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Based upon the assessment of data collected from the nineteen patients in this study: (1) There was no statistically significant difference over nine months in the retention of the NPG-GMA or BIS-GMA resin systems to dentin; (2) About 70% of the restorations were present at the end of nine months; (3) The Nuva system, however, had the most favorable surface when viewed by the SEM; (4) Adaptation of the adhesive resin to a rounded cervical defect was more difficult than for an angular lesion.

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A Comparison of an NPG-GMA and two BIS-GMA Adhesive Resin Systems

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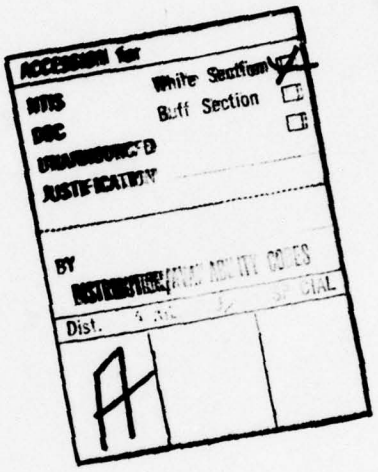

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INTRODUCTION

Studies have shown that unfilled resins can effectively adhere to an acid etched enamel surface.[1-4] Initial efforts to generate an adhesive union between dental resin and dentin, however, were ineffectual and disappoint.[5] There are quantitative and qualitative differences existing between enamel and dentin that obviate similar restorative tasks.[6] Bowen, therefore, was prompted to develop a system to overcome this impasse.[7-9] An adduct of N-phenyl-glycine and glycidyl methacrylate (NPG-GMA) was synthesized. Purportedly, the N-phenyl-glycine moiety forms a chelate ring with the calcium of the hydroxyapatite crystal of the dentin. The methacrylate residue then copolymerizes with a composite resin.[10]

Since cervical defects involve primarily dentin, an evaluation of the efficacy of the NPG-GMA concept would be applicable in this situation. The purpose of this study, then, is to compare an NPG-GMA and two BIS-GMA adhesive resin systems for restoring the facial aspect of noncarious, cervically abraded teeth without the use of local anesthetic and mechanical retention. This will be done both clinically and with the scanning electron microscope (SEM) in the laboratory.

METHODS AND MATERIALS

SUBJECTS: Thirty-two patients with cervical defects were selected. There were thirty-one males, ranging in age from forty-five to sixty-eight years old. The one female was twenty years of age. A total of 255 defects were restored. As a consequence of either patient death or departure from the area, nineteen individuals with a total of 156 restorations were evaluated for the entire extent of the study.

DEFINITION: The cervical defect as defined for this project was a noncarious abrasions or erosion affecting the cervico-facial aspect of the tooth (Fig. 2).

PROCEDURE: The study consisted of three phases:

1. Pretreatment assessment
2. Treatment
3. Follow-up assessments made at three month intervals over a nine month time frame.

PRETREATMENT ASSESSMENT

Each cervically abraded tooth and its investing periodontium was clinically evaluated using a mouth mirror, a sharp Jacob's hook explorer, and a Michigan periodontal probe. The following information was collected:

1. shape of the defect - angular or rounded;
2. gingival health -- the criteria of color, contour, texture, and bleeding were used to judge health or disease;
3. pocket depth -- six points circumscribing each tooth were probed (mesiofacial, facial, distofacial, distolingual, lingual, mesiolingual);
4. tooth sensitivity --
    a. thermal
        (1) cold -- ice placed on occlusal surface or incisal edge and on the cervical defect;
        (2) heat -- warm gutta percha placed as in a. (1);
    b. percussion;
5. occlusal or incisal wear -- a subjective decision, either normal or excessive.

In addition, each patient's oral hygiene regime was recorded. The following items were of interest:

1. tooth brushing technique,
2. type of tooth brush,
3. type and amount of dentifrice,
4. frequency of tooth brushing,
5. ancillary aids, such as floss, stimulants, or proxy brush,
6. aspect of the tooth which was brushed first.

Finally, a silicone impression (Citricon*) was made of each cervical zone to be restored. Impressions were filled with epoxy resin. After separation from the impression the resin replicas were coated with a thin layer of gold and palladium and examined with the SEM in the laboratory.

TREATMENT

Ten to fourteen days after the pretreatment assessment was made the patient was recalled. Three adjacent teeth with cervical defects in the same quadrant (of the same patient) were selected. The teeth were isolated with cotton rolls and a Sphedopter+. Each tooth to be restored was meticulously polished with flour of pumice, rinsed with oil-free water, and thoroughly dried. A clinically dry field was constantly maintained with a high speed evacuation system supplemented by both cotton rolls and a Sphedopter.

A local anesthetic was not administered. No mechanical retention was prepared in any of the teeth to receive a restoration.

*Citricon, Kerr, Romulus, Michigan 48174
+Sphedopter, Union Brooch Corp., 36-4037 St., Long Island City, N.Y. 11101

Each restorative material with its appropriate pretreatment etchant was handled and placed precisely as described by the manufacturer. The resin systems used were:

1. Cervident** (NPG-GMA),
2. Nuva Seal-Nuva Fil*** (BIS-GMA),
3. Adaptic Acid Etch **** (BIS-GMA with 50% phenyl-A dimethacrylate).

Each patient received all three resin systems in the same quadrant. The sequence of insertion of restorations (in an anterior-posterior fashion) was altered in different patients.

After waiting at least fifteen minutes for resin polymerization, minimal finishing was accomplished using a 12-fluted bur# and silicone carbide disks##.

Citricon impressions were then made and treated as described in the pretreatment assessment. The SEM was employed to evaluate:

1. restoration-tooth surface interface -- open or closed margins, and
2. restoration surface -- coarse or smooth looking surface.

FOLLOW-UP ASSESSMENTS

Clinical and laboratory assessments of the restored teeth, restorations, and periodontium were made at three month intervals over a nine month time span. The following qualities were evaluated:

1. gingival health -- the criteria of color, contour, texture, and bleeding were used to judge health or disease;

**Cervident, S.S. White Dental Pro Inter., Phila., PA 19102
***Nuva Seal-Nuva Fil, The L.D. Caulk Co. Div. of Dentsply Inter. Inc., Milford, Del. 19963
****Adaptic Acid Etch, Johnson & Johnson, Dental Products Co., E. Windsor, N.J.
#12-fluted bur, Teledyne Dental Emeco Div., 41 Bancker St., Englewwod, NJ
##Silicon Carbide disk, William Dixon Company, Div. of Grobetfile Co. of Amer. Inc., Carlstadt, N.J. 07072

2. pocket depth -- six points circumscribing each tooth were probed (mesiofacial, facial, distofacial, distolingual, lingual, mesiolingual);

3. tooth sensitivity --

a. thermal

(1) cold -- ice placed on occlusal surface or incisal edge and on cervical restoration;

(2) heat - - warm gutta percha placed as in a. 1);

b. percussion;

4. presence or absence of stain on the resin surface;

5. presence or absence of stain at the tooth-resin interface;

6. marginal integrity of the resin-tooth interface;

7. restoration surface -- smooth or coarse;

8. presence or absence of the restoration.

Citricon impressions were again made at each three month intervals and treated as described in the pretreatment assessment. At these periods the SEM was employed to assist in scrutinizing the following characteristics:

1. restoration-tooth interface -- open margins, chips, voids, etc., or closed margins;

2. restoration surface -- coarse, pitted, abraded, or a smooth looking surface.

To preclude the possibility of examiner bias, restored teeth were recorded using a color code. It was not until the termination of the study that the color coding was translated to reveal which resin system was employed.

The shapes of the cervical defects were categorized as notch or grooved, chiseled, or rounded. Figure 1 shows these three shapes. The frequency

of occurrence of each variety of lesion was noted in Table 1. It is evident that the angular type defects were the predominant form encountered. The notch or groove was the most common angular defect.

It was found in this study that angular defects appeared most often when a scrub technique with a hard or medium tooth brush was used. Also, when the facial surfaces of the teeth were brushed first, angular defects were more common than rounded ones.

The results listed in Tables 2 and 3 show that the periodontium for the patient population studied was healthy.

As indicated in Table 4, sensitivity to cold was the only response elicited. From a total of nineteen patients tested, only five responded with discomfort when ice was placed upon a particular tooth with a cervical defect.

TREATMENT

LABORATORY DATA: The results from the SEM studies will be summarized together with the data collected from the section entitled Follow-up Assessments.

FOLLOW-UP ASSESSMENTS

CLINICAL DATA: The periodontal status of the patients remained essentially unchanged for the nine months of the study.

Table 4 listed five patients who complained of cold sensitivity during clinical testing. At the three month level after resin insertion, pain was no longer initiated by the application of ice. This finding was consistant throughout the nine months of the study.

Six patients described slight to moderate discomfort when drinking cold liquids after the teeth with cervical defects had been restored. These six individuals did not include any members from the group experiencing sensitivity prior to resin placement. The pain associated with cold temperatures lasted from one to three weeks following placement of the restoration. At the first three month evaluation cold temperature (ice) did not elicit a painful response. It was not possible to unequivocally implicate any one restorative material as causing post-insertion thermal sensitivity, since the patient could not indicate which one of the trio of restored teeth was troublesome. There was only a general discomfort from the restored quadrant.

Over the nine month time span, none of the patients demonstrated percussive or heat sensitivity to clinical testing at the three month intervals.

The results for retention of each resin system over the nine month testing period are presented in Table 5. It is evident that at the three month level Cervident had the highest retention rate, but by nine months all systems exhibited similar results.

The results from Tables 6 and 7 indicate that a few of the observed restorations became stained, either on the resin surface or at the interface. The Cervident system, however, appeared to accumulate less surface stain than the other two resins.

A comparison of the surface textures of the resin systems was presented in Table 8. Restorations were air dried and were examined visually in addition to being assessed by moving a sharp Jacob's hook explorer over the resin and tooth surfaces. The three different resin systems were

comparable to one another in surface texture at each three month clinical evaluation.

LABORATORY DATA: Using the SEM there was a substantial difference between surface topography of the Cervident system and the juxtaposed tooth structure. From initial insertion of the resin through the nine month term, the Cervident appeared coarse, granular, wavy (Figures 3 and 4). There were distinct zones of overextension and smearing of the resin beyond defect boundaries. Many Cervident specimens began to show peeling and crazing at various time intervals (Figure 5). Few Cervident samples displayed frank, open margins. Almost all restorations demonstrated continued adherance of the over-extended resin onto the enamel through the nine months. The resin-tooth interface generally appeared intact after nine months. Demonstrable abrasion of the Cervident system was not apparent.

The Nuva Seal/Nuva Fil system exhibited many of the same qualities shown by the Cervident restorative. Most Nuva resins were overextended beyond the defect margin (Figures 6 and 7). Some specimens had zones of peeling and a rolling away of the resin from the tooth. Isolated islands and peninsulas of material were followed in some specimens for nine months without appreciable loss. Marginal integrity was considered acceptable throughout the course of observation except for areas of poor adaptation beneath the gingival crest (Figure 7). The Nuva system demonstrated superior surface texture over nine months when compared to the other materials reviewed. There was no apparent evidence of abrasion of the Nuva restorations at anytime.

The Adaptic system produced the roughest surface when viewed with the SEM (Figures 8 and 9). It was granular and coarse. Overextension was typically encountered. In spite of the ragged surface, virtually all Adaptic restorations displayed good marginal seal with the tooth structure except for some gingival defects. Abrasion resistance seemed commensurate to the Nuva and Cervident systems.

A persistent observation, common to all the restorative materials was the presence of material remnants on the enamel surface and the interior surfaces of the erosion cavity especially at the cavity margins (Figures 10-13). This strongly adherent material may interface subsequent restorations retention.

STATISTICAL ANALYSIS: The present study was conducted in such a manner that a single group of subjects was studied under three different experimental conditions simultaneously. As a result, the experimental data for each subject was composed of an assessment of each of the three treatment conditions repeated at three month intervals.

Computation of correlations between the mean number of restorations lost for each treatment condition at each follow-up assessment revealed that seven of the nine correlations were statistically significant (see Table X). Consequently, a test for the significance of the difference between two means for correlated samples, in accordance with Ferguson's method,[11] was computed. This compared the mean number of restorations lost for each treatment condition at each follow-up assessment. Such computations yield a t-score.

The resulting t-score (see Table Y) indicated that at the three month follow-up assessment interval there were significantly few restorations lost for Cervident, as compared to Adaptic ($t = 2.364$, p 0.05) and Nuva systems ($t = 2.191$, p 0.05). However, at the six month and nine month follow-up assessment intervals, statistically significant differences

between treatment conditions, in terms of mean number of restorations lost, no longer existed.

DISCUSSION

CERVICAL DEFECTS: Cervical defects are a common clinical occurrence. In a randome sample of 10,000 extracted teeth, Sognnaes, Wolcot, and Xhonga[12] found 18% had cervical tissue loss.

Radentz, Barnes, and Cutwright[13] concluded in their study that the cervical abrasion is related to a factor or factors associated with tooth brushing. Recommendations were made to our patients, therefore, to use less dentifrice, use a soft bristled brush, and to brush the occlusal surfaces first.

INHERENT PROBLEMS: Esthetics and tooth sensitivity are the most common complaints that patients make about cervical tissue loss. When the practitioner employs an adhesive resin to ameliorate this situation, he is undertaking a complex restorative task. Isolation and adequate visualization of the lesion's boundaries must be satisfactorily achieved. These goals often require a great deal of energy and inventiveness from the operator. Singularly demanding is the job of exposing the inferior margin of the cervical defect. This part of the lesion is often slightly subgingival (Figure 1A) and is bound by a narrow zone of tightly adherent, fibrotic tissue. The facial sulcular depth is negligible. If this area cannot be scrutinized, how can the resin restoration be properly inserted, contoured, and finished? Retraction cord gently placed in the gingival sulcus may offer an answer for this predicament. A rubber dam and a suitable rubber dam clamp may be considered, but the clamp may slip, mutilate and gouge the gingiva unless the tissue is surgically reflected. An admirable, yet cumbersome technique requiring anesthesia then unfolds. Surely an alternative

can be offored to mitigate such a perplexity. In this project it was practical to isolate abraded regions with cotton rolls and a Sphedopter, complemented by a high speed evacuation system. A clinically dry environment was maintained in a fashion that was comfortable to the patient and that was optimally conducive to the successful resin placement. Gingival retraction with cord was used when it was necessary to uncover subgingival margins. Rounded cervical defects were the most frequent lesions to require this procedure.

Inability to precisely contain the adhesive resin within the confines of the cervical defect even when visualization was adequate was a disadvantage of all three resin systems. The SEM shows many zones of over-extension of resin onto cementum and enamel (Figures 48, 60, 85). Excess restorative material supragingivally can result in the containment and harboring of plaque on the rough surfaced resin.

RESIN RETENTION: Bowen[7] has shown that NPG-GMA promotes an increase in water resistant bonding of resin to dentin. Chandler et al.[14] also investigated the adhesive potential of this material over a three and one half year period and found that composite resin margins that were placed over NPG-GMA were significantly better when compared to resin margins without NPG-GMA.

The Cervident restorative system employs NPG-GMA as an adhesive promoter. Lipton and Smith[15] studied Cervident in vitro and determined that there was no bonding to unetched enamel or unetched dentin, but demonstrable bond strength was attained when these surfaces were etched.

In vivo studies employing Cervident[16,17] resulted in retention rates of approximately 72% to 76% after one year. In this study, after nine months

There was no statistically significant difference in retention of the NPG-GMA and BIS-GMA systems (see Table 5).

STAIN AT TOOTH-RESIN INTERFACE: Stain at the interface of a composite restoration and tooth structure is of a multifactorial etiology: endogenous pigments, resin deterioration, metallic ions, etc. The three systems tested in this study behaved in essentially a similar fashion over nine months. The total number of observations of staining at the interface would sometimes decrease when a restoration was lost.

STAIN ON RESIN SURFACE: A multifactorial etiology, similar to the previous paragraph, is associated with stain on the resin surface. Adaptic and the Nuva system behaved similarly over nine months. The Cervident stained least when compared to Adaptic and Nuva.

SURFACE TEXTURE: Clinically, all three resin systems seemed equally rough -- or equally smooth -- until the nine month level, when Cervident clinically looked and felt the smoothest. The Nuva restorations appeared to offer the most favorable texture when viewed by the SEM.

It is the filler content of the composite resin that produces the irregular, granular surface. The choice of a cervical restorative material must reflect consideration of surface texture. The smoothest surface is desirable for gingival restorations, since plaque retention would be expected to be less than for a rough surface.

PULPAL CONSIDERATIONS: Dentin is composed of a myriad of tributaries -- odontoblasts -- that course pulpalward. These vital dentinal tenants must be considered when restoring defects at the cemento-enamel junction. What effects will an acid etchant have upon the odontoblasts and the housing dentin? Is it necessary to etch dentin to ensure for an adhesive resin bond?

Many workers have assessed acid etchants and composite resins and have determined unequivocally that pulpal irritation with its attendant sequellae are prevalent and predictable.[18-22] Independent studies by Torney,[23] Erikson,[24] and Rider et al.[25] have shown that acid pretreatment (of dentin) did not increase retention of dental resins. Erikson[24] found that acid etching opened dentinal tubules (which) may intensify a pulpal response to composites. According to Brannstrom,[26] etching vital dentin would decrease adhesion due to a widening of the tubule openings which would allow more fluid to pass from the tubules onto the surface.

In this study six individuals out of nineteen who received restorations developed post-insertion sensitivity to thermal stimuli. This was transitory; by three months discomfort was not clinically apparent. However, while overt symptoms were no longer evident even up to nine months, undersirable pulpal events may have been progressing. Is a period of furious pulpal distress ultimately possible?

Acid etchants are not innocuous agents when placed upon vital tissue. The inability of these materials to improve resin retention to vital dentin obviates their use.

THE ASYMPTOMATIC, NONCARIOUS CEJ DEFECT: The potentially deleterious sequellae associated with restorative dental resins and acid pretreatment of dentin have been mentioned. Should the practitioner, then, consider employing this type of system for restoring structural defects of the CEJ? Is it even necessary to place a restoration in an asymptomatic, cervical, noncarious lesion? If the tooth brushing procedure is clearly implicated it would be prudent to advise the patient of the correct brushing

technique and oral hygiene regime. A cervical adhesive resin is not warranted. It has been the experience of this investigator (JH) that the typically described cervical defect occurs in patients who routinely have superb plaque control in the area of the lesion. When coarse, rough adhesive resins were inserted in the area of the gingival margin, it was observed that tooth accumulated materials increased in this zone. If these materials are not removed we may extrapolate probable deterioration of the gingival apparatus in the more susceptible patients over a time span longer than the outlined by this study.

THE SYMPTOMATIC, NONCARIOUS CEJ DEFECT: Symptomatic defects at the cemento-enamel junction can be restored in a variety of ways. Some practitioners have even successfully treated cervical sensitivity by using desensitizing agents.[27] Adhesive resin systems are an expedient method for restoring the symptomatic cervical defect. We must, however, consider the potential deleterious sequellae associated with these systems. Adequate pulpal protection is probably the singularly most important step in assuring for post-insertion patient comfort. The use of metallic alloy restorations for cervical defects should not be abandoned. Any one restorative modality has its proper, functional place. The astute clinician should be aware of the circumstances where the restorative material he employs will perform most advantageously.

CONCLUSION

Based upon the assessment of data collected from the nineteen patients in this study, a number of conclusions have been reached.

1. There was no statistically significant difference over nine months in the retention of the NPG-GMA or BIS-GMA resin systems to dentin.

2. A clinically dry field for resin placement can be successfully maintained using cotton rolls, a Sphedopter, and a high speed evacuation system.

3. Noncarious cervical defects were basically of two types (angular and rounded) and were primarily associated with the patient's oral hygiene regime.

4. Adaptation of the adhesive resin to a rounded cervical defect was more difficult than for an angular lesion.

5. Stain on the resin surface and at the tooth-resin interface was essentially comparable over nine months for the three resin systems.

6. Surface texture for the three resins appeared to be similiar for the nine month study. The Nuva system, however, had the most favorable surface when viewed by the SEM.

7. While five patients complained of cold sensitivity after resin placement, at three months this problem subsided, and none of the resin systems produced pulpal discomfort over the complete course of the study.

8. A healthy periodontium was maintained by all patients for nine months

9. Asymptomatic, noncarious CEJ defects should not routinely be restored with adhesive resins requiring pretreatment acid etchants. Proper oral hygiene procedures can probably prevent further progression of the cervical defect.

10. Pulpal protection is required when acid etching and adhesive systems are employed.

11. Symptomatic, noncarious CEJ defects need not only be restored with adhesive resins; metallic alloys should be considered when appropriate.

12. Six patients who complained of pre-insertion thermal sensitivity no longer experienced this problem after resin placement.

FIGURE LEGENDS

Figure 1 Bucco-lingual outline of cervical defects observed in this clinical study.

Figure 2 SEM of replica of angular cervical defect. Gingival floor of defect (extends beneath and is covered by gingival epithelium (arrows). All SEM micrographs were originally 18 times magnification.

Figure 3 SEM of replica of Cervident restoration of lesion in figure 1 after 3 months. Overextensions of material are noted by arrows.

Figure 4 SEM of a replica of a Cervident restoration at 3 months with overextensions (arrows) and underfilled gingival margin (*).

Figure 5 SEM of a replica of the restoration seen in figure 4 at 9 months. Large areas of the restorative material have been lost (dotted lines denote approximate original extension).

Figure 6 SEM of a replica of another angular lesion. Gingival crest is at same height as the gingival floor of the lesion.

Figure 7 SEM of a replica of the lesion in figure 6 after 9 months restored with Nuva resin. Overextensions and gingival defects are present. The surface is smooth and evenly curved.

Figure 8 SEM of a replica of an angular defect extending deeply below the gingival crest.

Figure 9 SEM of a replica of the lesion in figure 8 restored with adaptic after 3 months. Overextensions (arrows) and a gingival defect (*) are present.

Figure 10 SEM of an angular lesion in a maxillary molar.

Figure 11 SEM of the lesion in figure 10 restored 3 months with Cervident. Overextension (arrow) is present.

Figure 12 Replica of lesion in figure 10 and 11 after 6 months. Small overextended tags of material remain although the bulk of material is missing.

Figure 13 SEM of same replica as figure 12. Remnants of restorative material are adherent to the dentin surface and should be removed before re-application of restoration.

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TABLE 1 PRETREATMENT ASSESSMENT
CLINICAL DATA:

Shape of defect*	Angular		Rounded
	Notched or grooved	Chiseled	
Total	88	40	28

*Based upon clinical examination and SEM evaluation

TABLE 2 (Summarial)

Gingival health	Healthy	Diseased
Total	156	0

TABLE 3 (Summarial)

Pocket depth (in mm)	0-2	2-3	3-4	4-5	5 or greater
Total	80	43	20	13	0

TABLE 4 Pretreatment Assessment.

Patient identification number*	Number of teeth	Sensitivity		
		Cold	Heat	Percussion
I	2	+	0	0
III	1	+	0	0
X	1	+	0	0
XVI	1	+	0	0
XIX	1	+	0	0

*Only those patients exhibiting thermal sensitivity were listed, all others responded normally.

0 = No sensitivity
+ = Sensitivity

TABLE 5 Retention of resin system to the tooth.

Resin system	Interval (months)	Lost	Retained	Per centage retained	Total
Adaptic	3	9	43	82.8	52
	6	12	40	76.8	52
	9	16	36	69.3	52
Nuva Seal/	3	11	41	78.9	52
Nuva Fil	6	16	36	69.3	52
	9	18	34	65.4	52
Cervident	3	3	49	94.3	52
	6	13	39	75.0	52
	9	14	38	73.9	52

TABLE 6 Stain on resin surface.

Resin System	Interval (months)	Number of retained restorations	Stain (number)
Adaptic	3	43	2
	6	40	3
	9	36	1
Nuva Seal/ Nuva Fil	3	41	2
	6	36	2
	9	34	4
Cervident	3	49	0
	6	39	1
	9	38	0

TABLE 7 Stain at tooth margin and resin interface

Resin system	Interval (months)	Number of retained restorations	Stain (number)
Adaptic	3	43	2
	6	40	1
	9	36	1
Nuva Seal/ Nuva Fil	3	41	3
	6	36	1
	9	34	4
Cervident	3	49	1
	6	39	3
	9	38	3

TABLE 8 Surface roughness (Clinical evaluation)

Resin system	Interval (months)	Number of retained restorations	Rough (number)
Adaptic	3	43	2
	6	40	6
	9	36	8
Nuva Seal/ Nuva Fil	3	41	3
	6	36	5
	9	34	8
Cervident	3	49	2
	6	39	5
	9	38	6

TABLE X Correlations between mean restorations lost for each treatment condition.

	3 months		6 months		9 months	
	N	C	N	C	N	C
A	0.456*	0.569***	0.382	0.665***	0.509*	0.728***
N	--	0.299	--	0.569***	--	0.565***

*Statistically significant at the p 0.05 level, two tailed test, df = 18.

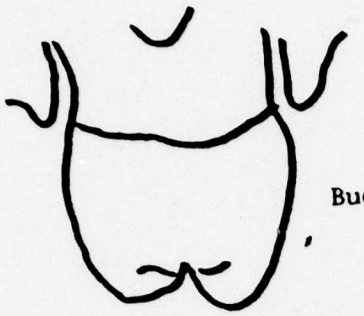
**Statistically significant at the p 0.02 level, two tailed test, df = 18.

***Statistically significant at the p 0.01 level, two tailed test, df = 18.

TABLE Y t-scores for the comparison of mean restorations lost for each treatment condition.

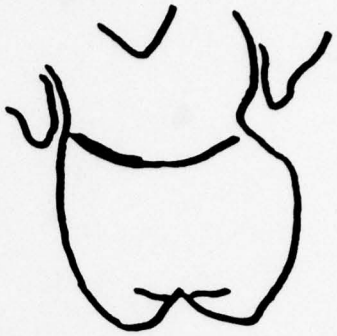
	3 months		6 months		9 months	
	N	C	N	C	N	C
A	0.567	2.364*	1.681	1.455	0.766	0.360
N	--	2.191*	--	0.825	--	1.000

*Statistically significant at the p 0.05 level, two tailed test, df = 18.



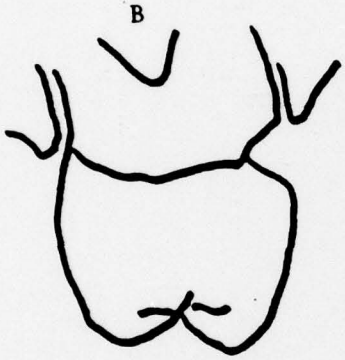
Maxillary molar without cervical defect.

A



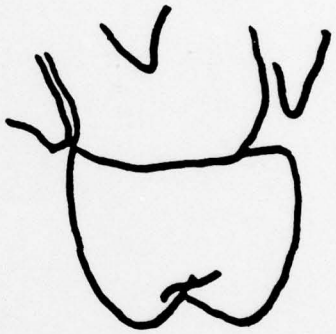
Rounded defect with superior margin of the free gingival crest superior to the inferior margin of the lesion.

B



Notched defect or groove.

C

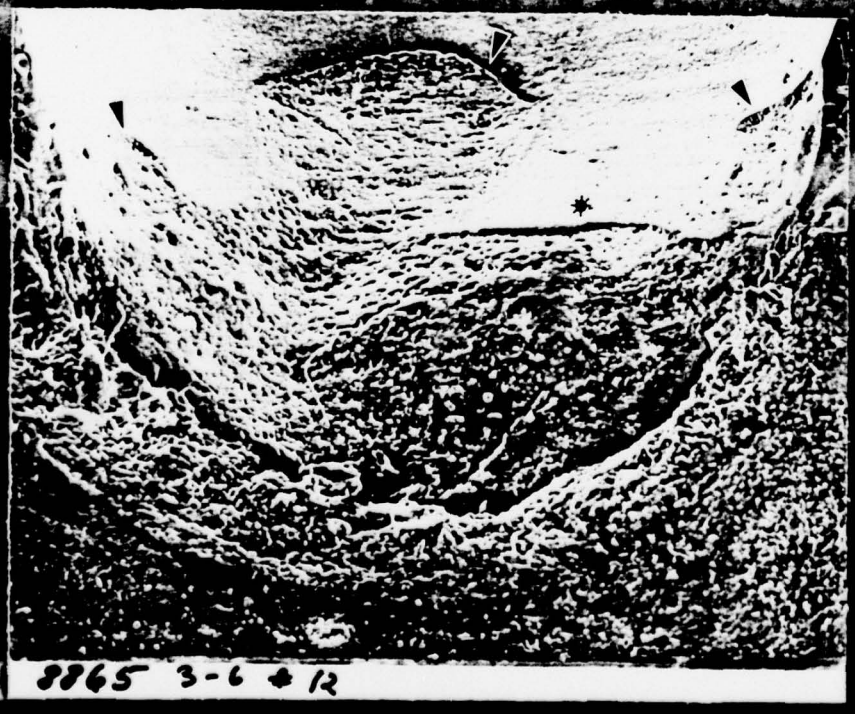


Chiseled defect.

FIGURE 1*

*Based upon clinical examination and SEM evaluation.

2



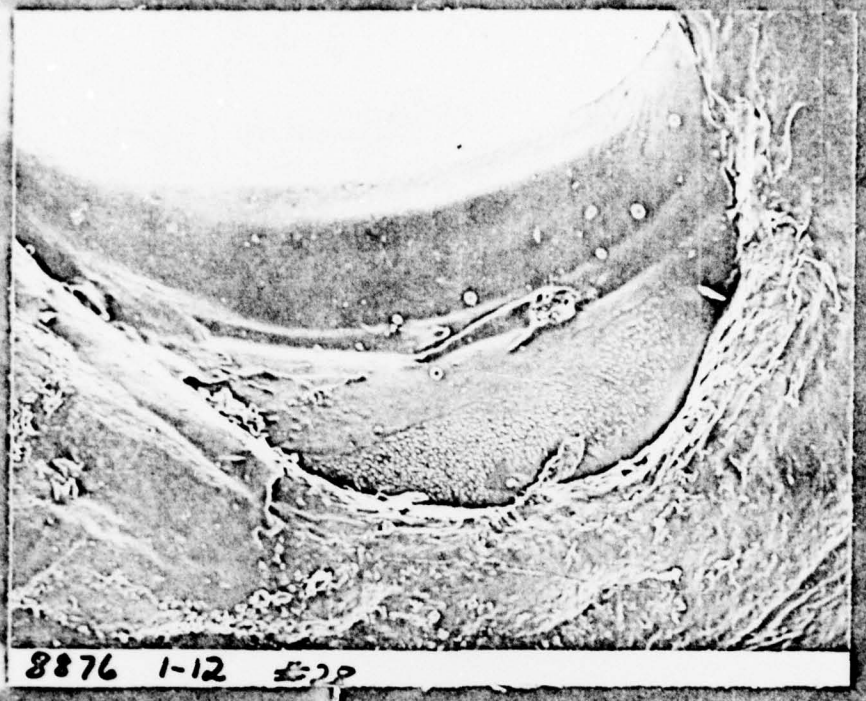
3

8870 2-12 #3

4

8868 15-1 #3

5



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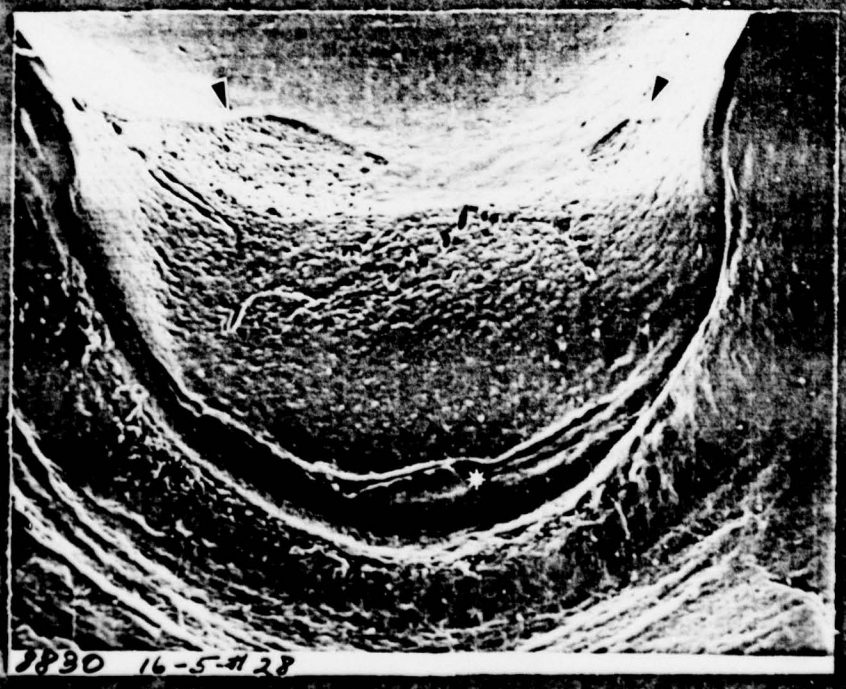

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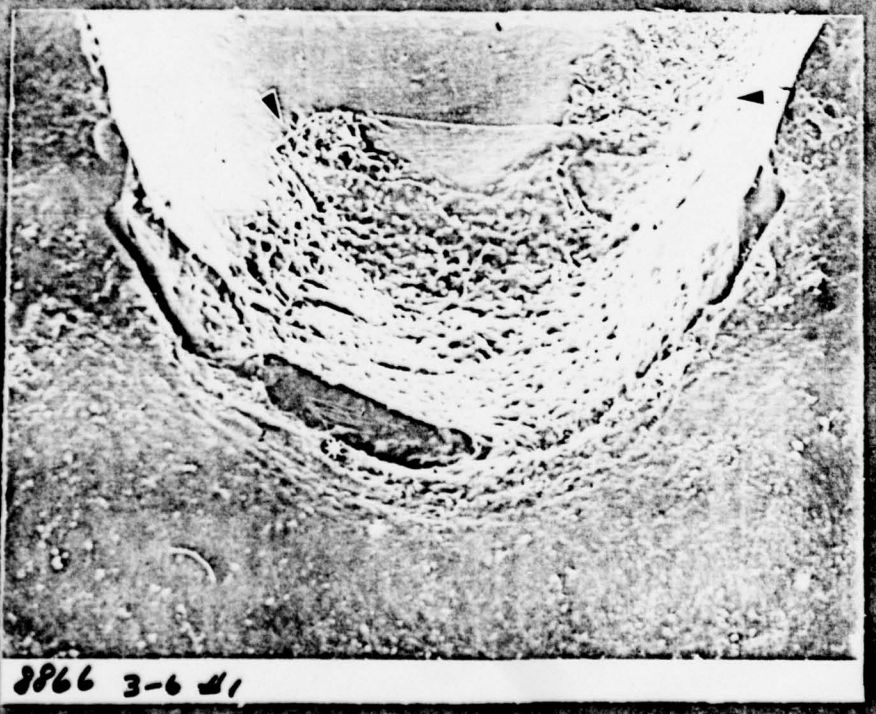

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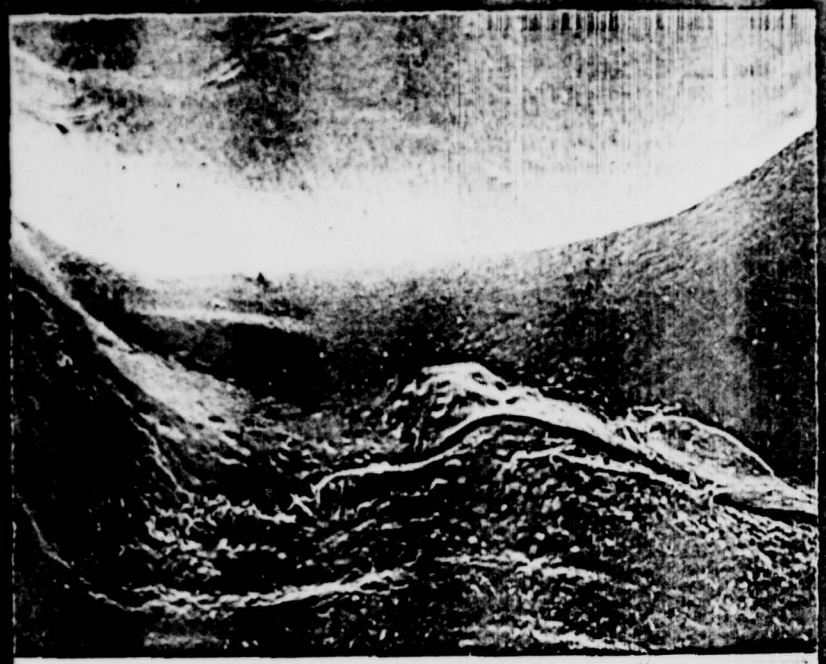

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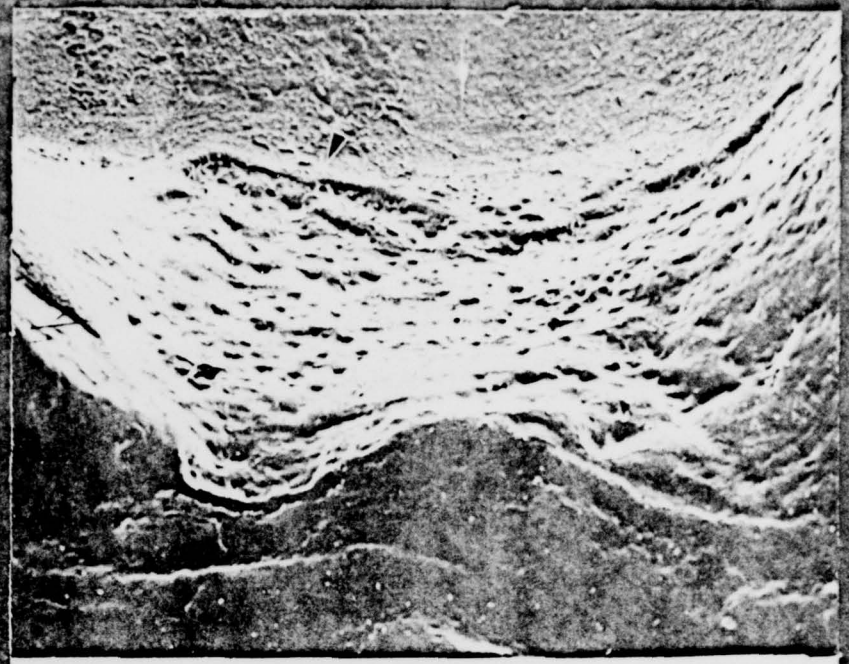

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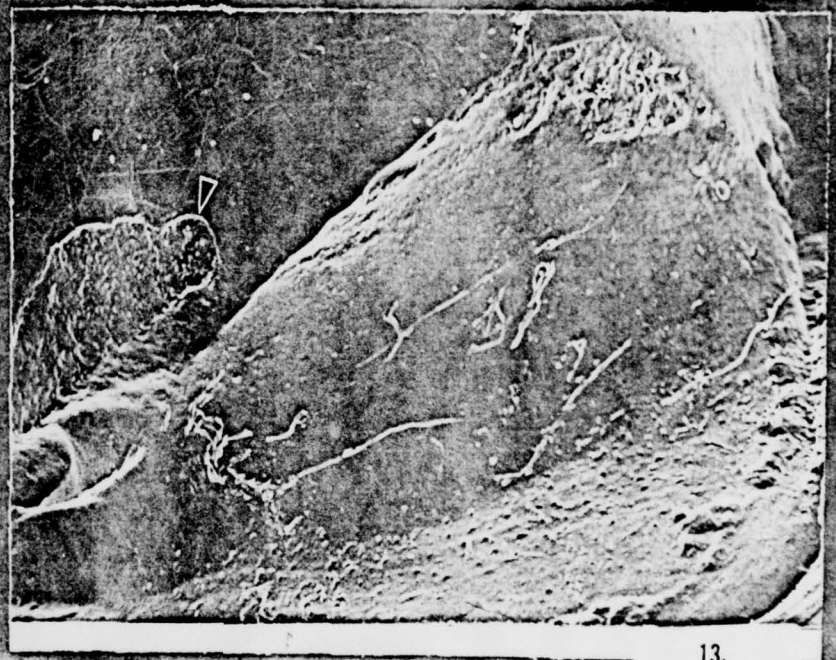

13.