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, working 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
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 material without any metal properties. It is electrochemically inert causing no galvanising or electro current disturbance effects at an interface and intracellular level. It is the most bioinert and biocompatible material currently available in the market, without any detected allergies or intolerances. The material exhibits lower surface free energy that leads to hydrophobic reduced plaque (biofilm) accumulation, so, less inflammation is expected leading to superior soft tissue health.

Zirconia fulfills highly desirable aesthetic results healthy, pink and beautiful tissue can be created around it. Unlike titanium, it may stimulate 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 interesting macrostructural properties, zirconia is the material of choice for the “new generation” of implants. Hashim et al. (2016) made a systematic review and evaluated the clinical success and survival rates of zirconia 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 provide an aesthetically harmonious restoration and glued 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 extraneously. The fit surface of the ceramic is treated with 5 % Hydrofluoric acid and silanated with silane (Ivoclar Vivadent). The TiBase is sandblasted and also silanated. Finally, the ceramic and TiBase are bonded with multilink hybrid resin cement (Ivoclar Vivadent, Figs. 18–20).

Following the bonding, the restoration is steam cleaned to remove any residue. The final restoration (Fig. 22) is now ready to be inserted, approximately 2 hours after the patient arrived in the practice (Fig. 23).

The restoration is finally torqued down to 25 Ncm. Following this, occlusion is checked, but no adjustment is required at this stage following the try-in adjustments.

PFT is placed in the access cavity and the access hole filled with opaque 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 impressions.

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

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Degradation rates at room or body temperature of Y-TZP ceramics are currently not available, and accer- tly Table 2, test methods are not yet tested in human organisms. Therefore, the use of Y-TZP implants in clinical settings remains a challenge. However, the development of new materials and technologies, such as the use of modern manufacturing processes and surface treatments, has led to improvements in the mechanical properties and biocompatibility of these implants, making them suitable for use in various clinical applications. Further research and development in this area are necessary to fully exploit the potential of Y-TZP implants in oral and maxillofacial surgery.

**Implant-trabeculae connection**

Connection of the trabeculae with the implant is achieved through three main ways: either by bonding, cementing, or as a combination of both. When bonding, the material of the abutment and the connecting screw is of crucial importance for the implant to be successful. As a consequence from titanium knowledge, screwing an abutment made from the same material as the implant is a "natural" step. Screw-threadography inside a screw, which 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 the entire setup. In case of cement fracture, one should estimate the con- sequence of removing the abutment screw.

A recent in vitro study by Preis et al. (2016) comes to strengthen the aforementioned performance of different implant-abutment con- nections, was investigated in six groups of different two-piece zir- conia implant systems. In group 1, the abutments were cemented with a carbon fibre reinforced polymer screw on an alu- minia toughened zirconia implant. In group 2, the abutments were screwed with a carbon fibre reinforced polymer screw on an alu- minia titanium screw. In group 3, the abutments were screwed with titanium screws on tetragonal zirconia polyoxynitride abutments. A standard screw-retained titanium implant served as the control. The bonded zir- onia system and the titanium refer- ence survived without any failures. Screw-retained zirconia-systems showed fractures of abutments and/ or implants, partly combined with screw fracture/loosening. Concerning the abutment/implant around the screw, indicate that the connecting design is crucial for clinical success.

Additionally, a study by Neumann et al. (2016) compared the fracture resistance of abutment retention screws made of titanium, poly- ethytherketone (PEEK) and 30 per cent carbon fibre-reinforced PEEK using an external hexagonal- implant/titanium abutment couple. U-shaped titanium abutments were fixed to implants using a carbon fibre reinforced polymer screw (group 1), polyethytherketone 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 the trend, 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. (2014). It is closer to the den- tist’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 restorations materials that will be used together with their limitations should be studied.

Most fixed prosthetics on single crowns or small bridges have been presented. The fracture resistance of two-piece zirconia and titanium implant prototypes under forces re- presentative of a period of five years of clinical loading was tested, during two in vitro experiments by Kohal et al. (2008). 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 parafunc- tional chewing, a softer prosthetic material could be a wise choice. The need for further investigation on re- movable prosthetics on zirconia im- plants should be kept in mind, too.

**Peri-implantitis**

Peri-implantitis in titanium im- plants is a serious and underesti- mated problem involving millions
of implants. The prevalence of peri-implantitis according to the review of Titzmann and Borglund (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 been rarely 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 Nascimento et al. (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 Quirynen and Listgarten in 1990. Failures of zirconia implants due to bacteria should be differentiated against those of technical reasons and the microflora 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 electrical charge. Depending on the roughness and the hydrophilic surface of every zirconia implant system, contamination may be easier to occur and 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 comparing to titanium. Local infection could minimise the risk in immediate implantation using titanium microparticles were released as a result of friction, electrochemical corrosion, or the synergistic effect of both and can either be taken up by macrophages, remain in the interstitial 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 prosthetic 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.

**Microparticles released by titanium on the immunological mechanism of the body could possibly initiate peri-implantitis.**
Introducing Dr. Naif Almosa - Chairman of the Digital Orthodontics Symposium Dubai

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.

By Dental Tribune MEA / CAPPmea

Dr. Naif Almosa, please if you can give us some insights into your background of life, work and education hailing from Saudi Arabia?

I was born in November 1981, married and father of three angels. I received the bachelor's degree of dental science from King Saud University (KSU) in 2006 and completed the internship program in 2007. After this I joined the orthodontic residency program at Gothenburg University in 2009 and gained the National Swedish Board of Orthodontics in 2011. I started the PhD program while I was resident in the clinical program in 2010 and completed my PhD degree in April 2014. In May 2014, I returned to Saudi Arabia and joined the department of Paediatric Dentistry and Orthodontics at KSU. In September 2014, I was assigned to be the Director of Internship Program until the summer of 2017. In April 2017, the Rector of the University assigned me as the Chairman of Paediatric Dentistry and Orthodontic department to present day.

As an active member and ambassador for the Saudi Orthodontics Society, how important is it to stay continuously up to date as an Orthodontist?

Very important. In Orthodontics, there is no excuse to stop learning. Technology is very fast in coming up with new discoveries so it is up to us to keep pace and combine it into our clinical practice. I can never emphasize enough how much we need to take advantage of the information that is readily available to us.

Orthodontics is growing to be an industry-driven specialty, and I strongly believe that as professionals, we have the best way for us to be updated and gain more insight and critical thinking in the face of all these new technologies and technology, it is intended 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?

The Saudi Orthodontics Society (SOS) is now in its 12th year, and we have held a fair number of conferences, annual and semi-annual meetings, workshops, etc. Always with the end 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 among the best and stay up to date in orthodontics. In my opinion, to learn from us and learn from 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 journal articles.

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 Orthodontics, we are actively engaged in the education of undergraduate students consistent with the development of competence 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 should continue to be updated and gain more insight and critical thinking in the face of all these new technologies and technology, it is intended the national scientific meetings, workshops, and international conferences.

What advice would you provide your students who look up to you as a mentor and role model for their future life?

During my time as the Director of Internship Program, I made it a point to provide the interns with as much exposure as possible. I provided them with different treatment options they could take. Internship is the transitional stage where they change from a guided student to an independent professional and it is the place where they have the chance to change the course they want to make. Even with all the new knowledge that is brought to our practice, adequate training is still very much a requirement. Never stop learning. Digital Dentistry will save time, enhance patient comfort, and have more accurate imaging. Orthodontics is growing, and we need to adapt and change. A 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 GCC?

Orthodontics in the Middle East is evolving at a rapid pace. I believe that it is improving with the increasing number 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 parents in our region have no idea when is the proper time for their kids to visit the orthodontist, and even in Orthodontics, how do you do the future of dentistry, orthodontists and the implementation of digital into your working profession?

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

Digital Dentistry has revolutionized dentistry. There are limitless possibilities. Orthodontists have notably seen a lot of progress with its rapid integration of the digital world, including 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 intra-oral 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, and have more accurate imaging. Orthodontics is growing, and we need to adapt and change. A professional excellence is a worthwhile goal, but do not forget to live your life.

We appreciate your valuable insights and wish you the very best in your future endeavours.

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We appreciate your valuable insights and wish you the very best in your future endeavours.
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 orthodontic treatment was going into the appointment door. Who would walk through the door? Would it be a mouthful full of food debris stuck in what looked like molten orthodontic brackets and profusely bleeding gums? Would I see impossible to reach staining around the brackets or think my patient just ate a packet of Cheezels™ only to find out that he or she had just brushed his teeth since the last time I saw them?

I used to loathe this type of patient, not just because I could find enough food in their brackets to feed a small nation but because I was never satisfied with the results I’d achieved after I’d finished their clean.

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 handpiece and pluggy prophylaxis paste to remove tenacious sticky mature 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 going into the appointment with a lacklustre 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. Knowing how important it is that the professional clean be good and that all biofilm be removed just added to my stress. I knew that I could never promise. This was frustrating me. I knew that I could never promise. This was frustrating me. I knew that I could never promise.

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 demineralisation. Each patients’ prophylactic efforts, including fluoride use are of paramount importance in preventing white spot lesions.” In another article, by Ren, et al (2014), it showed that “high treatment demand and the occurrence of biofilm-related complication 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

Combining all of the above problems, making me want a better solution. I want to provide my patients with the best treatment possible and 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 I left biofilm behind because I couldn’t get to it. I know plaque disclosure every single one of my patients as part of the “8 steps” of the Guided Biofilm Therapy protocol.

Fig. 1: AIRFLOW in action on orthodontic brackets

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

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 2016,5 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,5 it was shown that “dental plaque diagnosis using coloured solutions is one of the easiest and fastest ways to diagnose
dental plaque, which favours its subsequent removal under permanent control during the intervention. Using AIRFLOW removal of dental plaque approaches a ratio of 100%.

More than cleaning brackets

The are 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 AIRFLOW 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, Ramaglia et al showed 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 orthodontic brackets and bands was not only effective but time efficient. There were no detrimental effects to any composite material or cement in comparison to rubber cup and pumice.”

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/emsaustrail. 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 953 869.
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 threedimensional (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 rebonding 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. 1a). The brackets for each quadrant are packed together.

2. Six upper and six lower custom archwires with labels (Fig. x): The archwires and second molars have brackets allocated for a minimum of 5 seconds per tooth and air dry.

3. A setup of individual replacement jigs for each tooth (Figs. 1c-f): The first and second molars have brackets allocated for a minimum of 5 seconds per tooth and air dry.

4. Case paperwork (Fig. 1g): Clinicians are alerted to anticipated bracket interference when adjacent brackets are crowding some brackets may be deselected 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 threedimensional (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 rebonding 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.

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 with occlusion, that requires bite turbines or other composite buildup on the occlusal surface to open the bite. If there is substantial crowding some brackets may be deselected for placement later in treatment.

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 may vary 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 saliva secretion by the sublingual glands. An OptiView® lip and cheek retractor is positioned to provide a clear view of the entire oral cavity.

3. Step-by-Step Protocol:
   (1) Dry fit the group jigs to the initial casts to identify any problems in sequentially positioning the bonding 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. No air-drying or light curing step is required.
   (5) Apply a thin coat of adhesive to each bracket pad with an application instrument such as LiquidSteel Poly-Fill Plasmas® (Carl Martin, Solingen, Germany).
   (6) Use cotton tweezers to grip the jig.
   (7) Roll the jigs, from the lingual cusp 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 strong jet to release the jig from the bracket on the mesial and the distal surfaces, and then by rolling it gently to the lingual (yellow curved arrow) to remove the jig’s pad from the upper (11) and lower (12) arches.

Fig. 2: Group jigs are placed on dental casts to check the fit. (a) Interference (yellow arrow) is noted between the lower left canine and 1st premolar, during the prescribed bonding procedure. Both occlusal (a and b) and the left lateral perspectives (c) are shown. It follows that the lower left 1st premolar and 1st molar group p[ are must be removed before applying the group jig to bond the lower left canine and adjacent incisors.

Fig. 3: Ensure bonding instruments are laid out in the desired order: (a) mirror and cotton tweezers, (b) custom prescription brackets with custom fit placement jigs, (c) dry aids and super absorbent pads, (d) scaler, Weingart plier and filling instrument, (e) lip and cheek retractor, (f) bonding agent, etching-gel, microbrushes, (g) adhesives and uni-dose applicator. See text for details.

Fig. 4: Compared to conventional retractor (left), an Optiview® lip and cheek retractor is more comfortable for the patient, and improves intra-oral visibility.