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Deep resins, white fillings: A new technique for composite restorations

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Dear Reader,

Happy New Year for 2013! May you always have health and happiness in your life.

2012 was very busy for the MICD team. We travelled to various places in Asia to promote the MICD concept and slogan, “Enhancing smiles with minimal biological cost”. Our team was invited to many countries to deliver lectures and to conduct hands-on training. It is very gratifying for me to observe that the take-up of the MICD concept around the world has increased rapidly.

I have applied the MICD concept to the majority of worn smile redesign cases that I have treated. Worn smiles may have a negative impact on patients’ psychology, health, function and aesthetics. I have noticed in my practice that the demand for treatment of worn smiles has increased dramatically over the past decade, and I think that other dentists have probably observed this too. A combination of factors such as chemical erosion, abrasion, para-functional habits and occlusal prematurities are major causes of worn smiles. Redesign of worn smiles is one of the most complex clinical situations in dentistry and requires detailed examination and evaluation of the patient’s diet, history, eating disorders, behavioural factors, para-functional habits, and complete analysis of teeth, muscle, joint and airway (TMJA) harmony, and meticulous treatment planning to achieve the desired function and aesthetics with minimal biological cost.

There are various clinical techniques in oral rehabilitation. Conventional methods use full-coverage crowns that require aggressive tooth preparation and generally have high biological, financial and time costs. However, with the advancement of science and technology in adhesive restorative materials and the availability of digital occlusal analysis technology that can measure precisely different clinical parameters of the underlying force components in a dynamic state, clinicians can treat even complex oral rehabilitation in non or minimally invasive ways so that the biological cost of the treatment can be drastically reduced.

In my practice, I use resin composites in the majority of worn smile redesign cases and I follow the MICD full-mouth rehabilitation protocol, which has four logical clinical steps: 1. develop anterior aesthetics and guidance; 2. establish posterior teeth supports; 3. customise case finishing (aesthetic and force finishing); and 4. recheck para-functional habits.

Once I have restored the smile aesthetics and built up the posterior teeth supports, I customise case finishing. First, I perform the necessary aesthetic finishing, as it is visible to others and can be most appreciated by the patient, then in order to harmonise the occlusal force component I perform digital occlusal analysis and the force finishing of the case. The final step entails rechecking for the absence or presence of para-functional habits (bruxism and clenching) by asking the patient to wear a BruxChecker for three to four nights. After this period, if grinding patterns are visible on the BruxChecker, I always suggest wearing a thin night guard to the patient. I think the reader will find these simple clinical steps for redesigning worn smiles with minimal biological cost useful.

In this new issue of cosmetic dentistry, we have gathered a variety of quality clinical articles. I hope you will enjoy reading them.

Yours faithfully,

Dr Sushil Koirala
Editor-in-Chief
President Vedic Institute of Smile Aesthetics (VISA)
Kathmandu, Nepal
Dear Reader

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Bioactive materials support proactive dental care

Author, Dr John C. Comisi, USA

Resin bonding of the human dentition has become a “standard” in the United States and Canada. There are more than 80 different bonding systems on the market today. We have seen them evolve through multiple generations in an attempt to “simplify” the bonding process. Yet, as these agents have simplified, many in our profession have seen many challenges arise.

A significant number of reports in the literature have been showing that the “immediate bonding effectiveness of contemporary adhesives are quite favorable, regardless of the approach used (however) in the long term, the bonding effectiveness of some adhesives drops dramatically.” The hydrophillicity that both etch-and-rinse and self-etch bonding agents offer initially in the dentin-bonding process becomes a significant disadvantage in terms of long-term durability. The fluid droplets...act as stress raisers and form initial flaws that cause subsequent catastrophic failure along the adhesive composite interfaces.

The previously mentioned plasma proteins are released by the dentin when subjected to acids and cause hydrolytic and enzymatic breakdown of the dentin and resin bonding agent interface. These enzymes are called matrix metalloproteinases (MMPs).

Currently, there are only three methods of reducing these MMPs: 2 per cent chlorhexidine solutions that are used prior to application of bonding agents; etchants containing benzalkonium chloride, otherwise known as BAC (i.e., Bisco’s Uni-etch products); and polyvinylphosphonic-acid-producing products (glass ionomer and resin-modified glass ionomers).

Due to the short efficacy of these chlorhexidine solutions being used before bonding, this methodology has come into question as of late. Etchants with BAC have been shown to be valuable in the reduction of MMPs and should be considered in all bonding processes. However, the most intriguing methodology of reducing MMPs and remineralizing tooth structure is with the use of glass ionomer cements (GIC) and resin-modified glass ionomers (RMGIC).
Glass ionomers and resin-modified glass ionomers

Glass ionomer cements have long been used as a direct restorative material. Their early formulations made the material difficult to handle, and the breakdown of the material made it an undesirable solution in dental restoration. However, these materials, especially in today’s formulations and pre-encapsulated presentations, have many properties that make them very important in the restorative process.

The work at companies such as SDI North America (Riva product line), GC America (Fuji product line) and VOCO (Iono product line) have continued to make great strides in improving these products for easier and longer-lasting use of GIC and RMGIC products.

First, these materials are bioactive, and up until recently, they were the only materials with this property; that is, they have the capacity to interact with living tissue or systems. Glass ionomers release and recharge with ions from the oral cavity. This transfer of calcium phosphate, fluoride, strontium and other minerals into the tooth structure helps the dentition deal with the constant assault of the acidic nature of day-to-day ingestion of food and beverages and encourages remineralization; and the incorporation of phosphorous into the acid in today’s GICs creates polyvinylphosphonic acid.

This property of GICs makes them a major agent in the reduction of MMP formation, and thereby minimizing if not eliminating the collagen breakdown commonly found in many resin-dentin bonding procedures.

Second, they bond and ultimately form a union with the dentition by chemically fusing to the tooth. The combination of the polyacrylic acid and the calcium fluoroaluminosilicate glass typically found in GICs reacts with the tooth surface, which releases calcium and phosphate ions that then combine into the surface layer of the GIC and forms an intermediate layer called the “interdiffusion zone.”

No resin bonding agents are required due to this chemical fusing to the tooth structure. This ion release helps inhibit plaque formation and provides an acid buffering capability that helps to create an neutralization effect intraorally. In addition, these GICs have very good marginal integrity with better cavity-sealing properties, have better internal adaption and resistance to microleakage over extended periods of time, have no free monomers, can be bulk filled and offer excellent biocompatibility.

Another important consideration is that GICs are moisture-loving materials, which makes them very sensible for use in the intraoral cavity.

The transfer of dentinal fluid from the tooth to the GIC essentially creates a “self-toughening mechanism of glass ionomer based materials…serves to deflect or blunt any cracks that attempt to propagate through the matrix [and]…plays an adjunctive role by obliterating porosities [which] delay the growth of inherent cracks in the GIC under loading.”

The intermediate layer of the GIC provides flexibility during functional loading and acts as...
The use of GIC and RMGIC in the restoration of posterior Class V restorations and conservative Class I restorations provides many benefits. They are easy to place and reasonably forgiving, even in a slightly moist environment. They should be placed in a moist but not wet environment, so familiarity with technique is imperative as it is with all dental restorations. I will often use Riva SC (SDI) or Fuji 9 GP Extra (GC America) in posterior Class I and V restorations (Figs. 1–7).

Polishing and shaping of the materials must be done with water spray and fine/ultra fine composite finishing burs and polishers so as not to destroy the surface of the material (Fig. 8). The use of RMGIC products, such as Riva LC or Fuji II LC, is great in bicuspid and anterior Class V restorations, especially in high caries prone patients (Figs. 9–12).

Class II restorations, however, have always presented a challenge to the clinician. If the operator wanted to use GIC or RMGIC, there was no easy way to do this that appeared to provide satisfactory results. It is with this in mind that the “sandwich technique” was developed.

It was thought that using the properties of GIC to bond to the tooth and then applying resin-bonding agents and composite to the set GIC could help reduce sensitivity and bond failures typically seen in many resin-bonded composite (RBC) techniques.

Typically, the GIC is placed in the preparation, allowed to set, cut back to ideal form and then bonded to with an RBC technique. However, the inability of RBCs to adhere to the set GIC often creates many failures. The materials by themselves are incompatible over the long term.

The modified sandwich technique evolved as a means to overcome this problem. Placing RMGIC over set GIC—and then adding a RBC to that—provided a better solution, but was as laborious and time consuming to do, as is the sandwich technique.

The ‘Co-Cure Technique’

In 2006, an article was published that, in my opinion, has revolutionized the way I approach direct posterior restorations and direct restorations as a whole. The article presented a radical approach to direct posterior...
restorations, called the Co-Cure Technique. This technique is defined as the simultaneous photo-polymerization of two different lightactivated materials that involves "the sequential layering of GIC, RMGIC and composite resin prior to photo-polymerization and before the initial set of the GIC [which] enables an efficient single-visit placement of a [direct] restoration."16

In the Co-Cure Technique, the composite restoration does not require a bonding agent because the bonding agent is essentially the RMGIC. The RMGIC acts as the interface between the GIC and the composite material. It combines the GIC, RMGIC and composite in a way to form what can best be described as a "monolithic biomimetic restoration."

This restoration is an "open sandwich" type of sandwich technique. That is, the GIC component is exposed to the oral environment (Fig. 13) at the gingival portion of the restoration. It is quickly and efficiently accomplished and has significantly reduced postoperative sensitivity compared with typical direct RBC techniques. I have been placing these types of direct posterior restorations since 2008. They have become the cornerstone of my practice.

**Technique procedure (Fig. 14)**

After placement of an appropriate dental matrix, the technique incorporates the use of 37 per cent phosphoric acid to prepare the tooth for restoration. The acid is essentially "flooded" into the preparation in a similar manner to doing a "total-etch" RBC. It is, however, washed off after five seconds of placement. The tooth is then dried but not desiccated. The area remains slightly moist because the GIC that will be placed next is hydrophilic.

Fill the preparation with the triturated GIC material up to the level of the DEJ, then immediately place the triturated RMGIC in a very thin layer to cover the GIC and walls of the preparation. Finally, place the composite over the previous materials to slightly overfill the preparation. With a large round burnisher dipped in an unfilled resin material (i.e., Riva Coat by SDI or G-Coat by GC), wipe away the excess GIC and composite restoration material to create your margins and prevent ditching and white lines.

The occlusal table of the restoration can then be compressed gently with a plastic occlusal matrix by either having the patient bite or by the operator pressing gently with his thumb or forefinger to improve the coalescence of the three materials. This can help reduce the time involved in creating the final occlusion of the restoration by creating a functional occlusal table.

The restoration is then cured for 30 to 40 seconds with an LED curing light that generates at least 1,500 mW/cm². Appropriate light output is critical for all direct cured restorations, and assurance that appropriate output is provided by the curing light is needed for complete cure of any direct restoration.

The restoration is evaluated for complete cure and then a layer of an unfilled resin is placed on the expose GIC/RMGIC/composite complex and cured for an additional 10 seconds. The matrix band is removed and the restoration is trimmed and polished as any typical RBC restoration would be.

I have found that an entire three-surface posterior restoration can be accomplished in less than three minutes once the matrix has been placed. Typically, finishing the restoration can also be done in less than three minutes. This makes the direct posterior restoration quite efficient and beneficial to the clinician and the patient because we are providing a restoration that will help enhance healing of the dentition and reduce recurrent decay and restorative failure.

_Nanotechnology in dental materials_

Nanotechnology involves the production of functional materials and structures in the range of 0.1 to 100 nanometers by various physical or chemical methods. Today, the development of nanotechnology has become one of the most highly energized disciplines in science and technology because it can stimulate the creation of many new...
bioactive materials

Several studies have shown that the inclusion of these types of nano-fillers and nano-fibers into the dental materials (dental composites and bonding agents) can improve the physical properties by increasing the strength, polishability, wear resistance, esthetics and bond strengths in many dental applications.

It is also envisioned that the incorporation and utilization of these nanoparticles in the form of nanorods, nanofibers, nanospheres, nanotubes and ormocers (organically modified ceramics) into dental restorative and bonding agents can create more biomimetic (life-like) restorations. This will not only enable these materials to mimic the physical characteristics of the tooth structure, but will also be able to facilitate the remineralization of that structure.

As Saunders states in his conclusion, "such nanorestorative biomaterials could very credibly be the next transformative clinical leap" in restorative dentistry.

**Giomers**

In that vein, an exciting advancement in bioactive materials is the development of giomer products (SHOFU Dental, Beautifil II, and Beautifil Flow Plus). These giomers are resin-based composites that contain pre-reacted glass ionomer particles (S-PRG). These particles are made of fluorosilicate glass reacted with polyacrylic acid (just like a GIC), just before being incorporated into the resin. This creates a new type of bioactive material.

These giomer products display properties in a manner similar to GICs: They release ions and recharge with ions from the oral cavity, inhibit plaque formation and neutralize and buffer the acids of the mouth.

No other composite material has this property to date. I use these giomers instead of traditional nano-hybrid composites in my restorations because of these properties. They complete the entire biomimetic and bioactive nature of all the co-cure procedures that I create.

The Beautifil Flow Plus product line has also expanded the way that I create restorations due to their unique viscosities. These materials can be stacked (Fig. 15) and used in a restorative process I call the "modified resin cone technique" (Fig. 16).

They can also be applied to create direct composite veneers that can be easily placed, sculpted and highly polished (Fig. 17). Easy placement, the ability to stack and maintain position and shape, plus their bioactive nature, make these materials a "game changer."

**Resin-modified, light-cured bonding agents**

Another advancement that I have been working with is a product that is a resin-modified, light-cured bonding agent (SDI, North America: Riva Bond LC). This product is a specially formulated liquid RMGIC that can be used to bond composite restorations in the traditional sense, used in traditional sandwich and modified sandwich techniques and, of course, used in the Co-Cure Technique.

This concept is especially appealing in light of the research that indicates RMGICs provide quite good marginal seal when used as a bonding agent on cut dentin surfaces. I especially like to use it with the Co-Cure Technique and when doing anterior restorations.

Using this technique I am able to get a completely biomimetic, bioactive restoration in both situations because of the bioactive nature of the materials used.

The technique for use of this RMGIC bonding agent with composite is as follows:

1) Etch with 37 per cent phosphoric acid for five seconds.
2) Wash and dry but do not desiccate.
3) Triturate and apply the RMGIC bonding agent
with a micro-brush and cure for 20 seconds.  
4) Place composite to fill the preparation and cure as appropriate.

When I use this material in the Co-Cure Technique, I just substitute it for the traditional RMGIC material that I would have used otherwise.

_Resin-modified calcium silicates_

Another recent interesting product release is from Bisco and is called TheraCal LC. This light-cured bioactive material is used to seal and protect the dentin-pulp complex. It is the first of a new class of internal pulpal protectant materials known as resin-modified calcium silicates (RMCS).

It acts as a pulp capping and liner material. Calcium hydroxide (CH) has been the "gold standard" for pulp capping for many years. However, it has always had difficulties in use as a liner under RBC adhesives. In fact, despite their frequent use, the success of CH based therapies is only 30 to 50 per cent.21

It has also been shown that traditional resin-based light-cured liners have been cytotoxic to cultured odontoblast-like cells, while light-cured resin-based MTA cements presented the lowest cytotoxic effects.22 Based on this, the creation of light-cured RMCS is a logical step in developing a solution for direct pulpal protection. Calcium has been shown to be crucial to the formation of apatite, dentin bridge formation and re-apatite potential of affected dentin.

Additionally, alkalinity also seems to be contributory toward this goal. This combination in the RMCS material appears to form good, hard and thick dentin bridges and stimulates dentin pulp cells to turn into odontoblastic dentin cells.23

This type of material represents a promising new direction in direct pulp-capping clinical procedures with its ability to form apatite and further contribute to the formation of new dentin.

**Conclusion**

It is my belief that using bioactive materials in the provision of care for my patients has been paramount to the success of the care I have been providing. In this way, I have provided ways to heal the dentition, enhance the restoration and improve the health of my patients.

I believe we are on the threshold of further bioactive material advancements and that learning and incorporating these restorative materials into the daily-daily provision of care will continue to help our patients, our practices and our profession.

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

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**about the author**

**Dr John C. Comisi**, DDS, MAGD, has been in private practice in Ithaca, NY, since 1983. He is a graduate of Northwestern University Dental School and received his Bachelor of Science in biology at Fordham University. He is a member of the American Dental Association and its tripartite organizations, the Academy of General Dentistry, the American Equilibration Society, the International and American Association of Dental Research, a research associate at New York University Dental School and an editorial board member of Dental Products Shopper Magazine. Comisi is a Master of the Academy of General Dentistry, and holds fellowships in the Academy of Dentistry International, the American College of Dentistry, the Pierre Fauchard Academy and the International College of Dentistry. He may be contacted at jcomisi@jcomisi.com.
Deep resins, white fillings: A new technique for composite restorations

Author: Dr Irfan Ahmad, UK

Abstract

This article describes a new bulk-fill resin, or deep resin composite, SonicFill (Kerr Corp., USA), possessing fluctuating viscosity by the application of sonic energy. The rationale for the system is explained, together with concerns and the benefits in clinical practice. Deep resins are primarily indicated for white fillings in posterior teeth, but the unique varying viscosity of the SonicFill concept offers other useful clinical applications. Numerous case studies are presented for a variety of clinical situations including replacing defective posterior fillings; core build-ups and retaining fixed orthodontic brackets and retainers.

Introduction

The use of amalgam for posterior restorations has declined considerably in the last two decades, and continues to do so. The reasons are twofold, first, scientific advances in the development of superior, alternative restorative materials and second, patient wishes.

One of the major concerns about amalgam restorations is cavity preparation, which is both invasive and extensive, undermining the remaining tooth substrate already ravished by disease. Furthermore, placing amalgam restorations without a dentine-bonding agent fails to seal the margins, and is therefore potentially detrimental.

From the patients’ perspective, grey fillings are unsightly, especially in mandibular teeth, and usually shunned in favour of tooth coloured "white" restorations. However, the clinical time and cost of these
aesthetic white restorations is far greater than the single-step amalgam fillings.

The launch of bulk-fill composites, or deep resins, a few years ago is a sign of the times. The epicurean and prosperous lifestyles of the last two decades are being traded for austerity and frugal constraints. Hence, the introduction of these restorative materials is both timely and fortuitous.

Both patients and dentists are forgoing their hedonistic demeanour for asceticism, seeking ways to reduce expenditure while striving to maintain standards. Patients are declining treatment plans that they may have considered prior to the credit crunch, in favour of simpler and cost effective methods for restoring dental health. In addition, dentists are no longer complacent about elaborate treatment plan acceptance, and instead are offering less expensive, timesaving alternatives for achieving health and function, without the opulence of superlative aesthetics. Thus, the bulk-fill deep resins, which offer expediency and reduced treatment cost, are catering for the current economic volatile market.

Incremental vs. bulk-fill

Currently, the options for placing direct tooth coloured restorations are either by the incremental or bulk-fill approach. The rationale for incremental layering is that most universal hybrid composites can only be cured to a depth of 2 mm, and hence consecutive layers are necessary to fill the cavity. Furthermore, successive layers reduce the cavity configuration factor (C-factor) for lowering pulpal deflection and mitigating bond failure following polymerisation shrinkage. In addition, superior aesthetics can be achieved by mimicking the natural dentine and enamel layers with corresponding increments of the RBC and incorporating specific tints and stains. Hence, highly aesthetic restorations with superior anatomical form are possible. However, with contemporary universal hybrid composites possessing low-shrinkage & low-stress, the C-factor and microleakage are less of a concern. The disadvantages of incremental layering is the onerous process with greater probability for introducing porosity between the layers, and the protracted treatment session is reflected by a higher cost for the patient. Furthermore, the initial flowable stress relieving lining is ineffective for reducing cuspal deflection, further questioning the validity of this procedure.

Unquestionably, the incremental approach is ideally suited for anterior restorations where aesthetics are a prime concern, but is it also necessary for posterior restorations? In a recent article, Smales et al. stated that “...clinical technique is the determining factor for success and longevity of composites”, and added there has been “...little improvement in the last 30 years!” Therefore, any procedure that simplifies the taxing clinical technique of composite placement is likely to improve predictability and durability of restorations. Consequently, introduction of bulk-fill resins endeavour to expedite direct composite restorations in posterior teeth. The rational of the bulk-fill resins is reducing clinical steps by a filling the cavity in a “single” increment, thereby simplifying the existing incremental technique. This also ensures reduced porosity and uniform consistency restoration, with reduce clinical time and cost for the patient.

At present three types of bulk-fill resins are available, distinguished primarily by their viscosity, which is low, medium or fluctuating. The low viscosity variety offers superior adaptability, while the medium viscosity type is better for carving and sculptability (see schematic representation on the illustration below).

A utopian composite?

Contemporary resin-based composite filling materials can arbitrarily be categorised as flowable and universal composites. Each variety has unique chemical,
special topic – composite restorations

Flowables are low viscosity, offering improved wetability for better adaptation to cavity floors and walls, while the universal composites offer high viscosity allowing optimal sculptability and carving for creating correct anatomical morphology. Hence, the clinician is faced with a catch-22, ideally adaptability is essential, but the slumping sticky flowables are not conducive for shaping.

Conversely, the high resistance to flow of universal composites are ideal for contouring but may create voids within the restoration or the cavo-surface margins due to reduced fluidity. A utopian composite should possess the handling characteristics of a flowable for adaptation, as well as having high viscosity for facilitating sculpting. The SonicFill system resolves this dichotomy.

The SonicFill system consists of a handpiece that dispenses a resin-based composite filling material. The handpiece, designed by KaVo (Biberach), delivers sonic energy at varying intensities, which is adjusted on the shank from low to high (1 to 5) to control rate of composite extrusion. The handpiece fits onto the KaVo MULTIflex coupling and is operated by the universal foot control. The specially formulated deep resin is manufactured by Kerr (Kerr Corp., USA), which incorporates modifiers that react to sonic vibrations to alter the viscosity of the material. The Unidose capsules have smaller diameter 1.5 mm tips for accessing deep cavities, compared to the conventional larger 2.5 mm pre-loaded tips (PLT). The resin dispensing tips screw directly onto the handpiece head and deliver the composite when activated by the foot control. The sonic energy reduces the viscosity of the resin by 87% allowing adaptation in deep cavities, up to 5 mm, in a single increment (Fig.1). After the foot control is released the sonic energy ceases, and the resin returns to its high viscosity state, facilitating sculpting and carving to the desired anatomical form. Another defining feature of this unique deep resin is that it can be light cured to depths of 5 mm (20 seconds for LED units with an output of 800 mW/cm²) in a single layer. Additional 10 seconds curing from both buccal and lingual sides are also recommended. The final stage is polishing the white filling, which is achieved with appropriate rotary instruments such as OptiDisc & Opti1Step (Kerr, Switzerland)—see case study in Figs. 2–11. Furthermore, the SonicFill resin has greater radiopacity than enamel, allowing easy detection of secondary caries.

As with any new product, there is a degree of scepticism, and inertia for adopting to a new technique and material. Some of the questions asked about the SonicFill system include the following:

Does bulk filling increase polymerisation shrinkage and associated stresses?

A low shrinkage composite is defined as having less than 2% polymerisation shrinkage. In addition, the stresses associated with volumetric contraction are more significant since they should be lower than the shear bond strength of the dentine adhesive to prevent bond failure and formation of voids at the tooth–resin interfaces.

Some of the older “condensable” composites exhibited excessive stresses during the polymerisation phase causing detachment of the filling material from the cavity walls, resulting in marginal discrepancies and post-
operative sensitivity. Numerous newer low shrinkage resins offer < 2% contraction, and the highly filled (> 83% by weight) SonicFill resin has shrinkage of only 1.6%. Furthermore, the associated reduced stresses of 3 MPa are lower compared to many universal composites, which translates to the positive assumption that gap-free restorations are possible with bulk-fill deep resins.9

Is a “flowable” composite strong enough to resist occlusal forces?

Flowable composites, by definition, are weaker materials due to reduced filler content for lowering the viscosity of the material, and are therefore unsuitable for occlusal load bearing surfaces. Class I, II, and VI cavities require high strength and high wear resistant composites to maintain occlusal morphology.

Research has confirmed that universal composites function adequately under normal occlusal forces.10 Although SonicFill transiently becomes flowable by applying sonic energy, it is essentially a high viscosity, highly filled composite with a compressive strength of 254 MPa, greater than several universal composites.11 In addition, it displays a bottom to top Rockwell hardness ratio of 86% making it ideal for resisting occlusal forces.

Can a 5 mm increment be completely polymerised to its full depth?

The greater amount of photoinitiators in the SonicFill composite resin allow a high degree of conversion ratio, more than 86%, to a full depth of 5 mm (Fig.12). Therefore, the proverbial 2 mm layer thickness is an antiquated guideline for bulk-fill, deep resins.

Are aesthetics compromised using a single monochromatic layer?

Although aesthetics are paramount for the anterior region of the mouth, and indeed, success is often judged by the appearance of the restoration, posterior restorations are not assessed with the same critique. Innumerable clinicians, including the author, have published articles showing beautifully carved posterior composite fillings with intricate fissure patterns and staining that impeccably mingle with the surrounding tooth substrate. From an aesthetic perspective, these immaculate fillings are unquestionably flawless.

However, others frown at such “perfection”, stating that it is an exercise in self-indulgence, adding little functional or health benefits, to which a patient is totally indifferent. This is further elaborated by pointing out that patients do not notice this meticulous work or the effort required for achieving these highly aesthetic restorations (especially in maxillary molars). Further criticism is that patients are unlikely to photograph their posterior teeth, enlarge the images, and neither scrutinise nor appreciate the arduous effort for creating such “masterpieces.”

Can a 5 mm increment be completely polymerised to its full depth?

The maximum thickness recommended for most universal and flowable composites is 2 mm for ensuring adequate bottom to top polymerisation of the resin. The conversion of the monomer matrix to a polymer is primarily dictated by the formulation of the resin material. Nevertheless, many studies have concluded that the depth of conversion of bulk-fill composites is a viable possibility.12–14

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The endodontic status prior to providing
restorations in the right mandibular molar
requires monitoring before proceeding to a
definitive indirect restoration.

After removing the amalgam filling, extensive decay is precariously close to the pulp, which requires monitoring before proceeding to a definitive indirect restoration.

A steel matrix bank is placed, and dentine bonding agent applied.

A coronal build-up using SonicFill resin to review and monitor the endodontic status prior to providing a definitive indirect restoration.

Two months later the tooth was symptomless, and the SonicFill core is trimmed back for an indirect ceramic inlay.

An impression is taken using a polyvinyl siloxane impression material, forwarded to the dental laboratory for fabricating a ceramic inlay.

Furthermore, many object to stained fissures, which are perceived as dirty teeth. In reality, patients only desire clean, “white”, functioning fillings to alleviate their symptoms. From a clinical standpoint, posterior fillings should possess a hermetic marginal seal to prevent breakdown, and correct anatomical form to restore occlusion.

After all, amalgam fillings, which are blatantly obvious and unesthetic, have routinely been placed in posterior teeth for over a century without causing a massive revolt from the population. Therefore, offering patients white fillings that are functional and resilient at a fraction of the cost compared to layered restorations is an attractive option, especially in the current economic debacle; and the SonicFill system caters for this niche in the market.

Benefits

For reasons mentioned above, the dental marketplace has recently been flooded with bulk-fill composites for direct restorations in posterior teeth. However, not all the deep resins for white fillings are identical. The defining features of the SonicFill system are fluctuating viscosity for adaptability and sculptability, single increments of bulk-fill & bulk-cure up to 5 mm for expediency, high wear resistance for durability, and a reduced translucency for acceptable aesthetics. These key characteristics result in fewer clinical steps, saving time, reducing cost, improving efficiency, predictability, and longevity of direct posterior composite restorations.

Fluctuating viscosity

Most bulk-fill composites have a fixed, unchangeable viscosity that ranges from medium (e.g. Tetric EvoCeram Bulk Fill, Ivoclar Vidental, Liechtenstein), to low or flowable (e.g. Surefil SDR Flow, DENTSPLY Caulk, Germany). A major drawback of universal composites is that their consistency is thick, not conducive for spreading and achieving tight adaptation to cavity walls and floors. Methods such as applying external sonic vibrations and temperature improve fluidity and therefore helps manipulating the composite to “fit” the erratic terrain of cavities (Fig. 13). There are numerous external handheld sonic devices for applying vibrations for modelling resins, e.g. Compofixo (Kerr, Switzerland). Whilst these are efficacious for reducing viscosity of a resin, an extra step is added to the already onerous clinical procedure. Lowering viscosity is also possible by thermal means, e.g. heating resin to around 60 °C. However, the time to transfer the composite from the heating apparatus and adapting it to the cavity may cool the material, and hence negate the potential benefit. This is because heat is rapidly dissipated when the resin is placed in a tooth that acts as a heat sink at body temperature of 37 °C, thus reverting the composite viscosity to its unheated state. The SonicFill system overcomes the above two difficulties by lowering the viscosity at the point of delivery by applying internal vibrations to the resin, without the need for heat or external handheld sonic devices.

Another advantage of fluctuation viscosity is that an initial lining, or a capping occlusal layer is obviated. The difference in viscosities of a material, off course, improves its handling characteristics, but it also affects the physical and mechanical properties of the resin. Unaltered, low viscosity bulk-fill resins (e.g. Surefil SDR Flow, Venus Bulk Fill) have lower filler content to confer flowability, which in turn makes the material weaker, requiring a capping occlusal layer with a universal composite to resist occlusal forces. Conversely, with medium viscosity materials (Tetric EvoCeram Bulk Fill), an initial flowable composite layer is necessary as a lining for better adaptation to the cavity walls. Similar to stratification with a universal composite, applying an initial low viscosity layer may introduce incremental voids and therefore compromise the integrity of the restoration.

Fig. 23. The post-operative white fillings after shaping with OptiDisc aluminium discs and polishing with OptiStep silicone tips.

Fig. 24. A large defective amalgam restoration in the right mandibular molar requiring replacement.

Fig. 25. After removing the amalgam filling, extensive decay is precariously close to the pulp, which requires monitoring before proceeding to a definitive indirect restoration.

Fig. 26. A steel matrix bank is placed, and dentine bonding agent applied.

Fig. 27. A coronal build-up using SonicFill resin to review and monitor the endodontic status prior to providing a definitive indirect restoration.

Fig. 28. Two months later the tooth was symptomless, and the SonicFill core is trimmed back for an indirect ceramic inlay.

Fig. 29. An impression is taken using a polyvinyl siloxane impression material, forwarded to the dental laboratory for fabricating a ceramic inlay.
Bulk-cure

Bulk-fill, fixed viscosity composites such as Quixx and Surefil SDR Flow, Tetric EvoCeram Bulk Fill, Venus Bulk Fill, and x-Tra Fil (VOCO) offer a depth of cure of only 4 mm. In contrast, SonicFill is a true bulk-fill resin with a higher depth of cure up to 5 mm, compared to analogous products.

Strength and longevity

The survival of a composite, especially in the posterior regions, is determined by its ability to resist occlusal loads and maintain its anatomical form. Another advantage of the SonicFill resin is that due to its favourable strength, a capping occlusal layer is obviated, and research has confirmed that the high flexural strength (186 MPa) and compressive strength (254 MPa) of the SonicFill composite is comparable, or even greater than, several conventional universal composites.

Reduced translucency

In order to achieve a greater depth of cure, many bulk-fill deep resins are highly translucent to allow the curing light to sufficiently penetrate to the bottom of a single incremental layer. Unfortunately, the increased inherent translucency of materials such as QuiXFil compromises aesthetics by having a greyish appearance due to low value, which is unattractive and readily noticeable. On the other hand, the SonicFill resin is relatively opaque and available in a variety of VITA shades, A1, A2, A3 and B1 and when appropriately polished, yields acceptable aesthetics.

Clinical applications

The salient feature of the SonicFill system is fluctuating viscosity, and in clinical practice, varying viscosities offer vast versatility. In addition, the expediency for the provision of posterior white fillings is particularly beneficial for patients with limited compliance, such as the elderly or medically infirm who cannot endure protracted sessions for incremental layering, fissure staining and are satisfied with mediocre aesthetics. The clinical applications of SonicFill include posterior white fillings, coronal or core build-up, and cementing orthodontic brackets and fixed retainers.

Posterior fillings

The obvious use of a bulk-fill deep resin is resorting Class I, II and VI cavities in posterior teeth. These can either be new fillings or those that require replacement due to defective margins, marginal ditching, wear, poor morphology or bulk fractures, which applies to both failing amalgam and composite restorations. In order to retain an amalgam filling, creating undercuts are necessary (Fig. 14). However, after removing the offending amalgam filling, the remaining undercuts require obliterating to seal the cavity floor. This can be accomplished by reduction of the axial walls to remove the unsupported enamel, which is destructive and unnecessarily. An alternative method for obliterating the undercuts is sealing them by exploiting the initial low viscosity of the SonicFill resin, which flows into the undermined areas to preserve existing tooth substrate.

All composite resin fillings are particularly susceptible to hydrolytic degradation over time. This causes ditching, microleakage, loss of contours or even catastrophic fracture, which can result in sensitivity, secondarily caries and endodontic complications. Replacement of old defective composite fillings with SonicFill is effortless and straightforward to restore occlusal form, provide

Fig. 30_A palatal cusp fracture on a maxillary premolar with endodontic involvement.

Fig. 31_The lost palatal cusp is built-up with SonicFill resin to isolate the tooth from oral fluids before preparing an access cavity for root canal therapy.

Fig. 32_A fractured maxillary first premolar at the level of the gingival margin.

Fig. 33_Following root canal therapy, two fibre posts are placed to retain a core build-up.

Fig. 34_A core build-up using OptiBond XTR with SonicFill resin for supporting a definitive crown.
special topic  composite restorations

Fig. 35_Fixed orthodontic brackets can be accurately located and precisely cemented with SonicFill resin.

Fig. 36_Lingual orthodontic wire retained by correctly contoured (non-bulbous) resin, without impingement of the gingival margins for improved oral hygiene and periodontal health.

Coronar or core build-up

A gross loss of dentine and enamel is usually due to caries, tooth wear or trauma. In each of these circumstances, the objectives are building up the lost coronal substrate for restoring structural integrity, a foundation for a subsequent definitive restoration and preventing ingress of bacteria and oral fluids. The SonicFill resin, possessing high flexural strength, compressive strength, hardness, and reduced volumetric contractions together with a profound depth of cure is proficient for achieving these objectives.

For vital teeth that have extensive failing or fractured restorations, a coronal reconstruction serves as a long-term restoration, possibly for reviewing endodontic status and monitoring tooth vitality before the provision of a final restoration (Figs. 24–29). In addition, acute traumas causing cuspal fractures with pulpal exposure, necessitating root canal therapy, a core build-up acts to retain a rubber dam clamps for isolation during endodontic therapy (Figs. 30 & 31). Finally, for root treated teeth, intra-radicular posts can be used for building up a core with SonicFill resin for supporting an eventual crown (Figs. 32–34).

Retaining orthodontic brackets and fixed retainers

Fixed orthodontic therapy involves cementing orthodontic brackets with a resin cement or flowable composite. Because the latter possesses low viscosity, this presents a challenge for accurate location of the brackets. Furthermore, the inherent low viscosity of cements and flowables reduces thixotropic properties and makes removal of excess unset material a tedious chore. Although this is not officially included in the indications recommended by the company, the SonicFill resin resolved these problems since its dispensing tip delivers a small amount of material exactly where needed.

In addition, the initial low viscosity of the resin allows precise adaption to the enamel surface, and when its viscosity increases, the brackets can be accurately positioned and excess material removed with ease before light curing. This substantially reduces clinical time, and avoids inadvertent damage to the surrounding enamel by scraping with hand or rotary instruments, or laceration of the gingival tissues during removal of excess cement or flowable composite (Fig. 35).

Similarly, fixed orthodontic retainer wires can be accurately positioned on the lingual or palatal surfaces, and the highly viscous SonicFill unset excess resin removed prior to light curing. This avoids the frequently encountered lingual or palatal bulbosity associated with surplus composite around retainer wires (Fig. 36). Finally, since the SonicFill resin is precisely adapted to the retainer wire, inadvertent impingement of the gingival margin is mitigated, thus improving access for oral hygiene procedures, and preventing inflammation of the gingival margins.

Conclusion

Bulk-fill, deep resins, provide an expedient and cost effective solution for posterior direct restorations where aesthetics are not a paramount concern. The SonicFill system offers the best of both worlds; adaptability of a flowable and the sculptability of a universal composite with the added benefit of 5 mm depth of cure in a single increment. Deep resins: white fillings, delivered with simplicity and efficiency. In addition, the favourable mechanical properties of the SonicFill resin and its fluctuating viscosity allow other clinical applications such as core builds-ups and retaining orthodontic fixed brackets and appliances. Finally, it is not inconceivable that future varieties of bulk-fill deep resins may incorporate self-etching bonding agents that would obviate the need for a prior bonding protocol, and thereby further simplifying and reducing clinical steps._

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

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Conservative smile enhancement: Direct composite resin restoration of conoid lateral incisors

Author: Dr Monika Marciniak, Poland

Minimally invasive treatments restore form, function and aesthetics with minimal removal of sound tooth structure. Understandably, the restorations age with the patient. Eventually, teeth that have been restored will break down and patients will need to have those restorations replaced.

Fortunately, restorative materials and procedures evolve constantly. If an initial restoration was created using minimally invasive procedures, there should be more tooth structure to work with when a second restoration is needed. The following case report demonstrates such a conservative approach.

Case report

After orthodontic treatment, a 19-year-old female patient was dissatisfied with the unpleasant, disproportional appearance of her conoid maxillary lateral incisors. A direct composite technique was selected for smile enhancement at the initial appointment (Figs. 1–4).

Figs. 1–4, Pre-op view following orthodontic bracket removal. Conoid maxillary lateral incisors make the smile unpleasant and disproportional.

Fig. 5, Prepared right conoid lateral incisor with fixed celluloid strip and retraction cord inserted.

Fig. 6, Etching with 37% phosphoric acid for 30 seconds prior to application of a fifth-generation bond.
Following enamel-preserving preparation using a tapered, round-ended fine diamond bur and sand-blasting, a celluloid strip was placed subgingivally and fixed using flowable composite. This helped to create the desired emergence profile and contact points. Next, a retraction cord was inserted into the labial part of the gingival sulcus (Fig. 5).

After isolation of the operative field, the preparation was etched with 37% phosphoric acid for 30 seconds, then thoroughly rinsed and dried. Subsequently, a fifth-generation bonding agent was applied and light cured (Fig. 6).

The next step entailed creating palatal and two lateral enamel walls that were completed using...

Fig. 7. Completed palatal and two lateral enamel walls. The lingual shelf leaves room for the dentine layering.

Fig. 8. Distal and mesial lobes created with increments of dentine-shade resin.

Fig. 9. Darker-shade dentine on the cervical third. White tint...
increments of enamel-shade resin. Creating a lingual shelf in this manner left room for the subsequent dentine layering (Fig. 7).

The appropriate dentine-shade resin was then applied in order to create distal and mesial lobes. These were light cured for ten seconds (Fig. 8). Dentine in a darker shade was placed onto the cervical third. Prior to light curing, the white strip was painted horizontally along the incisal edge of the enamel shelf using a white tint and smooth brush (Fig. 9). Finally, an enamel resin layer was placed, contoured, smoothed with a brush and light cured (Fig. 10).

After completion of composite applications and polymerisation, fine flame-tipped finishing diamond burs and Sof-Lex discs (3M ESPE) were used for gross contouring and creating texture. The final polish was achieved using rubber finishers, a brush, a felt wheel and a paste kit (Fig. 11).

The same procedures were followed during reconstruction of the left lateral incisor (Figs. 12 & 13). Figures 14 to 16 show the situation 30 days post-operatively. The lateral incisors show favourable integration of form and colour as achieved through the direct composite resin restoration procedure. Adequate contours and proportions create a smile with harmonious symmetry and a natural appearance.

Some cases present with conoid lateral incisors displaying a lack of gingival harmony, as were the cases with those patients (Figs. 17 & 20). This usually manifests as the translocation of the gingival contour coronal to the zenith of the canine and central incisor. Such a clinical situation requires gingival recontouring before direct restoration.

In presented cases, the recontouring procedure was carried out using a Soft Tissue Trimmer bur (Edenta). Modifications were limited by the patient’s biologic width. As observed at four-week follow-up visits, there was a very good gingival response to the polished restorations (Figs. 19 & 21).

Conclusion

Conoid lateral incisors are not uncommon. They may be found unilaterally or bilaterally. Their poor appearance can spoil an otherwise attractive smile. The case presented describes a minimally invasive way of addressing this problem using direct composite bonding.

The step-by-step images illustrate how dentists can solve this cosmetic issue without using aggressive techniques and with the advantage of being in full control of shade matching and characterisation._

_about the author_ cosmetic dentistry

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graduated from the Medical University of Białystok in Poland in 1992, and runs a private practice with her husband. She has been publishing articles on direct composite restorations since 2007. She is a member of the European Society of Cosmetic Dentistry.

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Fig. 10 The final enamel resin layer contoured and smoothed with a brush.
Fig. 11 Completed composite restoration immediately after finishing and polishing.
Figs. 12 & 13 The same steps followed during reconstruction of the left lateral incisor.
Figs. 14–16 Post-op view after 30 days demonstrating favourable integration of the form and colour of the restored teeth.
Figs. 17 & 20 Gingival contour of conoid lateral incisors translocated coronal to the zenith of the canine and central incisor.
Fig. 18 Recontoured gingiva with retraction cord inserted.
Figs. 19 & 21 Very good gingival response to the polished restorations at four-week follow-up visits.
Improving success with your cosmetic cases using the TMJ QuickSplint

Any clinician who practises aesthetic or reconstructive dentistry knows the challenges of predictably executing multi-unit anterior dental cases. From acquiring proper and repeatable bite records to protecting provisional and final restorations, anterior bite plane devices (deprogrammers) are a useful tool when integrated into your protocol.

Research has shown that when posterior teeth are prevented from contact, the overall mastication forces are reduced by up to 70 per cent. This protective feedback mechanism is both beneficial to teeth and can relieve uncomfortable muscle pain resulting from overuse and spasms caused by excessive contraction.

For this reason, some providers regard anterior bite plane devices as the perfect first-line treatment for acute temporomandibular joint (TMJ) pain and dysfunction.

Most of the time, patients present for anterior reconstruction due to worn anterior incisal edges and/or abraded posterior dentition. This condition is most commonly associated with nighttime bruxing habits (sleep bruxism). Over time, sleep bruxism can cause aesthetically displeasing results, with loss of anterior guidance, occlusal...
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disharmony and overall destabilisation of the bite. Sleep bruxism, like many other oral conditions, is often painless but without intervention leads to more tooth wear and can result in TMJ pain and pathology.

Moreover, studies have shown that more than half the patients who grind their teeth due to para-functional habits are not aware of the behaviour, which can interfere with treatment needs and case acceptance. With time, sleep bruxism can result in firm and enlarged muscles of mastication. Enlarged muscles can increase the challenges of case aesthetics and often make it difficult to obtain a passive centric relation occlusal bite record.

In my practice, anterior deprogrammers have been used successfully for many years. These devices can help relax overused or hyperactive muscles. They allow the joints to seat passively in their anatomically ideal location through a protective pathway once the patient’s occlusion is disengaged. Used as a diagnostic tool, as a first line of treatment or as a step in treatment, anterior deprogramming devices are a valuable treatment tool.

The TMJ QuickSplint is a semi-custom anterior bite plane (deprogrammer) that was developed for immediate placement with minimal demand on the provider regarding time, cost or treatment expertise. Although other methods currently exist, I have found the TMJ QuickSplint to be especially useful in the following two areas in aesthetic dental care.

Achieving accurate open-bite centric relation records

A simple technique that can be used to achieve accurate bite records involves using the TMJ QuickSplint as a night-time appliance for one week prior to record making. The design of the TMJ QuickSplint shell and recommended fabrication technique provide a simple, consistent, reliable and fast method to deliver this device chairside. The TMJ QuickSplint used as a deprogrammer will relax the patient’s muscles of mastication and help provide a repeatable, accurate centric relation record. The TMJ QuickSplint is designed for maxillary or mandibular arch use, based on maximum contact, occlusal stability, operator preference or patient comfort.

The procedure is simple. After using the device for seven to ten days, the patient returns for records to be made. With the TMJ QuickSplint in place, the patient is asked to bite on the anterior plate (of the TMJ QuickSplint), slide forward and backward a few times and then while the jaw is in the most retruded position to firmly bite down on the TMJ QuickSplint and to hold and squeeze the jaw to stabilise the position.

Bite record material is then injected between the posterior teeth and allowed to set. The TMJ QuickSplint is then removed and the patient is asked to bite into the freshly made posterior sections that provide stability while new material is injected onto the anterior region, providing an accurate full-arch open-bite centric relation record.

Protecting provisionals and final restorations

Another common and significant problem is keeping provisionals in place while waiting for laboratory-fabricated restorations to be completed. It is not practical to fabricate any permanent bite protection for patients in provisionals and most systems on the market involve rigid acrylic liners that could potentially damage and
or loosen the restorations. Provisionals need to be luted to the preparations in such a way that the patient can visualise the end-result and have some functional benefit. Essentially, they need to be cemented well enough to function but easily removed without damaging the preparations.

Since the cause of the patient's original tooth wear is still present and active, this is not always easy and often leads to broken provisionals and upset patients and clinicians. Failure or unexpected events in aesthetic dental care can have negative consequences on patient perception, which is essential to building a strong cosmetic dental practice.

The TMJ QuickSplint is best fabricated using Blu-Mousse (Parkell) or your choice of similar fast-set bite registration material. This allows for rapid, accurate and careful placement over the top of the provisionals. The patient uses the TMJ QuickSplint at night to prevent damage to the provisionals during removal or placement, with the added benefit of reducing overall force and stresses on the interim restorations. After final delivery, we relign the TMJ QuickSplint to fit the final restorations. This can be worn until a definitive device is fabricated and delivered. In my practice, the patient is advised to keep the TMJ QuickSplint as an emergency device in the event of a symptomatic muscle flare-up or if the current appliance is misplaced or damaged.

**Dr John Weston** is an accredited fellow of the American Academy of Cosmetic Dentistry and an examiner for the American Board of Cosmetic Dentistry. He lectures nationally and internationally, publishes articles, conducts clinical research, and evaluates new and emerging dental technology and products for major dental companies. He is director and owner of Scripps Center for Dental Care, a multi-specialty practice located at Scripps Memorial Hospital in La Jolla, California. Information on other articles he has published can be found at www.scrippsdentalcare.com.

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Restoration of orofacial aesthetics: A new multidisciplinary concept

Introduction

Since ancient times, humanity seems to focus on the characterization of aesthetics standards which modulate the individuals and make them being noted and appreciated by the society in which they live. For this reason, trends in aesthetics are always established by standards determined by society as a whole. In dentistry, this applies too, hence the pursuit of oral aesthetics using the best technological and human resources in the various specialties. Nowadays, any oral restoration procedure is initiated from a detailed plan, which aims to satisfy the patient’s wishes. In general, the intended result of treatment is healthy, well-aligned, whitened teeth with an ideal occlusion and with a harmonious integration of orofacial aesthetics.

The time when the work of a dental surgeon entailed only exodontia, aggravated by the fear caused by the noise coming from the high-rotation system, belongs to past. Fortunately, whether owing to the evolution of the materials we use or formation improvement, today we are recognized for the excellence of our work, which unites science and art to provide safe and comfortable treatments, combining function and aesthetics in one of the regions of the body that most requires care, the face.

In the new area of orofacial aesthetics, as with other areas of dentistry, diagnosis and planning are indispensable for excellent dentofacial aesthetics. For the feasibility of these treatments, a multidisciplinary approach, employing new techniques such as botulinum toxin, filling materials and phototherapy, is an essential therapeutic approach for treating many dysfunctions. Therefore, in addition to dental procedures, new and efficient procedures, which are aimed at not only oral restoration but also orofacial restoration, are used for treating a gummy smile, dystonia, mandibular spasms, temporomandibular joint dysfunction syndrome, hypertrophy of the masseter, orofacial pain, loss of support of the lips, short interdental papillae or black space between the teeth, and other epidermal dysfunctions.

The aim of this article is to present new concepts in orofacial dentistry in order to promote new supporting therapies in the pursuit of multidisciplinary treatment. Using botulinum toxin for therapeutic purposes, filling dynamic wrinkles resulting from facial expressions with filling materials, and the application of phototherapy to orofacial aesthetics will be considered.

Discussion

The botulinum toxin commercialized in Brazil by different pharmaceutical companies originates from a Gram-positive bacterium called Clostridium botulinum. There have been many reports on the action of...
Botulinum toxin since the middle of 18th century, when Justin Kerner described it as “sausage poison” because of the effects in patients after eating contaminated sausage. Only in 1949, did Arnold Burgen report the discovery of the blocking action of botulinum toxin on neuromuscular transmission. Since then, many studies have been conducted on the therapeutic and cosmetic uses of botulinum toxin. It was first used for therapeutic purposes with the approval of health regulatory agencies in 1989 in ophthalmology to treat strabismus, blepharospasm and hemifacial spasms.

From 2000, botulinum toxin Type A began to be widely used in muscular and cosmetic therapies but without indication of use, that is off-label.

When it is injected into muscle, botulinum toxin Type A paralyses muscular movement. The mechanism of action of botulinum is the inhibition of acetylcholine, the neurotransmitter released by the action of nerve impulses at neuromuscular junctions, thus preventing muscular contraction. Consequently, temporomandibular joint dysfunction syndrome, muscular hypertonia (trismus), migraines and gummy smiles, among others, are dysfunctions that may benefit from the use of the toxin (Figs. 1a–3b).

Botulinum toxin is contra-indicated in lactating and pregnant women, people with autoimmune diseases, neurological diseases and diseases that affect the muscles, people allergic to egg protein and people using medicines derived from aminoglycosides.

Among the major risks of botulinum toxin is overdosing and application to incorrect regions, which may result in asymmetry. In terms of health, it could affect the movements necessary for good function such as blinking, chewing and swallowing.

Botulinum toxin has a temporary effect, thus its treatments must be seen as palliative and not definitive. For this reason, if treatment is satisfactory, it will have to be repeated to maintain the results. There is not a rule, each person has a singular reaction, but the applications are generally done every six to eight months, always by a skilled professional. The possibility of developing resistance and thus requiring increasingly higher dosages and shorter intervals between treatments is a matter of debate. Some studies show that over time the patient may develop resistance to the toxin, indeed requiring higher dosages in future applications. This dosage excess may cause an insensitivity of the patient to the effects. Other studies however show that over time the need for the toxin is reduced, which implies that lower dosages are required. After some time the relaxed muscle shows a decrease of conditioning spontaneous of activity, as an atrophy, thus explaining the decrease in need of toxin.

Filling materials are widely used in medicine. In orofacial dentistry, filling materials such as polyamide, hyaluronic acid and hydroxyapatite are employed to fill nasolabial folds, the lips, the barcode line of the upper lip and short interdental papillae, also known as black triangles or black spaces, and to sculpt the Cupid’s bow and model the philtrum, the vertical groove in the center of the upper lip (Figs. 4a–5c).

Therapeutic procedures to restore function are combined with procedures to restore aesthetics in
industry report  new concept of aesthetic restoration

Orofacial dentistry. For this reason, it is very important to define the concepts of facial and dental aesthetics for the integration of the procedures. Phototherapy combines function and aesthetics. Therapeutic lasers have been used for over 50 years in diverse medical specialties. The effects of phototherapy are based on the absorption of the electromagnetic energy and its conversion into chemical energy in the cell. This photo-biostimulation promotes the acceleration of scarring processes, as well as bio-modulation of pain and tissue remodeling.

Associated with dental treatment, orofacial aesthetics provides the link between the mouth and face. Phototherapy for aesthetic purposes thus assumes an important role in multidisciplinary treatment. Different wavelengths are used to treat facial dysfunctions that affect aesthetics. The most studied wavelengths are red, infra-red, amber and blue. The red wavelength acts directly on the mitochondria, increasing cell metabolism and, consequently, tissue repair. The infra-red wavelength acts on the cell membrane, modifying its permeability, controlling the input and output of ions, and modulating the propagation of nerve impulses in controlling pain. The amber wavelength interacts with the ribosomes responsible for amino acid synthesis. Finally, the blue wavelength increases the quantity of intracellular fluid, promoting hydration and cell swelling.

In orofacial aesthetics, phototherapy, among other therapies, is used to effect an increase in collagen, tissue swelling and whitening, cell biostimulation and lymphatic drainage.

Conclusion

Therefore, orofacial dentistry offers dental surgeons a multidisciplinary approach, combining oral and facial treatment, providing minimally invasive, integrated treatment with effective results in the dental practice. New treatments and therapies are constantly being integrated into modern dentistry. For this reason, continuing education is essential for the development of orofacial aesthetics.

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

**Figs. 5a–c** Immediate post-op photograph of Case 5 (a), filling of nasolabial folds, upper lip, Cupid’s bow and philtrum using Aqualift (c). During the procedure, the points requiring filling were marked (b).

**Figs. 6a–c** Case 6 treated to effect facial hydration and lighting using facial phototherapy biophotonics, showing photoactivation of collagen mask with blue LED (Elite, DMC) during the procedure (b).

**Conclusion**

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A meeting with the future
Lasers in aesthetic dentistry

Authors: Drs. Ilay Maden, Zafer Kazak & Özge Erbil Maden, Turkey

The exciting possibilities offered by the world of aesthetic dentistry are being experienced by an increasing number of dentists and patients worldwide as new materials, techniques and tools become widely available.

One such example is the laser, of which there are many for use in dentistry. To appreciate laser dentistry to its fullest, however, it is necessary to gain accurate information from unbiased sources, firstly about laser safety and the physics of laser–tissue interaction, and secondly about the specific uses of lasers in practice.

The most commonly used laser types in dentistry are erbium lasers (with two variants: 2,940 nm Er:YAG and 2,780 nm Er,Cr:YSGG), neodymium lasers (1,064 nm Nd:YAG) and diode lasers (810, 940 or 980 nm). Each type of laser has a different wavelength, and each wavelength has a different interaction with the specific body tissue being treated.

Crown lengthening or gingival levelling (Figs. 1a & b) is a routine procedure for laser-assisted aesthetic interventions. All lasers can be used for this procedure; however, there are two main advantages of using erbium lasers in crown lengthening. First of all, they can be used without anaesthesia, as they do not cause thermal damage to the tissue. This results in a stable gingival height after the procedure.

Since diode and Nd:YAG lasers work in a more thermal manner, a longer healing time should be expected for the tissue to settle. A prerequisite for success in crown lengthening is, of course, to respect biologic width. If there is less than 3 mm between the desired gingival level and the bone, the bone level must be decreased. While this is possible to do with erbium lasers (even flapless), neither diode nor Nd:YAG lasers are suitable for this, since they are only capable of removing soft tissue.

The same conditions are applicable for uncovering implants with erbium lasers, so it is possible to take the impressions for prosthetic procedures on the same day or within a short period. If it is necessary to remove bone or soft tissue for either indication, erbium lasers with adjustable pulse duration (referred to as VSP technology in
Fotona lasers, for example) are the only option without raising a flap.

Tooth preparation for crowns and bridges with lasers is not yet as efficient as one might like it to be; however, new research and technological improvements are ongoing. A diode or Nd:YAG laser can still be helpful during prosthetic work for troughing before taking impressions or desensitising prepared teeth if required. It is also possible to reduce or eliminate dentine hypersensitivity due to periodontal treatment or gingival recession by either modulating the nerve endings or blocking the dentinal tubules using a laser.

Another aesthetic treatment is gingival depigmentation (Figs. 2a & b), which can also be performed by using long pulses of erbium or diode lasers. It is possible to de-epithelialise the surface, as the pigmentation is usually in the basal layer.

Erbium lasers are safer, since they do not penetrate the tissue. The effect is only superficial, and this is exactly where the pigmentation is.

Diode lasers penetrate more deeply, especially if one is not careful and tries to remove tissue that is lighter in colour. As with other treatments, erbium lasers allow the tissue to heal faster; however, there can be mild bleeding during the operation.

Class V caries removal for composite fillings can easily be performed with an erbium laser, quickly, painlessly, and without any thermal side-effects, especially if the pulse durations are short enough—typically between 50 and 100 microseconds (Fig. 3). The shorter the pulse duration is, the more effective the laser energy will be at removing hard tissue. The margins of the cavity can even be bevelled for better aesthetic appearance and long-term colour stability if the laser is efficient enough to remove small amounts of sound enamel when needed.

Lasers also work selectively to only remove carious tissue, which has more water content than sound hard dental tissue. Surface modification can also be done with the erbium laser after cavity preparation for repairing composite fillings, or even for restoration cementation. One big advantage is that anaesthesia is not generally required when bloodless gingivectomy is used to uncover the borders of the carious lesion with an erbium laser using pulse durations of between 600 and 1,000 microseconds (Figs. 4a & b).
For tooth whitening, lasers can also be used for activation of the bleaching gel (Figs. 5a & b), which decreases the treatment time as well as post-operative sensitivity. As the laser is absorbed by the appropriate gel, the heat is only superficial and the contact time is decreased, leading to less or no sensitivity.

The Er:YAG laser beam is uniquely absorbed in the water molecules that are contained in all gels. The more water content (the more the gel is "soft" and a bit runny), the better the resulting bleaching interaction (known as the TouchWhite procedure, patented by Fotona). The colour is not of importance for this interaction, unlike with Nd:YAG and diode lasers, which are absorbed more efficiently in pigments and therefore require specially coloured gels to be effective.

Nd:YAG and diode lasers have very specific indications, such as the treatment of herpetic lesions (Figs. 5a & b) and non-invasive haemangioma, which can present aesthetic problems too. The advantages of treating a herpetic lesion by laser are that the pain is relieved shortly after lasing, the lesion heals faster and reoccurrence is less frequent in the treated area.

For haemangioma treatment, the lesion is coagulated by the strong absorption of the laser energy in haemoglobin, after which it is either left to be removed by mast cells or ablated.

The bio-modulation effect of these lasers is also advantageous, helping to increase cell turnover and blood circulation (with an anti-inflammatory effect), eliminate pain, improve nerve transmission, promote myo-relaxation, stimulate the release of growth hormones, and improve many more aspects of healing.

Other procedures like frenectomy or removal of overgrown tissue (lasers can be used to safely and easily remove tissues, like overgrowth, pigmentation, etc. but it is essential to be certain about the nature of the tissue that is being removed) can be carried out for aesthetic reasons in the anterior region (Figs. 7a & b).

Erbium lasers are preferred for soft-tissue procedures like these because they are fast, require minimum anaesthesia and do not cause a delay in healing. It is important, however, to be able to modify the parameters: if the pulse duration can be increased above 600 microseconds, preferably up to 1,000 microseconds, the quantity of heat delivered will rise—still without damaging the tissue—and cause haemostasis. If this cannot be achieved with the particular Er:YAG laser system, then a second wavelength must also be employed, such as diode or Nd:YAG in order to effect haemostasis.

Diode and Nd:YAG lasers can be used from start to finish for all soft-tissue interventions to yield blood-free surgery; however, this requires more anaesthesia and a longer healing time.

All of these benefits and many more increase the comfort of the patient and give dentists more reasons to enjoy their profession. For achieving a full and successful integration of laser technology into a clinician’s treatment offering, and to make effective use of the investment made, as well as to ensure the health and safety of patients, it is necessary to obtain an adequate education in both the biophysical interactions underlying these treatment protocols and the specific properties of each laser device.

All procedures presented in this article were performed using a LightWalker AT dental laser system (Fotona).

**Contact**

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DentalVibe® is a patented, award-winning multipurpose clinical instrument designed to alleviate intra-oral injection pain. It is a cordless, rechargeable, hand held device that delivers soothing, pulsed, percussive micro-oscillations to the site where an injection is being administered. Its proprietary VibraPulse Technology gently stimulates the sensory receptors at the injection site, effectively closing the neural pain gate, blocking the pain of injections.

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Stop hurting your patients!

Deliver the “WOW experience” and watch your practice grow

Author: Dr. Steven G. Goldberg, USA

Every dentist is looking to grow his or her practice, and we are all looking to bring in as many new patients as we can. Numerous excellent articles have been written by many highly successful clinicians and marketing gurus on a myriad of ways to grow your practice.

According to Dr. Joe Blaes, editor of Dental Economics, speaking of the DentalVibe Injection Comfort System in his column “Pearls for your practice” (January 2011), “The best WOW experience that we can give in dental practices is to not hurt our patients. You will get more referrals from patients if you have a pain-free practice than any other marketing tool you can use. [...] DentalVibe’s synchronized percussive vibration provides an ideal way to administer anesthetic injections, anywhere in the mouth, without discomfort. DentalVibe is cordless, portable, and easily affordable for every office.”

The fact is that as dentists we are so focused on our technical skills while we are performing our craft that we lose sight of one of the most important issues on the business side of dentistry: the patients’ perspective. They are desperately afraid that we are going to hurt them. Many people are so afraid of pain that they avoid going to the dentist altogether. According to worldental.org, studies by the Dental Fears Research Clinic in Seattle, Washington, report that upwards of 40 million Americans avoid going to the dentist because of this fear. This is quite alarming when you consider the negative health effects directly related to poor oral health.

Consider the following scenario. You spend half an hour with a new patient, treating tooth 14 with an MOD composite bonded filling. You carefully excavate the decay, skilfully prepare the tooth with perfect cavosurface margins, etch, prime, place adhesive and composite, and cure for the appropriate period. You spend a great deal of time creating a beautifully artistic representation of occlusal anatomy, and even place secondary grooves in the marginal ridges. Then you polish like you have never polished before. You are proud of the artistic piece that you have created and you have provided a tremendous service to your patient.

Stop hurting your patients!

Deliver the “WOW experience” and watch your practice grow

Author: Dr. Steven G. Goldberg, USA
However, when your patient goes home and reports back to his or her family and friends about his or her dental experience, is the patient going to tell them how wonderful your secondary grooves are? More likely, what the patient will say is whether you hurt him or her.

What patients remember is the very beginning of the appointment, the dreaded dental injection. If you anesthetise your patients painlessly, you will be considered a painless dentist. After all, dentistry does not hurt. A filling does not hurt, an extraction does not hurt, and even a root canal does not hurt, because once your patient is anesthetised, you are practising painless dentistry. But if you hurt your patients during the injection process, you are no longer considered a painless dentist.

With the use of the DentalVibe Injection Comfort System (Fig. 1), now in its second generation, as an adjunct to the injection process, you no longer have to hurt your patients to help them. This patented, award-winning device utilises revolutionary VibraPulse technology to send soothing, pulsed, percussive vibrations deep into the oral mucosa during the delivery of an injection. This stimulation is perceived by the submucosal sensory receptors, sending a message to the brain, effectively closing the neural pain “gate”, allowing for the comfortable administration of intra-oral injections. Adults and children have reported painless injections and dentists report less stress during the injection process. The device is cordless, portable, non-threatening, easily affordable, has been receiving rave reviews all around the world from key opinion leaders in dentistry, and has been featured on all of the TV news networks.

DentalVibe is based on the Gate Control Theory of Pain, proposed by Drs Ronald Melzack and Patrick Wall of McGill University, and published in the Science journal in 1965. According to this theory, there is a gating mechanism located in the dorsal horn of the spinal cord. This gating mechanism either permits or prevents the sensation of pain from travelling up the spinothalamic tract to the brain. When the DentalVibe is used simultaneously during the administration of an injection, the pulsed vibratory impulses generated by the device travel along thick myelinated A beta nerve fibres 37.5 times faster to the brain than the sensation of pain from the injection, which travels along thin unmyelinated C nerve fibres. As the vibration sensation reaches the brain first, a signal is sent to a synapse in the spinal cord, activating inhibitory interneurons that prevent the action of projection neurons, thereby shutting a gate, blocking the pain from the injection.

This is one dental product that holds universal appeal to consumers. Nobody wants to feel pain and these days patients are no longer willing to accept it, as they may have in years gone by. Therefore, Bing Innovations, the developer of DentalVibe, has launched a multimillion-dollar patient-awareness campaign, including TV commercials, print advertisements, cinema advertising, Internet banner advertisements and a web-based dentist locator. This tremendous effort is effectively educating tens of millions of consumers on the wonderful benefits of DentalVibe for virtually painless injections and driving patients to those dentists who use it.

Give your patients the “WOW experience” with DentalVibe, so that both you and your patients can enjoy our wonderful profession a little bit more._

**Fig. 4.** Block shot.  
**Fig. 5.** Gate control graphic.

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**Contact**

Dr Steven G. Goldberg, DDS, fellow of the International Academy for Dental-Facial Esthetics, Inventor of DentalVibe, Founder and spokesperson of Bing Innovations

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What constitutes new technology?

Water flossing revisited

Author: Deborah M. Lyle, USA

Fig. 1. Original Waterpik oral irrigator introduced to the dental profession in 1962.

Fig. 2. Waterpik Ultra Water Flosser with ten pressure settings and six tip designs.

Dental school graduates from the 1960s, 1970s and 1980s have probably heard of the Waterpik Water Flosser, but ask them to tell you what it does or whether it is effective, and they generally either do not know or else believe that it is not very effective at removing plaque. Graduates after 2000 may not even know what this technology is or what it does.

The hydrodynamic therapy action of an oral irrigator is not a new concept to the dental profession. The innovations lie in our improved understanding of the pathogenesis of oral disease, the role of plaque as a biofilm, and applying clinical evidence to make clinical decisions. Recent and ongoing research and applications have shown how the oral irrigator is a self-care product that warrants attention in the 21st century.

The original oral irrigator (known as a dental water jet, and more recently a water flosser) was developed by Dr Gerald Moyer, a Fort Collins, Colorado, dentist, and Dr John Mattingly, a hydraulic engineer at Colorado State University (Figs. 1 & 2). Moyer was looking for a product that could clean areas of the oral cavity that are not readily assessable by traditional methods such as toothbrushing and dental flossing. Together they designed a device that provided a controllable pulsating water stream for the targeted delivery of a solution and the self-cleansing of inaccessible areas by the patient. The current terminology, "water flosser," will be used throughout this article.

The water flosser delivers a pulsating stream of water or other solution that results in successive compression and decompression phases of the gingival tissue (Fig. 3). The solution strikes the tooth at the gingival margin, the impact zone, and is deflected subgingivally and interdentally, the flushing zone (Fig. 4). It was anecdotally believed that the water flosser was simply flushing out debris without removing plaque or having a positive impact on oral health. However, as early as 1969, studies were reporting significant plaque and calculus reduction in groups using the water flosser. More recently, significant plaque reduction has been demonstrated in studies with subjects with mild to moderate gingivitis, periodontitis, orthodontic appliances and diabetes.

The above studies used the traditional validated plaque indices, which provide a 1-D perspective; the presence of plaque is determined by disclosing solution. In 2009, Dr Bill Costerton and his team took this a step further to evaluate the removal of biofilm from the tooth surfaces using a water flosser. This ex vivo study utilised periodontally involved teeth that were extracted and inoculated with saliva to grow new biofilm over existing deposits. The teeth were treated with a water flosser for three seconds at medium pressure and then prepared and viewed under a scanning electron microscope (SEM). The removal of biofilm was evident as seen in Figures 5a & b, with almost 100 per cent removal from treated areas.

Self-care technology

Brushing is considered the first line of defence for maintaining good oral hygiene. Some power brushes are quite sophisticated; they help the user know when to change quadrants, when the two-minute brushing time is reached, and how the user is doing. They offer power selections that include cleaning action, massaging action or a gentle stroke for sensitive areas. There are different bristle configurations, brush-head sizes and designs, and angles and contours for cleaning the line angles, pits, fissures and posterior regions.
Careful analysis determines the individual recommendation of the right toothbrush for each patient. Toothbrushing targets only supragingival plaque, however. Numerous studies have indicated that significant plaque can remain after brushing. And all toothbrushing, whether power or manual, fails to clean interdentally, an area that the patient must address separately. It can be argued that interdental cleaning should be the first step, since that is the area where the risk of periodontal disease and infection is higher.

While dental floss is not a state-of-the-art technology, it is still considered the first choice for interdental cleaning among dental professionals. A major problem is that patients do not like to floss, tend to avoid the practice, and often demonstrate a technique that is less than adequate. Dentists and dental hygienists need to find alternative methods to accomplish interdental cleaning.

There are many products available that are designed or marketed to clean between the teeth and to motivate individuals to perform this task; how effective are they, and can they be used easily by most individuals? Interdental brushes have been shown to reduce plaque and gingivitis, but require a large enough embrasure space for access. Even the smallest designs may not fit into all interdental spaces or effectively clean the proximal surface concavities of the teeth. Floss holders are designed to make it easier to use floss, but do not eliminate all the dexterity challenges that patient’s face. Wooden sticks, rubber tips and toothpicks are not interdental cleaners.

The recent advent of “water flosser” as a descriptor is based on clinical findings from three studies (Table 1). The first study in this group was published in 2005, and demonstrated that the water flosser with a classic jet tip and either a power toothbrush or a manual toothbrush were significantly better at reducing bleeding and gingivitis when compared with a manual toothbrush and string floss. This was followed by a 2008 study that compared the efficacy of a water flosser with an orthodontic tip and a manual toothbrush to a manual toothbrush and string floss in 11- to 17-year-olds with fixed orthodontics. The water flosser group had significantly reduced plaque and bleeding over four weeks compared with the string floss group. The most recent study published in 2011 found that the water flosser with either the classic jet tip or a tip with individual bristle tufts was up to twice as effective as dental floss in as little as two weeks. The differences between the tips and floss were even more dramatic at four weeks.

How does a water flosser stand out from other self-care products?

The documented research on water flossers is extensive, spanning over 50 years. These studies were designed to address new developments in dentistry. The link between periodontal disease and systemic disease has been studied extensively and reported in the literature; some associations are very strong while others are less conclusive. It is well known that people living with diabetes have an increased risk of periodontal disease that starts earlier and leads to more severe complications in both children and adults. Controlling oral inflammation is important and may be more difficult to accomplish than in non-diabetic individuals.

A water flosser was compared with traditional oral hygiene in a cohort of Type 1 or Type 2 diabetic subjects over three months. The group that used the water flosser has significantly better improvements in gingivitis, plaque, and bleeding on probing compared with the group that continued with traditional oral hygiene methods.

Figs. 5a & b, Before and after using a water flosser on medium pressure for three seconds: biofilm on tooth under SEM (a); 99.9 % removal of biofilm from tooth surface under SEM (b).
industry news — water flossing

Studies between 1990 and 2000 continued to show the benefits of a water flosser in reducing bleeding, gingivitis and plaque.18–21 Some of the researchers proposed that the significant results from using a water flosser were associated with a change in the host response. With a new focus on host inflammatory modulation, a randomised controlled study was conducted comparing routine oral hygiene with routine oral hygiene plus a water flosser.5 The investigators used traditional bleeding, gingivitis and plaque indices, but also measured pro-inflammatory mediator interleukin-1ß (IL-1ß) and prostaglandin E2, anti-inflammatory mediator interleukin-10, and interferon-gamma, a cytokine key in killing bacteria. The study results demonstrated that the water flosser group had a significant reduction in plaque, bleeding and gingivitis indices plus probing depth compared with the control group. The cytokine profile was changed in the water flosser group, showing a decrease in the pro-inflammatory mediators and an increase in the anti-inflammatory mediators. Since the measurements were taken from gingival crevicular fluid, the researchers prevented a dilution effect by waiting eight hours after the subjects had used the water flosser.

Key findings include:

- Both groups had reduced plaque biofilm compared with baseline, but only the water flosser group had decreased inflammatory mediator IL-1ß.
- The reduction of bleeding on probing correlated with the reduction of IL-1ß not the reduction of plaque.

The selective reduction of pro-inflammatory mediators demonstrates a modulation effect

In the diabetes study mentioned above, the investigators measured the serum cytokine profile of the subjects. Over the three months of the study, the test group that used the water flosser showed significant reductions in IL-1ß and prostaglandin E2.7

Conclusion

The water flosser has an extensive body of evidence that demonstrates its safety and efficacy with multiple patients and different oral care needs, for example gingivitis, orthodontics, implants, crowns and bridges, individuals in periodontal maintenance programmes, and particularly those with good oral health. Studies in the past decade have addressed new areas such as host response, impact on systemic health, and the effect on biofilm at the microscopic level. The water flosser has the ability to provide individuals with an easy and effective way to maintain good oral health by accessing the areas that are not readily reachable and cleansable by traditional methods. Not all oral irrigators, dental water jets or water flossers have the same combination of pulsations and pressure. The overwhelming majority of studies have been done using the Waterpik Water Flosser. Dental professionals need to evaluate the evidence for each specific product, as studies are not transferable between technologies and manufacturers.

Editorial note: A complete list of references is available from the publisher. Photographs courtesy of Water Pik, Inc.

Table 1

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<tr>
<th>Reference</th>
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<td>Barnes et al.</td>
<td>Comparison of irrigation to floss as an adjunct to toothbrushing; Effect on bleeding, gingivitis, and supragingival plaque</td>
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<td>105</td>
<td>Waterpik Water Flosser (WP-60) with traditional jet tip and water (WF); Oral-B 35 manual toothbrush (Procter and Gamble, MT); Waterpik Sensonic Toothbrush (SR-700, PT); Reach floss, unflavoured, waxed (Johnson and Johnson, FL); Crest Cavity Control toothpaste (Procter and Gamble, MT)</td>
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<td>Parallel Examiner Blind 4 weeks</td>
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<td>Sharma et al.</td>
<td>Effect of a dental water jet with orthodontic tip on plaque and bleeding in adolescent patients with fixed orthodontic appliances</td>
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<td>Waterpik Ultra Water Flosser (WP-100) with orthodontic tip and water; Oral-B 35 manual toothbrush; Reach floss, unflavoured, waxed; GUM Eez-Thru floss threaders (Sunstar Americas); Crest Cavity Control toothpaste</td>
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<td>Rosema et al.</td>
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<td>Waterpik Ultra Water Flosser (WP-100) with standard jet tip (S) or prototype tip (P) with 3 bristle tufts; Reach floss, unflavoured, waxed; Oral-B Indicator 35 manual toothbrush; Everclean fluoride toothpaste (HEMA, Netherlands)</td>
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Table 1_ Overview of studies comparing water flosser to string floss. (Reprinted with permission from the Compendium of Continuing Education in Dentistry.)
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_Dear ESCD members, friends,

First of all, I would like to wish everybody a marvellous 2013. It feels like only yesterday when we had our congress in Bucharest last May and I was elected president. Now we are already in the middle of the organisation of our tenth anniversary congress in Turin in October.

I would like to thank all our members for your confidence and esteem during the last ten years and to give my assurances that it will be my task to reward your contribution. We value your membership in these poor economic times more than ever. Your help will allow us to excel in our services. The European Society of Cosmetic Dentistry (ESCD) is made up of all of us and without the contribution of all our members from all over the world who believe in our society and in the development of aesthetic and cosmetic dentistry, the society would not exist.

The society and its board are working very hard and making great progress. We have a brand new user-friendly website (www.escdonline.eu) with helpful information for ESCD members and for the public. The English version of the cosmetic dentistry magazine has become the official journal of the ESCD and it will be distributed free to all members who have paid their annual subscription fee. We are working with the editors of cosmetic dentistry throughout Europe to be able to translate and distribute the journal in local languages.

We are launching country study clubs for each nation in which we have a country chairman. These are aimed at educating and enabling members to share their professional experiences, and building camaraderie and pride in belonging to our association.

The Italian board is working on the organisation of our congress in October, which is themed “Esthetic truffles”, and we promise you fireworks in terms of both the scientific programme and the social events. Those familiar with our society are well aware of the great atmosphere and friendship that distinguish our gatherings. For the ESCD and friends evening, we have scheduled tasting of Piedmont regional wines and dishes based on truffles, and of course there will be music and dancing.

This year, we have drawn up a scientific programme that is relevant to the whole dental team: dentists, dental technicians, hygienists, nurses and secretaries. For the support staff, we will have a full-day lecture by Dr Alessandro Magnanensi, an expert in human resources, on the role of personnel in helping overcome the difficult economical situation that many of our offices are experiencing.

For dentists and technicians, practical hands-on sessions will be held on Thursday, while Friday and Saturday will offer presentations by well-known speakers in aesthetic dentistry and technology. Just to give you a taste: C. Orr, I. Loi, D. Winkler, M. Nicastro, F. Ferretti, B. Lesage, T. Quereshi, N. Perakis, R. Bonfiglioli, V. Mutone, A. DiFelice, G. Paolone, E. Manca and many others.

I warmly invite you to reserve 3 to 5 October 2013 and to bring all your staff with you for the tenth ESCD international congress in Turin. You won’t regret it, I promise!

With my very best wishes to all of you,

Luca Dalloca, President of the ESCD

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The annual conference of the Society for Color and Appearance in Dentistry

Author: Dr So Ran Kwon, USA

From 28 to 29 September 2012, the long-awaited fourth annual conference of the Society for Color and Appearance in Dentistry (SCAD) was held at the W Chicago City Center hotel.

The event was opened by Dr Stephen Chu, then SCAD president (2011–2012), followed by a warm welcome message from Dr Ronald E. Goldstein, the pioneer of aesthetic dentistry. The scientific meeting featured high-quality, evidence-based presentations on colour-related issues in dentistry by well-known speakers in dentistry attended by leading clinicians, researchers, specialists, dental technicians and general dentists worldwide.

The topics covered the wide field of aesthetic dentistry with a special emphasis on the theme, “White and pink—Emulating nature and beyond”.

The challenge of colour matching with composite resins was spectacularly demonstrated by Dr Newton Fahl (Brazil), Dr Jack L. Ferracane (USA) and Dr Didier Dietschi (Switzerland).

Clinical techniques and safety issues in state-of-the-art tooth whitening were well explained by Dr Linda Greenwall (UK) and Dr Yiming Li (USA). Special attention was given to obtaining credible results in monitoring tooth whitening using the newly introduced VITA Bleachedguide 3D-Master, with the inclusion of interpolated shade-guide...
units, in the presentation by Dr Rade D. Paravina (USA), Executive Director of SCAD.

Overcoming everyday challenges associated with different ceramic systems was discussed by Dr John O. Burgess (USA), Dr Michael Tholey (Germany), Dr Kenneth A. Malament (USA) and Prof. Edward A. McLaren (USA).

Bone and tissue interaction at the implant and abutment interface, creating the critical pink interface in aesthetic implant dentistry, was the topic of the presentations by Dr Dennis P. Tarnow (USA), Dr Maurice A. Salama (USA), Dr David A. Garber (USA) and Dr Aris-Petros Tripodakis (Greece).

The presentations on digital developments and their influence on general dentistry and dental laboratories by Dr Brian LeSage (USA), Aki Yoshida (USA), Michael Bergler (USA) and Claude Sieber (Switzerland) were very well received by the audience.

Colour science in general and a new form of precision in risk assessment were discussed in depth by Dr Stephen C. Bayne and Dr Sherilyn G. Sheets (both USA), and in a joint lecture by Drs Shigemi Nagai and Stephen Chu (both USA).

Besides the high-calibre poster sessions with a variety of first-rate research presentations and very well-attended lunch and learn sessions, the convivial atmosphere during the social programme, acknowledging and appreciating the diversity of the members, encouraged lively conversation with colleagues in a most comfortable environment.

The academy was very pleased to announce the first recipients of the newly established SCAD VITA Award for excellence in research related to colour and appearance in aesthetic dentistry. The award serves to acknowledge the successful professional collaboration with and the long-term support of VITA Zahnfabrik. The ultimate purpose of the award is to promote meaningful research related to colour and appearance in aesthetic dentistry.

Save the date for the fifth annual SCAD conference, which will be held from 3 to 5 October 2013 at the five-diamond Ritz-Carlton Hotel in Denver, Colorado. The list of confirmed presenters includes Pinhas Adar, Luiz Narciso Baratieri, Lawrence E. Brecht, Theodore P. Croll, Krikor Derbabian, Sillas Duarte, Charles J. Goodacre, Jens Fischer, So Ran Kwon, Ernesto A. Lee, Tali Mor, Dan Nathanson, Jacinthe M. Paquette, Stefan Paul, Wolfgang Rauh, Irena Sailer, Herbert Scheller, Thomas Sing, Edward J. Swift, Van P. Thompson and Marcos Vargas, and there are more to come (www.scadent.org).

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Some of the most critical issues concerning oral regeneration are going to be discussed at the International Osteology Symposium from 2 to 4 May 2013 in Monaco. The major challenges are making regenerative therapies easier and less invasive, and combating the serious issue of peri-implantitis. Both congress chairmen Niklaus P. Lang, Switzerland, and Massimo Simion, Italy, provide a unique insight into the programme.

Verena Vermeulen: The theme of the congress is “Decision-making with oral tissue regeneration”. Why is the focus on decisions?

Niklaus P. Lang: In dental practice, it is always a matter of having to make decisions. For instance, do you extract a tooth or do you retain it? By what criteria should you decide? Practitioners often choose a strategy for therapy intuitively, based on their familiarity with certain procedures, but the scientific evidence for one therapy option or another actually ought to take centre stage. That is what we want to communicate.

Massimo Simion: At the same time, there is still a lack of high-quality data for specific clinical situations. For this reason, meta-analyses frequently draw the conclusion that further studies are needed. Notwithstanding, we need to treat our patients and make decisions. In unclear situations, the views of experts are sought after—they are familiar with the literature on the one hand and possess a great deal of clinical experience on the other. This benefits congress attendees greatly because it provides them with a point of reference.

Lang: Most indications for oral regeneration are covered in the programme. Which ones are especially important to you?

Lang: The whole of Saturday is dedicated to the topic of peri-implantitis. Dentists often prefer to place an implant rather than to preserve a peri-
A odontally compromised tooth. This might then give rise to peri-implant complications in some cases. At the symposium, we will concern ourselves with the problem of these infections in relation to the oral cavity as a whole and consequently the need for holistic treatment.

Simion: Apart from bacteria, the manner in which an implant is placed and the implant surface appear to play a role, although it has not yet been possible to demonstrate the latter conclusively. There are also patient factors that have an impact, such as smoking or specific diseases. It is key for dentists and oral surgeons to be aware of all these factors and learn how to diagnose and treat peri-implantitis early. The answers to many questions are already close at hand. That is why we have devoted so much space to the topic at the congress.

And bone regeneration? Can we now assume that everyone knows all there is to know about this subject?

Simion: We perform guided bone regeneration (GBR) procedures on an almost daily basis—to enhance aesthetics, to treat angular bone defects and so on. But how can GBR be made easier and less invasive? When, for instance, is it possible to dispense with autologous bone or a non-absorbable membrane that is difficult to handle? Or how can you prevent bone resorption directly after a tooth has been extracted and so facilitate subsequent implant placement? Current questions for daily practice, like these, will be discussed at the congress.

One session will address patient-reported outcome measures. What does that involve?

Lang: To assess therapy success, we often only gauge objective parameters such as implant survival rate or bone level, but it is also important to establish whether the patient is satisfied with the function and the aesthetics or whether the patient experienced a lot of pain or swelling post-operatively. For a long time, such subjective parameters were neglected in implantology.

Is soft tissue a significant factor in aesthetics?

Simion: The quality and quantity of soft tissue is vital for aesthetics, but for function too. For example, the amount of keratinised gingiva around an implant seems to have an effect on recession development and the risk of peri-implantitis.

Dentists may be hesitant to harvest a graft from the palate because the procedure is invasive and painful. Soft-tissue substitute products are such an interesting alternative for this reason. At the congress, we will be taking a close look at when they can be used. They are very well suited to some indications but not to others.

Can you list three key reasons your colleagues should attend the Osteology Symposium in Monaco?

Lang: At this time of the year, Monaco is beautiful and the programme speaks for itself. It is well balanced, featuring both young and established colleagues. Some focus on empirical practice, others on the science. This mix is essential for us, for they go hand in hand. And last but not least, the Osteology Foundation will be celebrating its tenth anniversary in Monaco. Nobody should miss this.

Thank you very much for this interview.

Further information: www.osteology-monaco.org
International Events

2013

International Dental Show
12–16 March 2013
Cologne, Germany
www.ids-cologne.de

AACD Annual Meeting
24–27 April 2013
Seattle, USA
www.aacd.com

DGKZ Annual Meeting
26 & 27 April 2013
Berlin, Germany
www.dgkz.com

8th CAD/CAM & Digital Dentistry
International Conference
2 & 3 May 2013
Dubai, UAE
www.cappmea.com

International Osteology Symposium
2–4 May 2013
Monaco
www.osteology.org

SSER Annual Meeting
16–18 May 2013
Bucharest, Romania
www.sser.ro

EAED Spring Meeting
30 May–1 June 2013
Crete, Greece
www.eaed.org

MIS’ 2nd Global Conference
6–9 June 2013
Cannes, France
www.mis-implants.com

Nobel Biocare Global Symposium
20–23 June 2013
New York, USA
www.nobelbiocare.com

IACA 2012
1–3 August 2013
Calgary, Canada
www.theiaca.com

AAED Annual Meeting
7–10 August 2013
Washington, USA
www.estheticacademy.org

FDI Annual World Dental Congress
28–31 August 2013
Istanbul, Turkey
www.fdiworldental.org

ESCD annual meeting
3–5 October 2013
Turin, Italy
www.escdonline.eu

BACD Annual Conference
7–9 November 2013
London, UK
www.bacd.com
about the publisher

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Please note that all the textual components of your submission must be combined into one MS Word document. Please do not submit multiple files for each of these items:

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- all the image (tables, charts, photographs, etc.) captions;
- the complete list of sources consulted; and
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Questions?

Magda Wojtkiewicz (Managing Editor)
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