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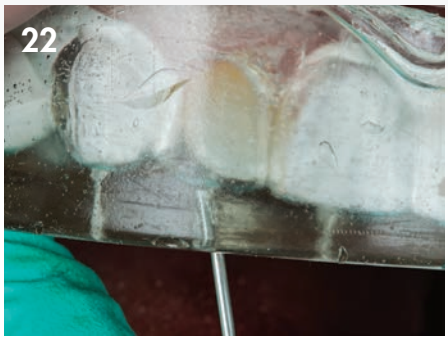

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Henry Schein launches work place giving - team volunteer days

Henry Schein has a long history of Global Social Responsibility through Henry Schein Cares. Their involvement in the improvement of oral health both in Australia and overseas has really helped to improve the lives of those who do not have access to dental care. More recently, Henry Schein Australia has introduced volunteer days for their team members. This is a great way for the team to get involved in projects close to their homes and lend a helping hand to Australians doing it tough.

The Sydney team cooked meals for the homeless at Our Big Kitchen, a community kitchen in the heart of Bondi. Their aim is to inspire individuals to come together to help people in need. Last year over 80 000 meals were made and distributed to disadvantaged Australians.

The Brisbane team also cooked meals for the homeless at Food Bank Queensland. Foodbank is now the largest hunger relief organisation in Australia – servicing over 2,600 charities in every state and territory to enable them to provide food to 710,000 people a month.

The feedback from team members who attended has been overwhelmingly positive. They have really enjoyed the opportunity to role up their sleeves within their local communities. More Team Volunteer Days are scheduled throughout 2019.

If you have any questions about Henry Schein Cares and other projects we are involved in, **please email scheincares@henryschein.com.au**

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Direct cusp replacement in the molar region using a thermoviscous bulk-fill composite restorative material – a clinical case report

Jürgen Manhart[1]

Summary

Today, direct composites restorations in posterior teeth are a crucial part of the standard therapy spectrum in modern restorative dentistry. The performance of this treatment method in the masticatory load-bearing posterior region has been conclusively proven in many clinical studies, even for extensive composite restorations with cuspal coverage. These restorations are usually carried out in an elaborate incremental layering technique. Aside from the possibilities that highly esthetic composites offer in the application of polychromatic multiple-layer techniques, there is also a great market demand for the most simple and quick and therefore economical to place bulk-fill composite materials for posterior teeth. A new development in this class of materials is a bulk-fill composite with thermally controlled viscosity behavior.

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Introduction

In recent years, the indications for direct resin-based composite restorations were continuously expanded due to improvements in the technology of composite materials and related adhesive systems, as well as an optimization of clinical treatment protocols in adhesive dentistry[1-14]. Today, direct resin bonded composites are becoming first choice for many dental practitioners for the restoration of posterior defects, even extensive cavities in load-bearing areas are considered suitable for the direct adhesive technique[9, 12, 15-17]. The maximum preservation of hard tooth tissues using direct composites as an alternative to indirect onlays and partial crowns is one of the major advantages and key elements when restoring severely damaged teeth with cuspal involvement[2, 9, 18-29]. The replacement of single cusps with direct composite restorations is meanwhile an accepted treatment method and scientifically proven[30]. However, when the replacement of several cusps is needed in very large defects, indirect restorations - requiring additional substance removal in many cases - are still the preferred option for most dentists[9, 17]. Longevity studies on posterior composite restorations including cusp replacement show an acceptable performance and qualify this treatment option as an alternative to conventional indirect restorations in selected clinical cases[16, 31-34].

To date, incremental layering is considered to be the gold standard for placing light-curing composite materials[35]. Generally, conventional composites are placed in individual layers of maximum 2 mm thickness due to their particular polymerization properties and limited depth of cure. Each increment is polymerized separately for 10 to 40 s, depending on the light intensity of the curing device used, the shade and translucency level of the respective composite paste and the light initiator system of the composite material[36]. Thicker layers of these conventional composites, however,

do not polymerize properly and therefore produce poor mechanical and biological properties[37-39].

Especially in the case of large-volume posterior cavities, the conventional incremental technique can be a very time-consuming and complicated, technology-sensitive procedure[30]. That is why many dentists are looking for an alternative to this complex multi-layer placement technique, so that direct composites can be processed in less time and thus more economically and at the same time with greater product safety[40-43]. The bulk-fill composites have been developed in recent years in response to this growing demand for more efficiency. Using a simplified application protocol these materials can be placed into cavities in increments of 4 to 5 mm thickness with short polymerization times of 10 to 20 s per increment when a high-intensity curing-light is engaged[36, 40, 44-47].

Bulk-fill composites are usually offered in two versions that require completely different application technique:

1. Low-viscosity, flowable bulk-fill composites, which flow well onto the cavity floor and the cavity walls and optimally wet the interior line and point angles of the preparations. These flowable bulk-fill composites must be protected on the occlusal surface by an additional capping layer (2 mm thickness) made of a regular hybrid composite which is qualified for load-bearing posterior restorations [30, 48, 49], since the flowable bulk-fill composites have a reduced filler content and contain comparatively large fillers in order to lower polymerization stress. As a result, however, they have poorer mechanical and aesthetic properties compared with conventional hybrid composites: for example a lower modulus of elasticity, a reduced wear resistance, an increased surface roughness and an inferior polishability[36, 50-54]. In addition, the capping layer allows to create the functional contouring of occlusal anatomical structures, as this would be very difficult or even impossible to manage with a flowable composite material.

2. Regular to high-viscosity, sculptable bulk-fill composites that can reach up to the occlusal surface and do not require an additional protective capping layer. Thus, no additional composite material is required.

Bulk-fill composite materials in both viscosity versions allow a single layer thickness of 4-5 mm due to optimized depth of cure. This means that the high-viscosity bulk-fill composites can be used in a single-layer technique in a cavity which depth corresponds at most to the depth of cure of the material. If deeper defects are to be restored or if the flowable bulk-fill composite variants are used, this always requires a two-phase procedure with an additional

Figure 1: Preoperative situation: insufficient old composite restoration with cuspal involvement in a first lower molar.

composite layer. Technically, the present bulk-fill composites that are available for the simplified restoration of posterior teeth are not really bulk-fill materials, because in particular many proximal cavities extend into areas that are deeper than the maximum curing depth of these materials (4 – 5 mm)[55, 56].

A new approach is taken by the thermoviscous bulk-fill composite VisCalor bulk (VOCO, Cuxhaven). This is a high-viscosity composite material at room and body temperature, which is converted to a flowable consistency by heating to a temperature of 68 °C in a composite oven or a special dispenser with heating function (Thermo-Viscous-Technology). In the heated phase, the material flows perfectly onto the cavity walls. Even in narrow and undercut areas of the defect as well as in internal line and point angles, an excellent wetting is observed, and thus facilitates the application of the restorative material into the cavity. VisCalor bulk again reaches body temperature within a short time when it comes to tooth contact and thus returns to the high-viscosity, sculptable state. VisCalor bulk thus combines the flowability of a low-viscosity composite during application with the sculpting ability of a high-viscosity composite within one single restorative composite material. Since the entire cavity can be filled with the same composite material, there is also a time saving compared to combined systems of flowable and sculptable composite materials. VisCalor bulk can be manipulated in layers up to 4 mm thickness. It is available in 4 shades (universal shade, A1, A2, A3). It exhibits a polymerization shrinkage of 1.44 vol.-% with simultaneously low shrinkage stress (4.6 MPa). With a flexural strength of 164 MPa, the material shows a high mechanical stability. VisCalor bulk ensures good color

Figure 2: Situation after careful removal of the old restoration and cavity preparation. In the area of the distal proximal box, the defect extended clearly subgingival and the distolingual cusp was missing completely.

Figure 3: Application of rubber dam.

Figure 4: Placement of a metal matrix band.

Figure 5: Conditioning of enamel and dentin with 35% phosphoric acid.

stability and stable mechanical properties thanks to low water absorption. The application compule is headed by a narrow, flexible cannula, which perfectly enables direct application of the thermoviscous composite to hard-to-reach and narrow cavity areas.

Clinical Case Presentation

A 50-year old female patient requested in our dental office the replacement of her composite restoration in tooth 46 (first lower right molar) (Fig. 1). The tooth showed an insufficiently shaped direct composite restoration especially in the areas of the replaced distolingual cusp and distal marginal ridge with lack of a sufficient distal proximal contact which resulted in frequent food impaction with respective negative consequences. During the clinical inspection, the tooth reacted sensitively in the cold test and showed no negative reaction to the percussion test. In consultation with the patient and after an explanation of the possible restorative alternatives and treatment fees, the patient decided on a direct bulk-fill restoration using VisCalor bulk (VOCO GmbH, Cuxhaven).

Treatment started with thoroughly cleaning the affected tooth of external deposits using a fluoride-free prophylaxis paste and a rubber cup. Shade determination was done on the moist tooth prior to the application of rubber dam. After administration of local anesthetics, the old insufficient composite restoration was carefully removed while conserving the remaining hard tissues. After excavation, the cavity was completely prepared and finished with a fine-grit diamond bur. In the area of the distal proximal box, the defect extended clearly subgingival. The distolingual cusp was missing completely and subsequently had to be reconstructed with composite (Fig. 2). The old composite restoration in tooth 47 was refurbished on the mesial surface as it had a nonphysiological contour (Fig. 2). The tooth was subsequently isolated with rubber dam (Fig. 3). A metal matrix was used to delimit the cavity. The matrix band was sealed at the mesial gingival margin using a wooden wedge (Fig. 4). At the distal proximal box, the matrix band was stabilized using a light-curing provisional composite material (Clip, VOCO GmbH, Cuxhaven). A distal wedge was omitted because of the risk of dislocating the cervical part of the metal band onto the floor of the proximal box (Fig. 5).

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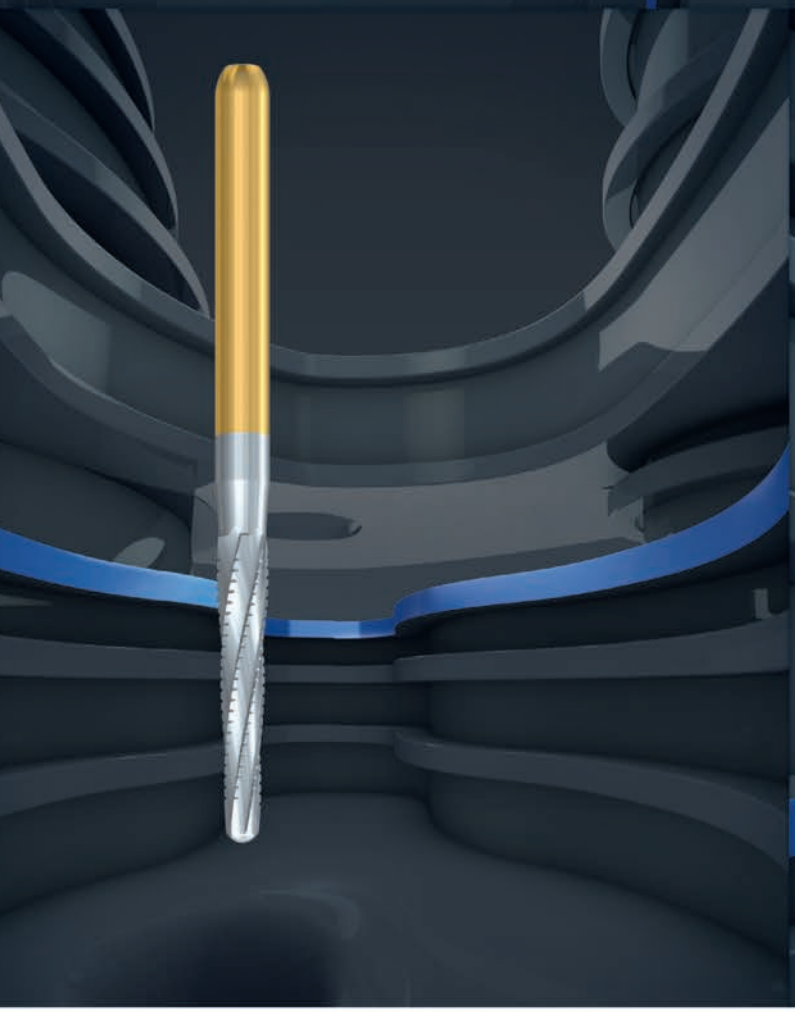

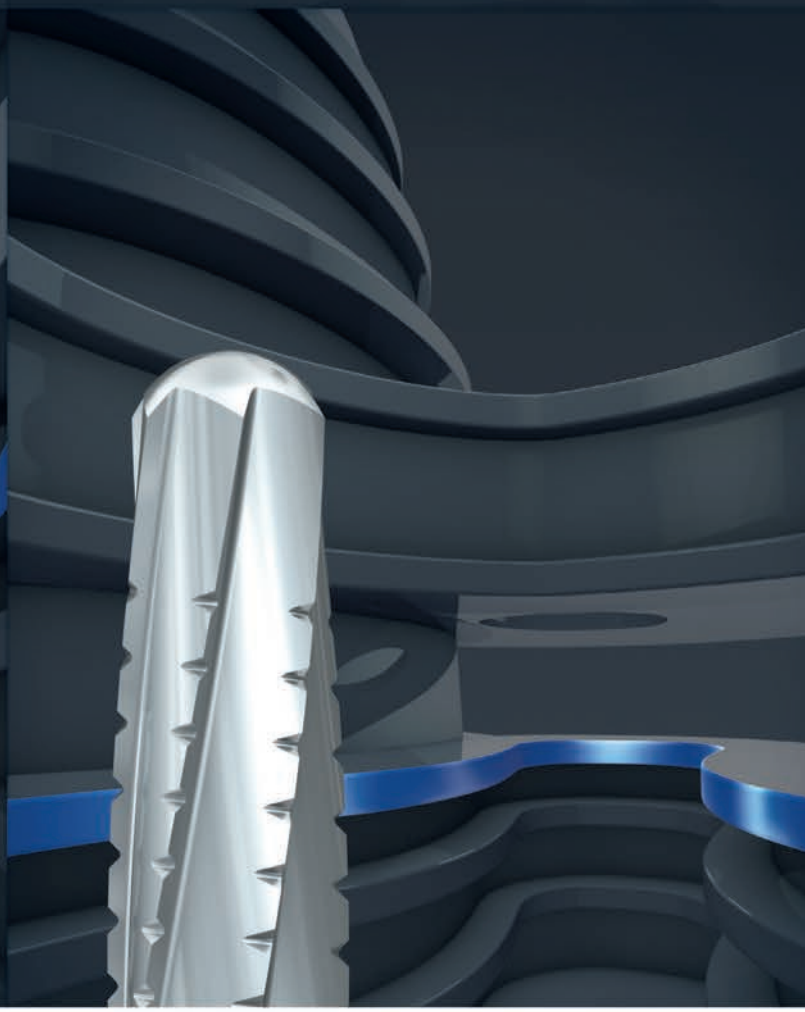

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Figure 6: Situation after thoroughly rinsing the conditioning agent and gentle air-drying the cavity avoiding desiccation of the dentin.

Figure 7: Adhesive pretreatment of the dental tissues with the universal adhesive Futurabond M+.

Figure 8: After careful evaporation of the solvent of the adhesive, the bonding was light cured for 10 seconds.

Figure 9: A shiny cavity surface means evenly sealing dentin and enamel with adhesive.

The universal adhesive Futurabond M+ (VOCO) was chosen for the adhesive pretreatment of the dental hard tissue. Futurabond M+ is a state-of-the-art universal one-bottle adhesive that is compatible with all common conditioning techniques and adhesive strategies currently in use (multimode adhesive): the self-etch technique without the use of phosphoric acid and both phosphoric acid-based "etch-and-rinse"-conditioning techniques (selective enamel etching with phosphoric acid or complete total-etch pretreatment of enamel and dentin with phosphoric acid). Also in these universal adhesives, the preliminary conditioning of enamel using phosphoric acid (selective enamel etching) results in better adhesion promotion[57-59]. Unlike former traditional self-etch adhesives, the new universal adhesives are insensitive to phosphoric acid etching of dentin[60-64]. The possibility of being able to vary the application protocol at short notice when using these universal adhesives without changing the adhesion promoter reduces the technique sensitivity and gives the necessary freedom to the dentist to react flexibly to different clinical situations (e.g. dentin close to the pulp, risk of bleeding of the adjacent gingiva, etc.).

In this clinical case, the total-etch adhesive pretreatment using phosphoric acid was used. 35% phosphoric acid (Vococid, VOCO GmbH, Cuxhaven) was applied along the enamel margins first for a reaction time of 15 s, followed by an additional conditioning of the dentin for further 15 s (Fig. 5). Subsequently the cavity was washed thoroughly for 20 s with the air-water-spray to remove the acid and precipitation residues. The cavity was then gently air-dried from excessive moisture avoiding desiccation of the dentin (Fig. 6). Ample amounts of the adhesive Futurabond M+ were applied and distributed generously in the area of the cavity using a microbrush (Fig. 7). It must be ensured that all cavity areas are sufficiently covered by the adhesive. After at least 20 seconds of carefully scrubbing the adhesive into the tooth surface, the solvent was carefully evaporated with dry, oil-free compressed air from the bonding agent until a glossy, immobile adhesive film resulted. Then, the bonding agent was subsequently light-cured for 10 seconds (Fig. 8). The result was a shiny cavity surface, evenly covered with adhesive (Fig. 9). This should be carefully checked before placing the restorative material, as any areas of the

Figure 10: The thermoviscous composite VisCalor bulk (VOCO, Cuxhaven) was heated in a composite oven (Caps Warmer, VOCO, Cuxhaven) at 68 °C.

cavity that appear matte are an indication that insufficient amount of adhesive has been applied to those sites. In the worst case, this could result in reduced bond strength of the restoration to these areas and, at the same time, in inadequate dentin sealing, which may lead to persistent postoperative sensitivity in vital teeth. This complication, which often requires the replacement of a newly-made bonded dental restoration, can usually be avoided by a careful adhesive protocol. If such dull-looking areas, not or inferior covered by adhesive, are detected in the visual inspection, additional bonding agent is selectively applied to them to optimize the adhesive layer.

The thermoviscous composite VisCalor bulk (VOCO, Cuxhaven) was heated in a composite oven (Caps Warmer, VOCO, Cuxhaven) at 68 °C (Fig. 10 and 11). The heated composite material was first applied only in a small amount on the floor of the distal proximal box (Fig. 12). The narrow, flexible cannula of the VisCalor bulk compule facilitates direct application of the composite even in hard-to-reach areas and narrow cavity areas (Fig. 11). A

Figure 11: The narrow, flexible cannula of the VisCalor bulk compule facilitates direct application of the composite even in hard-to-reach areas and narrow cavity areas.

special hand instrument (Easy Contact Point, Helmut Zepf Medizintechnik GmbH, Seitingen-Oberflacht) was inserted into the unpolymerized, still plastic composite material to create a physiologically correct formed proximal area with tight contact to the adjacent tooth (Fig. 13). By controlled pressure, the special hand instrument was forced towards the mesial surface of the neighboring tooth, anatomically shaping the metal matrix and simultaneously forming a cervical composite bridge, which stabilizes the matrix after polymerization (20 s, light intensity > 1.000 mW/cm^2) - the instrument is kept in place during light curing (Fig. 14) - and ensures a tight proximal contact (Fig. 15). The formation of physiologically contoured proximal surfaces with tight contacts to neighboring teeth still represents a challenge when placing direct composite restorations. In contrast to amalgam, composites show a certain viscoelastic recovery from distortion, which is often seen as undesirable by the user and complicates the adaptation of matrices to the neighboring tooth by packing pressure [65, 66]. With the next increment of VisCalor bulk the remaining cavity volume (maximum layer thickness 4 mm) was completely filled using the bulk-fill technique (Fig. 16) and the contour of the missing distolingual cusp was sculpted (Fig. 17). The composite material was again polymerized with a high-performance curing light for 20 s (light intensity > 1.000 mW/cm^2). After removal of the metal matrix band, the restoration was checked for imperfections. Additional 10 s light curing cycles from mesio-lingual, mesio-buccal, disto-lingual and disto-buccal in the region of both proximal boxes, especially at the gingival seat, were executed to ensure that all areas covered before by the metal matrix band experienced sufficient polymerization.

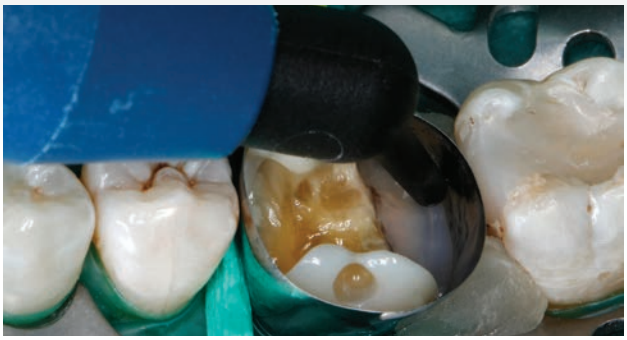

Figure 12: The heated composite material was first applied only in a small amount on the floor of the distal proximal box.

Figure 13: Shaping of the distal proximal area with a small amount of VisCalor bulk and a special hand instrument.

Figure 14: Light polymerization of the restorative material for 20 s (light intensity > 1.000 mW/cm²).

Figure 15: After polymerization, a cervical composite bridge stabilizes the matrix in the distal contact area.

After removal of rubber dam, the fissure relief and the fossae of the occlusal anatomy were finished with a pear-shaped fine-grit diamond bur. In the next step of the standard finishing sequence, a point-shaped fine-grit diamond was then used to finish the convexity of the cusps and triangular ridges. After the elimination of occlusal interferences and adjustment of the static and dynamic occlusion, the accessible proximal areas were contoured and prepolished with abrasive disks. The use of diamond-impregnated composite polishers (Dimanto, VOCO, Cuxhaven) achieved a satin matte, lustrous finish on the surface of the restoration. Subsequent high-gloss polishing was completed using the same Dimanto polishers with reduced pressure to optimize the luster of the restorative material. Figure 18 shows the completed direct bulk-fill composite restoration with cusp replacement, reconstructing the original tooth shape with an anatomical and functional occlusal surface, physiological formed proximal contact areas, and an excellent esthetic appearance. To complete the treatment, a fluoride varnish (Bifluorid 12, VOCO, Cuxhaven) was applied to the affected tooth using a foam pellet.

Conclusion

Composite-based direct restorative materials will gain in importance in the years to come. These restorations present a scientifically proved, high-quality permanent treatment option for the masticatory load-bearing posterior region and their reliability has been documented in literature[11, 67-73]. The results of a comprehensive review have shown that the annual failure rates of direct posterior composite restorations (2.2%) are not statistically different to amalgam restorations (3.0%)[69]. Even cuspal coverage direct composite restorations are meanwhile used frequently and prove to be a viable alternative to conventional indirect restorations in selected clinical cases[16, 31-34].

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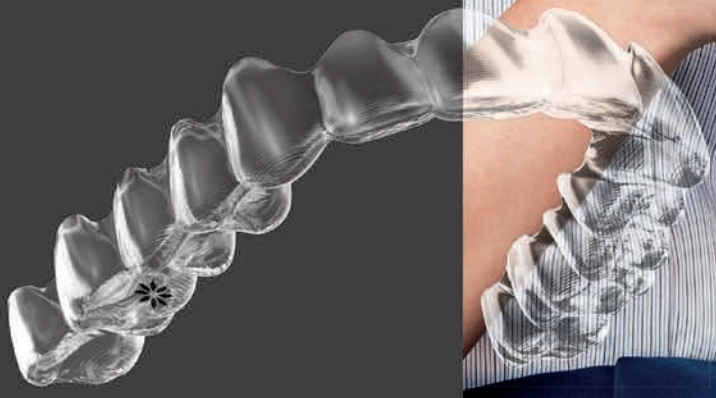

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Figure 16: With the next increment of VisCalor bulk the remaining cavity volume was completely filled using the bulk-fill technique.

Figure 17: The contour of the missing distolingual cusp was sculpted. The last increment of the composite was again polymerized for 20 s.

Figure 18: Final result: the direct bulk-fill composite restoration with cusp replacement blends in well to the surrounding hard dental tissue.

services are creating a need for reliable, easy-to-use and faster-to-complete and therefore more economical basic posterior restorative treatment options as an alternative to the time-consuming high-end solutions[42]. In addition to the universal hybrid composites, which are available in various shades and levels of opacity, new bulk-fill composites with optimized depth of cure have lately emerged on the market. They are specially designed for use in posterior dentition, where they produce esthetically pleasing restorations. The placement procedure is economically more efficient than that of conventional hybrid composites[74, 75]. Supplementary to low-viscosity and high-viscosity bulk-fill composite materials, the material options in the sector of light-activated direct placement restoratives with increased curing depth were recently expanded by a bulk-fill composite with thermally controlled viscosity behavior.

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Minimally invasive veneers with hybrid ceramics

Andreas Kurbad[1]

Aesthetic corrections with veneers should be minimally invasive and limited to the enamel and, despite the thin layer thickness in the mouth, develop a natural play of shade and light. The multichromatic CAD/CAM hybrid ceramic blank VITA Enamic MultiColor (VITA Zahnfabrik) has an integrated shade and translucency gradient with six finely graduated layers. The natural appearance of the tooth can be reconstructed almost at the touch of a button. Characterisation with stains can usually be omitted. The dual ceramic-polymer network structure of the hybrid ceramic allows narrow wall thicknesses of up to 0.2 millimeters, while remaining very edge-stable. These are the best conditions for restoring two upper middle incisors, as shown in this case report.

The aesthetic challenge

A 45-year-old female patient presented in the office and was dissatisfied with the aesthetic effect of her front teeth. The middle incisors had presumably lost incisal edge contour and length, due to abrasive and erosive processes. In addition, the anterior teeth were clearly discolored.

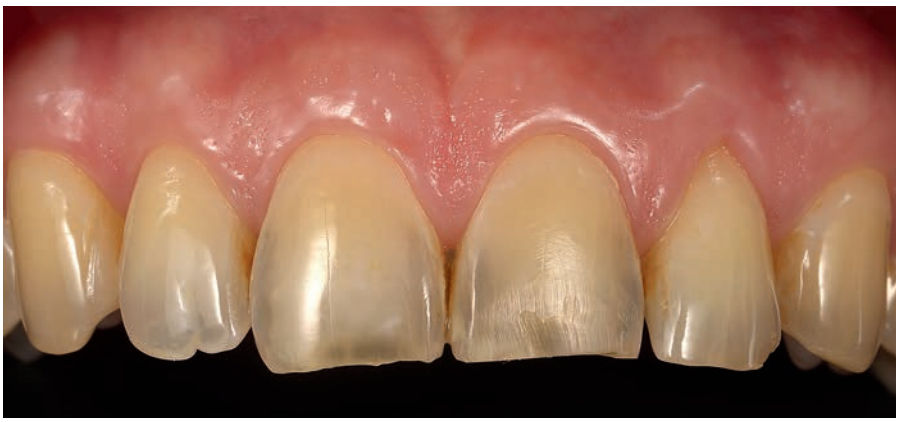

Figure 1: Initial situation: Erosion and abrasion led to a shortened incisor and the loss of the morphology of teeth URI and URI.

[1] Dr Andreas Kurbad
Private practice focussing on cosmetic dentistry and implantology, Viersen, Germany.

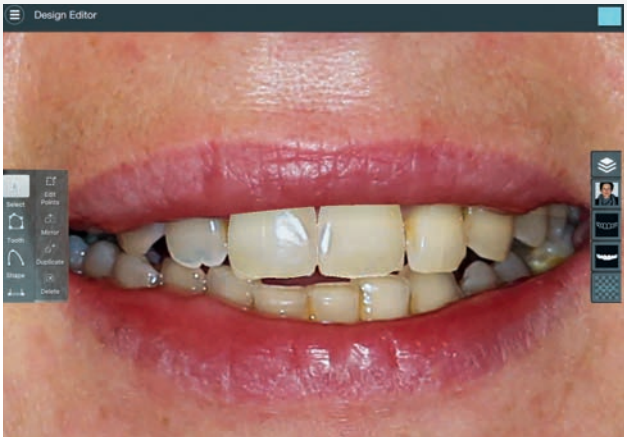

Figure 2: With the Smile Designer Pro software, ideal middle incisors were designed.

Figure 3: With a transparent silicone key and light-curing composite, the mock-up was fabricated intraorally.

Figure 4: The mock-up corresponded to the aesthetic expectations of the patient.

The patient wished to restore a natural appearance to these teeth using minimallyinvasive therapy. For targeted therapy, the situation was scanned with the Cerec Omnicam, and photos were taken. The Smile Designer Pro software simulated the extension of the incisal edge and the recontouring of the morphology. On this basis, a clinical mock-up was created which satisfied all participants.

CAD/CAM-supported fabrication

The mock-up was scanned intraorally to be included in the virtual design in the CEREC software as a biogeneric copy. Due to the vestibular loss of substance on teeth UR1 and UL 1, the preparation was performed in a very minimally invasive manner with a micro chamfer, applied in the cervical area. The clinical situation was now rescanned so

Figure 5: The minimally invasive preparation during the application of a micro chamfer in the cervical area.

Figure 6: The clinical situation was scanned with the Cerec Omnicam.

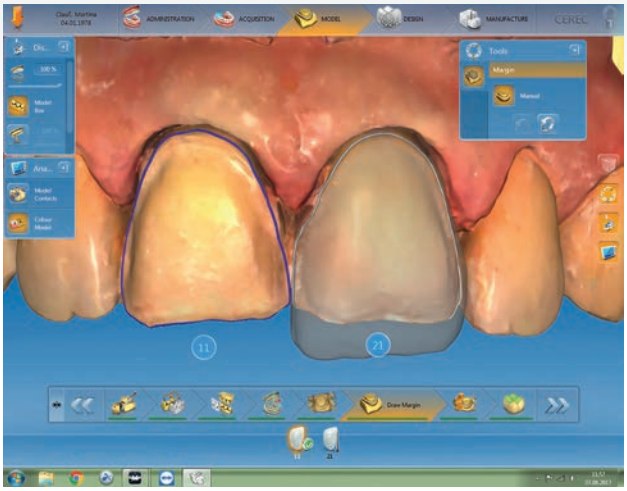

Figure 7: The design of the hybrid ceramic veneer in the Cerec software.

Figure 8: With the Cerec Smile Design Application, the restorations can be evaluated together with the lips.

that the virtual construction of the veneers and their CAD/CAM-based fabrication could take place. When working with rotating diamond tools, the focus was mainly on the surface texture. Finally, the veneers were polished to a high gloss and were incorporated in the same session.

Seating and final results

After clinical try-in, the two restorations were fully adhesively incorporated. The dominant feldspar ceramic network (86 wt%) of the hybrid ceramic veneer was etched in a proven manner with hydrofluoric acid and

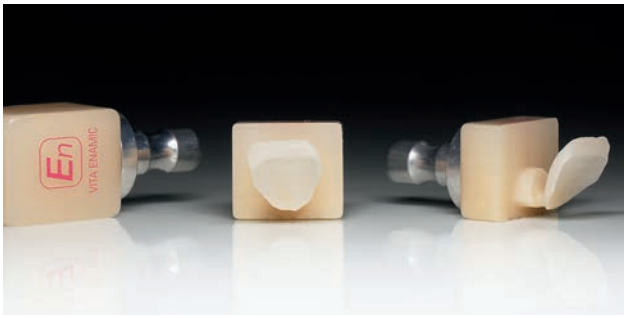

Figure 9: The sheer veneers made of VITA Enamic MultiColor immediately after grinding out.

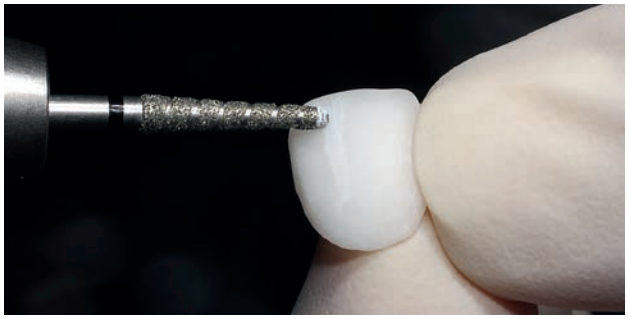

Figure 10: The incorporation of texture and morphology with the rotating diamond tool.

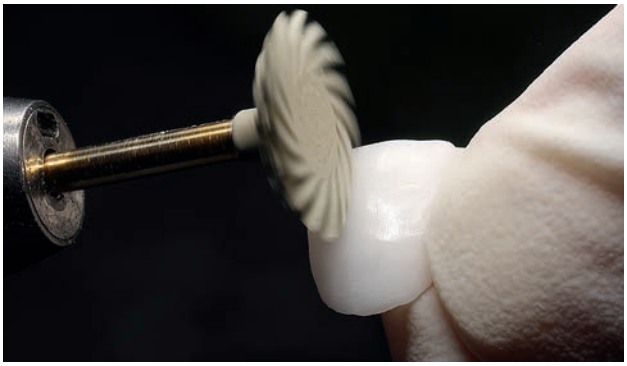

Figure 11: A simple high-gloss polish was enough to finish the restorations.

Figure 12: The finished veneers just before the clinical try-in.

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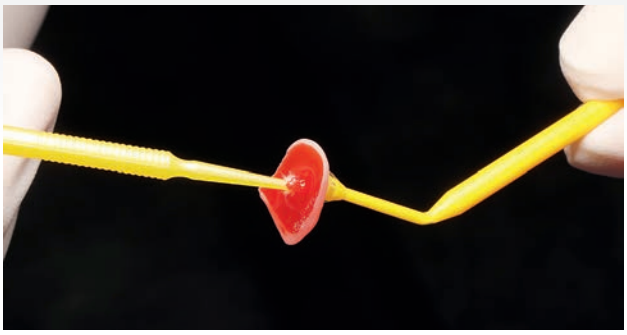

Figure 13: Conditioning with hydrofluoric acid creates a micro-retentive surface.

Figure 14: A light-curing one-component adhesive was applied to the tooth surfaces.

Figure 15: Both veneers integrated completely and naturally into the aesthetic zone.

Figure 16: Result: The curve of the incisal edges harmonised with the curve of the lips.

then silanised. The conditioning of the enamel was carried out with phosphoric acid and a light-curing single-component adhesive. After incorporation with a shade-matched composite cement, the hybrid ceramic veneers fit harmoniously into the aesthetic

zone. Thanks to the rapid production without any crystallisation or sintering firing and the integrated shade gradient, the two central incisors could be efficiently and aesthetically restored. The patient was highly satisfied with the minimally invasive and fast result.

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Injection moulding with composite to obtain a predictable aesthetic outcome

Ali Salehi[1]

Introduction

Using the injection moulding technique, composite restorations are created by injecting the composite into a silicone key that is directly positioned into the patient's mouth. The main advantage of this technique is that restorations can be first modelled in wax on a stone model, and then copied and transferred in detail to the natural teeth.

For complex morphologies, challenging aesthetic cases or cases requiring reestablishment of the occlusal vertical dimension, a predictable result can be obtained and chair time reduced with this relatively simple procedure. Adjustments can also be made afterwards if needed. Because these restorative treatments usually comprise extensive surfaces, the composite used should be strong and wear resistant enough and also offer the desired optical properties. G-ænial Universal Injectable is an ideal product for this indication thanks to its great thixotropy and excellent mechanical & aesthetic properties.

Case report

A 34-year-old, pregnant woman came to the dental office with the request to improve the aesthetic appearance of her smile. Her chief complaint concerned the shape of the lateral incisors (Fig. 1-2). She had already undergone a bleaching treatment and two veneer-lays on the heavily discoloured teeth 14 and 15, due to endodontic treatments covered with voluminous amalgam restorations in the past. After explaining the different
options, she decided to go for a treatment with direct composites because of financial reasons and the idea of the minimally invasive nature of the procedure.

A wax-up was made of the desired tooth morphology that had been defined in consultation with the patient (Fig. 3). Next, a non-perforated metal impression tray was filled with a transparent vinyl polysiloxane material (EXACLEAR, GC) and placed over the stone model with the wax-up (Fig. 4-5). The tray's only purpose being to be used as a mould to create the key, a full-arch tray with a smooth inner surface was selected so that the silicone could be retrieved easily in its whole and without damage

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Dr. Salehi graduated in 2007 as a Master in Dentistry at the Faculty of Dental Medicine of Strasbourg University, France. He completed an Erasmus internship at the Faculty of Dentistry of the Johannes Gutenberg University in Mainz, Germany. From 2008 - 2015, he was a clinical consultant at the Department of Prosthetics of the University of Strasbourg. and became a part-time Clinical-University Assistant in the same department in 2015.
Dr Salehi also maintains a private practice in Strasbourg.

Figure 1-2: Initial situation.

(Fig. 6-7). Care was taken not to press too hard, so that all incisal edges were covered with a sufficiently thick layer in order to avoid potential tearing or deformation which could lead to a bad reproduction of the wax-up in the mouth of the patient. The tray was sufficiently filled to cover all teeth, up to the second premolars.

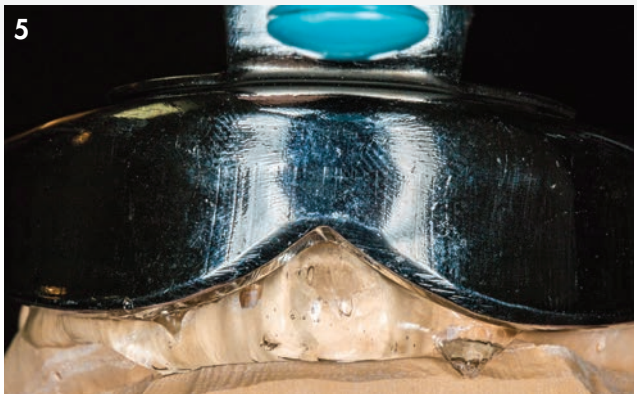
As a rule of thumb, the silicone key should always extend so far that it includes at least two teeth distally from the teeth to be treated on both sides; this ensures stability of the key when it is positioned in the mouth and a proper reproduction of the aesthetic project for a more predictable final result. In this regard, it should be noted that in a more ideal situation, a rubber dam could be used. In this case, the teeth should be sufficiently exposed through the dam and the clamps placed distally enough to avoid interference with the key. The latter should be trimmed cervically to allow proper seating without any tension between the key and the rubber dam.

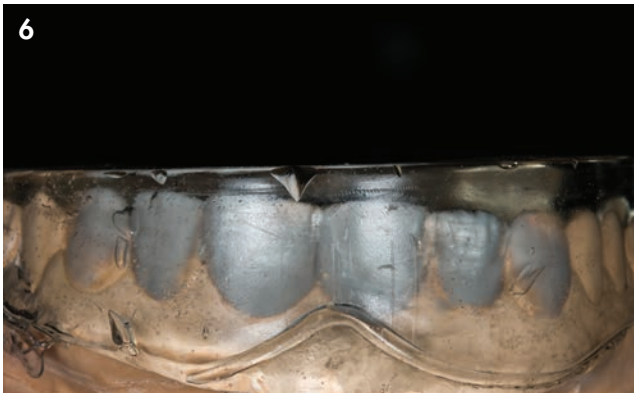
A fine, needle-shaped bur was used to drill the holes in the key through which the composite will be injected (Fig. 8). These holes were positioned at the middle of the incisal edge of each tooth, half-way between the distal & mesial borders, and made as small as possible but large enough to enable the tip of the composite syringe to pass easily and completely (Fig. 9). Care was taken not to damage the vestibular part inside the silicone key with the bur, to maintain the information of surface texture that had been created during the wax-up. This will guarantee a proper transfer and respect the idea of a predictable final aesthetic result.

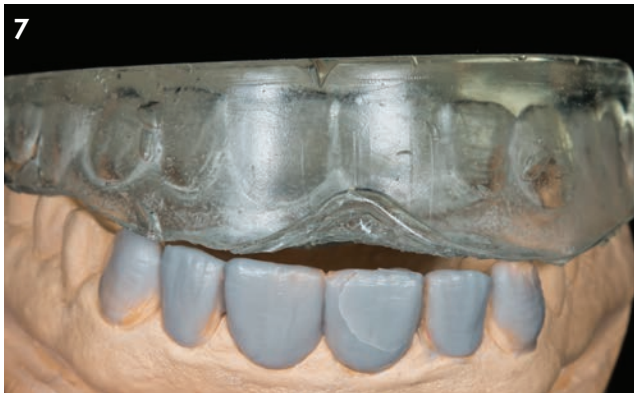
After cleaning, the procedure was started with a central incisor. The neighbouring teeth were isolated with Teflon tape (Fig. 10). Then, the enamel was etched (Fig. 11) to create extra micromechanical retention, carefully rinsed and dried. A frosty appearance of the surface was obtained (Fig. 12). A universal adhesive (G-Premio BOND, GC) was applied, left undisturbed for 10 seconds and thoroughly dried with maximum air pressure for 5 seconds before lightcuring (Fig. 13).

Next, the silicone key was positioned onto the teeth and the composite was injected (Fig. 14). G-ænial Universal Injectable (GC), shade A1 was selected for the procedure because of its high filler load and wear-resistance. The syringe was placed in the hole and slightly orientated towards vestibular. During the injection, a little bit of overflow is needed to ensure that all small voids at the

Figure 3: A wax-up was made in consultation with the patient.







Figures 4-7: A metal impression tray was filled with transparent vinyl polysiloxane (EXACLEAR, GC) and used to copy the stone model with the wax-up.

margins and interproximal spaces are filled. This can easily be verified through the transparent key (Fig. 15). Next, G-ænial Universal Injectable was light-cured through the transparent silicone. After removal of the key, the excess was taken out with a surgical scalpel blade (blade #12, Swann-Morton; Fig. 16). Further finishing was done with a flame-shaped bur at the cervical margin, to correct any possible overcontouring, (Fig. 17) and with metal strips (New Metal Strips, GC) interproximally (Fig. 18). Metal strips are more rigid than transparent ones, which makes them more efficient

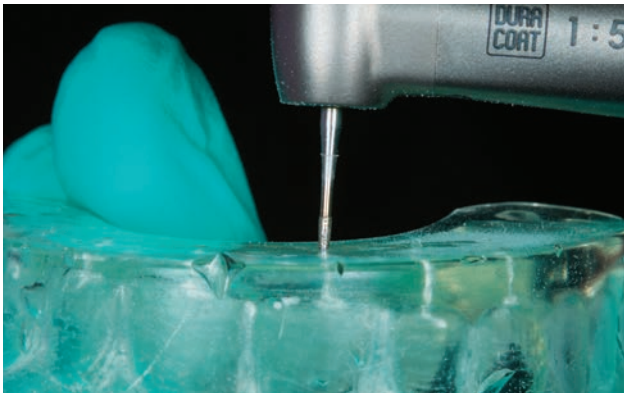


Figure 8: A needle-shaped bur was used to drill holes through the silicone key ending in the middle of the incisal edge.

Figure 9: It was checked whether the holes were large enough to enable the tip of the composite syringe to pass easily and completely.

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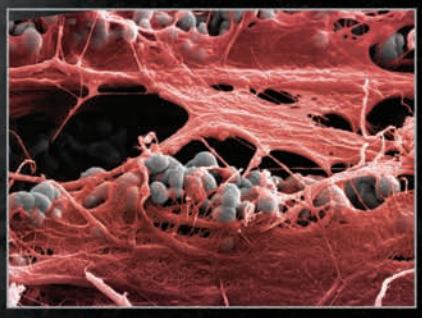

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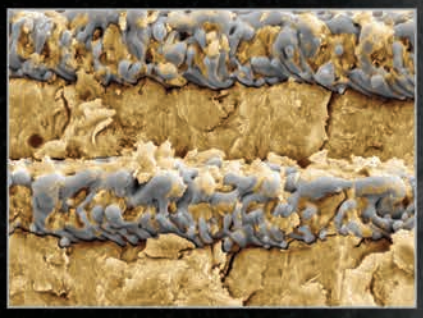

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Figure 10: Neighbouring teeth 11 and 22 were isolated using Teflon tape.

Figure 11: The enamel of tooth 21 was etched to enhance micromechanical retention.

Figure 12: After etching, the enamel surface showed a matt appearance.

Figure 13: The universal adhesive G-Premio BOND (GC) was applied in accordance with the manufacturer's instructions and light-cured.

and easier to use. Note that even though some bleeding might occur during this stage, finishing and polishing should be carried out thoroughly as smooth margins will help the gingiva to heal faster but also maintain the gingival health over time. The same procedure was repeated on the other incisors and the canines (Fig. 19-20).

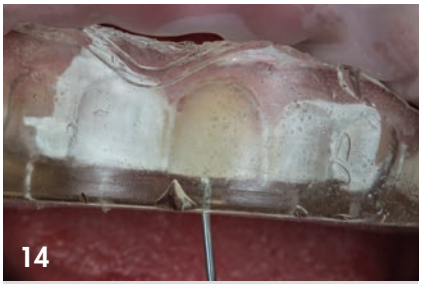

Figure 14: G-ænial Universal Injectable (GC) was injected into the silicone key.

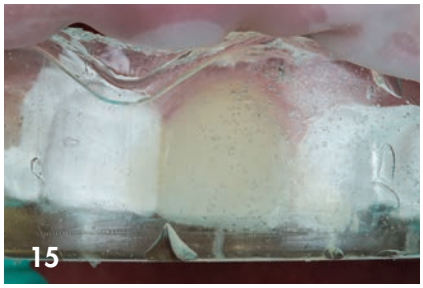

Figure 15: Due to the high transparency of the key, it can be visually checked if a sufficient amount of composite has been injected to cover the entire surface. The composite can also be easily light-cured through the key.

Figure 16: The excess was removed with a scalpel (blade #12). Due to the presence of the Teflon tape, the excess did not stick to the neighbouring teeth and it was easy to remove.

Figure 17: A flame-shaped finishing bur was used.

Figure 18: Interproximally, the margins were finished with metal strips.

Figure 19: The same procedure as shown for tooth 21 was repeated for the other teeth. Application of G-Premio BOND on tooth 12.

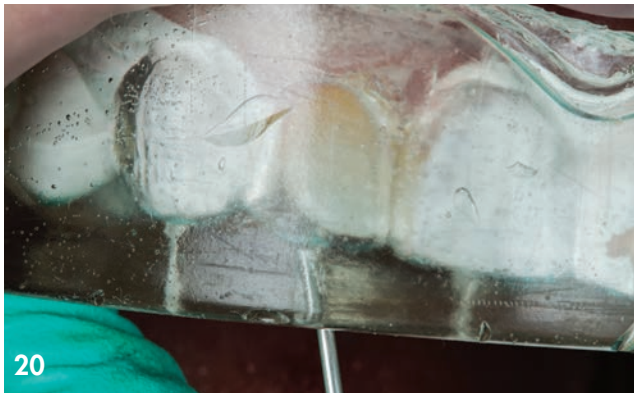

Figure 20: Injection of G-ænial Universal Injectable (GC) into the EXACLEAR key.

Figure 21-22: Result immediately after curing the composite.

Immediately after, it can be seen that the surface texture of the wax-up was transferred in detail to the direct veneers in the oral cavity, which gives the teeth a very natural and lifelike appearance (Fig. 21-22). Three days after the treatment, the gingival tissue had healed entirely (Fig. 23-25). In the recall session one week later, the surface was

Figure 23-25: Gingival healing 3 days after the treatment.

Figure 26-28: Final polishing was done at the recall session.

Figure 29-30: Result after final polishing.

polished again with soft rubbers and cotton wheels with polishing paste (DiaPolisher Paste, GC) (Fig. 26-28), to enhance the gloss while preserving the texture (Fig. 29-30).

The injection moulding technique is an easy approach that allows to plan restorations with complex morphology in advance and copy them in a predictable manner to the clinical situation. Even the surface texture can be copied from the wax-up, which saves valuable chair-time. In order to have a long-lasting result, the composite needs to have good mechanical properties. Considering the interesting properties of G-ænial Universal Injectable, being even stronger than many paste composites, it can be safely used for that purpose.

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Alignment of anterior teeth before minimally invasive veneers to treat microdontic laterals

Thomas Sealey[1]

Case Report

The patient was a 30-year-old female in good health who presented to the practice requesting smile enhancement.

It was decided to improve the alignment of her teeth with cosmetically-focused fixed upper and lower orthodontics followed by feldspathic veneers on her upper lateral teeth. Orthodontic planning of the final position of her lateral teeth allowed for a truly minimally invasive approach.

Presenting complaint

Her main complaints were that of uneven upper and lower teeth with gaps present. After full discussion and time spent looking at pictures of her smile, she decided that it was the imbrication of her teeth that she did not like the appearance of, in addition to being displeased by her smaller and spaced upper lateral teeth.

Diagnosis

A full clinical examination was completed, including all normal periodontal examinations and radiographs. There was nothing abnormal to report. Oral hygiene was considered poor at initial consult and hygiene therapy was recommended. There were no concerning social factors.

The upper left central tooth (UL1) had a small fracture of the mesioincisal edge. She was Angle class 1 on the left and class 3 in the right (Angle, 1899). She had microdontic upper lateral teeth. Her lower anterior teeth had minor crowding and her upper teeth

Figure 1: Full face - pre-operative.

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Private Practice, Essex, UK

Figure 2: Frontal smile view.

Figure 3: Right lateral smile view

Figure 4: Left lateral smile view

Figure 5: Frontal retracted view, teeth in occlusion

Figure 6: Right lateral retracted

Figure 7: Left lateral retracted

Figure 8: Right lateral retracted view, teeth slightly parted

Figure 9: Left lateral retracted view, teeth slightly parted

Figure 10: Anterior close-up view 1:1.5

had minor rotations and protrusive/retrusive positioning from the ideal arch shape.

Treatment planning

Aims of the treatment were to improve the alignment of the anterior upper and lower teeth and address the microdontic lateral teeth. In addition, options for the small fractured edge of UL1 were considered.

The options for the alignment were:

1. Referral to a specialist orthodontist for comprehensive orthodontic therapy to correct the posterior malalignment and return the patient to a class 1 position with normalised overjet and overbite
2. Accept the position of the posterior teeth and align only the teeth in the aesthetic zone
   a) Fixed labial
   b) Fixed lingual
   c) Removable clear aligners.

The options to address the microdontic lateral teeth and the fractured UL1:

1. Composite bonding
2. Ceramic veneer.

Figure 11: Right lateral close-up view 1:1.5

Figure 12: Left lateral close-up view 1:1.5

Figure 13: Upper occlusal view

Figure 14: Lower occlusal view

Treatment planning considerations

In all treatment planning, the treatment choice is dependent on the diagnosis and there is often a hierarchy of treatment options that should be pursued in a logical order, starting with the least invasive until a satisfactory outcome is achieved.

Research has shown that this treatment cascade is an appropriate approach, as often patients are pleased with the outcome and decide against further restorative treatment (Joiner, 2006). With that in mind, it was decided to complete external tooth whitening before orthodontic treatment began.

The aim was to assess the improvement of the tooth colour and then to re-evaluate the patient's expectations before tooth alignment was completed and before proceeding to alternative and more invasive options.

On 31 October 2012, the EU Council Directive (2011) came into force in the UK. It sets out who can use what strength of product when performing tooth whitening. This directive states that the use of tooth whitening or bleaching products containing more than 0.1% and up to 6% hydrogen peroxide present or released from other compounds or mixtures in these products is safe for use when prescribed by a registered dental professional.

The patient completed a three-week course of home tooth whitening using 16% carbamide peroxide.

When she returned, composite material was placed on her lateral teeth and shaped. The patient was then allowed time to assess the changes to her smile before deciding how to proceed with her treatment planning.

The patient decided that she indeed still wanted to continue with alignment of her upper and lower teeth.

After considering all the options, longevity of materials, treatment costs (now and in the future), advantages, disadvantages, risks and alternatives; she decided upon alignment of her upper teeth with fixed orthodontics, alignment of her lower teeth with removable clear aligners, followed by ceramic veneers on her upper lateral teeth and a composite repair to her fractured incisal edge UL1.

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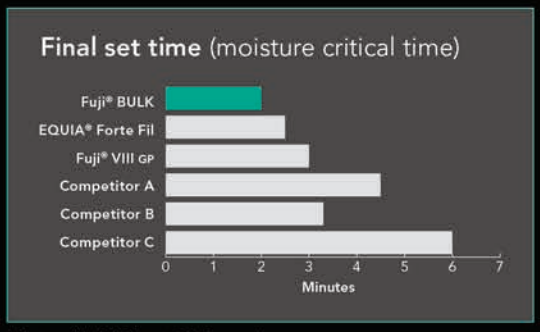

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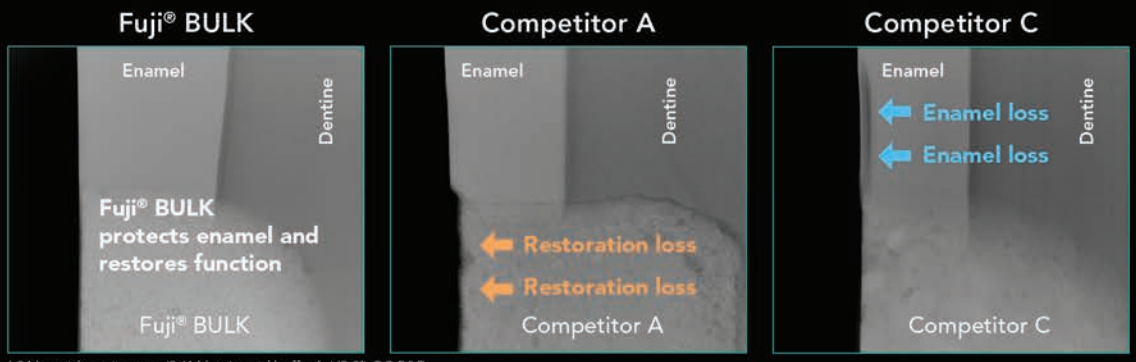

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Radiographs

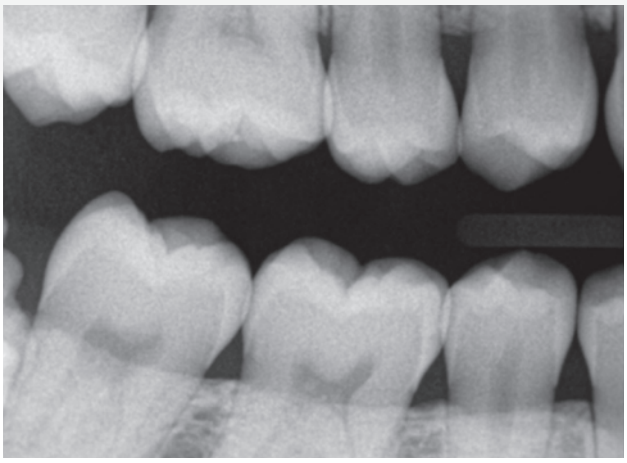

Figure 15: Right intraoral bitewing radiograph

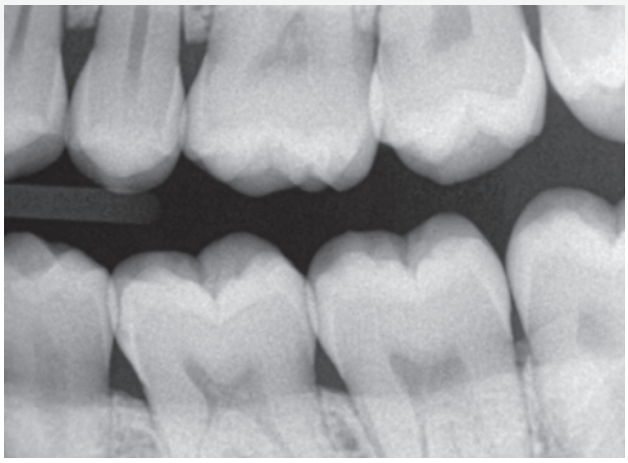

Figure 16: Left intraoral bitewing radiograph

Figure 17: Upper right central intraoral periapical radiograph

Figure 18: Upper left central intraoral periapical radiograph

Figure 19: Lower central intraoral periapical radiograph

Treatment process

Fixed labial brackets were placed on the patient's upper teeth and a 0.014 nickel titanium wire was secured with elastics. The movement of the teeth was monitored and after only eight weeks they had been positioned correctly with symmetrical spacing around the lateral teeth.

By blocking the bracket slot on the lateral teeth and jumping the orthodontic wire over the bracket, I was also able to retrocline the upper lateral teeth as far as the occlusion would allow. This placed them in a more retrusive position to provide more space facially for the planned final ceramics.

An alignment company fabricated four lower transparent sequential positioners to properly align the lower anterior teeth. Interproximal reduction was completed to the requested specifications with interproximal finishing strips, using wooden wedges to protect the gingiva (Rossouw and Tortorella, 2003).

Fluoride varnish was then applied. Each aligner was worn for two weeks, meaning a treatment period of eight weeks for both the upper and lower teeth.

After tooth alignment (Figures 20 and 21), an indirect fixed-wire retainer was constructed and cemented to the lingual surface of the lower anterior teeth using flowable composite and normal etch and bond protocol. A temporary removable upper retainer was made to retain the upper teeth.

At this stage, we reassessed the patient's expectations

Preparation

Figure 20: Eight-week tooth alignment frontal view

Figure 21: Eight-week tooth alignment occlusal view

Figure 22: Cross-polarised shade photo

Figure 23: Wax-up

Figure 24: Gürel technique reduction grooves

Figure 25: Preparation upper left lateral tooth

Figure 26: Retraction cord pre-impression

Figure 27: Veneers on model

Figure 28: Isolation for sandblasting

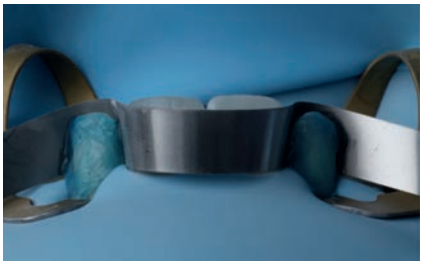

Figure 29: Isolation for acid etching

Figure 30: Dry-try of veneer upper right lateral tooth

Figure 31: Adhesive protocol

Figure 32: Light activation of cement

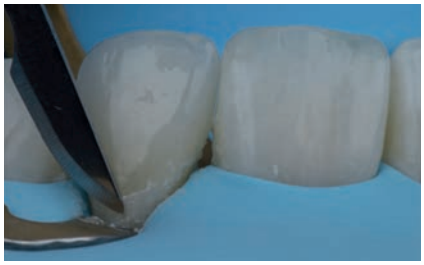

Figure 33: Finishing of margins with scalpel

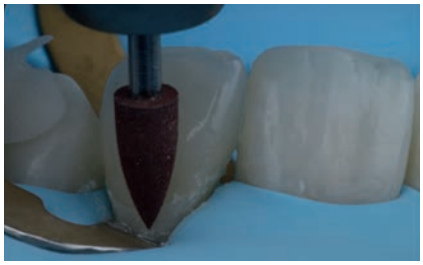

Figure 34: Finishing of margins with brownie point

Figure 35: Finishing of interproximal areas with finishing strip

Figure 36: Margins visualised before rubber dam removal

and she still felt that further improvements were needed. All options were again discussed.

We were of the opinion that to achieve an excellent aesthetic and tailor the colour-blend to the natural tooth, a direct composite approach should be used, or alternatively we could continue as planned using an in-direct ceramic veneer on her upper lateral teeth.

We discussed the differences in these materials, the increased maintenance of the composite restorations versus the increase preparation for the ceramic veneers, and the patient confirmed that she still wanted to proceed with the ceramic option.

Before the day of treatment, a wax-up for the planned final shape of the upper lateral teeth was completed in office using an additive technique (Figure 23). Custom silicone stents and guides were made to help direct the preparation following a minimally invasive protocol. Shade-matching photos were taken at the very beginning of the appointment as tooth dehydration will quickly change the appearance of a tooth and affect the colour-match detrimentally. Photography with cross-polarised filters while using custom composite shade tabs and a Vita shade guide helps with the shade determination and communication with the ceramist (Figure 22).

The Gürel (2003) reduction technique was used to ensure that only necessary tooth removal was completed to allow for the adequate thickness of veneer ceramic. Acrylic was placed over the lateral teeth using a stent taken from the wax-up. A depth-gauged diamond bur was used to remove 0.5mm of the facial-surface of the planned veneer position.

Pencil was used to mark the depths of these grooves before the acrylic was removed (Figure 24). Reduction only to the pencil marks was completed, ensuring the entire preparation was contained within enamel (Figure 25). The double retraction cord technique was used and an impression taken (Figure 26).

To maximise the beauty of the underlying colour of the natural tooth and create a new enamel skin to simply reshape the facial of these lateral teeth, it was decided to use a feldspathic ceramic for its excellent colour properties and external texture that the ceramist can place (Figure 27).

On the day of cementation, the temporary veneers were removed and the feldspathic veneers checked. The ceramic work was exceptional and a perfect fit.

The teeth were first isolated with an inverted rubber dam to prevent sulcular fluid contamination and the teeth individually clamped to retract the dam and expose the restorative margins.

The neighbouring teeth were protected by placement of a metal matrix strip and then sandblasted to remove any biofilm to increase micromechanical retention, followed by a short total etch of only 10 seconds (Figures 28 and 29).

The veneers were again tried-in to ensure that the rubber dam and the clamp placement did not interfere with the passive seating of these delicate feldspathic veneers (Figure 30).

After try-in, the veneers were conditioned with a 9.6% hydrofluoric acid etch for 60 seconds as per the material preparation guidelines followed by a cleaning product to remove any salts and phosphate molecule contamination. The fitting surface was then silanated and pre-loaded with a light-cure resin-cement.

The restorations were left in a covered restoration tray until ready for use.

An adhesive bonding system was then applied to the teeth. The mild self-etching adhesive creates a more stable and durable bonding interface, as there is only partial demineralisation of any exposed dentine and consequent bonding to the hydroxyapatite crystal that remains (Walter et al, 2011) (Figure 31). The restorations were then individually placed and agitated into position and lightcured for one second. The quick-cure allows easy clean-up of the margins before being fully cured under an oxygen inhibiting gel (Figure 32).

This gentle technique allows very easy clean-up and is much kinder to the gums as you don't get the cement stuck in-between the teeth etc. The margins were refined with a scalpel before being polished with a brownie and greenie before and after rubber dam removal (Figures 33 and 34). Composite interproximal finishing strips were used to clean the margins at the mesial and distal (Figure 35).

Due to the excellent soft tissue retraction of the rubber dam, the margins were easily visible and were able to be assessed with magnification to ensure a smooth transition from ceramic to tooth (Figure 36).

A fixed-wire retainer was then placed on the palatal surfaces of the upper teeth using flowable composite and normal etch and bond protocol.

After rubber dam removal, all occlusal and excursive movement were recreated and the restorations assessed for any interferences.

Figure 37: Full face

Discussion

Both the patient and clinician were very satisfied with the final result. The crowding has been eliminated and th indirect feldspathic veneers on both lateral teeth blend seamlessly with the natural teeth and are almost undetectable.

Regular review and six-monthly top-up tooth whitening will ensure the colour-blend and lustre of these teeth is maintained.

On such a young patient a minimally invasive approach is always followed where possible and we ensure that full consent is gained with absolute understanding of the proposed treatment options.

By following a protocol of aligning first and then home tooth whitening, we can sometimes reach the patient expectations without further intervention. This is the best scenario as we have achieved the patient desired goals without having to touch a tooth with a drill.

When the patient desires further intervention, it is advantageous to be able to show them the step-by-step photographic process of each of the type of treatments, be it composite veneers or minimal preparation ceramic veneers. Taking the time to properly document and catalogue these cases can be very consuming, but ultimately is a fantastic tool to help educate the better understanding of our patients.

One can feel very confident that patients can fully understand the treatment they are having and there are no surprises along the way by approaching the planning of every case in this manner.

During treatment planning, it is important to manage patients' cosmetic expectations. By doing this sooner than later, it can save the patient from more costs and often more destructive procedures.

Cosmetic orthodontic solutions are an invaluable tool in our armamentarium to align patients' front teeth in a predictable and minimally invasive manner that can achieve drastic smile transformations with very little risk to the health of the patient's teeth.

When combining this treatment with tooth whitening and composite bonding or minimally invasive ceramic techniques, one can achieve incredibly beautiful and natural

Figure 38: Frontal smile view

Figure 39: Right lateral smile view

Figure 40: Left lateral smile view

Figure 41: Frontal retracted view, teeth in occlusion

Figure 42: Right lateral retracted view

Figure 43: Left lateral retracted view

Figure 44: Frontal retracted view, teeth slightly parted

Figure 45: Right lateral retracted view

Figure 46: Left lateral retracted view

Figure 47: Anterior close-up view 1:1.5

Figure 48: Right lateral close-up view 1:1.5

Figure 49: Left lateral close-up view 1:1.5

smile aesthetics.

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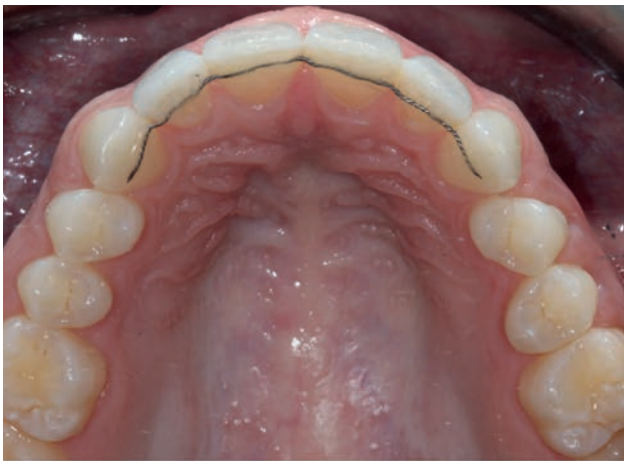

Figure 50: Upper Occlusal view

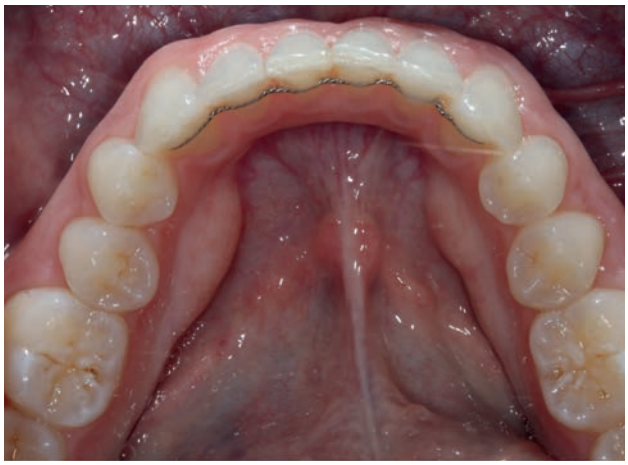

Figure 51: Lower Occlusal view

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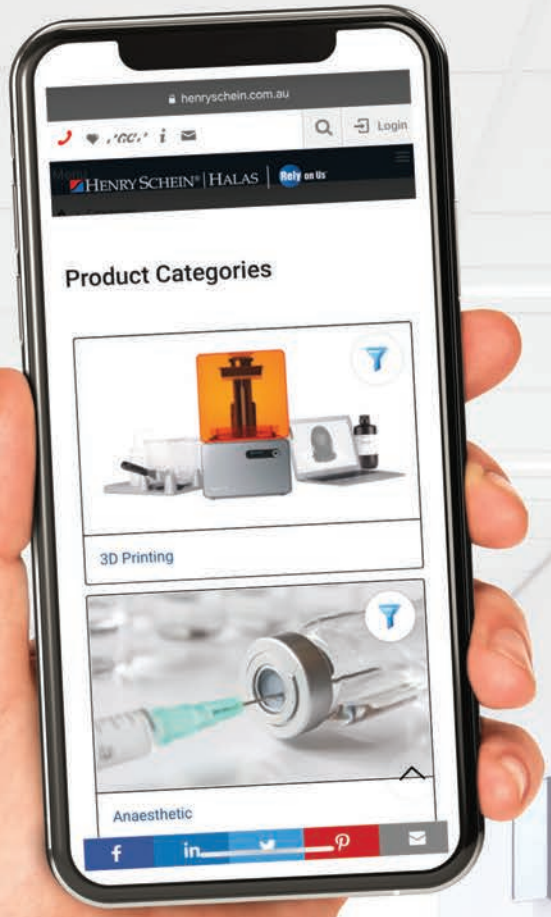

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Active care bleach: infiltrate and restore

Jordi Manauta[1]

Case details

Bleaching is no longer a vanity procedure. For many years, the benefits of non-invasive techniques have been proven to deliver amazing results, when the indications are followed correctly. The use of bleaching therapy to diminish and treat white spots is not without controversy, being rejected by some but adopted by many others.

The infiltration technique has been widely proven to eliminate unsightly enamel spots, if the depth is correctly evaluated and the indications are followed correctly; for example, in deep lesions, infiltration used in isolation is likely to be ineffective.

In the author's experience, bleaching of white and amber spots before treatment has been a winning strategy and the following points have been noted:

1. Amber spots. Generally, these turn into white spots, which are more susceptible to the acid treatment of infiltration therapy
2. White spots. Two phenomena happen in these cases. The first is a reduction in opacity due to a balance in the refraction index of the disarranged prisms. The second is that little or no bleaching occurs to the white spot. This enables it to blend better due to the low contrast between the newly bleached surrounding tissues and the white spot itself.

[1] Jordi Manauta graduated cum laude in dentistry from UNITEC (Universidad Tecnológica de México) and was apprentice to Dr Miguel Angel Tamés (Mexico) and Dr Walter Devoto (Italy). He holds Operative and Aesthetics Dentistry Master in UIC (Universitat Internacional de Catalunya) in Barcelona and is visiting professor in Siena and Marseille Universities. Author of the book, Layers (Quintessence, 2012) and Scientific consultant for two European journals, Jordi has authored and co-authored many publications in international journals. He works full-time in his private practice.

Figure 1: Initial evaluation of the patient, a 23-year-old woman, who was very dissatisfied with the present situation and the aggressive treatment option she had been recommended.

Figure 2: A cross-polarised picture is taken to better assess the extent of the lesion. Transillumination is used to estimate the depth of the lesion (not shown). It is decided to start a bleaching therapy to try and minimise the contrast between the spots and the tooth, and to bleach the amber spots

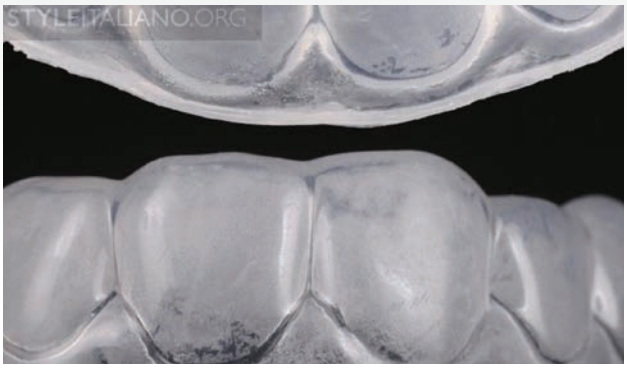

Figure 3: Bleaching trays must be extremely precise, cervical sealing must be perfect in order to keep the bleaching product in place and away from intraoral moisture

Figure 4: Fitting of the bleaching tray. The selected bleaching therapy was carbamide peroxide 10% for 20 days (White Dental Beauty, Optident) worn overnight. No sensitivity was reported; we are increasingly seeing this phenomenon with the new generation of products

Figure 5: After 20 days bleaching. Picture with lateral flashes

Figure 6: Cross-polarised image showing the latest situation. Some spots have vanished, the amber spots have turned white and other spots have softened in saturation

Figure 7: Adjacent comparison, note the amber spot

First-choice treatment

Bleaching should be a mandatory resource before stain treatment and restorative therapy. There is little awareness in the profession of the benefits of bleaching and some of the harmless side effects are also feared.

Infiltration therapy should be a first-choice treatment, together with bleaching for these cases. Icon Dry, which is used as a preview of the resin filtration after erosion, should be applied for two minutes to obtain proper visual assessment. Icon infiltration resin has to penetrate completely and a three-minute application is advised.

Figure 8: Mirror-like comparison

Figure 9: Mirror-like comparison of before bleaching (lower) and after (upper) with deep-view contrast

Figure 10: Post-bleaching evaluation, the patient starts treatment with resin infiltration. The first step is to isolate using rubber dam

Figure 11: 15% hydrochloric acid application for two minutes (Icon Etch, DMG, Germany). This step can be repeated up to four times. Increasing application frequency runs the risk of deeply eroding the teeth from intraoral moisture

Figure 12: Air drying, note how the spots become tremendously white

Figure 13: Treat with alcohol (Icon Dry, DMG, Germany). Manufacturer suggests a 30 second application of this agent. This is the result after 30 seconds

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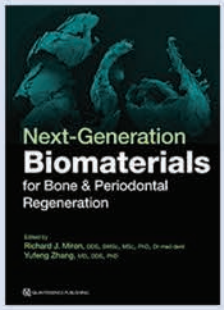

New and innovative biomaterials are being discovered or created in laboratories at an unprecedented rate, but many of them remain entirely foreign to practicing clinicians.

This book addresses this gap in knowledge by summarizing some of the groundbreaking research performed to date on this topic and providing case examples of these biomaterials at work.

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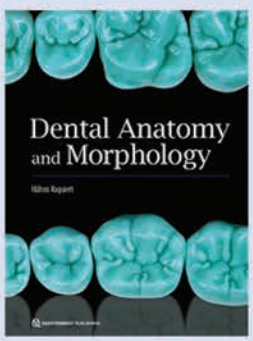

This beautiful atlas conveys not only the practical knowledge of dental anatomy but also the art of sculpting it in wax. The ideal anatomy of each dental structure is described in detail and the waxing techniques are beautifully illustrated step by step for visual reference.

The author demonstrates that for every morphologic feature there is an explanation in nature, assigning significance to every minute feature of dental morphology.

Organized by tooth and arch, this book views morphology through a clinical lens and repeatedly draws connections between anatomical features and clinical concepts.

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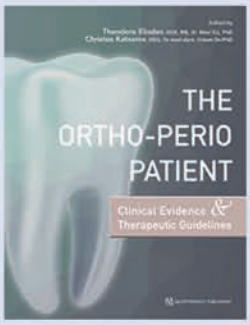
Ortho-Perio Patient: Clinical Evidence & Therapeutic Guidelines

Christos Katsaros & Theodore Eliades



Although most orthodontic curricula provide courses on interdisciplinary orthodontic-periodontic treatment, there are still surprisingly few resources on the topic.

Written by leading scholars in the field, this book provides a broad analysis of the topic from both the periodontal and orthodontic perspectives.

The authors systematically analyze the scientific and clinical interactions of these specialties by reviewing all the available evidence and using case studies to demonstrate principles discussed in theory.

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Figure 14: In the author's experience, this product applied for two minutes gives a better penetration and thus a better preview of the real outcome. At this stage, the clinician should decide whether to repeat the full erosion cycle or start the resin infiltration

Figure 15: Air drying of alcohol is very easy and, if the previous step was successful, infiltration can begin

Figure 16: Erosion is visible, especially when completing four cycles or more

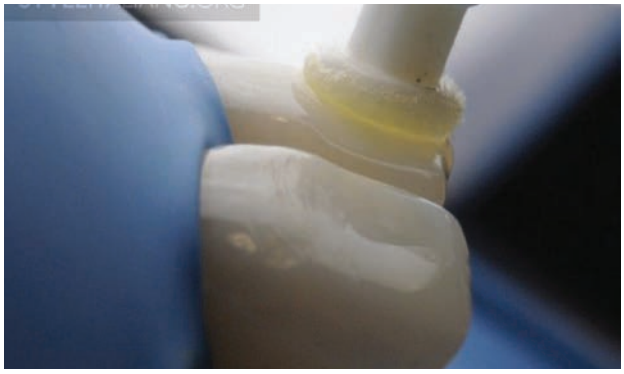

Figure 17: Resin infiltration. The resin has extremely low density and is solvent free and therefore able to penetrate as much as the alcohol. It is advisable to keep the lights low and allow the material to penetrate for about three minutes; failure to do so may result in an incomplete infiltration and a different result than the one obtained in the preview with Icon Dry

Figure 18: After infiltration, a small layer of enamel is placed to cover up the erosion caused during therapy

Figure 19: Polishing is mandatory with or without the use of a final composite layer

Figure 20: Final result after three weeks

Figure 21: Cross polarisation image shows a good result, which is not excellent, but not visible to the naked eye

Figure 22: Deep-view contrast of the final situation (increase in contrast, decrease in brightness of the digital image) helps in analysing the picture and allows a true assessment of the remaining lesions

Figure 23: Deep-view contrast of the initial situation dry

Figure 24: Mirror-like comparison of before (lower) and after (upper) treatment

Figure 25: A similar case was planned to be treated in the same way, but after 30 days bleaching, all the spots had disappeared (digital mock-up, right-hand side shows before the treatment, left-hand side shows after treatment)

Lasers in dentistry: gingivectomy by diode laser

Nikhil Sethi[1]

Lasers in dentistry can be divided into two main types: soft tissue lasers and hard tissue lasers. The laser used in this case is the Gemini 810 + 980 diode laser (Ultradent).

The main use of the laser in this case was to scallop the gingival margin of a primary canine to match the contralateral adult canine. It was also a valuable tool for providing haemostasis for the resulting composite addition to the cervical area.

Case presentation

A 42-year-old gentleman attended the practice with a primary upper left canine that had undergone significant cervical wear. Despite the number of years the primary tooth had been present, it was not mobile, and therefore there was no reason to replace it.

The patient was not happy with the colour of his tooth, and the difference in gum height compared to the contralateral permanent canine (Figure 1).

Figure 1.

[1] Dr Nikhil Sethi
Private Practice, London, UK

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Figure 2.

Treatment plan

After bone sounding, it was determined that the cervical margin could be relocated 1.5mm apically without risk of encroaching the biological width. The treatment plan was ordered to correct the gingival discrepancy, and then restore the tooth with composite resin to camouflage, giving the appearance of a permanent canine.

It was also decided to replace the composites on the central incisors to improve aesthetics and close the black triangles.

Treatment

Using the laser in gingivectomy mode, the gingival margin was carefully scalloped 1.5mm apically following a similar gingival scallop of the adjacent teeth (Figure 2).

This was extremely quick and effective with the added benefit of rapid haemostasis and creation of a coagulum, which reduced the risk of gingival crevicular fluid contaminating the field of isolation (Figure 3).

Gingival isolation was reinforced by using some Ultra-Pak retraction cord triple 0 (Ultradent) (Figure 4). After sandblasting and following a self-etching adhesive protocol (after enamel selective etching and rinsing), the tooth was then restored, producing a camouflage effect, copying the right permanent canine.

Six-month review

At the six-month review, excellent gingival symmetry and acceptable aesthetics were achieved (Figure 5). It was observed that the canine was far more similar to the contralateral tooth.

Additionally, the black triangle situation was improved by moving the contact point on the central incisor composite additions to within 5mm of the bone crest (using the principles of Tarnow et al).

Figure 3.

Figure 4.

Figure 5.

Conclusion

A primary observation of interest was the rapid response of healing following use of the laser. In an incredibly short space of time, the patient showed remarkable change.

In summary, the laser was the perfect tool for scalloping the gingival margin with precision, accelerating healing with the added benefit of rapid haemostasis.

Introducing a laser at our practice has allowed a faster process when considering adhesive dental procedures such as composite bonding at the gingival level owing to the ability to create a clean field of isolation after cutting with its instant haemostasis.

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Glass ionomers: the material of choice in paediatric dentistry?

Thomas Trentesaux,[1] Caroline Leverd,[2] Mathilde Laumaille,[3] Marion Jayet,[4] Caroline Delfosse[5]

The range of indications for glass ionomers in paediatric dentistry is extremely varied (early childhood caries, deep carious lesions on mature and immature teeth, etc.). Review of these materials that have undergone significant technical advances.

Although in France, glass ionomer cements (GIC) are mainly used by dentists to lute prosthetic pieces, it must be noted that they are less commonly used as a restorative material. In 2012, 56% of restorations were made from composites in comparison with 17% from glass ionomers[1]. According to the report by the French National Agency for Medical Product Safety (Agence Nationale de Sécurité du Médicament et des produits de santé, ANSM) of April 2015, 100% of dentists in France were using composites in 2012, compared with 40% using glass ionomers, which represent 15-25% of direct restorations[2]. These glass ionomers (GI) still suffer from a poor reputation. This reputation stems from the first glass ionomers developed in the 1970s by Wilson and Kent, as a result of their low resistance to flexion and abrasion. These were low viscosity GIs. Slow maturation and stabilization of moisture exchanges were required to achieve properties close to those of composites after one year. They have since undergone significant improvements and are now an excellent alternative to amalgam. Amalgam should now only be used as an exception, in particular for use in deciduous dentition (last resort use)[3]. GIs can also be a substitute for composites which, on a biological level, can pose a certain number of risks. Therefore, although usage restrictions may exist in some clinical situations, their indications are numerous when treating early childhood caries, deep carious lesions in mature and immature teeth, mineralisation defects, interceptive treatment and so on.

Composition and classification

GIs are composed of a mix of organic acids (polyacrylic acid, tartaric acid and itaconic acid) and fluoroaluminosilicate glass particles. The use of the first low-viscosity GIs was quickly abandoned due to their weak mechanical properties and great sensitivity to the moist conditions of the mouth. New GIs then started to appear on the market. Some GIs have been modified with the addition of resin (RMGI), others are condensable after modification of the liquid/ powder ratio and the particle size (high-viscosity GI - HVGI). The addition of freeze-dried polyacrylic acid to the powder makes it less sensitive to osmosis[1]. One last family (sometimes classified in the HVGI family) is strengthened with very small fillers (< 4 µm), which accelerate the setting of

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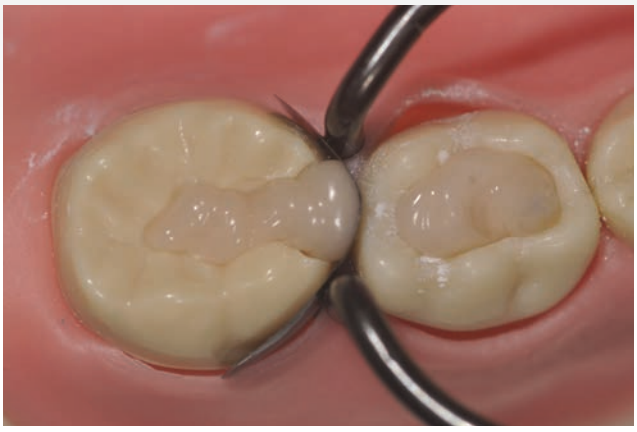

Figure 1: Glass ionomer with a shiny appearance once placed in the cavity.

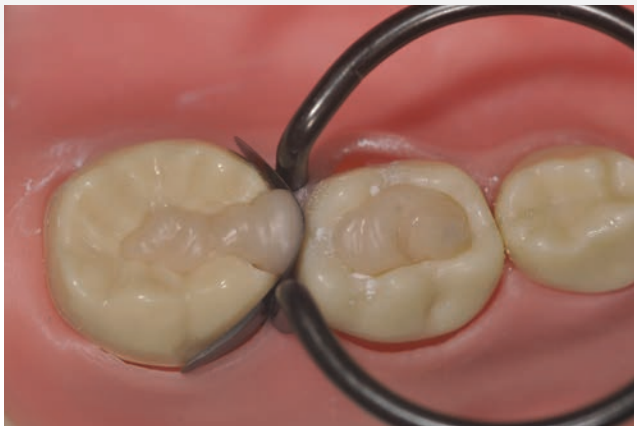

Figure 2: Progressive gelation of glass ionomer. It can be shaped when it turns matt.

the matrix (high-density glass ionomers - HDGI) (table 1). For both HVGIs and HDGIs, a coating is used to markedly increase the long-term mechanical properties (impregnated protected GI). This treatment comprises a nanofilled self-adhesive resin that combines extreme hydrophilic properties with very low viscosity. It compensates for the microporosity of GI[4] which is thus protected from desiccation and occlusal microtrauma for several months. Hence, GI can mature in optimised conditions[1]. GIs, which have long required hand-mixing of the powder and liquid, are today presented in a capsule, which saves time, is easier to use and improves the quality of the mixture.

An acid-base reaction

During the first phase, the H+ ions of the acid attack the surface of the glass particles, liberating in particular the calcium and aluminium ions. The ion release is facilitated by the tartaric acid which forms complexes between them. A polysalt is thus created that hardens gradually[5]. It should be noted that in a clinical setting, the GI has a glossy appearance during this phase. Humidity must be controlled, as this reticulation phenomenon is not stable. The mechanical properties would therefore be altered by desiccation or, in contrast, by excessive moisture addition. The GI should not be manipulated during this phase in order not to disturb the chemical bond. Phase two entails gelation of the material. It becomes matt, at which point it can be shaped (Fig. 1 and 2). The total time of the procedure is around three minutes, but this can vary depending on the type of GI and the manufacturer. Phase three entails maturation of the material. LVGIs required almost one year to reach the mechanical properties of a composite. This time has been reduced to a few hours for the latest generation of GIs.

Unique and numerous properties

One of the main benefits of these materials is their natural adhesion to dental tissues. This adhesion takes place through the ionic reaction of the carboxylate groups on the polyacid molecules with the phosphate ions from the tooth surface[4] and with the charged positive ions of the hydroxyapatite. An interfacial ion-exchange layer is formed. In clinical practice, this intrinsic adhesion obviates the need to use an adhesive. Nevertheless, in order to improve micro-mechanical adhesion, the use of a conditioner is recommended for treating the tooth surface. The latter reduces surface tension, eliminates the smear layer and partially demineralises the dentinal tubules. The wetting of the glass ionomer will be improved. This surface treatment is composed of a polyacrylic acid with concentrations between 10 and 20% for an application time of 10 to 20 seconds, depending on the dilution. This conditioner has become redundant for the latest generation of glass ionomers HDGI, which is intrinsically more acidic and does not require this usage. However, this information should be treated with care, as although the adhesion values remain comparable in the short term, this is not the case after six months, especially since the conditioner contributes to a reinforcement of the seal[6]. In contrast, its use is truly recommended when placing GI-based sealants in order to ensure their longevity. An excellent seal, which is an essential

Figure 3: Preparation for glass ionomer presenting a secondary cavity to ensure a maximum base.

Figure 4: Placement of a Lumicontrast® sectional matrix (Polydentia).

factor in avoiding pulp inflammation, is also ensured by low levels of polymerisation shrinkage. In addition, the incomplete opening of the tubules by the conditioner limits the occurrence of post-operative hypersensitivity. This seal, combined with the physicochemical properties of the materials, leads to remineralisation of the tooth[7]. GIs are therefore biocompatible and bioactive materials thanks to the release of fluoride, in particular during the first months after their placement, which provides them anti-caries properties.

But what about the true mechanical qualities?

These have significantly increased with the arrival of impregnated, protected HVGI, especially due to the increase in the number of fillers and the variability of their size. The placement of a thin protective coating (35 to 40 µm) increases the GI's hardness and resistance to wear, while also protecting it from moisture contamination[8]. Studies comparing amalgam restorations with GI restorations on deciduous teeth have demonstrated similar survival rates over two years[9]. Randomised clinical studies comparing restorations on permanent or deciduous teeth showed that there is no significant difference between the survival rates of HVGI and amalgam for periods over six years[10]. Other studies showed similar results when posterior restorations with composite and glass ionomer were compared over four years[11].

The results of these studies justify the use of GIs for occlusal cavities, cervical lesions and small-sized proximal restorations. One six-year study examining the restoration of 1,231 Class II cavities in deciduous teeth presented a success rate of 97.42%[12]. However, creating larger proximal cavities or mesial-occlusal-distal cavities increased the risk of fractures[13]. Restoring cavities in direct contact with heavy occlusal forces alters the durability of the restoration and explains the contraindication against restoring the cusp with this type of material. As far as placing sealants is concerned, Liu demonstrated that there is no difference at 24 months in the ability of a composite resin and a GI to prevent the occurrence of sulcus caries[14]. Mickenautsch evidenced in a systematic review of the literature that there are no significant differences in terms of preventing carious lesions at 48 months in comparison with a composite resin-based sealant, which is often considered as the reference[15].

Additional studies should be conducted to confirm these results over a longer term.

In order to improve the clinical longevity of restorations, two elements in particular should be considered: cavity preparation and the use of a coating. Soft cavities with rounded angles are sought to prioritise saving tissue that, however, present sufficient base to favour the occurrence secondary caries, in particular on primary deciduous molars, which have a strong cervical constriction (Fig. 3).

The use of a coating increases the mechanical properties of the GI [4, 16]. Its use is nevertheless disputed in deciduous teeth. In fact, when their presence in the mouth is limited, it can be prudent in terms of biocompatibility to avoid the use of surface resin when the restorative material does not contain it. In this case, it can be replaced by a cocoa butter type of product (GC), which means humidity can be controlled during the first maturation phases.

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Figure 5: Material required to place a sealant using the press finger technique (glass ionomer, Fuji Triage®, GC).

Figure 6: Pre-operative view of 36.

Figure 7: Cleaning of the sulcus.

Figure 8: Application of cavity conditioner (GC) for 10 seconds, gentle rinsing and drying.

Figure 9: Placement of Fuji Triage® (GC).*

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Figure 10: Application of cocoa butter on the tip of the index finger

Figure 11: Pressing the index finger onto the occlusal surface of 36 to ensure that the GI penetrates into the pits and fissures. Removal of excess.

Figure 12: Post-operative view.

Clinical indications

The spectrum of indications of GIs in paediatric dentistry is extremely varied: sealants, restorations of cervical lesions, temporary or permanent anterior restorations (choice of shade varies depending on the manufacturer), restorations of occlusal cavities, small proximal cavities[17], pulp protection and treatment of deep carious lesions, structural defects [18], traumas, and so on. Their use is indicated both for deciduous dentition and immature or mature permanent dentition. Condensable glass ionomers are an excellent alternative to amalgam[19], and also to composites in terms of biocompatibility. Although the material is reputed to possess low technique-sensitivity, operating protocols must be followed. Indeed, many failures stem from non-compliance with the working time, a poor choice of matrix, poorly adapted preparation or injection of an inadequate amount of material leading to air bubbles or issues with the seal. Humidity must also be controlled to guarantee that restorations will last. The use of a dam is optional but, as well as controlling humidity, using one provides greater comfort to both the young patient and the practitioner. The quality of the matrix is crucial for the success of the restoration (Fig. 4).

Figures 5 to 12 show the placement of a sealant on 36 using Fuji Triage (GC)*, from GC with the press finger technique. The latter enables the material to penetrate into pits and fissures thanks to controlled pressure on the occlusal surface.

Conclusion

Glass ionomers should take on an increasingly significant role in our treatment strategies. Long criticised for their lack of mechanical strength and their poor aesthetic qualities, the latest generations of GIs (high-viscosity GIs and high-density GIs, associated with a surface treatment) are excellent alternatives to amalgam or composite resins. These biocompatible materials can be used for impermeable, durable restorations that limit the recurrence of caries. They perfectly meet the challenges of minimally invasive dentistry, save dental tissue and preserve pulp vitality.

Key points

- Glass ionomers are biocompatible materials that are intrinsicly adhesive.
- Using a coating improves the mechanical and aesthetic qualities.
- Glass ionomers have multiple indications, both in deciduous and permanent teeth.
- Glass ionomers constitute, depending on the clinical situation, an alternative to both amalgam and composites.
- The press finger technique can be used to seal pits and sulci quickly.

** GC Fuji Triage is sold as GC Fuji 7 in Australia*

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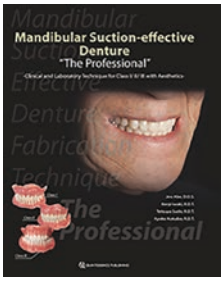

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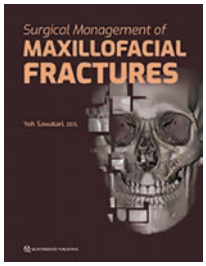

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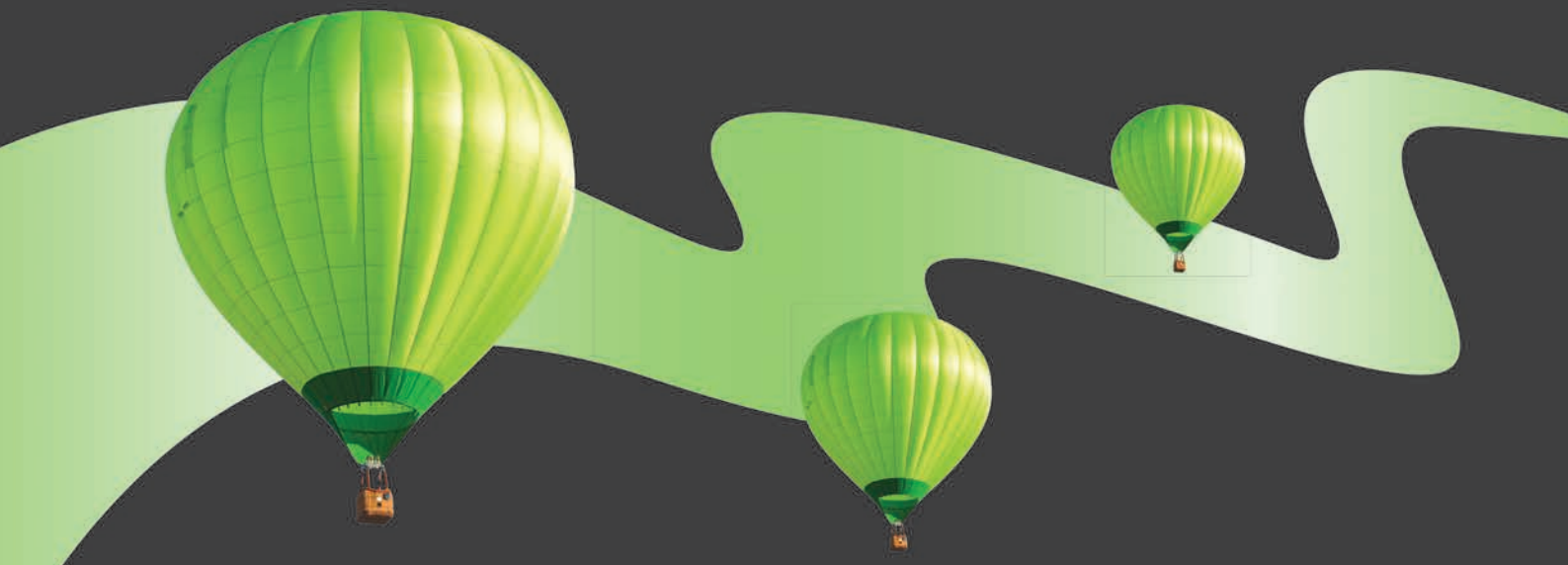

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