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New concepts in computer-guided implantology

opinion
CBCT and implants: A career-altering experience

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Dear Reader,

CAD/CAM has revolutionised engineering and manufacture since the 1950s. In the 1980s, such processes were progressively applied and integrated in the field of dentistry. It is no surprise that along with the technological milestones attained within the last decades, computerised dentistry and dental CAD/CAM technology have developed at a rapid rate. The 2011 International Dental Show in Cologne highlighted the unprecedented improvements in CAD/CAM, with exhibitors and attendees indicating that a growing number of manufacturers are joining the market.

The fast growth in CAD/CAM dentistry alongside new technology, materials and equipment has seen an increasingly rapid integration into both dental offices and laboratories. Without a doubt, digital technology is pivotal for the operational viability of every dental practice and laboratory. Are we prepared to keep up to speed with this growing industry? Can we implement this pool of information and technology in our practices without the proper expertise?

As with all new technologies, education and training are essential. The development rate of computerised technologies is not in sync with the level of training most dental professionals have attained. Evidently, with time, we will have to start implementing such technologies to remain up to date with standards and practices within the field. Companies and professionals specialised in digital dentistry place a great deal of effort and enthusiasm into training dental clinicians, technicians and dental assistants in basic and advanced techniques and procedures. Is this sufficient for the fast-paced and challenging reality they face on a day-to-day basis in their career? Every day, there are questions and uncertainties about approaching diagnostics, treatment plans and the selection of the proper material to obtain the desired outcome. Last but not least, the investment costs and the all-important return on investment have to be taken into consideration.

Since CAPP (Center for Advanced Professional Practices) started out in 2006 with the first CAD/CAM & Computerized Dentistry International Conference in Dubai, we have experienced a steady increase in the number of the events we hold and the number of participants and visitors. This year, the CAD/CAM & Computerized Dentistry International Conference will have spring and autumn editions: the sixth conference will take place in Dubai from 3 to 4 May 2012 and the seventh conference will be held in Singapore from 6 to 7 October 2012. This will be the first Asia-Pacific edition of the meeting. We would like to warmly invite all dental professionals to join us for these events. We are very excited to organise events focused entirely on computerised dentistry, aiming to build important bridges between our dental teams, dentists, dental technicians and the industry.

In 2012, the CAD/CAM magazine will serve as a platform for education and information exchange with a new rubric—digital platforms. Dental schools, societies, associations and companies are invited to announce their course schedules here. More information about this exciting project is available inside this issue.

Yours faithfully,

Dr Dobrina Mollova
Managing Director of CAPP
Dubai, UAE
Dear Reader

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Cover image courtesy of Renishaw: A Renishaw 9500 with frameworks already milled, loaded in a Renishaw inco milling machine.
New concepts in computer-guided implantology

Part I: Thread timing and implant phase

Author: Dr Gian Luigi Telara, Italy

Accuracy in guided implantology is an issue. The ability to perform implant placement both safely and correctly, in order to load a pre-surgical CAD/CAM bar or cementable metal final framework prosthesis and to digitise the entire procedure, is widely researched. Accuracy is a value also in a classical II-stage protocol and respecting hard and soft tissues for long-term implant site stability.

There is an ongoing debate amongst clinicians regarding which is the best available system. Vercruysen summarises this debate.1 The article reviews only some of the published articles on this topic. All of these articles emphasise the error margins and that they can be considered clinically more or less acceptable, and determine accuracy in implant placement by means of superimposition.

In mathematical terms, "precision" means the repeatability of a measurement, and "accuracy" refers to the correspondence of this measurement to the truth. In our field, accuracy has been considered the correspondence of the placed implant to the planning.

Fortin defines "accuracy" as an ideal, at present somewhat impractical, when considering a definitive prosthesis for immediate loading, with the present systems only offering predictable results (and as such only long-term reinforced provisionalals will be available), but does not quantify a threshold.2 According to Di Giacomo, at present a post-operative impression appears to be always necessary for immediate loading with a definitive prosthesis.3

Guided implantology is far better than a free-hand
approach, however. A guard-rail-like guide is certainly better than nothing.

Many systems are available today, and from a theoretical perspective they have been categorised into semi-active and passive systems. The systems in the first category, whatever the technique used to make the surgical guide (STL or stone surgery), have metal smooth guiding sleeves, which the implant and the implant-driver must pass through, and the second systems, also called navigation systems, do not have any metal sleeves and the surgeon is guided by the monitor. In this category, the surgical handpiece is indexed to spatial markers inside a surgical guide that is inserted into the patient’s mouth, but not in the surgical area. These spatial coordinates are viewed by an infra-red system, which transfers data to the computer, allowing the clinician to follow the surgical steps on the monitor. Alarm lights and sounds will warn the clinician of deviations from the desired position.

I propose a new definition of a passive system: a passive system must allow any operators (i.e. it must be operator independent) to achieve the same, repeatable results at an acceptable inaccuracy threshold. The accepted inaccuracy must allow clinicians to obtain a good metal-to-metal fit without placing tension on the implants. This “to what extent” predictability can determine the reliability of treatment. In fact, in fixed prostheses on natural teeth, passivity (at an acceptable gap) is about 40 to 50 µ in the arch; the same values could be considered acceptable for prostheses on implants. According to this definition, none of the systems on the market has replicable results, and have metal or virtual smooth sleeves. They must thus be considered metal or virtual smooth semi-active systems.

I have developed a new device according to the mathematical concepts of thread timing and implant phase, which can be applied to the implant movement while being screwed, thus allowing clinicians passivity during implant placement. In the future, owing to the predictability of implant placement, the proposed device could be fundamental to achieving the desired goals in computer-guided implantology.

**Materials and methods**

The implants were placed using the bottle-neck-like device, which begins implant rotation before it can touch the bone, thereby avoiding bone interference with implant movement owing to bone density gradients (“bone guidance”). The prototype of the device (Fig. 1a) consists of:

- an internally threaded sleeve ("embedded sleeve", with a “helical gear” feature at its top that is useful during implant placement; Fig. 1b); 
- an externally threaded sleeve ("osteotomy sleeve"), which has to be inserted into the embedded sleeve and serves as a regular sleeve for the osteotomy drills (because it is internally smooth; Fig. 1c); 
- a modified extender for drills (Fig. 1d); 
- an externally threaded sleeve, longer than the osteotomy sleeve, that acts as a ”bottle-neck" and
is screwed into it (Fig. 1e); and the “bottle-plug”, which is screwed onto the bottle-neck (Figs. 1f–h).

For the osteotomy, I used a regular surgical kit, not a dedicated one to precision, just modifying a plain extender to fit any osteotomy surgical kits (general and not guided surgical kits). The extender should match up with the sleeve before the drill touches the bone. The prototype was realised with no endo-stop features in the extender; only lines indicate depth.

The bottom end of the bottle-plug is provided with a helical gear (to match up with the corresponding embedded sleeve’s helical gear; Fig. 1i). The bottle-plug in the prototype device consists of two components, the cylindrical screwed part and the lid, and they are fastened together with a joint. The lid is integrated into the implant mounting component; thus, while the bottle-plug is being screwed onto the neck, the implant mount is entering inside the bottle-neck, forcing the implant downwards.

The implant mount has a hollow to allow for an implant fastening screw (the same as used to fix implants and abutments, just longer, to allow for minimal screwdriver length, when it is necessary to unfasten the components at the end). The mount also has a gauge for a wrench at its top (but it can work for a handpiece driver as well). Once implant placement has been carried out, the mount can be unscrewed from the implant and vertically unfastened from the bottle-plug. At this point, the surgical guide can be removed easily, with no risk of hex undercuts.

The device must resist the vertical dislodging torque created when screwing the implant into the bone. A screwed bottle-neck performs well for this purpose and the lid must be fastened to the vertical part of the bottle-plug.

SimPlant Pro Crystal (Materialise Dental) was used only to plan the implant position (Figs. 2–3a & b), but instead of using a surgical guide, a STL digital cast with analogue implant holes for placing analogues was used in the first case reported (Fig. 4). A plain stone model with a (presumably) correct analogue position was used for the second case reported (Fig. 5). In both cases, the analogues were, screwed to the device, and then the device was secured to a bite-like thing (using plain relining resin for the provisionals) to obtain a surgical guide (no surgical guide fixation to the bone was considered; Fig. 6).

No guided tapping drill was used. This is something that should be considered, especially in high...
density bone. It could imitate the implant, with sharp threads and narrow body, to be screwed to the bottle-plug, or a bottle-plug dedicated to the tapping step, with the tapping part integral to the bottle-plug itself.

In both clinical cases, the device was assembled chairside to allow for minimal vertical clearance (Figs. 7a–d). A base-plate resin was then used to create jigs to check accuracy between the models and the mouth.

_Results_

The case results were satisfactory. The device was easy to use (Figs. 8a & b) and jig correspondence between the abutments screwed on the analogue models and the clinical implant positions was obtained.

For the STL case, four abutments were modelled on the STL model, the resin jig was created directly in the mouth, and then its correspondence to the same abutments was checked on the STL model (Figs. 9a–c). For the stone case, a transfer was screwed onto the analogue, the resin jig was created, and then its correspondence was clinically checked (Figs. 10a & b).

_Discussion_

The present systems do not offer sufficient and reliable accuracy because they do not consider the concepts of thread timing and implant phase. Their weak point is the smooth sleeve (whether metal or virtual), which does not have any control over the mechanics of a screw, which an implant is. Shooting a bullet makes sense, but shooting a screw does NOT.

Smooth sleeve-dependent inaccuracy

The first element to be considered is the gap between the implant mount and the sleeve. A twisting implant apex is the natural effect. When the implant is guided by a smooth sleeve, the position in the arch will be correct only if the implant mount does not ever touch the sleeve during the process, but when the dentist is working there will always be contact, which will result in an error in B-L and M-V position. This is what I call the "position paradox effect" of a guiding smooth sleeve (similar to a guard-rail).

Since the sleeve has a top and a bottom plane, this paradox effect is reproduced in both these two planes, and an axis deviation is a natural consequence (what I call the "axis paradox effect of a smooth sleeve"). The gap affects position and axis: these parameters go hand in hand. Depending on the gap entity, it is possible to calculate the implant apex twisting entity, using simple proportionality (Fig. 11a). At a 20 mm depth from the top of the sleeve (approximately 13 mm below the ridge), the linear deviation will be 0.8 mm (1.6 mm on the diameter that is the possible implant apex twisting entity). Trigonometry is an easy way to calculate the deviation angle of the implant axis (sine/cosine and tan/cot rules). If the gap is 0.1 mm (0.2 on the diameter), the axis deviation will be a deviation of 2° 20' (Figs. 11b–d).

Tapered implants can engage bone at an even greater angle, particularly if the driver is conical at its first part. Consequently, it will work only at the end of the implant placement phase. According to the previous considerations, I suggest that it does not work efficiently. This cone-shaped driver limits too large an insertion torque because it may be damaging; however, the larger the axis deviation, the...
greater the torque perceived by the operator, who will be given an inaccurate sense of implant stability.

The good results reported in publications could have been affected by right-handed operators in isotropic D2 and D3 bone or by working in sites in which cortical plates can directionally address implant placement. Excellent results reported could have been affected by working in low-density bone, where the marketed system allows for a good axis and depth, but the drills created a truncated cone volume devitalised area (depending on the drill blades’ cutting power and operator’s hand force), because the low-density trabeculae would be drilled 360° around. The hex would be missed anyway.

The second matter to be considered is bone guidance. Depth and anti-rotational feature orientation depend on bone morphology and density.

When the implant has started its rotation inside the bone, it is not possible to change the threading pattern: while screwing the implant, the platform will move increasingly deeper downwards to the bone. Since it is possible to index a hex to a peripheral point along the circumference and a point along the same circumference can be indexed to the implant thread, the need to change the platform depth and hex orientation and control the threading pattern (implant phase) will be indicated. Any painted notch to index the hex and the sleeve is misleading information and naïve, as it is approximate, that is, no implant phase, and dependent on notch size, point of view (parallax) and operator's visual acuity.

Once the implant has started its rotation, it is not possible to correct the position by redirecting the implant, as the apex has been inserted into the bone and will act as a fulcrum. Even if the operator redirects the implant axis, the implant body will remain displaced in position (B-L and M-D). Moreover, the redirection would be done by sight, which is dependent on the operator’s visual acuity and a parallax error is a possibility.

The axis deviation introduces another concept: bone response in terms of bone density and bone anisotropy. As a matter of fact, on the other side of the surgical guide, when the implant touches the bone, with a smooth sleeve it is impossible to predict when it starts being screwed. The moment the implant starts rotating depends on the bone friction, depending on the density (HU), and the progression of the osteotomy and the implant insertion will be dependent on the HU gradient (anisotropy), which describes how rapidly the density changes per unit of length along the three spatial coordinates inside the bone. Unless we use a device able to force implants in a precise position (referred to as the surgical guide) along a path engineered according to a particular mechanics, the bone will determine the implant threading pattern (bone density for initial screwing, whether or not a crestal bone drill has...
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special guided implantology

Accepting inaccuracy, manufacturers and researchers have created depth-control systems in the hope of offering certainty about this parameter at least, but the gap will be responsible for not only position and axis deviations, but also depth errors. In fact, the implant mount endo-stop will match up with the sleeve at an angle. The first contact will be beyond the desired depth, and keeping on screwing the implant will create a great torque with surgical guide deformation and tension on the bone. The complete contact will correspond to a deeper implant position than desired. The correct depth may be halfway (maybe operator dependent and determined using the naked eye). Depth error, axis deviation and translation in crestal position in the axial deviation direction will be the results (Figs. 12a–e).

The likelihood of ideally positioning two implants is one out of seven billion and 500 million possibilities (just a few million less, if it is any comfort to us). And this evaluation comes from a 0.1 mm mean deviation and 1° deviation, which implies insufficient inaccuracy. Fancy what the chances would be of achieving acceptable accuracy.

Thread timing and implant phase

From a mathematical perspective, it is possible to describe all implant spatial coordinates concentrated on the platform, where we can summarise everything, and calculate its trajectory to create kind of a spiral path, through which it is possible to start and stop an implant platform along all the parameters, thus being able to truly speak of implant-guided prosthodontics.

The idea is based on the following: when screwing a coca-cola plug onto the bottle-neck, the final position will always be the same (Figs. 13a & b). Once two final positions have been found, two threads will be inside the plug; once three final positions have been found, three threads will be present on the plug. The label written on the plug can be considered to be a hex (or a trilobe). So the hex, that is the platform, can easily be reproduced in its position because the thread pattern and hex are indexed to each other. This means that if we can control the threading pattern, we can consequently control the platform position too.

According to this consideration, all the parameters that define the platform position can be controlled. The parameters are the position in the arch (B-L and M-D), the axis, the depth and the antirotational feature (classically, a hex) orientation.

The mechanical engineering of a screw is quite different from that of a bullet (smooth sleeve) and was defined by Archimedes (applications of an endless screw are still in use today, like the meat mincer) and by Euler (Swiss mathematician, who died in St Petersburg more than two centuries ago). In particular, Euler pointed out that the movement of a circle (in our field, the implant platform) can be described with mathematical formulas: a point along the periphery (in our field the progression of the platform while the implant is being screwed in multiplanar reconstructions) can be projected along a plane orthogonal to the direction of the circle movement itself (in our field, the projection of the platform while the implant is being screwed in multiplanar reconstructions). The projection will
describe a sine wave (in our field, the sine wave period can be identified with the implant thread pitch). With this in mind, I developed the device discussed in this article, which controls the threading pattern. In mechanical engineering, this is called thread timing, and the hex position can be defined as hex timing. For both of them we can speak of phase control (i.e., we can speak of the phase of the implant, both for the thread and the hex). Along this spiral track, the implant can be theoretically and actually screwed and unscrewed as many times as we desire (back and forth), and it will always be possible to know the hex position at the end of the spiral path (final analogue and implant position; Figs. 14a–c).

As a spiral circular motion is transformed into a pure translation, a threaded device will respect also position and axis. The information needed to correctly (position and axis, anti-rotational feature and depth) place an implant is in its platform and inside its threads. By creating in the surgical guide a track along which the implant is screwed before its contact with the bone, it is logically possible to start and stop the implant with a final seating with all the parameters always reproduced. We can thus decide when to stop the implant during its fall along this spiral track. The final position will always be the same, that is repeatable, and operator independent. The device meets my earlier definition of a passive system.

The maximum precision possible will be what manufacturers can effectively offer (a 1/100 mm is expected to be realistic), which corresponds to the actual implant placement. With a threaded system, there is no axial deviation. Therefore, there will only be a 1/100 mm position deviation (in the arch this will signify a possible 2/100 mm deviation), no axial deviation, depth and anti-rotational feature correspondence. This discrepancy is within the limits that allow the clinician to make a premade final prosthesisc and allows for presumably optimal long-term tissue stability.

Some of the systems available also consider hex orientation position, but in order to seat the implant correctly with regard to the anti-rotational feature, an extra rotation may be needed. Speaking of "correctly", at which angle resolution? If the feature described is in the shape of two points (painted or alike) to be vertically aligned, what is the point dimension? What is the eye resolution? Is it possibly a parallax error? Extra-rotation is an implicit admission of inaccuracy: the depth will not be respected as well, and the implant platform depth may be a little above or below the desired position (it depends on the degree to which the operator is out of phase, more or less than 180°). It is easy to realise that, unless all this has been calculated, all attempts to find the anti-rotational feature position and depth are only guesswork—a waste of time! Thread timing and implant phase have not been respected. Forget any notches on the implant mount and smooth sleeves, if anti-rotational feature orientation is the goal. Notches are history in digital guided implantology.

Once we have set a threading pattern, it is possible to set the stop point simply making a helical gear (a helical gear is realised by contouring the thread along its 360° run; a vertical step will be present once we have gone 360° all round) both in the bottle-neck plug and in the embedded sleeve (the coordinating feature inside the surgical guide), so that a vertical stop is realised in the device. When the two vertical parts match up, we can be certain that the hex is just where we have engineered it to be.

The device pitch must have the same implant pitch because differences will lead to bone stripping. In fact, a difference in implant and mount insertion speed (i.e., the distance covered in depth every 360°) and a different wave period (i.e., thread pitch), will lead to something different from an out of phase working device; it will lead to bone stripping.
particular, a longer mounting period will force the implant downwards into the bone, with consequent vertical bone stripping, whereas a shorter mounting period will force the implant to rotate horizontally, with consequent horizontal bone stripping. Self-tapping implants should show better torque control.

Rigidity

The device must be secured to the surgical guide to resist the rotational torque and vertical torque always present during the implant rotation inside the bone.

Components and undercuts

In the prototype device, a driver for a ratchet was used. It was completely redundant because the ratchet can cooperate directly with a plug-top feature for a ratchet at its top; thus, the driver is something that can be eliminated. Once the assembly has been fixed to the embedded sleeve, the plug can be screwed with the fingers, at least until sufficient torque is found, when a ratchet can be used.

When multiple implants have been planned, in case of divergent implants, hex undercuts could prevent the surgical guide from releasing itself from the bone, once the implants have been placed. In order to resolve this, the device, at least the mounting part, must be removed from the surgical guide. The device is thus divided in two components and the lid, which is integral to the driver, can be unscrewed, leaving the surgical guide along with all the other components still fastened to it, but disengaged from the implants, freely and easily removable.

For single implant placement, the lid is not necessary, because there are no hex undercuts. In this case, a bottle-plug with one component will be sufficient.

Crest module

The implant crest module morphology does not affect this guiding device because the bottle-neck’s internal diameter is just a little wider than the implant diameter at any point (platform or below the platform). By the way, additional threads in the crest module are not important either because, mathematically speaking, they are harmonic waves of the implant period (thread pitch).

Master cast

The helical gear can easily be oriented vestibularly in the threaded guiding device before pouring the master model.

Vertical clearance

To make the correct surgical guide, the helical gear must be engineered in the planning at a multiple pitch distance from the bone, just equaling the implant length (the implant must start rotating before it touches the bone to avoid bone guidance). For instance, the distance will be 9 or 10 mm for 9 or 10 mm long implants with a 1 mm pitch, and the distance will be a multiple of 0.75 for a 0.75 mm pitch (9 mm will correspond to 12 implant revolutions and 10.5 mm to 14 revolutions). The average mouth opening values should be considered. In case of tapered implants, a short distance can be considered because the implant apex can enter the osteotomy hole without being engaged. To reduce vertical clearance, the device can be pre-assembled, thus obtaining a working length even shorter than that of the present systems (Fig. 15). A shorter vertical clearance is possible also with trans-mucosal implants because the platform results are more superficial.

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With all the technologies available to dental practitioners today, very few can be described as "career altering". One of my original reasons for investing in a CBCT scanner was to assist with the complete evaluation of dental implant sites.

A major concern during implant placement is the possibility of placing an implant too close to or penetrating the inferior alveolar nerve canal, likely resulting in injuries such as paraesthesia, anaesthesia or dysaesthesia. In preparation for the insertion of fixtures, I wanted to be able to visualise important anatomic landmarks appropriately, such as the inferior alveolar nerve canal, mental foramen, maxillary sinus, incisive canal, nasal floor, mylohyoid ridge, and the location and morphologic variation of adjacent teeth. The data provided by the scan allows the dentist to locate such structures accurately beforehand, so that they and potential iatrogenic injuries can be effectively avoided during surgery.

Obviously, with traditional 2-D radiographs, I could visualise the general location of these entities and the approximate height of the alveolus, but a 3-D scan provides more information about the morphology of that ridge—its height and width to within a hundredth of a millimetre, as well as its angulation and variation of its form. Currently, I feel that the scope of data garnered from the CBCT scan is imperative for placing implants safely and correctly for the best restorative options, and this technology has indeed altered my approach to dentistry. I continue to learn from each case that I perform by taking low-radiation, limited, post-operative scans, which help me become a better surgeon.

The clear, virtual, revolving model of the dentition captured on the CBCT scan can be rotated, zoomed in on from any angle and viewed in 360° to assist in the determination of the implant site, as well as for the fixture’s proper inclination, length and diameter. As an added benefit, there are numerous CBCT-compatible, implant-positioning software programmes available, such as SimPlant (Materialise Dental), NobelGuide (Nobel Biocare), EasyGuide (Keystone Dental) and InVivo5 (Anatomage).

Besides its usefulness for implant patients, my CBCT has a myriad of other benefits. I use it to gain information for many of the procedures performed in my practice: extractions; diagnosis and treatment of pathology; orthognathic surgery; airway studies; dental, oral and maxillo-facial trauma; bone grafting; and evaluation of the paranasal sinuses.

For example, a CB image can show the relationship of a tooth to vital structures such as nerves, the sinus or other teeth, which could turn an apparently simple extraction into a complicated one or provide dentists with information to treat complex extractions more easily. Using preoperative 3-D reconstructions, like those produced by InVivo5, has become indispensable preceding my treatment of jaw tumours, congenital and developmental deformities, or maxillo-facial trauma.

In addition to educating me regarding preoperative planning, the CBCT allows patients to understand my reasons for the treatment that has been suggested better, so they feel more involved in their own dental health planning decisions. When they must decide between an implant and other possible treatment options, the 3-D images illustrate and enhance
my verbal explanation. Patients also enjoy the convenience of the in-office CB examination, which eliminates the need for an extra trip to an imaging centre and additional appointments at our office.

Also, as financial considerations and radiation exposure have become increasingly important concerns, patients appreciate that my CBCT machine exposes them to considerably less radiation and at a lower cost than the traditional medical CT scans taken elsewhere.

From a practice-building perspective, we have noted that patients are appreciative of in-office CBCT technology that results in safer and easier treatment, and they discuss their experience with family and friends, resulting in increased referrals.

Quite frankly, I cannot even imagine practising oral and maxillo-facial surgery without my i-CAT, and I would not want to place an implant without being aware of all the details that could affect its success or failure. The CBCT information helps me formulate the correct diagnosis, whether I am planning an implant, simple or complex dental procedure, or just consulting. For my practice, I consider it not only to be the standard of care, but the gold standard for dental practice.

Dr Steven A. Guttenberg, an oral and maxillo-facial surgeon, practises in Washington, D.C., where he is director of the Washington Institute for Mouth, Face, and Jaw Surgery. He is a diplomate of the American Board of Oral and Maxillofacial Surgery and a fellow of the American Association of Oral and Maxillofacial Surgeons and of the American College of Oral and Maxillofacial Surgeons, of which he is a former president. Dr Guttenberg teaches at the Washington Hospital Center and is chairperson of its Oral and Maxillofacial Surgery Residency Training and Education Committee. He frequently lectures nationally and abroad. His numerous scientific articles and book chapters have been published in dental and medical literature.
“Our growth is definitely driven by innovation and quality”

An interview with Gilles Pierson, CEO of the Acteon Group

_During the 2011 conference of the Association Dentaire Française (ADF) in Paris, Dental Tribune International spoke with Gilles Pierson, CEO of the Acteon Group, about the company’s history, new products and future strategies.

Gilles Pierson, CEO of the Acteon Group, and Matthias Diessner, Account Manager, DTI.

_CAD/CAM: Your business units Satelec, Pierre Rolland and Sopro were unified under the Acteon Group in 2003, followed by your Italian business unit, De Götzen, which joined the group in 2006. At IDS Cologne 2011, you introduced your new corporate identity and the new Acteon logo. What was the main reason for this rebranding?

The change in the group’s name is due to the fact that at the very beginning in 1980, Satelec existed on its own. Pierre Rolland merged with Satelec in 1985 to become Satelec–Pierre Rolland. After 1995, we decided to grow the company through acquisitions, so we acquired different companies like Sopro and De Götzen. It would not have been feasible to have named the group Satelec, Pierre Roland, Sopro, De Götzen and so on. We saw the necessity for a group name while maintaining the companies’ individual names. So the group is now named Acteon but the different companies that we acquired and that merged are identified as companies with their own history and their own products. This is also good for the employees, who still identify with their original companies while belonging to a large group. So we have kept the history of each company, but we have grouped them under the umbrella of Acteon. Satelec is still known in countries like France. Pierre Rolland, which is a 60-year-old company, is still famous, so it’s a little bit difficult to introduce the name of Acteon. Eight years on, awareness is growing, although the individual company names of Pierre Rolland and Satelec are still better known than the umbrella group of Acteon.

In countries where our history is shorter, like the USA, Asia or Australia, Acteon is now known as a company, and the different companies like Satelec, Pierre Rolland and Sopro as divisions. We found a way to keep the identity of each company in the group, while building a brand name that encompasses all of them.

_CAD/CAM: With a turnover of €113 million and a growth rate of 16% in 2010, last year was a tremendous success for the Acteon Group. 80% of sales were recorded in France. How was 2011 for you, and which markets do you consider most important for the group?

2010 was another big and successful year with a 16% increase. In 2011, we expect another 9% increase in sales, which is good if you consider the economic situation. Europe will
account for a stable 2% and the US for 10%. But the highest growth we are experiencing is in China, at approximately 20%. In general, Asia currently accounts for 20% of our global sales, so if we achieve a 20% increase, we will be very satisfied. Countries like Japan and India in particular are very strong markets for us, as was Thailand until November, before floods plagued the country.

2011 and the coming years will definitely be driven by Asia, and especially by China, where we have been established since 1987. We now have a team of 40 people there and expect an average growth of 30% over the next five years. China is definitely a booming market.

When we talk to other European companies who sell on the Chinese market, they often mention price sensitivity and the need to adapt to the local price level.

No, I don’t think it’s a question of price—it’s a question of mentality in China. They have cheap copies of all our products there. Twenty years ago, we sued the copycats. However, we realised that this was not productive because if the company simply closes and reopens in the next garage, you are fighting a lost cause. More importantly, we realised that the Chinese copies are our best advertising because the quality is very poor and the design is just ridiculous. Dentists first buy a Chinese copy but then they experience so many problems. As soon as they have the money to buy a European product at a European price, they will buy it. The fake Rolex made in China is sold in Europe, but the real Rolex made in Switzerland is sold in China. And the proper business-orientated Chinese client with a long-term plan will never buy a fake product.

On the other hand, we are seeing an alarming trend reversal in Europe. There are so many fake or copy products from China imported into Europe with a fake CE number or with a fake ISO 9000. The customs duties in the Shenzhen area do not block these fake products, so any kind of product can enter into Europe. These are healthcare devices to treat patients and they should not put patients in danger.

Do you believe that you will still be able to manufacture in France or in Europe in the future? Acteon’s policy is to manufacture and conduct research in Western Europe, and not to manufacture in China, South-East Asia, Brazil, India, or anywhere else. Our policy is to produce continuously in Western Europe. Our factories are in France, Italy and Germany. Acteon has established itself in a niche of the health-care market. This market is driven by quality and innovation. Western Europe is best known for these qualities and, consequently, you have to have your factory here to produce at such a level and to generate innovation based on the technology. This is Acteon’s philosophy.

Over the past 30 years, we have invested a large amount of the company’s profits in R & D. We currently have a total of 70 people in our R & D departments in the different companies, and our growth is definitely driven by innovation and quality.

You have invested in the digital dentistry market in particular...

We invest a lot in the digital dentistry market indeed. This is one of the fastest-growing mar-
feature  interview

Since the introduction of cone-beam technology to general dental and maxillo-facial surgery, ENT surgeons have become increasingly attracted to this form of technology and are thus becoming a very important market segment for this kind of product.

The large viewing area for the ear, nose and throat is especially convenient. We have good synergies with our medical division, which is also specialised in the ENT area. You see, there are many bridges between the dental and medical fields, between endoscopy in the medical and imaging in the dental field, between radiology in the dental and imaging in hospitals or ENT. We are pleased with the cone beam, and the sales figures are within our expectations.

Acteon will stage sponsored sessions on Wednesday, 6 June, from 16:00 to 17:00 (this includes a session hosted by Dr Bennani entitled 'A new gingival retraction technique for implants'). On Friday, 8 June, from 12:15 to 13:45, there will be a novel procedure for evaluating plaque status and soft-tissue inflammation using an intra-oral camera. These sessions will be of interest to dental hygienists, general dentists and periodontists. The crème de la crème of international speakers will reveal tips and tricks from their professional lives, and we invite everyone cordially to join us in Vienna.

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red dot design award winner 2011

_Your new CBCT System, WhiteFox, received the red dot design award in 2011, which recognises exceptional industrial design. What is the response from the market, and how are the sales figures for the WhiteFox system?

We place a heavy emphasis on design at Acteon for three reasons. The first reason is that the dental clinics are usually well designed because the patient is awake. It is not like a hospital, where the patient is under anaesthesia and asleep and does not care about his environment. In a dental clinic, patients like to have a nice environment to lower the stress of the experience.

Another point is that the dental assistant is participating increasingly in the choice of products. The clinical team likes nice designs and colours, whereas the dentist tends to be more attracted by technical features. But the dental assistant is playing an increasingly important role in decision-making when it comes to new acquisitions.

The WhiteFox was very well received by the market. The design is nice, but the technology is really advanced. For example, WhiteFox is the only scanner of its kind to feature a Hounsfield units calibration. This calibration is used for measuring bone density in order to allow for perfect planning and, if needed, for bone grafting prior to implantations.

No one can deny any longer that the future of dentistry is digital. For example, at Sopro, we manufacture a camera to detect tooth decay with fluorescence technology. So imaging is one thing, but with imaging you can go to diagnosis. Imaging for a diagnosis is really the key point of imaging, and if you have a good diagnosis, you can have a good treatment.
"Online learning is not the next big thing, it is the now big thing."

Donna J Abernathy
Training and Development Editor

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A 59-year-old male patient was looking for a new fixed restoration for his maxilla. His case history showed no general disease. The patient had been fitted with telescopic model casting prostheses in the maxilla and mandible.

Owing to the periodontally insufficient anterior residual teeth in the maxilla (teeth #12, 11, 21 and 22), the prosthesis could no longer be supported. After losing the residual teeth, the patient wanted a fixed implant-based restoration of the maxilla.

The residual teeth of the mandible showed the following findings. Tooth #48 was impacted and displaced. Tooth #45 showed mobility (Grade 3) and was periodontally insufficient.

The anterior residual teeth #33 to 43 presented with increased probing depths on the canine teeth and increased mobility (Grade 2).
The treatment strategy for the maxilla included, as a first step, a conservative periodontal therapy of the anterior residual teeth for strategic preservation and fixation of the existing prosthesis until implant insertion.

Afterwards, the residual teeth were removed and a bilateral sinus floor augmentation was performed in a two-stage procedure. Following 3-D planning, eight endosseous implants were inserted with the CAMLOG Guide System in a flapless procedure, and the prosthetic restoration was realised using a telescopic bridge.

In the mandible, tooth #45 was removed and the other teeth were treated with conservative periodontal therapy. The mandibular posterior teeth were replaced and realigned. Teeth #43 to 33 received re-veneering of the removable denture.

The planned minimally invasive flapless procedure for implant insertion requires a unique

Fig. 10. Transversal view at region 26. The central axial borehole is clearly visible and there is good ossification in the sinus.

Fig. 11. All views at implant region 27. From left to right: lateral view with projection of the temporary implant in region 25, transversal view, panoramic anatomic view, occlusal view.

Fig. 12. Transversal view at 24.
Fig. 13. Transversal view at 23.
Fig. 14. Transversal view at 17.
Fig. 15. All views at implant region 16. From left to right: lateral view with projection of the temporary implant in region 15, transversal view, panoramic anatomic view, occlusal view.

Fig. 16. Transversal view at 14.
Fig. 17. Transversal view at 13.
Fig. 18. Transversal view at 12.

Fig. 19. Surgical template with ball retention elements at positions 21, 15 and 25 for stable positioning of the template during drilling procedures. Careful cleaning and disinfection are mandatory before placement.

Fig. 20. Ball retentions on temporary implants for stabilisation of the temporary prosthesis, fixation of the scan template during cone-beam scan and positioning of the surgical template during the drill procedure.

Fig. 21. The gingival punch is guided through the sleeves into the mucous membrane. The punch has no depth stop.

Fig. 22. A scalpel is used to cut out and remove the punched gingival islands after removing the template.

Fig. 23. Resected implant locations 26 and 27.

Fig. 24. The template is mounted again. Start of the CAMLOG Guide drilling sequence with the pilot drill followed by drills of the appropriate lengths depending on the implant length (region 23).
fixation for the preparation of radiological materials. The fixation is facilitated by temporary implants in a suitable position.

In order to ensure accurate transferability, the fixation must be performed under radiological control in the identical position as the one for the implantation.

The scan template is fabricated based on prosthetic requirements (functional, aesthetic). A bone-anchored and prosthetic-oriented scan can be taken under radiological control owing to the unique fixation of the scan template using the interim implants.

The thickness of the mucous membrane can be measured by fitting the radio-opaque tooth along the plaster surface. The distance from holding sleeve to bone surface must not exceed 3.5 mm.
CAD/CAM was used to fabricate the bridge framework from a fibre composite (Everest C-Temp, KaVo) and veneered with an acrylic material. For passivation of the design, proven electroplating was used. Custom CAD/CAM-fabricated zirconia abutments were selected.

**Conclusion**

The original goal of the prosthetic reconstruction was a fixed bridge restoration. Owing to the hygienic and functional training phase with the long-term temporary appliance, the patient opted for a removable bridge.

The accuracy and simplicity with which the implants can be inserted in prosthetically correct or anatomically difficult situations is increased significantly by virtual 3-D implant planning using CBCT or CT in combination with the guided implant bed preparation and implant insertion. Implant therapy is thus facilitated.

The drilling sequence in the CAMLOG Guide System is different from other systems. While in a conventional drilling sequence, the pilot drill is advanced to the final implant length, the drilling sequence guided by the CAMLOG Guide first starts with the shorter pilot drill (length 6 mm).

To guide all drills by the sleeve geometry from the start, the drilling sequence is performed in succession from the 9 to the 11 mm drill and finally to the 13 mm drill (maximum implant length).

The CAMLOG Guide offers a sleeve system. As opposed to multi-sleeve systems, a single sleeve inserted into the surgical template is adequate for guidance during all drilling sequences and implantation procedures. The implants can be inserted through the sleeves.

**Editorial note:** The case was first published in C. Mairoana & M. Beretta (eds.), Manual of Oral Implantology (Edizioni Italia Press, 2010) and is reprinted here with kind permission.

A complete list of references is available from the publisher.

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Lithium disilicate, the restorative material of multiple options

**Authors**_ Lee Culp & Prof Edward A. McLaren, USA

As dentistry continues to evolve, new technologies and materials are continually being offered to the dental profession. Throughout the years, restorative trends and techniques have come and gone. Some material developments have transformed the face of aesthetic dentistry, while other initial concepts have phased out and died. Today all ceramic restorations continue to grow in the area of restorative dentistry, from pressed ceramic techniques and materials to the growing use of zirconia, and new materials that can be created from CAD/CAM technology. This article will explore new uses for the all-ceramic material, known as lithium disilicate, and the use of a digital format to design and process this material in new and exciting ways. An overview of the material and unique clinical procedures will be presented.

**Introduction**

Embracing proven alternative solutions and transforming traditional methods can be challenging to dental restorative teams facing increasing patient demands while being tasked with delivering high-strength restorative options without compromising the aesthetic outcomes. Traditionally, dental professionals have used a high-strength core material made of either a cast metal framework or an oxide-based ceramic (such as zirconia or alumina). This approach has two disadvantages.

Compared with glass-ceramic materials, the substructure material has high value and increased opacity but may not be aesthetically pleasing.1 This is especially an issue in conservative tooth prepa-
ration when the core material will be close to the restoration's exterior surface.

The other disadvantage is that although the high-strength material has great mechanical properties, the layering ceramic with which it is veneered exhibits a much lower flexural strength and fracture toughness.\textsuperscript{2, 3} The zirconia core (with a 900 to 1,000 MPa flexural strength) is less than half of the cross-sectional width of a restoration; it must be completed with a veneering material with a flexural strength in the range of 80 to 110 MPa (depending on delivery method).\textsuperscript{4} The veneering material tends to chip or fracture during function. Also, such restorations depend significantly on the ability to create a strong bond interface between the dissimilar materials of oxide-ceramic and silica-based glass-ceramic, a bond that is not difficult to create.\textsuperscript{5} However, the quality of the bond interface can vary substantially because of cleanliness of the bond surface, furnace calibration, user experience and other issues.

In today's industry, monolithic glass-ceramic structures can provide exceptional aesthetics without requiring a veneering ceramic. Greater structural integrity can be achieved by eliminating the veneered ceramic and its requisite bond interface.\textsuperscript{6} The relative strength of the available glass-ceramic material has traditionally been the disadvantage of these restorations. Owing to their flexural strength of 130 to 160 MPa, they are limited to single-tooth restorations, and adhesive bonding techniques are needed for load sharing with the underlying tooth.\textsuperscript{6} This has been resolved through the development of highly aesthetic lithium-disilicate glass-ceramic materials.

The 70 % crystal phase of this unique glass-ceramic material refracts light very naturally, while also providing improved flexural strength (360 to 400 MPa).\textsuperscript{7} This gives more indications for use and the ability to place restorations using traditional cementation techniques, while also having strength and aesthetics.

With a monolithic technique (Figs. 1 & 2), most restorations built from lithium-disilicate materials can be completely fabricated. This approach provides high strength and aesthetics but requires surface colourants for the final shade. When in-depth colour effects are needed, a partial layering technique may be employed. Although no longer a purely monolithic structure (Figs. 3 & 4) because the restoration maintains a large volume of the core material, the resulting restoration should reasonably maintain its high strength. However, no evidence supports this.

**Aesthetic options**

If covering or masking underlying tooth structure is part of the treatment plan, the restorative team can imagine doing so in an aesthetic way. The ceramist can make that vision a reality with IPS e.max (Ivoclar Vivadent) by using a very high opacity ingot. Ingot opacities available for IPS e.max include high opacity (HO), medium opacity (MO), low translucency (LT) and high translucency (HT).\textsuperscript{7} The MO ingot can be used as an anatomic framework material if restorations must be fully layered. LT ingot can be employed with stain and glaze methods for the scan, design, and milling of the veneer restorations.
industry report  

Lithium disilicate or hybrid layering techniques, which have been used for years with IPS Empress Aesthetic (Ivoclar Vivadent). The HT ingot is meant for stain and glaze techniques.

Choosing one of these four different aesthetic options depends on the preparation and the technique to be used in order to match the adjacent dentition or restorations. In addition, the laboratory can select the processing choice that is appropriate for the selected restoration. IPS e.max includes press and CAD/CAM options because lithium disilicate can be pressed from ingot form or milled from a block form. If the CAD/CAM option is used, the technician will design the restoration digitally rather than perform a full wax-up and invest/press.

**Preparation options**

If LT or HT ingots will be needed, then dentists can have flexibility with their preparations because of the translucent margins. This is the situation with partial preparations (for example inlays, onlays and veneers)—the margins can be placed wherever clinically proper. IPS e.max's translucency enables dentists to place the margins virtually anywhere on the restoration, blending seamlessly with the natural dentition.

Dentists can use a traditional preparation of 1.0 to 1.5 mm reduction (for example a full-crown preparation) if they need more opaque materials (for example HO and MO). Because the resulting restoration will have a slight opacity, the margins will be equi-gingival or slightly sub-gingival. In either case, the material will be fully layered to create the final restoration. IPS e.max provides the choice of using traditional or creative preparation designs.

**Cementation options**

Because lithium disilicate can be fully light-cure bonded or cemented using a self-etching primer with conventional resin-cement techniques, IPS e.max also provides options for cementation. Conventional self-etching primer cement is ideal for full crowns. For partial and veneer preparations for which adhesive protocol will be used, full light-cure bonding is preferred.

**Case study**

A 42-year-old female presented with discoloured teeth that had been repaired with various composite restorations placed throughout the years (Fig. 5). A lingual amalgam restoration in tooth #12 and composite restorations in teeth #23, 21, 11 and 13 showed recurrent decay that was diagnosed with digital X-rays. She possessed a negative medical history and good oral hygiene with resultant periodontal health and asymptomatic teeth. Treatment options of zirconia or porcelain-fused-to-metal crowns or CAD/CAM all-ceramic restorations were discussed with the patient.

Ultimately, CAD/CAM all-ceramic restorations were tested. When proper preparation and occlusal design considerations are followed, properly placed CAD/CAM-designed and -milled restorations have been extremely successful. The patient made a preparation appointment, during which the existing restorations were removed, and teeth #23 to 13 were prepared for all-ceramic veneer restorations, following accepted CAD/CAM glass-ceramic preparation guidelines (Fig. 6): adequate clearance, rounded internal aspects, and equi-gingival butt-joint margins were ensured. Once the preparations were completed, conventional impressions were taken and poured in high-quality, laser-reflective dental stone.

**Laboratory communication**

The dentist is to the dental technician what the architect is to the builder. Each has a primary role in indirect restorative dentistry, which is to imitate natural function and aesthetics perfectly and translate that into a restorative solution. The communication between the clinician and technician entails a thorough transfer of information, including...
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functional components, occlusal parameters, phonetics and aesthetics, and continues throughout the restorative process, from the initial consultation through treatment planning and provisionalisation to final placement.

The primary and conventional communication tools between the dentist and technician are:

- photography;
- written documentation;
- impressions of the patient’s existing dentition;
- clinical preparation; and
- opposing dentition.

This information is used to create models, which are mounted on an articulator to simulate the mandibular jaw movements.

The indirect restorative process involves the following steps:

1. The clinician prepares the case according to the appropriate preparation guidelines, takes the impressions, sends these and other critical communication aspects to the laboratory, and the laboratory receives all the materials from the dentist.
2. Then, the impressions are poured, models mounted, and dies trimmed.
3. Appropriate restorations—layered, pressed, milled, cast, or combinations—are made.

However, as restorative dentistry shifts further into the digital era, clinicians must change their perceptions and definitions of the dental laboratory. Traditionally, a laboratory is the site that receives and processes patient impressions and returns the completed restorations to the clinician, who adjusts and delivers them to the patient. Similar to how the Internet has transformed the communication landscape, the possibility of using CAD/CAM—restoration files electronically has spurred evolutions in the way dental restorative teams perceive and structure the dentist—laboratory relationship.

The digital process

When the E4D LabWorks system (D4D Technologies) was introduced in 2008 (Fig. 7), it was the first computerisation model to present a real 3-D virtual model accurately and account for the occlusal effect of the opposing and adjacent dentition automatically. It enables the user to design 16 individual, full-contour, anatomically correct teeth simultaneously. The device condenses the information from a complex occlusal case and displays it in a user-friendly format that allows clinicians with basic knowledge of dental anatomy and occlusion to modify the design. Once this has been completed, the information is sent to the automated milling unit.

The innovation of digitally designed restorations meant that some of the more mechanical and labour-intensive procedures (for example waxing, investing, burn-out, casting and pressing) involved in the conventional fabrication of a restoration were essentially automated. The dentist and technician had a consistent, precise method to construct functional dental restorations.

A file is created within the design software for each patient. The operator can input the patient’s name or record number and selects the appropriate tooth number(s) to be treated. Each tooth’s planned restoration is checked (for example full crown, veneer, inlay and onlay). Lastly, additional preferences include material choices and preferred shade. System defaults that can be set ahead of time or changed for each patient are preferred contact tightness, occlusal contact intensity and virtual die spacer, which determines the internal fit of the final restoration to the die/preparation. All this information can be entered prior to treatment or changed at any time if the actual treatment differs from what was planned.

When the images of the preparation, provisional restorations and opposing dentition are captured, the computer has all the required information for preparing the working models, preparation and opposing model. The real 3-D virtual model is then shown on the screen and can be rotated and viewed from any perspective (Fig. 8). In designing the restoration, the first step must be to define the final restoration’s parameters digitally. This is achieved by employing the opposing and adjacent teeth for...
industry report

Lithium disilicate

Occlusal interproximal contact areas and, finally, the gingival margins of the preparation.

Using input and neighbouring anatomic detail as a basis, the software will place the restorations in an appropriate position—but not to the clinically ideal location. Instead, the operator relies on his or her knowledge of form and function and experience to reposition and contour the restoration. As the crown’s position and rotation are fine-tuned, the software’s automatic occlusion application will readjust each triangular ridge and cusp tip—and the restoration’s contours, contacts and marginal ridges—employing the preferences and bite-registration information. The virtual restoration adapts all parameters in relation to the new position. Instantaneously, the position and intensity of each contact point is illustrated graphically and colour mapped, where it can easily be modified based on the operator’s and clinician’s preferences.

Through a variety of virtual carving and waxing tools, customisation and artistry are also possible. These tools can be used to adjust occlusal anatomy, preferences and contours, reflecting actual laboratory methods. Each step in the process is updated on the screen; therefore, the effect of any changes is immediately apparent. For this case, three files were loaded into the computer software for restoration design. Scans of the preparations, provisional restorations and opposing dentition were joined to form a composite file that represented the patient’s oral situation accurately (Fig. 9). Once the final virtual restorations have been completely designed (Fig. 10), the milling chamber with the predetermined shade, opacity and size of the IPS e.max block is loaded, an on-screen button is pressed, and an exact replica of the design is produced in ceramic in a short time.

Glass-ceramics are categorised according to their chemical composition and/or application. The IPS e.max lithium disilicate is composed of quartz, lithium dioxide, phosphorus oxide, alumina, potassium oxide, and other components. These powders are combined to produce a glass melt, which is poured into a steel mould, where it cools until it reaches a specific temperature at which no deformation occurs. This method results in minimal defects and improved quality control (owing to the translucency of the glass). The blocks or ingots are generated in one batch, based on the shade and size of the materials. Owing to the low thermal expansion that results during manufacture, a highly thermal, shock-resistant glass-ceramic is produced.

Next, the glass ingots or blocks are processed using CAD/CAM-milling procedures or lost-wax hot-pressing techniques (IPS e.max Press; Fig. 11). The IPS e.max CAD blue block is based on two-stage crystallisation: a controlled double nucleation process, in which the first step includes the precipitation of lithium-metasilicate crystals. Depending on the quantity of colourant added, the resulting glass-ceramic demonstrates a blue colour. This ceramic has superior processing properties for milling. After
the milling process, a second heat-treating process is performed in a porcelain furnace at approximately 850 °C, at which temperature the metasilicate is dissolved and the lithium disilicate crystallises. This results in a fine-grain glass-ceramic with 70 % crystal volume incorporated into a glass matrix.

With two crystal types and two microstructures during processing, the IPS e.max CAD material demonstrates distinctive properties during each phase. The intermediate lithium-metasilicate crystal structure promotes easily milling, without excessive bur wear, while maintaining high tolerances and marginal integrity. In the blue stage, the glass-ceramic contains approximately 40 % volume lithium-metasilicate crystals that are approximately 0.5 µm. The final-stage microstructure of lithium disilicate gives the restoration its superior mechanical and aesthetic qualities. In this stage, the glass-ceramic contains approximately 70 % volume lithium-disilicate crystals that are approximately 1.5 µm (Figs. 12–15).

The laboratory process

Once designed and milled, the IPS e.max ceramic restorations are then prepared for final aesthetic adjustments. After the milling sprue has been removed, the technician defines surface texture and occlusal anatomy using diamond and carbide burs, carefully avoiding any alteration to the perfected occlusal and interproximal contacts. Afterwards, restorations are rinsed to remove surface debris and dried. Then, the milled blue restorations are placed in a conventional ceramic furnace for the crystallisation process. These restorations were digitally designed with an incisal cut-back design that will allow a minimal application of translucent ceramics to mimic the incisal effects found in nature. Contoured to final anatomic shape, the restorations are further aesthetically improved by subtle colouring and glazing.

Restoration placement

Next, 5 % hydrofluoric acid (IPS Ceramic Etching Gel, Ivoclar Vivadent) was applied for 30 seconds onto the internal surfaces of the glazed restorations. Then they were rinsed and dried. This was followed by a silane coupling agent (Monobond-S, Ivoclar Vivadent), which was also placed for a minute onto the internal surfaces, and then air-dried. For the final cementation, Variolink Veneer (Ivoclar Vivadent) was used. After excess cement had been removed, final light-curing was done. The occlusal contacts were then reviewed and excursive pathway freedom was confirmed. Owing to the correct capture and alignment of the bite-registration information, few adjustments were required.

Conclusion

IPS e.max is about restorative options. Dentists and technicians now have a material with which they can do anterior or posterior restorations. With four different opacities or translucencies available, a variety of creative aesthetic options can be accomplished in a restoration. Dentists and their laboratory ceramists now have the opportunity to be more creative for their patients (Figs. 16–18).

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

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CEREC announces its next anniversary

Waiting for the big 30 just won’t cut it! That’s why Sirona, the company that pioneered digital dentistry more than 26 years ago and the world’s leading producer of dental CAD/CAM systems, is celebrating the 27-and-a-half-year anniversary of its industry-changing CEREC dental CAD/CAM system with a three-day extravaganza from 16 to 18 August 2012 at the Venetian Resort Hotel Casino in Las Vegas.

Commenting on the humorous name of the event, CEREC 27-and-a-half, President of Sirona Dental Systems, LLC, Michael Augins said: “We simply can’t wait another two-and-a-half years to get our customers together again. We had more than 3,000 attendees at CEREC 25 and their enthusiasm for our products and the success of the programme has encouraged us to do it all over again.”

Earlier this year, Sirona launched CEREC Software 4.0, which was the most advanced and comprehensive redesign in the history of the CEREC software platform. “We feel the need to celebrate our ongoing success with our most loyal customers and friends,” commented Augins. “What’s more, an event this big needs the best possible venue, and the Venetian in Las Vegas is the ideal location to host what we believe will be the biggest and best CEREC event to date.”

For those who prefer round numbers in their company milestones, the CEREC 27-and-a-half-year anniversary celebration will also commemorate the 20th anniversary of Schick digital radiography, the tenth anniversary of Sirona’s inLab Dental Lab CAD/CAM System and the fifth anniversary of the GALILEOS Digital Imaging System. In addition to CEREC, special education tracks will highlight these product lines to broaden the appeal of the event. The event, according to Augins, is geared towards all dental and laboratory professionals and follows Sirona’s traditional and successful continuing education (CE) event formula, consisting of education, A-list entertainment, networking and fun.

As during the CEREC 25 event, CEREC 27-and-a-half will offer participants the opportunity to earn up to 18 CE credits across a comprehensive spectrum of topics and tracks, and will offer premium entertainment and memorable parties. There will also be an exhibit hall showcasing top dental companies and their products and services. As usual, Sirona also plans to showcase the who’s who of digital dentistry. Although final details are still in progress, the following marquee lecturers have already agreed to participate: Dr Gordon Christensen, Dr Frank Spear, Dr Rella Christensen, Prof Andreas Bindl and Imtiaz Manji.

“The CEREC 27-and-a-half celebration will be a great destination for advanced CAD/CAM and digital dentistry education provided by the best educators in our field, as well as a great open communication forum for Sirona, our colleagues, clients, associates and other professionals who hold the same interests,” commented Roddy MacLeod, Vice-President of CAD/CAM for Sirona Dental Systems. “It will be the digital event of the year!”

Although August may seem far on the horizon, space is limited and dental and dental laboratory professionals are encouraged to visit www.CEREC27andahalf.com or call +1 888 23 CEREC for additional information as it becomes available, including special early registration tuition and lodging packages.
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Introducing Lava Ultimate CAD/CAM Restorative
A new class of CAD/CAM material

3M ESPE recently introduced Lava Ultimate CAD/CAM Restorative, a unique new CAD/CAM material with long-lasting aesthetics and performance. Based on 3M ESPE's renowned nanotechnology, Lava Ultimate CAD/CAM Restorative offers a polish that lasts and backs it up with a ten-year warranty—something no other chairside block can match.

This new class of CAD/CAM material provides a fast, no-firing process that is easy to mill, helping dentists maximise the productivity of their in-office restorative systems. The unique restorative offers a functionality that other chairside materials cannot: Lava Ultimate CAD/CAM is resilient, non-brittle, and is incredibly durable and shock absorbent. A few minutes of polishing are all that is necessary to achieve an enamel-like lustre. The material also allows dentists to make adjustments easily, as well as build up and reseat restorations. Lava Ultimate CAD/CAM Restorative will be offered in eight shades, four of which include both high and low translucencies, giving dentists the choices they need to create natural-looking restorations.

This new material builds upon two of 3M's core technology platforms: ceramics and nanotechnology. Lava Ultimate CAD/CAM Restorative is formulated from a blend of approximately 80% nano-ceramic particles embedded in a highly cured resin matrix using a 3M proprietary manufacturing process. The result is a unique, patented material that maintains a brilliant, long-lasting polish.

"This material saves dental professionals time in two ways—by providing a faster milling time and by eliminating the need for an additional firing step," said Mark Gates, Vice-President of Sales and Marketing, 3M ESPE. "Our confidence in this material is evidenced by our ten-year warranty, so dentists can also feel confident using it in practice."

Lava Ultimate CAD/CAM Restorative is indicated for a full range of permanent adhesive, single-unit restorations, including crowns, onlays, inlays and veneers. Additionally, the material is ideally suited for implant-supported restorations because of its high flexural strength and low wear. Lava Ultimate CAD/CAM Restorative reduces stress to the implant, and dentists can adjust the material for occlusion with additive and subtractive techniques. With enamel-like beauty, ease of use and guaranteed ten-year durability, Lava Ultimate CAD/CAM Restorative gives dentists an outstanding new way to maximise their CAD/CAM systems, while offering patients a beautiful and durable restoration. Finished restorations are also available to dentists and laboratories through Straumann CARES Digital Solutions, and the material will be available in 2012 to Lava Milling Centers.

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For more information and to reserve a spot for your course(s) in the upcoming issues, please contact Vera Baptist, Product Manager CAD/CAM, at +49 152 29929405 or v.baptist@dental-tribune.com.
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www.scandefa.dk

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27 & 28 April 2012
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www.itinstitute.org

International CAMLOG Congress
3–5 May 2012
Lucerne, Switzerland
www.camlogfoundation.org

CAD/CAM & Computerized Dentistry
International Conference
3 & 4 May 2012
Dubai, UAE
www.cappmea.com

Astra Tech World Congress
9–12 May 2012
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www.astratechworldcongress.com

Nobel Biocare Symposium 2012
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Avignon, France
www.nobelbiocare.com

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Questions?

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