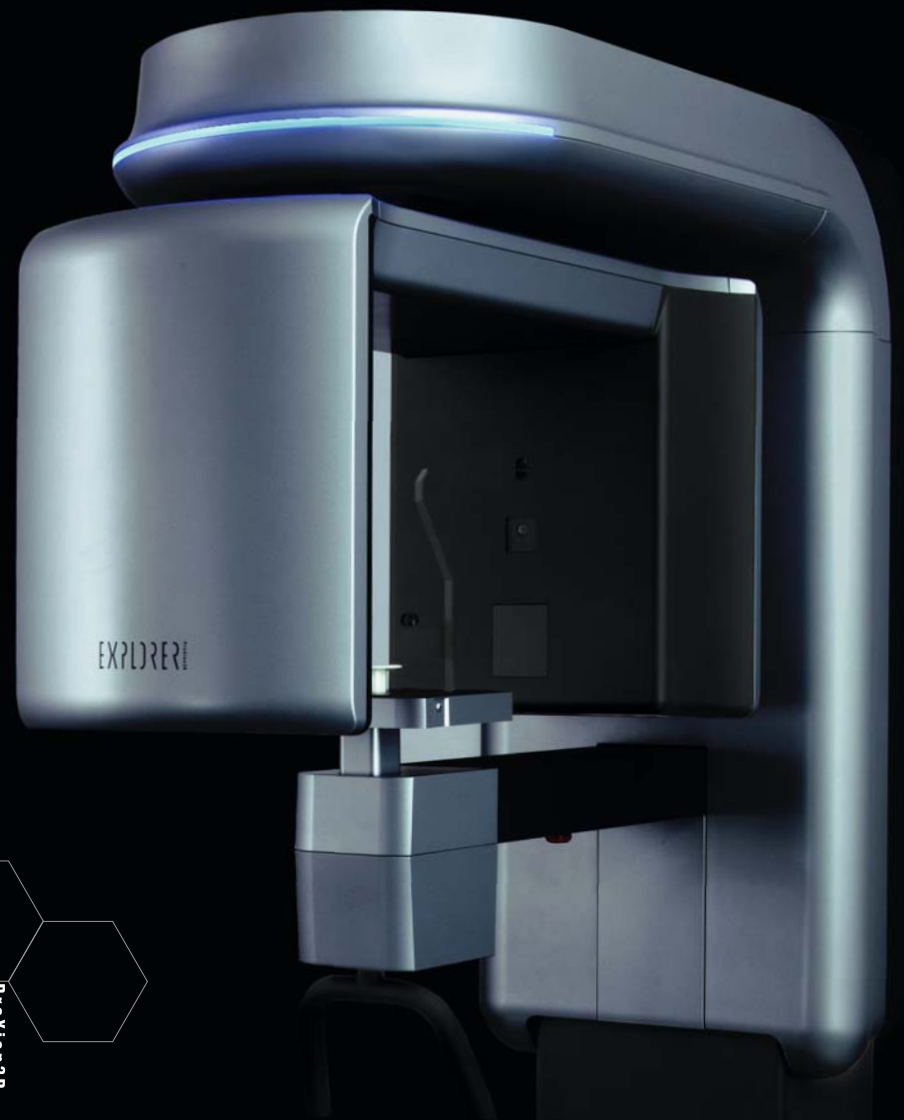


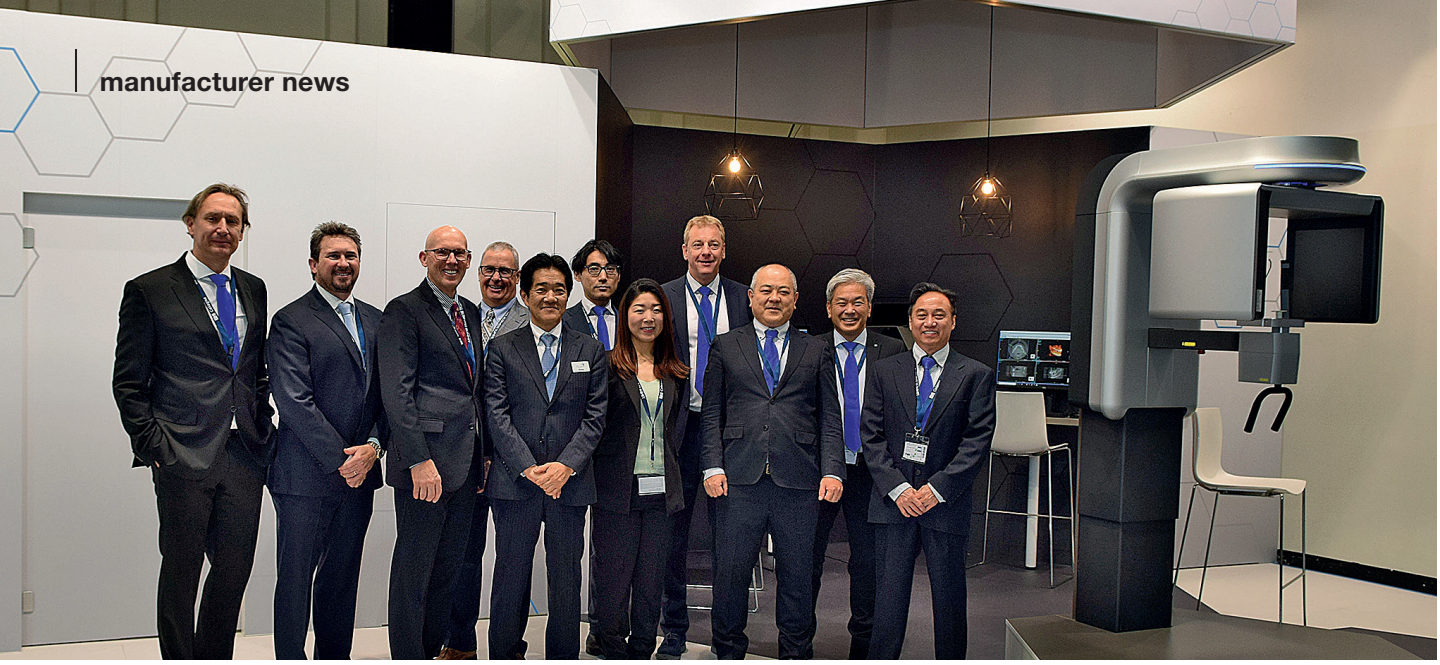
EXPLORER PreXion3D

At the IDS 2019, the Japanese technology group *PreXion* successfully introduced their new CBCT system *PreXion3D EXPLORER.* The high-performance system, especially developed for the European and US market, allows for an extraordinary combination of the most precise imaging, great picture detail, low radiation exposure, safe diagnostics and digital planning, covering the entire range of indications in modern dentistry.

Show what you're made of—with precision from *PreXion*.

PreXion
make IT visible

PreXion (Europe) GmbH Stahlstraße 42–44 · 65428 Rüsselsheim · Germany
Tel.: +49 6142 4078558 · info@prexion-eu.de · www.prexion.eu



PreXion

A new precision standard in 3D imaging

At IDS 2019 in Cologne, PreXion, the Japanese CBCT specialist, presented its newly developed system, the PreXion3D EXPLORER, which was primarily developed for the European and US market. With the device presentation at the PreXion booth in Cologne and the new international website www.prexion.eu, the company presented itself to a larger European audience for the first time. Hardly any other company is as specialised in three-dimensional X-ray diagnostics as the high-tech company PreXion, which has been active on the market for more than 15 years. Its new CBCT system PreXion3D EXPLORER, impresses with a clear and ultra-precise 3D image with the lowest possible radiation exposure and simplest operation. Compared to three-dimensional digital images, conventional 2D X-ray images offer only limited diagnostic information. However, the pulsed, cone-shaped beam of a CBCT minimises the radiation exposure, but increases the image information many times over by means of three-dimensional representation. With a 0.3 mm focal spot and a voxel size of only 75 µm, the PreXion3D EXPLORER offers a unique combination of highest possible image quality with lowest possible radiation exposure owing to its automated beam stop function. With a maximum field of view (FOV) of 150 x 160 mm and integrated imaging software, the finest spatial structures of hard- and soft-tissue can be displayed. In addition, the device impresses with its ease of operation and comprehensive planning programmes across all dental indication areas. Exclusive consulting appointments can be arranged at info@prexion-eu.de or via the homepage.

PreXion (Europe) GmbH
Stahlstraße 42
65428 Rüsselsheim, Germany
www.prexion.eu

SDS Swiss Dental Solutions

Ceramic implant forms with osteogenic functionality

While SDS ceramic implants were being applied routinely at the Swiss Biohealth Clinic of Dr Volz, the experience and knowledge that were gained there led to the development of a new kind of implant. The improved biocompatibility of zirconium dioxide implants, together with the bone and soft-tissue growth associated with it have provided new options for implantation wherever pronounced oval alveoli need to be treated, or multiple rooted teeth must be replaced. To this end, the implant ranges “oval” and “balcony” were developed, available in different diameters and lengths, both as single pieces and in two parts, and which were able to optimally close the alveoli, especially with emergency implantations.
The new SDS “sinus implants” (Fig.) were developed specifically for sinus lifting. Due to the increased biocompatibility of ZrO_2, bone growth is also optimally exploited for this indication. In the apical area of the sinus implants, a plate is introduced, which on the one hand spares damage to the Schneiderian membrane upon sinus lifting, and on the other forms a large cavity under the plate due to an umbrella effect. The actual implant serves as a tent pole in this cavity, which creates optimal conditions for inward bleeding and the bone regeneration which results from this. Bone graft material is not necessary in almost all cases. The sinus implants are also available in various diameters and lengths.

SDS Swiss Dental Solutions AG
Konstanzerstr. 11
8280 Kreuzlingen, Switzerland
www.swissdentalsolutions.com

TBR Dental

Z1 implant—The science of smiling

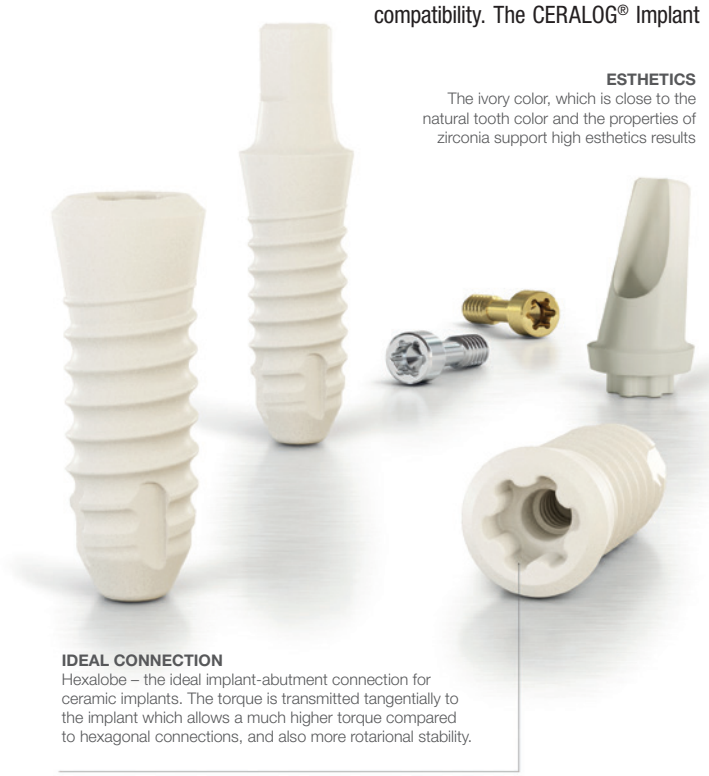
Restorative and cosmetic dental procedures continue to grow in popularity, with dental implant treatment proving to be an ideal solution for those seeking to replace missing teeth. Advanced implant systems can be placed within one surgery and are often indistinguishable from a patient's natural teeth. Although some titanium implants can become visible through the gingiva—thereby compromising the overall visual result—this risk is eliminated with the TBR Z1 implant. Dental implants must integrate with the three surrounding tissues—the bone, connective tissue and epithelial tissue. The main challenge involved with the implant's periodontal integration is the long-term stability of the implant–tissue interface. This challenge is met by the Z1. Seamlessly combining a durable titanium post with an innovative zirconia collar, the unique design of the Z1 encourages the soft tissue to heal around the implant in a way that mimics natural gingival growth, ensuring a highly satisfactory outcome. The importance of a healthy smile cannot be underestimated, especially as the world's most powerful gesture can affect an individual's self-confidence, self-image and overall quality of life. Practitioners can continue helping patients retain a smile to rival the Mona Lisa's by offering the latest treatments, which have been optimised to improve dental function and aesthetics.

TBR Dental Group
24 Impasse René Couzinet
31500 Toulouse, France
www.tbr.dental

CAMLOG

Natural aesthetics with the CERALOG® Implant System

The demand for highly aesthetic, natural-looking restorations is continually increasing. This trend favours ceramic implant solutions with high levels of biocompatibility, particularly zirconia, known for its excellent soft-tissue compatibility. The CERALOG® Implant System is established and has been in clinical use for more than seven years. It offers a high level of predictability and provides aesthetically pleasing results. The two-piece design of the system that allows for screw-retained prosthetics offers great benefits. CERALOG® is easy to use, owing to the simplified prostheses, lean instrumentation, and clearly structured surgical procedure. Options for the treatment workflow include flexible trans- or submucosal healing of the two-piece CERALOG® Hexalobe implant and transmucosal healing of the CERALOG® Monobloc implant. The implants are made of yttria-stabilised tetragonal zirconia, which is a ceramic widely used in the dental industry and other highly demanding medical fields. The ivory colour of the material, which is very close to that of a natural tooth, and the properties of zirconia lead to natural-looking results. Zirconia is a chemically inert, making it especially suitable as an implant material. Due to its manufacturing process called ceramic injection molding (including sintering and hot isostatic pressing), it offers an outstanding combination of excellent mechanical properties and high strength.



ESTHETICS
The ivory color, which is close to the natural tooth color and the properties of zirconia support high esthetics results

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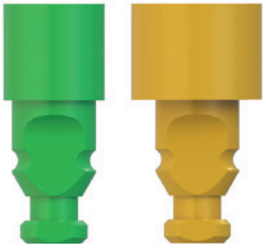
Hexalobe – the ideal implant-abutment connection for ceramic implants. The torque is transmitted tangentially to the implant which allows a much higher torque compared to hexagonal connections, and also more rotarional stability.

CAMLOG Biotechnologies GmbH
Margarethenstr. 38
4053 Basel, Switzerland
www.camlog.com

Dentalpoint

ZERAMEX® XT— CAD libraries now available



The CAD data for exocad and 3Shape are now available. Thus, the digital workflow for the reversible screwed and 100 per cent metal-free ZERAMEX XT system is ready. Now, all users can download the libraries under the download and media section of the ZERAMEX website. The main focus is on the new "Digital Implant Replica". It is part of the newly introduced digital workflow on the ZERAMEX XT system. The new "Digital Implant Replica" will replace the previous replica and can also be used for conventional impression taking. In addition, the user is equipped with a new scanbody, which is conveniently delivered in a set including a new screw. All information can be found in the product range and in the fax order form, which are also available for download under the media section of the ZERAMEX website. If you have any questions about the articles, please contact our order office. For technical questions, our technical advice will be happy to help. All contact details can be found online under www.zeramex.com/en/contact.

Dentalpoint AG
Bodenäckerstr. 5
8957 Spreitenbach, Switzerland
www.zeramex.com

Nobel Biocare

NobelPearl now available in the USA

Nobel Biocare has received FDA approval to market NobelPearl in the USA. A unique alternative to titanium, the two-piece ceramic implant solution has been designed to support a natural soft-tissue appearance. It is especially beneficial in patients with a thin mucosal biotype. NobelPearl is metal-free and comes with a cement-free internal connection made possible by the innovative VICARBO® screw made of carbon-fibre reinforced polymer. The thread design and tapered implant shape combined with the tapered drill protocol, have been engineered to achieve high primary stability. The hydrophilic sand-blasted and acid-etched ZERAFIL™ surface, combined with a partially machined collar, is further proven to osseointegrate. NobelPearl follows a range of well-established workflows for two-piece implants and is integrated into Nobel Biocare's digital workflow. Clinicians seeking a successful start in ceramic implantology can gain peace-of-mind with this new solution.

Nobel Biocare Services AG
P.O. Box
8058 Zurich, Switzerland
www.nobelbiocare.com

WITAR

Biocompatible ceramic implant

Metal-free, biocompatible and aesthetic: Ceramic implants have gained popularity among dentists and patients. Building upon this trend, WITAR offers a new AWI implant system for transgingival healing. With this, the company promises an implant treatment that is safe, cost-efficient and simple. The two-piece system that has been developed and patented recently is made from Y-TZP ceramic and offers a reliable and easy handling. Treatment steps had been optimised for an increased safety and biocompatibility. At the same time, treatment costs and time could be reduced.

The implant system consists of nine two-piece ceramic implants that are available in three different diameters (3.9, 4.5, 5.0 mm) and lengths (8, 10, 12 mm). With this, the system is indicated for all bone classes. Additionally, the one-piece AWI implant is available in two sizes (10, 12 mm) with a diameter of 3.9 mm and can be used in the anterior mandible. Four full-ceramic abutments of which two are straight and two are angled by 15 degrees, belong to the system as well. Furthermore, the system includes a sterilisation box, surgical tray with milling machines made from ATZ high-performance ceramics, and turning tools.

WITAR Consulting GmbH
Rodenkirchener Straße 148
50997 Cologne, Germany
www.witar.de

Straumann

Natural ceramic—proven quality

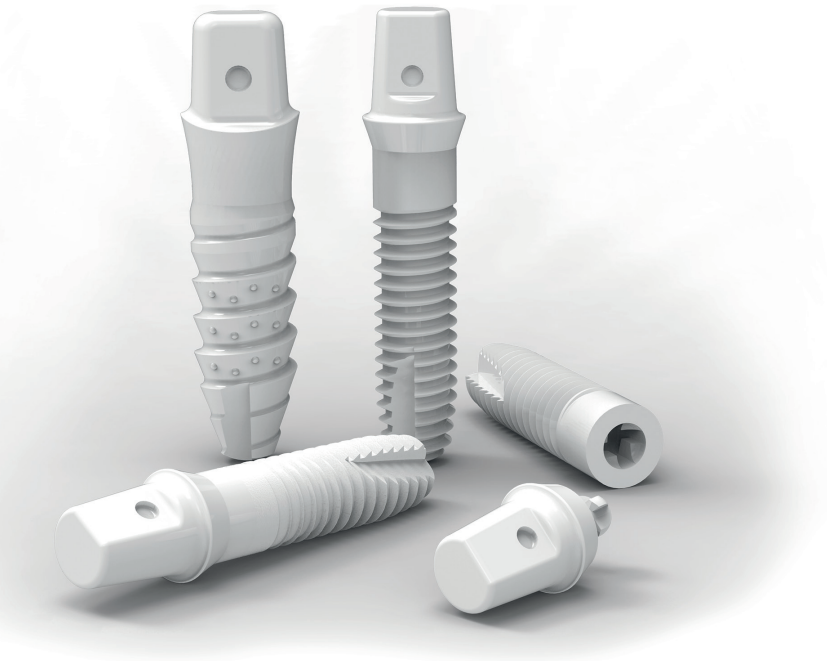
PURE ceramic implants have an ivory colour that resembles natural tooth roots. This gives the most natural look even in thin gingiva biotypes. ZLA, the surface of the PURE ceramic implant, is characterised by macro- and micro-roughness which is similar to the original Straumann SLA surface. In several studies, the ZLA surface has also demonstrated similar healing patterns, healing times and osseointegration qualities with regards to peri-implant bone density and bone-to-implant contact (BIC). In addition, the zirconia-based ZLA surface of PURE implants shows a favourable formation of the epithelial attachment, as well as significant lower bacterial accumulation compared to titanium-based SLA surfaces. Compared to titanium implants, a higher degree of soft-tissue integration around the PURE ceramic implant was observed in scientific studies. By placing the Straumann PURE ceramic implant system, excellent aesthetic outcomes with favourable soft-tissue attachment and papilla formation around the implant can be achieved.

Institut Straumann AG
Peter Merian-Weg 12
4052 Basel, Switzerland
www.straumann.com

COHO Biomedical Technology

Zirconia implants that resemble natural teeth

With the one-piece ZiBone zirconia implant, COHO offers a metal-free implant system which meets high aesthetic demands. It convinces with outstanding biocompatibility and causes no allergic reactions. ZiBone implants and instruments are made of high-purity zirconia partly stabilised with yttria and hafnium—an extremely strong material which has been used for orthopaedic implants for years. Zirconia implants do not have the dark gleam found in titanium implants and they do not show dark margins in the case of receding gum lines, owing to their white colour. Restorations with ZiBone look very natural, as zirconia allows light to pass through—just like natural teeth would do. The one-piece system is available in three different sizes (3.6, 4.0, 5.0 mm) with five different lengths (8, 10, 11.5, 13, 14.5 mm). Abutments with different heights and angles are also available for the two-piece system. Furthermore, COHO offers the Zircasso implant system, which comes in different screw patterns and abutment designs allowing the dentist to meet individual patient demands. COHO knows what patients expect from a new implant, which is why the Zircasso system has been perfected over a period of ten years both in terms of design and functionality. The unique design was developed to reduce the most common complications and to improve on the characteristics of previous implants.



COHO Biomedical Technology CO., LTD.
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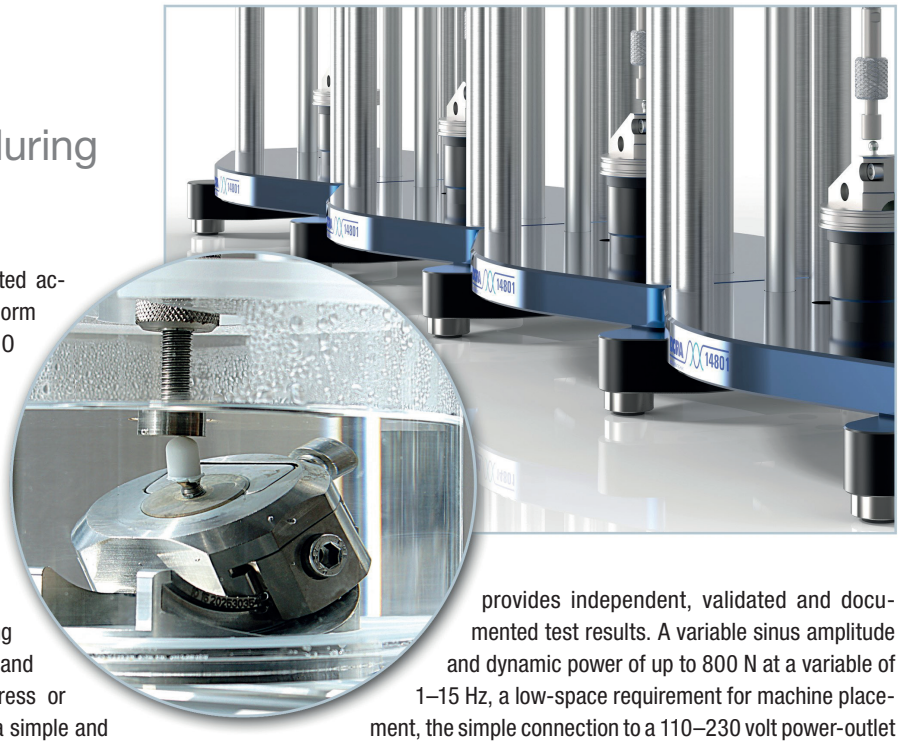
Taoyuan County 338, Taiwan (R.O.C.)
www.zibone.com

LARADO

Implant testing during production



Implant systems are normally tested according to the DIN EN ISO 14801 norm before they are launched. LARADO presents an especially developed dental implant testing unit—DORA 14801—which guarantees the observance and consistency for product quality before and during production and also allows for immediate design modifications. The DIN EN ISO 14801 norm concerns itself with the testing of dental implants regarding wear and failures caused by alternating stress or loads. The DORA 14801 provides a simple and economic solution for testing with a maximum of efficiency regarding cost and time. In principle; it relates to the quality of implants which must be insured not only in the development phase, but also in later production by batch and ISO 14801-exams. Thus, a high level of security is obtained with respect to endurance, connection and structure of implants. The main factor of efficiency is obtained through one master control unit and is the basis for the connection of 1 to 8 individual test stations that provides independent, validated and documented test results. A variable sinus amplitude and dynamic power of up to 800 N at a variable of 1–15 Hz, a low-space requirement for machine placement, the simple connection to a 110–230 volt power-outlet and the independence from compressed air or hydraulic systems are some of the advantages of the DORA 14801.

LARADO
Prüf- & Mess-Technik GmbH
Franz-Kirsten-Straße 1
55411 Bingen am Rhein, Germany
www.14801.de

TAV Dental

State-of-the-art zirconia dental products

Zirconia healing caps and locators, multi-units with zirconia ring and last but not least zirconia implants are just some of the special products TAV Dental is manufacturing using the advanced ceramic injection technology. The passion behind developing zirconia products for dental implantology is to provide patients with products which are much healthier for their body along with the advantage of uncompromising aesthetic results.
TAV Dental zirconia products are designed by a highly professional dedicated team and manufactured using high-end ceramic injection molding technology, thus resulting in state-of-the-art products to improve the patient's quality of life.
The team vision is to redefine, better than ever, the quality of zirconia dental products and its performances and to make this premium zirconia line common worldwide.

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Metal out—Ceramics in!

Along with digitalisation, ceramic implant technology is currently one of the fastest-growing and most innovative areas in dentistry. Intensive research and ongoing development, mean that zirconia implants are now to be taken seriously as an alternative to titanium implants in dental implantology. Dentalpoint with its ZERAMEX brand is a pioneer in "white implants". In this interview with *ceramic implants*, Philip Bolleter, Head of the Technical Department, and Adrian Hunn, Head of Marketing and Sales, discuss the current state of ceramic implants.

Mr Hunn, what impressions did you take away with you from the 2019 International Dental Show?

Hunn: Two core topics are clearly the centre of interest for all suppliers on the market: digitalisation and new materials. Many suppliers have jumped on the bandwagon with ceramic implants and now include at least one type of ceramic implant in their portfolio. Naturally, we are very pleased about that. It indicates that we are on the right track and in which direction the trend is going. From day one, we have focused on ceramic implants and the wisdom of this focus has now been confirmed. The second major topic, is digitalisation and we do not just want to fill gaps there, we want to be at the forefront in 2019 with product development and innovation.

What makes ZERAMEX different to other ceramic implant manufacturers?

Bolleter: The main difference is that we have now accumulated 12 years of experience in developing and processing ceramic implants. Dentalpoint has dedicated itself to ceramics and metal-free systems and has concentrated exclusively on these. Unlike other manufacturers, we only use sintered and hipped alumina-toughened zirconia for manufacturing implants. With the manufacturing processes developed in-house, it is possible to guarantee the maximum strength and precision required. We successfully launched the robust metal-free, carbon fibre-reinforced VICARBO connecting screw in 2014. These developments and our many years of experience are what set us apart from other ceramic implant systems.

Will ceramics replace titanium implants in the future?

Hunn: Although I, of course, would like to think that they will, it probably won't happen. Yet, what we are seeing right now is a massive increase in demand from patients for metal-free implants. More and more patients want natural and biocompatible products and are asking their dentists about alternatives to titanium implants. Of course, this puts pressure on dentists to offer both titanium and ceramic implants. So, if they do not want to lose patients, they will be forced to offer ceramic implants as well. According to market studies, the market share of ceramic implants is currently about 3 to 5 per cent. The share should rise to 24 per cent by 2022. For us, this means that above-average growth with ceramic implants is possible in such a quickly growing market.

Do you still hear about ceramic implants breaking?

Hunn: Less and less, fortunately. Some dentists still refer to the Tübingen implants, but this is much rarer now. Most dentists are very well informed. Discussions with professors from various universities in Germany and Switzerland have confirmed that there is no longer any question about whether our implants will break or can successfully osseointegrate at the implantation site. We have the same osseointegration success rates as leading titanium implants, and therefore, this is no longer an issue. The development stage for the osseointegration of ZERAMEX implants has been completed. For this reason, we are now focusing on prostheses and have made advances in this area. We will be able to present some further innovations later this year.

Philip Bolleter (Head of the Technical Department at Dentalpoint).

Can any patient who needs tooth prostheses be treated with ZERAMEX?

Bolleter: Basically, any conventional treatment for single teeth or bridges can be implemented with ZERAMEX. Of course, as well as the usual contra-indications in the patient, there are also certain limitations in relation to reduced diameters or special abutments. But generally speaking, all options are possible. We will soon be launching the new screw-retained LOCATOR[1] (Zest Dental Solutions) as well, and this will also make metal-free hybrid treatment possible in edentulous jaws.

What can customers expect from ZERAMEX in 2019, and what innovations can the European industry look forward to?

Bolleter: Most innovations are happening on the digital side, where we will be introducing the full integration of the digital workflow. The workflow for digital impression taking with an intraoral scanner from the more recent ZERAMEX XT system has already been available since March. The CAD libraries for exocad and 3Shape are now available for use. Fully individualised abutments or monolithic zirconia crowns will also be available later in the year. ZERAMEX has established the new digital solutions department, which will be rolled out over the next few months for dentists, dental technicians and laboratories for optimal support with digital treatment. It will provide dental technicians with a comprehensive service package

which they can use to send in data and in return receive a complete treatment plan, with little processing time required. In addition, the service centre is on hand to offer advice to dentists by hotline and e-mail. As for other innovations, firstly there is the new metal-free LOCATOR. Also, a reduced diameter is going to be introduced for the ZERAMEX XT system in autumn. There are more innovations and surprises in the pipeline, but we are keeping them under wraps for now.

Hunn: I would also like to add that, in addition to the innovations we have mentioned so far, there is going to be a revised ZERAMEX brand image. At the end of the year, we will present our innovations in a roadshow to all interested parties, and I am really looking forward to that.

What advice would you give to dentists who are uncertain about ceramic implants?

Hunn: I would advise them to ask their colleagues about their experiences and which systems they can recommend. This often leads to a good exchange of important and interesting information. Of course, they always have the opportunity to contact us directly if they want, for example, to arrange a commitment-free test surgery. Our experienced specialist advisers are available to give practitioners advice and will also support them with dental procedures if needed. Every employee in our company thinks ceramic and can provide professional help and answer many questions in that regard.

1 LOCATOR® is a registered trademark of Zest Anchors, Inc., USA.

Adrian Hunn (Head of Marketing and Sales at Dentalpoint).

about the interviewees

Philip Bolleter was Head of Research and Development when Dentalpoint was first established. He is now in charge of the technical department of the company. He is also one of the brains behind the development of Dentalpoint's groundbreaking ZERAMEX technology. **Adrian Hunn** has been a manager at ZERAMEX since 2018 and is now in charge of marketing and sales. He has extensive international experience in senior management positions in sales and marketing.

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Fig. 1

Fig. 2

Harnessing the advantages of ceramics

High aesthetics, strength, great biocompatibility—zirconia is a material that offers a wide variety of benefits for implant patients. However, zirconia also has its limitation and it would be foolish to overlook them. By developing an entirely new production material, the implant manufacturing company Argon Medical has addressed these limitations. At IDS 2019, Richard Donaca, head of the Germany-based family business, spoke with *ceramic implants* about their new ceramic implant system.

Mr Donaca, at the IDS 2019 you presented a new ceramic implant. What is unique about it?
The material we have developed for our new ceramic implant system is compounded according to a patented formula. The special feature is that it has a synthetic content and, thus, also a certain elasticity is given. This is very important to us because elasticity allows us to achieve a higher tensile strength. In general principle ceramic is extremely stable—even more stable than titanium. However, there has always been the following problem: when loading forces beyond a certain maximum limit act on the ceramic, the material tends to break rather than relocate or trap the loads. We have taken on this problem in the development of our new system. The new material allows us the elasticity that is needed in our field, whereas this material also works extremely accurate and is also used in measurement springs. The material is already certified as a class III product. Its origin is from the medical sector and has not yet been harnessed in the dental field. Of our new ceramic implant product range, there will initially be a one-piece version with different diameters. However, the implants will be available soon as a two-piece version. In my opinion, we are at the forefront of this technology as we start with a diameter of 3.3 mm and then go up to 4.3 mm and 5.3 mm.

How does the implant–abutment connection of your new system look like?
In order to achieve the desired tightness, we have chosen a one-degree cone, which ensures the connection between implant and abutment. On the bottom of the abutment is the so-called “nose”, which connects the implant with the abutment by spreading the flanges of the nose with a firm click. In addition, there is a screw-in stabilising pin, which ensures that the implant components are connected to each other. The one-piece system will be released around April or May. The two-part system will be ready for the market a bit later, probably in the summer, because we are currently analysing three materials for the abutments. Manufacturing the abutment out of the same material as described earlier would be one option. In addition, it is possible to make it from polyether ketone ke-

Fig. 1: Richard Donaca (CEO of Argon Medical, left.) and Jürgen Isbaner (board member of the OEMUS MEDIA AG). **Fig. 2:** The Argon Medical booth at this year's IDS, where the company presented their new ceramic implant system.

tone (PEKK) or a fiber-reinforced plastic. At the moment, I am still using a test technique to find out which material is most suitable—because of course, the implant structure should also have a certain elasticity. However, I have already noticed that PEKK is not exactly successful in this context. However, the fiber reinforced plastic is very promising and an abutment of the same material as the implant body will probably work fine as well.

> "Our new material has a synthetic content and, thus, a certain elasticity."

What are the big current challenges for Argon Medical?

One big challenge is to harness all the benefits of our newly developed material. So it could be used in very small dimensions and for example you can manufacture membrane fixation pins. We are currently working on ensuring complete freedom from metal, as more and more customers and patients are demanding it. Another challenge is the increasingly difficult approval of new medical devices. There is not only the DIN EN ISO 14801 standard, like the dynamic fatigue test for dental implants, under the stipulation of which we have to produce our implant abutments. For example, we have recently applied for approval of new titanium bases in the US. In the past, it was always common practice to test only the connection of the abutment. However, the Food and Drug Administration (FDA) now states, "A titanium base is part of a complete system and a complete system must be tested as one unit." So now we have the duty to mechanically rebuild everything from scratch. This means that both the implant and the abutment have to be redone, a certified zirconium and a certified adhesive must be used—and all this must then be tested together as one unit.

How do you prepare for the new European Medical Devices Regulation coming into force?

We are currently in the middle of our preparations for the forthcoming European Medical Devices Regulation (MDR). In April, we have our first FDA hearing, and I suspect that the FDA will also be geared towards the upcoming MDR. Of course this topic is a special challenge, as it simply demands very defined processes. So far it raises the impression that not even the authorities are prepared for it yet. However, our certification body, BSI, as the largest certification body in the world, is very concerned about this topic. I have the impression that in this context, the chaff will be separated from the wheat—so to say—because the large corporations are also involved in the competent committees—and so they then steer the topic of MDR. The certification bodies and the smaller companies get a lot of pressure from the top. The corporations do of course have the necessary manpower and capital to cushion it all up to some extent. In addition, they do often have entire departments that deal exclusively with MDR. In the future, we will probably also have to bring a few people on board, who are only specialised in this topic.

Does that mean for you as a consequence that you have to adjust prices upwards?

I don't think we will do that. Rather, we will try to cover any additional costs related to MDR by growth and increasing volumes. Our new ceramic implant is expected to cost 199 Euro and for the abutment we are calculating so far with 69 or 79 Euro. We're still barely half the price of most manufacturers, and we are convinced that it is the best way to stay with this philosophy.

Thank you for the interview.

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On complementing each other

Straumann has teamed up with Z-Systems to extend its ceramic implant portfolio: the Basel-based implant manufacturing giant has obtained exclusive distribution rights for the new Z-Systems zirconia-based implant line. At this year's International Dental Show, Frank Hemm, Head Marketing & Education at Straumann, and Rubino Di Girolamo, CEO of Z-Systems, spoke with Georg Isbaner, managing editor of *ceramic implants*, about their collaboration, what it means for the future of the two companies and how the new implant line from Z-Systems complements Straumann's PURE implant range.

Mr Hemm, Mr Di Girolamo—please could you give us some insight into the new collaboration between Straumann and Z-Systems?

Hemm: The cooperation is already fairly advanced. Straumann now holds a 34 per cent stake in Z-Systems and we have signed a worldwide distribution agreement that provides Straumann with exclusive worldwide distribution rights for the new Z-Systems implant line. After IDS 2019, we will begin distribution in Europe—starting with the diameters that are already available. However, I should emphasise that the collaboration goes beyond a mere distribution agreement. The fact that we are now a large minority shareholder in Z-Systems underscores the fact that we want to strengthen the mutual ties between our two companies.

What does the new collaboration mean for joint customers in Europe and especially in Germany?

Di Girolamo: If you were to come to us asking about the SNOW implant, we would naturally refer you to Straumann. There are no conflicts of interest, quite the opposite: I think that the new collaboration has many clear positive effects. The fact that Straumann is now helping to support sales strengthens confidence in both the new product and the existing ones.

Hemm: Of course, there are some overlaps in our customer bases, but the exchange among the two companies works very well.

The capital injection from Straumann will presumably help to support and accelerate for Z-Systems' broad product pipeline. What are the next steps for Z-Systems?

Di Girolamo: We will complete our fifth generation by developing a tissue-level implant with same internal geometry and screw technique. We will then focus on the sixth generation, which has already been placed in pilot surgeries. For this new generation, we will develop a different exterior design and use smaller diameters. These will be the major developments in the near future.

> "The new metal-free line from Z-Systems is the perfect complement to PURE."

Until now, the big challenge has been to screw ceramic to ceramic. How have you solved this problem?

Di Girolamo: The material properties of zirconium dioxide only allow ceramics to be screwed with ceramics if you work very precisely. It is of utmost importance that the individual composite parts, i.e. the abutment, implant and connecting screw, fit extremely accurately. Otherwise tensions arise that ceramic cannot absorb very well. With the help of new tools, we can now achieve extremely high level of precision that was not possible two or three years ago. Our previous design, the BL, for example, still had an integrated metal part because it was not then

Fig. 1: From left: Georg Isbaner (Editorial Manager of *ceramic implants*), Frank Hemm (Head Marketing & Education at Straumann) and Rubino Di Girolamo (CEO of Z-Systems).

possible to achieve the necessary precision. In the meantime the machine industry has made significant progress and it is now possible to work with ultra-high precision.

Hemm: Z-Systems provides us with all-ceramic solution—implant, abutment and connecting screw, which we had not yet been able to offer—our PURE two-piece version still uses a metal insert. The possibility of being able to offer a completely metal-free solution with a bone-level design that complements PURE was one of the factors that made Z-Systems so attractive.

Speaking of PURE: is the new Z-Systems implant line a replacement or a complement?

Hemm: We will continue to market and develop our PURE range, which offers a soft-tissue level parallel-walled design in both monotype and two-piece versions. The advantage of PURE is that it has exactly the same geometry as our existing implants and can be placed with the existing Straumann instruments. Z-Systems complements it by offering a bone-level design with apical taper. This enables us to cater for individual customer requirements for bone-level implants and for higher primary stability with the apical taper. In this respect, the new metal-free line from Z-Systems is the perfect complement to PURE.

So far, ceramic implants have been predominantly used for single-tooth restorations. Do you think that it will also be possible to carry out multi-unit work with ceramics in the future?

Di Girolamo: We have 17 different abutments for the SNOW implant, including bridges. We are fully convinced by the quality and prosthetic capabilities and I am sure that we can go even further with ceramics.

Hemm: Today, we have customers who use ceramics in all indications. However, I have the impression that dentists are still somewhat cautious about using ceramics. They are gradually exploring the various treatment options beyond single tooth replacement, to partial gaps, and full-arch solutions. The prosthetic possibilities already exist, that's for sure.

Z-Systems certainly offers the widest and most advanced ceramic portfolio. What do you say to critics who don't believe the hype surrounding ceramic implants?

Di Girolamo: Right from the beginning, we have focused on developing and manufacturing products of the highest quality, stability and durability. Straumann follows the same principle. If quality manufacturers adhere to these principles, ceramics will eventually become standard.

Hemm: We do not want our customers to compromise on osseointegration or stability with ceramics. We have demonstrated the strength of our PURE implant system in stability tests. We have also proven scientifically that a ceramic implant with the ZLA surface is comparable in terms of osseous healing to a titanium implant with an SLA surface. The two-piece design was important to us

for prosthetic flexibility. In addition, it is vital that ceramic implants are compatible with existing procedures, instruments, and digital workflows including digital pre-planning programmes. Our ability to assure this will hopefully persuade dentists to adopt this material, which is still relatively young. Of course, our customers do not want to compromise on product quality, treatment outcomes

> "We want to invest in a strong partner who has expertise in a specific area."

or well-established workflows. With PURE, we are able to meet these requirements and with Z-Systems we are also well on track.

Let's talk about education: will there be a need for further education programmes that focus entirely on ceramics?

Di Girolamo: I think dentists should at least do some kind of additional training, because some things cannot be transferred from titanium to ceramic implantology. Here, of course, we rely heavily on Straumann, as they have comprehensive training programmes.

Hemm: We take this topic very seriously. Straumann stands both for science and education. In this context, our partnership with the International Team for Implantology (ITI) deserves special mention. As with other product launches, our programmes follow the "train the trainer" concept. We will train a small number of practitioners who will then be able to instruct the broader user base.

Ceramic implantology is positioned mainly in the premium segment. Is Straumann planning to make ceramic implants more accessible through Neodent?

Hemm: Price is certainly a factor that constrains ceramic implants today. This is partly because production costs are significantly higher in comparision with titanium implants. This is why we are developing other processes to reduce manufacturing costs. The most suitable alternative technique is injection moulding, which we are currently developing with Neodent to reduce costs while maintaining consistent quality, high stability and surface characteristics. I believe this will make ceramic implants more affordable and will enable us to mass produce. Today, the grinding process of one ceramic piece relatively time consuming. If demand for ceramic implants suddenly exploded, we wouldn't be able to meet it with currently available production methods.

In the past, Straumann's initial investments have often ended with full acquisitions. What are the plans for Z-Systems?

Hemm: Not every Straumann investment ends in a full acquisition. The main reason for such collaborations is because we want to invest in a strong partner who has expertise in a specific area—for example Dental Wings in the digital field, or Z-Systems in ceramics. If someone else can do something better than we can, it is highly likely that we will complement each other perfectly. In addition, I think it is important for both companies to maintain continuity in leadership and to provide the right incentives. It is important for our colleagues at Z-Systems to continue working and fighting for their company. It is vital for every company to keep its brand identity—which is why and you don't see a Straumann "Village" here at IDS 2019. Instead, Neodent, Medentika and our other brands have their own booths. It is important that we do not consume companies by investing in them, but keep their individual brand identity. With regard to Z-Systems, it is by no means set in stone that our collaboration will end in a majority shareholding or a takeover.

In your opinion, how will the ceramic implant market develop in the near future?

Di Girolamo: We believe that the share of ceramics in the medium and upper segment will increase massively over the course of the next ten years. By continuously developing application technologies, we believe that we can achieve a market share of up to twenty per cent during this period.

Thank you for the interview.

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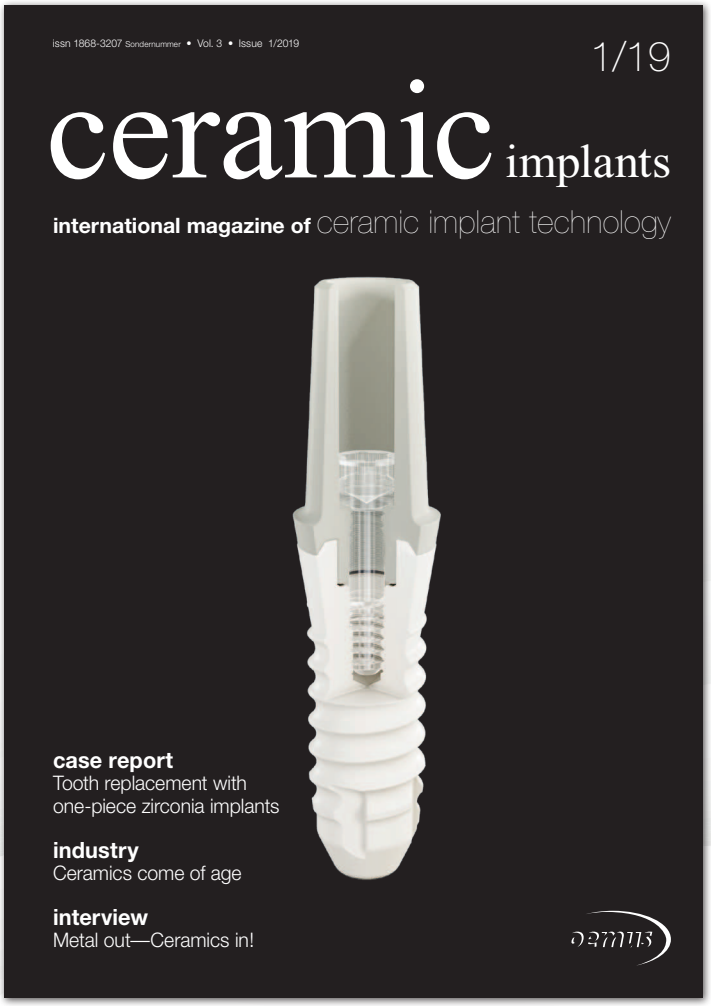

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CI 1/19

Ceramic implantology— At eye level with titanium

The European Society for Ceramic Implantology (ESCI) will hold their First European Congress for Ceramic Implant Dentistry on 11 and 12 October 2019 in Zurich, Switzerland. The congress will provide both interested beginners and experienced users with valuable new insights into the successful application of ceramic implants as an additional and reliable therapy alternative to the established titanium implants. At IDS 2019, *ceramic implants* had the chance to talk to Dr Jens Tartsch about his new role as ESCI President, the current state of ceramic implantology and what congress participants can look forward to this autumn.

> "We have received a lot of positive feedback from the press and from manufacturers, and above all from the dentists."

Dr Tartsch, in addition to your practical work as an implantologist, you are the President of the European Society for Ceramic Implantology (ESCI), which was founded in 2018. What was your first year as President like?
It was an exciting and, in my opinion, a very successful first year. We have received a lot of positive feedback from the press and from manufacturers, and above all from the dentists. Since its founding, the ESCI has been able to gain members from ten European countries. A special event was the First European Council for Ceramic Implantology, held in Zurich in October 2018, where the ESCI Board, the ESCI Scientific Advisory Board with its high-grade members, and the most important manufacturers as ESCI Company Partners met to discuss scientific questions concerning ceramic implantology. At the end of the event, the first official statement on the subject of "dental implantology with zirconia implants", supported by all participants, was adopted.

What distinguishes the ESCI from other dental associations and who is involved in it?
The ESCI is a Europe-wide network and an active community for ceramic implantology. It is a neutral and independent dental association that combines scientific research and clinical experience. All interest groups who aim to foster ceramic implantology are involved in it: dentists, dental technicians, institutions and research facilities, clinics, universities and manufacturers.

In your opinion, what are the major scientific issues related to ceramic implantology?
I would like to answer this with the official ESCI statement: current clinical studies on zirconium dioxide implants, available for a period of five years, show comparable results with titanium implants. This is why zirconia implants can be recommended for clinical use. However, further long-term data is needed to confirm the very promising short and medium-term data. In addition, improved manufacturing processes and standardised testing procedures are also needed.

Ceramic is well-established in dentistry. However, as an implant material it has only been used successfully for a few years. How did this renaissance in implantology come about?
There has been a massive shift in technology, especially in terms of materials, surface design and restorative con-

Fig. 1: Dr Jens Tartsch, Founding President of the European Society for Ceramic Implantology (ESCI).

cepts. The bad reputation the material once had, owing to very high fracture and loss rates, is, therefore, no longer valid today. As a result of these developments, the ceramic implant is at eye level with the titanium implant today. With this prerequisite, the advantages of the material, such as healthier peri-implant soft tissue or improved aesthetics, are now being discovered, especially in general implantology.

Speaking of prosthetic requirements: what distinguishes ceramic implants from titanium?
Here, one must first distinguish between a one-part and a two-part concept. The restoration of one-piece ceramic implants including impression taking and cementing of the restoration is more similar to the restoration of a natural tooth. Special attention must be paid to the removal of the cement residues, which cannot be reliably guaranteed below 1.5 mm subgingival level. Therefore, the implant shoulder and, thus, the crown margin of this very implant type must be placed at a strict "tissue level". This applies to all ceramic implants whose restoration is cemented. In terms of prosthetic requirements, two-piece ceramic implants are quite similar to titanium implants. Open and closed impressions are possible, and various abutment options increase prosthetic flexibility. A reversible screw connection allows for bonded restorations that are similar to a titanium bonding base, which makes the subgingival placement of the crown margin possible. There is evidence of ceramic implants for single-tooth restorations and smaller bridge restorations. However, internal stresses, too high loads or large overhangs should be avoided.

What are the differences in surgical handling?
Here, too, ceramic implants are similar to titanium implants. The biological principles known from titanium also apply to ceramics—and so do the guidelines from the manufacturers. However, in contrast to titanium, a ceramic implant should never be placed using too much torque, as the material cannot dissipate any overheating that may occur. Furthermore, especially with one-piece implants, exact positioning of the implant axis, high primary stability and no overloading must be ensured during the healing phase. Augmentative measures can be performed in the same way as with titanium implants.

Implant surfaces also play a major role in ceramic implantology. What's your opinion on this?
Ceramic implants with modern microrough surfaces show almost the same osseointegration qualities as titanium implants. It has not yet been clarified, however, how much "roughness" is really required for successful osseointegration, as every surface manipulation induces energy into the material and, thus, carries the risk of material damage due to phase transformation. This is why scientists are currently conducting a lot of research on

how to strike a balance between the lowest possible surface treatment and the maximum surface roughness that is required for successful osseointegration. Some successful concepts are already available.

Ceramic implantology exists in an area of tension between evidence-based dentistry on the one hand and an increasing patient desire for the most biocompatible, metal-free and aesthetic dental prosthesis possible on the other. How should the dental industry, which carries out and finances a large part of the research, deal with this subject?
I don't think that there is an area of tension anymore today. First of all, ceramic implantology naturally needs a scientific, but also practically oriented approach. One of the ESCI's declared goals is to implement this approach. Above all, as dentists we have to extensively deal with these topics ourselves and should not leave it exclusively to the industry, since the independence of the results

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ESCI congress 2019

is of utmost importance. Ultimately, we hold the responsibility for our patients. Yet, this also means that we must not blindly follow the wishes of our patients, but rather inform them about the correct indication, as well as advantages and disadvantages of the available alternatives. The enlightened patient must be involved in the decision, but the correct indication and correct application lies solely within the responsibility of the dentist. When these principles are followed, ceramic implants can be a reliable extension of the treatment possibilities in addition to titanium implants.

> "Ceramic implants with modern microrough surfaces show almost the same osseointegration qualities as titanium implants."

For the First ESCI congress, to be held on 11 and 12 October in Zurich, you have attracted a large team of speakers from seven countries. What can the participants look forward to?

The First European Congress for Ceramic Implantology will be held according to the motto "Facts of Ceramic Implants", since only facts count today when it comes to ceramic implants. The participants can look forward to these facts. The scientific framework with its high-grade speakers is unique in ceramic implantology and provides important background information both for interested newcomers and for already experienced users. In addition to the lectures and a "Meet and Greet the Implants" there will be "abstract and case presentation short lectures", which will be open to young researchers and ESCI members. The best presentation in its category will receive the ESCI Award. Apart from that, the venue on Lake Zurich and the social setting promise a one-of-a-kind event and a well-deserved break from the daily routine. Further information on the congress and the registration can be found online at www.esci-online.com.

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Ceramic implants—Game changer in implant dentistry

On 10 and 11 May 2019, the 5th Annual Meeting of the International Society of Metal Free Implantology (ISMI) will take place on the premises of the Constance Clinic under the theme "Ceramic Implants—Game Changer in Implantology". Renowned speakers and participants will discuss practical experiences and current trends in the use of ceramic implants on both congress days. With its 5th annual conference, ISMI—founded in January 2014 in Constance, Germany—would like to push boundaries and offer new insights into a particularly innovative field of implantology. After a successful kick-off event in 2015, and the successful annual congresses in Berlin (2016), Constance (2017), and Hamburg (2018), ISMI returns to its place of origin and invites participants once again to Constance in 2019. The two-day event starts on Friday with a Pre-Congress Symposium, seminars and the broadcast of a live operation via the Internet. The highlight of the first congress day will be the ISMI White Night, taking place directly after the day's programme (hedicke's Terracotta) and offering participants a relaxed atmosphere with wine and music to wind down the day. On Saturday, which will be dedicated to scientific lectures, a wide range of topics will be presented and discussed, covering almost all areas of metal-free implantology. The Scientific Director of the conference will be ISMI President Dr Dominik Nischwitz.

ISMI was founded with the aim of promoting metal-free implantology as an innovative and particularly trend-setting field within implant dentistry. In this context, ISMI supports its members with training offers, as well as current tech and market information. In its public relations work, i.e. in specialist circles, as well as in patient communication, ISMI is also committed to a comprehensive establishment of metal-free implantological treatment concepts. ISMI members receive a 20 per cent discount on the congress fee.

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Scientific Director:

Dr Dominik Nischwitz | Germany

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CI 1/19

1st EACim congress to take place in June

The European Academy of Ceramic Implantology (EACim) is an independent non-profit organisation looking forward to sensitising health professionals on the use of biocompatible materials such as ceramics in dental implantology. The EACim was created by a group of practicing clinicians, teachers or speakers with a strong expertise in ceramic implants as an alternative to titanium implants. The objectives of the Academy are to spread and promote the practice of ceramic implantology in Europe in complete independence, to create spaces for sharing experiences and know-how with a European focus, and to offer professional training for surgeons to the use of ceramic implants, and general practitioners to the fabrication of ceramic implant-supported prostheses.

Members of the EACim will profit from meetings and trainings, scientific programmes, hands-on courses, seminars, and congresses in association with other events in Europe—all aimed at sharing knowledge and experiences. The Academy will also provide a database of scientific articles on data and long-term feedback, basic sciences in biomaterials, immunology and biocompatibility, clinical cases of implants and metal-free prostheses or restorations, as well as peri-implantitis issues.

The 1st EACim congress will take place on 28 June 2019 at the hotel Intercontinental Paris-Avenue Marceau in Paris, France, with the congress theme: “Ceramic implants: an alternative to titanium”. The event will be chaired by Dr Pascal Valentini, Co-Director of the Corsica University for the Implantology Diploma, Ass. Professor at Loma Linda University (USA), and Past President of the European Association of Osseointegration (EAO). Dr Jochen Mellinghoff, Doctor of Philosophy in Public Health, MSc Oral Surgery, lecturer and author, will be responsible for the moderation. A detailed programme can be found on the EACim website at www.eacim-ceramic-implantology.com.

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New frontiers in metal-free implant dentistry

The 8th Annual Congress of the International Academy of Ceramic Implantology (IAOCI) took place this past February in Tampa, Florida (USA). This year's theme was "New Frontiers in Metal-Free Implant Dentistry" and one of the main purposes was to once again bring clinicians, scientists, industry leaders, manufacturers and speakers together to exchange, discuss, share knowledge and information on the recent advances that have occurred in ceramic implantology.

In response to our rapid growth and the objectives of the academy, we sought the services of a professional dental event and association management company. We had seventeen exhibitors, eight of which were ceramic implant manufacturers; this is a world first in any implant meeting. We were excited about being able to facilitate and provide a business-to-business networking platform during this event where OEM ceramic manufacturers were matched with and able to come to agreements with businesses looking to develop or launch their own line of ceramic implants in the near future.

The event was a success as we reached our goal to provide a programme that was a good balance of scientific research and evidence, as well as clinical experiences from speakers lecturing on over ten different types of ceramic implants. This year we had our highest attendance ever with 130 dentists in attendance from four continents. They represented 27 countries, 38 US states including Hawaii. For the first time we were able to offer two-way simultaneous translation of the entire congress into English and Spanish. There was also great interest from exhibitors and sponsors as we surpassed our attendance goals; we even had to limit the number of exhibitors due to the limited space available. Relevant topics such as ceramic implant surface modification for optimal osseointegration, biological protocols to enhance the success and fast osseointegration of ceramic implants and macroscopic implant design concepts were expertly and extensively discussed.

Our 9th Congress in 2020 will be held in New Orleans, Louisiana, from 12 to 14 March 2020. One of our objectives is to further increase our ever-growing attendance and membership, introduce a metal-free implantology focused table clinics session and competition to our event. We want our members and others to come in and present their work and research. We are reaching out to young clinicians, residents, dental students and all that are interested to come and present their scientific and clinical projects. The Academy is growing very fast with a broad vision and objective; therefore, we would like to invite more dentists to become members, actively participate in the life, activities and growth of the IAOCI. As we witness a positive and growing interest in ceramic implants, we will be launching international chapters in 2019 and beyond in order to be able to serve and assist our members and supporters outside of North America. Please visit our website www.iaoci.com to see more information on our activities and upcoming events.

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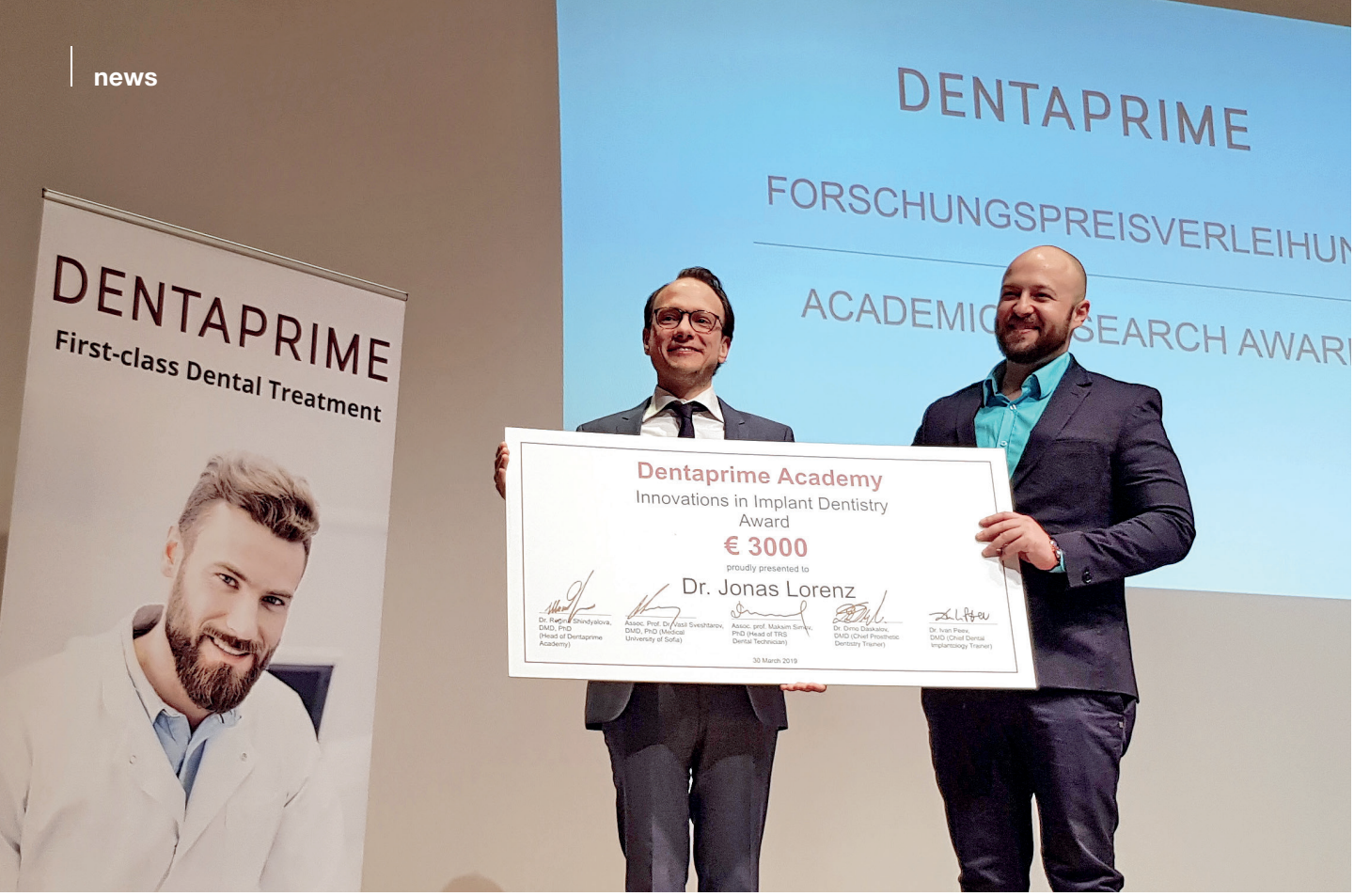


Dr Jonas Lorenz awarded with

Research Prize Dentistry

Since 2014, the Dentaprime Dental Clinic has been awarding the Research Prize Dentistry for outstanding scientific work focusing on dental implantology. On Saturday, 30 March 2019, Dr med. Dr med. dent. habil. Jonas Lorenz from the Clinic for Oral and Maxillofacial Surgery of the University Hospital (Frankfurt on the Main, Germany) received the prize for his work titled "Prospective controlled clinical study investigating long-term clinical parameters, patient satisfaction, and microbial contamination of zirconia implants". The aim of the prospective clinical study was to analyse dental implants made from zirconia, regarding their clinical performance compared to natural teeth. The study found that the investigated one-piece zirconia implants presented favourable long-term clinical results, comparable to natural teeth (SBI and PAL), and, regarding adhesion of plaque and creeping attachment (CR/REC), even superior. The full version of the study can be found online following the QR code.

clinical study

Source: Presseportal/Dentaprime

Strong focus on ceramic implantology

At 2nd DGZI Future Congress in October

On 4 and 5 October 2019, the German Association of Dental Implantology (DGZI) will host their 49th International Annual Congress as "2nd Future Congress for Dental Implantology" in Munich, Germany. The overriding aim of the event will be to provide top-notch practical education on the highest level and to bridge the gap between the latest scientific findings and industry innovations, with a view to the integration into the daily clinical practice of the latter. This year, there will be a focus on ceramic implantology on Friday with Germany-based Drs Dominik Nischwitz, Manuel Bras da Silva, Pascal Marquardt and Armin Nedjat presenting different practical approaches to the topic in their table clinic sessions. There, congress participants will have the opportunity to acquaint themselves with the subject matter by learning about different treatment protocols, performing surgical techniques (such as socket preservation, block augmentation and biological implantation), and discussing the various application possibilites of the "white implants" with the presenters on the basis of clinical case studies.

DGZI
Deutsche Gesellschaft für Zahnärztliche Implantologie e.V.

Contact: www.dgzi.de

Applications now open for the

Oral Reconstruction Foundation Research Award 2018/2019

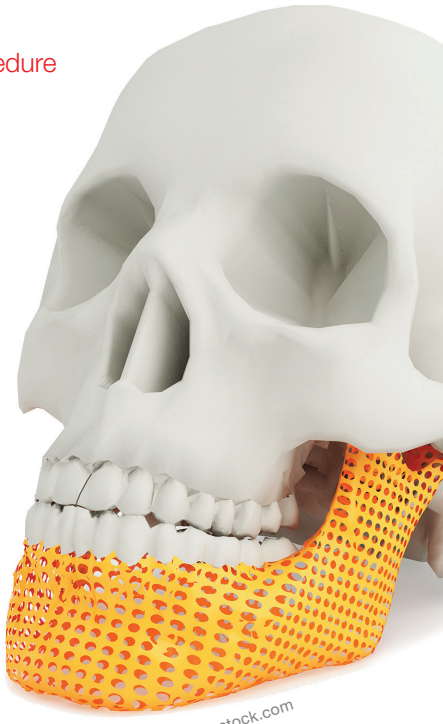
The Oral Reconstruction Foundation announced that it is now accepting applications for the 2018/2019 Oral Reconstruction Foundation Research Award, which is presented every two years and is open to all young, talented scientists, researchers, and dedicated professionals from universities, hospitals, and practices. Eligible scientific papers include those that have been published or accepted for publication in an English peer-reviewed journal that addresses one of the following topics in implant dentistry, oral reconstruction, or related areas: diagnostics and planning, hard- and soft-tissue management, sustainability of implant-supported prosthetics, physiological and pathophysiological aspects, or advances in digital procedures. The recipient of the Oral Reconstruction Foundation Research Award 2018/2019 will have the opportunity to present his or her work at the Oral Reconstruction Global Symposium, which takes place in New York City from 30 April to 2 May 2020. Furthermore, the authors of the three best contributions will receive prizes of EUR10,000, EUR6,000, and EUR4,000 respectively. To be considered a candidate for this award, visit www.orfoundation.org/awards to download the mandatory registration form and to review the eligibility requirements. The registration deadline is 30 November 2019.

ORAL RECONSTRUCTION FOUNDATION

Source: Oral Reconstruction Foundation

Novel Bone Augmentation Procedure

Successful for challenging cases



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Researchers from the Medical Center of the Goethe University Frankfurt (Germany) recently published a case study in the *Journal of Oral Implantology* that evaluates the use of a novel augmentation alternative in a former head and neck cancer patient. By using a combination of a xenogeneic bone substitute (BO) and platelet-rich fibrin (PRF), they were able to successfully perform an implantation in a severely compromised mandible. A 61-year-old female with cancer in her mandible was treated by a tumour resection in her jaw, as well as neck dissection on both sides, resulting in disfiguration to the lower jaw. The patient's blood was drawn, centrifuged and combined with the BO to fill an anatomy-specific three-dimensional titanium mesh. The titanium "cage" was made from a CT scan generated model of the patient's mandible. The mesh was placed at the involved surgical sight, and then covered with collagen matrix plus a final layer of PRF clots were used to cover the matrix. In this case study, researchers introduce an extremely promising new method of dental reconstruction in treating a severely compromised mandible in a patient recovering from head and neck cancer. The original article is titled "Individualized Titanium Mesh Combined with Platelet-Rich Fibrin and Deproteinized Bovine Bone: A New Approach for Challenging Augmentation" and was published in the *Journal of Oral Implantology*, Vol. 44, No. 5, 2018.

Source: Journal of Oral Implantology

Congresses, courses and symposia

5th Annual Meeting of ISMI

10–11 May 2019
Venue: Constance, Germany
www.ismi-meeting.com

1st EACim congress

28 June 2019
Venue: Paris, France
www.eacim-ceramic-implantology.com

EAO Congress 2019

26–28 September 2019
Venue: Lisbon, Portugal
www.eao.org

49th DGZI International Annual Congress— Visions in Implantology

4–5 October 2019
Venue: Munich, Germany
www.dgzi-jahreskongress.de

1. European Congress Ceramic Implant Dentistry

11–12 October 2019
Venue: Zurich, Switzerland
www.esci-online.com

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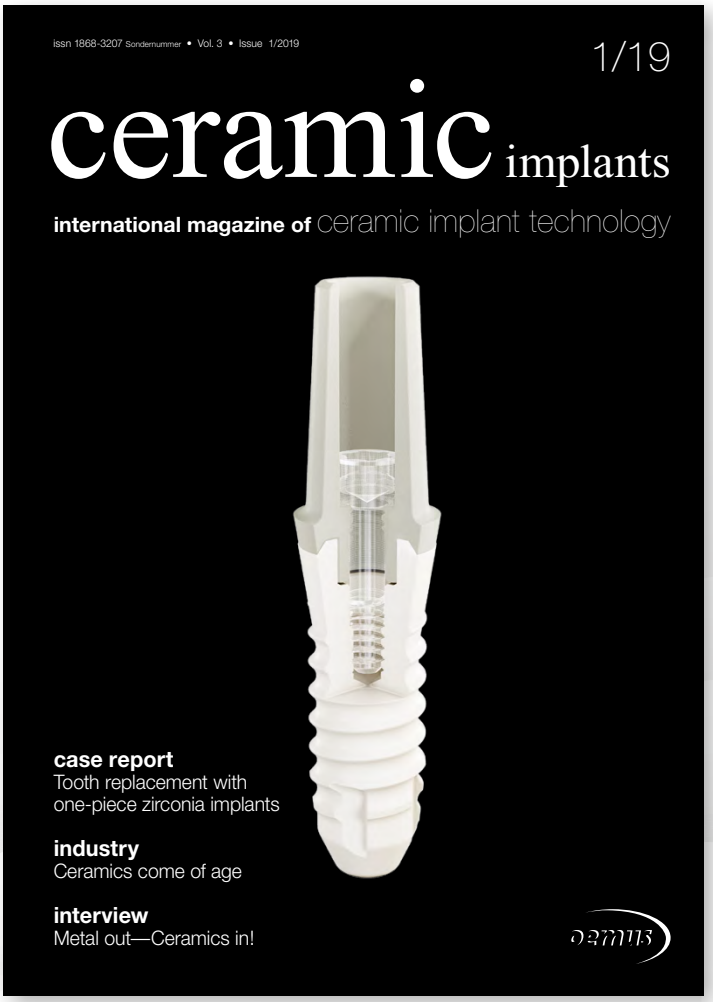

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