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Film Thickness of Dentin Desensitizing Agents on Full Crown Preparations: Influence of Product and Gravity

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Clinical Relevance

Dentin sensitivity is considered a side effect of crown preparation. It has been suggested that dentin desensitizing agents can help to reduce post-cementation sensitivity; however, it is not known how these agents affect the morphology of crown preparation.

SUMMARY

Objective: To determine the thickness of resin layer formed when dentin desensitizing agents are applied to teeth prepared for full crown restorations.

Design: *In vitro* measurements of resin layer thickness.

Methods and Materials: Forty caries-free human premolar teeth were prepared as for a full metal-ceramic crown restoration with a retention groove placed mesiobuccally. Stratified allocation created five groups of eight teeth, which were treated with various desensitizing agents. Four teeth within each group were treated upright, and four were treated while inverted, resulting in a total of 10 experimental groups. Teeth were sectioned and resin layer thickness measured under an environmental scanning electron microscope at certain sites across the section.

Results: Analysis was carried out using three-way analysis of variance. On flat tooth surfaces, light-cured resins (Prime & Bond and Seal & Protect) formed layers of 16.2 ± 8.9 μm and 23.4 ± 10.6 μm, respectively. More concave sites had significantly thicker layers ($p<0.05$) than flat or convex sites. At the internal shoulder angle, mean thicknesses were 84.1 ± 27.8 μm and 104.3 ± 56.6 μm, respectively. At the retention groove, figures were 86.6 ± 3.13 μm and 136.2 ± 72.0 μm. Differences between these two resins were not significant ($p>0.05$). Light-cured resins formed significantly thicker layers on inverted samples at the occlusal indentation only ($p=0.004$), with a mean of 66.9 ± 21.6 μm; upright samples had a mean of 36.6 ±

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DOI: 10.2341/13-215-L

12.4 μm. Self-activating resins (Pain-Free Desensitizer, Viva Sens, and Gluma Desensitizer) formed no consistent layers.

Conclusion: Within the limitations of this *in vitro* study, light-cured resins consistently pooled in convex areas of crown preparations. A great portion of retention grooves can potentially become occluded by resin. The self-activating products tested did not form significant layers.

INTRODUCTION

Sensitivity after cementation of crowns occurs in approximately 10% of patients.[1] Therefore, exposing vital dentin, particularly with crown preparations, represents a challenge to the pulp, which may over time result in loss of vitality and endodontic pathology. Brännström and others[2] noted that some patients are, for unknown reasons, less able or unable to form secondary dentin. Such patients may well be at a greater risk of sensitivity or bacterial contamination after restorative procedures. Postcementation studies suggest that about 10% of patients receiving crowns or bridges will report sensitivity in the following weeks and months.[1,3,4] Furthermore, Valderhaug and others[5] found that approximately 10% of crowned teeth become nonvital after 10 years. Thus, reducing the insult to the pulp is fundamental to restorative dentistry. To reduce the risk of postoperative sensitivity and irritation to the pulp, several methods have been advocated including 1) utilizing the sealing/soothing properties of temporary or permanent luting cements, 2) using antiseptic agents, 3) coating the preparation with fluoride or other varnishes, 4) sealing the preparation with a dentin bonding agent (DBA), 5) applying one of the two groups of chemicals specifically marketed as dentin desensitizing agents (DDAs) or desensitizers, 6) performing laser or ozone therapy, and 7) performing iontophoresis.

Scanning electron microscope (SEM) studies[6–9] have related sensitivity in teeth to patency of dentinal tubules, that is, the fluid is able to flow outward. The greater the number and diameter of exposed tubules, the greater the permeability of the dentin and the likelihood of sensitivity. Dentin permeability and sensitivity are both reduced when the dentin tubules are occluded.[10]

The primary use of DDAs is to control hypersensitivity associated with exposed root dentin and cervical wear lesions. DDAs can be divided into two groups: the first group includes resins that normally require etching or conditioning with or without light-curing, forming a seal over the dentinal surface; and the second group requires the rubbing action of a chemical against the tooth with a brush or cotton pellet, precipitating various proteins or crystals into and around the dentinal tubules. The latter are not light-cured.

Studies on film thickness of DDAs are few. It is not known whether different types of modern DDAs form a layer across crown preparations, whether this is affected by gravity, or whether the layer is of sufficient thickness to cause a clinical or technical challenge. Hypothetically, this film thickness can reduce the available restorative space and result in either esthetically compromised or overcontoured restorations. It may also have a negative effect on the auxiliary retentive features by occluding them.

The aim of this study was to measure the film thickness of the DDAs over features of full crown preparations, such as chamfer and shoulder margins and retention grooves. The objectives were to 1) assess the effect of the gravity over this film thickness and 2) determine if specific crown preparation features are more prone to be affected by the DDAs. The null hypothesis was that the film thickness of the DDAs makes no difference to the morphology of full crown preparations.

METHODS AND MATERIALS

Tooth Selection

Relevant ethical approval was obtained. Caries-free, human premolar teeth, extracted for orthodontic reasons, were collected. Teeth with unusually shaped crowns were rejected. Forty-five teeth were selected. After storage in distilled water and thymol, the teeth were individually mounted in dental plaster so they could be handled without touching the coronal surfaces and located securely during preparation. When mounting, care was taken to ensure that the long axis of the teeth was perpendicular to the base of the plaster mount and the crowns of the teeth were exposed 1 mm coronal to the cementoenamel junction.

Material Selection

Before tooth preparation, five DDAs were obtained to represent a range of chemistries and modes of action. These are presented in Table 1.

Tooth Preparation

Tooth preparation was standardized using a laboratory clamp and a straight handpiece, aligned

Table 1: *Products Used*

Trade Name	Key Specifications	Directions to Use
Seal & Protect	Dentsply DeTrey, Konstanz, Germany This product is the only light-cured dentin desensitizing agent available that is claimed to infiltrate and coat the dentin in the same manner as a dentin bonding agent.	Clean dentin with rubber cup and pumice Wash and dry; do not desiccate Apply liquid liberally Leave undisturbed for 20 s Remove excess with air Light-cure for 10 s Apply second layer Remove excess with air Light-cure for 10 s Remove oxygen-inhibited layer with a cotton pellet
Prime & Bond NT	Dentsply DeTrey, Konstanz, Germany This product is a single-bottle, fifth-generation dentin bonding agent. Though not a desensitizer as such, it can theoretically function as one by blocking dentinal tubules.	Clean dentin with rubber cup and pumice Wash and dry Total etch of enamel and dentin, starting with enamel; no more than 15 s for dentin Wash and dry; do not desiccate Apply liquid liberally Leave undisturbed for 20 s Remove excess with air Light-cure for 10 s Remove oxygen-inhibited layer with a cotton pellet
Pain-Free	Parkell, Edgewood, NY, USA With this product, monomers are claimed to flow into dentinal tubules; calcium within the collagen reacts with the oxalic acid to form calcium oxalate crystals, cross-linked to the tooth structure by a resin network.	Clean tooth surface with moist cotton wool Dry surface with a fresh cotton roll Mix one drop of each of the two components Apply with a cotton pellet for 20-30 s, using a rubbing/pumping motion to encourage the liquid to penetrate the surface
Viva Sens	Ivoclar Vivadent, Schaan, Liechtenstein This material claims to act via infiltration of the monomer and formation of calcium fluoride ions and proteins in the dentinal tubules. Potassium fluoride may have a nerve-inhibiting effect.	Use precoated brush to mix liquid well Clean tooth surface thoroughly Dry with gentle air Gently rub liquid onto the tooth for 10 s Disperse and dry gently with air for 10 s Do not rinse, eat, drink, or brush for 30 min afterward
Gluma	Gluma, Heraeus Kulzer, Hanau, Germany Gluma is claimed to cause the precipitation and coagulation of plasma proteins, reducing dentin permeability and occluding peripheral tubules. It also has an antibacterial effect.	Clean tooth surface and rinse Apply a small amount of liquid with pellets or brushes Leave for 30-60 s Dry carefully until fluid film has dispersed Rinse thoroughly

vertically using a spirit-level (Figure 1). A flat, immobile stage was created such that the tooth could be moved around the cutting bur. Height was adjusted on the upright of the clamp for each tooth such that the finish line would be level around its circumference. Each tooth was prepared for a full-coverage metal-ceramic crown. A 1.5-mm shoulder was cut on the buccal surface and a 0.5-mm chamfer on the lingual surface. A retention groove was placed in the mesiobuccal aspect of each tooth, measuring 1.0-mm deep at its gingival floor. The occlusal reduction was aided by guide grooves to represent 1.5-mm of clearance.

Bulk reduction was carried out using the straight handpiece set to a cutting speed of 40,000 revolutions/min and a flat-ended, tapered diamond bur (#KTSM0043, Skillbond, High Wycombe, UK) that was cooled with a constant stream of water from a handheld syringe. Once the preparation form had been established, fine finishing was carried out by hand with an air-turbine handpiece (SUPERtorque 660, KaVo, Charlotte, NC, USA) and the aid of binocular loupes at 2.5× magnification (Micro 250N, SurgiTel, Ann Arbor, MI, USA). Round (Hi-Di #637, ISO 198-020, Dentsply, Surrey, UK) and flat-ended (Hi-Di #557, ISO 173-013, Dentsply) tapered diamond burs were used of coarse and fine grain. All procedures were undertaken by the same operator (RDB).

Forty-five teeth were selected and prepared as described previously. One tooth was set aside as the control. Four teeth were set aside to run two pilot studies to calibrate the ESEM and choose the best dye material. The remaining teeth were divided into two groups according to whether they appeared larger or smaller than average. Five groups of eight teeth were then created, ensuring an equal balance of large and small teeth across each test group. Each

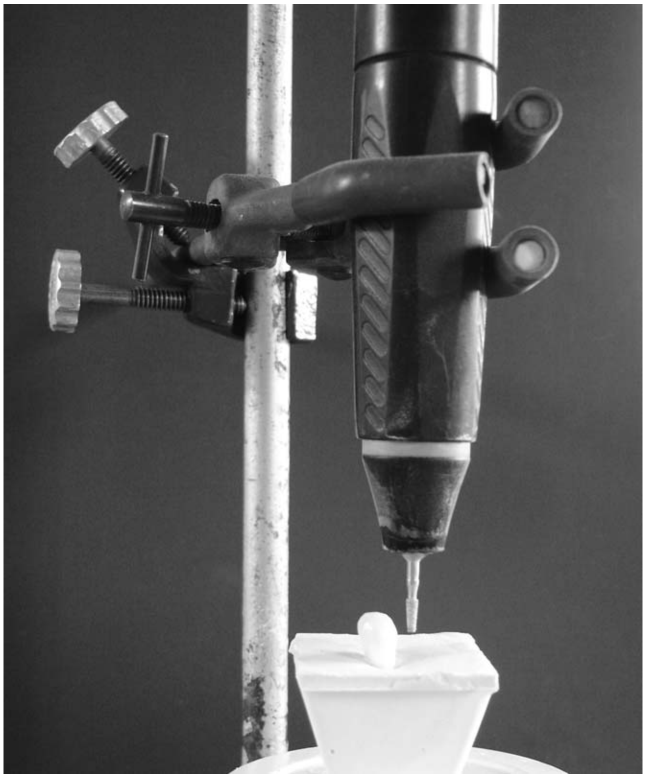

Figure 1. *Straight handpiece mounted vertically in laboratory clamp.*

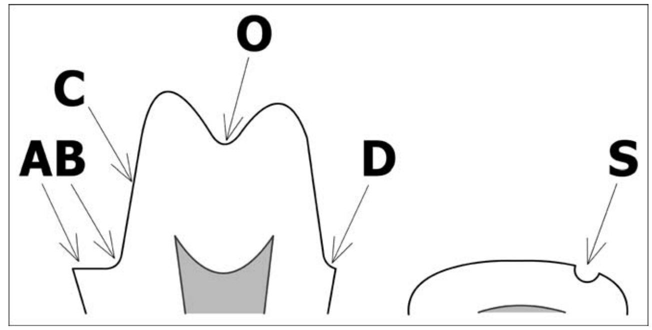

Figure 2. *Measuring positions along tooth section. (A): Shoulder edge. (B): Internal shoulder angle. (C): Midpoint of buccal wall. (D): Internal chamfer angle. Abbreviations: O, occlusal indent; S, deepest part of retention groove.*

group would be treated with a particular DDA; groups were named accordingly: PB (Prime & Bond), SP (Seal & Protect), PF (Pain-Free), VS (Viva Sens) and G (Gluma).

To test the effect of the gravity on the flow of each solution, half of the samples in each group (with an equal balance of larger and smaller teeth) were mounted upside-down, resulting in four teeth in each test group. This was to mimic the variation of tooth orientation that might be encountered clinically. Manufacturers' instructions were followed to apply the DDAs (Table 1). One layer of each material was applied in each group except for the SP (for which two layers were needed according to the instructions). Samples from the PB and SP groups had the oxygen inhibition layer gently removed with a damp cotton pellet. Samples from PF, VS, and G groups were left for 30 minutes (per the instructions for VS) before sectioning.

The teeth were sectioned buccolingually in half using a diamond disc (#SCSMO016 Intensiv, Skillbond), which was positioned in the clamped straight handpiece and water-cooled. Holding the tooth by the root so as to not contaminate the coronal prepared area, the cut surface of each section was then polished to a fine grit with abrasive discs (Soflex, 3M ESPE, St Paul, MN) used in sequence with water. Each section was mounted by the root on a small ball of adhesive putty (Blu-Tack, Bostik-Findley, Paris-La Défense, France) such that it could be transported without fear of damage to the prepared surfaces. In addition, midcoronal sections were prepared from selected slices to allow examination of the retention groove. Specimens were then mounted on a specimen plate for examination under a Field-Emission Gun Environmental Scanning Electron Microscope (FEG-ESEM XL30, Philips, Eindhoven, Netherlands) and a voltage of 10 kV. To avoid operator bias, the specimens were coded using a random number generator (SPSS software version 13.0, IBM Corporation, Armonk, NY) prior to being examined under the microscope.

Measurements in micrometers (μm) were taken at five points along the section of the tooth (Figure 2) and for slices containing the retention groove. The maximum thickness found at each site was recorded.

RESULTS

Group PB: Prime & Bond

A measurable layer formed at most sites with this material (Table 2). As suggested by the ESEM images, PB had a greater tendency for pooling in concave areas of the preparation, regularly reaching thicknesses of 50+ μm in these areas (Figure 3). The internal shoulder angle (point B) and retention groove (point S) showed the most pooling. Flatter areas seldom exceeded 20 μm.

There was a trend for thicker resin layers when the sample was prepared upside-down. One-way analysis of variance (ANOVA) revealed a significant difference at three sites: the buccal wall (p=0.038), the internal shoulder angle (p=0.05), and the occlusal indent (p=0.003).

Table 2: *Results for Prime & Bond (μm)*

Measuring Site	N	Minimum	Maximum	Mean	SD
Shoulder edge	8	0.0	16.3	8.26	4.69
Internal shoulder angle	8	50.8	121	84.13	27.75
Buccal wall	8	1.9	30.1	16.24	8.85
Internal chamfer angle	8	11.8	96.5	64.36	29.08
Occlusal indent	8	25.3	101	57.79	29.85
Retention groove	3	83.2	89.4	86.57	3.13

Table 3: *Results for Seal & Protect (μm)*

Measuring Site	N	Minimum	Maximum	Mean	SD
Shoulder edge	8	0.0	21.0	4.95	8.35
Internal shoulder angle	8	26.8	199	104.28	56.57
Buccal wall	8	10.3	39.5	23.36	10.55
Internal chamfer angle	8	39.3	339	92.06	100.59
Occlusal indent	8	21.3	57.5	45.73	13.09
Retention groove	3	88.6	219.0	136.20	71.97

Group SP: Seal & Protect

A layer of resin was seen at most sites (Table 3); at times this was visible to the naked eye. SP was also seen to accumulate at concave areas of the preparation while forming thinner layers on flat surfaces, approximately ≤25 μm (Figure 4).

Extreme values were obtained from one of the upright samples (#302), which reached ≥200 μm at three sites (B, D, and S). This may be why values generally dropped for the inverted group. Nonetheless, one-way ANOVA revealed no significant differences between the sites. If sample #302 is left out of the calculations, a significant difference is found only at site D (p=0.009). In this case the data skewed in the opposite direction because the four inverted samples all had higher values than the three upright samples.

Group PF: Pain-Free

Minimal surface coverage was seen; however, a degree of infiltration into dentin was apparent (Figure 5). In most cases, no surface layer was observed (Table 4). The greatest thickness seen with this product was 22.1 μm, and all mean values by site were <3 μm. Significance testing is not appropriate for such low numbers; calculating the median was more relevant, and this was 0 μm for all sites.

Group VS: Viva Sens

No consistent surface layer was observed (Table 5) for the VS group. The highest recorded value was 32.6 μm. Although a value of 27 μm was recorded in a retention groove, the other two readings were zero. Despite this, all mean values for this product were <10 μm, and the median value was 0 μm. No statistical analyses were appropriate.

Group G: GLUMA

Minimal to no coverage was seen with GLUMA (Table 6). The highest recorded value was 57.1 μm. No mean was greater than 8 μm, and the median was 0 μm at all sites. No statistical analyses were used.

Univariate Analysis of the Data Between the Groups

The measurements were also subjected to three-way ANOVA analysis followed by Tukey *post hoc* test based on the type of DDA used, orientation of the mounting, and position where the measurement was taken on the preparation. ANOVA confirmed that

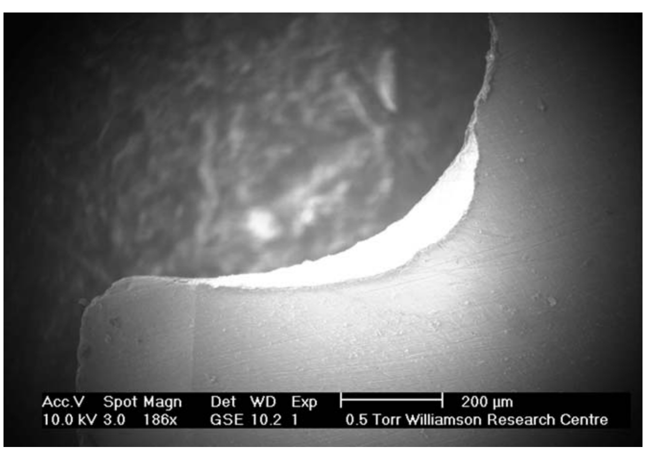

Figure 3. *Point B: a clear pooling effect is seen in the Prime & Bond group. Thickness = 82 μm.*

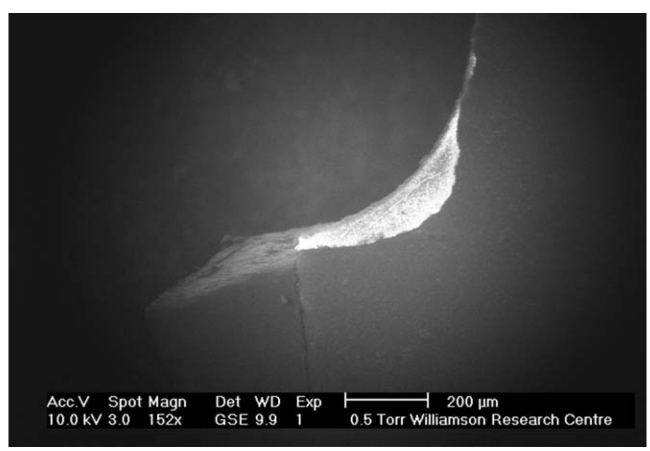

Figure 4. *Point B: 108 μm in the Seal & Protect group.*

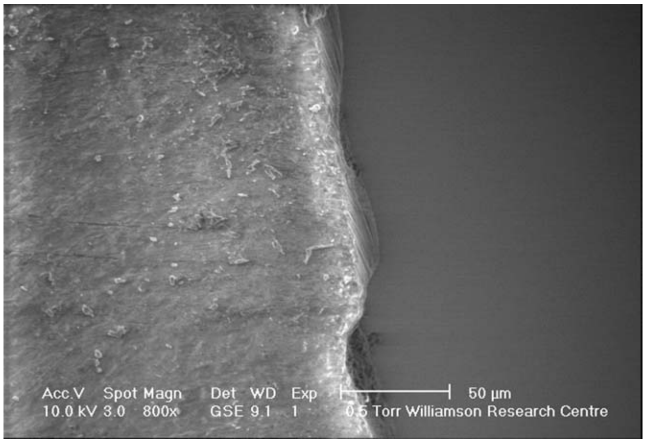

Figure 5. *Point C: 0 μm in the Pain-Free group. Note that the outer tooth layer appears to be infiltrated with resin.*

there were significant differences based on the type of DDA used ($p<0.001$) and the position on the preparation ($p<0.001$); however, orientation of the tooth had no significant influence ($p=0.538$). It was also confirmed that the combination of type of DDA and preparation position had significantly different effects on the results ($p<0.001$).

The *post hoc* Tukey test confirmed that the DDAs could be subdivided into two subsets: subset 1, consisting of PF, G, and VS, and subset 2, consisting of PB and SP. The two subsets were significantly different ($p<0.001$). Subset 2 showed significantly higher readings; however, there was no significant difference within each subset ($p=1.000$ and $p=0.322$, respectively).

The Tukey test based on the preparation position subdivided the data set into three subsets: subset 1, consisting of positions A, C, and O; subset 2, consisting of positions O, D, and B; and subset 3, consisting of positions D, B, and S. There was no significant difference within the subsets ($p=0.064$, $p=0.086$, and $p=0.205$, respectively), but the three subsets were significantly different ($p<0.001$) compared with each other (Table 7).

Table 4: *Results for Pain-Free (μm)*

Measuring Site	N	Minimum	Maximum	Mean	SD
Shoulder edge	8	0.0	12.4	1.55	4.38
Internal shoulder angle	8	0.0	18.0	2.25	6.36
Buccal wall	8	0.0	22.1	2.76	7.81
Internal chamfer angle	8	0.0	0.0	0.0	0.0
Occlusal indent	8	0.0	5.1	0.64	1.80
Retention groove	3	0.0	8.1	2.70	4.68

Table 5: *Results for Viva Sens (μm)*

Measuring Site	N	Minimum	Maximum	Mean	SD
Shoulder edge	8	0.0	0.0	0.0	0.0
Internal shoulder angle	8	0.0	8.2	1.02	2.90
Buccal wall	8	0.0	14.0	1.75	4.95
Internal chamfer angle	8	0.0	32.6	5.09	11.47
Occlusal indent	8	0.0	15.7	3.26	6.20
Retention groove	3	0.0	27.6	9.20	15.93

DISCUSSION

Results were comparable with those of other studies. On a flat, nonconcave surface, the mean thickness of various adhesive resins ranged from 13 to 115 μm[11] and from 3 to 48 μm.[12] At point C (the buccal wall) the adhesive resins had mean thicknesses within both of these ranges: 16.2 ± 8.85 μm (PB), and 23.4 ± 10.55 μm (SP).

At concave areas of the preparations (the buccal chamfer or shoulder), means of 20-355 μm[11] and 14-183 μm[12] have been recorded. At point B (the internal shoulder angles), values of 84.1 ± 27.8 μm (PB), and 104.3 ± 56.6 μm (SP) were found in this study, which again lie within these ranges.

Our ESEM images and measurements show minimal or no coverage with the precipitating-type DDAs, VS and G, and with the self-polymerizing DDA, PF. Previous SEM studies have shown minimal or no surface layer on dentin after treatment with various precipitation-type DDAs and a thin layer with PF.[13–16] G formed a layer up to 327 μm thick[11] but this was after sealing with light-cured adhesive and therefore can be discounted. PF forms a layer of clinically negligible thickness (N. Gendusa, personal communication, 2006) as does G.[11]

The methods used are similar to those in the literature. Pashley[11] and Peter and others[12] added resins to crown preparations before sectioning, polishing, and examining them microscopically. Previous studies have used a fluid cell system to simulate pulpal pressure, first described by Pashley[11] and Paul

Table 6: *Results for GLUMA (μm)*

Measuring Site	N	Minimum	Maximum	Mean	SD
Shoulder edge	8	0.0	11.4	1.43	4.03
Internal shoulder angle	8	0.0	57.1	7.14	20.19
Buccal wall	8	0.0	0.0	0.0	0.0
Internal chamfer angle	8	0.0	0.0	0.0	0.0
Occlusal indent	8	0.0	16.2	2.03	5.73
Retention groove	3	0.0	10.0	3.33	5.77

Table 7: *Tukey* Post Hoc *Testing of the Measurements (μm) By the Position on the Preparation*

Position	Subset		
	1	2	3
Shoulder edge	3.24		
Buccal wall	8.82		
Occlusal indent	21.89	21.89	
Internal chamfer angle		32.30	32.30
Internal shoulder angle		39.76	39.76
Retention groove			47.60
Significance (*p*)	0.064	0.086	0.205

and Scharer.[17] This was unnecessary in the current study as permeability was not being measured.

Although this project succeeded in demonstrating the pooling of DDAs at preparation angles, consistent surface layers were not achieved within DDA types, and a highly variable degree of cover was observed. It was difficult at times to distinguish a genuine resin layer rather than depth of the sample or other artifact. In addition, a gap beneath the layer or a peeling effect was sometimes seen (Figure 6). This peeling may be due to damage from sectioning and polishing or from dehydration of the sample. For this reason, ESEM examination was carried out within three hours of preparation.

Precipitation-type DDAs, where present, appear in much thinner sections than the light-cured DDAs. It is likely that these thin sections are more friable than their counterparts and hence more prone to being dislodged or lost in the process of sectioning and polishing. The manufacturer of VS advises that the patient should wait half an hour after application before eating or brushing teeth, presumably to give the material sufficient time to harden within the dentinal tubules; therefore, a half-hour delay was used in this study for all of the non-light-cured materials. Nonetheless, materials that are susceptible to being removed by tooth brushing are presumably also susceptible to the forces of sectioning and polishing. It is therefore impossible to say whether sites that recorded a zero in fact had a resin layer present before sectioning.

Only PB formed a consistent layer close to the shoulder angle (point A). Three of the eight SP samples had a layer present whereas the other products showed scarcely a sign of any covering (an occasional crystal-like structure was seen). This may be because PB was the only material used that had a dedicated enamel etching step. In addition, resin may be thinned further by the proximity of the convex margin.[18] Peter and others[12] also found their lowest thickness values in this region (3 ± 1 μm for the material Syntac). It should also be noted that pooling of the material in certain areas (for example, point A at the shoulder edge) can have a negative effect on the marginal adaptation of the final restoration.

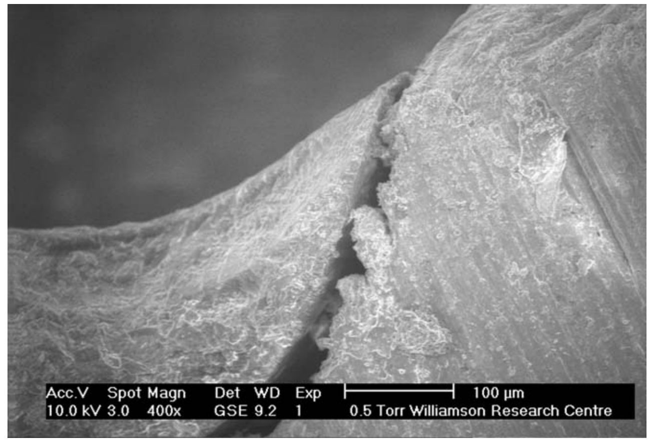

Figure 6. *Gap formation between the dentin desensitizing agent and the tooth.*

When studying the ESEM images, it was found that a number of sites had not been prepared into dentin, and resin was thus applied to cut enamel. In particular, this was seen at the occlusal indent and buccal wall. In the case of PB and SP, this did not appear to matter, as both products are capable of enamel bonding. The remaining three DDAs, however, did not appear to bond to enamel, perhaps because they are designed to enter dentinal tubules; on enamel surfaces they have no suitable bonding site. Most crown preparations carried out *in vivo* do not involve the removal of all enamel;[19] hence, this was maintained in this study.

The question raised earlier was whether the presence of a resin layer at the key sites of a crown preparation might influence other aspects of crown design or its success. Most of the surface areas of a tooth prepared for a conventional crown consist of flat or convex surfaces. Adding an adhesive desensitizing resin such as PB or SP forms a layer 16.2-23.4 μm thick on flat surfaces *in vitro*, resulting in a combined value of 19.8 ± 10.1 μm for both products. A tooth with exactly 1 mm of clearance from its opposing tooth will, after the addition of resin, still have 0.98 mm of clearance, which is a difference of 2%. This is unlikely to make any practical difference.

A standard metal-ceramic crown requires 1.5 mm of reduction on the buccal surface, including space for the luting cement. PB and SP have been shown to pool at the buccal shoulder angle *in vitro*, forming a layer with a mean thickness of 94.2 ± 44.3 μm but reaching values as high as 199 μm. A space of 1.5 mm available for crown fabrication would thus be reduced to approximately 1.4 mm, a difference of 7%, or as little as 1.3 mm, a difference of 13%. If the tooth was underprepared initially, the effect of the resin layer will be further magnified. As mentioned earlier, Begazo and others[20] found widely varying shoulder widths and shoulder angles between 3446 tooth preparations for the same type of crown; however, in another survey, Poon and Smales[21] noted that metal-ceramic crowns in particular had underprepared cusps and buccal shoulders. Despite the use of binocular loupes in our study, once sectioned, many of the teeth were also found to have underprepared buccal shoulders, with a minimum width of 1.25 mm.

When looking at retention grooves, this study found that a layer 89.9 ± 6.67 μm thick was formed with PB and SP. This appeared sufficient under the ESEM to block out a significant portion of the groove; in one extreme case (219 μm) the groove appeared almost totally occluded. The necessary dimensions of a groove in order to have a positive effect on crown retention are subject to debate;[22–24] however, results suggest that the degree of pooling that occurs with light-cured DDAs in retention grooves *in vitro* may be sufficient to render the groove ineffective.

Gravity made a significant difference at one site only: the occlusal indent. Resin layers on upside-down samples were some 30 μm thicker than those on upright samples, suggesting that gravity has made a difference: excess resin has flowed down the mesial and distal walls and across into the occlusal reduction. With a thickness of 66.9 ± 21.62 μm, the layer is unlikely to cause technical problems, unless the occlusal surface has been underprepared. It is also noteworthy that in this study the teeth were mounted upside-down to confirm if gravity has any effect on the results. In real clinical scenarios the operative angles will differ according to the jaw of the operation and position of the tooth; therefore, the results of this study cannot be extrapolated to clinical scenarios with confidence.

There is no clear evidence for any one DDA being more effective on crown preparations than any other, though many different types have their advocates. Available products are either designed for dentin bonding (DBAs) or the treatment of root hypersensitivity (DDAs); no products are specifically designed for preparation sealing. An ideal product would be universally effective at eliminating sensitivity, compatible with all luting or bonding cements, and thin enough in application so as not to risk encroaching on crown space.

DDAs have been successfully used in this way since at least 1992,[25] and with 1-2 million tubules exposed by the average preparation,[19] the theory of blocking or sealing the tubules is plausible. A greater evidence base from further well-designed clinical trials would go some way to solving a problem that has hitherto been dealt with by anecdote as much as by fact. In the meantime, a carefully planned and executed crown preparation, with a view to reducing the risks caused by such factors as oral bacteria, under- and over-preparation, and poor impressions or provisional restorations is unlikely to cause significant sensitivity, and a DDA may well be unnecessary.

CONCLUSIONS

Within the limitations of this study, the following conclusions could be suggested:

1. Light-cured desensitizing resins form a surface layer across crown preparations, pooling in concave areas such as internal chamfer angles and retention grooves. In certain instances, this may affect the space requirements of the subsequent crown.
2. When using light-cured desensitizing resins, the effect of gravity should be taken into account as these materials have a tendency to pool in accordance to tooth position and gravity.
3. Self-curing or precipitating-type desensitizing resins do not form a surface layer.
4. Evidence for the use of desensitizers in sealing crown preparations is scarce. Although their use is unlikely to cause problems, adherence to sound principles in the various stages of crown preparation, provisional restoration, and cementation is at present a more reliable solution for preventing postoperative sensitivity.

Conflict of Interest

The authors of this manuscript certify that they have no proprietary, financial, or other personal interest of any nature or kind in any product, service, and/or company that is presented in this article.

(Accepted 23 January 2014)

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