Protocol on how to use SDR
Prof Peet van der Vyver presents a pictorial essay on the use of Dentsply’s SDR

Recent developments in composite resin materials and bonding technology have made possible the routine use of these materials in posterior teeth (Van der Vyver & Bridges, 2002). Direct posterior composite resin restorations are now 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). The main shortcomings of composite resin materials are polymerisation shrinkage (Dietschi, Magne & Holz, 1994) and polymerisation stress. Polymerisation stress can result in contraction forces on the cusps that can result in cuspal deformation (Pearson & Hegarty, 1989), enamel cracks and ultimately decrease the fracture resistance of the cusps (Wiecezkowski et al, 1988).

This article aims to provide clinicians with a protocol on how to use SDR (Dentsply) as a flowable base material for direct and indirect restorations, by means of a pictorial essay illustrating the benefit of this new innovative restorative material.

Cavity configuration and the method of insertion of composite resin into the cavities can influence the gaps at the interface between the dentine/enamel and the restoration (Walshaw & McComb, 1996). According to Davidson and De Gee (1984), the parallel walls of a box shaped cavity may restrict the flow of composite during polymerization, causing stresses at the resin dentine interface (Feilzer, De Gee & Davidson, 1987). The present generation of chemically or light activated flowable composites undergo free volumetric shrinkage of 4-9 per cent as compared to regular viscosity and packable composites at 2-5 per cent, with an average of 3.5 per cent. According to Jensen and Chan (1985), polymerisation shrinkage stresses have the potential to initiate failure of the composite-tooth interface which could cause deformation of the tooth, which might result in post-operative sensitivity and could even open pre-existing enamel micro-cracks (Jensen & Chan, 1985).

SDR is marketed as a low stress flow-able base material that can be placed in layers of up to 4mm in thickness and each bulk increment light-cured for only 20 seconds, as long as you leave at least 2mm on the occlusal surface for regular viscosity composite resin. According to the manufacturer, a polymerizable modulator was chemically en-bedded into the flowable resin material that allows extended polymerization without a sudden increase in cross-link density. This extended “curing-phase” maximizes the overall degree of conversion, minimizing the polymerization stress by up to 60 per cent compared to conventional flowable composite resins (Inside Dentistry, 2009). The volumetric shrinkage is 3.6 per cent but more importantly, the stress generated during the polymerization is 1.4 MPa, whereas many other flowable composites are above 4 MPa. The material is available in only one universal shade and can be used with any dentine bonding system.

Figs 1-19 outlines two clinical case reports that illustrate the benefits and clinical application of this new innovative flowable base material for direct posterior composite resin restorations.

Base materials are mainly indicated to reduce the volume of filling material (Lutz, et al, 1986).
or to create adequate geometry to the cavity preparation for inlay / onlay preparation techniques (Dietschi & Spreafico, 1997). The shape of the cavity preparation will depend on the extent of the decay or the geometry of the restoration to be replaced. The removal of decay often creates unwanted undercuts which are not compatible with the principles of cavity preparation design for inlays/onlays. In order to preserve sound enamel/dentine as much as possible, the internal tapered design should be obtained by the application of a base material (Dietschi & Spreafico, 1997). Sherrer et al., 1994 demonstrated that the resistance to fracture for full ceramic crowns is significantly influenced by the elasticity of the core material and luting cement. Because of the favorable properties of the SDR material the author is of the opinion that it might be the ideal material to block out undercuts in order to preserve additional enamel for adhesion and to improve cuspal strength during ceramic inlay cavity preparations. Figures 20–29 depicts a clinical case report to illustrate the clinical application of the SDR flowable base material to allow ideal cavity preparation design for indirect posterior inlay/onlay restorations.

Conclusions

Providing the clinician with a flowable base material for posterior direct and indirect restorations that can be placed and cured in bulk must be one of the most exciting technological advancements in dentistry towards technique simplification for what is generally regarded as a highly technique sensitive procedures.

The fact that SDR exhibits excellent adaptation to the preparation walls due to its flowable nature, reducing the potential for void formation on the margins that could lead to post-operative sensitivity or aesthetic failure of the restoration. Another unique characteristic of the SDR material is the self-leveling feature which eliminates the need to manipulate or sculpt the material before curing. This also creates an ideal surface for the addition of any regular viscosity composite resin to complete direct restorations, providing the desired strength, aesthetics and wear resistance for occlusal surfaces.

The reduced polymerization stress of the SDR base material on normal and compromised cusps after conventional cavity preparation might provide the clinician with an improved and simplified operative technique to provide patients with more durable posterior restorations.

Fig 11: SDR: Smart Dentine Replacement (Dentsply) compule tip, which incorporates a fine, needle-like tip for precise dispensing of the material with the attached macro dispensing tip.

Fig 16: Pre-operative view of the upper right maxillary second molar. Clinical and radiographic examination of the upper right first molar revealed a previously placed porcelain inlay restoration and interproximal decay on the mesial aspect of the tooth.

Fig 27: The cavity preparation was prepared for bonding using XP Bond (Dentsply) mixed with the S-Prep activator (Dentsply) according to the manufacturer’s instructions. The translucent shade of Calibra Resin Cement (Dentsply) was used as a lining cement for remanufacture of the premolar restoration.

Fig 28: Completed restoration after finish polishing with a non-cross-linked 3M Inlay/Onlay polishing finishing paste (Fildes-Harr.) illustrating the optical integration of the composite restoration and the shape of the composite restoration. Note the optimal integration of the composite resin and SDR with the surrounding tooth structure.

Fig 29: Immediate post-operative view after removal of the rubber dam. The final restorative material was placed using a self-cure activator (Dentsply) and an engraved polishing paste (3M-Ivoclar) illustrating the optimal aesthetics, improved interproximal contour and the shape of the composite restoration. The material was left to dry for 4 min before the temporary porcelain veneer was etched with a thin layer of Prime & Bond NT mixed with Microfilm (Dentsply).