Two year clinical results confirm:
The SDR™ Filling Philosophy works

SDR™ - Smart Dentin Replacement
has revolutionized the filling procedure of posterior restorations. The combination of bulk filling with excellent flow-like cavity adaptation makes SDR™ unique. A new controlled polymerization mechanism means that the complex layering of posterior restorations is no longer needed.

Two US experts, Dr. Burgess and Dr. Munoz, conducted a clinical trial that measures the efficacy of SDR™. The following criteria were investigated: fracture, proximal contact and interproximal wear, recurrent caries, post-operative sensitivities, and gingival indices in posterior restorations.

At 12 months 131 restorations and at 24 months 123 restorations were evaluated. SDR™ showed excellent results in all categories.

There have been no observations of recurrent caries associated with SDR™ at base, 6 months, 12 months and 24 months. Post-operative sensitivity related to SDR™ could not be detected for the investigated period of time and no loss of restorations was observed related to SDR™.

The results clearly prove that the SDR™ Filling Philosophy works well in the indicated class I/II restorations. This is a major advantage for the daily practice, because SDR™ provides a simple and efficient placement procedure of posterior restorations.

SDR™ – Smart Dentin Replacement – combines bulk application with self-leveling consistency: simple and efficient for posterior restorations. Experience the unique SDR™ Filling Technique.

www.dentsplymea.com

AEEDC Excellence in Clinical Equipment Award for SDR™ - Smart Dentin Replacement

During the recent UAE International Dental Conference & Arab Dental Exhibition – AEEDC Dubai 2011 – DENTSPLY International was presented with the Excellence in Clinical Equipment Award in recognition of SDR™ - Smart Dentin Replacement.

The AEEDC Dubai 2011 Award winners, selected by the AEEDC Scientific Advisory Committee, recognise the significant achievements of both individuals and organisations and their outstanding contributions to oral health.

The AEEDC Dubai Excellence in Clinical Equipment Award commemorates the dental clinic product/equipment that is a revolutionary breakthrough in professional oral care, or has achieved groundbreaking improvement to an existing product. The criteria for selection of the winning product were as follows:

- Innovation or modernisation of existing equipment, materials, or instruments.
- Outstanding quality of production.
- Safety of product.
- “A” to “Z” time.
- Simplicity of steps.

SDR™ - Smart Dentin Replacement, combines bulk application of up to 4mm with self-leveling consistency for simple and efficient posterior restorations.

Mr. Dean Hallows, Commercial Director – Middle East and Africa, DENTSPHIL International said: “I am proud to accept this award on behalf of DENTSPHIL International for SDR™ - Smart Dentin Replacement. We are delighted that the SDR™ Scientific Advisory Committee has chosen to recognise us in this way, in line with our commitment to Better Dentistry”

For more information about SDR™ - Smart Dentin Replacement, please visit the DENTSPLY Middle East & Africa website: www.dentsplymea.com

DENTSPLY’s Dean Hallows and Dina El Refaey with the AEEDC Excellence in Clinical Equipment Award
Dynamics

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A New Concept for Dentin Replacement in Posterior Composite Restorations

by Jürgen Manhart

1. Introduction
In stress-bearing posterior applications, composite restoratives have been used as an aesthetic alternative to metallic restorations for more than two decades and their popularity has steadily increased, especially over the last few years. The first clinical data gathered for posterior restorations in the early 1980s, particularly with regard to mechanical properties, were not encouraging. The abrasion resistance of those early composites was so low that fillings lost their contours. Fractures, marginal breakdown and marginal leakage caused by polymerization shrinkage also limited the durability of composite restorations. These shortcomings have been considerably reduced by recent improvements of both composites and adhesive systems. However, the negative effects of polymerization shrinkage, such as insufficient marginal integrity, unsatisfactory adhesion to cavity walls, or cuspal deflections continue to be the greatest problem of composite restoratives. The stress developed during polymerization results from the shrinkage effects occurring when the monomers react to form a polymer. Therefore, limiting this polymerization stress without sacrificing the high degree of conversion (which is essential for good mechanical properties of the material) seems to be a promising element in synergistic approaches to the problems associated with shrinkage.

In light-cured composites, the organic phase of the uncured composite paste contains free, uncombined methacrylate monomers. Upon initiation of light curing, these monomers combine, in a free radical process, to form larger oligomers and finally the long-chain, cross-linked, cured polymer. Since the distances between the individual components of the polymer formed are shorter than between the individual monomers before this reaction, polymerization leads to a net loss of volume. This effect is referred to as polymerization shrinkage. As long as the monomers are able to move freely, because they are not yet part of a network, there is only little or no development of polymerization stress. However, as more monomers react, the developing polymer network begins to become rigid, in part due to increasing covalent bond formation (cross-linking) between adjacent polymer chains. As the mobility of the monomers essentially ceases, any further shrinkage of the system results in an increase in polymerization stress. This stress is not only trapped in the composite itself, but also exerts forces on any interface to which the composite is bonded by means of adhesive pretreatment.

The transfer of this polymerization stress is the cause of numerous clinical problems. In a well-bonded composite restoration, the stress resulting from polymerization shrinkage is transferred through the interface with the tooth structure and may cause deformation. This tooth deformation may result in enamel fracture, cuspal movement and cracked cusps. An influence of cavity design on the transfer of polymerization stress is documented in dental literature. The term “C-Factor” describes this influence; it relates to the number of composite restoration surfaces bonded to the tooth by an adhesive to the number of unbonded surfaces. The higher the C-Factor, the greater the stress-related forces acting on the cavity walls. It is apparent that Class I and II cavities have the highest C-Factors, making these restoration types most susceptible to the effects of polymerization stress.

In a less well-bonded restoration, polymerization stress may initiate debonding of the composite from the tooth (adhesive failure) if the forces developed exceed the bond strength. The resulting gap between the restoration and the cavity walls may produce postoperative sensitivity, microleakage, and/or secondary caries. Furthermore, internal stress of the composite has the potential to initiate micro-cracking within the restorative. If the bonding to the cavity walls is strong enough to avoid gap formation during hardening, the stress concentrated inside the composite can still produce micro-cracks. As a result of this phenomenon, a restored tooth remains under stress even when there is no functional loading. This implies a greater risk of failure during tooth function. Therefore, controlling the amount of polymerization stress due to shrinkage may, in all probability, improve the clinical success of composite systems.

2. SDR™ Smart Dentin Replacement Composite
In traditional methacrylate-based composites, visible light curing proceeds rapidly, especially directly after photo-initiation. This rapid polymerization leads to a rapid increase in polymerization stress. The polymer chains cross-link at a high rate thus, the developing polymer undergoes a significant amount of shrinkage, and the network is unable to relieve the resulting stress due to its adhesion to the cavity walls. This explains why, despite efforts to reduce polymerization shrinkage, the effects of the resulting stress are evident across a wide range of composites with sometimes very different shrinkage values. If trapped stress caused by polymerization shrinkage is not dissipated, adverse effects will always be present.

In the traditional, methacrylate-based composite systems widely used today, the most common approach to reducing the effects of polymerization stress is to incorporate inorganic fillers into the polymerizable resin matrix, so as to reduce shrinkage by reducing the resin portion of the composite. Of course, there is a practical limit to the amount of fillers that can be added without affecting the clinical usability of the material. Although the polymerization shrinkage is greatly reduced in these highly filled systems, there is still a dramatic increase in the stiffness or elasticity modulus due to the inclusion of fillers, keeping the stress high.

Alternatively, one could develop a composite with a lower overall modulus to reduce the effects of polymerization stress. Unfortunately, in the commonly available methacrylate composites, a low final modulus results in inferior mechanical properties and is therefore not a practical solution. Another approach would be to replace the methacrylate chemistry with different resin chemistry. But this would also require altering the materials that are used in conjunction with the new composite system (e.g. adhesives).
The low-viscosity, flowable composite “SDR™ Smart Dentin Replacement” (DENTSPLY DeTrey) is based on the traditional methacrylate chemistry. However, it contains a UDMA-based polymerization modulator, designed to permit internal reduction of the stress caused by polymerization shrinkage by means of a slower modulus development in the curing phase without any decrease in the rate of polymerization or degree of conversion. The functional groups of this methacrylate allow it to react with other typical methacrylate systems which are currently used in almost all composites. Thus, traditional methacrylate-based etch&rinse or self-etch adhesives react with SDR™ in the same way as with conventional composites. SDR™ has the required physical and mechanical properties for use as a posterior bulk-fill flowable base. SDR™ (filler content: 68 % by weight, 44 % by volume) is indicated for flowable base as a bulk-fill base in Class I and II composites. However, it contains a UDMA-based traditional methacrylate chemistry.

SDR™ (DENTSPLY DeTrey) is based on the conventional composites. SDR™ has the required physical and mechanical properties for use as a posterior bulk-fill flowable base. SDR™ (filler content: 68 % by weight, 44 % by volume) is indicated for use as a bulk-fill base in Class I and II direct composite restorations and as a cavity liner. After curing, the SDR™ base has to be covered with a methacrylate-based universal or posterior composite to reconstruct the occlusal anatomy.

3. Clinical Case
The following clinical case report describes the step by step replacement of an old amalgam filling in a lower molar with an SDR™ (DENTSPLY DeTrey) composite restoration.

A female patient reported occasional pain caused by osmotic or thermal stimuli in a first lower molar, which had been restored with amalgam. During clinical examination, the tooth responded normally to a vitality test, and a percussion test did not show any abnormalities, either. Probing of the accessible areas of the mesio-proximal box floor with a pointed probe showed a small marginal gap. The patient agreed to receive a direct composite restoration, using the new SDR™ technique.

First, external deposits were thoroughly removed from the molar, using a fluoride-free prophylaxis paste and a rubber cup (Fig. 1).

The depth of the cavity (mesial box floor) was measured with a graduated periodontal probe, because SDR™ can be bulk-placed in increments of up to 4mm (Fig. 2). The amalgam was carefully removed, without unnecessarily damaging the remaining tooth structure (Fig. 2), caries was excavated, and the cavity was fully prepared and then finished using a fine-grit diamond (Fig. 3). Fig. 4 shows the situation after rubber dam application. The dam separates the treatment site from the oral cavity, ensures effective and clean working conditions and prevents any contamination with blood, sulcular fluid or saliva. Contamination of enamel and dentin would greatly reduce the adhesion of the composite to the tooth structure, so that a successful, long-lasting restoration with optimal marginal integrity could not be guaranteed. Besides, the dam protects patients from irritants, such as the adhesive system. The rubber dam is therefore an important tool for work simplification and quality assurance in the adhesive technique. The effort required to apply the dam is very low and also compensated for by eliminating the need to change cotton rolls and allow the patients to rinse their mouths.

Fig. 2 Situation after the removal of the old amalgam filling.  
Fig. 3 Fully prepared and finished cavity.  
Fig. 4 Isolation of the treatment site with a rubber dam.

The following clinical case report describes the step by step replacement of an old amalgam filling in a lower molar. During clinical examination, the tooth responded normally to a vitality test, and a percussion test did not show any abnormalities, either. Probing of the accessible areas of the mesio-proximal box floor with a pointed probe showed a small marginal gap. The patient agreed to receive a direct composite restoration, using the new SDR™ technique.

First, external deposits were thoroughly removed from the molar, using a fluoride-free prophylaxis paste and a rubber cup (Fig. 1). The depth of the cavity (mesial box floor) was measured with a graduated periodontal probe, because SDR™ can be bulk-placed in increments of up to 4mm (Fig. 5). The restorations are completed by reconstructing the occlusal anatomy with approx. 2mm of a methacrylate-based universal or posterior composite.

Fig. 5 Measurement of the maximum cavity depth with a graduated periodontal probe.  
Fig. 6 Determination of the proximal extension with a pre-contoured sectional metal matrix.

Fig. 6 shows the adaptation of a pre-contoured sectional metal matrix with a tension ring, determining the mesial extension of the cavity. The convex shape of the sectional metal matrix can be slightly customized prior to application by careful deformation with thumb and forefinger. The tension ring helps to separate the teeth, so as to compensate for the matrix thickness. The vertical extensions of this ring, reaching into the interdental space, adapted the contoured matrix band to the sides of the proximal box. A plastic wedge was used to tightly adapt the matrix in the cervical area. The wedge was used only to avoid any cervical excess and did not have to be forced into the interdental space, since composites do not require a high packing pressure. To optimize the contours, the matrix can be carefully bent against the adjacent tooth with a medium-sized ball plugger (cold deformation). The creation of a physiologically contoured proximal surface in close contact with the adjacent tooth is still a challenge in composite restorations. Unlike amalgam, composites show a certain degree of visco-elastic recovery after deformation, which is often undesirable and makes the adaptation of the matrix to the adjacent tooth by packing pressure more difficult.

Continued over page >>>
The self-etch, one-component, tert-butanol-based adhesive Xeno® V (DENTSPLY DeTrey) was used for bonding. The adhesive was generously applied to and distributed over the cavity surface with a mini brush (Fig. 7).

At this point, the cavity should be thoroughly checked for any non-shiny surfaces, which may indicate that insufficient amounts of adhesive have been applied to these areas. In the worst case, this may lead to reduced adhesion of the restorative to these areas and inadequate dentine sealing, possibly resulting in postoperative hypersensitivity. If such areas are found during visual inspection, they will need selective reapplication of the adhesive.

SDR™ composite (DENTSPLY DeTrey), available in one translucent universal shade, was then bulk-placed in the cavity as a base in a 4mm increment directly from the Compula tip, starting at the deepest part of the defect (Fig. 11).

To avoid any air inclusions, the thin metal cannula of the Compula tip should always be immersed in the material during extrusion. Thanks to its flowable consistency, the composite increment self-levels within a few seconds (Fig. 12). Any air bubbles visible in the material should be eliminated using a probe tip.

Next, Ceram•X™ mono+ composite (DENTSPLY DeTrey) was used to carefully sculpt the occlusal surface and complete the restoration (Fig. 15).

When reconstructing the occlusal anatomy, it is important to sculpt the surface with great care and remove any excess while the material is uncured. This will substantially facilitate the subsequent finishing procedure and reduce it to only a few steps. After light-curing for 20 seconds (Fig. 16), the restoration was checked for any imperfections (Fig. 17), and then the sectional metal matrix was removed (Fig. 18).
of the occlusal anatomy (Fig. 21). The treatment was concluded by applying fluoride varnish to the tooth with a foam rubber pellet.

In the region of the proximal extension, the material was additionally light-cured from the buccal and oral regions (Fig. 19). The polymerized restoration was already well-contoured. After rubber dam removal, the fissure relief and the fossae were further outlined with a pear-shaped diamond finisher. In the next step of the standardized finishing sequence, a round-end bullet-shaped diamond finisher was used to increase the convexity of the triangular ridges and create harmonious transitions between the various features of the occlusal anatomy. After eliminating occlusal interferences and adjusting static and dynamic occlusion, polishing discs were used to contour and pre-polish the proximal surfaces, as far as accessible. Then the restoration was satin-polished using composite polishers.

The final high-shine polish was achieved with the aid of a composite polishing paste. Fig. 20 shows the final result, restoring the original tooth shape of this first lower molar with an anatomical and functional occlusal surface and a physiological proximal contact. The mesial view shows the seamless transition between composite material and tooth structure and the details of the occlusal anatomy (Fig. 21). The treatment was concluded by applying fluoride varnish to the tooth with a foam rubber pellet.

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A 40-year-old patient, visiting the clinic for the first time, presented with amalgam restorations on teeth 14 to 17 (Fig. 1a). In consultation with the patient, it was decided to replace these with composite restorations, in order to achieve a good functional and aesthetic result. It was decided therefore to place restorations using SDR™ as a liner, which was capped by a layer of Ceram•X™ mono+ composite resin material.

One of the great advantages of SDR™ is its very low polymerisation shrinkage stress, which allows it to be applied in up to 4mm increments at a time. The material adapts to all cavity walls to form an even layer without air inclusions due to its low viscosity and self-levelling properties.

This has a number of significant advantages over the conventional composite build-up technique. The procedure is considerably easier, resulting in better and more reproducible high-quality restorations that can be placed in less time. The low polymerisation shrinkage greatly reduces the risks of postoperative pain and microleakage. Any conventional composite restorative material can be used for capping.

In the case presented here, we worked with Ceram•X™ mono+ by DENTSPLY. The favourable consistency of Ceram•X™ mono+ makes this material easy to shape and polish.

Clinical case
The patient received local anaesthesia. While it was taking effect, the shade of the teeth was taken. It matched Vita* A3, corresponding to M5 within the Ceram•X™ mono+ system.

A rubber dam was applied for maximum protection against contamination. After removing the amalgam and excavating the cavity, Palodent® matrices were put in place and secured with wedges (Fig. 1b).

The teeth were etched with 35% phosphoric acid for a total etch time of 20 seconds for the enamel and 15 seconds for the dentine. After thorough rinsing with a gentle water spray, Tubulicide, primer and bond were applied successively. Any methacrylate-based bonding system is compatible with SDR™ and Ceram•X™ mono+.

We believe that it is not possible to create good contacts when two matrices are present in the same interdental space at the same time. We therefore chose to restore teeth 15 and 17 first.

SDR™ was first applied to tooth 15, guiding the applicator tip as far mesially as possible in the prepared cavity. This allowed the SDR™ to flow into the cavity under the pull of gravity. The self-levelling properties of SDR™ ensured optimum adaptation to the cavity walls. As soon as the material had formed an even layer, the matrices were carefully placed with two instruments to provide the appropriate dimensions for tooth 15 (Fig. 2a). SDR™ was immediately polymerised for 20 seconds to prevent the composite from flowing distally. The same procedure was performed on tooth 18 (Fig. 2b).
Subsequently, Ceram•X™ was built up in teeth 15 and 17 in two layers. The first layer extended from the palatal cusps to the SDR™ lining substrate (Fig. 3a), the second layer from the buccal cusps to the first composite layer (Fig. 3b). Two layers were used to keep the shrinkage stress to a minimum. Moreover, this is a relatively simple way to achieve an anatomically correct result (Fig. 3c). After application of the Ceram•X™ mono+, the composite was first shaped with a modified cusp moulding instrument. A Sutter instrument was used to create the fissures. Finally, a small brush was used to make the outline as smooth and straight as possible.

Ceram•X™ mono+ was then applied as described for teeth 15 and 17 (Figs. 5a to 5c).

Any remaining excess composite resin was removed with a polishing stone. The restorations were polished with an Occlbrush.

The matrices of teeth 17 and 15 were carefully removed (leaving the wedges in place), whereupon teeth 14 and 16 were restored.

After inserting the SDR™ material (Fig. 4a) the matrices were again secured in place, this time so as to obtain good contacts (Fig. 4b).

A scaler, a scalpel and interdental abrasive paper were used to remove excess material from the interdental embrasures (Fig. 6a).

To make the restorations look as natural as possible, the fissures were stained with an ochre and brown staining liquid. The staining liquid was applied with a very thin explorer (Fig. 6b), any excess was removed with a microbrush previously immersed in bond. The staining liquid was light-cured for 20 seconds.

Conclusion
The use of SDR™ has a number of obvious benefits in posterior restorations:
• SDR™ can be applied in layers up to 4mm in thickness, considerably speeding up and simplifying the treatment procedure.
• The low polymerisation shrinkage greatly reduces the risks of postoperative sensitivity, microleakage and secondary caries.

*Vita is a registered trademark of VITA Zahnfabrik H. Rauter GmbH & Co. KG.
New Ceram•X™ mono+ with improved sculpting properties

Aesthetics has always been an important topic in restorative dentistry; however until recently this had been limited to the anterior region. With the development of high-performance posterior composite resins this has fundamentally changed. It is difficult to envisage dentistry without composite restoratives and their bio-identical properties, now used routinely in every dental practise.

First generation composite restoratives have continuously improved in handling and clinical characteristics since their introduction. Today’s dentist can choose from high-quality, aesthetic and durable materials, with long-term studies available for many composite materials. To be able to guarantee long-term aesthetic results and excellent strength, selecting the most suitable composite restorative is important. This is because dentists not only have to meet their patients’ aesthetic demands; they must also be highly familiar with the physical properties of the restorative material used. An important development during the past two years has been the exploration and optimization of new filler particles. This development has its' origins in separate specialized composite restoratives for the anterior and posterior restorations. Due to the high masticatory loads, restoratives for the premolar or molar restorations must withstand higher mechanical forces. To achieve this, these materials were usually macrofilled and resistant to masticatory pressure, however there were aesthetic shortcomings.

Microfilled composite restoratives were primarily used in the anterior region and factors like aesthetics and polishability were paramount. For a long time, hybrid composite resins were thought to be the solution to this problem. These restorative materials are characterised by fillers of widely differing sizes, combining the advantages of microfilled with macrofilled resins.

Further improvements in mechanical and aesthetic properties were achieved with the introduction of nanotechnology. In 1997 nanotechnology was first applied to dental materials, in DENTSPLY’s dental adhesive Prime&Bond^NT. In 2003, DENTSPLY combined nanotechnology with methacrylate-modified polysiloxane, resulting in the nano-ceramic restorative composite Ceram•X™ in two variants: 1. Ceram•X™ mono for the single-translucency technique 2. Ceram•X™ duo for the double-translucency layering technique

After five years on the market, more than 18 million Ceram•X™ restorations have been placed over the world. Due to increasing demands on the material and in response to customer requirements, a new version of Ceram•X™ mono has been introduced featuring optimised sculpting properties.

About Ceram•X™ mono+

Ceram•X™ mono+ is a light-curing radiopaque nano-ceramic composite for aesthetic posterior restorations as well as Class III and V restorations using the single-translucency technique. By combining nanotechnology with organically modified ceramic particles, and due to its low (12% w/w) resin matrix content, Ceram•X™ mono+ offers natural aesthetics, superior handling characteristics and an extraordinary low monomer release. The new formulation has improved the consistency of the material and therefore its endurance in comparison to the original version of Ceram•X™ mono. The fissure relief created by the dentist shows no confluence during the sculpting phase, even in the case of extensive restorations which easily allows smaller details to be created. Ceram•X™ mono+ is also less sticky, helping to avoid detachment from the cavity wall during placement of the restorative material. For greater strength and reduced microcrack propagation, efficiently cross-linked nanoparticles of only 2–3nm in size form a polysiloxane matrix. The working time is more than 2 minutes, allowing Ceram•X™ mono+ to be processed under less favourable lighting conditions without gelling. The original shading system which provides an aesthetic result with only seven shades for all indications has been retained. These shades are of medium translucency and cover the full Vita® range. The 16 Vita® shades were assigned to groups of similar value in chroma resulting in seven groups of up to three Vita® shades that are covered by the Ceram•X™ mono+ shades M1 to M7. Shade selection can be performed either with the Vita® shade guide or with Ceram•X™ mono+ shade tabs. The i-shade label shows which Ceram•X™ shade corresponds with which Vita® shade.

Ceram•X™ mono+ is based on the same formula as Ceram•X™ which has been successfully used all over the world since 2003 and is therefore covered by many years of clinical experience and a considerable number of published studies.

Clinical case

A 19-year-old male patient appeared for a routine check-up. As there were no current bitewing radiographs available the corresponding x-rays were taken bilaterally. The radiological diagnosis showed proximal caries with dentin involvement on the:

- mesial aspects of tooth 47
- mesial and distal aspects of tooth 46
- distal aspect of tooth 45

None of the defects had been detectable intraorally by clinical examination. The patient was informed of his options and decided in favour of aesthetic composite restorations. At the patient’s request, the right inferior alveolar nerve was anaesthetised by a block injection. While the patient was waiting for the effect of the anaesthesia, the teeth to be restored were cleaned with non-fluoride polishing paste. The shade was taken on the still moist teeth using a Vita® shade guide converted to the corresponding Ceram•X™ mono+ shade with an i-shade label. As these were the teeth of a young patient, the shade choice for both restorations was A2, corresponding Ceram•X™ shade M2.
When the local anaesthesia had taken effect, a conservative tooth preparation was performed. They began with tooth 46 because it had to be prepared both mesially, distally and the defects were most pronounced. Restoring all lesions in a single session had the advantage that the defects on teeth 45 and 47 could be prepared in a minimally invasive manner without impinging on the line angles approaching them through the cavities of tooth 46. Once the preparation had been completed, the operating field was isolated with rubber dam for maximum contamination protection (Figures 1 and 2). Teeth 45 and 47 were restored first, followed by the conditioning and restoration of tooth 46.

The cavities were thoroughly rinsed with a water spray. Excess water was air-thinned carefully, without drying the dentine. Using the total-etch technique, 36% etching gel (DeTrey® Conditioner 36 Gel) was applied inside the cavities, starting from the enamel. The soaking time was 20 seconds on the enamel and 15 seconds on the dentine. At the end of the required etching period, the cavities were thoroughly rinsed to keep gel residue from being trapped in the collagen fibre matrix. This could have caused postoperative symptoms in the dentine. After rinsing, excess water was removed from the cavities with a soft air stream, taking care not to over-dry the sensitive dentine in order to prevent the exposed collagen fibre matrix from collapsing. The restorations for teeth 45 and 47 were placed first, without using a matrix band, and a partial matrix band was placed on tooth 46.

A generous layer of the one-bottle XP BOND® adhesive (DENTSPLY) was applied to all prepared enamel and dentine surfaces with a microbrush and left in place for 20 seconds without manipulation (Figure 3). After the required soaking time, the ethanol-containing solvent was carefully air-thinned. This process is completed when the adhesive no longer flows within the cavity, yielding a coherent shiny film. This adhesive layer is polymerized for 10 seconds, yielding an oxygen inhibition layer that gives the cavity a shiny surface on which the composite restorative can be applied.

A thin layer (max. 1mm) of X-flow™ (DENTSPLY) in the selected A2 shade was applied as a liner/stress breaker directly from the Compula® Tips and polymerized for 20 seconds (Figure 4). Finally, the cavities were restored incrementally with Ceram+X™ mono+ M2, first converting the Class II cavities into Class I cavities by building up the proximal region (Figure 5). Layers with a maximum thickness of 2mm were built and each polymerized for 20 seconds (Figure 6). The rubber dam was removed and the restorations were finished and polished with extra-fine diamonds and PoGo® polishers (DENTSPLY). The occlusion and articulation were checked, and the tooth surface received a fluoride treatment after the polishing step had been completed.

Conclusion

Ceram+X™ mono+ is a composite restorative that is easy and flexible to use and yields economic yet high-quality direct restorations in the anterior and posterior regions. Its greater endurance and improved sculpting properties provide enough working time for a sophisticated reconstruction without confluence, especially in the posterior region. The simple and easy-to-understand shade system facilitates aesthetic restorations, simplifying the complex composite restoration procedure thanks to an excellent shade match and equally excellent polishability.

References


* Vita is a registered trademark of VITA Zahnfabrik H. Rauter GmbH & Co. KG.
**PRODUCT NEWS**
from DENTSPLY

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**ENDO ACTIVATOR**

*Activate your endodontics*
This innovative device agitates irrigation solutions during endodontic treatment. Evidence-based endodontics has shown that cavitation and acoustic streaming significantly improve debridement and the disruption of the smear layer and biofilm. The EndoActivator® System is designed to safely and vigorously energize the hydrodynamic phenomenon. Activated fluids promote deep cleaning and disinfection into lateral canals, fins, webs and anastomoses. A cleaned root canal system facilitates 3-D obturation and long-term success. Activate your endodontic solutions today with this easy-to-use technology.

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**CALAMUS® DUAL**

**DOWNPACK & BACKFILL**

*Fast and tightly sealed root canal fillings*
The Calamus® Dual is a new device for downpack and backfill obturation procedures. It provides an outstanding solution for time-saving, clean and long-lasting, homogeneous, three-dimensional obturations of root canals. The slim and lightweight hand pieces are ergonomically designed, giving a large operation angle and keeping the root canal entrances clearly visible. The easy to “click-on” electric heated pluggers are available in sizes small (ISO 40, taper .03), medium (ISO 50, taper .05) and large (ISO 60, taper .06). These three models constitute a complete range, with sizes, tapers and stiffness that are optimised for most cases.

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**WaveOne™**

*Bringing simplicity to endodontics*
WaveOne™, from DENTSPLY Maillefer, sets new standards in endodontics by bringing simplicity to the root canal shaping procedure, using only one NiTi instrument per root canal in most cases. The WaveOne™ motor works in a reciprocating mode. A large rotating angle in the cutting direction provides high efficiency, whereas a smaller angle in the reverse direction allows the WaveOne™ file to safely progress along the canal path, whilst reducing the risk of a screwing effect and file breakage. The shaping time is decreased by up to 40% versus a traditional continuous rotary technique. The WaveOne™ file geometry was conceived specifically to benefit from the reciprocating movement of the WaveOne™ motor. The DENTSPLY M-Wire™ NiTi provides flexibility and resistance to cyclic fatigue. The global performance of WaveOne™ is the result of an extensive collaboration between DENTSPLY and some of the most prominent Endodontists in the world.

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**ChemFil™ ROCK**

*Advanced Glass Ionomer Restorative*
For dentists faced with compromised clinical situations, ChemFil™ Rock is the brand of Glass-Ionomer restoratives that delivers simplicity and durability. Its unique zinc-reinforced chemistry offers excellent mechanical properties and a simplified placement process. ChemFil™ Rock offers up to 25% higher strength compared to other leading brands’ and excellent resistance to fracture and wear. Considering the principal advantages of Glass Ionomers, ChemFil™ Rock is an important step towards an easy, economic and reliable basic restorative material.

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*data on file*
More than performance

Xeno® V+ is the one component self-etching adhesive that provides more than just performance. Why do dentists switch to a new dental adhesive? In most cases it is simple: performance and convenience are the most important purchase criteria. The new improved Xeno® V+ offers both the excellent Xeno® bonding performance plus additional new convenience features, reduced light curing time (only 10 seconds) and a new patient friendly aroma. The new version, Xeno® V+, will be available from September 2011.

The future is bright

The new SmartLite® Max LED Curing Light provides an array of features so you can perform procedures conveniently and flexibly. Dual Wave length LEDs offer confidence that any restorative material is being thoroughly cured the first time around (dual LEDs are for photo-initiators in the 390-460nm wavelength range.) With multiple modes (boost, ramp, pulse and standard) you can perform the way that suits each dental case best. There is a long-lasting battery, and with cordless or corded operation, you can avoid running out of battery in the middle of a procedure. The SmartLite® Max LED Curing Light is also fan and vent-free to allow for easy disinfection.

Stop layering, start filling!

SDR™ is the first bulk-fill flowable composite base material saving up to 40% of time versus conventional layering composites. SDR® Posterior Bulk Fill Flowable Base is a single component, fluoride containing, visible light-cured, radiopaque resin composite restorative material designed to be used as a base in Class I and II restorations. The SDR® material has handling characteristics typical of a “flowable” composite, but can be placed in 4mm increments with minimal polymerization stress. SDR® has a self-levelling feature that allows intimate adaptation to the prepared cavity walls. Available in one universal shade, it is designed to be overlayed with a methacrylate based universal/posterior composite. *data on file
Case Report

AH Plus® and Core & Post

Authors: Dr. André Reis and Dr. Érico de Mello Lemos

This clinical report describes a reliable, fast and easy protocol for the aesthetic rehabilitation of a patient that presented a large, discoloured composite restoration, and compromised pulp vitality on the left central maxillary incisor.

A 21-year-old male patient was seen at the Graduate Operative Dentistry clinic of the Guarulhos University School of Dentistry with the chief complaint of “poor aesthetics” especially due to the presence of a discoloured left central maxillary incisor. His dental history included an accident that resulted in a horizontal fracture of the tooth. It had been restored with a composite resin and intra-dental metal pins were used to retain the restoration. Thermal testing revealed that the tooth had compromised pulp vitality. The proposed procedure included endodontic treatment, fiber post cementation and preparation for a full-coverage all-ceramic crown.

Endodontic treatment and post cementation were performed in a single appointment. For the endodontic treatment, the endodontic auto-mix sealer AH Plus® Jet™ (DENTSPLY) was used and for the post cementation and core reconstruction, the DENTSPLY Core&Post system was used.

Description of the step-by-step protocol:

Preliminary intra-oral view of the maxillary anterior teeth presenting severe discoloration due to trauma and previous restorative treatments.

Access surgery to the root canal under rubber dam isolation.

An initial radiograph was taken. Even though there was no sign of periapical alterations or clinical symptoms the tooth had compromised vitality.

NiTi rotary instrumentation: ProTaper® Universal files (DENTSPLY Maillefer) were used up to file size F5.

The AH Plus® Jet system is very easy to use. The auto-mix syringe makes the application of the sealer faster than the standard version and promotes a homogeneous mixture between the cement components.

Application of the endodontic cement into the root canal using AH Plus® (DENTSPLY DeTrey) with the aid of an auto-mix syringe and Intra Oral Tip.

ProTaper® Universal Gutta-percha point size F5 (DENTSPLY Maillefer) was selected. Perfect adaption was achieved in the determined working length.

Palatal view of the central incisors. Note the presence of the metal pins used for retention of the old composite restoration.

Andre F. Reis received his M.D. and D.D.S. degree from the Piracicaba School of Dentistry, University of Campinas, Brazil. In 2005 he received his PhD in Restorative Dentistry from the University of Campinas and the University of North Carolina at Chapel Hill, NC, USA. Currently he is Assistant Professor, Clinical and Pre-clinical Instructor of Operative Dentistry at the Guarulhos University, Sao Paulo, Brazil. He also maintains a busy private practice focused on adhesive dentistry with composites and ceramics.

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After the mixture of adhesive system and activator was applied into the root canal, excess solvent was removed with an air stream and excess adhesive solution was removed using paper points to avoid pooling into the root canal.

This picture shows the tooth immediately after the endodontic treatment, and prior to the gutta-percha removal for post preparation.

After rinsing with water, paper points were used to remove excess water.

Before applying luting procedures, the fit of the fiber post was tried in the root canal.

After mixing one drop of XP Bond® with the Self Cure Activator in the CliXdish™, the mixture was applied over the fiber post surface and excess solvent was removed with a gentle air stream.

After the Largo Peeso Reamer No 1. (DENTSPLY Maillefer) was used for removal of the gutta-percha and endodontic cement, the Precision Drill No. 2 (DENTSPLY Maillefer) was used for the preparation of the root canal according to the fiber post that was selected - X•post™ No. 2 (DENTSPLY DeTrey).

This figure shows the tooth immediately after the endodontic treatment, and prior to the gutta-percha removal for post preparation.

After the mixture of adhesive system and activator was applied into the root canal, excess solvent was removed with an air stream and excess adhesive solution was removed using paper points to avoid pooling into the root canal.

Radiographic image after gutta-percha removal for preparation of the post bed.

Radiography immediately after endodontic treatment.

Phosphoric acid, such as DeTrey Conditioner 36 (DENTSPLY DeTrey), was applied into the root canal and on dentine and enamel surfaces for 15 seconds.

Insertion of Core•X™ flow into the root canal. The thin-flowing Core•X flow™ composite build-up material is excellently suited for cementing the post and for building the core.

Insertion of the applicator tip into the root canal.

Continued over page >>>
Second appointment: During the second appointment, the tooth was prepared for the ceramic crown and received a provisional.

Final radiographic aspect after post cementation. The perfect fit of the fiber post into the root canal can be observed. Core•X™ flow presents adequate radiopacity, which permits easy identification of the core build-up composite and tooth structures.

This picture shows the first retraction cord already inserted into the gingival sulcus.

This picture shows the second retraction cord being inserted into the gingival sulcus.

The second and thicker retraction cord was removed before the impression was taken. The first (and thinner) retraction cord was kept in place (gingival sulcus) during the impression. This picture shows the VPS (vinyl polysiloxane) Aquasil digit™ impression material being applied.

Final impression. Note the accuracy and sharp details of the preparation margins.

An immediate provisional was made using a silicone mould that was made from the existing tooth. An auto-mix self-cured methacrylate resin was used (Integrity®, shade A1).

The completed restoration.
No System?

DENTSPLY Core & Post System
Adhesive Core Build-up Kit

DENTSPLY Core&Post System – a unique treatment solution for the placement of core build-ups and endodontic posts

- Complete treatment solution for fast and easy procedures
- CTS (Certified Treatment System): Products with proven compatibility
- Excellent performance of system components
Aesthetic Veneers with Ceramco®3
By Dr Paulina Celej & MDT Kasia Subotowicz (author)

Well known material, lesser known application; the other side of Ceramco®3.

For over 10 years I have been using and producing aesthetic restorations with Ceramco® porcelain, initially with Ceramco® II and now with Ceramco®3. Ceramco® is firmly established as an excellent material for PFM (porcelain for metal) work delivering all a ceramist could want from an alloy veneering material: production reliability, easy handling and guaranteed results. But there is a lesser known side to Ceramco®3, that of aesthetic veneers and it is this veneer construction that this article will focus on.

Situation
A young patient was complaining about discoloured upper anteriors and damaged central incisors. The anteriors were darker and greyer than the remaining dentition which had a uniformity of shade and value. Various options and treatment plans were considered with the decision made to construct veneers on the central and lateral incisors in order to match the shade and value of the other teeth (Fig. 1).

Diagnostic Process
Impressions and face bow recordings were taken using a polyvinyl siloxane for maximum accuracy and stability. In the laboratory, master and working models were poured and a detailed diagnostic wax up (Fig. 2) was prepared and returned to the dentist, along with the master model for consultation with the patient. This allowed the patient to compare the current situation with the proposed end result and confirm the treatment plan.

With patient confirmation the dentist and technician worked together to create a detailed shade mapping for the veneers. It is important that this step is carried out prior to the cutting of the preparations as this is when the teeth are in their natural moist state. If this step is done after the preparations have been cut the teeth will have dried out and may exhibit different shading characteristics. The dentist then prepared the teeth with the aid of a silicone key (Fig. 3) that was taken from the diagnostic wax up. A reduction of approximately 0.6mm was done (Fig. 4) and new impressions taken and returned to the laboratory for permanent veneer manufacture. From a stent prepared from the diagnostic wax up, the dentist created provisional acrylic veneers for the patient to wear while the permanent restorations were being made.

A mould of the anterior section was created from the new master model in a highly accurate soft silicone material (Deguform®) (Fig. 5).

To create the refractory model a suitable veneer refractory material (Duceralay Superfit from DeguDent) was mixed and carefully vibrated into the silicone mould. The base of the model should not be too thick or the model will absorb too much heat during porcelain baking, possibly leading to under fired porcelain.

Once set the refractory can be trimmed to expose the cervical margins and if necessary they can be marked for easier identification (Fig. 6).

The model was then degassed in a standard porcelain furnace using the following programme: Start temperature 650°C, dry time 5 mins for models up to 6 units, 7 mins for larger, heat rate of 55°C/min with a high temperature of 1100°C. This temperature is then held for 5 mins (7 mins for larger models).
Veneer Build Up
Prior to build up the area of the preparations were sealed by applying a thin wash of overglaze mixture and firing on a standard glaze cycle. This leaves a hard shiny surface that prevents moisture being absorbed from the porcelain by the refractory during porcelain build up. This layer should be kept as thin as possible to ensure accurate adaption of the porcelain to the fit surface particularly in the cervical and interproximal areas.

The first porcelain layer was an opaceous dentine and dentine modifier mixture placed cervically to match the chroma in the patient’s lower anteriors. Opaceous dentine was then added to break up the outline of the incisal preparation line (Fig. 7).

Using the silicone matrices and the detailed shade mapping the appropriate dentine powder was built to full contour before being carefully cut back for placement of the individual effect. In the cervical third, slightly opaque horizontal lines were recreated with ivory natural enamel whilst opal light, natural enamel blue and clear were used to match the patient’s natural incisal edge. Careful layering of the ceramic is essential not only for shade accuracy but to ensure marginal and cervical accuracy of fit (Fig. 8).

Additions, characterisations and glazing were carried out in the standard way before the veneers were removed from the refractory model. This was done using rotary instruments first to carefully remove the bulk of the refractory material and then lightly sandblasting at approximately 2 bars with clean 25 micron glass beads, taking great care not to damage the veneer margins. Should any correction be needed then this can be done with a low fusing ceramic material.

Checking on master models
The veneers were carefully finished cervically and interproximaly with rubber wheels and cylinders and the fit checked on the master models (Fig. 9). Lateral and protrusive excursions were then checked for any possible interference (Fig. 10). Finally the veneers were etched with a ceramic etching gel making sure that the entire internal (fit) surface of the veneers is covered.

Veneer fitting
On return to the clinic the veneers were tried in to check fit, contacts and shade. Note how the natural teeth have dried out during the try-in process (Fig. 10). Compare this with Figs. 11 & 12 after the veneers have been cemented and the teeth have returned to their natural moistened state. This is why shade mapping should always take place before treatment commences.

The key with the refractory technique is to ensure that the shade mapping is as accurate as possible as it is difficult to check the shade during the manufacturing process.

Conclusion
In my opinion the combination of Ceramco®3 and refractory model techniques can produce veneers, inlays and onlays of the highest aesthetic quality. Delivering in this period of reducing prices and increased time pressure, cost effective and time saving cosmetic solutions to your laboratory.
The flexibility of the tips is a genuine added value. These MAP systems, endo- and retro-kits, are dedicated not only to specialists in endodontics, but will also be very helpful for generalists who can be led to use these devices in their daily practice.

Dr. Stéphane Simon  
University of Paris – Diderot (Paris 7), France  
Associate researcher – University of Birmingham, UK

I am enthusiastic about the MAP System. I fell in love with it two years ago when I saw it at the AAE Meeting and since then I use it in every case, when I use MTA.

Dr. Arnaldo Castellucci  
Dental School  
University of Florence, Italy
Simplicity is the real innovation

- Only one sterile NiTi instrument per root canal in most cases
- Decreases the global shaping time by up to 40%*
- Reciprocating technology respecting the root canal anatomy
- Single use as new standard of care

*data on file
Case Report Start-X™
Calcified Pulp Chamber Floor
By Drs. E.Berutti, G.Cantatore, A.Castellucci

Minimally-invasive dentistry has become the primary goal in all dental fields\(^1,2\). In Endodontics this concept finds its application in ultrasonic instruments\(^3\) which can be used for:

1. access refinement, finding calcified canals and removal of attached pulp stones.
2. removal of intra-canal obstructions (separated instruments, root canal posts, silver points and fractured metal posts).
3. increased action of irrigating solutions.
4. ultrasonic condensation of gutta-percha.
5. placement of mineral trioxide aggregate (MTA).
6. surgical endodontics: root-end cavity preparation and refinement, and placement of root-end obturation material.
7. root canal preparation.

Start-X™ tips consist of five inserts, each tip designed for a specific application, thus simple to use and aimed not only at specialised Endodontists, but above all at the general practitioner.

Other characteristics include efficiency, resistance to breakage and durability. All of the tips are fabricated with a steel alloy and have a water port; thus they can be used with or without irrigation.

All Start-X™ tips have an angle of 110° between the attachment to the handpiece and the working part. This provides perfect visibility while working in all situations. Furthermore, the cutting surface of the Start-X™ tips consists of flat micro-blades. These flat blades have three advantages:
1. Each blade has two cutting angles joined by a flat surface, which translates into optimal efficiency and precision of cut.
2. The blade is sufficiently thick, giving it remarkable resistance to wear.
3. The grooves between the blades collect debris, provide tip cooling and make the insert extremely simple to clean after use.

The Start-X™ tips are available with two different attachments: EMS and Satelec.

Clinical case
Tooth 26, irreversible pulpitis, with calcified pulp chamber floor (Fig. 1 and 2).

Fig. 1
Tooth 26 did not respond to pulp vitality tests. The pulp chamber has almost completely disappeared due to calcification.

Fig. 2
The roof of the chamber has been removed. The calcified matter occupying the pulp chamber is visible.

Elimination of calcification: Start-X™ tip No 5
The active tip is concave in shape to better adapt to the convexity of the floor of the pulp chamber and is provided with micro-pyramids that make it particularly aggressive. Thus it may be used to eliminate the pulp chamber calcifications before starting to shape the root canals. Then the anatomy of the floor with its pigmentation guides the operator towards the canal orifices (Fig. 3).

Fig. 3
The calcification is eliminated using a Start-X™ tip No 5.

Finishing of access cavity walls: Start-X™ tip No 1
This tip has a tapered shape; the tip of the insert is inactive and may be compared to a “Batt” bur. Therefore it is possible, in absolute safety and with great simplicity, to finish the walls of the pulp chamber even if it is highly calcified, with roof and floor almost touching. In these cases, the use of the normal “Batt” bur is impossible, because the inactive tip is considerably larger and the use of normal burs with active tips is both dangerous and invasive.

Furthermore, by placing the Start-X™ No 1 tip in correspondence with the canal orifices it produces the working cones (Fig. 4) for the introduction of NiTi rotary instruments into the root canal, for example the mesial canal of mandibular molars or the buccal canal of the maxillary molars and the canals of maxillary premolars.

Fig. 4
Using a Start-X™ No 1, working cones have been made in correspondence with the root canal orifices; these are indispensable to use rotary NiTi instruments safely.
MB2 canal scouting: Start-X™ tip No 2

The orifice of the MB2 lies along the line joining the mesio-buccal canal and the palatal canal (Fig. 5 and 6). Frequently a depression, almost an isthmus, exists that starts from the mesio-buccal canal and runs towards the palatal canal and at the palatal end of this groove lies the orifice to the MB2(4). In many cases, access to this canal is hindered by a dentinal shelf that must be removed. In other cases, the MB2 has a very sharp coronal curvature, to the extent that the canal orifice is frequently close to the boundary between the wall and floor of the access cavity.

With the Start-X™ No 2, both the dentinal shelf and part of the initial sharp coronal curvature can be eliminated; the orifice to the MB2 is thus transferred onto the floor of the pulp chamber. This enables us to clearly see the canal orifice and subsequently to scout it to the apex without any problem of coronal interference.

The Start-X™ tip No 2 has a tapered shape and the tip of the insert is active. The tip must be moved back and forth along the depression that runs from the mesio-buccal canal towards the palatal canal. At the same time the tip is also pushed mesially; this also cuts the mesial wall of the access cavity, displacing it more mesially. Thus the depression will no longer lie on the boundary between floor and lateral walls of the pulp chamber cavity, but will be situated upon a mesial extension of the pulp chamber floor that we have made by using the Start-X™ tip No 2 (Fig. 7).

Essential bibliography


Based on the simple concept of ONE TIP – ONE CLINICAL INDICATION, each tip in the Start-X™ range offers practitioners a different benefit:

**Tip 1** refines the access of the cavity walls by removing restorations, caries and dentine inferences from the access cavity walls.

**Tip 2** helps locate the second mesiobuccal canal of maxillary molars by removing the dentinal layer in the pulp chamber floor.

**Tip 3** removes calcifications from the pulp or from the root canal coronal third.

**Tip 4** will remove screw or cast metal posts.

**Tip 5** removes calcifications from the pulp chamber floor.
PathFile™

MAKING THE GUIDE PATH ACCESSIBLE TO EVERY CLINICIAN
PathFile™, A NICKEL-TITANIUM ROTARY SOLUTION

- Flexible and resistant to cyclic fatigue, these new files offer many advantages compared to manual solutions.

TREATMENT - RETREATMENT - OBTURATION
- Root canal treatment files
- Retreatment files
- Gutta percha points and 3D warm obturators

X-SMART™

ENDO MOTOR FOR THE GENERAL PRACTITIONER
- Has a simple, large, flat control panel and LCD screen
- Advanced handpiece – light and small contra-angle head that can be adjusted to 6 positions
- Compact and portable – operated without foot pedal and can be battery operated as well as electrically powered
- Three auto-reverse modes

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ENDO FROM A TO Z

DENTSPLY MAILLEFER