

Perfect optical and structural tooth mimetic with a modern composite

By Dr Clarence Tam



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There is no single key to stress-free esthetics in restorative dentistry today. Indeed, the ingredients leading to the perfect direct composite result are multivariate and may depend to some degree on your artistic tendencies that day. It is no secret that the *sine qua non* of cosmetic and restorative dentistry is predictability. Predictable restorative materials embody the hallmarks of chameleon effect, ease-of-polishability, biomimetic physical properties, ideal texture and handling, minimal polymerization shrinkage, superior wear resistance and good radiopacity. Basically, the more the material works and the less you have to, the better. Prior to this point, one turned to bonded porcelain restorations for strength and durability. VOCO's GrandioSO is a cutting-edge nanohybrid composite representing a paradigm shift where direct composite restorations can be placed with such ease, physical and esthetic predictability that you will find yourself reaching for it time and again.

Biomimicry

Biomimicry of a material is the next best thing to actually reproducing natural enamel and dentin for a restoration. Prior to this point, the numerous resin

composites I had previously tested featured numerous struggles in compromise. On one hand, a product may be really optically-perfect, but a nightmare to handle. It may not stick to your instrument, but it may not stick to anything. It might be a pleasure to butter and shape, but lack chameleon effect and radiopacity. In the development of GrandioSO, VOCO has strived to exactly reproduce the optical and physical parameters of natural tooth structure, allowing any direct restoration to restore the original strength of the tooth long-term.

Physical properties

GrandioSO represents the culmination of years of collaboration in research that has produced a composite resin with a strikingly-high filler weight percentage of 89% (w/w). Correspondingly, a high filler percentage equates with low linear polymerization shrinkage, previously one of the main struggles of other composite systems. As recurrent caries is the Number 1 stated reason for clinical failure, this feature allows for maintained marginal integrity and optimal long-term success.

Elastic modulus and thermal behaviour

VOCO has utilized two main ingredients that lend strength to GrandioSO. They have incorporated glass ceramics in a bed of resin featuring 60% functionalized nanoparticles (20-40 nm). Strength is integral in the design of a composite as restorative materials will be subjected to the same dynamic and damaging cyclical loads as natural tooth structure. Lending stiffness back to the tooth as well as minimally-disturbing residual tooth structure must be an uncompromised quality. GrandioSO thus is actually the most tooth-like direct composite material available, boasting an elastic modulus over 16.55 GPa (dentin range: 16.55 to 18.62). The thermal loading figures are equally impressive by showing significant absolute minimal dimensional change within a 5 mm diameter lesion and an 11 degree Celsius variation. This is important to prevent cyclical thermal flexure and fatigue of residual tooth structure, a feature which would in its absence accelerate its demise.



Surface invincibility – composite posing as porcelain? Looking like tooth

The reasons behind the outstanding surface longevity of GrandioSO are multifactorial. Firstly, GrandioSO boasts a Vickers Micro-Hardness reading in excess of 211 MHV that significantly is more than two-fold greater than any other tested composite material and approaches that of human enamel (350-450 MHV). This is significant in the resistance form and feature of any restoration, and is invaluable for marginal resistance to wear and leakage. Indeed, the combination of surface hardness, naturomimetic coefficient of thermal expansion and high filler content make this composite a real alternative to ceramic/porcelain restorations.

Guts and glory: creep, compressive strength and tensile Strength

One of the main factors that biased my attention to using GrandioSO in all posterior bonded restorative applications was its compressive strength. At 439 MPa, it is significant because it is the only composite material tested to date that actually exceeds the compressive strength of my preferred indirect bonded porcelain material (IPS e-max, [Amherst, NY]). In this regard, it behaves like porcelain, an enviable characteristic for any composite. This is important for the durability of posterior restorations because inelastic deformation or “permanent set” will destroy your marginal integrity and marginal bond. Stress under tension is usually the Achilles heel of any material. GrandioSO features a tensile strength value of 72 MPa, nearly twice that of natural dentin.

Stress-free esthetics: meet the chameleon

Sculpting direct composite beauty is hard enough. VOCO has engineered GrandioSO to recognize this by allowing simplicity of not only placement, but also shade selection. Due to the unique optical properties of GrandioSO, often, only a main single shade is required for a completely invisible restoration. If you feel like being ultra-creative and mixing shades, you don't have to. VOCO have created two unique shades: GA3.25 and GA5. In the case shown, GA5 was utilized for the cervical aspect of the MODB subgingival lesion, and GA3.25 was used for the entire coronal aspect. The polishability of this composite is unmistakably exceptional.

Simplicity in esthetics, fortitude in predictability, and pleasure in placement make VOCO's GrandioSO perhaps the single key to predictable esthetics in restorative dentistry today. The following clinical case demonstrates the properties and advantages of this modern nanohybrid composite.

CLINICAL CASE



Figure 1: Roeko (Coltene/Whaledent, Langenau, AG) rubber dam isolation and mesiobuccal oblique angle view of 24 MOD amalgam restoration with proximocervical recurrent caries.



Figure 3: Occlusal view of preparation after amalgam and caries removed.



Figure 4: Adaptation of dual Triodent V3 rings (Triodent Ltd., Katikati, New Zealand) with sectional matrices and wedges in place.

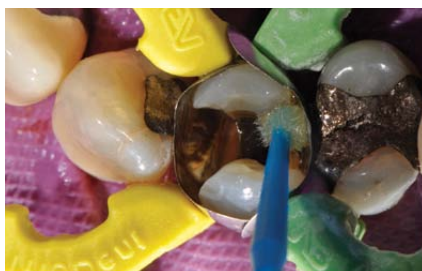


Figure 6: Application of Futurabond NR (VOCO) into the preparation overlapping margins (20 seconds) slightly before air thinning (5 seconds) and light-curing (10 seconds) as per manufacturer's instructions.



Figure 8: Mesiobuccal oblique post-restorative photo showing close adaptation and shade match of GA3.25 GrandioSO to slightly dehydrated tooth surface. Colour integration on full rehydration should be seamless.



Figure 2: Preparation photo with amalgam and caries removed: mesiobuccal oblique angle.



Figure 5: Activation of primer into bonding resin of SingleDose Futurabond NR (VOCO) and mixing of liquid A and liquid B.



Figure 7: Marginal ridge construction coronally with GA3.25 GrandioSO (VOCO), cervically with GA5 GrandioSO.



Figure 9: Pre-polishing occlusal view after rough contouring with NTI (Kahla, AG) football and needle-point diamonds.

Clinical case

An 89-year-old female patient exhibited a case of deep recurrent caries involving the proximocervical surfaces of tooth 24 MODB featuring an old amalgam restoration *in situ*. After clinical and radiographic analysis of vitality as well as assessment of residual tooth structure, it was decided to replace the amalgam restoration with a direct composite restoration. It was ascertained that such a polychromatic tooth featuring extensive pulpal sclerosis would be best-restored with a direct bonded composite resin restoration due to the need to preserve maximal residual tooth structure. The premolar was isolated with rubber dam before the old amalgam removed from the tooth and the caries extirpated by drilling (Figures 1 to 3). This was followed by the adaptation of two sectional matrices (V-ring system, Triodent, NZ), which were fixed using the appropriate tensioners and interdental wedges (Figure 4). Futurabond NR (VOCO), a light-curing self-etch bond, was selected as the adhesive. After activation, the adhesive was massaged in for 20 seconds. The application was followed by five seconds of air drying as well as ten seconds of light-curing, according to the instructions for use (Figures 5 and 6).



Figure 10: Result after occlusal adjustments and final polishing with D*Fine Double Diamond (Clinicians Choice Dental Products, New Milford, CT).

The marginal ridge was constructed coronally using the nanohybrid composite GrandioSO in shade GA3.25, while the cervical marginal ridge was created in shade GA5 (Figure 7). After finishing the mesial and distal proximal walls, the remaining occlusal cavity was incrementally filled with GrandioSO GA3.25, whereby every layer was polymerised for 20 seconds. The shade of the restoration provides an excellent match to the existing dental hard tissue of 24 (Figure 8). Coarse contouring was followed by finishing of the occlusal surface. Polishing culminated in the completion of the restoration (Figures 9 and 10). The post-operative X-ray image confirms the excellent radiopacity of GrandioSO and shows the precise

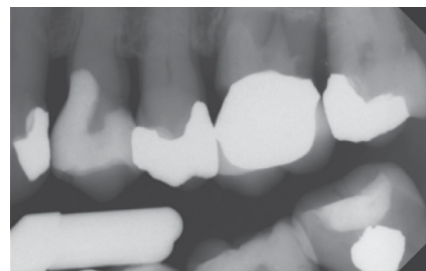


Figure 11: Post-operative PA demonstrating good radio-opacity of GrandioSO and precise adaptation to margins along with natural emergence profile proximally.

adaptation of the restoration at the margins, as well as a natural proximal emergence profile (Figure 11). ♦

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