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Operative Dentistry publishes articles that advance the practice of operative dentistry. The scope of the journal includes conservation and restoration of teeth; the scientific foundation of operative dental therapy; dental materials; dental education; and the social, political, and economic aspects of dental practice. Review papers and letters also are published.

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Contributions

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EDITORIAL

The Crystal Gazers

The decreased incidence of dental caries has provided an excellent opportunity for crystal gazers to polish their globes, dim the lights, and concentrate their gazes on what lies ahead for dentistry. An issue currently under discussion is the change that should be made in the curriculum of dental schools—especially as it relates to operative dentistry—to adjust to the decreased prevalence of dental caries. One suggestion has been to reduce by 650 hours the time allocated to restorative dentistry (Reed & Mann, 1983).

Adjusting to the decrease in the incidence of dental caries by reducing the time allotted to the teaching of operative dentistry is a solution that represents only a superficial assessment of the matter. It is the type of solution adopted by Crashmore Airlines—to use an analogy of George W Ferguson—which, when confronted with a 40% reduction in passengers, promptly reduced the training of its pilots by 40%. Safewing Airlines, on the other hand, reacted to its reduction in passengers by curtailing the number of its flights and reducing the flying time of its pilots. The reduction in flying time, however, was only temporary because of the need to accommodate extra passengers from the soon defunct Crashmore Airlines.

Recommendations affecting the future of dentistry are sometimes made by crystal gazers that are not conversant with the practice of dentistry, and this is as it should be because unencumbered with the business of everyday practice they are able to assess the issues objectively, just as a blind person, unprejudiced by any predilection for specific colors, shapes, or lines, is obviously the best person to judge the state of the art in painting. [From an idea of Anderson (1974).]

Reed & Mann (1983) assure us that a graduate of the curriculum now available in many dental schools "... is adequately trained for the practice of dentistry today." That this assumption is erroneous when applied to operative dentistry illustrates another qualification for crystal gazers, that is, not to be burdened with a knowledge of present circumstances. Given the knowledge and techniques available, the performance of many graduates of today's dental schools falls far short of what it should be in operative dentistry—and operative dentistry is the largest part of dental practice. Reducing the time allotted to operative dentistry would lower its standard even further. It would help, however, to solve the problem of an inadequate supply of patients because the decrease in the number of carious lesions would be offset by an increase in the need to replace failing restorations.

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ORIGINAL ARTICLES

Diamond Working Faces on Gold Foil Condenser Points

Condenser points with diamond-surfaced nibs rather than nibs with serrations made by filing or machining facilitated the condensation of gold foil.

CLYDE D LEACH • ROLAND GRUBB

Summary

A new design of condenser point having the face of the nib plated with diamonds was compared with conventional points for wear, porosity, and hardness of condensed foil, quality of restorations produced in the laboratory by students, and clinical effectiveness as judged by members of a study club. The diamond-faced points were equal to the conventional points in the quality of the restorations produced and demonstrated increased facility in the manipulation of gold foil.

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INTRODUCTION

One of the important features of the condensation of gold foil is the design of the working face of the condenser point. The basic design of cross-cut serrations advocated by Black (1908) is essentially what we use today. Our investigation of condenser points has disclosed wide variation in the sharpness and longevity of the serrated cuts. It is important that the working face withstand the repeated blows of condensation without deleterious alteration of the original design. A poorly serrated face can cause problems and frustrations for the beginning student as well as the experienced operator (Miller, 1966; Smith, 1972) and contributes to a decrease in the quality and quantity of gold foil restorations. In his excellent article Smith (1972) discusses the factors that should influence the selection of condensers. He concludes that: "Manufacturers should be encouraged to produce condensers with shallow serrations which promote good compaction without burnishing or tearing gold foil." Others agree that a condenser face that is poorly serrated, worn, or smooth will cause lateral slippage, burnishing, and poor adhe-

sion of the next pellet of gold foil (Miller, 1966; Medina, 1969).

Of the manufacturers that have recently produced condenser points, only two are currently active (McShirley Products, 150 West Verdugo Ave, Burbank, CA 91502, USA, and Suter Dental Manufacturing Company, P O Box 1329, 632 Cedar St, Chico, CA 95297, USA). The purpose of this article is to describe a new design for the working face of condenser points for gold foil, discuss its advantages and disadvantages, compare its design with that of currently available condenser points, and report the results of tests to determine its effectiveness in condensing gold foil.

MATERIALS AND METHODS

Design of Condensers

For many years small chips of industrial diamonds have been plated onto shafts of burs for the reduction of tooth structure by rotary instruments. It seemed reasonable that the current problem of manufacturing condenser points with adequate serrated faces might be solved by processing diamond chips onto the working face of the condenser point. No basic change in design would be involved other than the texture of the face.

Several sets of points without serrations were acquired (McShirley Products) and diamond chips 50 μm in size were plated onto the face of the nib without increasing the area of the surface of the face (Commander Dental Products, 3456 Laurelvale Drive, Studio City, CA 91604, USA). The sizes of points selected for this research were No 2 straight round (0.55 mm diameter), No 3 straight round (0.75 mm diameter), No 18 straight parallelogram (0.25 x 0.6 mm), and No 19 straight parallelogram (0.6 x 1.2 mm). These are the points generally used for condensing class 5 restorations with gold foil.

Comparison of Working Faces

Scanning electron microscope (SEM) micrographs were taken to compare the differences in design between McShirley, Suter, and diamond points.

Test for Wear

A set of four points (Nos 2, 3, 18, and 19) was randomly selected from each manufacturer and subjected to 8 hours of condensing action with an Electro-Mallet (McShirley Products) set at an intensity of 8 and a frequency of 18. If we assume 15 minutes use for condensing each class 5 restoration, 8 hours would represent approximately 32 foil procedures. Two ingots of pure gold mounted in autopolymerizing acrylic resin were used in this test. One operator tested all of the Nos 2 and 3 points and another operator tested the Nos 18 and 19 points so that the same technique would be used on each size. SEM micrographs were taken after the 8-hour test, the points cleaned of any gold, and additional SEM micrographs taken.

Various methods of cleaning the gold from the face of the nib were attempted. The points were placed in a solution of surfactant in an ultrasonic cleaner for 12 days but none of the gold was dislodged. Several sticky substances were used in attempts to pull the gold off the face, but these efforts were unsuccessful. On the theory that the melting point of nickel is higher than that of gold, the tips of the condensers were flamed and efforts made to brush off the heated gold. However, this did not prove to be practical in most attempts, particularly on the diamond tips where the heat caused all, or some, of the diamond-nickel composite to separate from the nib of the condenser point.

Tests for Porosity and Hardness of Condensed Foil

Nos 2 and 3 diamond points and Nos 2 and 3 regular serrated points (McShirley Products) were used to fill 16 cavities prepared in two cylinders of filled methylmethacrylate that had been machined flat on both sides.

Each cavity measured 3 mm square by 1 mm deep. Each cavity was given a code number from 1 to 16 and filled with ½ mm of crystalline gold (mat gold), covered by ½ mm of fibrous cohesive gold (gold foil), both condensed with an Electro-Mallet set at a frequency of 18 and at various settings of intensity. The 16 cavities were divided into four

groups and condensed with the following points for the straight handpiece: four with a No 2 regular serrated point, four with a No 2 diamond point, four with a No 3 regular serrated point, and four with a No 3 diamond point. All of the samples were condensed by the same operator.

POROSITY

Each block of samples was photographed and then polished through a series of grits down to a high shine with particles of aluminum oxide 1 μm in size. So that the hardness tests would be consistent, none of the surfaces of foil was subjected to the variable of work hardening by burnishing. Each sample was again photographed at a magnification of 75X to compare surface porosity.

HARDNESS

These same 16 samples were tested for hardness by indenting each one 10 times on a Knoop Hardness Tester with a 134° Diamond Knoop Indicator and a load of 100 g. The indentations were measured with a lens of 20X magnification on a measuring microscope. Averages were computed and converted to Knoop Hardness Numbers (KHN) (Craig, 1980).

Laboratory Tests by Students

Diamond-tipped points Nos 2, 18, and 19 were issued to one entire class of sophomore dental students for use in their course on the class 5 gold foil restoration. The class of the previous year had been issued the corresponding set of McShirley points. Each class received the same six-week course instructed and graded by the same faculty using the same criteria. A comparison was made to determine if grades on their final examinations differed significantly.

The final examination consisted of the preparation of a cavity for a class 5 gold foil, the condensation of the foil, and the finish of the restoration. The grade for the preparation of the cavity was used as the control since these grades should show no significant difference, given the same instruction and instrumentation. The class using the McShirley points consisted of 108 students; that using the diamond points, 116 students. Each procedure was graded by three instructors and the grades averaged. Mean scores for the preparation of the cavity and the finish of the restoration were calculated for each class. To test for significance, Z scores were calculated from these mean scores.

Clinical Evaluation

In a subjective clinical evaluation, 12 members of the Jones Foil Study Club were each asked to condense a class 5 foil using the diamond points and independently rate them. The following eight questions were asked to be rated on a scale of 1 to 3, 1 being better, 2 equal, and 3 worse than the points they used previously. These scores were then averaged.

- Manipulation of foil (skips or burnishes)
- Adhesion of foil to body of foil
- Surface texture during condensation
- Presence of pits or porosity
- Surface smoothness before finishing
- Burnishability of surface
- Density and hardness of surface
- General evaluation

RESULTS

Designs of Working Faces

McShirley points (Fig 1) are serrated by machine. This method leaves poorly formed and indistinct pyramids on the nib.

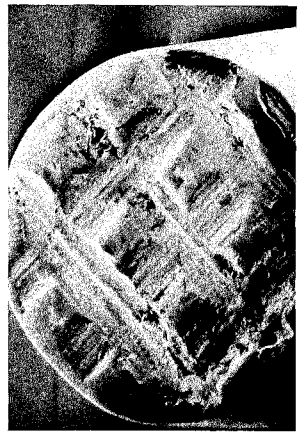


FIG 1. *McShirley point, No 3 round, new (X70)*

Suter points (Fig 2) are serrated by hand filing and are then coated with nickel alloy to

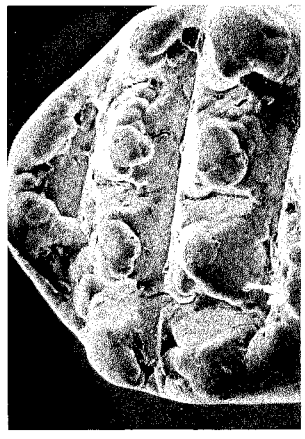


FIG 2. *Suter point, No 3 round, new (X70)*

protect the underlying steel from corrosion. It can be seen in the SEM micrograph that the plating of nickel (smooth areas in photographs) does not cover evenly but tends to round off the basic sharpness of the pyramids formed by the serrations.

Diamond points are illustrated in Figure 3. The diamonds form sharp pyramids sur-

FIG 3. *Diamond point, No 3 round, new (X70)*

rounded by the nickel alloy used in the plating process. Some diamonds are partly covered by the nickel but because there is a layer of diamond-nickel composite on the nib more diamonds should appear as the point is used.

Wear

SEM micrographs at a magnification of approximately 140X (see figures for actual magnification) taken of the condenser points after 8 hours of use show considerable changes on the nib face of all of the points. The diamond points and the Suter points both collected gold on the face while the McShirley points did not, most likely because the original surface was flatter. Nearly all of the smaller points (Nos 2 and 18) showed almost complete failure in design. The original serrations on the face of the McShirley Nos 2 and 18 points were flattened, chipped, and basically rendered useless (Figs 4 and 5).

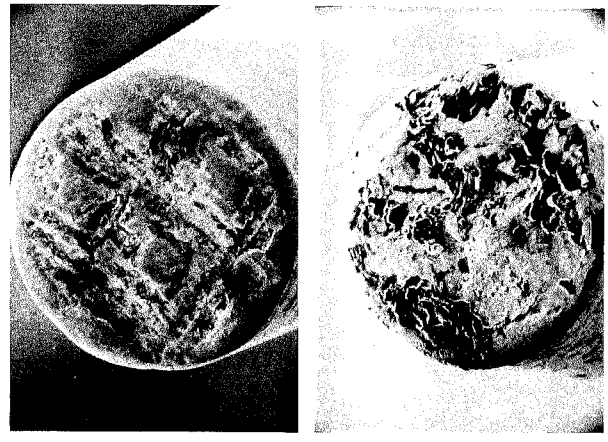


FIG 4. *McShirley point, No 2 round*
(a) *new (X73)* (b) *after 8 hours of use (X75)*

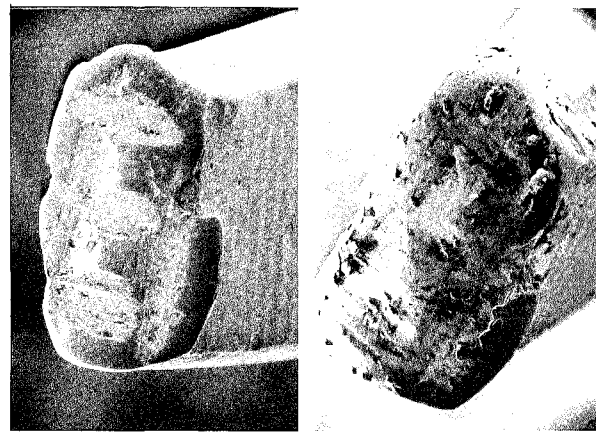
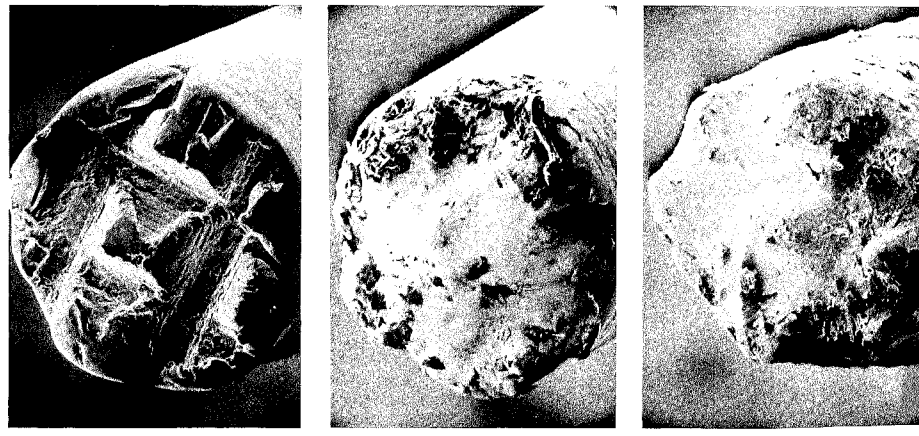


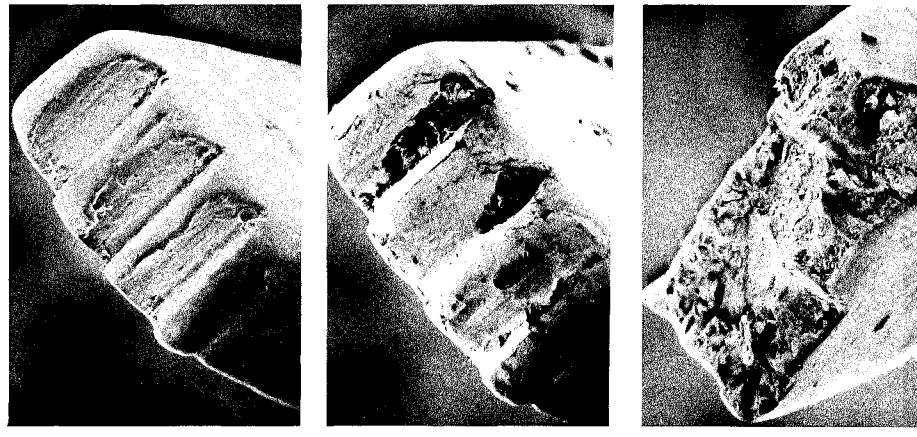
FIG 5. *McShirley point, No 18 parallelogram*
(a) *new (X70)* (b) *after 8 hours of use (X75)*

FIG 6. *Suter point, No 2 round*



(a) *new (X70)* (b) *after 8 hours of use (X75)* (c) *after attempting to remove the gold (X65)*

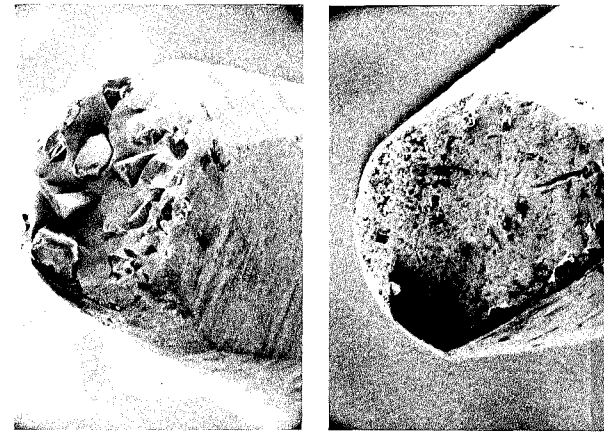
FIG 7. *Suter point, No 18 parallelogram*



(a) *new (X70)* (b) *after 8 hours of use (X75)* (c) *after attempting to remove the gold (X73)*

The Suter No 2 point fared the best of the small round points, some semblance of the original design still being apparent after the gold was cleaned from the face (Fig 6). The Suter No 18 point held up very well until it was flamed to remove the gold on the face, after which it was rendered nonfunctional (Fig 7). The diamond No 2 point failed at the junction of the plating and nib during the test (Fig 8) and the diamond No 18 point was

FIG 8. *Diamond point, No 2 round*



(a) *new (X70)* (b) *after failure of diamond bond (X73)*

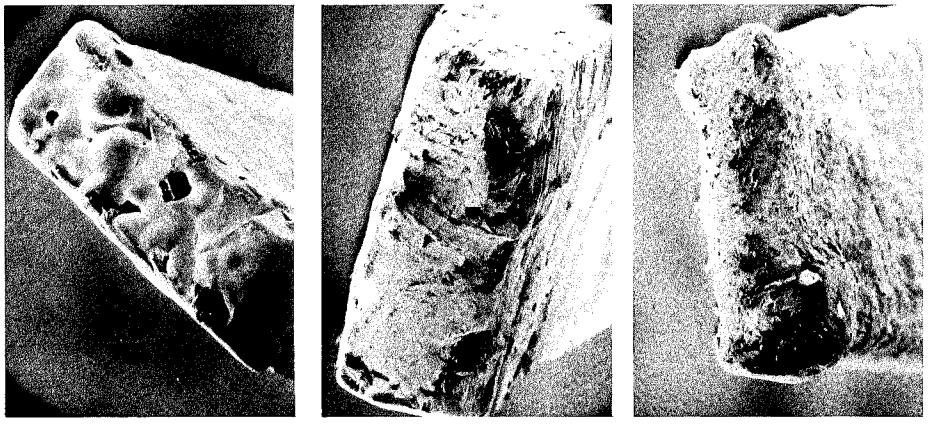


FIG 9. *Diamond point, No 18 parallelogram*

(a) *new (X70)* (b) *after 8 hours of use (X75)* (c) *after attempting to remove the gold (X70)*

barely usable but was also ruined in the attempt to clean out the foil (Fig 9).

The larger points withstood the 8 hours of testing much better. The McShirley Nos 19 and 3 points were flattened on the surfaces but were relatively free of gold (Figs 10 and 11).

The Suter No 19 point filled with gold rather badly to the point of questionable use and was rendered useless by cleaning with heat (Fig 12). The Suter No 3 point though obviously worn still retained a semblance of its original design; it also collected some gold but not as much as the No 19 point; and

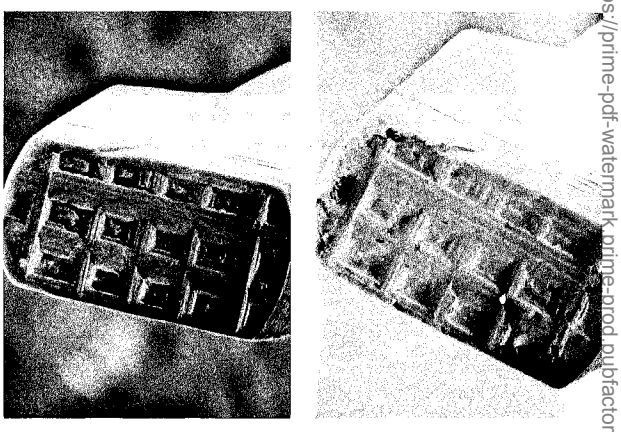


FIG 10. *McShirley point, No 19 parallelogram*

(a) *new (X35)* (b) *after 8 hours of use (X38)*

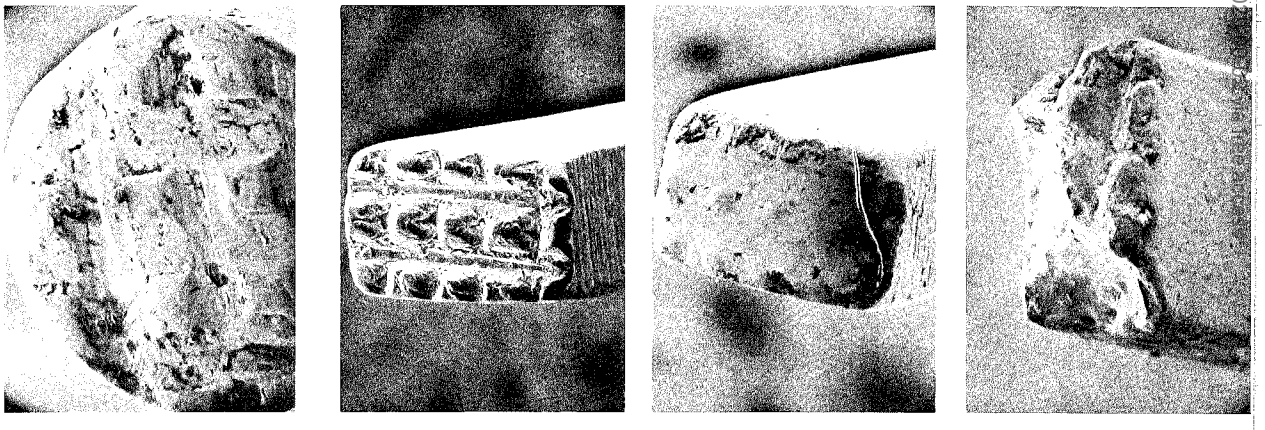


FIG 11. *McShirley point, No 3 round, after 8 hours of use (X75)*

FIG 12. *Suter point, No 19 parallelogram*

(a) *new (X33)* (b) *after 8 hours of use (X35)* (c) *after attempting to remove the gold (X35)*

withstood the cleaning without total loss of design features (Fig 13). The diamond No 3 point collected some gold in between the diamonds on its face but was still reasonably sharp and still usable, though it did, however,

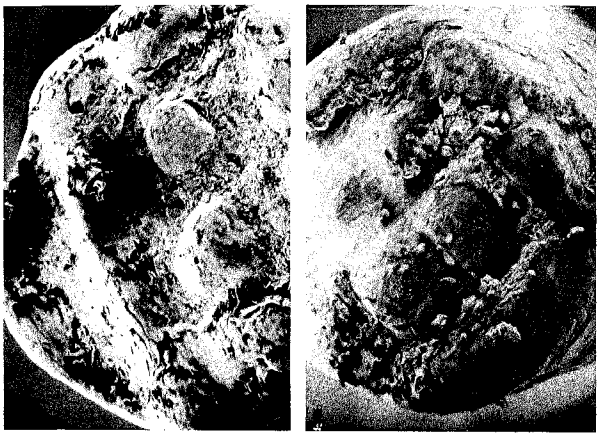


FIG 13. *Suter point, No 3 round*
(a) *after 8 hours of use (X71)* (b) *after gold has been removed (X69)*

fail at the junction of plating and nib when heated for cleaning (Fig 14). The diamond No 19 point collected somewhat more gold than the No 3 point but some diamond chips still protruded through the gold and it did survive the cleaning with slight loss of one corner of the plating (Fig 15). However, the gold was not substantially removed.

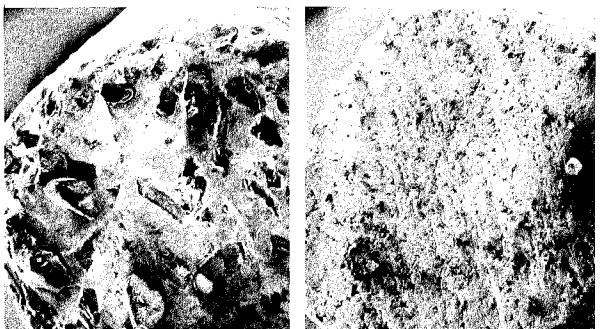
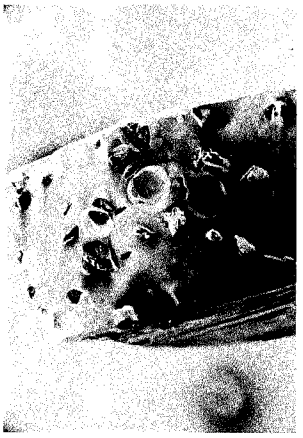


FIG 14. *Diamond point, No 3 round*
(a) *after 8 hours of use (X80)* (b) *after failure of diamond bond (X74)*



(a) *new (X38)*

(b) *after 8 hours of use (X38)*

(c) *after gold has been partly removed (X37)*

FIG 15. *Diamond point, No 19 parallelogram*

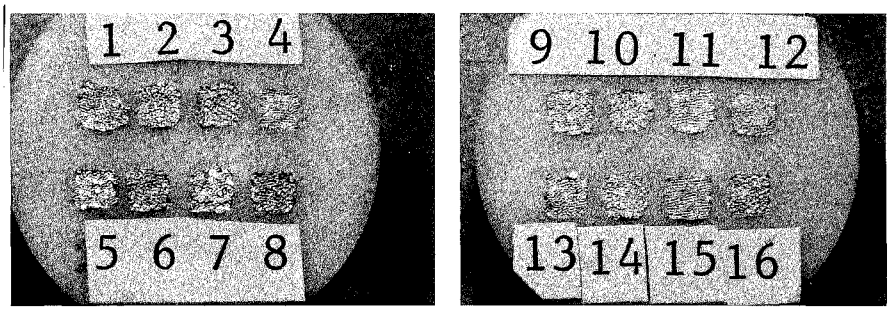


FIG 16. *Sixteen sample condensations. Note the difference in texture between the McShirley point samples and the diamond point samples (X2)*

(a) *Samples No 1, 4, 5, and 7 were condensed with a McShirley point No 2. Samples No 2, 3, 6, and 8 were condensed with a diamond point No 2.*

(b) *Samples No 10, 12, 14, and 16 were condensed with a McShirley point No 3. Samples No 9, 11, 13, and 15 were condensed with a diamond point No 3.*

Porosity and Hardness

POROSITY

The surface texture created by points used for condensing the 16 sample preparations is illustrated in Figure 16. Close examination of these samples shows a difference in the texture. The diamond nibs leave a slightly rougher surface with less reflection of light. The serrated points leave a smoother, shinier surface indicating some burnishing.

The rough texture left by the diamond points would account for the operators' reports of the ease with which subsequent pellets of foil were attached to the bulk of the foil. The surface produced by the diamond points was adequately coarse to indicate lack of burnishing but not so coarse as to indicate cuts or tears. The surface had a dull mat finish which allowed the operator to see where the foil was being stepped. Representative samples of the polished foils are shown in Figure 17. Each picture has three numbers. The first number indicates the sample number, the second number the intensity setting of the Electro-Mallet, and the third number the size of condenser point. The upper row shows the results of the regular serrated

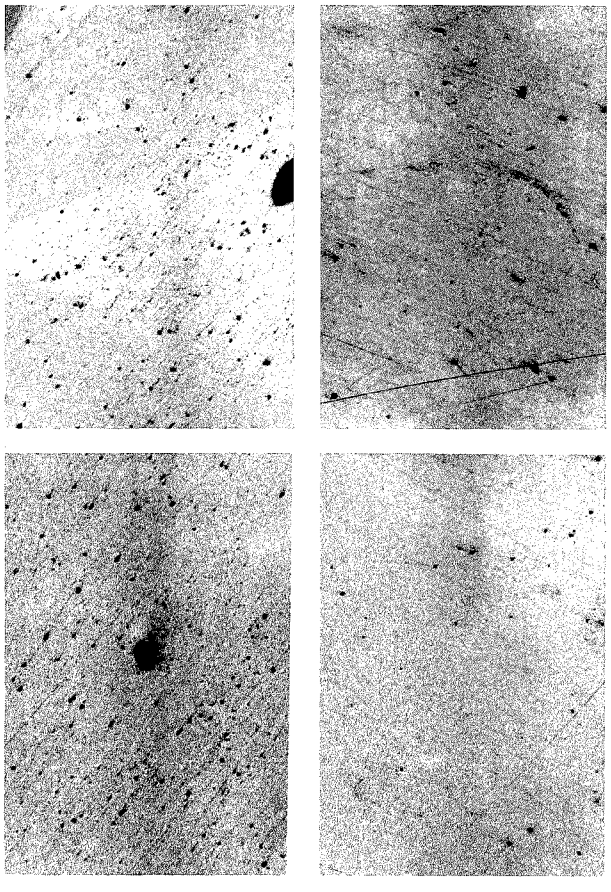


FIG 17. *Shows two pairs of foils selected from the 16 sample condensations. The intensity was set at 8 and the frequency at 18. First number* = sample number; second number = intensity; third number = point size.

(a) 1-8-2 *and* (b) 2-8-2 *compare condensation by a serrated point No 2, with condensation by a diamond point No 2.*

(c) 9-8-3 *and* (d) 10-8-3 *compare condensation by a serrated point No 3, with condensation by a diamond point No 3.*

Table 1. Knoop Hardness Number of Condensed Specimens

No 2 Points				No 3 Points			
McShirley		Diamond		McShirley		Diamond	
*	KHN	*	KHN	*	KHN	*	KHN
1	60.7	2	74.3	9	81.4	10	81.4
4	69.2	3	69.0	11	74.1	12	77.0
5	77.4	6	77.8	13	79.5	14	76.5
7	71.07	8	53.3	15	71.5	16	79.6
Average	71.07		68.6		76.62		78.62

*Sample Number

points and the bottom row shows the results of the diamond points. Each pair is vertically matched for comparison.

When these vertically aligned photographs are compared they do not show any significant differences in patterns of porosity produced by condensers of the same size. Given the same size point the diamond points are equal to the serrated points in their ability to condense foil. Note, however, that the No 3 points left a much less porous surface than the No 2 points (compare Fig 17 c & d with a & b). Varying the intensity did not result in any observable difference in porosity even at an intensity setting as low as 5. This may be explained by the ability of the operator to see the stepping process better with a larger point, resulting in a better overlap and fewer noncondensed voids. Use of a No 2 point may be contraindicated in favor of a No 3 point, given equal settings of intensity and frequency.

HARDNESS

The average Knoop Hardness Numbers of the specimens (Table 1) condensed with No 2 points show no statistically significant difference between the McShirley points and the diamond points, but the No 3 points produced a higher KHN than the No 2 points. A Student's *t*-test of the means of the KHN between the No 2 points and the No 3 points shows a statistically significant difference ($P < 0.05$) in hardness. These results correspond to the visual evaluation of the 16 specimens for porosity, which showed the specimens condensed with the No 3 point to be less porous (Fig 17). The KHNs of this study are also in agreement with previously published data (Ingraham, 1976).

Laboratory Test by Students

Table 2 shows that there is no statistically significant difference ($P > 0.01$) between the preparations of the cavities of the class of 1981 and the class of 1982. There is a statistically significant difference ($P < 0.01$) in the quality of the condensation of the restorations between the class of 1981 and class of

Table 2. Results of Student Participation

	1981 Class (n = 108) Mean Score	1982 Class (n = 116) Mean Score	Significance
Preparation	76.8	79.6	Z Score = 1.8 Not significant $P > 0.01$
Condensation	74.8	83.1	Z Score = 6.1 Significant $P < 0.01$

1982. Even though the data confirm the use of the grades for the prepared cavities as a control, there may be hidden uncontrolled variables unknown to the researcher. However, these overall results indicate an improved quality of condensation with the use of diamond design.

Clinical Evaluation

During the admittedly subjective clinical project, the evaluators indicated that in their judgment the resulting gold foil restorations equaled or surpassed the quality produced by the normally serrated points. More important, however, the operators expressed enthusiasm for the handling properties of the diamond-faced points. In their judgment the foil was easier to manipulate and quickly and easily adhered to the previously condensed foil. The points allowed the operator to see the process of stepping the foil and permitted the operator to pick up cylinders from the foil annealer without damaging or crushing them. The results of this evaluation are shown in Table 3.

Table 3. Results of Clinical Evaluation (n = 12)

Areas Evaluated	Mean Rating*
Manipulation of foil (skips or burnishes)	1.16
Adhesion of foil to body of foil	1.25
Surface texture during condensation	1.17
Presence of pits or porosity	1.33
Surface smoothness before finishing	1.50
Burnishability of surface	1.25
Density and hardness of surface	1.33
General evaluation	1.25

* 1 = better than, 2 = equal to, and 3 = worse than the points the operator was accustomed to using.

The specific designs of points previously used by the operators were not ascertained. However, it can be assumed that some had used McShirley points and some had used Suter points. The best ratings were given to the manipulation of the foil and texture of the surface. These good ratings were attributed to the handling qualities and would be directly related to the design of the nib face. The ratings that were closest to equal were surface smoothness before finishing, presence of pits or porosity, and density of the foil. These three areas have to do with the size of the points and the intensity of the force, which should be factors independent of the design of the nib face.

DISCUSSION

When this research was designed, Suter gold foil points were not available. When they became available they were included, but some of the data do not include results involving Suter points.

Collection of gold on the face proved to be a problem for both the Suter and the diamond points during the test for wear. The collection of gold onto the nib of the Suter and diamond points during the test for wear, which was conducted against an ingot of pure gold, may be a result of constant 8 hours of use against the ingot. Operators who have used both types of points report that they have not had a problem of gold collecting on the nib that could not be removed with a sharp gold knife. Tests for hardness and porosity were conducted with new points. Collection of gold on the nib was not a problem during these tests. The test for wear was an attempt to determine whether the nibs would maintain their topographical features over a period of time. Use against a gold ingot may not be a valid test for collection of gold. McShirley points as a rule did not collect gold on the nib due to its flatter design. An effort should be made to remove any gold that collects after each use of condenser points. Flaming of the points is contraindicated as a method to clean gold from the nib due to possible damage to the temper of the steel and the nickel plating. Flaming was done in this instance as a method to remove excess gold so that the

nature of any wear could be studied. It was not fully satisfactory but these results are shown in order to make a complete report of the results of the experiments. Points should be carefully inspected for wear or breakage after each use and be replaced as soon as wear is evident. If the gold is annealed in a flame, points should not be placed directly in the alcohol flame; use of a foil carrier is mandatory.

In addition to the clinical advantages of the diamond points during condensation some other advantages are important. The size of the diamond chips could be varied to the operator's preference—a larger size for a coarser face or a smaller size for a finer face. Collection of foil on the diamond surface may prove to be a limiting factor in the size of diamond chips. Further tests are required to determine if 50 μm is the optimum size for the diamond chips. Worn regular points can be processed with diamond chips at the owner's option. The cost of the original diamond-faced set of condenser points will be higher (approximately double the regular price); however, worn points can be plated with diamonds at approximately the same cost as a new serrated point.

Although these points have not been shown so far to be more likely to damage enamel, the possibility exists since diamonds are harder than steel or enamel. Proper technique, as described by Medina (1969), where a layer of foil is carefully condensed onto the margin, should prevent chipping of the enamel margins.

In the evaluation of students' work, the finished foils were rated significantly better when use of diamond points were compared with McShirley points. It could be debated that the results should be the same given equal areas of nib face and equal intensities of force. When the handling qualities are also considered it can be argued that these make it easier to condense the gold foil, giving the operator more time to finish the foil properly. Good condenser points cause fewer problems for the operator.

CONCLUSIONS

1. Small points (Nos 2 and 18) wear out within the first 8 hours of use and should be replaced often.
2. Nib designs that improve handling qualities collect gold and should be checked regularly and replaced if necessary.
3. No 3 points produce a foil that is overall less porous than that produced with No 2 points even at lower settings of intensity.
4. No 3 points produce a foil that has a significantly harder surface than one produced by No 2 points.
5. Clinicians were favorably impressed by the handling qualities of the points with the diamond nibs.

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Rubber Dam Clamps — Their Use and Abuse

Clamps that are stretched to their maximum and held there by clamp forceps until applied to teeth are readily distorted and lose stiffness.

T J O'TOOLE • J A von FRAUNHOFER
G M FURNISH • C E CARROLL

Summary

Ivory 8A rubber dam clamps, when opened to the maximum separation with the clamp forceps and then released, lose resiliency and do not return to the original separation of the jaws. The life of a clamp is prolonged if it is opened only wide enough to slip over the tooth.

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Introduction

The usefulness of a rubber dam for maintaining a dry field of operation in most aspects of operative dentistry is well established (Spohn, Halowski & Berry, 1981; Sturdevant & others, 1968). However, for a rubber dam to function satisfactorily, the clamp used to retain the dam must remain tight and immobile when placed on a tooth. Most practitioners find that clamps rapidly lose their resilience with use and hence have to be discarded because of inadequate clamping ability.

Assistants and practitioners in many dental offices may be in the habit of opening clamps to their maximum with clamp forceps and maintaining the clamps this way until they are fitted over the teeth. The present study investigated whether this method of using clamps could shorten their working life while alternative practices might prolong

their usefulness. Accordingly, we undertook to determine the forces required to open rubber dam clamps to accommodate different sizes of teeth as well as to measure the distortion of the clamp that occurred from repeated opening of the jaws.

Materials and Methods

Ivory 8A rubber dam clamps, of stainless steel and of carbon steel (Ivory/Eastern, San Fernando, CA 91340, USA), were measured with a Boley gauge at their outer extremity in resting position (average distance = 14.4 mm), then at the minimum opening (20.2 mm) required for placing the clamp on a lower first permanent molar of an adult dentoform (Columbia Dentoform Corp, New York, NY 10016, USA), and finally at the maximum possible opening obtainable with Ivory rubber dam clamp forceps (24.5 mm). The thickness of the bow of clamps of stainless steel was 0.65 mm and of carbon steel, 0.74 mm.

Six rubber dam clamps were opened at a rate of 475 mm · min^{-1} with a Unite-O-Matic testing machine (United Calibration Corp, Garden Grove, CA 92641, USA) to the minimum distance 10 times and six to the maximum distance 10 times (Groups A and B). The force needed to open the clamps and the resulting distortions were measured. Distortion of the clamp was defined as the difference in separation between the outer extremities of the clamps in resting position and after testing. The clamps of the group that had been distorted by opening to the maximum were then opened to the minimum distance to test for a weakening of the clamps (Group C).

At this stage, all clamps were restored to their original dimensions by crimping around the bow of the clamp with three-pronged pliers. For Groups D and E, the clamps were then tested at the distance to which they were opened in the first two sets (Groups A and B). For Groups F and G, all clamps were restored again to their original dimensions, heat-treated in a laboratory furnace at 400 °C for 10 minutes, and opened the same distance as in the first two tests.

Results and Discussion

The results for the series of tests on stainless steel and carbon steel clamps are given in the table. Comparisons of the force required to open the stainless steel and carbon steel clamps in the test series A through G using Student's t test showed that the force required for the carbon steel clamps was greater than that for the stainless steel clamps ($P < 0.001$ for series A through F and $P < 0.01$ for series G). A comparison of the distortions, however, shows the distortion of the stainless steel clamps to be greater than that of the carbon steel clamps ($P < 0.001$) for series A, B, and D tests. There was no statistically significant difference in the distortions between the two sets of clamps for test series E and F, while in series G the distortion of the stainless steel clamps was less than that of the carbon steel clamps ($P < 0.001$).

The force required to open both types of clamp to the maximum possible separation of jaws was about 30% greater than that needed to open the jaws to the minimum distance, that is, sufficient to fit over the tooth, while the distortion was more than three times as great for the stainless steel and six times as great for the carbon steel clamps. Opening the jaws of the clamps to the minimum separation after they had been stretched by prior opening to the maximum required far less force (approximately 50% less) than that required to open a new clamp to the minimum. This indicates that permanent distortion of the clamps occurred during maximal opening. Opening the clamps only as far as necessary to fit over the tooth reduces the distortion of the clamps and should preserve their clinical usefulness.

Bending the clamps back to their original dimensions after the clamps had been distorted by maximal separation had no significant effect on either the force required or the resulting distortion when the maximum separation was repeated (Group D). Similarly, bending had no effect on the force for minimum opening of both types of clamp previously opened only to the minimum; distortion of the stainless steel clamps was reduced by 50%, but there was no difference in the distortion of the carbon steel clamps (Group E). This indicates that if distorted clamps are

Force Needed To Open Clamps and Distortion of Clamps

Group	Test Regimen	Stainless Steel Force kgf (N) Mean SD	Stainless Steel Distortion %	Carbon Steel Force kgf (N) Mean SD	Carbon Steel Distortion %
A	Maximum opening	6.15 ± 0.74 (60.31 ± 7.26)	21.4 ± 1.2	9.72 ± 0.25 (95.32 ± 2.45)	14.73 ± 0.41
B	Minimum opening	4.67 ± 0.34 (45.79 ± 3.33)	6.0 ± 1.6	6.76 ± 0.32 (66.29 ± 3.14)	2.35 ± 0.38
C	Minimum opening (clamps from Group A)	2.85 ± 0.44 (27.95 ± 4.31)	0.0	4.58 ± 0.15 (44.91 ± 1.47)	0.0
D	Maximum opening (after bending with pliers) (clamps from Groups A & C)	6.38 ± 0.74 (62.56 ± 7.26)	19.6 ± 1.5	9.62 ± 0.20 (94.34 ± 1.96)	13.90 ± 0.45
E	Minimum opening (after bending with pliers) (clamps from Group B)	4.59 ± 0.35 (45.01 ± 3.43)	3.1 ± 1.3	6.73 ± 0.31 (66.00 ± 3.04)	2.00 ± 0.29
F	Minimum opening (after bending & heat treatment) (clamps from Groups B & E)	4.85 ± 0.30 (47.56 ± 2.94)	2.1 ± 1.5	6.19 ± 0.29 (60.70 ± 2.84)	4.24 ± 2.07
G	Maximum opening (after bending & heat treatment) (clamps from Groups A, C, & D)	6.71 ± 0.78 (65.80 ± 7.65)	9.7 ± 1.91	7.91 ± 0.26 (77.57 ± 2.55)	21.61 ± 1.99

bent back to shape, the clamping action is restored provided the distortion is of low order. Bending and heat treatment (Group F) had no effect on the force for minimum opening of the stainless steel clamps, and the distortion of the stainless steel clamps was considerably reduced. In contrast, the force for minimum opening of the carbon steel clamps was reduced ($P < 0.01$), while the distortion was virtually doubled. Bending and heat treatment before maximum opening (Group G) had no significant effect on the force for opening of the stainless steel clamps, but the force was decreased for the carbon steel clamps. The distortion of the stainless steel clamps was decreased by approximately 55% compared to that of Group A, but the distortion of the carbon steel clamps was increased by approximately 30%. This suggests that a minor homogenizing treatment, 10 minutes at 400 °C, has beneficial effect on the stainless steel clamps but not on the carbon steel clamps.

Conclusions

The common practice of opening clamps as far as possible before fitting them over the teeth is detrimental to the life of the clamp and its efficacy. If the jaws of the clamps are opened only to the minimum separation, that

is, sufficient to slip over the tooth, the life of the clamp and clamping action are preserved. Bending distorted clamps of stainless steel back into shape and then heat-treating will restore them to function, but this procedure discolors the clamps brown. This procedure of bending and heat treatment is not suitable for clamps of carbon steel.

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Editor's note:

A rubber dam clamp is used to help retain the dam on teeth and in some instances to retract free gingiva. There is growing sentiment among dentists that the terms 'retainer' and 'retractor' are more suitable names for these appliances than is 'clamp', especially as 'clamp' has a harsh connotation. As a consequence dentists are encouraged to substitute the terms 'rubber dam retainer' and 'rubber dam retractor' for the term 'rubber dam clamp'. Furthermore, and for similar reasons, a rubber dam clamp forcep is better named 'retainer holder'.

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"Extension for Prevention": Historical Development and Current Status of G V Black's Concept

HALLA SIGURJONS

Summary

G V Black's concept of "extension for prevention" was first outlined in 1891 and almost immediately began to exert great influence on dental practice. However, the extension of the preparations originally suggested by Black met with objections from some colleagues. The leaders of the trend toward conservative cavity preparations, due to refined instruments and higher speed handpieces, have revised the principle of extension. Were G V Black alive today, with all of the modern technological advancements, he would probably subscribe to the current trend of more conservative restorative dentistry.

INTRODUCTION

The concept of "extension for prevention" was first described in 1891 when G V Black published an article in *Dental Cosmos* entitled "The Management of Enamel Margins" (Black, 1891). Over the years this concept has become synonymous with the name of the author (Cannon & Palkuty, 1974). At the time, Dr Black was professor of pathology and bacteriology at Northwestern University Dental School (Black & Black, 1940). His ideas, which included a classification of types of cavity and a systematic approach to the preparation of cavities, spread quickly through the profession and influenced the practice of dentistry.

Black taught principles and followed them with detailed techniques suited to conditions of his day. One must remember, as Miles Markley has observed, that in those times there was no fluoridation of water, few toothbrushes, a limited knowledge of dental pathology, and primitive instrumentation. Despite these limitations, Dr Black produced guidelines that are still the basis of the teaching and practice of restorative dentistry. The only changes have been brought about by technical advances in materials, instrumentation, and control of caries.

This article reviews the concept of extension for prevention and traces its modification over the years. The discussion includes the influence of hand instrumentation, rotary instrumentation, and improvements in restorative materials on the preparation of cavities.

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DESIGNS OF

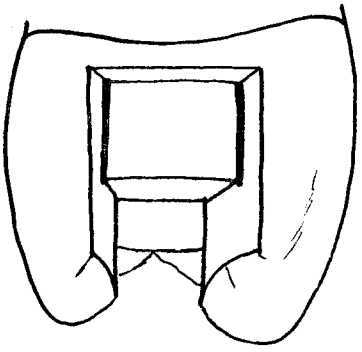


FIG 1. *Black*

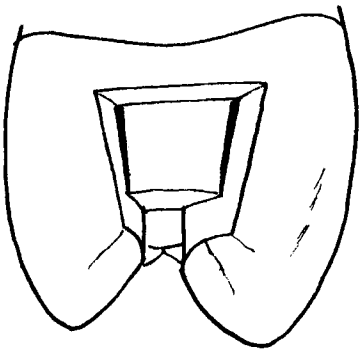
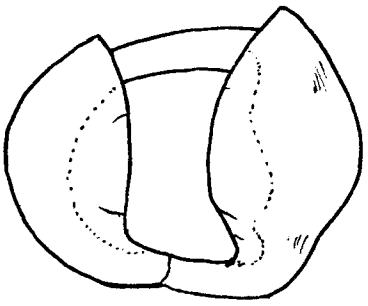
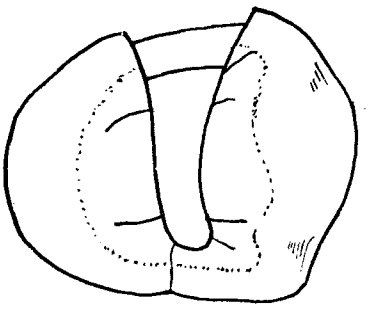


FIG 2. *Prime*





THE CONCEPT

Black's basic idea was to prevent the recurrence of dental decay by placing margins of restorations along lines that would be cleansed by the normal excursion of food (Black, 1924). To obtain this self-cleaning benefit, the margins of the restoration should be placed as close as possible to the mesiobuccal, distobuccal, mesiolingual, and distolingual line angles of the teeth. If the anatomy of a particular tooth makes it possible to accomplish this in a narrow cavity, so much the better. However, if the tooth requires wide cutting to meet this criterion, then the tooth substance should be sacrificed.

According to Black, the proximal area of high risk to decay has specific boundaries outlined occlusally by the contact point, buccally and lingually by the embrasures, and cervically by the position of the healthy gingival papilla (Black, 1904).

The intent of this approach was to prevent the recurrence of decay in the surface of the enamel adjacent to the restorative material. Cutting away undermined enamel should not be confused with extension for prevention in spite of the fact that this practice may lead to placing margins of cavities on portions of the tooth less resistant to decay (Black, 1924).

Extension in Incisors and Canines

In the preparation of proximal cavities of anterior teeth, the enamel margins should be extended sufficiently toward the labial and lingual surfaces so that the margins of the finished restoration will be well away from the contact of the two teeth. This does not mean that cavosurface margins must be especially conspicuous. They should be ex-

CLASS 2 CAVITIES

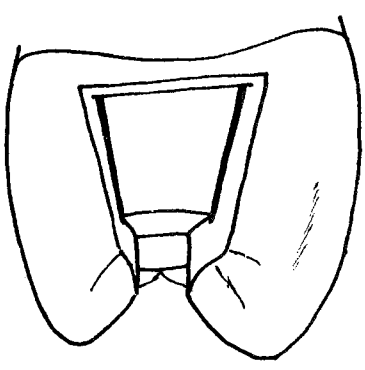


FIG 3. *Bronner*

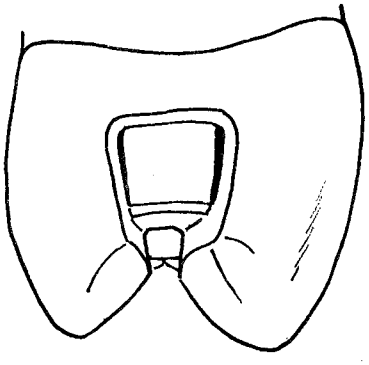


FIG 4. Markley

tended into the embrasure so that the margin of the restoration can be kept clean and then carried under the free gingiva cervically.

Extension in Molars and Premolars

In the preparation of proximal cavities in molars and premolars, the margins should be extended into both embrasures to be well removed from contact with the approximating tooth (Fig 1). The amount of extension is determined in each case by the anatomy of the embrasure. The extension should be sufficient so that the buccogingival and the linguogingival cavosurface point angles are covered by the free margin of gingiva. The occlusal step should occupy the full middle third of the occlusal surface buccolingually. The buccal groove and other sharp grooves should be included in the preparation.

Extension of Gingival Third Cavities

For gingival third cavities, the free gingiva should be retracted during preparation, so that the cervical margin of the finished restoration will be covered by the free marginal gingiva. The mesiodistal extension should reach the angles of the tooth classified as the immune area.

Black's Instrumentation

The sequential instrumentation recommended by Black consisted of an inverted cone bur for initial outline of the preparation, followed by the use of hatchets and chisels to remove unsupported enamel. Instruments available to the dentists of Black's time were large and did not hold an edge well. Therefore, it would have been very difficult to accomplish more conservative preparations.

OPPOSITION TO THE CONCEPT

Not all dentists agreed with Black. The announcement of his concepts brought on a long-standing controversy, especially in the eastern United States. Before Black developed a systematic classification of cavities, decay was excavated and the holes created filled as they were. For some years, Dr Rodrigues Ottolengui of New York City led the opposition to extension for prevention (Ottolengui, 1901). He stated that the tooth had no immune areas and since the patient could not be guaranteed that decay would never attack any part of the filled surface of the tooth, the dentist had no right to remove sound tooth tissue and replace it with a foreign mass. Ottolengui added that extension to him involved all caries or enamel that might be called infected, but should go no farther and no imaginary lines of immunity should be sought.

In 1910, at a banquet given by the Chicago Odontographic Society to honor Black, Ottolengui publicly apologized for having started the opposition and admitted being wrong. "If there is one privilege a man has, it is to come forward and publicly admit his error, and it has been my great pleasure to come here tonight that you would give me the opportunity to say that I am sorry, very sorry, that I started that opposition, because I was wrong" (Black & Black, 1940).

Another of Black's vocal opponents was C Edmund Kells of New Orleans (Kells, 1926). He believed that while theoretically the concept of extension for prevention was sound, no area on a tooth is always immune to the ravages of decay. The walls of the cavity and the filling materials had to be exactly right — conditions rarely met by the average operator — or the restoration would fail. Kells also criticized the destruction of sound tooth substance by extension of cavities in bicuspids and molars. The entire pulpal floor frequently extended from the mesial to the distal margin, even when there was no decay in the pits.

THE TREND TO CONSERVATIVE CAVITY PREPARATIONS

The classical teachings of Black were based on the high rate of failure of small restorations placed during his time. Removal of tooth substance without pain was difficult and incomplete removal of caries was the major concern (Lester, 1978).

As time passed, however, dentists came to realize that their restorations, prepared according to Black's principles, were not holding up as expected. Patients returned with fractured teeth and fractured restorations.

In 1928 Prime made a plea for conservatism. He said that the overcutting of teeth eventually leads to their fracture, death of the pulp, or injury to the gingivae, resulting in loss of teeth. He compared a dentist, operating in such a way, with a lifeguard that saves a drowning person but, because of the method of rescue, injures the individual and causes death. Prime proposed very conservative cavity preparations (Fig 2). His design for a class 2 cavity included a narrow, shallow occlusal step, triangular proximal boxes, and narrow gingival walls inclined to the axial for retention.

Bronner (1930; 1931) published two articles that suggested that the proximal extension be determined by the profile of the narrower of the two teeth in contact. He also suggested that Black's principles of preparing class 4 cavities be applied to the preparation of class 2 cavities. In this modification the occlusal was constricted and the proximal extended to remove any caries or decalcification (Fig 3) and to allow the dentist to finish the restorations and the patient to care for them. In Bronner's preparation, the proximal outline converged occlusally since the area between the marginal ridge and the contact point is seldom the primary seat of decay and therefore requires no extension for prevention. Bronner recommended that proximal sections be self-retentive and not depend upon the occlusal step for retention. The occlusal extension was chiefly a preventive measure but it was thought to aid in resisting forces directed proximally on the marginal ridge of the restoration.

In his *Textbook of Operative Dentistry,* McGehee (1936) included Black's ideas on extension for prevention. However, as this procedure often called for overcutting in individuals with good oral hygiene, he advocated a more conservatively prepared cavity. He described a new form of class 2 cavity in

which the buccal and lingual margins converged toward the occlusal (Black's margins were parallel). McGehee noted that if this alteration were made, much of the enamel and dentin of the marginal ridge and the cusps could be preserved.

In 1949, Brown suggested outlines for class 2 cavities in deciduous teeth. The proximal walls should be prepared with sufficient flare to establish the margin in immune areas, but this flare should always be kept minimal.

Miles R Markley stated that his first five years of practice consisted of numerous clinical failures. He wrote: "Time and time again, the isthmus of the amalgam would fracture and allow the filling to come loose or drop out. I didn't know what was wrong" (Christen, 1978). Bronner's article provided a different basis for Markley and he began to prepare conservative cavities. Tradition was strong, however, and Markley's new ideas represented heresy. For 20 years he went on gaining clinical experience, evaluating patients, and testing his ideas in study clubs before he published his concepts. In 1951 Markley presented several modifications of the preparation for amalgam that included the following features: occlusal walls that were parallel to the enamel prisms, a constricted occlusal outline, proximal margins extended only far enough for access, proximal retention just within the dentin, and a beveled axiopulpal line angle, which reduced stress at the juncture of the occlusal and proximal portions of the restoration (Fig 4). Markley felt that extension for prevention for amalgam restorations at the buccogingival and linguogingival angles could be made with a minimum of width at the marginal ridge. Markley emphasized the importance of round internal line angles. It is a well-known principle of engineering that sharp internal line angles, in any structure, create a zone predisposing to fracture; the same applies to teeth. To obtain these round angles, he designed the pear-shaped #330 bur (Christen, 1978).

To test the resistance of the tooth to forces after cavity preparation, Vale (1956) reduced the intercuspal width from the recommended one-third to one-fourth. A tooth prepared with a cavity one-fourth the intercuspal width required the same force to break it as did an intact tooth, but when the width was increased to one-third, only two-thirds of the force was required to break the overcut tooth. Vale also recommended a narrower occlusal step as well as rounded internal line angles to reduce stresses that might lead to fracture of the root.

Gilmore (1964) concurred that a narrow occlusal outline and rounded internal line angles were preferable to Black's method. He recommended that the proximal clearance from the adjacent tooth be limited to 0.5 mm compared to Black's proposed range of 0.8 – 1.2 mm.

Rodda (1972) agreed that large cavity preparations jeopardized the strength of the tooth. He suggested a conservative preparation with narrow occlusal outline and an S-shaped curve cut in the buccal wall to produce a 90° relationship of the buccal wall to the cavosurface. He also felt internal line angles should be rounded and proximal walls should converge occlusally.

Almquist, Cowan & Lambert (1973) concluded that if patients could be taught to clean their teeth thoroughly, there would be no need to extend the cavity margins more than is necessary for adequate preparation and finishing. They proposed a "slot" preparation consisting of a self-retentive proximal box which followed the current principles of conservative preparation of cavities.

Other dental practitioners, for example, Ferrier, True, Shooshan, and Jones, also suggested modifications in the design of the cavity that have led to more conservative restorations.

CURRENT CONCEPTS

To conclude this review we will look at two leading current textbooks in operative dentistry.

Baum, Phillips & Lund (1981) recommend that the position of the buccal and lingual walls of the cavity be determined by the contacting surface of the adjoining tooth. In mouths that are relatively free of caries, this clearance need be only the thickness of an explorer (0.4 mm). In mouths susceptible to caries this clearance should be as much as 0.75 mm. Gingival extension should be carried 1 – 1.5 mm below the contact point,

depending on the location of the lesion. The occlusal orifice should be restricted.

Gilmore & others (1982) state: "Originally the term extension for prevention was used by Black, but studies on recurrent caries failed to document that the amount of tooth reduction or the exact location of the margins is directly related to the incidence of secondary decay. The extension for convenience is done in the unaffected areas of the tooth to provide room for inserting the material."

DISCUSSION

Black's designs of cavities have largely been replaced by more conservative cavity preparations. Although some might suggest that modern cavity preparation is too conservative, it appears that the current style of preparation and current amalgam lead to a good result. We do know that the so-called immune areas really do not exist for there is no such thing as a self-cleaning surface. However, in spite of the availability of information, many practitioners overcut teeth. This may occur because of high-speed cutting and poor selection of bur.

The aim of the dental profession should be to preserve healthy teeth for a lifetime. As life expectancy is extended, the teeth and surrounding tissue should also last longer. In Black's day, older people more or less expected to lose all of their teeth. Today this is no so (Christen, 1978).

If G V Black were alive today, he would probably have modified his cavity preparations due to improved techniques and materials. We still do not violate any of his basic rules, but have simply brought them up to date. We are no longer practicing a radical extension for prevention, but have changed the slogan to "constriction with conviction."

Acknowledgments

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OPERATIVE DENTISTRY, 1983, 8, 64-66.

DENTAL PRACTICE

Occlusal Morphology as It Relates to Carving Amalgam or Waxing Occlusal Surfaces

Accurate reproduction of triangular fossae is an important element in the design of the occlusal surfaces of restorations.

JAMES M CHILDERS

Summary

Two deficiencies that are commonly observed in the occlusal form of restorations are failure to reproduce correct triangular fossae and faulty direction of the associated grooves.

INTRODUCTION

The longer one works with teeth and becomes familiar with their morphology, the more one is impressed with the logic of the physiologic and masticatory design of the occlusal surfaces. When such design is not re-established during the fabrication of restorations, or when the design is executed improperly, the efficiency and the protective mechanisms of the individual teeth are compromised.

This article has evolved from many years of working with dental students and from observing countless numbers of dental restorations fabricated by many practitioners. Certain conceptual errors that tend to be common to dental students are also common in the performance of graduate dentists. It should be stressed that these errors are conceptual rather than the result of inadequate skill or application.

Two critical considerations of occlusal morphology will be discussed that, when thoroughly understood and incorporated into restorative procedures, can significantly elevate the quality of future restorations.

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AREAS OF CONCERN

The occlusal surface comprises multiple characteristics, but discussed here will be the complex of the marginal ridge and the triangular fossa. The logic of the design of this complex in the virgin posterior tooth is so apparent it is difficult to escape the conclusion that the complex is a very important, if not the most important, occlusal anatomical consideration. When this area of the posterior tooth is studied, it becomes apparent that the purpose of the design is to direct the bolus of food from the occlusal embrasure and to shunt the bolus to the center of the tooth for more effective mastication. The function of the triangular fossa can be better appreciated when one studies the area of the marginal ridge in a lateral profile of a posterior tooth.

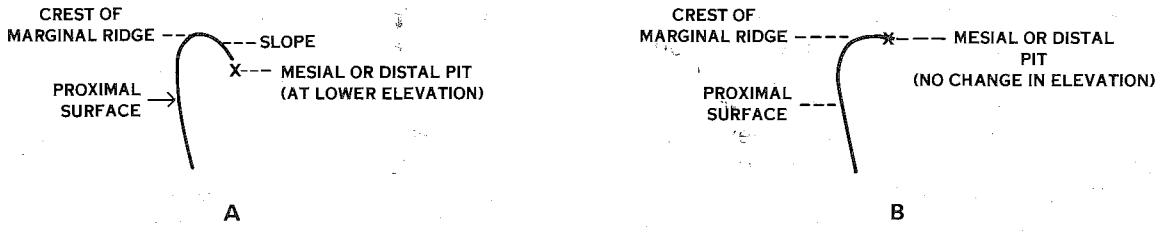

FIG 1. *Diagram to show the correct* (A) *and incorrect* (B) *form of the mesial or distal pit on the occlusal surface.*

Deficiency of the Triangular Fossa

One of the commonly observed conceptual problems is illustrated in Figure 1. In so many carved amalgam restorations or wax patterns, no slope is created between the crest of the marginal ridge and the associated pit (either mesial or distal). The resulting plateau provides a table for attrition but does not provide for proper shunting of the bolus of food to the center of the tooth. Reference to B in Figure 1 will assist in visualizing the error. At this point the reader should mentally compare A and B of Figure 1 with the design that he or she tends routinely to incorporate in his or her restorations. Tendencies toward the concept depicted in Figure 1B should be modified accordingly.

Direction of Facial and Lingual Grooves

To complete consideration of the complex of the marginal ridge and triangular fossa, it is necessary to consider the anatomical design of the occlusal surface from the occlusal perspective. The second conceptual problem relates to the direction given to the facial and lingual grooves, which form two borders of the triangular fossae—the third being formed by the crest of the marginal ridge. The correct occlusal design is depicted in Figure 2A.

Before progressing to the next conceptual problem, it should be reaffirmed that the crests of adjacent marginal ridges should be placed at the same height before triangular fossae are established. The desirability of corresponding heights of marginal ridges is well recognized.

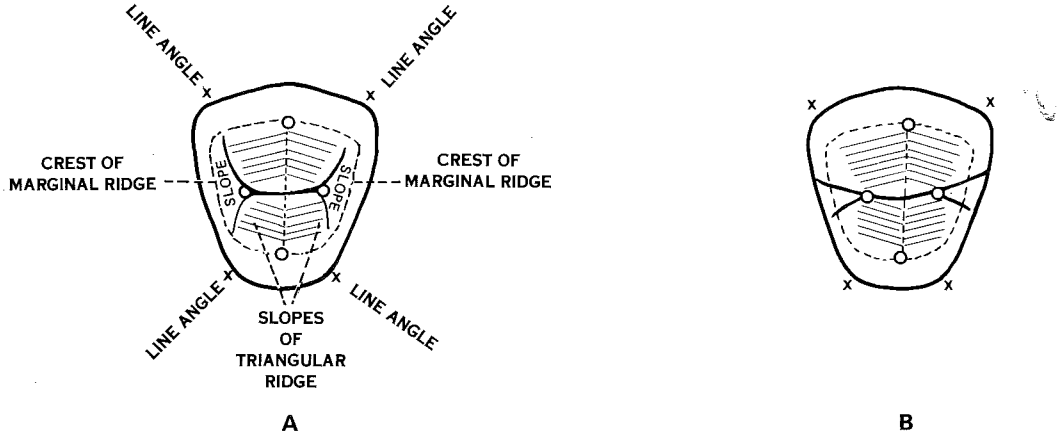

FIG 2. *Diagram to show the correct and incorrect configurations of the facial and lingual grooves bordering the mesial and distal fossae on the occlusal surface:*
A — *correct (gull-wing) with the grooves directed toward the angles of the tooth;*
B — *incorrect (crow's foot) with the grooves directed toward the marginal ridge.*

Certain observations of norm are necessary before the problem can be properly identified and evaluated. Note that the facial and lingual grooves are widely divergent and have a "gull-wing" appearance as they depart from the mesial or distal pit. If one wishes to orient the correct direction of these grooves to dental landmarks, it should be noted that the facial and lingual grooves are directed toward the external line angles of the tooth. Also, correct direction of these grooves can be ascertained by relating them to the crest and planes of the cuspal triangular ridges. It is apparent that the crest of the triangular ridge and the relevant groove of the triangular fossa serve as the two terminals for the slope of the triangular ridge. Therefore, the crest of the triangular ridge and the relevant groove of the triangular fossa must have good relationship if the occlusal surface is to have good perspective and efficient design. At this juncture the commonly observed error can be noted. Figure 2B depicts triangular fossae in which the divergence of the facial and lingual grooves is much more constricted. The grooves have "crow's-foot," or V-shaped, configuration rather than the correct gull-wing divergence. The grooves in Figure 2B are not directed at the external angles of the tooth and cannot contribute to a harmonious relationship with the crest of the triangular ridges as terminals for the slopes of the triangular ridges.

The crow's-foot, or V-shaped, configuration also contribues, in many instances, to the grooves crossing the marginal ridge (as depicted). The integrity of the roll of the marginal ridges should be uninterrupted except in instances where an occlusoproximal developmental groove properly crosses it.

Once again the reader should mentally compare the configuration of the triangular fossae in A and B of Figure 2 with those that he or she tends to produce in restorations. Tendency toward placing the grooves as in Figure 2B should be modified accordingly.

CONCLUSION

Dentists have a professional obligation to be familiar with, and to restore accurately, the functional characteristics of natural teeth. No one associated with dental practice may be released from this obligation (Wheeler, 1974).

(Accepted 14 January 1983)

Reference

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The Dovetail Class 3 Inlay

Many class 3 cavities that are too large to be restored with gold foil are excellent indications for gold inlays.

MELVIN L REDFERN

Summary

A tooth with a class 3 lesion, or defective restoration, that is too large for treatment with gold foil may be restored with an inlay incorporating a dovetail on the lingual surface, the dovetail including more of the lingual surface than would usually be necessary for a small lesion. Except for the distal of the canine, the direct technique of constructing the inlay is recommended.

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INTRODUCTION

Cast gold restorations of the approximal surfaces of anterior teeth have received, at best, a modicum of attention. Very little has been written about either the history or the morphological development of the class 3 inlay.

It appears that on the rare occasion when the class 3 inlay is taught in the classroom, its retentive elements are engineered into an approximal slot. This configuration, having only incisal, gingival, and axial walls, obviously results in a very conservative restoration. However, clinical observations and experience over the years have taught me that a tooth robust enough to be capable of retaining an inlay in its approximal surface only could be more beneficially restored with gold foil. Anterior teeth not suitable for restoration with gold foil—those with mesial and distal surfaces badly destroyed from decay or failing restorations—need a cavity with more

retention than is available in the cavity consisting of only a slot.

By using the breadth of the lingual surface of the tooth we can include a lingual axial wall with its surrounding wall. This design not only increases markedly the area of retention but also the number of teeth suitable for inlays.

In all of dentistry today we are seeing, on the average, an older group of patients. The emphasis in operative dentistry is changing. In the past we restored the damaged surfaces of teeth of patients, ranging in age from the teens to 30 years, with silver amalgam, temporary materials, inlays, and occasionally gold foil. Today we have older patients with broken and worn cusps and recurrence of decay around these extensively restored teeth. The posterior segments of the arch can be brought back to useful form with crowns, inlays, or onlays, but the methods for reconstituting the anterior teeth are not so clearly defined. Options are more constrained. Do we really need to use so many ceramic crowns? A second questionable alternative is the new group of composites.

My professional career has spanned the years from silicates and resins to this new generation of composites. If past performances can be used as an indication of the future, I find myself frankly pessimistic as to the durability of composites. Even if these new wonders do exceed our fondest expectations, they still do not solve the problems of adequate contact and gingival adaptation. I cannot see where anything less than metal is going to satisfy, for the near future, these two important considerations in the choice of an anterior restorative material.

If you wish to give added service to the anterior segments of the arch with a time-proven restorative material and provide these teeth with the optimum opportunity to serve your patients through the extended years that modern medicine and dentistry have bequeathed them, I recommend the use of the class 3 inlay with lingual dovetail retention constructed by the technique here described.

INDICATIONS

1. Where gold foil cannot be used because of a broken or friable lingual wall
2. Extensive caries
3. Replacement of restorations of silicate, resin, or composite that have failed. The dovetail class 3 inlay should be thought of as a redintegrative restoration after repeated assaults by resins of all types. This restoration can be a preferable alternative to the more radical ceramic crown.

TYPES

1. Direct wax pattern
2. Indirect (distal of upper canines only; supplemented at times with retention by pins)

The distal of upper canines can certainly be managed with direct wax patterns, but it is easier, because of the line of draw, to take impressions, especially when using the pin-lay technique for additional retention.

PREPARATION (DIRECT)

Armamentarium

fissure burs (700 and 701)
Wedelstaedt chisel (10-15-3)
hoe 8-3-25 (modified to a right and left blade by changing the angle of the cutting edge of the blade with the long axis of the blade from 90° to 45°)
separator (metal or wedge-shaped toothpick)
diamond stone (bullet-shaped, small, fine)

Procedure

Place rubber dam and separate the teeth with a wooden wedge at the gingival. Later, when the gingival extension is more definitely determined, a metal separator may be substituted to gain access for the preparation of the gingival floor. There needs to be approximately 0.5 mm clearance from the gingival margin to the crest of the interproximal wedge to facilitate the fabrication and removal of the wax pattern. Often the wooden wedge must be replaced to take advantage of the space it occupies. The metal separator provides more positive retraction of the gingival papilla, but usually reduces access. It is much easier to

work in the absence of the metal frame when preparing the lingual dovetail.

With the wedge firmly in place and separation complete, remove the extruded ends of the wedge to prevent their interfering with the instrumentation.

Using the 700 bur at high speed, break through the lingual marginal ridge from the lingual. Move the bur gingivo-incisally and try to determine the extent of the undermining of the incisal enamel by removing decay or old restorative material. The extent of the impingement upon the incisal angle is the determining factor in the final shaping of the dovetail (Figs 1 and 2). The incisal angle must be protected and conserved as much as possible for here is the area most susceptible to failure. If it becomes obvious that a larger dovetail is needed to meet the demands of retention, then this retention must be acquired at the expense of the lateral breadth of the lingual surface of the tooth. As long as the line of draw of the dovetail remains commensurate with that of the approximal boxing, retention is gained without weakening the incisal angle. The distal or mesial outline of the dovetail demarcating the gingivo-incisal length is no longer a straight line but becomes more curved. The indications for the use of the class 3 inlay usually predispose some variant of the preparation shown in Figure 2. By extending the incisal or gingival arms of the dovetail, separately or in unison, it is possible to take advantage of the most suitable retentive area of the tooth. It is also common to find incipient caries in the lingual pit of the incisors, and the gingival arm can be extended to include this lesion.

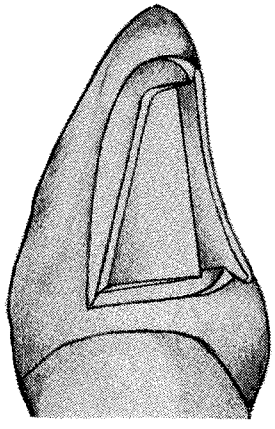

FIG 1. *Approximal view of prepared cavity*

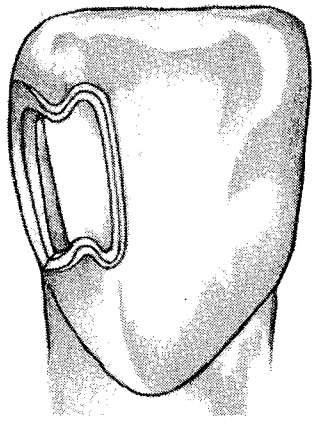

FIG 2. *Lingual view of prepared cavity*

Do no more than establish the lingual outline at this time. The finish will come after the completion of the facial outline. This sequence offers a better perspective to the final development of the all-important dovetail.

Establish the facial outline with the Wedelstaedt chisel from the facial and the fine diamond stone from the lingual. The diamond is used mostly in the contact and incisal areas. The final finishing is done from the lingual with the appropriate modified 8-3-25 hoe.

When preparing cavities for conservative and esthetic gold foil restorations, a reverse bevel may occur on the facial margin. As long as the margin is harmonious and regular, this bevel is irrelevant. However, for an inlay, such beveling will cause a distortion or fracturing of the wax pattern and, therefore, after any facial chiseling the facial wall must be planed judiciously from the lingual with the appropriate modified 8-3-25 hoe. With the facial wall completed, return to the lingual once more.

The outline of the lingual has been established with a 700 bur at high speed. The fine sharpening and detailing of the retentive grooves of the dovetail is now accomplished with a 701 bur in the slow-speed handpiece, which gives more tactile sense. The slower 701 bur shapes the approximal boxing at the

incisal and gingival; it also develops the gingival floor, which is, for all purposes, a continuous bevel from the cavosurface margin to the axial wall. It is broken slightly by the boxing in the facial area of the axial wall but blends into a continuous plane as it meets the dovetail at the lingual. The faciogingival line angle will be somewhat acute. See Figure 3.

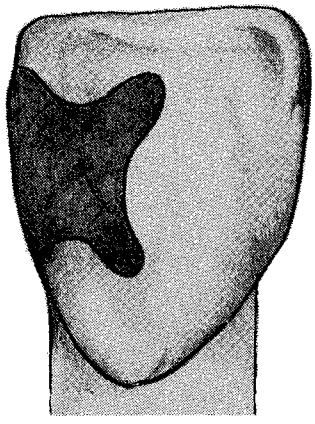

FIG 3. *Lingual view of restoration with more extensive dovetail*

Any remaining caries and restorative material is removed from the axial wall and that surface is recontoured to a configuration that facilitates draw.

The entire outline of the lingual dovetail is beveled with the diamond stone and any loose enamel prisms are removed from the gingival cavosurface margin with the Wedelstaedt chisel.

PREPARATION (INDIRECT)

Armamentarium

hoe (14-6-8)
gingival margin trimmers
twist drill (0.024)
nylon bristles (0.023 and 0.022)
fissure burs (700 and 701)
diamond stone (small)
Sproule mandrel with $\frac{3}{8}$-in garnet disk (medium)

Procedure

The considerations of the dovetail are the same; however, care must be taken to ensure that the line of draw of the dovetail is oriented more incisally to accommodate the approximal boxing which opens to the incisal. The facial and lingual walls of the approximal are finished with the garnet disks and the 14-6-8 hoe in place of the modified 8-3-25. Margin trimmers are used to bevel the gingival floor. The approximal outline form is shown in Figure 4.

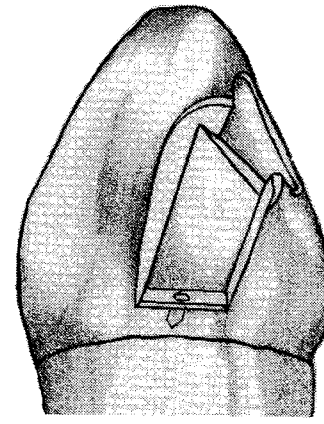

FIG 4. *Approximal view of a cuspid with a prepared cavity with a hole for a pin*

At times additional retention is needed. A pinhole 1 mm deep is placed in the gingival floor, parallel with the axis of draw, with a 0.024 twist drill. To maximize the thickness of dentine between the pinhole and the enamel, keep the twist drill close to the axial wall.

Before taking the impression, place a length of 0.023 nylon bristle in the pinhole. Replace the 0.023 with the 0.022 bristle before waxing the die.

WAX PATTERN (DIRECT)

Armamentarium

matrix material (clear, 2½ - 3 in)
separator
die lubricant (Microfilm)
wax carver (D-2, University of Washington)
discoid-cleoid

heating instrument (D-1, University of Washington)
cuttle strip (fine and extra-fine)
sticky wax
liquid wax carrier (modified No 18, University of Washington)
used 700 bur
⅓ length cotton roll
casting wax (Kerr blue regular)

Procedure

Sparingly cover all surfaces of the preparation with Microfilm on a cotton pledget. Blow and wipe off all excess. Excess Microfilm makes it difficult to confine the wax pattern while it is being carved. Just a little is needed to permit removal of the pattern. Cover the matrix strip, also, with a trace of Microfilm. This facilitates removal of the matrix free from any drag.

Hold the matrix in the fingers of one hand and heat the blue wax until a drop can fall onto the matrix in a spot approximately 1 mm away from an edge. Glaze with air and repeat until a stack of wax drops large enough to accommodate the size of preparation has accumulated. Approximate the soft wax pile to the lingual opening of the preparation. Pull the matrix facially until the wax makes contact with the preparation. Fold the matrix over the lingual of the tooth and press with a finger (if a metal separator is in position use the one-third length of cotton roll beneath the finger). Simultaneously, confine the wax on the labial by pulling the matrix tight. The gingival margin must be included in this procedure or a new start is required. Adding wax at the gingival is extremely difficult in most cases. Cool the wax with the air and remove the matrix band with an incisal tug.

With a warm D-1 instrument lute the wax flashings to the margins on the lingual and remove the excess with the wax carver. Use the wax carver to lute the entire labial margin. With the carver, expose as much of the gingival margin as possible both lingually and labially. The final finish of the gingival will be done later with a finishing strip while the approximal surface is being contoured.

Shape the lingual anatomy by both adding wax with the modified No 18 liquid wax carrier and reducing bulk with the wax carver and the discoid-cleoid.

Before returning to the facial, break through the contact with a few strands of floss. Follow with an extra-fine cuttle strip to contour the approximal and finish the facial and gingival margins.

With a damp cotton pledget warmed in the Bunsen flame, polish the lingual surface of the pattern.

A used 700 bur constitutes the sprue. Place the warmed head of the bur into the bulkiest area of the pattern and stay away from all margins. Cool immediately with air. Carefully withdraw the pattern and do not try to reseat it. Examine the pattern carefully; if for any reason you find the pattern inferior, start over. Temporary stopping is used to protect the tooth between appointments.

INVESTING AND CASTING

With a small heating instrument, carefully lute the sprue to the pattern with sticky wax. Be sure to fill the grooves of the bur with wax. Add a bit of surplus contour for contact if needed. Invest in any appropriate investment material. When removing the metal sprue, take care not to bend it so as to break the head of the bur from the shank; the head is very difficult to recover from the investment.

Cast in a soft 22-karat inlay gold. Examine the casting carefully for any defects or bubbles. Relieve both axial walls slightly to provide for a layer of insulation to the pulp. Remove the sprue and return to the operatory.

FINISHING

Armamentarium

separator
gold file (pull-type)
Burlew wheel
green stone (flame-shaped)
white stone (flame-shaped)
discoid-cleoid
heating instrument (D-1)
sticky wax
fine polishing compound in alcohol
finishing strips (cuttle, fine, and extra-fine)

Procedure

Determine the line of insertion of the casting and place it on a D-1 instrument with sticky wax. Seat the casting very carefully, check the contact area, and make any necessary corrections. Check for premature contact from the lower incisors and correct.

Place the rubber dam. Press the casting firmly to place with the blunt end of the D-1 instrument. Use the pull-type gold file to burnish the facial margin below the contact, as far incisally as possible. Re-establish the separation with the wooden wedge. When the wedge is inserted now, it is an advantage to place it in such a way as to impinge upon the casting. This has the dual advantage of stabilizing the casting as well as separating its contact during the finishing process. Now return to the lingual and finish the margins with the green and white stones, and discoid-cleoid. Lute the casting to the tooth on the lingual with sticky wax and return to the facial with the fine-cuttle finishing strip to burnish the facial margin above, and including, the contact area. Polish the same areas with the extra-fine strip. Remove the wedge and polish the approximal surface and the gingival margin with the extra-fine strip threaded between the teeth, gingival to the contact.

The casting is removed by pushing from the facial with a right-angled explorer. Again, orient the casting with the line of draw on to the D-1 instrument with sticky wax. Clean the casting with a solvent. The preparation is cleaned with H_2O_2 and dried thoroughly.

Cover the inside of the casting sparingly with zinc phosphate cement on a camel hair brush. Return the casting to the preparation and apply firm pressure with the D-1 instrument. Use the pointed end of the same instrument to wedge at the interproximal. The blunt end is used to remove excess cement and to burnish the lingual margins. Remove excess cement on the facial by passing dental floss through the contact. Burnish the facial carefully with a D-2 wax carver.

When the cement has set, separate the contact area once more and polish the facial, approximal, and gingival margins with the extra-fine finishing strip. The lingual is polished with a Burlew wheel. Final finish is accomplished with a paste of a fine abrasive in alcohol in a rubber cup. Before dismissing the patient, check the occlusion once more.

(Accepted 1 February 1983)

POINT OF VIEW

Contributions always welcome

Let's Really Standardize Our Tooth Numbering System

JAMES T O'CONNOR

Do you play the numbers? Tooth numbers, that is. When you think of the third molars as a group, do you first say to yourself, "the 8s," and then translate that into tooth #1, #16, #17, and #32?

You are not alone. Many of us older dentists have been doing that ever since the insurance claim forms first demanded that we use the standard system for numbering teeth. Almost every dentist then in practice had been taught a different system in dental school—the Palmer 1-8 quadrant system with that funny little quadrant symbol, ⌊ , or ⌋ , which couldn't be reproduced on a typewriter without giving the typist a fit.

First she would have to make the vertical component of that quadrant symbol and then back space one or *two* spaces to make the horizontal arm and sometimes even change to the next line to get it right. Despite all that effort, it still looked like the midline was off center when she finished with it. That was probably the reason the system fell into disrepute: it was the dental typists that revolted, certainly not the dentists. What dentist (they all being such logical chaps) would object to using the same number for the same tooth no matter in which quadrant it was located? Upper, lower, right, or left, a first bicuspid was always a "4," not tooth #5, #12, #21, or #28, depending on its quadrant location.

Indeed, once a dentist has been exposed to the natural logic of the quadrant system, it is hard to put it aside for the 1-32 system. That system totally ignores what nature is plainly telling us—there are four similar sections of eight teeth in most humans. Nature loves order but it does not issue serial numbers!

Ask any orthodontist which system he prefers. "Extract the "4s," or: "Please remove tooth number five, tooth number twelve, tooth number twenty-one, and tooth number twenty-eight for your patient." He could probably have a patient fitted with bands in the time it takes to dictate that last mouthful.

Oral surgeons also seem to stick to the "8s" rather than use the serial numbers of the third molars. In addition, over the years I have found that auxiliaries in my office find the quadrant system much easier to learn and to use. They find it much easier to explain to a patient who may question an entry on our itemized statement. "Mrs Brown, UL4 on your bill refers to the fourth tooth on the upper left counting from the big tooth in the middle." Matter of fact, I'm convinced that

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using the letter code for the quadrants eliminates the need for many patients to question the bill. They remember work done "on the upper left side" much more easily than they remember work done "on their #12" last month.

By the way, that's how I got my typist to cooperate with the 1-8 system used in my office. We don't use the quadrant symbol, we use the letter code for the quadrant, UR1, UL4, etc. Everyone in the office finds it easier to learn and to use—everybody but the insurance company clerks, that is. True, they are not in the office, but they are our office managers nevertheless. We must use their system and take the time to translate our code into theirs whenever we write to them or file an insurance claim for a patient.

"Come now, fellow," you say, "you are a nonconformist. Everyone else is able to use the 1-32, A-T system, in fact it's the approved system of the American Dental Association (ADA). Why can't you bend a little in the interest of standardization?" Hah, I reply, the rest of the world is on my side. When the Fédération Dentaire International (FDI) adopted an official international system of numbering, it chose the 1-8 quadrant system. Actually, it went a step further and used a number for each quadrant also. The FDI system prefixes the tooth number with a number for each quadrant: 11 is the central incisor in the upper right quadrant, 31 is the central incisor in the lower left quadrant. The FDI is an international, multilingual organization and that is probably the reason it opted to avoid a letter code for the quadrants as it would be different in each language.

How come, then, we in the United States are now using a different system of numbering teeth from that used by the FDI? It seems that back in the late 1960s some groups in the United States, interested in standardization, agreed that the numbering system then in use in the federal services should be recommended for common usage (ADA, 1967). That explains the predilection for serial numbers.

Subsequently the FDI adopted its differing system; apparently it recognized the logic of using the same number for the same tooth. In fact, by using a number prefix for each quadrant, it also streamlined tooth numbering by employing only 16 numbers (8 tooth numbers, 8 quadrant numbers) rather than the 52 symbols necessary in the 1-32, A-T system.

So if it is standardization that we want, we, the ADA, should adopt the 1-8 code to get in step with the rest of the world. We could, at first (as a transitional crutch and to avoid confusion with the 1-32 code), use our English letter code for the quadrants instead of the FDI number prefix. That change would make translating our code into the FDI code much less confusing when, for instance, identifications are necessary after an international aviation accident, or other such mass disasters involving nationals from many countries.

As things stand now, can't you just imagine a French forensic dentist on receiving the patient records coded in the present ADA 1-32 system sighing: "Ah, these crazy Americans! They fill so few teeth in the lower jaw, just a 31 or a 32 now and then. And what is a 30? An edentulous left mandible?".

OK, that's an exaggeration, but if we truly believe in standardization shouldn't it be universal, that is, international? And remember, 50,000 Frenchmen can't be wrong! (Imagine saying that in serial number code: "Frenchman #1, #2, #3, ..., #50,000, can't be wrong.")

If you agree, let your delegates to the ADA know what you want. They can be reached at the headquarters of your local district dental society. They are the only ones with the power to improve our international communications and esteem.

Reference

AMERICAN DENTAL ASSOCIATION (1967) *Transactions.* P 31. Chicago: ADA.

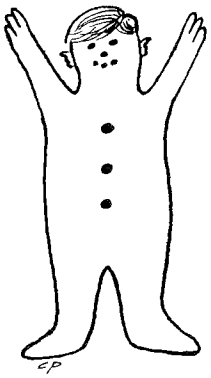
Wit and Wisdom

A BEDTIME STORY

Once upon a time there lived a little old man dentist with his little old wife dentist. They both practiced together in a quaint little office in the woods. They were very happy, but they had no children and they did want a little child dentist of their own.

One morning when the little woman dentist was baking gingerbread, she laughed to herself and said, "I'll make my little old man dentist a gingerbread boy dentist."

So she took a piece of spicy dough, and she rolled it out smooth, and she cut it out in the shape of a fine gingerbread boy. She gave him raisins for eyes, a wide smiling mouth, and down the front of his jacket she put a row of almond buttons. Then, with a little pat, she popped him into the hot oven.



When she thought the gingerbread boy dentist was baked, the little old woman dentist, still laughing to herself, opened the oven door to peek inside. But before she had time to put a finger on him, the gingerbread boy dentist hopped right out of the oven saying, "But I want a practice of my own!" And he slipped

through the kitchen door and ran out on the path to the woods.

The little old woman dentist ran after him calling, "Come back, come back! You can practice here with us!" But the gingerbread boy dentist kept running into the woods and the little old woman dentist couldn't catch him.

The little old man dentist saw the gingerbread boy dentist run past with the little old woman dentist after him. "Stop! Please come back. We need you here with us!" he called. But the gingerbread boy dentist only waved and kept on running.

A plump banker bunny nibbling green dollar bills at the edge of the forest looked up as the gingerbread boy dentist ran past, and his bunny banker nose quivered hungrily.

"I'd be delighted to loan you $3,200 for a two-operatory practice at 147½% interest, compounded twice daily — payable in easy weekly installments of only $742.69 for a five-year period."

But the gingerbread boy dentist kept right on running.

"Wait a minute!" cried the plump banker bunny. "I can also throw in 0.92 shares of our new series of Cityrockybank adjustable-rate, cumulative preferred stock with a par value of $25 per share."

But the gingerbread boy dentist ran on, followed by the little old woman dentist, the

little old man dentist, and now the plump banker bunny.

A fuzzy federal bear cub sniffing for scandalous statistics looked up as he passed, and his little red tongue flipped out hungrily.

"Advertise, gingerbread boy dentist, advertise!" he cried out. "Just imagine your name in lights across a huge billboard on the busiest expressway in the city. You'll become famous overnight! People will be calling your office and your appointment book will be overflowing."

But the gingerbread boy dentist kept on running. The fuzzy federal bear cub scrambled along as fast as he could, but he could not catch him. And the gingerbread boy dentist ran on into the deep woods.

An insurance fox peeked out of hiding as he passed, and his sharp eyes shone hungrily.

"Watch out, gingerbread boy dentist," he called. But the gingerbread boy dentist kept on running faster.

However, the insurance fox did not run after him. He just said sweetly, "I don't want to interfere with your practice in any way, gingerbread boy dentist. But the big Recession River is just ahead, and I will be glad to give you a ride across on my tail if you like, so that the little old woman dentist and the little old man dentist and the plump banker bunny and the fuzzy federal bear cub will not catch you."

The gingerbread boy dentist looked at the big Recession River ahead. He looked at the woods behind. Then he looked at the fox.

"Insurance fox, since you are so kind, I will accept the ride," he decided.

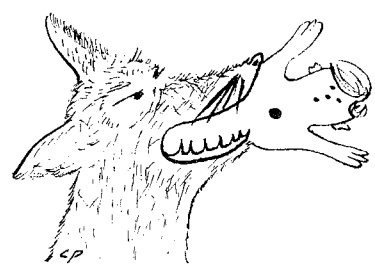
So he hopped onto the insurance fox's tail and they started across the big Recession River. Soon the water grew deeper and deeper, and the insurance fox called out:

"If you want to keep above the water, gingerbread boy dentist, you must climb on my back. Of course this means that you must never use gold foil in your practice. It's an obsolete technique anyway and much too expensive. You will be able to use other methods more quickly and save us both money. Besides patients don't want that unsightly gold in their mouths."

So the gingerbread boy dentist hopped onto the insurance fox's back, and on they went. But the big Recession River got still deeper and the fox called out:

"Hop on my head, gingerbread boy dentist, or you will fall off. However, you must now start using nothing but removable partial dentures rather than fixed bridgework on any of your patients. Fixed prostheses are very difficult to change should your patient lose any additional teeth, whereas removable appliances are equally effective and much more economical. Plus, patients appreciate the ease with which a removable appliance can be cleaned. All that string and stuff used to clean a fixed bridge is a real pain!"

So the gingerbread boy dentist hopped onto the fox's head. Suddenly the sly insurance fox flipped his head and opened his mouth and in went the gingerbread boy dentist.



And that was the last of the gingerbread boy dentist.

CAROLYN F PALMER, DDS
Blountville, TN 37617

References

MOTHER GOOSE, Stolen from.

DEPARTMENTS

Book Reviews

REALITIES OF DENTAL THERAPY: A DETAILED REVIEW OF PERIODONTAL PROSTHETIC TREATMENT

By R L Moloff and S D Stein

Published by Quintessence Publishing Co, Inc, Chicago, 1982. 456 pages; 945 illustrations, 112 in color. $78.00

The authors have presented what they feel is an atlas of diagnosis and treatment sequencing for the management of simple and complex problems in everyday practice. The atlas format was chosen to serve as a stimulus for developing the reader's concepts and techniques because it would permit the reader to relate the problems encountered to the treatment proposed.

The text is based on a 3 to 5 day lecture course and is roughly divided into three segments. In the first segment, which consists of three chapters, the authors outline their basic concepts of health and disease and how one state may progress or be converted to another. The clinical objectives and responsibilities of involved therapists are outlined when a multidisciplinary approach is required.

The ideas expressed and approach to therapy—disease control, correction of the deformities caused by the diseases, and maintenance—are generally in harmony with the opinions currently in vogue. A quick perusal convinces the reader that the authors have the skill to manage complex dental problems. Many of the clinical results they demonstrate are ample proof. Their best results were achieved when given *carte blanche*. Less satisfactory results were obtained when confronted with nonconformity. Is this nonconformity the "reality" the authors are addressing? The authors contend that treating patients under ideal circumstances is a fantasy. The insidious insinuation is that compromise takes the form of incomplete treatment and is tantamount to licensed mediocrity. It further illustrates that the authors have failed to recognize the reality that there is not one ideal treatment, based on materials or techniques, universally applicable to all patients. Rather, there are philosophical and technical approaches that allow practitioners to achieve comparable results under variable circumstances. Ideal treatment involves selecting intelligent alternatives without bypassing biologic, mechanical, functional, or esthetic requirements.

Beyond demonstrating the authors' capabilities, a textbook should convey a message. There should be an organized format that guides the uninitiated to greater understanding. In their second section, devoted to randomly arranged case reports, the authors have chosen to rely on photographic "documentation rather than get overly involved with semantics and terminology." The text consists primarily of captions to the photographs and fails, in its brevity, to present the authors' interpretation of facts. This represents a serious misunderstanding of an author's responsibilities. The pictures in any presentation, spoken or written, should serve to enhance the impact of the verbal message. To understand a picture completely, the viewer must draw on past experience or depend upon a description. Rather than being a textbook, illustrated with documentation from patients, this is a book full of pictures held loosely together by a thin web of cogitation. The authors have shown us that they can do it, but have failed to give adequate directions to anyone who wants to learn how.

A simple alternative would have been to arrange the examples of patients exhibiting the problems in an order of increasing complexity and point out the common but diverse nature of problems and their solutions. Restatement in this way would allow the reader to build on previous information, recognize similarities and dissimilarities, and develop a rational basis for formulating judgments and prescribing treatment. As it is, it appears there is no order in the universe.

The authors' style is generally nonauthoritarian. This approach is very useful in verbal presentations, but in a textbook the message is so soft that many readers will not perceive it. The authors' objectivity must be brought to task. They offer quasi-scientific explanations for performing certain tasks or selecting specific materials that are nothing more than rationalization. In one instance the incorporation of a unilateral posterior open bite into a restoration was intended to "keep both arches with ideal occlusal planes." When two opposing arches with ideal occlusal planes are brought together in occlusion, these two curved planes are coincident. The authors advocate the use of splinted interim restorations of acrylic resin for patients with severe occlusal trauma because they "act like shock absorbers thereby decreasing the magnitude of force and promote healing." In fact, the elastic properties of the periodontal ligament far exceed those of acrylic resin. Any "healing" observed is more likely the result of redistribution and redirection of force.

In their introduction to chapter 5 the authors recognize that they have delivered their message and should be prepared to close. Yet they fall prey to some overwhelming urge and submit a "mixture of assorted thoughts and procedures" in an effort to "round off any loose ends and cover any material that has been omitted." The book would be better off without this chapter. If the information were so critical it should have been organized into the body of the text.

The sixth chapter also appears to be out of place. The central message, that each practitioner must develop his own philosophy, is easily lost. There is also an undertone of summation creeping in. The final chapter is an adequate summary statement, and the reader is left wondering why the authors felt a need to make two summary statements.

The layout, printing, color reproduction, and other technical aspects of publication are reasonably well done with what was provided. However, it must be a little embarrassing to the authors, who include a disclaimer that "the photographs have not been retouched," to see such obvious signs of burning and dodging for contrast enhancement. In fact more, and more artful, finishing of the photographs should have been performed. Many pictures would benefit from enlargement and alterations in composition. The lack of standard format, some errors in composition, and other defects in the preparation for photography are the author's responsibilities. The publisher must accept responsibility for the final preparation for publication. Additional cropping would eliminate distractions from many photographs.

This book appears to be directed toward general practitioners looking for a few pearls of wisdom to help them solve some of their frustrations. However, it is not organized into the compendium format with which most practitioners feel comfortable. As such it will have little impact on the profession.

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THE LIFE AND TIMES OF G V BLACK

By Charles N Pappas

Published by Quintessence Publishing Co, Inc, Chicago, 1983. 128 pages. $24.00

This book begins with a description of some of the honors which Dr G V Black received at a testimonial banquet given by the Chicago Odontographic Society in 1910, and at a banquet given in his honor in 1911, in Jacksonville, Illinois.

The second chapter deals mainly with the Black family and the personal side of G V Black's life. His ancestors dated back to colonial times, with his great-grandfather William Black holding the rank of captain in the North Carolina Militia in 1775. The remainder of the chapter describes G V Black's parents and their pioneering life. It then jumps to some considerations of operative dentistry and the early texts on the subject.

The third chapter, "Community," tells of the main events of G V Black's life: his entry as an enlistee in the Union Army, the death of his first child, and of his first wife, his second marriage, his acquaintance with Thomas Gilmer, and his growing involvement in the dental literature and community affairs.

Chapter four, "Purpose," reviews some of

the major contributions which G V Black made in the field of dental caries, operative dentistry, dental anatomy, amalgam research, and education as dean of the dental school at Northwestern University. It includes many illustrations taken from Black's textbooks of operative dentistry.

The final chapter deals with the service and contribution of Dr G V Black. It reviews his publications as well as the advances and new perspectives in operative dentistry.

The book is nicely illustrated with historical photographs of individuals and places, as well as reprints from his numerous textbooks. It is short, easy to read, and upon completion one has a superficial understanding of G V Black, the man, and his accomplishments.

The style of writing has a tendency to be disjointed, and in an effort to be brief, covers Black's life in a very superficial fashion.

The author draws heavily on Carl and Bessie Black's book, *From Pioneer to Scientist,* published by Bruce Publishing Company in 1940—a much more complete book on the life and activities of G V Black. Pappas' *The Life and Times of G V Black* is written in an easy-to-read style, is well illustrated, and provides the reader who has only a casual interest in G V Black with a highlighted version of his life.

CLIFFORD H MILLER
Associate Dean
Administrative Affairs
Northwestern University Dental School
Chicago, Illinois

Announcements

RECIPIENTS OF 1983 STUDENT ACHIEVEMENT AWARDS

Academy of Operative Dentistry

University of Alabama	Earl Dewayne Rogers
University of Alberta	Richard Chilibeck
Baltimore College of Dental Surgery	Gary M O'Shea
Baylor College of Dentistry	Richard Mark Peppard
Boston University	Jeffrey Ganeles
University of British Columbia	Patricia Ann Hunter
University of California at Los Angeles	Teresa Kit Yang
University of California at San Francisco	Larry M Odono
Case Western Reserve University	Jeffrey Allen Cavalancia
University of Colorado	Louisa I Gallegos
University of Connecticut	Robert Elwood Briggs
Creighton University	Steven Astuto
University of Detroit	Stephen R Harris
Emory University	Robert Michael Taft
Fairleigh Dickinson University	Kieran James Aurori
University of Florida	Alberto A de Cardenas
Georgetown University	Emanuel Delegramaticus
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Louisiana State University	Steven Edward Ripple
University of Louisville	Robin A Wetherell

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Ann Lindsay Griffen
Wah-Wai Katrino Koo
Hiroyuki Kohyama
John Leo Gentuso
H W Kleijn-van Willigen
Philip J Bales
Wayne Pentilla
A R Burgoyne
Brent B Coffield

AGD AWARD TO WILMER B EAMES

Dr Wilmer B Eames was chosen the sixth recipient of the highest honor awarded by the American Academy of General Dentistry, given in memory of the late Albert L Borish, a leader in the Academy's Continuing Education and Mastership programs.

Dr Eames is honored for his contributions to dentistry and continuing dental education, particularly his role in developing the Academy's materials and techniques project, the results of which appear as a regular feature in its *Journal of the Academy of General Dentistry.*

He is professor emeritus at Emory University School of Dentistry and currently a visiting professor at the University of Colorado School of Dentistry. He developed the standardized mercury-alloy ratio that now is taught internationally. He is an honorary fellow of the AGD, a fellow of the American College of Dentists, and the International College of Dentists. Dr Eames is an associate editor of *Operative Dentistry.*

NOTICE OF MEETINGS

American Academy of Gold Foil Operators

Annual Meeting: 29 and 30 September 1983
University of California
at Los Angeles
Los Angeles, California

Academy of Operative Dentistry

Annual Meeting: 16 and 17 February 1984
Chicago, Illinois

INSTRUCTIONS TO CONTRIBUTORS

Correspondence

Send manuscripts and correspondence about manuscripts to the Editor, Professor A Ian Hamilton, at the editorial office: OPERATIVE DENTISTRY, University of Washington, School of Dentistry SM-57, Seattle, WA 98195, USA.

Exclusive Publication

It is assumed that all material submitted for publication is submitted exclusively to *Operative Dentistry.*

Manuscripts

Submit the original manuscript and one copy; authors should keep another copy for reference. Type double spaced, including references, and leave margins of at least 3 cm (one inch). Supply a short title for running headlines. Spelling should conform to *Webster's Third New International Dictionary,* unabridged edition, 1971. Nomenclature used in descriptive human anatomy should conform to *Nomina Anatomica,* 4th ed, 1977; the terms 'canine', 'premolar', and 'facial' are preferred but 'cuspid', 'bicuspid', and 'labial' and 'buccal' are acceptable. SI (Système International) units are preferred for scientific measurement but traditional units are acceptable. Proprietary names of equipment, instruments, and materials should be followed in parentheses by the name and address of the source or manufacturer. The editor reserves the right to make literary corrections.

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Submit two copies of tables typed on sheets separate from the text. Number the tables with arabic numerals.

Illustrations

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References

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