Latest developments in self-etch adhesives

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Over the past four to five years, there has been a definite trend towards self-etching dentine bonding agents. These materials bring with them the advantages of speed and decreased technique sensitivity through a minimised number of steps involved in their application, as well as an increased tolerance to variations in the operator's technique. Whilst a moist bonding technique is still necessary, these materials are water-based themselves and hence are more tolerant of the dentine being too wet or too dry.

One of the newest 6th Generation (two bottle, two step) self etching dentine bonding agents to become available is Adper Scotchbond SE from 3M ESPE. Previously, 3M ESPE had one of the earliest products to the market place in Prompt-L-Pop, which was formerly under the ESPE banner. The bond strengths achieved by the early version of Prompt-L-Pop were not that favourable and so the product has since been improved and has evolved into the present Adper Prompt, which has much greater bond strengths and is a very good adhesive.

However, in an effort to further improve the self-etch product, 3M ESPE developed a different approach to the self etching concept. All other products on the market work in one of two manners. The first requires that "Bottle A" be the acidic agent in a ready to apply state. This liquid is applied to the tooth and etching commences. The second approach has been to have the acidic agent in an inactive state in order to allow chemical stability of the components and thus afford shelf-life for the product. With this approach, "Bottle A" and "Bottle B" are mixed prior to application and this then activates the acidic monomers. This mixture is then applied to the tooth structure.

3M ESPE's approach was different. Instead of having a ready-active acidic monomer in "Bottle A" or mixing the two bottles prior to application on the tooth, they discovered that mixing "Bottle A" and "Bottle B" on the tooth surface, thus assembling the active adhesive ingredient on the actual tooth structure, lead to the development of greater bond strengths. Adper ScotchBond SE is the product of this research and together with the inclusion of proprietary zirconia-based nanofiller particles, it enjoys the benefit of also being radiopaque, unlike some of the other major products on the market.

This short case presentation demonstrates the application technique for Adper Scotchbond SE.

Case report

As part of an overall smile rehabilitation, the right maxillary canine shown in Figure 1 was treatment planned for a composite veneer. The tooth already had a small existing cervical restoration which was to be removed in the process. As a rubber dam isolation technique was not planned, Trichloroacetic Acid was applied to the peripheral gingival margins.

Figure 1.

Figure 2.

Figure 3.

Figure 4.

Figure 5.

Figure 6.

The existing composite was removed down to the level of clean, non-sclerotic dentine and a gingival retraction cord was placed for further isolation of the margin (Figure 2). This is an important step as dentine bond strengths to heavily discoloured, sclerotic dentine are diminished.

37% Phosphoric acid was then applied to the exposed enamel surface (Figure 3) and rinsed away after 15 seconds. As a general rule, self-etch systems bond very well to etched or instrumented enamel, but less well if the enamel is untouched. When working on anterior teeth where large areas of enamel are present, this is a highly recommended step.

After rinsing away the phosphoric acid etchant, care was taken to lightly air dry the tooth. This resulted in some areas of enamel (but not all) taking on a frosty appearance, whilst at the same time ensuring that the dentine retained a relatively moist look (Figure 4). Slight over-wetting or over-drying of the tooth at this stage is well tolerated by this adhesive system.

Bottle A of the Adper ScotchBond SE system was then applied to the tooth (Figures 5 and 6). This pink coloured liquid is primarily water with some HEMA component. It will allow dissociation of the

Figure 7.

Figure 8.

Figure 9.

Figure 10.

Figure 11.

Figure 12.

acidic HEMA phosphate later. It is important that the entire surface to be bonded is coated with this liquid. The bright pink colour makes it easy to assess the spread of this liquid (Figure 7).

After the pink liquid in Bottle A was applied, the liquid in Bottle B was then immediately applied (Figure 8). The liquid in Bottle B contains the active HEMA Phosphates (acidic component - activated when it comes in contact with the pink liquid), as well as the nanofiller particles, additional monomers for film thickness, and photoinitiators - which provide the yellow colour of this liquid. When the yellow liquid comes into contact with the pink liquid on the surface of the tooth, the two mix, the acid becomes active and begins to etch, and the pink dye is bleached away (Figure 9). This colour change system is a simple and valuable tool for the clinician to see that the entire tooth surface is covered with activated adhesive (Figure 10).

After the Bottle B, yellow liquid had been applied for 20 seconds (using a constant rubbing action), the surface of the tooth was lightly air-dried for 10 seconds (Figure 11).

A second coat of Bottle B, yellow liquid was then applied to the tooth, this time only for 5 seconds and then air dried again for 10 seconds (Figure 12). This second application helps to thicken the layer of monomers in the final set adhesive. The air stream should be used to thin the adhesive in areas where it may seem to pool.

Figure 13.

Figure 14.

Figure 15.

After the second coat of yellow liquid and air drying, the adhesive was then light cured for 10 seconds using a high intensity LED curing light (Elipar FreeLight 2) (Figure 13), and the composite veneer was then placed.

Figures 14 and 15 demonstrate the finished case 11 months after placement. Teeth 13, 12, 11, 21, and 23 were restored with Filtek Supreme XT and tooth 12 was a Nobel Biocare, Replace implant restored with a PFM crown. The aesthetic integration is very nice and the marginal integrity of the composite veneers is perfect at this early stage in the clinical outcome.

About the author

Dr Michael N. Mandikos received his Bachelor of Dental Science Degree with honours from the University of Queensland. He completed a three-year residency program at the State University of New York at Buffalo (USA), graduating with a Certificate in Prosthodontics and Masters Degree in Biomaterials in 1998. He has researched direct and indirect composite resins and he has published several papers in Australian and international journals on clinical and dental materials topics. Dr Mandikos has presented continuing education programs at dental meetings throughout Australia and Southeast Asia and is a Fellow of the Royal Australasian College of Dental Surgeons. He is a Visiting Specialist Prosthodontist to the University of Queensland Dental School and the Royal Australian Air Force. He maintains a private practice limited to implant and restorative dentistry in the Brisbane suburb of Graceville.