Digital dentistry event held for the second time in Singapore

Global movers and shakers to gather at CAD/CAM and Digital Dentistry International Conference

An interview with SDA president Dr Ruan Chee Keong

"Dentistry is way behind in embracing new technologies"

DT Asia Pacific

SINGAPORE: With digital imaging and dental CAD/CAM, advanced information technology has gained increased significance in dental practice in recent years. While it has become widely established in Western markets by now, most dentists and dental laboratories in Asia are only now starting to incorporate the new technology into their workflow. Owing to under-penetration in dental offices and increasing interest by dentists in investing in the technology, markets in the region are therefore expected to see dramatic growth by 2016, according to a recent paper by Cana-
Taking guided implantology to the next level

Dr Lutz Ritter
Germany

Exciting times are indeed ahead for digital dentistry, as was evident from the firework of innovations present — again in all fields of dentistry at the latest International Dental Show in Germany. As professionals, we have to keep up to date, but also be cautious of new technologies.

Despite all the improvements in different technologies, it has not necessarily become easier to stay abreast of developments. The ongoing expansion of possibilities and updates in the field of CAD/CAM dentistry has increased the need for qualified education and professional exchange at peer level.

Particularly in guided implantology, new opportunities for treatment planning and therapy are becoming available through the combination of existing 3-D technologies. The use of new 3-D diagnostics with the help of CBCT has not only improved pre-treatment diagnostics in general, but has also opened up new possibilities in the planning process through the use of intelligent software.

At the same time, questions arise constantly and the responsibilities of the user to offer complete diagnostics have increased as well. Linking X-ray-aided planning with CAD/CAM systems already in the planning phase is an innovation that is intended to make the transition to implant-supported prostheses much easier.

By now, dentists are able to perform many of the steps themselves, including digital planning, manufacturing drilling templates chairside and fabricating CAD/CAM prostheses.

In considering its many advantages, it should not to be forgotten that technology has to remain comprehensible, transparent and usable for the dentist. The aim of my presentation at this year’s CAPP Asia conference in Singapore is to place the emphasis on the practice-relevant aspects of the latest technologies and to provide perspectives on the advantages they have to offer.

Along with the latest tips and tricks, I want to communicate the possibilities and limits of current technology, such as manufacturing drilling templates chairside and many others.

I hope that you draw something of interest from the presentation. Personally, I want to invite newcomers to become acquainted better with the often-difficult first steps with the help of experienced users. Even from a surgical perspective, I can say it is worth the effort.

Dr Lutz Ritter is currently a maxillofacial and plastic surgeon at the University Hospital of Cologne’s Centre for Dental, Oral and Maxillofacial Surgery. On Saturday, 5 October 2013, he will be presenting a paper titled “Taking guided implantology to the next level: Integrating CAD/CAM and CBCT” as part of the second Asia Pacific CAD/CAM and Digital Dentistry International Conference scientific programme in Singapore.
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CAD/CAM and growth factors

Key areas of dental innovation

Dr Nilesh R. Parmar
UK

Dentistry has come a long way since our forefathers were forced to use foot powered drills and mix amalgam from its bare components. Modern day dental equipment and materials are at the cutting edge of medical and dental innovation, and it’s trade shows such as the International Dental Show (IDS) where the developments of the future are announced. Modern dentists no longer have merely a straight probe and a dental drill at their disposal. We now have scans, 3-D images, growth factors and an almost unlimited choice of materials available to use.

In writing this piece, I made a tough decision to focus on what I believe to be key areas of dental innovation. It is in these areas of imaging, CAD/CAM technology and growth factors that I believe are going to be important in the dental surgery of the future.

CAD/CAM

Computer-aided design/computer-aided manufacturing has had a presence in dentistry for nearly 20 years. However, it is only in the last ten years that developments have really made a difference in the reliability, ease of use and functionality of these devices. We now have CAD/CAM machines (e.g., CEREC, iTero, Lava) that can scan an entire arch, design and fabricate all-ceramic restorations in the practice. The popularity of chairside CAD/CAM units has never been greater. The materials that we are able to use in conjunction with CAD/CAM scanners have gone from monolithic, one-shade blocks to multi-layered, all-ceramic, lithium-disilicate constructions that can be sintered and finalised in as little as 15 minutes.

The appearance of these restorations, although still needing a well-trained (and artistic) dentist, could be said to be on par with certain lab-based fabrications whilst maintaining the advantages of being a chairside single visit restoration. CAD/CAM technology is now almost universally used in the fabrication of dental implant abutments and bars, reducing construction times, designs and fit. Dentists are now beginning to use chairside CAD/CAM devices to restore dental implants without the need for any impressions.

CBCT 3-D scanners and CAD/CAM integration

 Cone beam computed tomography (CBCT) scans are now commonplace in dentistry, particularly in implant dentistry where Grundahl (2007) found that 40 per cent of all CBCT scans were taken for implant treatment. Where 3-D scans were reaching a shortfall was in actually relaying the information obtained into the mouth during the surgical procedure. One recent innovation has been to overlay scans of the patient’s own teeth and soft tissues onto the CBCT scan data. This gives an accurate representation of the hard and soft tissues and their relationship to each other. For example, an implant can be planned in the implant software with the angulation of the implant taking into account the ideal position of the final crown, which can also be shown in the CBCT scan. In order to do this, the dentist would have to make a study model and then wax up the ideal final restoration contour, ensuring some barium sulphate within the wax in order to show up in the scan. This was both costly and time consuming. Recent developments have allowed one to take an image, growth factors and an almost unlimited choice of materials available to use.

I have been fortunate to see a prototype facial scanner from Sirona and even managed to have my face scanned (Figs. 1 & 2). The detail achievable with these units is impressive. Once this information is combined with 3-D scans, teeth scans and jaw articulation, a fully working and movable representation of the patient’s head can be compiled on the computer screen. Allowing for treatment planning and assessment to be carried out without any need to see the patient. One application of this may be in developing countries, where various experts from around the world can examine complicated facial reconstruction cases without them actually seeing the patient. As already mentioned, the opportunities for patient education are huge, and with procedures such as plastic surgery and orthognathic surgery being so difficult to properly consent for, facial scanners will greatly aid clinicians.

Growth factors

Available for a long time in medicine and dentistry, growth factors have been the reserve of PhD students and professors until recently. The resurgence of the usage of platelet rich plasma (PRP) has come about with added research showing that using PRP can greatly improve osteoblast proliferation (Parmar 2009) and accelerate soft-tissue healing. Companies are now offering clinical courses for dentists to make, produce and use PRP in their own surgeries within 15 to 30 minutes. The main advantage of PRP is that it's free; it is obtained from the patients' own blood, thus removing the risk of rejection; and can be made in vast quantities. As more research is published, coupled with simpler production kits, PRP use will increase in all aspects of invasive dental surgery.

The above is just a short description of what is being developed for the future. Dentistry has never been so intertwined with technology. The next ten years will prove to be exciting and I eagerly await to hear, see and use the new technologies that are being developed today.

Dr Nilesh R. Parmar runs a successful five-surgery practice close to London and is a visiting implant dentist to a central London practice. His main area of interest is in dental implants and CEREC, CAD/CAM technology. He can be contacted at drnileshparmar@gmail.com. More information can be found on his website, www.denileshparmar.com; Twitter: @NileshRParmar; or Facebook: Dr Nilesh R. Parmar.

Photo courtesy of Dr Nilesh R. Parmar, Lava.

Fig. 1

Fig. 2

“"The popularity of chairside CAD/CAM units has never been greater."
Computer-aided crown design—Fabrication of CAD/CAM crowns chairside

Dr Andreas Bindl
Switzerland

CAD/CAM technology allows dental professionals to manufacture solid all-ceramic crowns chairside. A digital image of the preparation is captured with an intra-oral camera and the crown is designed accordingly.

IPS e.max CAD (Ivoclar Vivadent), which has been on the market for some time, is a lithium disilicate glass-ceramic that demonstrates a flexural strength of 560 MPa. This ceramic is machined to the desired shape while it is still in its metastable or blue state (approximately 150 MPa). Subsequently, the ceramic is crystallised for 20 minutes. During this process, the material attains its final state and obtains its excellent mechanical and aesthetic properties. IPS e.max CAD is available in a low translucency (LT) version, which is suitable for the fabrication of crowns and implant-retained crowns. The high translucency form is intended for the construction of inlays and partial crowns. The stains

A variety of ceramics are available for the construction of the crown, for example an aesthetic, easy-to-mill ceramic such as IPS Empress CAD (Ivoclar Vivadent). This leucite glass-ceramic is weaker than zirconium oxide, these crowns must be seated with the adhesive technique (for example with Syntac/Variofil, all Ivoclar Vivadent). This makes them strong enough to withstand masticatory forces in the long term.

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Fig. 7: Bucco-oral cross-section of the restoration: the minimum occlusal thickness of 1.5 mm was checked. — Fig. 4: Occlusal view of the crown in the blue state during try-in, before crystallisation firing. — Fig. 5: Bucco-oral view of the crystallised and glazed crown on tooth 4.5.

As a result, subsequent polishing is unnecessary. Owing to the high strength of the restoration, adhesive cementation with a separate dentine conditioner is not indicated as long as the thickness of the ceramic is not less than 1.5 mm. Self-adhesive cementation materials can be used. The new self-adhesive composite SpeedCEM (Ivoclar Vivadent) is particularly suitable for this purpose.

In this case report, the chairside creation of a crown is described on the basis of a clinical case using IPS e.max CAD LT and the new SpeedCEM luting cement.

Clinical case report

Tooth 25 of a 52-year-old female patient was restored with a crown owing to extensive destruction of the dentin hard tissue (Fig. 1). First, the tooth was prepared with a shoulder of approximately 1 mm in width (epigingivally). Subsequently, the preparation was dusted with IPS Contrast Spray (Ivoclar Vivadent) and a digital impression was taken with the CEREC Bluecam camera (Sirona).

The Version 5.8 of the CEREC software generates a visual image of the antagonist, which replaces the centric bite record. In order to match the maxillary and mandibular teeth, an image of the centric situation was captured from the buccal aspect (Fig. 2). The maxillary and mandibular teeth were matched semi-automatically (Fig. 1).

The Version 5.8 is capable of designing biogenic occlusal surfaces for full crowns. The software provides a design proposal for the tooth morphology, which is based on the occlusal surface of the distal neighbouring tooth and the antagonist (Fig. 1). The image of the bucco-oral cross-section of the crown allows the user to check the minimum occlusal thickness of 1.5 mm (Fig. 1). The minimal densification of the ceramic (0.2 vol.%) during the crystallisation process is taken into account by the software and adjusted accordingly.

and glaze are applied before the crystallisation process.

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After the crown had been milled, the proximal and occlusal contacts were adjusted on the patient (Figs. 6 & 7). In this case, the white and creme materials from the corresponding stain assortment (IPS e.max CAD Crystall./Stains, Ivoclar Vivadent) were sparingly applied to the cusp tips and the sunset material to the tooth neck and in the fissures.

Immediately afterwards, a glaze in spray form (IPS e.max CAD Crystall./Glaze Spray) was applied to the outer surfaces of the crown. The spray was applied several times. Once the restoration had been fully coated with a white-opaque glaze layer, the crown was fired in a combined crystallisation and firing process in the Programat CS furnace (Figs. 8 & 9).

Before the restoration was cemented in place, the inner surface of the crown was etched with 4.9 per cent hydrofluoric acid (IPS Ceramic Etching Gel, Ivoclar Vivadent) for 20 seconds. Subsequently it was silanised for 60 seconds (Monobond Plus, Ivoclar Vivadent). The crown lumen was filled with the self-adhesive SpeedCEM. Next, the crown was securely seated on the prepared tooth by applying even pressure (Fig. 10).

The cement residue was polymerised for one second per surface (mesio-oral, disto-oral, mesio-buccal, distobuccal) with a curing light (blue-phase in the low power mode, Ivoclar Vivadent) at a distance of about 5 mm. In this cured state, the cement was removed with great care using a scaler and a probe. The cement was fully cured with the bluephase in the high power mode. Subsequently, the cement margin was polished.

The final inspection revealed the restoration to be in harmony with the overall situation (Figs. 11 & 12).

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- Scientific Session: Friday 10:00 Surface Scanning in Computer Guided Dental Implantology
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**Contact Info**

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