

CAD/CAM

international magazine of digital dentistry

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Impression and registration
for full-arch implant dentures

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Dear Reader,

I have great pleasure in presenting to you this year's first issue of the **CAD/CAM** international magazine of digital dentistry. The magazine, just like the International Dental Show in Cologne (this year's show runs from 12 to 16 March), is all about the latest developments in digital dentistry.

Dentists use a great deal of equipment and it is thus not possible to be a good dentist today if we are not updated on the latest methods and technologies relating to dental equipment; knowledge only is not enough. Being updated means keeping up with all the latest technological advances. Such advances apply to many areas of dentistry: CAD/CAM, scanning software, surgical guides, treatment planning. These new technologies, however, though they are excellent and very useful, cannot be used efficiently and successfully without adequate knowledge.

Furthermore, there is the risk that dentists may rely so heavily on these new technologies that they forget about the important human aspect in addition to the significant knowledge and skill required.

As a professor and Vice Regent for Italy of the International College of Dentists, I strongly believe in the importance of sharing knowledge and experience in any way possible. I think that a magazine like **CAD/CAM** that addresses all of the above topics guides all of us through the recent developments in our profession, and keeps us informed about what is available and how this can improve our offerings to our patients.

This edition of **CAD/CAM** is concerned particularly with implantology. You will find information on new concepts in computer-guided implantology, using CAD/CAM techniques and facial aesthetic analysis, as well as the latest industry news and information on upcoming meetings.

I hope that you will find the magazine useful and interesting.

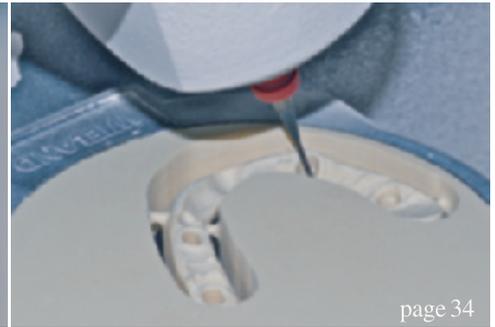
Yours faithfully,



Prof. Mauro Labanca, MD, DDS



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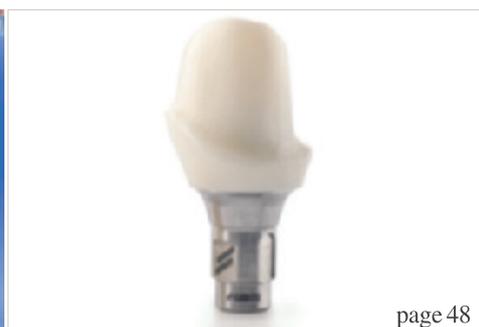
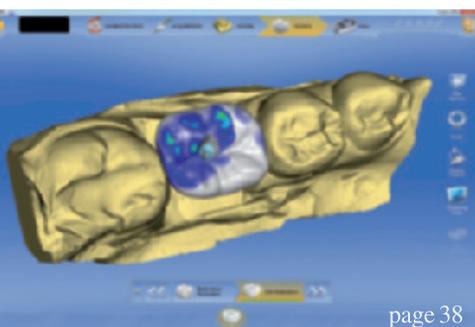
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Welcome to the “Block Party”

Author_ Dr Curtis Jansen, USA



a little bit of sense and sensibility regarding dental materials. Dental material manufacturers need to invest in the technology, methodology and product design, as well as the material evolution to the restoration (blocks, mandrels, discs), in order to introduce a new material for CAD/CAM dentistry. Then, in collaboration, dental CAD (computer-aided design) and dental CAM (computer-aided manufacturing) developers must work with that material to produce consistent optimized results. This takes time and effort. Only those materials proven through economic evaluation, clinical validity and proven demand will make it to the final stages and into the software of the CAD systems and into the mills of the CAM systems and ultimately into our patients mouths.

CAD/CAM also requires the dentist to take more control of all facets of patient care; it requires more thought than a whim and a handwritten prescription to choose the right material. CAD/CAM requires thinking through the restorative and aesthetic process before proceeding with a restoration, all better things for the dental professional as a whole. As more and more laboratories and dentists invest in digital dentistry, everyone gains.

I'm "all in" for "daily digital dentistry." I have digital impression-only systems and a chairside CAD/CAM System, E4D Dentist (Fig. 1). There still isn't just one system that can complete all of the restorative indications we have in dentistry. It is my preference to select the techniques and materials that excel in a particular area, rather than compromise to have one system that says it does a little of everything. For me and my practice (a prosthodontic practice located in Monterey, CA), all of my single-unit restorations are fabricated using the E4D Dentist system. In addition, with the opening of E4D Sky™ Network and the newest version of the E4D's DentaLogic software, more and more of my total restorative care will be touched by digital technologies on a daily basis.

When you are first introduced to CAD/CAM chairside dentistry, you have the opportunity to refine your thinking on restorative care. You'll no doubt become a better diagnostician and clinician—because of looking at your preoperative conditions and preparations on a large monitor—but also a better and more confident provider of

_Restorative clinicians have been spoiled in the past regarding materials for direct and indirect restorations. We've had the great luxury of seeing an ad in a journal, getting an offer in the mail or online, or attending a CE course about a new product, technique or service, and then immediately or the next day, we could take action. If we saw a new restorative material for fabricating restorations, we would simply write the request on a lab slip for the new material and expect to get it back in a couple weeks.

Think of the poor laboratory technician on the other end, reading perhaps for the first time, the method you want used to fabricate your restoration or a specific new material or a mix of materials and techniques. Remember, a laboratory slip or prescription is a work authorization, and if you write one, the laboratory technician has to comply. If we change our minds for the next restoration, we simply prescribe something else. I'm sure technicians sometimes feel as if they're chasing their tails with all the new materials, techniques and requests. Consider the investment in materials, systems, training and the learning curve they have to endure every time a new material is prescribed.

To the relief of patients, dentists, team members and technicians comes CAD/CAM dentistry and

Fig. 1_Chairside CAD/ CAM System.
(Photos/Provided by
Dr Curtis Jansen)

_ce credit CAD/CAM

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Figs. 2 & 3 Lava Ultimate is ideal for implant superstructures.

when to do what in different clinical situations. Given the number of restorative materials available at your fingertips, you'll make better-educated decisions with each particular patient situation. Using the E4D Dentist system, you have access to a number of proven materials (blocks), each with either an Ivoclar Vivadent or 3M ESPE logo on it, so you know exactly what you are getting. The abundance of material options allows you to select the best one for the given clinical situation. A quick review of what is available follows.

Block Party attendees

Resin

In the category of resin, you have the option to select the Paradigm MZ100 block from 3M ESPE. Complementing the success of the direct restorative Filtek Z100, this block contains ceramic particles with an average size of 0.6 microns with cross-linked monomers that provide the ideal wear resistance, strength and radiopacity necessary for posterior use. I use it primarily for partial coverage restorations as well as some full coverage restorations on implants. The use of this resin for indirect restorations requires placement using an adhesive cementation protocol. I personally have an onlay restored with MZ100 in my own mouth, tooth #3.

When compared to conventional feldspathic porcelain restorations fabricated with chairside CAD/CAM, the Paradigm MZ100 restorations showed better colour match through ten years.¹ This same study also showed no difference in margin finish, surface finish, anatomic form, caries or sensitivity. The authors actually concluded that "the composite inlays performed as well as the porcelain inlays with less bulk inlay fracture." In an *in vitro* fatigue study on occlusal veneer restorations,² Paradigm MZ100 had significantly higher fatigue resistance (100% survival at 185,000 cycles up to

1,400 N loads) compared to CAD/CAM feldspathic porcelain (0% survival).

Resin nano ceramic

A new category for chairside CAD/CAM dentistry is the resin nano ceramic created with the introduction of the new Lava Ultimate block. This material defines a new category, resin nano ceramic, which provides some unique and beneficial characteristics for us to have for chairside. We all know that 3M ESPE and its Lava brand have become synonymous with zirconia restorations and they've expanded this technology to additional digital applications. Lava Ultimate material contains a blend of three fillers: zirconia and silica nanoparticles agglomerated into clusters, individually bonded silica nanoparticles and individually bonded zirconia nanoparticles.³

Lava Ultimate contains approximately 79% (by weight) of this filler blend that reinforces a highly cross-linked polymeric matrix cured using a proprietary manufacturing process. The result is a unique block with indications for chairside fabrication (blocks) and use. It's indicated for a full range of permanent, adhesive, single-unit restorations including crowns, onlays, inlays and veneers. The material is ideally suited for implant supported restorations (Figs. 2 & 3) because of its high 200 MPa flexural strength (higher than conventional feldspathic blocks and layering ceramic used in metal-ceramics) and relatively low modulus (compared to ceramics).

From a time management standpoint, the use of resin or resin-ceramic system provides faster milling times and no need for an additional step of sintering or firing. As a sign of its full confidence in this new category of material, 3M ESPE is introducing a unique 10-year warranty on the use of the Lava Ultimate block. The 3M ESPE Lava Ultimate block will be offered in eight shades with two translucency options (LT and HT).



Figs. 4–6 IPS e.max CAD and IPS Empress CAD provide strength and beauty for challenging esthetic cases.

Glass ceramic

In the glass ceramic category, with E4D Dentist you have the two most popular ceramics in the history of dentistry right at your fingertips, IPS Empress CAD and IPS e.max CAD in block form. These blocks can be used together or separately depending on the clinical situation to create extremely aesthetic restorations. Here an example is shown milling both IPS Empress (#7–#10) and e.max CAD (#6 and #11) (Figs. 4–6).

It's all about the preparation

It should be noted that the proper and successful utilization of any of the metal-free types of materials (resin, resin ceramic, glass ceramic) require following approved preparation guidelines. These are simply providing proper clearance for the particular material—typically 1.5–2 mm occlusally (2 mm for implant restorations) and 1 mm axially; heavy chamfer or shoulder; rounded internal angles and butt joint margins—which need to be visible!

All digital capture systems today can only capture what they see and if you clinically can't see the margins, don't try and capture them digitally; first gain visualization through proper soft-tissue management. With all these materials, the preparation is of the utmost importance!

Concern has been raised by those without firsthand experience about the aesthetic limitations of mono-block restorations or the limited longevity of surface-characterized (glazed) metal-free restorations. It should be noted that it is often the dental bur that removes the glazed surface and not natural wear; one need only walk on 2,000-year-old tiles in Europe to realize the natural fusion of the glazed material into the base ceramic.

Proper design, record (bite) taking and attention to detail in the use of various software packages along with the replication of the virtual design in ceramic after choosing the correct shade and translucency, quickly relieve any hesitation about aesthetics and reinforce the benefits of doing and more and more chairside restorative treatment.

Table I

Leucite-reinforced ceramics

IPS Empress ushered in the aesthetic revolution, and I've had nearly 15 years of clinical utilization of the IPS Empress material, first via the press technique and now through milling of the IPS Empress CAD blocks. IPS Empress CAD blocks are available in two translucencies (LT and HT), as well as the extremely useful IPS Empress CAD Multiblock. The IPS Empress CAD Multiblock has a blend of translucency and colour intensity graduating through the block from the cervical position to the occlusal/incisal.

The coordinated software of the E4D Dentist System (DentaLogic) provides a simple way to position your restoration first virtually then actually within the block in order to customize the shade and translucency of your restoration even before you begin any customization. The clinical documentation, verification and confidence of using IPS Empress have been established via long-term data.⁴

Lithium disilicate ceramic

IPS e.max is a high-strength ceramic with a flexural strength of 360–400 MPa that defines a new level of strength for metal-free restorations. While veneering ceramics (for metal, zirconia or ceramic substructures), it exhibits strengths in the 100–120 MPa range, IPS e.max CAD provides a monolithic full-contour material that was predicted to resist fractures and chipping greater than other layered processes (veneered metals, ceramics or zirconia). In a comparative study of durability and fracture resistance between layered, lab-fabricated zirconia restorations and monolithic IPS e.max restorations, the IPS e.max restorations provided reduced fracture and more durable results.⁵

IPS e.max CAD blocks have the unique characteristic of being distributed in a partially crystallized stage (blue to violet coloured). This means that after milling, the IPS e.max CAD blocks need



Fig. 7



Fig. 8

Figs. 7 & 8 _The B.O.B. (Burn Out Block) provides the opportunity to design cast gold restorations virtually.

to be fully crystalized in a two-stage ceramic oven (e.g., Programat CS) prior to final delivery. This provides a major benefit to the entire procedure, with the advantages that the IPS e.max CAD milled restoration can be tried in the mouth and contacts verified before final firing and characterization. This makes the final delivery of the restoration more predictable and consistent.

The introduction of DentaLogic software version 2.0 coincides with the availability of additional shades of IPS e.max for chairside use. IPS e.max Impulse introduces five new shades, three Value and two Opal shades. Because of the different brightness values of the three Value blocks, restorations can be optimally integrated into the surrounding tooth structure in terms of their shade. The two Opal blocks allow clinicians to imitate the lifelike opalescent effect, which is desired in anterior restorations. The Opal blocks are ideally suited for the fabrication of veneers and thin veneers.

IPS e.max CAD blocks can also be seated with adhesive or conventional protocol depending on the retentive characteristics of the preparation following approved guidelines (Table 1).

Acrylic

Even though the price of gold has reached an all-time high⁶, if nostalgia and/or clinical concern of adequate clearance, margin design or material preference steer you toward metal-based restorations, you can still take advantage of digital scanning and designing benefits while providing you or your laboratory with a simplified fabrication process for metal-based (gold) restorations.

The BOB (Burn Out Block) block from D4D Technologies can be selected for any preparation style and then scanned and milled for presentation to a laboratory for investment, burnout and casting (or pressing), thus providing you with consistency

in design, contacts and contour for your skilled design applications (Figs. 7 & 8).

_Conclusion

Chairside CAD/CAM systems have provided clinicians with a new level of control in the practice of dentistry. From diagnosis through preparation and material selection, clinicians now have the capability of selecting from a variety of materials with proven clinical performance and to deliver restorations with unmatched efficiency and productivity. The categories of resin, resin ceramic and glass ceramic give today's modern practices the ability to offer solutions for the majority of crown and bridge indications right in the office. _

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

_about the author

CAD/CAM



Dr Curtis Jansen completed his DDS and his prosthodontic education at the University of Southern California (USC) School of Dentistry. He taught full time at USC and was director of implant dentistry in the Department

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