Implant Restorations with CEREC

By Dr Simon Chard, United Kingdom

Dental implants are a fantastic addition to the repertoire of any restorative dentist and allow us to provide a tooth replacement in a way that minimises damage to remaining dentition. The restoration of dental implants requires a sound knowledge of restorative dentistry, prosthodontics and periodontology.

Traditionally, this has been carried out with an analogue impression taken with an impression coping either via an open or closed tray impression technique. A skilled technician then fabricates this restoration over a 2- to 3-week period. The time and skill required for these restorations both from the clinician and technician command high fees for the patient.

This case report highlights a novel method of restoring implants utilising the modern advances in digital intraoral scanning and chairside milling. It illustrates how an aesthetic single implant retained crown can be provided chairside without the need for analogue impressions (Figs. 1 & 2: Pre-operative condition).

Following a discussion of the options for replacement of LR6, the patient elected for an implant retained solution. A MegaGen AnyRidge 4 x 10 mm implant was placed utilising a surgical guide for position of the pilot hole. An immediate temporary crown was fabricated using the MegaGen fuse abutment and DMG Luxatemp. A silicone index of the diagnostic wax-up was fabricated and the temporary crown was polished and taken out of occlusion while the implant fully integrated (Fig. 3).

Following 3 months of integration, the patient attended the practice for the restoration of the implant with a definitive crown. During this period, the soft tissue had been given time to mature and a beautiful molar soft tissue profile had formed (Figs. 4 & 5).

Traditionally, capturing the detail of this soft tissue profile with analogue methods is complicated and time consuming; however, utilising a digital intraoral scan (CEREC Omnicam) a “gingival mask scan” can be taken to accurately replicate this soft tissue and use it to guide the subgingival emergence profile of the restoration (Fig. 6).

Following removal of the temporary crown, a TiBase was placed into the fixture head and a scan body used as a reference point for the scanning of the implant (Figs. 7 & 8).

Following digital intraoral scanning (DIOS) of the opposing arch and buccal bite, a digital design was created using the biogeneric individual design mode. In this design mode on the CEREC Omnicam, the software evaluates the other teeth captured in the DIOS and tries to recreate what it believes to be the
the low translucency monolithic e max CAD Block in its purple phase (taking around 18 minutes) and checked for precision of fit on the TiBase (Figs. 13 & 14).

This is then tried in intraorally to assess contacts and occlusion in static and dynamic function (Figs. 15 & 16). The restoration is then stained using Ivoclar e max Crystal Glaze so as to provide an aesthetically harmonious restoration and glazed with Glaze Spray. It is placed in an Ivoclar Vivadent Programat C2i firing furnace for 15 minutes to crystallise the ceramic, turning it from purple to tooth-coloured (Fig. 17).

The ceramic restoration is then bonded onto the TiBase extracorally. The fit surface of the ceramic is treated with 5 % Hydrofluoric acid and silanated with Silar (Ivoclar Vivadent). The TiBase is sandblasted and also silanated. Finally, the ceramic and TiBase are bonded with multilink hy- brid resin cement (Ivoclar Vivadent, Figs. 18–20).

Following the bonding, the restora- tion is steam cleaned to remove any residue. The final restoration (Fig. 22) is now ready to be inserted, approxi- mately 2 hours after the patient ar- rived in the practice (Fig. 23).

The restoration is finally torqued down to 25 Nm. Following this, occlusion is rechecked, but no ad- justment is required at this stage following the try-in adjustments.

PTE is placed in the access cavity and the access hole filled with opa- quing composite (OMC Venus Pearl) and stained with Venus tints (Figs. 24–26).

In conclusion, as you can see in the final result (Figs. 27–29) an aesthetic, biologically designed and durable restoration has been fabricated. The patient has been delivered the final restoration in a single visit without the need for traditional analogue im- pressions.

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

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From titanium to zirconia implants

By Sofia Karapataki, Greece

Zirconium is a metal with the atomic number 40. Zirconium dioxide (ZrO2) or Zirconia is a ceramic ma- terial without any metal properties. It is electrochemically inert causing no galvanising or electro current disturbance effects at an inter- and intracellular level. It is the most biocompatible and biocompatible mate- rial currently available in the market, with no detected allergies or intoler- ances. The material exhibits lower surface free energy that leads to hy- drophilic reduced plaque (biofilm) accumulation, so, less inflammation is expected leading to superior soft tissue health.

Zirconia fulfils highly desirable aes- thetic results. Healthy, pink and beau- tiful tissue can be retrieved around an implant, with no-tissue transparancy. Its high aesthetic resembles natural tooth. Unlike titanium, it may stimu- late bone growth in the long-term with ultimate osseointegration for both bone and gum. In addition to the white colour, a low modulus of elasticity and thermal conductivity have made zirconia implants a very attractive alternative to titanium in implant dentistry. With its inter- esting macrostructural properties, zirconia is the material of choice for the “new generation” of implants. Hashim et al. (2006) made a system- atic review and evaluated the clinical success and survival rates of zirconia ceramic implants after at least one year of functioning. They concluded that in spite of the unavailability of sufficient long-term evidence to justify using zirconia oral implants, zirconia ceramics could potentially be the alternative to titanium for a non-metalic implant solution. This is also shown in the review made by Cioce et al. (2007), that through the material used for implants. It is of major im- portance for the implant to be kept in the tetragonal phase to keep its mechanical and physical properties over time. It is well established that the stability of this phase is affected by several compositional parame- ters, including grain-size, processing conditions and quality control.

Purity or rather contamination with impurities, density and porosity of the final product as well as pre- sintering and sintering process time and are also some of these param- eters. Environment or conditions (loading temperature-humidity), in which the product will be used it makes a difference whether zirconia is produced for a hip prosthesis or for dental implants) are to be kept in mind. And last but not least, han- dling of the material is of utmost importance.3,14 Lugi et al. (2010) sug- gested engineering guidelines for the use of zirconia as dental material.

Producing zirconia implants

There are two ways of producing zir- conia implants: through moulding and through milling of prefabricated rods. The first method produces im- plants with specific shape and spe- cific low roughness on their surface. Milling of the rods on the other hand, is done either on partially or fully sintered zirconia. The fabrication of an implant through soft machining of partially sintered ZrO2 provides the advantage of easier milling than the fully sintered ZrO2. It requires less milling time and causes less wear of the cutting tools.6,10

In hard machining of fully sintered ZrO2, no sintering shrinkage is ex- pected and there is no need for a sin- tering oven. However, microcracks maybe introduced so since diamond zirconia is known as the toughest material existing, only diamond tool are used for cutting sintered zirconia. The grinding of the fully sintered ZrO2 causes a certain degree of transformation (from tetragonal to monoclinic phase) in the surface of this material.10 When comparing the final surface of the soft machined ZrO2 to the hard machined ZrO2, it is expected that the former will have a more consistent final state, given that it is left intact (no sandblasting or grinding) after the final sintering.

The implants that are produced need to be roughened in order to be osseointegrated. Question arises what is the optimal roughness and surface that is produced after it, in order for zirconia implants to be successfully osseointegrated in any of the afore- mentioned production methods. It seems that the rougher the body, the better the odds for osseointegra- tion.4 This though should not be the goal for the head of the implant in case that it is visible in the mouth— it could favour bacteria colonisation.

The best method to achieve the op- timal roughness as well as the mo- mentum that should be realised with respect to the material’s prop- erties is also not established. Finally, depending on the procedure, the roughened surface needs to be to- tally clean, free of all foreign bodies.

Ageing of titanium vs zirconia

Aging of titanium implants is a not widely known phenomenon and starts four weeks after their produc- tion which decreases dramatically the osseointegration potential.15–18

Aging of zirconia (Low Temperature Degradation LTD, i.e. the slow trans- formation of the metastable tetrago- nal crystal to the stable monoclinic structure in the presence of water or water vapour) on the other hand is quite well investigated.
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Implant-abutment connection

Connection of the abutment with the implant is performed by three ways: either by screwing, cementing, or even as a combination of both. When screwing, the material of the abutment and the connecting screw is of crucial importance for the implant to be intact. As a consequence from titanium knowledge, screwing an abutment made from the same material as the implant was a “natural” step. Screwing though zirconia inside a zirconia is a nonsensical procedure, cannot result in a tight connection, because of the stiffness of the material. This loosening could possibly result in fracture and if this happens to the implant, it could jeopardize everything. In case of contact failure, one should estimate the convenience of removing the abutment screw.

A recent in vitro study by Preis et al. (2018) was able to strengthen the aforementioned performance of different implant-abutment connections, was investigated in six groups of different two-piece zirconia implant systems. In group 1, the abutments were cemented to a carbon fibre-reinforced polymer screw on an alumina-toughened zirconia implant. In group 2, the abutments were cemented to a carbon fibre-reinforced polymer screw on an alumina-toughened zirconia implant. In group 3, the abutments were screwed with titanium screws on tetragonal zirconia polycrystalline abutments. In group 4, standard screw-reinforced titanium implant served as the control. The bonded zirconia system and the titanium reference mixture survived without any failures. Screw-reinforced zirconia systems showed fractures of abutments and/or implants, partly combined with screw fractures. Screw failures concerning the abutment/implant region around the screw, indicate that the connecting design is crucial for successful healing. Additionally, a study by Neumann et al. (2014) compared the fracture resistance of abutment retention screws made of titanium, polyetheretherketone (PEEK) and 30 per cent carbon fibre-reinforced PEEK using an external hexagonal implant/abutment interface. Titanium and U-shaped abutments were fixed to implants using carbon fibre-reinforced polymer screw (group 1), polyetheretherketone screws (group 2) and 30 per cent carbon fibre-reinforced PEEK screws. They found that the titanium screws had higher fracture resistance, compared with PEEK and 30 per cent carbon fibre-reinforced PEEK screws.

Screwing abutments can be a process, but cementation on the other hand could be a simpler and less time-consuming procedure as it is also shown in the study by Brüll et al. (2015). It is closer to the dentist’s basic education, resembles the procedure of cementing a post in natural endodontically treated teeth and requires no extra instruments. A combination of both screwing and cementing though, could make the procedure more complicated. More studies are required to determine the proper abutment material, cementation method and procedure.

The restoration materials that will be used together with their limitations should be studied.

Mostly fixed prosthetics on single crowns or small bridges have been presented. The fracture resistance of two zirconia and titanium implant prototypes under forces representative of a period of five years of clinical loading was tested, during mandibular in vitro experiment by Kohal et al. (2009). In this experiment the crown materials had no influence on the fracture strength of the zirconia implants. Still, in certain cases such as treating a patient with parafunctional chewing, a softer prosthetic material could be a wise choice. The need for further investigation on removable prosthetics on zirconia implants should be kept in mind, too.

Peri-implantitis

Peri-implantitis in titanium implant systems is a serious and underestimated problem involving millions of patients. It should be considered, in order to produce an implant that is not prone to fracture. A clinical study by Cah-rel et al. (2011) showed a marked tendency of one-piece implants with a narrow di-meter (1.2 mm or more) with a percentage that reached 91 per cent of the fractured implants. Threads and shape of implants should be designed according to the need, al-
Microparticles released by titanium on the immunological mechanism of the body could possibly initiate peri-implantitis.

of implants. The prevalence of peri-implantitis according to the review of Titzmann and Berglund (2008) varies between 12 and 43 per cent of implant sites. Many aetiological factors have been implicated, bacterial contamination among them. In peri-implantitis, the lesion extended apical to the pocket epithelium contains large proportions of plasma cells and lymphocytes but also PMN cells and macrophages in high numbers. Peri-implantitis though has hardly been reported on zirconia implants. Zirconia demonstrates a low affinity to bacterial plaque, small amounts of inflammatory infiltrate and good soft tissue integration. These properties might lower the risk for peri-implant diseases. This hypothesis is strengthened by the results of the study conducted by Nasir and colleagues (2004), where cast and polished titanium were presented with the highest incidence and total count of bacteria, while zirconia showed the lowest.

Rosenberg et al. (1990) claimed distinct differences between bacterial profiles of infected and overloaded titanium implants. The latter were characterised by the absence of mobile rods, spirochetes and classical periodontopathogens, along with a predominance of Gram-positive organisms, similar to what is observed in periodontal health. These observations were supported by Quynen and Listgarten in 1990. Failures of zirconia implants due to bacteria should be differentiated against those of technical reasons and the microbiota should be investigated. It should be kept in mind that bacterial cells have a net negative charge on the cell wall, although the magnitude of this charge varies from strain to strain. Especially on the Gram-negative bacteria, LPS as a major component of their cell membrane increases even more the negative charge. Titanium is also negatively charged, thus acting repulsively to bacteria. This could be one of the reasons of success of titanium implantation in a contaminated environment. Zirconia though has no electric charge. This could be a reason of early failure when zirconia is implanted in a contaminated environment. Studies are needed to clarify whether the latter could affect the osseointegration result and what is the relative danger against those of technical reasons.

Intolerance to titanium and genetic predisposition to inflammation has been introduced as an additional and independent risk factor (Odds Ratio 12 and Odds Ratio 6 respectively) for peri-implantitis. The authors propose a direct effect of the released microparticles of titanium on the immunological mechanism of the body that could possibly initiate peri-implantitis. Zirconia particles on the other hand have no effect on the release of TNF-α. Titanium microparticles are released as a result either of friction, electrochemical corrosion, or the synergistic effect of both and can either be taken up by macrophages, remain in the intracellular space near the releasing site, or systemically migrate in organs such as liver, spleen and lung, as Olmedo et al. (2003 and 2002) found.

Same group of authors made a long-term evaluation of the distribution, destination, and potential risk of both TiO2 and ZrO2 microparticles, in an animal study. They evaluated:

(a) the presence of particles in blood cells and liver and lung tissue,
(b) Ti and Zr deposit quantitation,
(c) oxidant-antioxidant balance in tissues and
(d) O2- generation in alveolar macrophages.

Ti and Zr particles were detected in blood mononuclear cells and in organ parenchyma. At equal doses and times post administration, Ti content in organs was consistently higher than Zr content. Ti elicited a significant increase in O2- generation in the lung compared to Zr. The consumption of antioxidant enzymes was greater in the Ti than in the Zr group.

Conclusion

Scientific studies are promptly needed to fulfil gaps like long-term clinical evaluations of all existing zirconia implant systems. Protocols used to design, manufacture and test titanium implants cannot simply apply to produce and evaluate the zirconia ones. Every step, from production to surgery and prosthesis reconstruction needs to be carefully planned, with respect to the properties of the new material. Accordingly, the advantages of zirconia would be fully beneficial and the risk of failure could be minimised.
Dr. Naif Almosa, Chairman, Department of Paediatric Dentistry and Orthodontics, Assistant Professor and Consultant in Orthodontics at King Saud University, Riyadh, Saudi Arabia.

Interview with Dr. Naif Almosa, Chairman, Department of Paediatric Dentistry and Orthodontics, Assistant Professor and Consultant in Orthodontics at King Saud University, Riyadh - Saudi Arabia.

What are some of the activities organized by the Saudi Orthodontics Society? What are the benefits of the members and why should non-members register?

The Saudi Orthodontics Society (SOS) is now in its 12th year, and we have held a full number of conferences, annual and semi-annual meetings, workshops, etc. Always with the end goal of excellence in the orthodontic field, we have invited speakers from different parts of the world to bring us to their experience and knowledge. Being a member of the SOS, you get the opportunity to be exposed to the latest and stay up to date in orthodontics. In my opinion, to learn from and interact with these colleagues would be enough incentive for non-members to register. Surely, if you go through our website, the SOS members do have the added benefit of preferential rates on some activities as well as access to specific journals.

You are now part of the faculty at College of Dentistry, King Saud University. Could you share more information on the Orthodontics programme being run by the college?

In the orthodontics department, we are actively engaged in the education of undergraduate students consistent with the development of competency in general dentistry. The department offers didactic, pre-clinical and clinical experiences in paediatric dentistry and orthodontics integral to comprehensive patient care. We also offer post-graduate programs for specialty training in Paediatric Dentistry and Orthodontics. This is a 36-month program leading to a Master’s degree. In addition, three years ago, we started the Doctorate Program in both specialties, Pedo and Ortho. The doctorate program is a four-years full time program, which includes didactic, clinical, and research activity where the students must write a thesis at the end of the program under supervision of our unique faculty members.

Orthodontics is growing to be an industry-driven specialty, and I strongly believe that as professionals, we have a duty to be updated and gain more insight and critical thinking in the face of all these new products and technology, that is why we have started the national scientific meetings, workshops, and international conferences. What are some of the activities organized by the Saudi Orthodontics Society? What are the benefits of the members and why should non-members register?

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Dr. Naif Almosa, following your active and extensive education, how do you reflect on your education experiences in Saudi Arabia as well as in Sweden? During my time as the Director of the Internship Program, I made it a point to provide the interns with as much exposure as possible to all the career options they could take. Internship is the transitional stage where they change from a guided student to an independent professional and it is critical that they have an idea of all the possibilities they can enter in the dental profession. It is not a one-stop trip, you will go through different experiences. Awareness and learning is very important to me. I would advise the students to never stop learning. Each person you meet will teach you something, whether professionally or as a human being. Professional excellence is a worthwhile goal, but do not forget to live your life.

How do you rate the level of dentistry in the field of Orthodontics in the Middle East region, particularly in the GCC?

Orthodontics in the Middle East is evolving at a rapid pace. I believe that it is improving with the increasing addition of new orthodontists who have been graduated from different schools around the world. We are also seeing more companies being established here that are enhancing innovation in digital orthodontics, and of course, we are now able to have global collaborations through e-learning and scientific meetings in different parts of GCC. I must admit that we are still lacking a more comprehensive educational program for our patients in GCC, especially with regards to the importance of oral hygiene and how it impacts orthodontic treatment. Unfortunately, most of the parents in our region have no idea when is the proper time for their kids to visit the orthodontist, because in some cases, this usually results to a very serious and more complicated treatment procedure when their children are already grown up.

Digital Dentistry is slowly taking over the dental profession, even in Orthodontics. How do you see the future of dentistry, orthodontics and the implementation of digital into your working profession?

Digital dentistry has revolutionized dentistry. There are unlimited possibilities. Postorthodontics has notably seen a lot of progress with its rapid integration of the digital process like the CAD/CAM, and in radiology, there's the cone beam computer tomography. Orthodontics, with its multidisciplinary needs, has been a bit slower, but digital photography, CAD/CAM, laser, and intraoral scanners have brought about so much progress. Again, even with all the ease that technology is bringing to our practice, adequate training is still very much a requirement. Never stop Learning. Digital Dentistry will save time, enhance patient comfort, allow more accurate impressions and show patients creative virtual treatments options moving away from the old notions that the dental clinic is “a place to be feared”, changing into “a place to be experienced”.

We appreciate your valuable insights and wish you the very best in your future endeavors.
The orthodontic patient - From hell to heaven

Tabitha Acret explains how Guided Biofilm Therapy has revolutionised how she treats orthodontic patients

By E.M.S

If you're anything like me, my heart would sink a little when I would see that a teenage patient in active orthodontics was booked to see me. Who would walk through the door? Would it be a mouth full of food debris stuck in what looked like mouldy orthodontic brackets and profusely bleeding gums? Would I see impossible to reach staining around the brackets, trying to use a prophylaxis cup to remove tenacious sticky plaque from modules and on the gingival side of the bracket. As I frantically worked away, I would be loathing the patient in the chair, blood and tears from both of us was going into the appointment with a lackluster result.

Far too often, I felt under pressure to get their teeth cleaned in the "child" timed appointment slot, never feeling like I had removed everything. I was always feeling frustrated trying to manoeuvre my ultrasonic tip around brackets, trying to use a prophylaxis cup to remove tenacious sticky plaque from modules and on the gingival side of the bracket. As I frantically worked away, I would be loathing the patient in the chair, blood, sweat and tears from both of us was going into the appointment with a lackluster result.

Good oral hygiene vital for orthodontic patients

Good oral hygiene is paramount to successful orthodontic treatments. Without good oral hygiene, a patient’s outcome will be compromised. This was frustrating me. In a journal article by Lovrov S, et al (2007) it was shown that “despite improvements in materials and preventative efforts, orthodontic treatments continue to carry considerable risk of enamel deminer-alisation. Each patient's prophylactic efforts, including fluoride use are of paramount importance in preventing white spot lesions”. In another article, by Ren, et al (2004) it showed that “high treatment demand and the occurrence of biofilm related complications requiring professional care, make orthodontic treatments a potential public health threat”. Knowing how important it is that the professional clean be good and all biofilm be removed just added to my stress. I knew that I could never remove all the biofilm and that there would be areas around the brackets my ultrasonic or prophylaxis cup just couldn’t get to. Then, if you add in the mix that the patient already has some demineralisation of the enamel where the ultrasonic couldn’t be used, then the frustration and difficulty of the appointment just doubled again.

In search of a better solution

Combing all of the above problems made me want a better solution. I want to provide my patients with the best treatment possible and I don’t want my patients leaving their appointments with biofilm still trapped in modules. After initially discovering success with AIRFLOW® (EMS) for implant patients, I was interested in what it could offer my orthodontic patients.

What I discovered is that by using AIRFLOW in combination with Guided Biofilm Therapy, I was getting amazing results. If you had asked me before AIRFLOW to plaque disclose my ortho patients, I may have thought you were either crazy or you hated me. Before AIRFLOW, I didn’t want to plaque disclose my patients who have orthodontic appliances as I would have provided proof of the areas where I left biofilm behind because I couldn’t get to it. I know plaque disclose every single one of my patients as part of the “8 steps” of the Guided Biofilm Therapy protocol.

Guided Biofilm Therapy

By using the Guided Biofilm Therapy protocol, you achieve predictable biofilm removal with 100% and 90° degree accessibility. It’s safe and effective around the sulcus, there is no change in the surface of the appliance and not only is it more comfortable for the patient with better results, I am happy! I feel so much happier with my results not only at the time of the appointment but because the long term benefits for the patient in terms of motivation and education are so much better. Not only do the patient and I see better results, but it is also clinically proven that using a plaque disclosing solution to guide biofilm removal shows better outcomes for the patient. In Botti et al (2016) and Viorica et al (2007, 2008) all confirm higher efficiency in professional prophylaxis when done with the use of a disclosing agent.

In the study by Viorica et al, Dental Plaque - Classification, Formation and Identification, it was shown that “dental plaque diagnosis using coloured solutions is one of the easiest and fastest ways to diagnose

Fig. 1: AIRFLOW in action on orthodontic brackets

Fig. 2: The 8 steps of the Guided Biofilm Therapy compass

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Prof Ross Hobson*

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The easiest and fastest ways to diagnose some demineralisation of the enamel where the ultrasonic couldn’t be used, then the frustration and difficulty of the appointment just doubled again.

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In the study by Viorica et al, Dental Plaque - Classification, Formation and Identification, it was shown that “dental plaque diagnosis using coloured solutions is one of the easiest and fastest ways to diagnose...
More than just cleaning blankets
The two other key reasons why following the Guided Biofilm Therapy protocol is imperative for orthodontic patients as well as routinely in all prophylaxis procedures. The first is the long term health of the enamel and gingiva. By using AIR-FLOW technology combined with AIRFLOW PLUS powder, I know that I am providing the least damage to the patients enamel and orthodontic appliances. In a clinical comparison of the efficacy and efficiency of two professional prophylaxis procedures in orthodontic patients, Ramgilla et al show that “In orthodontic patients, use of AIRFLOW polishing is a lot safer, efficient and effective to remove stains and dental plaque in comparison to rubber cups and pumice”.

The second great thing was that I now had time to finish within the appointment time. I wasn’t feeling so under the “pump”. I used to find that I was always running late in these appointments and now I was finishing easily within the time allocated. In effects of an air-powder polishing system on orthodontically bracketed and banded teeth, Barnes et al show that “Air polishing around composite material or cement in fixed orthodontic patients is not only effective but time efficient. Reference 8. Botti RH, Bossù M, Zallocco N, Vestrucci A, Polimeni A. Effectiveness of plaque indicators and air polishing for the sealing of pits and fissures. Eur J Paediatr Dent 2010 Mar;3(1):15-8.”

Conclusion
By using Guided Biofilm Therapy with AIRFLOW technology combined with appropriate home CHI instruc-
tions and motivation, I am providing the best treatments possible for my patients. I love Guided Biofilm Therapy. It’s changed my attitude toward treatment, my treatment results and my patients’ long term outcomes. Guided Biofilm Therapy is evidence-based dentistry. It is the new standard of care we should all be looking to reach.

For information on EMS and Guided Biofilm Therapy, visit www.ems-dental.com and follow EMS Australia and New Zealand on Facebook - facebook.com/emsausznz. To test drive this revolutionary protocol in your practice today, book a free in-practice Guided Biofilm Therapy demonstration by emailing info@ems-australia.com or call 0405 393 867.

References

Fig. 3a-c: Top to bottom: Initial situation; after disclosing, and after Guided Biofilm Therapy.
Efficient Bonding Protocol for the Insignia® Custom Bracket System

By Dr. Angle Lee, Dr. Chris Chang & Dr. W. Eugene Roberts, Taiwan

Insignia® (Ormco, Glendora, CA) is a computer-assisted design and manufacturing (CAD/CAM) process for producing a specific fixed appliance system to treat a malocclusion. Custom brackets and archwires to achieve the prescribed alignment are produced by a reverse engineering process, based on the digital set-up of final intermaxillary occlusion. Precise placement of each bracket is critical for producing a three-dimensional (3D) alignment to efficiently accommodate the final rectangular finishing wire, with no need for detailing adjustments. Positioning jigs for each bracket are fabricated to assist the clinician in accurately bonding or re-bonding the prescribed custom attachment on each tooth. The purpose of this report is to describe a standardized protocol for efficiently placing the custom appliance in the prescribed position. All orthodontic supplies and auxiliaries described in this article were produced by the same manufacturer (Ormco, Glendora, CA), unless otherwise stated.

Preparation for Bonding

Prior to the installation appointment, the clinician and assistant(s) should inspect the following items in the patient’s kit box (Fig. 1): 1. Custom prescription brackets with well-fitted application jigs (Fig. 1e-f). The brackets for each quadrant are packed together. 2. Six upper and six lower custom archwires with labels (Fig. 1d). 3. A setup of individual replacement jigs for each tooth (Figs. 1e-f). The first and second molars have brackets already loaded. 4. Case paperwork (Fig. 1g). Clinicians are alerted to anticipated bracket interference with occlusion, that requires bite turbos or other composite buildup on the occlusal surface to open the bite. If there is substantial crowding, some brackets may be designated for placement later in treatment.

Clinical tips: The custom-fit group jigs should be dry-fitted to dental casts of the malocclusion for two reasons: (1) check the bonding positions; (2) determine if there is any jig interference when adjacent brackets are properly positioned (Fig. 2).

Bonding Process

1. Tray Arrangement

Place the jigs and bonding instruments in the desired order, usually in the progression that they are used (Fig. 2). The arrangement varies according to the desired tray position relative to the patient, and the handedness of the clinician and assistant.

2. Isolation Procedure

Begin moisture control by placing dry aids on the cheek mucosa to block the parotid gland orifice and isolate the soft tissue. Super absorbent pads are placed between lower molars and the tongue to control saliva secretion by the sublingual glands. An OptiView® lip and cheek retractor is positioned to provide a clear view of the entire oral cavity including the buccal surfaces of the molars (Fig. 4).

3. Step-by-Step Protocol

(1) Dry fit the group jigs to the initial casts to identify any problems in sequentially positioning the bondable pads on each tooth.
(2) Apply etching-gel for 30 seconds to the facial surface of each tooth.
(3) Rinse thoroughly with water spray for a minimum of 3 seconds per tooth and air dry.
(4) Apply the bonding agent (Ortho Solo®) onto all teeth to be bonded.
(5) Apply a thin coat of adhesive to each bracket pad with an application instrument such as LiquidSteel Poly-Fill Plasma® (Carl Martin, Solingen, Germany).
(6) Use cotton tweezers to grip the jig(s).
(7) Roll the jigs, from the lingual cup or incisal edge, to the facial surface, and apply pressure from a 45-degree angle (yellow arrow) to prevent disturbing the adhesive layer so as to achieve good bonding. (8) Spray the jig-bracket assembly with water to ensure water is noted between the lower left canine and 1st premolar, during the prescribed bonding procedure. Both occlusal (a) and the left lateral perspectives (c) are shown. It follows that the lower left 1st premolar and 1st molar group jig must be removed before applying the group jig to bond the lower left canine and adjacent incisors.

4. Case paperwork (Fig. 1g): Clinicians must inspect the following items in the patient’s kit box (Fig. 1): (1) Custom prescription brackets with custom fit placement jigs (c), six upper and six lower custom archwires with labels (d), replacement jigs for each tooth (f), and case paperwork describing special treatment procedures (g).

5. Bonding Process

(1) Dry fit the group jigs, (2) apply etching-gel, (3) rinse, spray, and dry. (4) Use etched surfaces with the bonding agent (primer), (5) apply a thin layer of adhesive resin to each bonding pad with a filling instrument, (6) use cotton tweezers to grip the jig(s), (7) rotate the pad and jig from the lingual cup or incisal edge to the facial surface, and apply pressure from a 45-degree angle (yellow arrow). (8) Use a microbrush dipped with bonding agent to clean off excess adhesive. (9) Spray the jig-bracket assembly with water. (10) Use a strongpoint plier to release the jig from the brackets on the mesial and the distal surfaces, and then by rolling it gently to the lingual (yellow curved arrow) to remove the jig(s) from the upper (11) and lower (12) arches.

6. Case paperwork (Fig. 1g): Clinicians should inspect the following items in the patient’s kit box (Fig. 1): (1) Custom prescription brackets with custom fit placement jigs (c), six upper and six lower custom archwires with labels (d), replacement jigs for each tooth (f), and case paperwork describing special treatment procedures (g).

7. Bonding Process

(1) Dry fit the group jigs, (2) apply etching-gel, (3) rinse, spray, and dry. (4) Use etched surfaces with the bonding agent (primer), (5) apply a thin layer of adhesive resin to each bonding pad with a filling instrument, (6) use cotton tweezers to grip the jig(s), (7) rotate the pad and jig from the lingual cup or incisal edge to the facial surface, and apply pressure from a 45-degree angle (yellow arrow). (8) Use a microbrush dipped with bonding agent to clean off excess adhesive. (9) Spray the jig-bracket assembly with water. (10) Use a strongpoint plier to release the jig from the brackets on the mesial and the distal surfaces, and then by rolling it gently to the lingual (yellow curved arrow) to remove the jig(s) from the upper (11) and lower (12) arches.

8. Bonding Process

(1) Dry fit the group jigs, (2) apply etching-gel, (3) rinse, spray, and dry. (4) Use etched surfaces with the bonding agent (primer), (5) apply a thin layer of adhesive resin to each bonding pad with a filling instrument, (6) use cotton tweezers to grip the jig(s), (7) rotate the pad and jig from the lingual cup or incisal edge to the facial surface, and apply pressure from a 45-degree angle (yellow arrow). (8) Use a microbrush dipped with bonding agent to clean off excess adhesive. (9) Spray the jig-bracket assembly with water. (10) Use a strongpoint plier to release the jig from the brackets on the mesial and the distal surfaces, and then by rolling it gently to the lingual (yellow curved arrow) to remove the jig(s) from the upper (11) and lower (12) arches.

9. Bonding Process

(1) Dry fit the group jigs, (2) apply etching-gel, (3) rinse, spray, and dry. (4) Use etched surfaces with the bonding agent (primer), (5) apply a thin layer of adhesive resin to each bonding pad with a filling instrument, (6) use cotton tweezers to grip the jig(s), (7) rotate the pad and jig from the lingual cup or incisal edge to the facial surface, and apply pressure from a 45-degree angle (yellow arrow). (8) Use a microbrush dipped with bonding agent to clean off excess adhesive. (9) Spray the jig-bracket assembly with water. (10) Use a strongpoint plier to release the jig from the brackets on the mesial and the distal surfaces, and then by rolling it gently to the lingual (yellow curved arrow) to remove the jig(s) from the upper (11) and lower (12) arches.

10. Bonding Process

(1) Dry fit the group jigs, (2) apply etching-gel, (3) rinse, spray, and dry. (4) Use etched surfaces with the bonding agent (primer), (5) apply a thin layer of adhesive resin to each bonding pad with a filling instrument, (6) use cotton tweezers to grip the jig(s), (7) rotate the pad and jig from the lingual cup or incisal edge to the facial surface, and apply pressure from a 45-degree angle (yellow arrow). (8) Use a microbrush dipped with bonding agent to clean off excess adhesive. (9) Spray the jig-bracket assembly with water. (10) Use a strongpoint plier to release the jig from the brackets on the mesial and the distal surfaces, and then by rolling it gently to the lingual (yellow curved arrow) to remove the jig(s) from the upper (11) and lower (12) arches.

11. Bonding Process

(1) Dry fit the group jigs, (2) apply etching-gel, (3) rinse, spray, and dry. (4) Use etched surfaces with the bonding agent (primer), (5) apply a thin layer of adhesive resin to each bonding pad with a filling instrument, (6) use cotton tweezers to grip the jig(s), (7) rotate the pad and jig from the lingual cup or incisal edge to the facial surface, and apply pressure from a 45-degree angle (yellow arrow). (8) Use a microbrush dipped with bonding agent to clean off excess adhesive. (9) Spray the jig-bracket assembly with water. (10) Use a strongpoint plier to release the jig from the brackets on the mesial and the distal surfaces, and then by rolling it gently to the lingual (yellow curved arrow) to remove the jig(s) from the upper (11) and lower (12) arches.

12. Bonding Process

(1) Dry fit the group jigs, (2) apply etching-gel, (3) rinse, spray, and dry. (4) Use etched surfaces with the bonding agent (primer), (5) apply a thin layer of adhesive resin to each bonding pad with a filling instrument, (6) use cotton tweezers to grip the jig(s), (7) rotate the pad and jig from the lingual cup or incisal edge to the facial surface, and apply pressure from a 45-degree angle (yellow arrow). (8) Use a microbrush dipped with bonding agent to clean off excess adhesive. (9) Spray the jig-bracket assembly with water. (10) Use a strongpoint plier to release the jig from the brackets on the mesial and the distal surfaces, and then by rolling it gently to the lingual (yellow curved arrow) to remove the jig(s) from the upper (11) and lower (12) arches.

13. Bonding Process

(1) Dry fit the group jigs, (2) apply etching-gel, (3) rinse, spray, and dry. (4) Use etched surfaces with the bonding agent (primer), (5) apply a thin layer of adhesive resin to each bonding pad with a filling instrument, (6) use cotton tweezers to grip the jig(s), (7) rotate the pad and jig from the lingual cup or incisal edge to the facial surface, and apply pressure from a 45-degree angle (yellow arrow). (8) Use a microbrush dipped with bonding agent to clean off excess adhesive. (9) Spray the jig-bracket assembly with water. (10) Use a strongpoint plier to release the jig from the brackets on the mesial and the distal surfaces, and then by rolling it gently to the lingual (yellow curved arrow) to remove the jig(s) from the upper (11) and lower (12) arches.