

Illustration of the different clinical applications of a nano-ceramic composite: A pictorial essay

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Composite resin materials offer patients a restorative option with excellent aesthetics and acceptable longevity for anterior and posterior teeth.

The advantages of using composite resin materials to restore anterior teeth include: (1) restorations can be placed in one visit; (2) aesthetics and functional results are controlled by the operator; (3) minimally invasive restorative technique; (4) the material is biologically compatible to the gingival tissues when it is properly placed and polished; (5) minimal wear on opposing dentition; (6) easy to handle and manipulate the material; (7) easy to repair compared to ceramic materials (Mopper, 2008).

According to Ruiz (2011) Class I and Class II posterior composite restorations are two of the most common restorative procedures performed by general and restorative dentists in private practice. Direct posterior composite resin restorations are predictable and durable and in many instances their superior aesthetic and tooth-supporting properties make them the optimal treatment option when restoring the posterior dentition (Liebenberg, 1997; Van der Vyver & Bridges, 2002).

Therefore, when developing their latest composite restorative material Ceram.x[®] SphereTEC[™] one (Dentsply Sirona), the manufacturer, did not only focus on improving mechanical strength but developed an innovative filler technology – namely SphereTEC[™] – enabling to improve handling properties as well.

SphereTEC[™] filler technology

The patent applied SphereTEC[™] technology uses primary glass fillers with a mean size of 0.6 µm to create granulates in a mean size of 15 µm. These granulates are produced in a spray drying process resulting in nicely rounded spheres (Fig. 1).

The aim of this pictorial essay is to illustrate the different clinical applications of the new Ceram.x[®] SphereTEC[™] one nano-hybrid composite material, that the clinician can utilize for the restoration of anterior and posterior teeth.

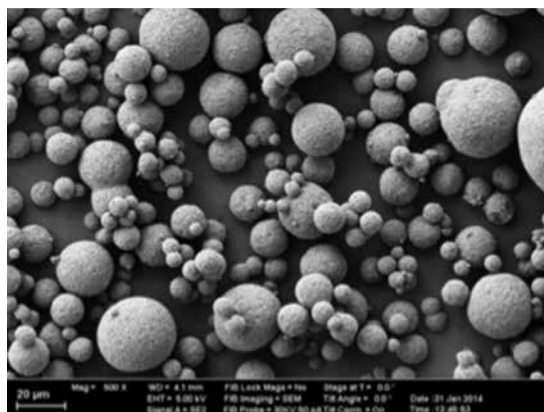


Figure 1: Typical SEM-picture of SphereTEC[™] fillers (Hagner, 2014).

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Case Report 1: Class I restorations



Figure 2: Pre-operative view of mandibular left, first and second molars that presented with fissure caries.



Figure 3: Final cavity preparations after removal of the carious tooth structure resulting in two Class I preparations.



Figure 4: Post-operative view of the two restored molars using the Prime&Bond® Etch&Rinse bonding system (Dentsply Sirona) and Ceram.x® SphereTEC™ one, shade A2 composite resin material.

Case Report 2: Class II restorations



Figure 5: Pre-operative view of maxillary right, second premolar that presented with distal decay resulting in continuous food impaction between the premolar and the molar tooth.

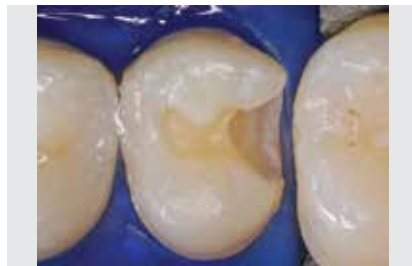


Figure 6: Final cavity preparation after removal of all the carious tooth structure guided by Caries indicator (Seek, Ultradent).



Figure 7: Placement of Palodent® V3 sectional matrix system. Note that in this case there is not good adaptation between the sectional matrix band and the palatal proximal margin (arrow) – this will lead to excess material at this margin that will complicate the finishing of the restoration.



Figure 8: Matrix band adaptation against the palatal proximal margin was improved by packing a small piece of Teflon tape (PTFE Thread Seal Tape, Valtec, 0.1 mm) between plastic footprint of the ring and matrix band to ensure minimal finishing after restoration of the proximal box. After etching with phosphoric acid, Prime&Bond® one Etch&Rinse was applied according to the manufacturer's instructions, before the proximal box preparation was filled with SDR®, posterior bulk fill flowable base (Dentsply Sirona) up to the level of the anticipated contact point and light-cured for 40 seconds.



Figure 9: The marginal ridge was built up with Ceram.x® SphereTEC™ one, shade A2 and the Palodent® V3 ring removed to allow deflection of the Palodent® V3 matrix band away from the cavity margins to allow more space to sculpt the occlusal anatomy during the restoration of the remaining Class I preparation. Note the anatomical marginal ridge that was formed by using the Palodent® V3 pre-contoured matrix band.



Figure 10: Post-operative result of the aesthetically pleasing restoration on the maxillary second premolar after it has been in service for 18 months.

Case Report 3: Class III restorations



Figure 11: Buccal, pre-operative view of a maxillary right lateral incisor with a caries lesion on the distal aspect of the tooth.

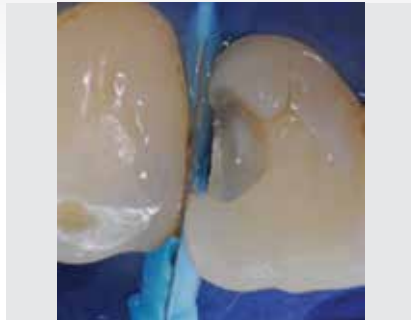


Figure 12: Palatal view of the initial cavity preparation using a WedgeGuard® (Dentsply Sirona) from the Palodent® V3 matrix system to protect the adjacent tooth during cavity preparation.



Figure 13: Buccal view of the Class III restoration restored with Ceram.x® SphereTEC™ one shade A2 after 12 months in service. Note the excellent chameleon effect of the Ceram.x® SphereTEC™ one material resulting in a highly aesthetic restoration that retains its polished surface.

Case Report 4: Class V restorations



Figure 14: Pre-operative view of mandibular left canine, first and second premolars that presented with buccal caries.



Figure 15: Cavity preparations and isolation of gingival cavity margins with retraction cord.



Figure 16: Post-operative view of the three Class V restorations after 19 months in service restored with shade A2, Ceram.x® SphereTEC™ one. Note again the excellent chameleon effect of the material and the superb finish and luster that was maintained.

Case Report 5: Small Class IV restorations



Figure 17: Pre-operative view of a fractured maxillary left central incisor that require a small Class IV restoration.



Figure 18: Post-operative view of the final restoration after 8 months in service. A combination of Ceram.x® SphereTEC™ one shades A1 and A2 was used to accomplish this aesthetically pleasing restoration.

Case Report 6: Endodontic treatment and restoration of a Class I access cavity



Figure 19: Pre-operative, periapical radiograph of a non-vital mandibular left first molar that presented with a large periapical area, probably caused by a previously placed leaking occlusal restoration.



Figure 20: Post-operative, periapical radiograph after root canal obturation, using a single WaveOne® GOLD 35/06 instrument (Dentsply Sirona) for root canal preparation.



Figure 21: Occlusal view of the access cavity after obturation of the root canal system.



Figure 22: Magnified occlusal view of the pulp chamber floor showing remnants of the root canal cement after cleaning the access cavity with alcohol. The remaining cement can influence the bond strength of bonding and restorative materials to cavity walls and margins as it often further dissolves when we apply dentine bonding systems containing solvents.

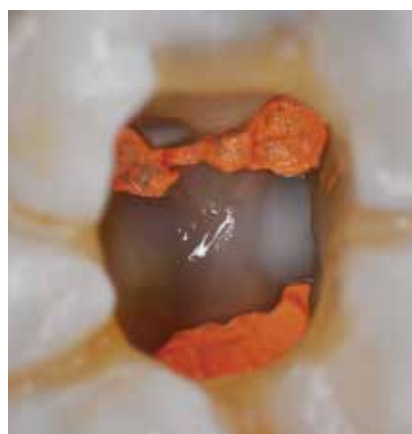


Figure 23: Clean, cement free pulp chamber and walls after air-polishing with Bicarbonate soda using the Aqua-Abrasion unit (Velopex™). This surface will produce higher bond strengths and improve marginal seal upon restoration of the access cavity.

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Figure 24: After etching the enamel margins with phosphoric acid and applying Prime&Bond® Etch&Rinse according to manufacturer's instructions, the bulk of the occlusal cavity was first filled with a 2 mm increment of SDR®, posterior bulk fill flowable base and light-cured for 40 seconds. This was followed by a second 4 mm increment of SDR® and light-cured for 20 seconds.



Figure 25: Post-operative occlusal view of the restoration using shade A1 of Ceram.x® SphereTEC™ one. This material allows for precise sculpting of occlusal anatomy due to the slump resistance property of the material.



Figure 26: Oblique view of a periapical radiograph clearly showing the four root canals that were prepared with WaveOne® Gold size 35/06 instrument. Note the healing of the periapical pathology. Also visible on these radiographs are the excellent adaptation of the SDR® material to the pulp floor ensuring good coronal seal.



Figure 27: Occlusal view of the Ceram.x® SphereTEC™ one Class I restoration after six months in service.

Discussion

The innovative filler technology SphereTEC™, enabling to improve mechanical strength and handling properties of composite materials.

The author's experience with Ceram.x® SphereTEC™ one

is in line with the results of User Evaluations conducted by the manufacturer (Dentsply Sirona, Scientific Compendium Ceram.x® SphereTEC™ one, 2015) which indicate that placement of Ceram.x® SphereTEC™ one is less technique sensitive and is characterized by:

- Easy and fast shade selection.
- Simple, controlled application of the composite paste into the cavity.
- Secure adaptation of the composite paste to cavity floor, walls and margins.
- Easy shaping of the uncured composite into the desired anatomical form.
- Fast finishing and polishing procedure to achieve surface luster.

Technique sensitivity of placement of posterior composite restorations is further decreased by combining Ceram.x® SphereTEC™ one with the flowable bulk fill composite SDR®. This low stress flowable base material can be placed in layers of up to 4 mm in thickness.

Conclusion

In the case reports depicted in this article the combination of Ceram.x® SphereTEC™, SDR® posterior bulk fill flowable

base and the Palodent® V3 sectional matrix system delivered improved and simplified operative techniques to provide patients with more durable restorations.

References

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