User Report

DR. RALPH SCHÖNEMANN, MAY 21, 2008

There are numerous self-etch-bonding systems on the market that sometimes differ very much from one another with regards to their chemical composition. It is of great importance for the practicing dentist to understand their effectiveness; and whether these systems can guarantee a permanently sealed bond between the dentin and enamel tooth structure and the restorative material.

There is a need to improve the bonding technique and simplify the application procedure. The ideal product should be a reliable bonding system that saves time; and at the same time, is less susceptible to error during application. Self-etching adhesives simultaneously condition the enamel and dentin. In one single step, they simultaneously penetrate, dissolve and incorporate the dentin smear layer into the adhesive hybrid layer. The previously required step of infiltrating monomers into the demineralised zone is no longer necessary. Consequently, the potential collapse of the collagen network after dentin conditioning is avoided, since its removal via rinsing and subsequent drying is no longer required. A very positive side effect from this method is a significant reduction in postoperative pulp sensitivity.

Since this adhesive can be clinically applied to both prepared and unprepared enamel, good bonding to both of these enamel surfaces is therefore an additional requirement. Exposed dentin can appear to be, to a greater extent, related to the combined abrasive, erosive or functional surface changes. In several instances, no abrasive preparation is required. The same requirement for good adhesion also applies for these different dentin substrate surfaces as well.

This is precisely where an obvious difference in efficiency exists among newer systems. Some of these adhesive systems show good results on dentin, but fail to perform well on enamel. Unprepared enamel appears to represent the highest requirements, since the lowest adhesive values are often measured here. The extent as to how much the different chemical composition and differences between the micromorphology of the prepared or unprepared enamel and dentin substrates influence the non-uniform adhesion values is of great interest.

The different pH values among self-etching adhesives (pH 1-3) have great significance compared to the pH value of phosphoric acid, since this determines how much and how deep the enamel surface will be demineralised. In comparison, phosphoric acid for dental medical uses has a pH value between 0.7 (35 %) and 0.9 (15 %) depending on its concentration. Recent studies demonstrate no relevant statistical differences between the adhesion values for prepared and unprepared enamel surfaces with self-etching adhesives. The requirements for the different scientific examination methods (in vitro) are very high, and should provide good predictability regarding the clinical probability of success. There is great interest as to whether or not a correlation exists between the ultramorphology of the interfaces and the improved adhesion values.

In the following clinical case, One Coat 7.0 self-etching adhesive was used, in which no initial etching of the enamel and dentin using phosphoric acid was required (Fig. A). Synergy D6 was used as the restorative composite material together with One Coat 7.0 from Coltène/Whaledent. The consistency of this composite is very well-suited for modelling complex anatomical occlusal surfaces. The sculpted contours are retained due to its non-slumping, non-sticky consistency until light curing has been performed. This restorative material adapts itself very well against the margins of the cavity. One Coat 7.0 guarantees a durable bond. Shade selection is very easy thanks to Duo Shades which enable accurate self-blending visualization for very esthetic, undetectable results. The self-blending Synergy D6 Duo Shades were created by grouping

Fig. A: Technique sensitive steps such as rinsing and subsequent drying which may lead to postoperative sensitivity, are not required. Etch with phosphoric acid or clean using pumice stone only in cases with unprepared enamel.

Vita™ shades with similar properties such as colour, saturation and intensity. The Duo Shades were then perfected to enhance both the translucency and colour. For example, Synergy D6 Dentin A2/B2 corresponds to the natural dentin layers with colour shades that lie between the colour spectra A2 and B2. This results is a product with an innovative shade concept which clearly simplifies shade selection. In most situations, only one Synergy D6 dentin duo shade is required to create esthetic and undetectable restorations.

Restorations with marginal discolorations do not always require new treatment in areas that can be well-controlled. In the following case, the reason for restorative intervention was due to occlusal pain on an existing composite restoration on tooth 45 which was approximately 8 years old. The shade was selected before placing the rubber dam. The old inadequate restoration was then removed completely under the rubber dam. The secondary caries close to the pulp in the distal region with irregular dentin structure was carefully excavated to avoid opening of the pulp cavity. Figures 7 and 8 show the application of two customised non-elastic partial matrix bands. The matrix bands were reduced in height using a scissors. The wooden wedges were also reduced in height using a scalpel to form a larger spherical approximal contact point. Since the band width is 7 mm, the wooden wedges must be inserted deeply to achieve a sufficient space between teeth 44 to 46. The easily adaptable band was simultaneously contoured externally using one of the anatomical placement instruments from Coltène/Whaledent. A spherical condenser was used to shape the inner contour of the contact point by thinning out the wall thickness of the very soft metal foil. It is advantageous to work with both instruments by leveraging them against each another, and to repeatedly insert the wooden wedges accordingly.

The One Coat 7.0 self-etching adhesive was applied (Fig. 10) for 20 seconds by brushing lightly with the microbrush. The hydrate layer around

Fig. 1: Inadequate restoration for tooth 45.

Fig. 2: Selection of the enamel transparency.

Fig. 3: Roeko Flexidam and rubber dam clamps were applied with Hygenic Wedjets.

Fig. 4: Partial removal of the old restoration.

Fig. 5: View of secondary caries.

Fig. 6: Removal of caries using the Diatech FG 081 016 ML.

Fig. 7: Cavity after excavation of caries.

Fig. 8: Application of customised non-elastic matrix bands from roeko using the anatomical placement instrument from Coltène/Whaledent.

Fig. 9: Forming the approximal contact using the spherical condenser from Coltène/Whaledent.

the collagen is very sensitive and responsible for the stability of the fibres. With traditional phosphoric acid etching, the collagen network can collapse upon longer applications or due to intensive drying after rinsing. The penetration of the monomers into the network of collagen fibres that occurs during this sensitive technique, is a point of weakness. Incomplete penetration can lead to clinically detectable postoperative complications. The existing marginal gaps can lead to the development of secondary caries. Using a self-etching adhesive such as One Coat 7.0, the monomer and etchant reach the deepest point of demineralisation. Too little penetration of the monomer due to collapsed collagen fibres can therefore be excluded. In addition to the benefit of saving time, there is the additional security of reducing postoperative sensitivity. The occurrence of microleakage is highly unlikely for this bonding technique. The polymerisation protocol for One Coat 7.0 requires 10 s and 20 s for each incremental layer of Synergy D6. The first increments transform the existing class II cavity into a class I cavity (Fig. 17).

Fig. 10: Application of One Coat 7.0 in 20 s.

Fig. 11: Gentle air stream of excess bond.

Fig. 12: Coltolux LED is being positioned.

Fig. 13: Polymerisation of the bonding for 10 s.

Fig. 14: Application of the Synergy D6 dentin material.

Fig. 15: Modelling of the distal wall using the spherical condenser from Coltène/Whaledent.

Fig. 16: Polymerisation of the first increments for 20 s.

Fig. 17: Modelling of the mesial wall.

Fig. 18: Polymerisation of the second layer for 20 s.

Fig. 19: Modelling of the dentin core.

Fig. 20: Polymerisation of the third layer.

Fig. 21: Application of the Synergy D6 enamel material.

With the simplified matrix technique, both partial matrix bands initially can remain in situ. With more complex systems, now would be a good time to remove the clamps and matrix bands to improve access. These clamps present an obstruction for me, when I want to create good occlusal morphology. The described technique results in tight approximal contacts, and at the same time, allows good access for ambitious modelling.

Further modelling is followed by the formation of the dentin core, which already contains a simplified fissure system (Fig. 19). Each additional increment is cured for 20 s. The core is then covered with a layer of enamel material to obtain a clear opalescent effect.

This multilayer technique illuminates the appearance of a natural tooth, especially in younger patients (Fig. 21). The consistency of Synergy D6 allows the fabrication of very anatomical occlusal surfaces (Fig. 22). These delicate structures can be contoured and shaped very easily using a microbrush (Fig. 24). Individual characterisation can be incorporated very discretely

Fig. 22: Design of the occlusal fissures.

Fig. 23: Modelling the occlusal morphology using the anatomical placement instrument from Coltène/Whaledent.

Fig. 24: Shaping the fissures and smoothening of the margins.

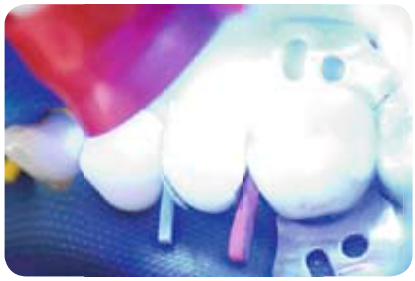

Fig. 25: Final polymerisation for 20 s.

Fig. 26: Opening of the matrices.

Fig. 27: Removal of the fixed partial matrices using a clamp.

Fig. 28: Situation after gross preparation.

Fig. 29: Prepolishing interdentally using Comprepol 2111.1 from Diatech.

Fig. 30: Occlusal prepolishing using Comprepol 2101.1 from Diatech.

Fig. 31: Occlusal polishing using Composhine 2201.1 from Diatech.

Fig. 32: High-gloss polishing using Brushine 7002.1 from Diatech.

Fig. 33: Checking the static and dynamic occlusion using Hanel articulation paper 40µ.

Fig. 34: Static occlusal contacts.

Fig. 35: Finished adhesive restoration using Synergy D6 and One Coat 7.0.

into the fissures. After the last polymerisation, the matrix bands are opened, with removal of excess material (Fig. 27). Due to the good bond to unprepared enamel, this can be somewhat more difficult. In combination with this, the time invested to place well-adapted, non-elastic matrix bands will pay for itself (Fig. 28).

After the removal of the rubber dam, the removal of excess material is performed in interproximal areas that are difficult to access using oscillating fine diamond files. Pre-polishing using polishers from Diatech (Fig. 29 and 30), and the static and dynamic occlusion were checked using Hanel occlusion paper (Fig. 31 and 32). Fine and high-gloss polishing create the last step towards functionally and esthetically perfect results (Fig. 33-35).

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