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Dear Reader,

It is a great honour and distinct pleasure to present the third 2013 issue of CAD/CAM to you! 2013 is a memorable year for dentistry. The 35th International Dental Show in Cologne in Germany will be remembered for the significant number of companies exhibiting upgrades and introducing new products in the field of CAD/CAM and digital dentistry. Countless booths with eye-catching designs and product displays demonstrated the latest trends and technological developments, including CAD/CAM chairside in the laboratory, computer-guided implantology, 3-D dental imaging, CAD/CAM materials, computerised orthodontics, digital impressions, software, management and education. IDS established that digital dentistry is no longer the future; it is already the present.

In this issue of CAD/CAM, you will find beautifully illustrated and well documented articles that report on CAD/CAM restorations, CAD/CAM lingual orthodontic system and implantology.

I am pleased to announce that the CAD/CAM is the official publication of the second Asia Pacific CAD/CAM and Digital Dentistry International Conference, organized by CAPP Asia, which will take place in Singapore on 4 and 5 October 2013. The event is already becoming a major platform for shaping the future of digital dentistry in the Asia Pacific region. It will attract the crème de la crème of opinion leaders in dentistry, who will be sharing their knowledge and experience with the world’s dental elite. The objectives of the main scientific session and the dental technicians’ parallel session will be to exchange valuable knowledge, to help cultivate a spirit of collaboration in the dental team, and to enable networking. These sessions are expected to spark heated discussions on the latest methods and techniques and on how to improve them, thus paving the way forward in dentistry. The exhibition will provide hands-on access to the latest digital dentistry systems. The event will facilitate direct interaction with the leading dental manufacturers, discussions on the scientific relevance of their products, and gathering of useful feedback from current and prospective users. It is from this valuable feedback that the companies taking part in the event will be able to develop their 3-D technologies further, with a view to best meeting the needs of the dental team.

We are proud to welcome to this year’s conference in Singapore some of the most exciting names in digital dentistry, who will be presenting papers during the conference: Dr Lutz Ritter, Germany; Dr Andreas Bindl, Switzerland; Dr Eduardo Mahn, Chile; Prof. Tae Weon Kim, South Korea; Morten Ryde, DT, Denmark; Joachim Maier, MDT, Germany; Dr Bernd van der Heyd, MDT, Germany; Werner Gotsch, MDT, Germany; Dr Chanchai Kingawattanagul, Thailand; Dr Simon Kold, Denmark; Dr Khaled Abouseada, Egypt; and Dr Kurt Dawirs, Germany. A parallel session targeted at dental technicians will be held on the second day of the conference, with presentations by Rik Jacobs, the Netherlands; Carsten Kelm, Germany; Ike Intoratat, Thailand; Barış Çakır, Germany; Christopher Adamus, DT, Poland; Simon Docker, UK; and Ralf Oppacher, MDT, Germany.

In December 2012, CAPP joined the elite group of international continuing medical education providers who are accredited by the American Dental Association. Hence, delegates attending can expect to enjoy cutting-edge presentations in the dental field and to benefit from top-quality scientific discussions.

The conference exhibition will be honoured by the presence of the leading dental manufacturers, including Sirona, Ivoclar Vivadent, 3Shape, DeguDent, Amann Girrbach, Wieland Dental, Roland DG, Dentegra, eCligner, all of which will be showcasing their latest masterpieces. There will also be other important industry players at the conference. We look forward to welcoming you to the vibrant city of Singapore.

Yours faithfully,

Tzvetan Deyanov
BDM & Business Partner CAPP & Dental Tribune Middle East & Africa
content _ CAD/CAM

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Despite the increasing popularity of the current CAD/CAM laboratory systems and continuing technical advances, some clinicians have remained reluctant to incorporate the very same CAD/CAM techniques into their clinical chairside practices. Two often-repeated misconceptions relate to the perceived lack of strength and lack of aesthetics of the ceramics available for use with these systems. A wide variety of materials are available to use with the E4D Dentist System (D4D Technologies), and each has a separate set of aesthetic and mechanical properties that must be considered. This article will review current materials and show clinical examples of restorations made using the E4D Dentist System.

One distinct advantage of chairside CAD/CAM is having the ability to make restorations in a single visit from a solid pre-manufactured block that is essentially flawless in construction. A pre-manufactured block is made in ideal conditions, and as a result, has an ideal density with none of the residual porosity found in many layered or pressed porcelains.

Porosities may act as a weak point and lead to the buildup of internal tensile stress in the ceramic and eventually cause a catastrophic failure. Monolithic restorations have several distinct advantages over layered restorations when it comes to mechanical properties. Layered restorations are often veneered with weak feldspathic glasses that can chip or break, especially if not supported properly by the framework.

Furthermore, one does not need to worry about delamination and micro-chipping of the veneering porcelain, which has been reported to be as high as 25 per cent for porcelain-fused-to-zirconium restorations.1 IPS Empress (Ivoclar Vivident) is a feldspathic glass with approximately 45 % leucite crystals for dispersion strengthening. The 5 µm leucite crystals improve strength and fracture toughness by acting as "roadblocks" to prevent crack propagation. IPS Empress is an aesthetic material and is available in polychromatic blended shades that give the restoration a layered appearance. Empress Multiblock has a flexural strength around 160 MPa and requires isolation and attention to detail when bonding to ensure long-term success.

IPS Empress has been on the market for approximately 24 years, and as a result, good clinical research on the longevity of these restorations exists in the literature. A literature review conducted by Brochu and El-Mowafy evaluated and summarized six clinical studies that met their inclusion criteria. They
concluded the survival rates for IPS Empress inlays and onlays ranged from 96 per cent at 4.5 years to 91 per cent at seven years. IPS Empress crowns had a survival rate ranging from 92 per cent to 99 per cent at three to 3.5 years.

For both crowns and onlays, most failures were due to bulk fracture. In general, IPS Empress has higher failure rates in the posterior than the anterior and higher fracture rates on molars compared with premolars. Therefore, IPS Empress is an excellent material choice in the anterior for aesthetically demanding patients. However, alternative materials exist for posterior use.

**Case presentation**

A new patient called the office and said his crown “exploded.” He presented to the clinic with the crown missing on tooth #9 (Fig. 1). The E4D Dentist System was used to make a digital impression of the preparation and the bite registration. Using the intuitive design features in the E4D software, a restoration was designed (Fig. 2). An IPS Empress CAD Multi A1 restoration was milled and characterized using IPS Empress Universal Stains. For delivery, the crown was prepared by etching with 4.9% hydrofluoric acid for 60 seconds and silanated for 60 seconds with Monobond-Plus (Ivoclar Vivadent). The tooth was pumiced; Optibond XTR (Kerr) was applied and cured for 20 seconds; and Nexus 3 resin cement (Kerr) was used to bond the crown (Fig. 3).

The use of IPS Empress has been selective partly because of the popularity of IPS e.max CAD (lithium disilicate). IPS e.max CAD comes in a lithium metasilicate state (blue colour) that is not fully crystallized but can be easily machined. The milled restoration is then placed in the oven for 19 to 26 minutes to crystallize the glass. During crystallization, the lithium metasilicate crystals are replaced with lithium disilicate crystals, increasing flexural strength from around 160 MPa to 360 MPa.

IPS e.max was introduced to the market in 2006. Gehrt and colleagues followed 104 IPS e.max crowns in 44 patients and found the corresponding survival rate for all restorations was 97.4 per cent after five years and 94.8 per cent after eight years of clinical service with location not significantly impacting survival rate. These results were for IPS e.max press restorations that were cut back and veneered. It

**Figs. 4–6** In this case, a patient who was not happy with the aesthetics of an amalgam restoration presented with recurrent caries on the mesial of tooth #13. The E4D Dentist System was used to make a digital model, and restorations were milled out of IPS e.max CAD HT A2 blocks.
can be hypothesized that monolithic chairside milled IPS e.max may perform better.

In a 10-year study, Kern et al. found three-unit fixed partial dentures (FPDs) made from monolithic lithium disilicate ceramic showed five- and 10-year survival and success rates that were similar to those of conventional metal-ceramic FPDs. They concluded that for the monolithic lithium disilicate FPDs, the calculated survival rate was 100 per cent after five years and dropped to 90.8 per cent (when considering only catastrophic ceramic fractures) and 87.9 per cent (when considering catastrophic ceramic fractures and biological failures) after 10 years. It is interesting to note that all catastrophic failures occurred in molars. Single-unit monolithic IPS e.max can be expected to perform better than FPDs in this study.

Interestingly for both clinical studies mentioned, the restorations that were conventionally cemented performed just as well as those that were bonded. Therefore, assuming proper retention and resistance form has been achieved, it is acceptable to conventionally cement monolithic IPS e.max restorations.

Because of the incredible flexural strength of IPS e.max, some clinicians were concerned that IPS e.max may be aggressive on the opposing dentition. In a clinical study, Silva et al. found IPS e.max to be more gentle on the opposing enamel than feldspathic ceramics with a wear rate on enamel similar to natural definition. Chairside CAD/CAM allows the clinician to predictably provide more conservative restorations, such as IPS e.max inlays and onlays, that have a longevity similar to full coverage crowns. The advantage to onlays over crowns is the conservation of healthy tooth structure and subsequent prolonging of the tooth’s life cycle.

Chairside milled onlays are an ideal restoration compared with direct resins. Despite their popularity, large posterior resin-based composite (RBC) restorations last only six to seven years. RBC restorations have poor clinical longevity, higher recurrent caries and greater need for replacement compared with the alternative, high-copper amalgam.

Amalgam and cast gold are not a popular option for many patients because of aesthetic concerns, and an E4D onlay restoration is the ideal treatment for many patients who refuse these alternative treatments. Milled inlays and onlays have been shown to be very successful.
One study found a success rate of 90.4 per cent after 10 years with older feldspathic ceramics as well as older milling and design technology.18

In this case, the patient was not happy with the aesthetics of the amalgam restorations, and she had recurrent caries on the mesial of tooth #13. The E4D Dentist System was used to make a digital model, and the design software proposed well-contoured, anatomical restorations that were milled out of e.max CAD HT A2 blocks. For delivery, the restorations were prepared by etching with 4.9 % hydrofluoric acid for 20 seconds and silanating for 60 seconds with Monobond-Plus (Ivoclar Vivadent). The tooth was pumiced clean; Optibond XTR (Kerr) was applied and cured for 20 seconds; and Nexus 3 resin cement (Kerr) was used (Figs. 4–6).

Despite the benefits of onlays, single-unit crowns are still the preferred restoration for the general dentist, and the E4D Dentist System fabricates excellent restorations with a short learning curve. With the strength of IPS e.max, predictable restoration of second molars using the E4D Dentist System is possible (Figs. 7–9).

Once the learning curve of single-unit restorations is mastered, it will not be long before the benefits of the E4D Dentist System become apparent for more complicated cases. A 37-year-old male presented for a consult for dentures. He had been to several dentists and an immediate denture was the treatment plan he had selected. He presented with severe acid erosion and abrasion from a combination of gastroesophageal reflux disease (GERD) and bruxism (Figs. 10 & 11).

Occlusal examination revealed a lack of anterior guidance and posterior support. The lateral pterygoids were sensitive to palpation, and upon visual examination it was noted that he had hypertrophic masseters. Lip commissures were folded and he appeared to have a collapsed vertical dimension of occlusion (VDO). He did not close in a repeatable position and had a severe anterior deviation from centric relation.

When evaluating the location of the gingival margins it was determined that compensatory eruption had taken place. However, based on the closest speaking space during the production of sibilant sounds, the patient had excess freeway space.

It was determined that the patient lost vertical dimension of occlusion, and therefore compensatory eruption did not keep up with the rate of erosion. Two centric-relation (CR) records were made using bimanual manipulation, a custom triad jig and a rigid bite material. The case was mounted on a semi-adjustable articulator in centric relation and the mounting was verified with the second CR record.

It was decided (based on freeway space, aesthetics and phonetics) that to recapture the lost VDO the patient needed to be opened 2.5 mm in the anterior; this correlated to around 1 mm in the posterior. A diagnostic wax-up was made. The teeth were prepared and temporized based on the diagnostic wax-up (Figs. 12 & 13). The patient was kept in temporaries for six weeks to verify tolerance of the new vertical dimension, phonetics (particularly “F” and “S” sounds) and CR.

In the provisionals, anterior guidance was established with no balancing interferences during lateral excursive movements. CR was stable and at the end of the six-week trial period the patient was pain-free upon palpation of his lateral pterygoid muscles, Figs. 12 & 13. After a diagnostic wax-up was made, the teeth were prepared and temporized.

Fig. 14. The E4D Dentist System clone feature copies the occlusion and anatomy of the temporaries exactly.
and the provisionals did not show signs of malocclusion, such as fracture or accelerated wear. His central incisors were hitting just inside the wet-dry line of the lower lip during “F” sounds. During “S” sounds, the closest speaking space, the patient’s maxillary and mandibular anterior teeth did not touch.

Once verified, a vinyl polysiloxane (VPS) impression of the temporaries was made along with a bite registration. At this point, centric relation was equal to maximum intercuspal position (MIP). The E4D Dentist System’s clone feature copied the occlusion of the provisionals exactly (Fig. 14).

The software, DentalLogic, allows the clinician to superimpose the provisional “clone” model over the restoration design to determine accuracy (Fig. 15). One of the most powerful features of the software is the ability to turn the clone model clear and analyze how accurately the software has copied the anatomy and occlusion. The accuracy of this is within microns and an intuitive colour map displays the discrepancy that exists between the temporaries and the final crown design (Fig. 15).

The restorations were milled and prepared by etching with 4.9% hydrofluoric acid for 20 seconds and silanating for 60 seconds. The tooth was then pumiced, curing solution applied and cured for 20 seconds. The restoration was then ready for cementation.

The occlusion was identical to the provisional and thus no adjustments were needed on the day of delivery. With the option now to use IPS e.max HT, this case had a better aesthetic result because the LT block appears slightly monochromatic and opaque.

**Summary**

Dental patients typically want tooth-coloured indirect restorations; and with the newer ceramics that are available for chairside milling, the same high-quality ceramic restorations that labs are producing can be fabricated in a single appointment.

With a chairside CAD/CAM system, large, technique-sensitive and inferior direct resins require less treatment planning because milled IPS e.max onlays can take their place. Chairside CAD/CAM dentistry is not the only way to provide patients with high-quality restorations, but it certainly is the most exciting from both a clinician’s and patient’s viewpoint.

Multiple-visit, single-unit restorations; single-unit temporaries; difficult resins; expensive monthly fabrication fees; and bonding restorations after weeks of contamination with temporary cement and saliva is routine for most dentists who have not invested in CAD/CAM technology. The old adage “what you don’t know you don’t miss” holds true.

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

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**Dr Wally Renne, DMD**, is a 2003 graduate of the College of Charleston and a 2008 graduate of the Medical University of South Carolina (MUSC) College of Dental Medicine. He is active in undergraduate dental education and holds a full-time faculty position in the department of oral rehabilitation at MUSC. He is the course director for CAD/CAM technologies and ceramics and runs the E4D CAD/CAM clinic at MUSC. Dr Renne maintains an active general dentistry practice utilizing both the CEREC AC and E4D Dentist System. His special interests in patient treatment include advances in CAD/CAM dentistry, adhesive dentistry and conservative dentistry. He is active in dental research and currently has a patent pending for a new dental adhesive that is permanently antimicrobial and has revolutionary bond durability components that prevent enzyme degradation of the hybrid layer. This bonding agent may prevent recurrent caries and bond breakdown in the long term.
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Using in-office CAD/CAM technology and lithium disilicate to fabricate efficient and predictable restorations

In today’s fast-paced world, instant gratification is expected to be synonymous with worthwhile results. This also applies to dental treatments. While there have been many recent technological innovations specifically for chairside restorations, dentists have faced complications when mastering complex and time-consuming protocols.

The E4D Dentist System (D4D Technologies) eliminates those obstacles by providing outstanding clinical results in a single visit using intuitive, efficient and state-of-the-art technologies.

The E4D Dentist System’s three-dimensional software simplifies designing and milling multiple restorations. This provides dentists with more control over the aesthetic process. The E4D in-office CAD/CAM system is equipped with a high-speed intraoral laser scanner for capturing digital impressions, which provides restorations with better-quality fit and function because it incorporates intraoral digital impressions, traditional impressions and models.

The E4D Dentist System streamlines work for dentists, who gain the enhanced confidence of producing reliable restorations for every patient case. Meanwhile, patients receive both enhanced and more efficient care with faster treatment times.

Contributing to efficiency and accuracy is the E4D design software, which facilitates required modifications to finalize restorative designs in record time.

Restorative designs are then sent to the E4D precision milling unit, which incorporates dual spindles and diamond burs to efficiently form CAD materials into restorations that exhibit exceptional fit, maximized strength and lifelike aesthetics. In fact, restorations fabricated using CAD/CAM processing have demonstrated less chipping or fracturing, which enhances the predictability of the restoration.

Among the materials that can be processed chairside with the E4D Dentist System is lithium disilicate (IPS e.max CAD, Ivoclar Vivadent), which is available for processing CAD/CAM restorations indicated for placement in the anterior and posterior.

Author: Dr John C. Schwartz, USA

Fig. 1. A preoperative, buccal view of the patient’s smile revealing unsightly crown margins and gold restorations.

Fig. 2. Preoperative occlusal view of the patient’s unsatisfactory restorations.

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The material is also indicated for an assortment of dental procedures, including partial and full coverage inlays and onlays, thin veneers (0.3 mm) and implant superstructures. Lithium-disilicate glass ceramic trumps traditional ceramic materials because of its durability and high flexural strength values.

**Case presentation**

A 55-year-old woman presented requesting removal of the maxillary left bicuspid and molar crowns. Their unsightly margins and the gold restorations were visible in her smile (Figs. 1 & 2), and the patient had grown weary of their unsettling and lacklustre appearance. Her goal was to whiten her dull-looking teeth in order to reflect the brighter colour of her natural anterior dentition.

In-office CAD/CAM restorations (IPS e.max CAD) were discussed with and agreed to by the patient. The optical qualities of IPS e.max CAD, which include a fairly low refractive index, optimal light transmission and lifelike translucency, would provide natural appearing and highly aesthetic restorations.1 2

**Preparation and digital impression taking**

The existing crown restorations were removed and the teeth were prepared for IPS e.max CAD crowns. Preparations included a 2 mm occlusal reduction and a 1–1.2 mm shouldered margin. A scan was performed of the patient’s arch and prepared teeth, and the margins were identified (Fig. 3).
Digital restoration creation

The autogenesis feature in the E4D Dentalogic intuitive software was used in conjunction with E4D CAD proposals (Fig. 4), which incorporated images of the buccal and occlusal aspects (Figs. 5 & 6) and contact intensity (Fig. 7).

The restorations were designed and then sent to the E4D milling unit, where lithium-disilicate high translucent (HT) blocks (IPS e.max) were milled. After completion, the monophasic crowns were first tried in the patient’s mouth to appraise fit, contour and anatomical harmony, then crystallized.

Customization

The restorations were removed from the furnace, then cleaned and dried. To fulfil the patient’s desired goal of having a more natural coloured smile, the restorations were appropriately stained and glazed. The ideal shade stain was placed on the tip of a hygienic brush and applied to the restorations.

Once staining was complete, the crowns were fully crystallized and fired. The case was ready for seating using universal cement (Multilink, Ivoclar Vivadent).

Cementation

Lithium-disilicate glass ceramic restorations (IPS e.max CAD) can be traditionally cemented or bonded adhesively. As a result, any restrictions that may be presented due to placement or location within the mouth are eliminated.4, 5

The internal aspects of the crowns were cleaned with Ivoclean and etched with Ceramic Etching Gel. The Ceramic Etching Gel was applied for 20 seconds, rinsed with water and dried in preparation for silanating using the Monobond Plus Primer (Fig. 9).

The Monobond Plus Primer was applied with a microbrush for 60 seconds to the internal surfaces of the restorations to ensure a sound bond between the restorations and cement, as well as increase bond strength (Fig. 10). Excess primer was air dried.

The solution was then applied to the prepared teeth and allowed to sit for 40 seconds. The Multilink A&B solution (Fig. 11) was air blown gently to remove excess. Note that the patient’s surrounding gingival tissues may turn white temporarily (Fig. 12).

Fig. 10. The Monobond Plus Primer was applied with a microbrush for 60 seconds.

Fig. 11. The preparations are cleaned and three drops each of Multilink A&B solution are mixed in a well.

Fig. 12. Excess Multilink A&B solution is air blown gently to remove excess.

Fig. 13. Multilink Automix cement is loaded into the crowns.
Next, the internal aspects of the IPS e.max CAD crowns were loaded with Multilink Automix (Ivoclar Vivadent) (Fig. 13) and seated on both the maxillary left bicuspid and molar with slight pressure applied. The “wave” technique was then used to cure the excess cement to a gel-like state, which enabled easy removal (Fig. 14).

By incorporating the essential components of smile design and accurate scanning, the E4D Dentist System helps to ensure the accuracy and predictability of resulting restorations.

When milled from highly esthetic lithium-disilicate blocks (IPS e.max CAD), the restorations enable dentists to provide exceptional treatments tailored to the patient’s authentic esthetic characteristics.

Excess cement was removed from interproximal and cervical areas using a microbrush, after which complete polymerization was achieved by curing from the buccal, lingual and distal aspects.

**Conclusion**

The combination of lithium-disilicate blocks (IPS e.max CAD) and the E4D Dentist System is a state-of-the-art material and technology solution that enhances the predictability, aesthetics and ease-of-use of in-office CAD/CAM procedures. Restorations completed with this complementary combination demonstrate excellent fit, function and aesthetics (Figs. 15 & 16). As a result, dentists can provide progressive, one-day treatments to patients, eliminating more invasive and time-consuming procedures that can require multiple appointments.

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

**Fig. 14.** The crowns are seated and the Wave technique used to facilitate easy cleanup of excess cement.

**Fig. 15.** Postoperative, buccal view of the patient’s restored smile, complete with more natural looking IPS e.max CAD lithium-disilicate crowns.

**Fig. 16.** Postoperative occlusal view of the final chairside fabricated E4D restorations.

(Photos courtesy of Dr. John C. Schwartz)

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As a full-time general dentist, CAD/CAM technology is a subject that has been of significant interest to me. I incorporated CAD/CAM into my practice more than 10 years ago and have been a proponent of the technology and its efficiency ever since.

I began with CEREC 3, and then graduated to CEREC 3D. After successfully incorporating 3-D technology into my practice, I was excited to see some new faces emerge in the CAD/CAM marketplace. E4D, Itero and Lava COS were all options to consider for digital capture, but only the E4D Dentist System and CEREC offered both scan and mill capability in the office.

When the time was right for me to upgrade to the newest technology, the E4D Dentist System by D4D Technologies was just a better fit—literally and figuratively. The software, support, training and results were more in line with my practice goals and vision, and I felt more confident in the longevity of the hardware. While both systems can produce high-quality restorations, I felt that I would be better supported in achieving restorative success with the E4D Dentist System. I made my decision to switch late in 2010 and have never looked back. Since then, research and development in CAD/CAM restorative materials have exploded. We have a wide variety of material options to choose from to meet all of our restorative and aesthetic demands.

My peers routinely ask me about how to use technology most effectively to cope with rising costs and lower margins. I often answer by suggesting that they incorporate chairside CAD/CAM into their practices. I am confident that chairside CAD/CAM is the future of restorative dentistry, not only from a clinical perspective, but also in terms of profitability and marketing.

Simple economics

Over the last five years, my practice has doubled in revenue. In 2010 it grew 18 per cent while other practices were struggling to break even. It consistently produces more than $1 million on a four-day work week, with an average collection rate of 98 per cent. It maintains an overhead of about 55 per cent and normally attracts more than 30 new patients per month.

Fig. 1. Tooth #2 before.
Fig. 2. Tooth #12 after (same-day IPS e.max).
I am able to do all of this while participating with more than 15 preferred provider organizations (PPO), as well as several reduced-fee plans and two union plans. I attribute the success of the practice to five key factors (Table 1).

Although every factor plays a critical role in the growth and success of a practice, technology has the most significant impact on my practice’s ability to generate high-quality restorative dentistry in a more efficient and less stressful way. My practice utilizes networked office management software with computers in every operatory, office and support area.

In addition to digital radiography, we regularly use intraoral cameras, diode and erbium lasers and, most importantly, chairside CAD/CAM technology. Our ability to provide high-quality dentistry with ease and efficiency relies on the integration and utilization of all of these different technologies, with CAD/CAM being at the centre of our restorative treatment appointments.

The decision to purchase and implement new technology can be challenging. In a PPO practice, where fees can be as much as 30 per cent lower than in a fee-for-service office, the decision can be even more intimidating. With a lower potential profit margin, added capital expenditures can have more of an impact on your bottom line.

I considered several factors when choosing to add CAD/CAM to my technology armamentarium. Quality, fit and durability of the restorations were the primary focus of my clinical decision. The profitability, practical application and return on my investment were the primary focus of my business decision.

**Control and aesthetics**

Aesthetics was a significant concern as well. Would I be able to achieve optimal aesthetics with the available materials with same-day CAD/CAM dentistry?

Would the materials available offer enough variety to handle complicated aesthetic challenges?

After I completed some additional clinical training in CAD/CAM aesthetics, including staining and glazing IPS Empress and IPS e.max ceramic (Ivoclar Vivadent), and now the simplified polishing of LAVA Ultimate (3M ESPE), I was surprised by how easy it was to achieve great aesthetics. I now find myself tackling the more challenging cosmetic cases on my own because I have more control when characterization is done chairside.

The E4D Dentist System also offers the option to have your restorations designed and/or milled offsite using the E4D SKY network. For an additional fee, you can actually send your scans to D4D Technologies to expert designers to have your designs or milling completed if you choose. This is a great service for dentists who are new to the technology, are just getting into more advanced restorative/cosmetic cases or want to maximize utilization while still keeping a full schedule.

In addition, the E4D Dentist System (DentaLogic Version 4.5) can import and export open file for...

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Table 1. Five key factors to practice success
mats (.stl), providing additional options for utilizing a variety of digital services from laboratories and services through the E4D Sky network.

Not only can it match the esthetics, strength and durability of traditional indirect restorative methods, but CAD/CAM technology can also provide a significant and immediate financial advantage over traditional impression-based dentistry. It allows a dentist to produce and deliver restorations in one visit.

It reduces overhead by eliminating external fabrication fees and it reduces material costs associated with impressions and provisionalization as well reducing chairtime.

_Scheduling same-day dentistry_

Every patient visit costs a practice time and money. Each time a patient is seated we use perishable goods, expend valuable chairtime, utilize staff time and must track and manage scheduling.

The average crown delivery visit requires 30 minutes of chairtime and costs a practice more than $50 in overhead expense.

It is critical to maximize the efficiency with which you provide dentistry in order to remain profitable, and one visit is more efficient than two. The economics of single-visit vs. multiple-visit indirect restorative dentistry is obvious and impactful.

In addition to an increase in total profit and hourly productivity, the dentist has 30–45 minutes of additional down time to produce more dentistry, provide hygiene exams and perform administrative duties.

Beyond the financial return on investment are the intangible and immeasurable benefits that same-day dentistry provides. If a patient does not need a temporary, he or she is certainly less likely to call you over the weekend to have the temporary re-cemented.

If a second visit is not necessary to insert a restoration, then the potential of cancelling, changing or not showing for the appointment is eliminated. This reduces stress and opens up valuable time in your schedule to produce more dentistry profitably.

_Marketing same-day dentistry_

Whenever I am speaking with dentists or team members about practice management and increasing production, marketing strategies invariably become a topic of discussion. I usually suggest that the best marketing techniques focus on addressing the concerns that our patients have regarding dentistry.
Fear, money, time and discomfort are common barriers to dental treatment. CAD/CAM addresses the issue of time quite well, but for most patients every dental visit represents time away from work, family members or other important tasks. By providing same-day restorative treatment you are saving your patients precious time.

People don’t like going to the dentist. It’s not personal. It’s just not pleasant. Have you ever had a colonoscopy? Not a great memory. Now imagine the thought of a colonoscopy that took not one, but two visits and required you to “wear a temp between each visit that may fall out.”

It is much easier for patients to accept treatment if they can fit it into their budget, as well as into their schedule.

Show patients that you value their time and that you have made a significant time/money investment in your practice in order to facilitate the ease and efficiency with which you can provide treatment, and I will show you a great marketing strategy.

Not only is time a major deterrent to treatment acceptance, but so is fear. When patients are told that they need a crown, these are the thoughts and images that come to mind: An awful tasting impression materials or temps that fall out during an important meeting. Ugly gray lines near the gum lines around old crowns. Think about how powerful a marketing tool it is to be able to tell them that in your practice:

- they don’t need any impressions,
- they don’t have to wear a temp,
- there is no metal under the crown so they won’t have gray lines,
- and the entire procedure can be done in one visit, during which they will have 30–45 minutes to catch up on work, return e-mails or just relax and watch TV (I have TVs in all of my operatories).

When that patient leaves with a brand new crown and goes back to work or out with friends, he (or she) is going to talk about what a wonderful and convenient experience he just had in your office. “No, I don’t have to go back. My dentist can do crowns in one day.” That’s how to market your practice, and the results that you see will far outweigh the financial concerns that are preventing you from making a huge leap forward and a difference in your dentistry.

Although the decision to implement new technology into your practice can be stressful and challenging, reduced productivity due to outdated technology should be of greater concern.

Make an investment in your office, your team and your practice, and the results that you see will far outweigh the financial concerns that are preventing you from making a huge leap forward and a difference in your dentistry.

Matthew Krieger, DDS, is a 1998 graduate of New Jersey Dental School. He completed a GPR at Mt. Sinai Hospital in New York City. He started his practice in 2003 and built it into a full-time practice in just one year. He has consistently grossed more than $1 million since 2006. In addition to running a full-time private practice, Krieger is the founder and CEO of Symposia C.E., and he serves as a practice efficiency consultant with High Performance Dental Consulting. Krieger maintains more than 500 hours of C.E. credits and continues to expand his knowledge in dental practice management.
Non-extraction treatment of a Class II case with a missing mandibular central incisor using a CAD/CAM lingual orthodontic system

Author_ Dr. Khaled M. Abouseada, Saudi Arabia

The Incognito appliance is manufactured using state-of-the-art CAD/CAM technology. The first step in the fabrication process is taking accurate polyvinyl siloxane impressions and bite registration using polyvinyl siloxane, and then creating a model in plaster and a diagnostic wax-up thereafter (according to my direct instructions). The final model is then sent to me digitally for feedback, and I can make a series of changes until I am satisfied with the final result. The final model is then scanned with a 3-D scanner and the brackets are designed on the computer.

The bracket and archwire system consists entirely of individualised components. The bracket bases and bodies, the position of the bracket body on the bases, the bracket-slot orientation (ribbonwise), the direction of the archwire insertion (vertical or horizontal) and the archwire geometry are all individually adjusted to each tooth, according to malocclusion and the orthodontist's instructions. Rapid prototyping tech-
Technology is used for the manufacturing of the lingual brackets. The braces are then cast from gold alloy, mounted in a flexible indirect bonding tray, and shipped out ready to be bonded. Direct bonding is feasible too, owing to the extended individual bases.

Bending archwires is one of the most difficult tasks in orthodontics. In this system, computer-operated bending of archwires using robots is used to manufacture precisely shaped archwires. Even super-elastic archwires can be precisely shaped. This helps solve three major problems in lingual orthodontics:

1. Patient discomfort during the adaptation phase: The appliance is designed to be as flat as possible, not much higher than a bonded retainer; this significantly improves patient comfort.
2. Difficulties in re-bonding: The customised bracket base covers the major part of the lingual tooth surface and therefore allows direct re-bonding without the need for any other positioning aids.
3. Inaccuracies in finishing: Inaccuracies of the slots due to production and resulting variation in torque play are now part of the past, owing to Incognito. Measuring rates show divergences of not more than 0.008 mm between the slots. The precisely shaped archwires also make high-standard finishing easily achievable.2, 3

Figure 1 shows the different steps in manufacturing braces with the Incognito system.

This case report describes the treatment of a patient with a skeletal Class II malocclusion due to a retrognathic mandible and protrusive maxilla. He also had a congenitally missing mandibular left central incisor. The extraction of a single mandibular incisor can be employed as a compromise treatment of certain malocclusions if the end result fulfils the requirements for a healthier dentition that is functionally and aesthetically harmonised in relation to the surrounding structures.4 In this case, one of these incisors was missing so extraction was not necessary.

The Class II malocclusion was corrected by non-extraction orthodontic treatment with a CAD/CAM fixed lingual appliance (Incognito). The Class III molar relationship had not changed at the end of treatment, but a Class I canine relationship was achieved and the facial profile improved owing to improvement in the position of the mandibular incisor in relation to the mandibular plane, which affects the position of the lower lip.

_Diagnosis and aetiology_

The patient was male, aged 23 years and 9 months, and had the chief complaint of crowding of the maxillary and mandibular anterior teeth. He had Class III canine and molar relationships on both sides, a 2 mm overjet, a 4 mm overbite, a missing mandibular left central incisor, the maxillary midline was coincident with the midsagittal plane, the mandibular midline was shifted to the left, the maxillary dental arch had about 7 mm of crowding and lower dental arch had 8 mm of crowding, excluding the width of the missing mandibular
incisor, and the maxillary lateral incisors were in crossbite (Fig. 2). According to cephalometric analysis, there was a Class II jaw relationship and normal vertical facial height. The patient was in good health and his medical history showed no contra-indications to orthodontic therapy (Fig. 3).

_Treatment objectives_

The treatment objectives included correction of the maxillary and mandibular crowding, improvement of the dentoalveolar and maxillomandibular relationships, improvement of facial aesthetics, and establishment of a stable occlusion and better smile.

_Treatment alternatives_

Three treatment options were suggested to the patient. The first alternative entailed labial orthodontics using either metal or clear brackets. The second option entailed lingual orthodontics, as the aesthetic demand was very high for the patient and clear aligners would not have been able to achieve the needed results. Both options 1 and 2 were non-extraction. The third option was to extract all four first premolars but this would have affected the facial profile negatively. After detailed discussion with the patient, we chose option 2, non-extraction using a lingual appliance.

_Treatment progress_

Treatment began with customised, pre-adjusted, CAD/CAM fixed lingual appliances (0.5588 mm slots) placed on both the maxillary and mandibular arches using an indirect bonding technique. Levelling, alignment and expansion of the arch were achieved using heat-activated, super-elastic, customised wire (14, 16, 16 x 22; and 18 x 25). Detailing and finishing were performed using 16 x 22 stainless-steel wire and 18.2 x 18.2 Beta III Titanium Archwire. The total active treatment time was 17 months. Patient compliance was good. For retention, fixed maxillary and mandibular retainers were provided, as well as an Essix retainer at night.

_Treatment results_

The post-treatment extra-oral photographs showed general improvement in the facial profile. The post-treatment intra-oral photographs showed satisfactory dental alignment, Class I canine and Class III molar relationships, and a normal overbite and overjet. In addition, the maxillary and mandibular incisors had a normal inter-incisal angle due to the interproximal reduction in the maxillary arch. In Figure 4, we can see how accurate the model was compared with the final treatment outcome for both arches. At the end of treatment, a normal morphological and functional occlusion was obtained, with anterior guidance in lateral and protrusive excursions. Class I canine relationships were obtained on both sides. The good interdental relationship also provided a well-balanced facial profile with lip competence.

_Discussion_

The treatment objectives were attained with the non-extraction treatment protocol using a
case report CAD/CAM lingual orthodontic system

CAD/CAM lingual system. Obviously, the results reflect the effects of not only the proclination of the mandibular anterior teeth, but also the relief of crowding in both arches and the accuracy of the model in reflecting the final result (Fig. 5). We still had to perform interproximal reduction in the maxillary arch to achieve a normal overbite and overjet, with the canines in a Class I relationship. Another treatment option would have been to extract the maxillary and mandibular first premolars. However, this was not a favourable treatment alternative owing to its negative effect on the facial profile.

Performing lingual orthodontic treatment for each patient in the average orthodontic office is now a reality. The treatment results are of a high level, and all our patients may benefit from an invisible appliance. Former problems, such as discomfort, speech alteration, finishing inaccuracies, and particular tooth anatomy, can be overcome in this manner.5

The extraction of the mandibular incisors constitutes a therapeutic alternative in treating certain anomalies. It is not a standard approach to symmetrically treating most malocclusions, but the therapeutic aims must be adjusted in certain clinical situations to individual patient needs, even when this means that the final occlusion achieved is not ideal. The deliberate extraction of a mandibular incisor in certain cases allows the orthodontist to improve occlusion and dental aesthetics with minimal orthodontic treatment. In all cases, however, a diagnostic cast is required to predetermined the occlusal possibilities precisely.6

Conclusion

The key to success in lingual orthodontics in terms of both professional and patient satisfaction is practice and training. The Incognito system can be used for all types of malocclusions with the same precision as labial braces.

The possibility of incisor extraction should be a part of every clinician's portfolio of treatment techniques. If it is planned carefully and executed properly, incisor extraction can be an effective way of satisfying a particular set of treatment objectives.

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

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Immediate restoration in the edentulous mandible

According to the Maló procedure using the CAMLOG Guide System and Vario SR abutments

Author: Dr Ferenc Steidl & Sebastian Schuldes, Germany

The Vario SR prosthetic components for fixation of implant-supported occlusally screw-retained restorations were used in this case to treat neuropathic pressure-indicated facial pain. The 66-year-old patient came to our practice for the first time in May 2010 complaining of persistent pain in the right mandible. The pain intensified when the complete mandibular denture was inserted. However, pronounced pain continued even after several days of not wearing the prosthesis. The intensity of the pain varied between 6 and 10 on the visual analogue scale.

The following diagnosis was made:

- severe mandibular atrophy;
- crestal position of the bilateral mental foramina;
- chronic neuralgiform facial pain in regions 43 to 45—the trigger point indicated the mental foramen region.

Treatment planning

The patient had been treated with two one-piece diameter-reduced implants in regions 31...
and 43, as well as a complete mandibular denture anchored by ball abutments (Figs. 1 & 2).

After extensive counselling and discussion, we opted for a temporary fixed mandibular restoration on four implants with simultaneous explanation of the existing implants.

Benefits of the selected restoration concept:

- explantation, implantation and immediate restoration in one sitting;
- a high level of safety owing to 3-D implant planning;
- durable temporary restoration with CAD/CAM high-performance plastic;
- precision template-guided implantation with the CAMLOG Guide System;
- high patient satisfaction with fixed screw-retained immediate restoration.

_Pre-implantation planning_

Because the existing denture satisfied the basic aesthetic and functional requirements, the given situation was reproduced in plastic containing barium sulphate according to backward planning. The desired prosthetic was fabricated from clear plastic with a titanium reference pin for the scanning template (Fig. 3). In order to make the prosthetic tooth axis visible in the CBCT scan, holes were drilled through the radiopaque teeth in the axis (Fig. 4).

The DICOM data was then read into the coDiagnostiX implant planning system (Straumann). Computer-supported analysis offers the possibility of accurate diagnosis and planning the implants in agreement with anatomical and prosthetic requirements (Figs. 5a & b). Positioning of the terminal implants at an exact 30-degree angle is a crucial requirement for the success of this treatment (Figs. 6 & 7).
case report guided surgery

Fabrication of the drilling template and immediate restoration

The position of the implant determined during 3-D implant planning was transferred to the drilling template in the dental laboratory using the gonyX coordinate table. The guiding sleeves with depth stops from the CAMLOG Guide System were precisely bonded on to the scanning template, thereby converting the scanning template into a drilling template (Fig. 8).

In order to fabricate the immediate restoration, a model was required. Corresponding cavities were incorporated into the cast (Fig. 9). The CAMLOG Guide insertion posts were then used to insert the laboratory analogues into the cast (Fig. 10). It was important here to position the insertion posts with the screw-retained laboratory analogues according to the required cam alignment Fig. 11). Figures 12 and 13 show the Vario SR abutments and Vario SR titanium caps on the cast.

A laser scanner was then used to digitise the cast (Fig. 14). In order to simplify the CAD of the immediate restoration, it made sense to superimpose the desired prosthetic situation defined by backward planning over the existing situation (Fig. 15). The design was created with DentalDesigner (3Shape; Figs. 16 & 17). After a suitable milling strategy had been determined, the data was transferred to a five-axis milling machine. A tooth-coloured PMMA blank was used as the material of choice (Figs. 18–20).

In contrast to traditionally fabricated temporary solutions, CAM-fabricated immediate restorations distinguish themselves by their high resistance to fracture. This property is an important technical requirement for complication-free function of the restoration. In order to achieve pleasing aesthetics, gingiva-coloured...
plastic was used (Figs. 21 & 22). Careful polishing is required to keep plaque deposits as low as possible. The bonding gap around Vario SR titanium caps should be sized for tension-free intra-oral bonding (Fig. 23).

_Surgical procedure_

The one-piece diameter-reduced implants were explanted (Figs. 24 & 25). The drilling template was secured using four osteosynthesis screws (Fig. 26). These provided adequate stability and safety for guided implantation. In order to correctly align the insertion posts, corresponding markings were milled into the CAMLOG Guide guiding sleeves in the laboratory (Fig. 27).

Implantation was flapless using the CAMLOG Guide System gingival punch (Fig. 28). The implant bed was prepared accurately with the CAMLOG Guide System and depth referenced with drills of ascending lengths in an intermittent drilling technique (Fig. 29). After a central implant had been inserted, a terminal implant was inserted (Fig. 30). The second centrally positioned implant was then placed and the second terminal implant thereafter (Figs. 31–34).

_Seating the immediate restoration_

After removing the CAMLOG Guide insertion posts, the Vario SR abutments were inserted at 20 N cm (Figs. 35 & 36). The Vario SR titanium caps were shortened to the required length, placed on the Vario SR abutments and mounted with the Vario SR prosthetic screw (Fig. 37). The immediate restoration fabricated pre-implantation could then be bonded in the mouth tension-free (Figs. 38–41).

_Discussion_

The procedure demonstrated here, which follows the All-on-4 technique taught by Paulo Maló from Lisbon, led to the complete disappearance of the severe facial pain about two months post-operatively. The immediate prosthetic restoration was highlighted in particular in the patient’s evaluation. This resulted in an immediate improvement in mastication, speech function, food intake and quality of life. Remission of neuralgiform symptoms protracted over two months after seating of the fixed prosthesis and corresponding load relief of the mental foramen.

This case illustrates the failure of a number-reduced implant treatment concept in the advanced atrophied mandible and the potential of purely implant-supported prostheses to avoid pressure-induced neuropathies. The mandibular restoration was converted into a removable bar-retained superstructure (Figs. 42 & 43).

_dr Ferenc Steidl_ obtained his degree in dentistry in 1996 from Friedrich Schiller University in Jena in Germany. He subsequently undertook specialist training in oral surgery in Bietigheim-Bissingen and at Diakonie Hospital in Schwäbisch Hall in Germany. He has been practising implant dentistry since 1997. In 2001, he qualified as a specialist in oral surgery through the Baden-Württemberg Federal Chamber of Dentists (LZK) in Germany. He is a member of the German Society of Dental, Oral and Craniomandibular Sciences (DGZMK), German Federation of Oral Surgeons (BDO), German Association of Oral Implantology (DGI), Academy of Oral and Maxillofacial Surgery (AGKI), German Society of Periodontology (DGP), and Central German Association for Dental Implantology (MVZI). In 2008, he became a fellow of the European Board of Oral Surgery (European certification). Dr Steidl works at a group practice for maxillofacial surgery in Stommerda and Bad Frankenhausen in Germany.

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Fig. 26. Fixation of the drilling template using four osteosynthesis screws.

Fig. 27. The fixed drilling template.

Fig. 28. Gingiva punching.

Fig. 29. Implant bed preparation with the CAMLOG Guide form drill.

Fig. 30. Positioning of one central and one terminal implant.

Figs. 31 & 32. Implant bed preparation and insertion of the final implant.

Fig. 33. All four SCREW-LINE implants CAMLOG Guide in the defined final positions.

Fig. 34. Detailed view of the precisely maintained cam alignment.

Figs. 35 & 36. The Vario SR abutments were inserted (Fig. 35) at 20 N cm (Fig. 36).

Fig. 37. The Vario SR titanium caps were shortened according to the prosthetic unit.

Fig. 38. Check of the tension-free seating of the immediate restoration on the Vario SR titanium caps.

Fig. 39. The surgical procedure was stress-free and controlled.

Fig. 40. A dual-hardening luting composite (combo.lign, bredent) was used for intra-oral bonding of the immediate restoration.

Fig. 41. A final photograph of the immediate restoration in the mandible.

Fig. 42. The final restoration was milled from a zirconium oxide bar.

Fig. 43. The final mandibular restoration.

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Bridge construction in the anterior region of the maxilla

Author: Dr Steffen Wolf, Germany

Initial situation

A 67-year-old patient presented to the dental practice for consultation on implant placement. The anamnesis revealed some specific conditions, particularly an allergy to dental metals.

At this time, prosthetic restoration in the area to be reviewed consisted of an insufficient crown in the anterior region with an attachment monoreducer-combination denture. Significant loosening of the abutment teeth in the anterior region was found. Posts and cores that had already loosened several times were found in the insufficiently filled root canals, probably due to monoreducer leverage (Fig. 1).

The prognosis for conservative restoration was thought to be extremely poor.

During the consultation, the patient expressed a preference for an implant solution. The patient also specified a cost limit.

Procedure

Treatment planning

For optimum assessment of the initial situation and subsequent treatment planning, after assessing the clinical situation, a dental panoramic tomogram diagnosis with intra-operative assessment of the implant site was favoured as method of choice (Fig. 2). This would take into account the minimally invasive therapeutic concept of surgical augmentation. Treatment would involve the extraction of non-conservable teeth and the immediate placement of a Straumann Bone Level implant in the region. Two implants were to be inserted in the premolar region. We planned to expand bone with the bone spreading technique and to use two Straumann Standard Plus Narrow Neck CrossFit implants (NNC) made from Roxolid implant material if the transverse bone at the site was compromised. Prosthetic restoration was to fulfil the requirements for an allergy-free dental prosthesis. The prosthetic construction was to be manufactured with the Straumann CARES System in the in-house laboratory.
Surgical procedure

Owing to the impaired vasoconstriction, adrenaline-free local anaesthetic was administered pre-treatment with one subsequent injection during the operation. Extraction of the central and left lateral incisors was without complication. A central crestal incision was made with little crestal bone denudation and no relief incision. The anticipated reduction of the transverse bone then became clearly visible, and bone spreading was performed and two NNC implants were placed (Fig. 3). The insertion sites in the region of both left premolars were prepared by manually shaving the bone until an even bone plateau had been created. The autologous bone chips gained here were later used for bone augmentation in the left central incisor area.

Once the implant sites had been carefully prepared by means of bone spreading (Fig. 4) and the final implant cavities drilled, the prepared bone was meticulously examined with a bulbous probe and gauges from the Straumann surgery set. The two NNC implants were then inserted into the controlled, intact bony structures (Fig. 5). An NNC SLActive implant of 3.3 mm in diameter and 14 mm in height was inserted in the region of the first premolar, and the 3 mm reduced-height NNC healing cap was used for both the implant seal and for primary soft-tissue conditioning. We decided to use an NNC SLActive implant of 3.3 in diameter and 12 mm in height and the matching 3 mm closure screw for the region of the second premolar.

Once this stage of the operation was complete, restoration of the alveolar bone in the central anterior region was performed. The immediate implantation of a Straumann Bone Level implant of 4.1 mm in diameter and 10 mm in height fitted with the 0.5 mm Regular CrossFit Connection closure screw was then performed. The walls of the alveolar bone were undamaged, and there was primary implant stability. As a sufficient amount of autologous bone chips had been gained from maxillary crest levelling in the premolar area, this was used as a volume filler for bone augmentation. The distance between the body of the implant and the wall of the alveolar bone that required augmentation was 1–2 mm. Vertical bone augmentation was performed, and there was a slight overlap owing to a platform switch at the implant shoulder. Restoration of the alveolar bone around the lateral incisor was performed using...
a collagen matrix. Suture closure in the area of the anterior implant resulted in complete coverage of the augmentation area. The closure screw lay only minimally exposed approximately 3 mm below the mucogingival tissue. Soft-tissue closure at the NNC closure screw supported transgingival healing of the implant (Fig. 6). Intra-operative haptic assessment of the various fixations of the implant insertion aids was easily possible (Fig. 7). In order to assess post-operative treatment success with regard to adequate peri-implant bone coverage in particular, a control CBCT scan was taken to verify the correct implant–bone relation. This meant additional augmentation measures could be safely dispensed with (Fig. 8). Perioperative medication included antibiotic endocarditis prophylaxis. The patient was also given post-operative pain medication for one day.

**Prosthetic restoration**

Following integration of a provisional denture and a complication-free healing period, individualised gingival architecture was then created in the anterior region. In order to facilitate continued wearing of the provisional denture during the gradual process of soft-tissue conditioning, our dental laboratory prepared and shortened a Regular CrossFit Connection temporary abutment with hard polymer plastic, individualised to the area of the soft-tissue profile (Figs. 9–11). The impression for the incisor abutment was taken with a gingiva former in place on the basis of a Regular CrossFit Connection impression post to match the individual impression post. The NNC implants were incorporated into the impression (Fig. 12) with the ready-made NNC impression posts. On account of the patient’s allergy and in consideration of the aesthetic aspect, in addition to titanium abutments (Fig. 13) it was decided to use a zirconia-based bridge framework with ceramic veneering (Figs. 14 & 15). The titanium abutments and zirconia bridge were designed virtually using the Straumann CARES Scan CS2 scanner in our own dental laboratory and the framework was made at the Straumann Milling Center in Leipzig. Because of the inter-occlusal distance, an anatomically formed zirconia occlusal surface was used, which was optimally prepared with the Straumann CARES System processing software during the construction phase. In consideration of the aesthetic aspect, the individualised veneering was mostly in the vestibular region (Figs. 16 & 17). A post-operative radiographic control confirmed correct positioning of the prosthetic components (Fig. 18).

**Conclusion**

The patient was extremely satisfied with both the result and the cost–benefit relationship. Appropriate design of the emergence profile, the titanium abutment and the zirconia bridge entirely fulfilled the aesthetic requirements in the visible areas. In the event of later loss of the second molars, the patient wishes to undertake prosthetic restoration of the ensuing end gap situation. As shown here, in cases of compromised bone and in consideration of the aesthetic zone and CAD/CAM elements of different materials, the use of NNC implants can lead to very positive results.

*The prosthetic restoration was made by David Szymanska, MDT (laboratory).*

**_about the author_**

Dr Steffen A. Wolf attained his Doctor of Dentistry degree in 2000 from the Department of Oral and Maxillofacial Surgery at the Freie Universität Berlin headed by Prof. B. Hoffmeister. Since 2000, he has worked in his own private practice in Halberstadt in Germany. He received a Master of Science degree in Oral Implantology in 2010 from the DGI.

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FOR DENTAL PROFESSIONALS
Non-precious metal alloys are enjoying increased demand in dental technology. Additive manufacturing with laser melting ensures the uniformity and accuracy of ceramic-veneered, non-precious metal restorations created from powder using laser energy. Are the traditional manufacturing processes of dental technicians, such as casting and milling, making a comeback?

CAD/CAM magazine spoke with Master Dental Technician Dieter Spitzer of Unicim, a manufacturer of dental restorations based in Berschis in the Swiss canton of St. Gallen, Switzerland.

Digital process networking is linking dentists, laboratories and dental manufacturers more closely than ever and putting everyone involved under pressure to act. The entire process chain, from impression taking to prosthetic restoration, is undergoing a dynamic transition—a trend away from casting and toward digital additive manufacturing.

_Can you give us an idea of the process of creating dental restorations from metallic powders using additive manufacturing technology?

Once the 3-D CAD data is complete, the support structures are set up using data-processing software. Various software solutions are available for this purpose. One of the most common is CAMbridge, which requires licence fees. Alternatively, there is AutoFab Mlab, which is licence-free and allows you to assign specific measurements. With Concept Laser’s systems, the customer is able to choose freely and is not bound by any software. The processed data is transmitted to the machine via the network or USB port and the construction job is started. With this process, you can finish a project fully automatically overnight. Once complete, the components are removed from the building board and refinished. After manually removing the support structures, the surface is then micro-blasted with aluminium oxide, and the crown edges are thinned down in the case of bridges.

_Will milling and casting soon be a thing of the past in dental prosthetics?

Milling and casting will remain part of the standard repertoire of dental laboratories for training and application. Additive manufacturing options will offer many advantages in the future and reduce production risk enormously. Unfortunately, they are still far too rarely seen in practice by dentists and dental technicians. Some of this has to do with the old school mentality of doing everything manually. The dental laboratory of the future will be more of...
a hybrid: milling and casting where desirable but with additive manufacturing as a top alternative. "Add on versus take away," I like to call it. In summary, the casting process, from the cast object to the finished product, is usually very time-consuming and can lead to distortion, especially with large-span restorations. With additive technology, we achieve contour accuracy more easily than with milling. Our workplaces in dental technology are also cleaner thanks to CAD/CAM: less dust, bonding agent, glue, and outgassing. Ultimately, the deciding factor is quality. Compared with casting and milling, additive printing processes are creating entirely new ways of thinking in terms of production, workflow and the products themselves.

_How are these changes expressed?

We need to look at different levels here. First is the transition from manual craftsmanship to high-precision, high-accuracy industrial CAD/CAM production. Milled non-precious metal restorations have significant disadvantages owing to material consumption: high production costs and system-related lower quality in terms of fit and shape retention. During casting, we also encounter disadvantages in terms of low material density, mould costs, production time and rework. Nearly all of these disadvantages disappear with laser melting. By using proven materials like remanium star CL and rematitan CL from Dentaurum with our Mlab cusing R, we have been very satisfied with the quality of our system-manufactured products. In the case of large-volume restorations, any excess tension that arises can be alleviated through subsequent heat treatment, thus avoiding any potential distortion. Of course, the same applies to cobalt–chromium alloys or titanium.

_You mentioned changes to the products. What changes were you referring to?

I'm quite optimistic. I'll describe a couple of them. First, the geometric flexibility of prostheses is enabling a new way of looking at shapes or functions. In the future, imagine restorations with channels into which medications can be fed. The dentist or orthodontist can provide treatment, and the patient will not have to deal with temporaries. The second major change is the selective density of a component made possible by the process. Thus, for example, not only can bridges with more than ten sections be manufactured in a one-step process tension-free, but they can also be increasingly applied in heavily utilised areas, such as cantilevers, edges or brace elastics. In model casting, that is not always an easy problem to solve. Geometric freedom is a genuine plus for us, as it opens up new possibilities for restoration design. For example, brace elements can be made much finer while retaining sufficient mechanical properties. These new options also increase the longevity of dental products. In casting or milling, we have to deal with cost, material waste and lower material density; in casting especially, we have oversized dimensions and much lower material densities. With cast restorations, breakage is always an issue. But it does not have to be that way. Another benefit is the ability to create combinations through module or multicomponent construction methods. Base elements implanted into the jawbone are used as primary structures. An additively manufactured foundation element is then put into place as a secondary structure, on to which a secure, durable veneer such as HeraCeram is applied. Another aspect relates to new materials, such as non-precious metal titanium.

_Titanium is hard and biocompatible._

Titanium is the ideal material for allergy sufferers, for example. In combination with laser melting and veneering, we can maximise its biological benefits. From a visual standpoint, titanium restorations offer a risk-free silver-grey lustre. Manufacturers of non-precious metal alloys have spread pseudoscientific criticism regarding the aesthetics of titanium. Low-dose fluoride in toothpaste or mouthwash, for example, has no impact on appearance. We cannot deny the reality that titanium has not only caught up with non-precious metal alloys in importance, but also surpassed them. This is precisely why, in 2012, Unicim invested in an Mlab cusing R system for titanium applications from Concept Laser, which allows us to process reactive titanium material in a closed.
The unit can be used with dental materials certified under the German Medical Devices Act, such as rematitan CL from Dentaurum. Because of the high amount of material waste, milling-based processing of titanium is too expensive and casting is highly impractical.

_What are some of the problems that arise in the casting of titanium?_

The reaction of titanium with oxygen causes the formation of an alpha-case layer on the outside. This leads to embrittlement of the surface and must be removed. If not removed, it can lead to problems with the adhesion of veneering. With LaserCUSING, no alpha-case layer forms. This makes laser melting with titanium powder excellent for processing. The very fine-grained microstructure of the laser-fused parts of this titanium alloy allows greater firmness than with conventional castings. The dentist receives a high-performance, long-life alternative that is easy to work on and more affordable than a precious metal solution. Finally, dentists and patients can benefit from a product that is both durable and natural in appearance.

_What is the position of dentists regarding this issue?_

Interest is undoubtedly growing, not least because it is impossible to ignore the technical, time-saving and affordability benefits. But we also need to look at the process chain. In order to prepare the data for manufacturing, it must be in STL format. STL data from different scanners can be processed using the CAMbridge or AutoFab Mlab data-processing software available from Concept Laser. Nowadays, conventional dental impressions form the basis for CAD data. The accuracy of the data depends on the preciseness of the work performed by the dentist. Higher accuracy is essential. A high-quality intra-oral scanner costs about CHF20,000. If we had complete data migration from the dentist to the dental laboratory, we would be one step further. In the long term, however, that is unavoidable. Quality assurance and documentation needs will make open, manufacturer-independent data transfer an increasingly critical requirement. Especially in terms of affordability, the topic of laser melting is becoming more important.

_Thank you for the interview._
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Experience business solutions with Straumann CARES customized prosthetics solutions

The market for dental restorations presents a broad variety of prosthetic offerings. Yet customers experience constant challenges to make the right choice when it comes to fulfilling their primary product needs of high efficiency, cost effectiveness and long-term reliability. Thanks to the trustworthy relationship with dental clinics and laboratories for close to 40 years, Straumann has learned very well what matters to them and their business. Straumann is committed to adapting its service and products to the clinical and professional needs.

Straumann CARES customized solutions deliver dental professionals all they will need in their practice or laboratory (Figs. 1–4). With CARES X-Stream they have a service that provides an implant-based single-tooth prosthetic restoration in only one step: they do 1 scan, 1 design and receive 1 delivery.

Invested on their customers’ behalf, Straumann constantly develops and improves its portfolio, namely of zirconium dioxide (zerion) for:

- High precision milling to deliver very detailed and fine morphology and smooth surfaces;
- Framework constructions;
- Crowns and bridges.

Fig. 1. CARES® customized solutions.
Fig. 2. CARES® zerion® zirconium dioxide.
Fig. 3. CARES® metal frameworks.
Fig. 4. CARES® crowns and bridges.
Fig. 5. The new CARES® zerion® LT (Low Translucency) shades for framework constructions.
Fig. 6. CARES® abutment, zirconium dioxide (ZrO₂).
Fig. 7. CARES® abutment, titanium (Ti).
Fig. 8. CARES® Variobase™ Abutment, zerion®.
Ease of use by simply polishing the delivered restoration to finalize the zerion HT crown or bridge; Conquering demanding cases thanks to the shade diversity. Simple characterization can be efficiently applied to create a beautiful and individualized result.

Work with confidence—customized, aesthetic, reliable original Straumann solutions

Ensuring a perfect harmony of design, Straumann abutments are engineered for an original and precisely attuned fit on Straumann implants. The proven clinical long-term success explains why "Once you go Straumann, you never go back"—simply because Straumann’s exceptional quality delivers more!

Straumann CARES customized abutments provide the foundation for exceptional restorative results

The high design flexibility combined with the high standards of precision make the CARES customized abutments an outstanding benefit for practitioners and dental technicians alike (Figs. 6–8):

- Customized shape and patient-specific emergence profile;
- Validated long-term performance due to the original Straumann connection;
- Optimized path of insertion thanks to the design flexibility to adjust angulations;
- High convenience in the restoration procedure thanks to an accurate design allowing time saving and cost efficiency;
- Control over the cement gap.

Moreover CARES abutments blank size enlarged more than 20 per cent to increase design options and 9 new zerion LT (Low Translucency) shades available for CARES Variobase abutments.

Straumann CARES Screw-retained bridges and bars offer an excellent solution in challenging cases

CARES Screw-retained bars deliver a finished and ready-to-use strong mechanical connection capacity without compromising the biological benefits of the implants:

- Low design complexity: direct placement on implants (no additional abutment needed), allows treating patient-specific emergence profiles with full design control;
- High quality through original Straumann connection;
- Biocompatible and corrosion resistant;
- Each framework is milled completely from one block of material ensuring homogeneous and predictable quality.

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Mechanical Aspects

- Transfer of force load on taper screw and conical connection to implant surface and bone evenly
- Limited force load distribution to connection and limited engagement
- Increased stress to flat top screw
- Reduced of micro movements while controlling the micro gap through a conical, tight sealing connection
- The abutment only sits on the narrow implant shoulder: Limited sealing of the implant-abutment connection
- Increased possibility of soft tissue impingement

Surgical aspect

- Lateral mastication forces are absorbed by the inner connection, reducing excessive loading of the screw
- Lateral mastication forces are absorbed by the screw thereof resulting in increased danger of screw breakage.
- Consideration of the biological distance with a horizontal offset between micro gap to bone
- Typical Bone Control Design feature of the Straumann Bone Level implant
- The flat implant connection can have an effect by over tapping the biological distance of the micro-gap
- The Bone Control Design feature of the Straumann Bone Level implant isn't respected

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Original Straumann Bone Level Implant–Abutment Connection
Example of a flat non-original Bone Level Implant–Abutment Connection
3Shape releases CAD solution for post and core restorations

3Shape, the provider of 3-D scanners and CAD/CAM software solutions for the dental industry, has launched its CAD solution for post and core restorations, which includes dedicated post and core intra-oral scanning with 3Shape TRIOS and unique CAD design workflows in Dental System 2013. 3Shape’s Post and Core solution utilises special scanning capabilities, 3Shape Scan Posts, and sophisticated software tools for reliable capture, and optimally shaped and functional post and core designs. The solution saves time by allowing laboratory technicians to design all layers in a single digital workflow.

3Shape patented Scan Posts for use in clinics and laboratories

3Shape has developed special Scan Posts (patent pending) to facilitate the accurate capture of a post and core’s position and depth. Scan Posts are approved for both intra-oral use in the clinic and for model scanning in the laboratory. Scan Posts are autoclavable, and come in various shapes and sizes to support drill systems from major suppliers.

Flexible input: uses scans from TRIOS and from dental laboratory scanners

3Shape’s Post and Core solution can be used with 3Shape TRIOS digital impressions and 3-D scans of gypsum models. Dentists with 3Shape TRIOS can kick-start post and core cases in the clinic by capturing and sending highly reliable images to the laboratory for direct designing. A special dual-scan workflow using 3Shape Scan Posts ensures accurate capture of the true depth and position of the root canal. If gypsum models are the input source, laboratory technicians simply insert Scan Posts in the model before scanning.

Sophisticated design tools

In the laboratory, technicians align the captured Scan Posts and allow the software to calculate positions and depths automatically. By first designing the anatomy layer and applying dedicated post and core modelling tools, technicians can create optimally shaped and functional post and core designs that are matched to the clinical case and ready for manufacture through wax print and cast, milling, or laser sintering.

Frédéric Rapp, director of the Crown Ceram dental laboratory in France, said: “In combination with TRIOS, 3Shape’s Post and Core design software gives us a fast and easy way to model optimally shaped and robust post and core restorations. The full digital workflow makes it very easy to design parallel post and cores, or work with cases involving multiple posts.”

All types of post and core cases

Laboratories can design post and core cases for standard crowns, single-piece retained crowns, and anatomical single-piece retained crowns that are cut back for veneering. 3Shape’s Post and Core design solution is fully functional in Dental System 2013 and with 3Shape TRIOS. 3Shape Scan Posts are available to both dental clinics and laboratories through 3Shape distributors. Please contact your local 3Shape representative for details and purchase information.

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From veneers to bridges: Zirconia reinforced composite

_Schütz Dental_ presents a new material combining high performance acrylics and zirconium dioxide. Tizian Zirconia Reinforced Composite blanks enables you to produce temporary restorations of up to 16 units and even lets you complete final restorations of up to 3 units. These restorations stand out thanks to their outstanding antagonist and TMJ friendly properties. These bionic qualities derive from the moderate Vickers hardness and corresponding elasticity module. Milling blanks (available in two heights) fit in the 98 millimeter open system holder and are suited to dry-milling.

This material (Fig. 1) is suitable to produce final restorations up to three-unit bridges. This bridges might even expand to the posterior region. This adds to its suitability for final crown structures as well as fully anatomical crowns, inlays, onlays and veneers. This material can also be used for implant cases and long-term temporaries for up to a whole arch and lasting for up to two years of wear (Figs. 2–3).

The elasticity module of this material is 3.050 MPa which is lower than the one of zirconium dioxide. This fact and the optional facing with composite prevents from any chipping.

If you’re looking for a veneering material for final restorations, the specially developed composite, dialog Occlusal from Schütz Dental, comes highly recommended. Cases which where faced with this composite make convincing results thanks to its fantastic translucence, homogeneity and plaque-resistance. Tizian Zirconia Reinforced Composite blanks come in a range of five tooth colours.

Thanks to the excellent physical properties, this material is ideal for use on patients with CMD or Bruxism (Fig. 4). When working on implants, the elasticity of the system works as a buffer. This reduces the pressure on the implants and the bone structure.

The chemical formula is free of TEGDMA and Bisphenol A. This makes the material biocompatible with a lot of potential for the future.

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08-09 NOVEMBER 2013
DUBAI, UAE
www.cappmea.com/aesthetic2013

**DENTAL TECHNICIAN FORUM part of IDEM SINGAPORE 2014**
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Nobel Biocare announces new digital workflow and new regenerative product at Global Symposium in New York

**Announcement of new fully integrated digital workflow**

With a strong focus on patient safety and treatment efficiency for dental professionals and their patients, Nobel Biocare is developing a seamless workflow, from patient diagnostics and treatment planning to surgery and later also prostheses, all efficiently and digitally connected through Nobel Biocare’s secure online network, NobelConnect. The next step, previewed at the symposium, continues to build on the individual strengths and expertise of the treating team by digitally linking NobelProcera laboratory technicians and NobelClinician users.

Starting with diagnostics and treatment planning in NobelClinician software, the highly accurate surface model obtained with the second-generation NobelProcera 2G Scanner can now be included at any stage of treatment through fully automated and precise smart fusion technology. This enables even better representation of introral tissue for diagnostics and planning. Furthermore, it reduces (procedural) treatment costs and shortens treatment time by allowing CT/CBCT scans to be taken at the first patient visit, offering clinicians a truly flexible way of working.

Radiographic guides, specific markers and scan protocols are no longer necessary. A decision on guided surgery can be taken at any stage. Fully automated, precision-fitted surgical templates are generated at the click of a button using the integrated surface scan and planned implant

Nobel Biocare welcomed more than 2,000 attendees to the famed Waldorf Astoria New York for the exclusive and sold-out Nobel Biocare Global Symposium 2013, which was held from 20 to 23 June. Over 100 world-famous researchers, scientists, clinicians and academics took the stage to share their insights and perspectives on how to provide better treatment to more patients. The exciting programme, prominent guests and historic location provided the ideal platform for announcing Nobel Biocare’s new digital workflow and latest regenerative product, and for the inauguration of the Foundation for Oral Rehabilitation (FOR).

“We are making continued improvements in efficiency and at the same time we continue to invest significantly in our future,” said Richard Laube, Nobel Biocare CEO. “Our Nobel Biocare Global Symposium in New York is one of these investments and sold out months ago. The establishment of FOR is another clear example, as well as our efforts in innovation with the launching of our exciting new products and solutions.”
positions. In addition to the fully guided traditional approach, NobelGuide now offers options for guided pilot drilling. The decision on the position, orientation and depth of the first drill during implant site preparation is one of the most crucial steps. The NobelGuide pilot drill template helps to solve this challenge and enables clinicians to finish the surgery using their existing freehand techniques. All surgical templates can be visualised immediately in NobelClinician and ordered online, and are delivered ready for use.

The iPad-operated drilling unit OsseoCare Pro truly sets a smarter standard in safety and efficiency, and is seamlessly linked to NobelConnect. This allows the secure transfer of digital plans from NobelClinician directly to the intelligent device for freehand surgery or guided surgery options—all immediately and neatly documented in automated clinical reports. After the surgery, patient-specific data is exported back to NobelClinician and stored in the fully encrypted NobelClinician file for later reference.

A predictable restorative outcome is assured through the design of individualised prostheses in NobelProcera software. The software is directly linked to the global network of NobelProcera production facilities for the manufacture and delivery of functional and natural-looking dental restorations designed to last a lifetime.

New regenerative product to be added to Nobel Biocare’s products and solutions portfolio

Nobel Biocare recently entered the field of regenerative solutions with a new membrane, creos xeno.protect, which it will offer in selected European markets. A biodegradable collagen membrane, creos xeno.protect is for dental use in guided bone regeneration and guided tissue regeneration procedures. It creates a favourable environment for bone regeneration in the defect area by preventing the migration of undesired cells from the
surrounding soft tissue and allowing the ingrowth of osteogenic cells. The first results demonstrated excellent revascularisation behaviour and tissue compatibility, combined with an extended barrier function. The membrane furthermore offers excellent handling properties, with a minimal size increase when hydrated, as well as easy repositioning and unfolding. The official launch date will be advised at a later date.

New NobelProcera abutment will achieve aesthetics from a new angle

Precise engineering has been part of Nobel Biocare’s heritage since its beginning and the forthcoming NobelProcera Angulated Screw Channel (ASC) Abutment is another milestone in that history. This new NobelProcera abutment can be designed with an angulated screw channel, which allows for a more optimal and aesthetic screw access position. Clinicians were previously limited to cement-retained solutions in some cases for aesthetic reasons or because of access difficulties; now they can opt for screw-retained solutions and experience easy placement and removal options with a screw access hole that can be placed according to preference.

The concept behind the angulated screw channel is to provide a free choice of screw access position to improve aesthetics (in the anterior region), enable easier access (in the posterior region) and provide restorative flexibility with increased treatment options. All this is supported by the new easy-to-handle Omnigrip interface tool. With the unique Omnigrip interface, the friction-based pick-up component of the screwdriver easily connects to the screw. Screw tightening is then possible in all situations, whether the screwdriver is straight or at an angle. The ASC concept combined with Omnigrip will be introduced in 2014, starting with selected NobelProcera abutments.

Foundation for Oral Rehabilitation inaugurated at Nobel Biocare Global Symposium 2013

The official inauguration of FOR took place on 20 June during the Nobel Biocare Global Symposium 2013 in New York. Goodwill Ambassador for the United Nations Population Fund Dr Bertrand Piccard was awarded the foundation’s first FOR Humanity Award in recognition of his Winds of Hope humanitarian foundation. Prof. P.-I. Brånenmark was elected the first FOR Honorary Fellow. Shaped by leading clinicians and scholars, FOR aims to build on Nobel Biocare’s long-standing commitment to science, education and humanitarian engagement. By promoting oral health care and humanitarian endeavours, the foundation seeks to provide on-demand opportunities for learning, sharing and mentoring for better patient care. Its endowment of FOR demonstrates the strong emphasis Nobel Biocare places on training and education, and underscores the future contributions the company plans to make to the oral health community. Visit www.for.org to learn more about FOR and these latest announcements.

Innovative scientific Nobel Biocare Global Symposium covers four complete patient journeys

The Nobel Biocare Global Symposium 2013, themed “Designing for life: Today and in the future”, was aimed at the dental professional who wants to acquire the latest science-based knowledge and techniques in implant dentistry. The innovative and insightful programme was designed to maximise the learning experience. The programme centred on four patient journeys: missing anterior and posterior single teeth; missing multiple anterior teeth; missing multiple posterior teeth; and managing the terminal/failing dentition—the transition to edentulism. The attendees were able to follow each patient journey from planning to maintenance, including possible complications and how to avoid them. Important clinical themes were also covered, such as minimally invasive treatment, graftless solutions, immediate replacement and function, soft-tissue health and aesthetics. The programme included the most recent information on the key factors for successful oral rehabilitation, such as diagnosis and treatment planning, surgical and restorative treatment, and patient follow-up.

Learn more about the latest products, solutions and events on the Nobel Biocare website, which offers product information, first-user comments, course programmes, an online store for easy purchase and much more._

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The 35th International Dental Show (IDS) posted record-setting results when it closed in the middle of the March 2013 in Cologne. The world’s leading dental trade fair attracted 125,000 trade visitors from 149 countries. That figure represents an increase of six per cent compared to the previous event. Records were also set in terms of the number of exhibitors and the occupied exhibition area.

This year 2,058 companies (+5.3 per cent) from 56 countries presented a wide range of innovations, products and services on 150,000 square metres of exhibition area (+3.4 per cent). With 68 per cent of the exhibitors and 48 per cent of the visitors coming from abroad, the fair was also more international than ever before. “The degree to which IDS’s global attraction increases from one event to the next is impressive,” said
Dr. Martin Rickert, Chairman of the Executive Board of the Association of German Dental Manufacturers (VDDI). “Thanks especially to the trade visitors’ high level of internationality and decision-making authority; we expect the positive effects of the fair to continue for the rest of the business year. We’re also expecting sustained growth in the German and international healthcare markets.”

Trade visitors were also highly satisfied with the event. The visitor survey revealed that 74 per cent of visitors said they were (very) satisfied with IDS. What’s more, the fair’s comprehensive spectrum of products and numerous innovations caused 79 per cent of the visitors to rate the product range as either good or very good. In terms of reaching their trade fair goals, 74 per cent of the visitors surveyed said that they were satisfied or very satisfied. Overall, 95 per cent of the visitors surveyed would recommend a visit to IDS to their business partners.

“IDS is the top event for the dental market. In 2013, it again drew the attention of the international dental world,” concluded Dr Peter Engel, President of the German Dental Association (BZÄK). “Demographic developments will make continuous updates of healthcare structures necessary, and they will be dependent on technical advances and innovative therapies. At the trade fair, the industry has impressively demonstrated its ability to meet this challenge. But brainstorming for a (dentally) healthy future isn’t required within the dental sector alone. It also has to come from public policymakers. Germany is at an excellent international level technically and scientifically, as was demonstrated by this year’s IDS. However, austerity regulations are making it more difficult for innovations to make their way to the dentists’ practices.”
International Events

2013

IFED 8th World Congress
18–21 September 2013
Munich, Germany
www.ifed-2013.com

ESCD annual meeting
3–5 October 2013
Turin, Italy
www.escdonline.eu

2nd Asia–Pacific Edition
9th CAD/CAM & Digital Dentistry International Conference
5 & 6 October 2013
Singapore
www.cappmea.com

EAO 2013
16–19 October 2013
Dublin, Ireland
www.eao.org

AAID Annual Meeting
23–26 October 2013
Phoenix, AZ, USA
www.aaid-implant.org

BACD Annual Conference
7–9 November 2013
London, UK
www.bacd.com

5th Dental–Facial Cosmetic International Conference
8–9 November 2013
Dubai, UAE
www.cappmea.com/aesthetic2013/

10th International DLOAC CAD/CAM Symposium & EXPO 2013
15–17 November 2013
Garden Grove, CA, USA
www.dloac.org/cadcamedexpo

ADF Annual Dental Meeting
26–30 November 2013
Paris, France
www.adf.asso.fr

Greater New York Dental Meeting
29 November–4 December 2013
New York, USA
www.gnydm.com

2014

Imagina Dental 2014
13–15 February 2014
Monaco
www.imaginadental.org

ITI World Symposium
24–26 April 2014
Geneva, Switzerland
www.itibon.org

9th CAD/CAM & Digital Dentistry International Conference
9 & 10 May 2014
Dubai, UAE
www.cappmea.com
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- all the image (tables, charts, photographs, etc.) captions;
- the complete list of sources consulted; and
- the author or contact information (biographical sketch, mailing address, e-mail address, etc.).

In addition, images must not be embedded into the MS Word document. All images must be submitted separately, and details about such submission follow below under image requirements.

Text length

Article lengths can vary greatly—from 1,500 to 5,500 words—depending on the subject matter. Our approach is that if you need more or less words to do the topic justice, then please make the article as long or as short as necessary.

We can run an unusually long article in multiple parts, but this usually entails a topic for which each part can stand alone because it contains so much information.

In short, we do not want to limit you in terms of article length, so please use the word count above as a general guideline and if you have specific questions, please do not hesitate to contact us.

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We also ask that you forego any special formatting beyond the use of italics and boldface. If you would like to emphasize certain words within the text, please only use italics (do not use underlining or a larger font size). Boldface is reserved for article headers. Please do not use underlining.

Please use single spacing and make sure that the text is left justified. Please do not centre text on the page. Do not indent paragraphs, rather place a blank line between paragraphs. Please do not add tab stops.

Should you require a special layout, please let the word processing programme you are using help you do this formatting automatically. Similarly, should you need to make a list, or add footnotes or endnotes, please let the word processing programme do it for you automatically. There are menus in every programme that will enable you to do so. The fact is that no matter how carefully done, errors can creep in when you try to number footnotes yourself.

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Please number images consecutively throughout the article by using a new number for each image. If it is imperative that certain images are grouped together, then use lowercase letters to designate these in a group (for example, 2a, 2b, 2c).

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In addition, please note:

- We require images in TIF or JPEG format.
- These images must be no smaller than 6 x 6 cm in size at 300 DPI.
- These image files must be no smaller than 80 KB in size (or they will print the size of a postage stamp!).

Larger image files are always better, and those approximately the size of 1 MB are best. Thus, do not size large image files down to meet our requirements but send us the largest files available. (The larger the starting image is in terms of bytes, the more leeway the designer has for resizing the image in order to fill up more space should there be room available.)

Also, please remember that images must not be embedded into the body of the article submitted. Images must be submitted separately to the textual submission.

You may submit images via e-mail, via our FTP server or post a CD containing your images directly to us (please contact us for the mailing address, as this will depend upon the country from which you will be mailing).

Please also send us a head shot of yourself that is in accordance with the requirements stated above so that it can be printed with your article.

Abstracts

An abstract of your article is not required.

Author or contact information

The author's contact information and a head shot of the author are included at the end of every article. Please note the exact information you would like to appear in this section and format it according to the requirements stated above. A short biographical sketch may precede the contact information if you provide us with the necessary information (60 words or less).

Questions?
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