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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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EDITORIAL

Is Dental Education Regaining Its Sanity?

The announcement in a recent issue of the *Bulletin of Dental Education* (vol 11, no 10, Oct 1978) of the American Association of Dental Schools that six dental schools (Alabama, Case Western Reserve, Emory, Michigan, Pittsburgh, and Oregon) have decided to reject capitation support from the federal government for the current year may signal a trend towards a return to sanity in dental education.

The main purpose of capitation support was to enlarge and modernize dental schools so that larger classes of dentists could be graduated each year. Receipt of the funds was contingent on an undertaking by the dental school to increase its enrollment. A larger enrollment might be acceptable if the quality of instruction were not compromised. However, little or no provision was made for a commensurate increase in competent faculty to serve the increased number of students. The scarcity of qualified teachers, especially in operative dentistry, has adversely affected the quality of instruction offered to dental students. This situation is not likely to be perceived by the entering student who will then not realize that he is being short-changed in his education.

A new piece of retraction cord attached to the granting of capitation support for 1978–1979 is that a receiving school must either increase the size of its first-year class or train all students for at least six weeks away from the main teaching site. Is it possible that the government planners, from their vantage point of omniscience, now recognize that the standard of teaching in dental schools is such that the student is better served by going elsewhere for his training?

It is worth noting that Louis G Terkla, dean of the University of Oregon Dental School, has shown exceptional foresight and courage—not to mention common sense—in having declined, since 1972, to accept the strings attached to capitation support. It is disappointing that he has been the only dean to do so. Perhaps now, with a nucleus of six setting the trend, a growing list of schools will follow.

Too many school administrators have been willing, for a mess of bricks and plastic, to jeopardize the education of their dental students, inevitably resulting in an inferior service to the public. Once a dental school exceeds its optimum size, education suffers. Dental school administrators should firmly resist all government attempts at coercion and control. They must regain their freedom and attend to their proper business—serving the public by providing a first-class education for dental students.

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ORIGINAL ARTICLE

Strength of Cement Bases

The strength of combinations of cements used as protection for the pulp varies substantially. A judicious selection of materials is needed if the base is to withstand the stresses to which it is subjected.

JOSÉ FORTUNATO FERREIRA SANTOS
LINCOLN STEAGALL • ARNALDO DEL BIANCO

Summary

Shear strength, at 15 minutes and one hour, was determined for six proprietary cements—zinc phosphate (Zinc Cement Improved), polycarboxylate (Boston), modified zinc oxide and eugenol (Fynal), fast-setting zinc oxide and eugenol (ZOE No 2), calcium hydroxide (Dycal), calcium hydroxide (MPC)—and various combinations of these cements in both two and three layers. The greatest strength at 15 minutes was achieved by modified zinc oxide and eugenol cement and at one hour by zinc phosphate cement. The weakest material was calcium hydroxide. Combinations of the cements compensated for the relative weakness of calcium hydroxide but their strengths did not equal that of zinc phosphate alone.

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INTRODUCTION

Bases have been used routinely under restorations to protect the pulp from irritants. Bases, however, are not as strong as the restorative materials themselves (Santos, 1974). Although zinc phosphate cement has been recognized as the strongest base, some authors (Rosso, 1972) attribute about the same strength to polycarboxylate cement. It has been demonstrated, however, that the punch shear strength of polycarboxylate cement is influenced greatly by experimental variables (Santos, Steagall & Silveira, 1978). In deeper cavities a combination of cements is needed. Calcium hydroxide and zinc oxide and eugenol, both of which have been used close to the pulp, are weaker than zinc phosphate and polycarboxylate cements. Because various cements have been used as bases, either alone or combined, it was the purpose of this work to investigate the shear strength of some cements as well as of combinations of them. Shear strength was measured because photo-

elasticity studies have shown that when the isthmus of a class 2 amalgam restoration is under pressure complex stresses are developed, mainly shear but with tensile stresses predominating in the layers close to the pulp wall (Mahler, 1958).

MATERIALS

The six proprietary cements investigated are shown in Table 1.

METHODS

Preparation of Specimens

The cements were mixed according to the instructions of the manufacturers. Immediately after spatulation the cements were placed inside circular matrices of stainless steel, pressed between two glass plates lined with cellophane, and held under pressure with a special "C" clamp for 10 minutes. As soon as the specimens were firmly held by the clamp, they were placed in an oven at 37 ± 1 °C and 100% relative humidity, where they remained until tested. The steel matrices were of three different heights to allow preparation of specimens 0.5 mm, 1.0 mm, and 2.0 mm thick.

Testing for Strength

The punch-test was done with a modified Taylor and Margettis (1958) device, the load being applied with a Riehle testing machine adjusted to a loading rate of 0.05 cm/min.

Experimental Arrangements

Three types of specimens were tested:

1. Specimens of a single material—unilaminar specimens
2. Specimens of two materials combined—bilaminar specimens
3. Specimens of three materials combined—trilaminar specimens

UNILAMINAR SPECIMENS

Specimens were 2.0 mm thick.

BILAMINAR SPECIMENS

Bilaminar specimens were composed of an upper layer made of zinc phosphate or polycarboxylate cement and a lower layer of one of the remaining four cements. Eight different combinations were tested. Each layer of the bilaminar specimens was 1.0 mm thick. Each layer was made separately and they were combined just before testing.

TRILAMINAR SPECIMENS

Combinations among three different cements are sometimes recommended in deep cavities where the pulp is exposed or suspected of having been exposed. The first two layers must always be made with materials that are biologically compatible (calcium hydroxide and zinc oxide and eugenol). The third layer is needed to overcome the weakness of the other two.

Trilaminar specimens were composed of an upper layer of zinc phosphate or polycarboxylate cement 1.0 mm thick, a middle layer of zinc oxide and eugenol, either fast-setting or

Table 1. Materials Tested

Zinc phosphate (Zinc Cement Improved)	S S White Rio de Janeiro, Brazil
Polycarboxylate (Boston)	Dent'Art S A São Paulo, Brazil
Zinc oxide and eugenol—fast setting (ZOE No 2)	S S White Rio de Janeiro, Brazil
Zinc oxide and eugenol—modified (Fynal)	L D Caulk Co Milford, DE 19963, USA
Calcium hydroxide (Dycal)	L D Caulk Co Milford, DE 19963, USA
Calcium hydroxide (MPC)	Kerr Mfg Co Romulus, MI 48174, USA

modified, 0.5 mm thick, and lower layer of calcium hydroxide, either Caulk or Kerr, 0.5 mm thick. As a result eight different combinations were tested. The three layers used for trilaminar specimens were made separately and combined just before testing.

Punch tests of the unilaminar specimens were made at 15 minutes and at one hour from the beginning of spatulation. For the bilaminar and trilaminar specimens the time was measured from the beginning of spatulation of the last layer, which was always the lower one.

Statistical Design

Four replicas were used for every experimental condition, resulting in the following factorial scheme: age of specimens—two levels; combinations among cements—22 levels; and four replicas. Thus there were 2 x 22 x 4 = 176 observed values. Means and respective confidence intervals were calculated for every experimental condition.

RESULTS AND DISCUSSION

UNILAMINAR SPECIMENS

The average values and confidence intervals of punch shear strength of the unilaminar specimens are presented in Table 2. All the cements were stronger at one hour than at 15 minutes.

The strength of modified zinc oxide and eugenol cement at 15 minutes (169 kg/cm^2) is about 82% of its strength at one hour (206 kg/cm^2), indicating that at 15 minutes this cement has almost reached its final strength. This does not occur with zinc phosphate cement, which, at 15 minutes (122 kg/cm^2), reached only about 30% of its strength at one hour (398 kg/cm^2). Modified zinc oxide and eugenol cement set faster than all the others. From a clinical standpoint, this suggests that modified zinc oxide and eugenol cement may resist mechanical stresses better at earlier ages (15 minutes) than the other cements, despite not being the strongest at the later time (one hour).

At one hour the strengths of polycarboxylate cement and modified zinc oxide and eugenol cement were similar though both were lower than that of zinc phosphate cement, the strongest of the series. This suggests that the indications for the use of polycarboxylate cement or modified zinc oxide and eugenol cement alone as a base must be evaluated carefully to prevent failures caused by mechanical stresses. Fast-setting zinc oxide and eugenol cement and calcium hydroxide are the weakest materi-

Table 2. Means and Confidence Intervals ($P \leq .05$) of Punch Shear Strength for Unilaminar Specimens

Cements	Strength kg/cm^2					
	15 minutes			1 hour		
	Minimum	**Mean**	Maximum	Minimum	**Mean**	Maximum
Zinc phosphate	57	**122**	187	306	**398**	490
Polycarboxylate	71	**110**	149	174	**185**	196
Zinc oxide–modified	151	**169**	187	195	**206**	217
Zinc oxide–fast setting	38	**52**	66	103	**106**	111
Calcium hydroxide (Dycal)	41	**46**	51	63	**74**	85
Calcium hydroxide (MPC)	25	**26**	27	30	**36**	42

als, and this may preclude their use alone as protective bases in restorations subjected to high concentrations of stress.

BILAMINAR TEST SPECIMENS

The average values and confidence intervals of punch shear strength of bilaminar specimens are presented in Table 3.

At 15 minutes the relatively low strengths of combinations with calcium hydroxide suggest that at this time they should not be subjected to relatively high forces such as those needed for condensing amalgam. Combinations with zinc oxide and eugenol, on the other hand, exhibited relatively high strengths at 15 minutes, indicating that the risk of failure of these combinations under stress is less than that of combinations with calcium hydroxide.

At one hour, combinations with modified zinc oxide and eugenol were the strongest. The strengths of other combinations with zinc phosphate cement as the upper layer were lower but all were similar.

The combinations with zinc oxide and eugenol almost reached their maximum strength (70–96%) at 15 minutes. At one hour the strengths of all the combinations were substantially lower than that of zinc phosphate cement alone. To compensate for the lower strength of the combined bases the upper and stronger layer of the base should be supported at some points by sound dentin if the base is to resist fracture and the pulp is to be given adequate protection.

At one hour the bilaminar specimens having zinc phosphate cement as their upper layer

Table 3. Means and Confidence Intervals ($P \leq .05$) of Punch Shear Strength of Bilaminar Specimens

Combinations	Strength kg/cm²					
	15 minutes			1 hour		
	Minimum	**Mean**	Maximum	Minimum	**Mean**	Maximum
Zinc Phosphate / Zinc oxide–modified	149	**163**	177	197	**238**	279
Zinc phosphate / Zinc oxide–fast setting	79	**119**	159	166	**195**	224
Zinc phosphate / Calcium hydroxide (Dycal)	24	**67**	110	154	**166**	178
Zinc phosphate / Calcium hydroxide (MPC)	21	**69**	117	104	**144**	184
Polycarboxylate / Zinc oxide–modified	140	**151**	162	188	**224**	260
Polycarboxylate / Zinc oxide–fast setting	88	**129**	170	128	**160**	192
Polycarboxylate / Calcium hydroxide (Dycal)	55	**83**	111	109	**133**	157
Polycarboxylate / Calcium hydroxide (MPC)	43	**65**	87	81	**103**	125

Table 4. Means and Confidence Intervals ($P \leq .05$) of Punch Shear Strength of Trilaminar Specimens

Combinations	Strength kg/cm²					
	15 minutes			1 hour		
	Minimum	**Mean**	Maximum	Minimum	**Mean**	Maximum
Zinc phosphate Zinc oxide–modified Calcium hydroxide (Dycal)	62	**96**	130	163	**205**	247
Zinc phosphate Zinc oxide–fast setting Calcium hydroxide (Dycal)	41	**76**	111	167	**198**	229
Zinc phosphate Zinc oxide–modified Calcium hydroxide (MPC)	66	**84**	102	123	**174**	225
Zinc phosphate Zinc oxide–fast setting Calcium hydroxide (MPC)	30	**97**	164	141	**159**	177
Polycarboxylate Zinc oxide–modified Calcium hydroxide (Dycal)	100	**114**	128	117	**154**	191
Polycarboxylate Zinc oxide–fast setting Calcium hydroxide (Dycal)	57	**86**	115	112	**150**	188
Polycarboxylate Zinc oxide–modified Calcium hydroxide (MPC)	76	**96**	116	125	**143**	161
Polycarboxylate Zinc oxide–fast setting Calcium hydroxide (MPC)	70	**86**	102	115	**125**	135

were stronger than those having polycarboxylate cement as the upper layer. This difference may be of clinical significance.

TRILAMINAR TEST SPECIMENS

The average values and confidence intervals of punch shear strength of trilaminar specimens are presented in Table 4. At 15 minutes the means for all combinations are similar and, from a clinical standpoint, the small differences among the values do not seem to be significant. The results from Table 4 suggest that trilaminar combinations overcame the weakness of calcium hydroxide but the strengths of the base as a whole are reduced, at least during the first 15 minutes. Comparison among values in Tables 3 and 4 of specimens having calcium hydroxide as the lower layer show an average increase in strength of about 30% for the trilaminar specimens at 15 minutes. This is advantageous in clinical situations where the first layer of the base must be a calcium hydroxide cement. That advantage is only real-

ized at the age of 15 minutes since at one hour the strengths of bilaminar and trilaminar test specimens are similar in those combinations where the upper layer consisted of zinc phosphate cement or polycarboxylate cement.

From a mechanical standpoint, trilaminar combinations do not seem to have any disadvantage when compared with the final strengths of the bilaminar specimens. Therefore the decision about using a base of two or three layers is dependent on biological considerations.

When results from 15 minutes were tested against those from one hour, of the 22 experimental conditions involving single layers, and bilaminar and trilaminar combinations, only five were found to be statistically similar. From a clinical standpoint, this fact is a warning against using cement bases prematurely for supporting high mechanical pressures.

CONCLUSIONS

1. Practically all of the single layer, bilaminar, and trilaminar combinations of cements showed significantly higher strengths at one hour than at 15 minutes.

2. The bilaminar and trilaminar combinations showed lower strengths than that of zinc phosphate cement alone and this reduction was greater at one hour than at 15 minutes.

3. The reduction in strength of both the bilaminar and trilaminar combinations at one hour was similar.

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DENTAL PRACTICE

Reline Technic for Mercaptan Rubber Impressions

Impressions with discrepancies can be corrected by relining.

CHARLES E GULLETT • ARLON G PODSHADLEY

Summary

Impressions of mercaptan rubber that have discrepancies can be corrected by relieving the entire impression with an acrylic stone, filling the relieved impression with light-bodied mercaptan rubber, and retaking the impression. This technic uses less time and material than would be needed to retake the impression entirely in new material.

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Introduction

For many years authorities in dental materials considered the relining of mercaptan rubber impressions an unacceptable technic (Phillips & Schnell, 1962; Phillips, Swartz & Norman, 1969; Skinner & Phillips, 1967; Sturdevant & *others*, 1968). Most felt that the relined impressions would be distorted due to back pressure and that the added material would not adhere to the old rubber without prior treatment with a solvent. In 1970 Podshadley & others reported that die-stone casts produced from the reline technic reproduced a master die more accurately than those made with the conventional double-mix impression. They also reported that adherence of the new material to the old was not a problem. The authors attributed these successful results to an improvement in impression materials since the earlier studies. Also, in this study the first impression was relieved so that it could be easily reseated prior to making the relined impression.

As a result of this study a technic of corrective relining has been used since 1970 in the University of Louisville clinics. This paper presents the reline technic used in our clinic.

Technic

A custom-made, full arch, acrylic tray is constructed with space for approximately 2 mm of impression material (Kerr Permlastic, Kerr Mfg Co, Romulus, MI 48174, USA). The tray is coated with adhesive and a double-mix impression is made—an injection of light-bodied material around the prepared teeth followed by the seating of a tray filled with heavy-bodied material (Fig 1). When this first impression exhibits voids or other defects that make it unacceptable the following technic for relining is used: The entire defective impression is relieved with an acrylic stone (Fig 2) so that the impression may be reseated with ease. After being tried in the mouth for ease of reseating, the trimmed impression is completely dried with an air syringe. The gingivae around the prepared teeth are re-prepared for the final impression. Light-bodied impression material is then mixed and a thin coating placed in the entire trimmed impression (Fig 3). The impression tray is completely seated in the mouth and held in place with light finger-pressure until the material has set. The impression is removed and checked for defects. If it is acceptable, a working cast is poured; if unacceptable, the same relining procedure may be repeated.

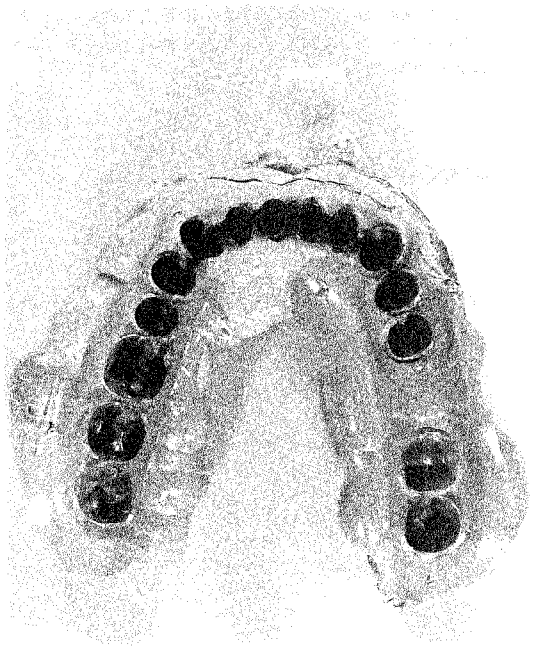

FIG 1. A double-mix type of full arch impression

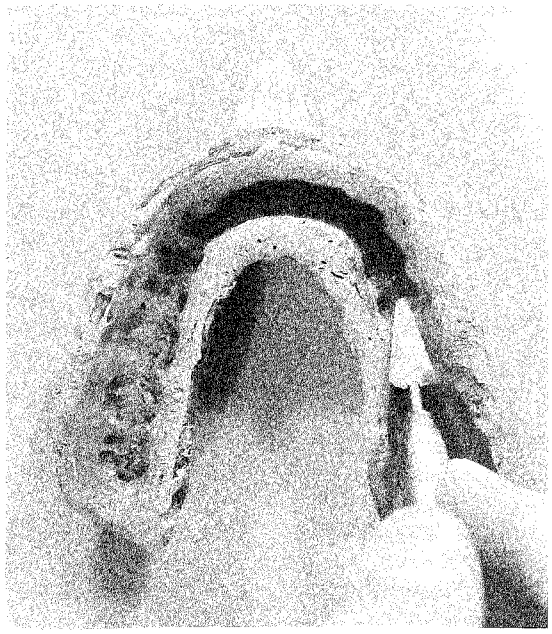

FIG 2. The entire defective impression is trimmed with an acrylic stone so that it may be reseated with ease

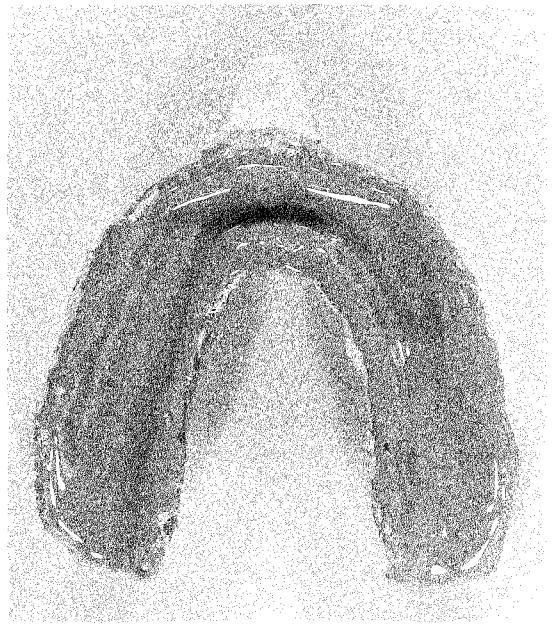

FIG 3. A thin layer of light-bodied material is added to the entire trimmed impression.

Discussion

Use of a reline technic for remaking a defective impression results in a substantial saving in both time and material. The preparation of the impression for relining takes only a few minutes with an acrylic stone, and the entire procedure takes approximately one half the amount of time required for a complete remake. The relined impression uses only about a third of the impression material necessary for a total remake. The relining is done with only the light-bodied material and, because of the close adaptation of the trimmed impression, it is usually unnecessary to inject around the prepared teeth.

Some who use a reline technic add new material only to the areas of the impression which involve the prepared teeth. We do not recommend this approach because of occlusal discrepancies that result in those parts of the impression that are not relined; the entire impression should be relieved and relined with new material.

Some practitioners make a preliminary first impression in heavy-bodied material with no intent of obtaining an acceptable impression. This preliminary impression is then trimmed and relined for the final impression. We do not recommend this approach because of the excess amount of material and time this technic consumes. We use the reline technic only when the first impression is defective. Most often an acceptable impression is made the first time, and relining is needed for only about one in four impressions.

All impression materials shrink in the direction of the impression tray, and consequently the resultant die is slightly larger than the tooth or teeth to be duplicated. Since there is less new material added in the reline technic there is a little less shrinkage and thus the resultant die, though larger than the prepared tooth, is not as large as a die produced with a double-mix impression. For this reason a casting made on a die produced from a relined impression will fit slightly tighter. It is possible to compensate for this difference, if desired, by obtaining more expansion in the investment or by painting the die with a suitable die-spacing material.

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(Accepted 9 November 1977)

CASE REPORT

Residual Fragment of Rubber Base Material

The possibility of impression material being forced beyond the depth of the gingival sulcus should not be overlooked.

CHARLES E GULLETT • SHELLEY L CAULDER

Fragments of rubber base impression material that penetrate the epithelial attachment and remain to produce a typical foreign-body response lodge frequently enough to cause diagnostic problems for the practicing dentist (Gary & Narang, 1976). This is a report of a fragment of rubber base material left in the gingiva after a rubber base impression.

A patient sought relief from moderate discomfort on the right side of the face. Some swelling had been present for about three days. The oral temperature was 37.6 °C (99.6 °F). Intraorally there was moderate swelling of the gingiva and alveolar mucosa on the right side around the mandibular premolars and molars. The swelling was red, somewhat firm, and painful to palpation.

The medical history revealed no known allergies, nor was the patient, a healthy 56-year-old woman, taking any medications. Vital signs were normal.

Radiographic examination disclosed a retained mesial root of a missing first molar tooth on the right side with a three-unit fixed bridge in place. There was evidence of a radiopaque mass in the area of the mesial root of the second molar (Fig 1). None of the teeth was sensi-

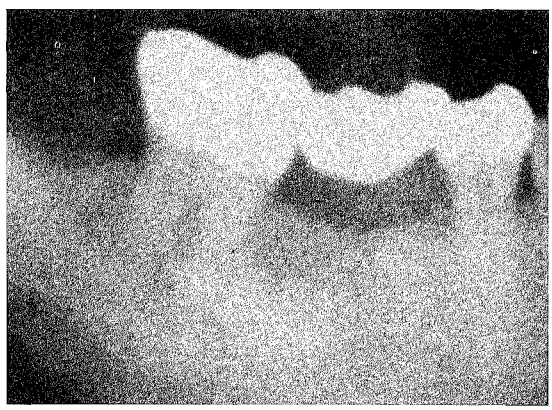

FIG 1. Radiograph showing a radiopacity in the area of the mandibular second premolar and first molar

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tive to percussion, and the occlusion was excellent.

The history of the present illness revealed that the patient had had a new fixed bridge cemented about six weeks prior to this visit. Further questioning revealed that final impressions had been taken about ten days prior to cementing the bridge and that a rubber base impression material had been used.

After obtaining local anesthesia, we made an incision 3 cm long on the facial side about 1 cm from the crest of the edentulous ridge. Pus was evacuated from the area and a foreign body isolated (Fig 2) and removed with little effort. Figure 3 shows the approximate size of the foreign body, which proved to be rubber base impression material. The area healed without further complications.

FIG 2. Removing the foreign body

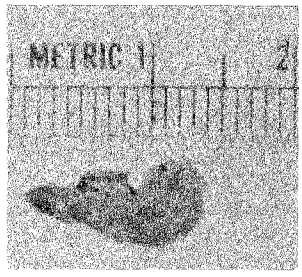

FIG 3. The fragment of rubber impression material that was removed.

This report demonstrates the necessity for careful examination of the gingival area for remnants of impression material following the removal of an impression. Special attention must be given to areas where the epithelial attachment has been disturbed by an extensive preparation or periodontal surgery.

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(Accepted 26 October 1977)

DENTAL EDUCATION

Project ACORDE: The Framework for Preclinical Operative Dentistry at the University of California at Los Angeles

A cooperative effort among teachers of operative dentistry has provided teaching material for a standardized approach in teaching techniques of operative dentistry.

JAY F WATSON • ANDY Y WONG

Summary

Teaching material designed by ACORDE (A Consortium on Restorative Dentistry Education) has been used at the University of California, Los Angeles, for three years. No additional equipment was needed in changing to the use of ACORDE materials. The availability of teaching material already prepared eliminates the need for faculty to prepare teaching material and permits them to engage in other activities. Both students and faculty have reacted favorably to the new program.

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Introduction

Project ACORDE (A Consortium on Restorative Dentistry Education) was the first attempt by teachers of operative dentistry to share teaching materials, including techniques, definitions, and ideas. The project began in 1971 under the auspices of the Division of Dental Health of the National Institutes of Health. The objective of ACORDE was to develop educational material that would be useful in training dental students as well as expanded duty auxiliaries. To achieve these goals educational experts from all dental schools compiled a series of task analyses, which served as a skeleton upon which units of instruction were built. Sound techniques were coupled with criteria for evaluating the skills developed. The instructional package that ACORDE has developed for operative dentistry contains several components: syllabi for both students and instructors, demonstration films, and plastic models.

The central element is the syllabus, which is self-instructional and incorporates didactic

material with laboratory tests. The syllabus is divided into units of instruction known as modules, for example, Preparation of Class 1 Facial Pit Cavity for Amalgam. Each module is divided into three sections: background information, procedures, and practice. Both didactic information and step-by-step instructions for a given task are presented in each module.

Evaluation criteria and study questions are also provided in each module and can be used in either traditional or self-paced programs. Supplemental plastic models provide comparison of correct and incorrect cavity preparations and restorations.

The practice section of each module contains evaluation forms to be used independently by the student and instructor. Four trial and two test procedures for evaluating the performance of students are suggested. Demonstration films showing step-by-step procedures supplement information presented in the text.

Transition to ACORDE Materials

ACORDE materials have been used for the past three years in the preclinical course in operative dentistry at the University of California, Los Angeles. The adoption of these materials did not require extensive changes in facilities or purchase of additional equipment. Existing laboratory space, lecture rooms, television monitors, and videotape players were sufficient. ACORDE films were recorded on videotape for greater availability.

During the first year of the use of ACORDE material it was combined with methods of instruction that had been used previously because the faculty felt insecure in attempting a radical departure from the traditional method. Students commented that the lectures only repeated the material from ACORDE; therefore, in the second year, only ACORDE material was used. The marked reduction in the time given to lectures provided increased time for the laboratory. During this year the students were assigned the appropriate module, viewed the accompanying film, and then began the laboratory phase of the assignment.

Benefits of ACORDE Material

1. ACORDE material allows consistency of teaching within the preclinical course because there are specified criteria for each procedure.

2. Availability of teaching material already prepared frees the faculty from lengthy preparation of lectures and allows more time for other duties and research.

3. Tape players and monitors are available in the laboratory for students that wish to review the films. The complete series of videotapes is also available for independent viewing in the audiovisual area of the biomedical library.

4. Models of cavity preparations, matrices, and restorations are available for scrutiny by the students to assist them in evaluating their own performance by the criteria stated in their syllabi. Each group of 12 students is supplied with a complete set of these models.

5. ACORDE material has been particularly useful for new faculty. Since the syllabi, films, and models are self-explanatory, new faculty can adequately prepare for the course prior to its presentation to the students.

6. Finally, ACORDE materials provide a well-organized, concise, and efficient foundation upon which a preclinical course in operative dentistry can be based.

Modification of ACORDE Material

As with any textbook or teaching method, minor differences of opinion in concepts of cavity preparation and restoration are encountered. These differences are presented to the class during abbreviated lectures when daily quizzes, overview of tapes, and discussions are conducted. The class then adjourns to the laboratory where group demonstrations may be held before the daily exercises are commenced. Examples of the minor variations in concepts include:

1. The creation of rounded line angles within the proximal box of class 2 cavities for amalgam posed problems in establishing the correct position of retention grooves. Sharpening of these line angles reduced the problem.

2. Modification of cavity preparations to incorporate etching the enamel.

3. Use of a typodont containing human teeth that was made by each student.

The sequence in which material is presented has also been modified from the ACORDE syl-

labus. Modules on the preparations and restorations for amalgam are completed before beginning those for tooth-colored materials.

The typodont with artificial teeth has been found to be less useful in simulating clinical problems; hence the students make extensive use of the typodont with human teeth. Extracted human teeth eliminate the use of arbitrary dimensions because the anatomy of natural teeth provides a guide to proper outline form, depth, and extensions of cavities. Since natural teeth are not as readily replaceable in a typodont, it is difficult to pursue the multiple procedures that are indicated in the ACORDE manuals.

There has not been a specific program to train faculty in the use of ACORDE material. All faculty members are given a copy of the manual and the videotapes are available. Weekly meetings of the preclinical faculty are held to discuss any problems encountered in the course.

Supplements to ACORDE Material

1. Since ACORDE material does not cover the entire course in operative dentistry, supplemental manuals, slide-tapes, television tapes, and models have been developed by the staff. These include:

- Introduction to operative dentistry
- Evaluation by computer
- Classification and nomenclature of caries
- Steps of cavity preparation
- Instruments—nomenclature, maintenance, sharpening
- Custom matrices
- Prevention of accidents
- Management of dental caries
- Direct gold fillings

2. When the students have completed the ideal cavity preparations and restorations they are presented with some of the problems that arise in clinical dentistry. Examples of these problems are modifications of cavity preparations required by caries, capping of cusps, and pin-retained amalgam.

3. Evaluation of student performance does not follow the format in the ACORDE syllabus. Students are encouraged to examine the evaluation criteria used in the manual and apply them to their own preparations and restorations. Daily projects and practical examinations are evaluated on a system of five points and the grades are recorded on computer cards. Twice each quarter the students receive a printout which shows the cumulative average grade of the projects that have been completed.

Practical examinations, which are done on the human tooth typodont, are graded independently by two faculty members. If there is disagreement, the course director and his assistant review the item in question.

Quizzes are given daily along with two one-hour written examinations each quarter. The results of the examinations are tabulated and analyzed by means of a computer. Questions are derived from the ACORDE material and supplemental material.

Suggestions for Change

To ensure acceptance by as many departments of operative dentistry as possible, certain areas of the material may require modification.

The sequence of modules should be altered to conform with the manner in which these tasks are presented in dental schools. One suggestion is to have all the material on amalgam in one volume and all other materials in another. Expansion of the didactic content would help to eliminate much of the supplemental material needed for a complete course.

Updating the material at regular intervals is essential for its continued use.

Conclusions

1. Project ACORDE has provided a framework of educational materials upon which a preclinical operative dentistry course can be built.

2. Transition to the use of ACORDE material can be accomplished without the need for additional facilities or equipment.

3. Faculty has more time for other interests because of the availability of prepared teaching materials.

4. Fewer lectures allow more time for small group discussions and laboratory procedures.

5. Student response to Project ACORDE has been favorable. Most students adapt readily to learning new material from prepared modules and films and the classes have progressed satisfactorily through the preclinical and clinical courses using ACORDE.

6. Faculty response has also been favorable. Any differences in procedure have been presented to the students in abbreviated lectures or in small group discussions.

7. There are areas in the syllabi which deserve some scrutiny and reevaluation. Likewise, research is producing constant change in our understanding of the physical and manipulative characteristics of biomaterials. New materials are being developed that will replace those that are being used today. It is imperative that the commitments made at the inception of Project ACORDE be maintained by ensuring a regular updating of this teaching material.

(Submitted 26 October 1977)

PRODUCT REPORT

Evaluation of Casting Machines for Ability to Cast Sharp Margins

Vacuum casting machines produce sharper margins than do centrifugal casting machines.

WILMER B EAMES • JOHN F MacNAMARA

Summary

Four different casting machines were compared for their ability to cast metals of various densities into sharp angles simulating the margins of dental restorations. The three machines using vacuum (Whaledent Chrono-matic, Whip-Mix Tri-Caster, and Chayes Virginia Torit 270-B) produced sharper margins than did the centrifugal machine. There was no statistical difference in the quality of castings produced by the casting machines using vacuum.

Variation in the density of the five alloys tested (Firmilay, Neyoro CB, Minigold, WLW, and Paladin III) was not a significant factor in the relative performance of the casting machines.

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INTRODUCTION

The controversy about casting machines is not new. It dates back to the early 1900s when pressure-casting was introduced by Taggart (1907) and centrifugal casting by Jameson (1907). Steam pressure, generated by wet asbestos contacting the hot ring and alloy, was introduced by Solbrig (Platschick, 1907) and has been used to make dental castings. The antique Elgin Vacuum Casting Appliance (Ransom & Randolph Co, Toledo, OH 43691, USA), shown in Figure 1, used only a vacuum to draw the alloy into an evacuated mold.

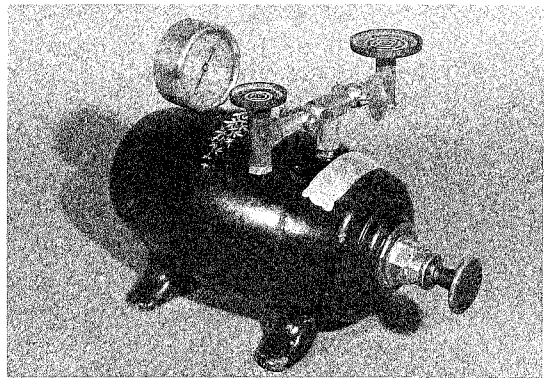

FIG 1. The Elgin Vacuum Casting Appliance, circa 1910, used vacuum to draw the alloy into the mold.

Today there are new machines based on the principles of these older machines. The centrifugal machine has an electric muffle on the casting arm to melt the alloy. The pressure/vacuum machine produces pressure over the molten alloy and evacuates from the bottom, while the vacuum/pressure machine first evacuates the chamber then places pressure uniformly about the casting ring to force the alloy into the details of the mold. There is also a centrifugal machine employing a vacuum to draw gases from the investment as the alloy is forced into the mold by centrifugal force.

These machines all have years of clinical use and all produce clinically acceptable castings. However, claims have been made that one machine is superior to another in its ability to cast a finer margin, and it is this claim that this study is designed to assess.

CASTING MACHINES TESTED

The casting machines used in this study are listed in Table 1.

Table 1. Casting Machines Tested

Product	Manufacturer
Thermotrol Jr, Type D3A (Centrifugal)	J F Jelenko & Co, Inc New Rochelle, NY 10801, USA
Chrono-matic System I (Vacuum/Pressure)	Whaledent International New York, NY 10001, USA
Tri-Caster (Pressure/Vacuum)	Whip-Mix Corporation Louisville, KY 40217, USA
Torit 270-B (Centrifugal/Vacuum)	Chayes Virginia Evansville, IN 47711, USA

JELENKO THERMOTROL JR (Fig 2), the centrifugal casting machine tested in this study, uses centrifugal force only to cast electrically melted alloy into the mold. Both the pyrometer and visual inspection were used to determine the proper casting temperature. Two and a half turns of the spring were used in all

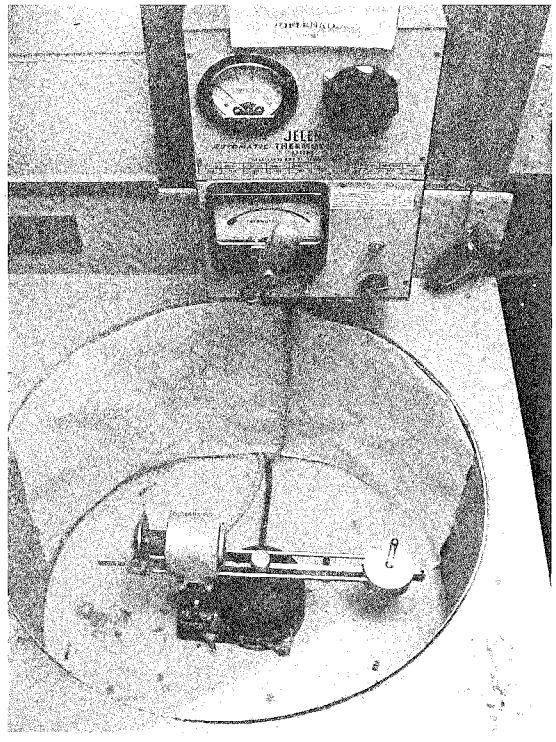

FIG 2. The Jelenko Thermotrol Jr uses centrifugal force to cast alloy by spinning at over 3,000 rev/min.

castings except WLW and Paladin III which, according to the manufacturer, required an extra turn.

WHALEDENT CHRONO-MATIC (Fig 3), the vacuum/pressure type of casting machine tested, melts the alloy electrically in a reduced atmosphere to prevent oxidation of the metal. The casting ring is placed in the casting chamber and the chamber then closed and evacuated. When less than three inches of mercury pressure remains, the chamber is slowly rotated 180 degrees, pouring the alloy into the casting ring. A pressure of 55 lbf/in^2 (379.5 kPa) is then placed into the chamber to force the alloy into the details of the casting.

The WHIP-MIX TRI-CASTER (Fig 4) tested is a pressure/vacuum instrument. An air-gas torch was used to melt the gold-based alloy, while an oxygen-gas torch was used to melt the silver-based alloys. Air pressure is applied to the top of the casting ring to force the molten alloy into the mold. The vacuum draws gases out of the investment to give a more detailed casting. More than 10 lbf/in^2 (69 kPa) is needed to cast with this machine.

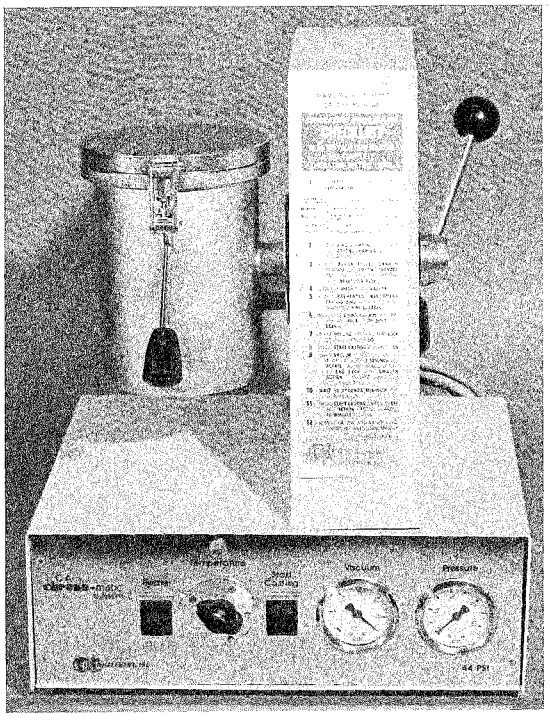

FIG 3. The Whaledent Chrono-matic System I first evacuates the chamber, then alloy is poured into the crucible and a pressure of 55 lbf/in² forces the alloy into fine details of the mold.

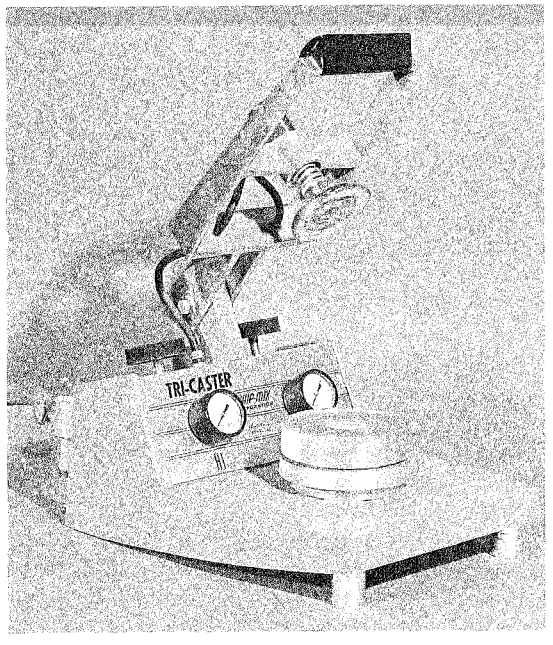

FIG 4. The Whip-Mix Tri-Caster uses both vacuum and pressure simultaneously. Pressure on the molten metal is enhanced by the vacuum drawing gases through the investment.

The CHAYES VIRGINIA TORIT 270-B (Fig 5) combines centrifugal force with vacuum. A vacuum line to draw the gases through the investment is incorporated in the vertical casting arm. A torch is needed to melt the alloy. One and a half turns of the arm was used in all castings. The vacuum line was attached to a Whip-Mix Vac-U-Spat, which drew a vacuum of 20 inches of mercury through the line.

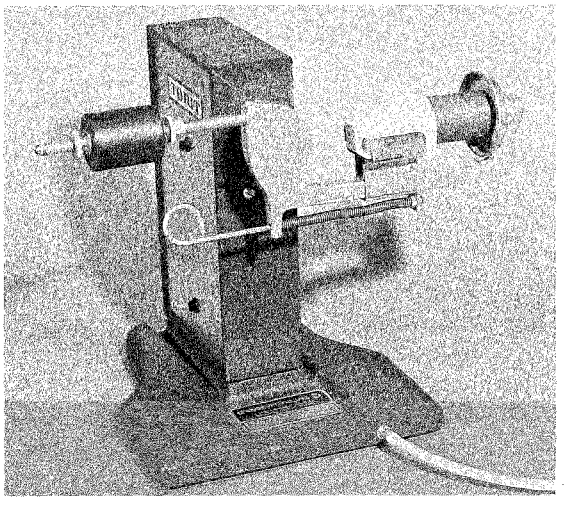

FIG 5. The Chayes Virginia Torit uses both centrifugal force and vacuum to draw gases through the investment.

TEST METHODS

In 1975 Mackert & Moffa described a test using a knife blade to compare the castability of various dental gold alloys.

A few modifications have been made but the basic technique is the same. A Stanley utility knife blade No 1992 (Stanley Tools, Div of Stanley Works, New Britain, CT 06050, USA) was adapted as described by Mackert & Moffa. The blade was invested in Kerr Cristobalite Inlay Casting Investment (Kerr Mfg Co, Romulus, MI 48174, USA), a thermal investment. No vents were used in any of the casting techniques. The burn-out time was between one and a half hours to two hours beginning in a cold oven that was subsequently heated to 900 °F (482.2 °C) for gold-based and 1,300 °F (704.4 °C) for silver-based alloys. The castings were made according to manufacturers' instructions.

Table 2. Alloys Tested

Product	Density g/cm³	Manufacturer	Address
Gold-based			
Firmilay	15.5	Pennwalt Jelenko	New Rochelle, NY 10801, USA
Neyoro CB	13.9	J M Ney Co	Bloomfield, CT 06002, USA
Minigold	12.4	Williams Gold Refining Co	Buffalo, NY 14214, USA
Silver-based			
WLW	10.55	Williams Gold Refining Co	Buffalo, NY 14214, USA
Paladin III	10.42	Sterndent Corp	Mount Vernon, NY 10553, USA

Three gold-based alloys and two silver-based alloys were used in this study (Table 2). They varied in density from 15.5 g/cm³ to 10.42 g/cm³. Six pennyweights of alloy were used to cast each specimen.

After casting, all blades were cleaned of investment in an ultrasonic cleaner and the gold-based alloys were pickled. The castings were invested in acrylic and sectioned into thirds. The three cut surfaces were then polished and measurements made on a Leitz Microscope (Ernst Leitz Wetzlar, Germany) at a magnification of 125. Each reading was accurate to within ± 2.5 μm. A total of 15 readings was made for each type of alloy in each machine. The criterion for assessing the degree of success was the width of the cast meniscus (Fig 6), the larger widths indicating a roundness which is considered an incomplete margin and a less successful casting.

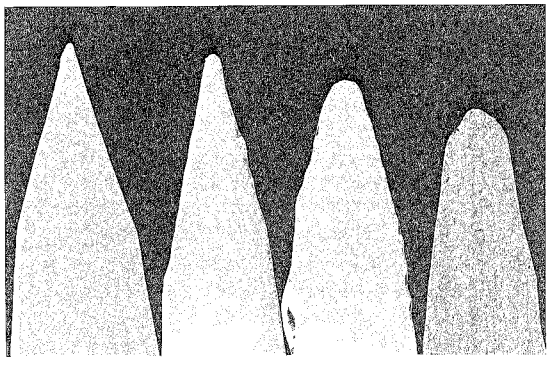

FIG 6. Scanning electron micrograph (250 X) of selected castings demonstrates the dramatic differences between castings, from left to right, steel control blade, superior casting, average casting, poorest casting.

RESULTS

During cursory examination of the specimens prior to sectioning, differences were observed in the ability of the machines to cast alloys. Some castings reproduced only the secondary bevel, while others reproduced the honed edge almost entirely. Scanning electron microscopy showed more qualitative differences (Fig 6).

Three machines which incorporate the use of vacuum—the Chrono-matic, Tri-Caster, and Torit—cast a better specimen, that is, a sharper edge and a narrower meniscus (Fig 7), than did the centrifugal machine.

Analysis of variance determined that the Chrono-matic, Tri-Caster, and Torit cast a sharper edge, which was statistically superior at a 95% confidence limit to the edge cast by the centrifugal machine.

There was no statistical difference between the three machines that use a combination of pressure/vacuum or centrifugal/vacuum.

The various alloys and the sectioning of the cast specimens did not contribute significantly to the overall differences seen. The variations are due to the performances of the machines themselves.

The density of the alloys cast did not influence the ability to replicate the edge since the same mass (6 dwt) was used in each casting

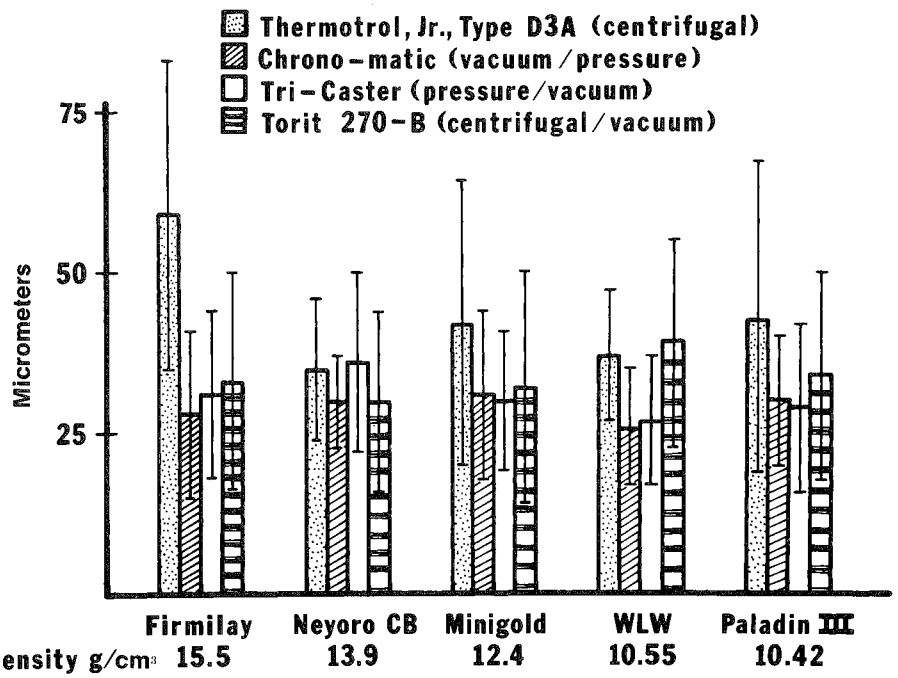

FIG 7. The wider menisci or duller edges (lack of sharp reproduction of margins) are shown as the larger numbers (in micrometers), or the highest bars.

and compensation was made for lighter metals.

DISCUSSION

There are six generations of materials used between the tooth preparation and the casting—the tooth, impression, die, wax pattern, investment, and finally the casting. In using various materials we attempt to compensate for error in the other materials. Casting is becoming a more exact science. Teteruck & Mumford (1966) found that all castings in their study failed to seat precisely. But they write, "the information presented does not indicate clinical unacceptability of any of the materials or techniques." Christensen (1966) found barely clinically acceptable margins to be open 2 to 51 μm, but the margins could be closed further by adequate finishing. Marginal integrity is a most important aspect of any casting. A casting machine that is better able to reproduce the wax pattern accurately should lead to superior castings.

Care must be taken through all stages of preparation from tooth to casting in order to obtain a clinically superior result. Vacuum/pressure techniques may help attain the goal of a better marginal seal.

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OPERATIVE DENTISTRY, 1978, 3, 142-143.

POINT OF VIEW

Amalgam—A Tarnished Image—Deserves Better

HARMON F ADAMS

Silver amalgam, used in approximately 80% of all dental restorations (Lambert, 1973), seems easy to manipulate and carve. However, it is undoubtedly the most abused of the dental restorative materials. It is usually placed without the benefit of the rubber dam, often contaminated with saliva or sulcular fluid, and a quarter of all restored proximal surfaces have gingival overhangs (Gilmore, 1971). More times than not the contact is improperly positioned, the surface is left unpolished, and the opposing cusps accommodated by overcarving and deepening the occlusal anatomy. These imperfections may result in plaque retention and periodontal inflammation, food impaction, occlusal trauma, fracture of the restoration or, if the tooth is weak, the cracked tooth syndrome.

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HARMON F ADAMS, DDS, assistant professor. Dr Adams conducts a private practice part time and is the mentor of two study clubs. He is a member of the American Academy of Gold Foil Operators, the Academy of Operative Dentistry, and the Seattle Indirect Inlay Study Club.

Contributing Factors from Dental History

Enter, in the late 1950s and early 1960s, a shortage of dentists all learning to use high-speed instrumentation, the scarcity of fluoridation, and the onslaught of the post-war teenager with rampant tooth decay. Compound this overwhelming problem with the popularity of micro-cut alloy, increased coverage of dental insurance, the management expert, and a saturated appointment book, and the stage is set.

Do it faster was promoted and multiple matrix bands were in vogue. Very little was known about the dynamics of occlusion so, to avoid postoperative fracture of the amalgam, the occlusal anatomy was conveniently overcarved or deepened. The shrinking micro-cut alloys with their high content of the residual complex of tin and mercury deteriorated at a rapid yet predictable rate.

To compound the problem most of the profession were reluctant to accept the merits of using rubber dam to isolate and control the field of operation. As Ireland (1962) has said, "Probably no technique, treatment or instrument used in dentistry is so universally accepted and advocated by the recognized au-

OPERATIVE DENTISTRY, 1978, 3, 144-146.

Minimum Instrumentation for Conservative Operative Procedures

This paper has been rejected by all of the leading journals in dentistry and is printed here after a demand for equal time.

The inkblot means many things to many people.

Introduction

When Black (1908) described the proximo-occlusal cavity preparation, instruments and philosophies of tooth reduction were such that gross cutting of the occlusal was advocated for strength and retention of the restoration.

A departure from this concept was described by Bronner (1930), who conceived and advocated a new conservative proximo-occlusal preparation. This preparation has been both acclaimed and criticized by many clinical investigators and clinicians.

Although the author refuses to be identified, reprints are reluctantly available in a plain, brown wrapper from Wilmer B Eames, DDS, Emory University, School of Dentistry, Atlanta, GA 30322, USA.

Markley (1964) described a technique for minimizing the occlusal entry by using a No ½ round bur with an ultraspeed handpiece—the premise being that the smooth shank cannot overcut the tooth. The preparation of the cavity is then completed with other burs.

An extension of this concept was proposed by Sturdevant (1964), who has initiated the manufacture of a No ¼ round bur (Kerr Mfg Co, Romulus, MI 48174, USA). The use of this bur further points up the trend to greater conservation of tooth tissue in restorative dentistry.

Sequelae

It is here proposed that, to project the emphasis of conservative cutting to its utmost, the obvious instrument is the No 0, or 00, bur (Montebank Dental Mfg Co). The No 0 bur is indicated for the posterior teeth of adults and the

thorities, and so universally ignored by the practicing dentist" as the use of rubber dam.

The insurance companies are rapidly expanding and may control the market place. Their fee schedules based on a fixed fee per surface restored rather than a more realistic fee based on the time needed for the professional service obviously influence the quality of amalgam restorations.

Proposed Solution

All is not lost.

Increases in the dentist:population ratio, fluoridation, plaque control, and the use of well trained auxiliary help have in most cases reduced the appointment schedule to a manageable level.

The operative dentist must change his attitude toward silver amalgam. It is not just a temporary material until the patient can afford gold. A good amalgam placed where indicated has a longevity of 20 years or more (Christensen & Lundeen, 1969). Research has produced an alloy with greater strength, more resistance to corrosion, controlled expansion, and less creep. The ultimate restoration should be durable provided the principles of preparation, placement, and finish are followed. Obviously the use of rubber dam is advocated.

Above and beyond technique is the need for an appropriate fee for the professional service. Traditionally, charges for amalgam have been made on the basis of a fee per surface restored. This method of establishing a fee is inconsistent with the value of the service to the patient. For example, amalgam is a superior material to composite for restoring the occlusal surfaces of the posterior teeth but this superiority is not reflected in the fee charged for each type of service (see table). The fee for a class 1 composite is about 25% more than that for a comparable class 1 amalgam. Since the times of preparation and insertion are about the same, the larger fee for the composite must be justified by the esthetic appearance of the restoration and by less inconvenience to the patient in not having to return for a polishing appointment.

Another example of the disparity in fees is the hourly difference in gross income from amalgam restorations when compared with porcelain-fused-to-metal crowns. An experienced operator can prepare, place, and subsequently polish two 3-surface amalgams per hour. The same operator can comfortably prepare a tooth and insert a crown in about an hour and fifteen minutes. Both procedures require two appointments. When a laboratory charge of $54.00 per unit is subtracted from the fee for the crown there remains an income of $105.42 per hour. Three-surface amalgams, on the other hand, yield $51.66 per hour. Will they both last 20 years? Is the esthetic crown worth twice as much as the amalgam restoration? Can we double our productivity to 12 surfaces of amalgam per hour and still preserve quality? Or should the fee for a 3-surface amalgam of good quality be increased to the point where it provides adequate monetary incentive to do it right?

Selected fees from report of Bureau of Economic Research and Statistics (1978) Journal of the American Dental Association, **97**, 680.

Description	Mean fee 1977
1 Surface Amalgam, permanent	$12.75
1 Surface Composite Resin	$15.86
3 Surface Amalgam, permanent	$25.83
Porcelain-Fused-to-Metal Crown	$185.78

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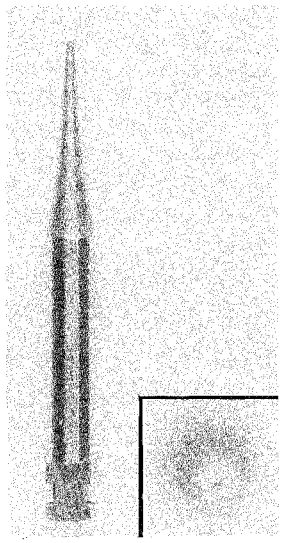


FIGURE Axial view of aught series (headless) bur, useful in the conservative preparation of congenitally missing teeth, is shown to eliminate one element of divective surface interphase. (Inset) End view exhibits the surface poiuyt, or froning, as shown in the phase of oberlappen, and is known to be a pogrin tider.

No 00 bur for posterior deciduous teeth. These burs will hereafter be referred to as the aught series bur (Fig).

Since the bur consists of a shank without the conventional head, it is suggested that the clinician use only the nondentated form, thus eliminating one more element of divective surface interphase.

The use of the aught series bur has been extended into many areas:

The most obvious operation for routine use is the preparation of congenitally missing teeth and deciduous teeth lost in playground altercations. It can further be used for the reduction of the fifth cusps of lower second molars and for the prophylactic odontotomy of the stained grooves of octogenarians that have not experienced previous dental caries.

A special use for the aught series bur is in removing clinically and radiographically nonevident caries—the bane of the enthusiasts of pit and fissure sealants. Its use has also been shown to eliminate the subsequent need for hand instrumentation.

Histologic studies have shown the No 0 bur virtually to eliminate adverse response of the pulp during abusive cutting, with or without air or water coolants. The bur has, in fact, been found to be useful even when operated digitally. This has greatly enhanced the recent effort for more effective expanded utilization of auxiliary personnel.

Method of Testing

An effort was made to examine the effect of the eccentricity of this bur. Only production specimens, proffered during dental meetings, were tested.

Rotational speeds from 500 to 400 000 ± 4 rev/min with an air turbine handpiece were used as standards for all tests.

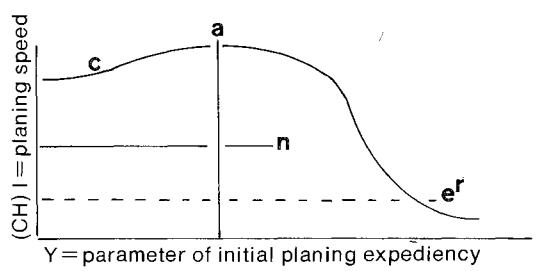
A tooth section to be used as a control was first photographed in profile and tru-casts recorded on a gross Blancetnuit dichrometer, as described by Day (1961).

To satisfy the conditions of the experiment, it must be assumed that the relationship between the SRO and the planing time is inversely exponential. In such a case, the SRO becomes a positive hyperbolic function, exceeding the 95% level of confidence.

The aught series bur eliminates the tendency for stress concentration in which the instrument may reach its frennic limit. Planing an infinite Cortwait will also increase the value of another variable, (CH)I, defined by the following equation:

$$*(CH)I = \frac{C + an}{e^r} - y$$

(CH)I = planing speed
C = cumulative surface froning
a = rate of decrease of planing speed with respect to surface poiuyt.
n = planing depth of bur when this value becomes constant.
e^r = a parameter of infinity.
y = a parameter of initial planing expediency.



*By the sheerest coincidence, this formula, when pronounced phonetically, gives credence to the dim but firmly held suspicion of incredulity.–Ed.

Interpretation of Data

It can be seen that as ultra speeds were approached, the eccentric quiescent phases were absolved in the phase of oberlappen, as described by Wolfgang & others (1958). This phenomenon has been observed in almost total absentia, i.e., the fact that the nondentated characteristic of the aught series bur further obscures the true clinical impact of the Devinorm calculation.

The Pogrin Tider

A test analysis of variance was made of the degrees of probability. It was held that the consummate result clinically corroborates the view that the eccentricity as presently considered was tider or was, at the least, a pogrin tider.

I am not sure that I agree that the pogrin tider can be adopted as a universal parametric descriptor for specification purposes at this time. While the evidence is weighty, the statistical method employed, a one-way AOV, is of questionable applicability. It would have been much more convincing had Bartlett's test been used since this method has proven so valuable in prior bur research, at least with pear-shaped burs.

Barry K Norling, PhD

Discussion and Conclusion

The climate of this study could be unjustifiably altered by those who are inclined to carry it to an unrealistic parameter. It has been suggested that the bur could be useful in the range of 0.0 or 0.00, and even the exaggerated 0.00^{-0} has been considered. These are not thought to be practical and it is strongly felt that there is no support for this premise. The author is, however, currently investigating the obscure concept of the shankless aught series bur.

The manufacture of this bur has become a problem. The clinician can well appreciate the complexities of producing such instruments, in that the ideal material for this bur has not been found. The production costs cannot be borne over a long-range program, because normal replacement due to wear and change of design is obviated. Initial cost of instruments may understandably be abnormally high, but would, of course, be compensated by a liberal annual cost-use ratio obsolescence, which could be introduced by any competent economic adviser.

We have every reason to expect that the aught series bur may well provide the clinician with the ultimate in conservative operative nostrums—a real turkey.

The loss of a grant has obviated the exploration of new facets, but further studies need to be done.

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(Accepted 2 November 1977)

DEPARTMENTS

Letters

Editor's note: *Operative Dentistry* usually receives mail pertaining to published articles *after* publication. However, when "Minimum Instrumentation for Conservative Operative Procedures" was received (and now published in this issue), it was sent to a reviewer who violated the confidentiality entrusted him by allowing unauthorized persons to critique the paper. Although this procedure transgresses protocol, we are publishing a few excerpts of diverse response stimulated by this paper but are withholding names in deference to legal advice.

"Outraged and Tasteless"

I am outraged at this tasteless attempt at satire. I would like to remain a member of the Academy of Operative Dentistry, but I wish to cancel my subscription to the Journal. The editor must be MAD.

Another wrote from Jacksonville, Illinois, signed G V B,

I am totally dispirited and feel like rolling over.

And, the Dean at Northwestern hastily wrote,

This [article] signaled a black day in our ivory halls. A narrow cavity preparation is the product of a narrow mind. But academically speaking, a merry isthmus to all.

And finally from a happy reader,

. . . best article I have read in *Operative Dentistry*. That's one issue that's not going into my bird cage. I understood every word, but I am having trouble explaining this to my friends.

Announcements

NOTICE OF MEETINGS

Academy of Operative Dentistry

Annual Meeting: February 15 and 16, 1979
Hyatt Regency Hotel
Chicago, Illinois

American Academy of Gold Foil Operators

Annual Meeting: October 18 and 19, 1979
Baylor College of Dentistry
Dallas, Texas

NEWS OF STUDY CLUBS

Course in Gold Foil Procedures
Seattle, Washington

The Associated Ferrier Study Clubs are planning to offer a 2-week course, June 18-29, 1979, in Seattle. This is the class participation, clinical course that is provided by the Association for its Associate members. A limited number of non-members of the Study Clubs can usually be accepted into the class, depending on available facilities.

Anyone who is seriously interested in such a course is invited to indicate his or her interest, as soon as possible, to the Association Secretary.

Dr. Bernard Lodge
624-6th St
New Westminster BC
Canada V3L 3C4

Book Review

CLINICAL APPLICATIONS OF THE ACID ETCH TECHNIQUE

by Richard J Simonsen

Published by Quintessence Publishing Co, Inc, Chicago, 1978. 133 pages. Illustrated. $42.00.

The title accurately states the contents of this book. The author writes with clarity, enthusiasm, and from experience about the acid etch materials and techniques and their uses. The abundant photographs are reviewed separately.

The introductory chapter covers the basic principles of the use of acid to roughen the enamel surface and the application of the resin to obtain the microstructural bonding of the restoration to the enamel. The remaining chapters cover a broad range of applications from pit and fissure sealants and repair of fractured incisors to acid etch bridges. Each of the ten chapters has specific and current references. In addition there is a suggested reading list of 275 references for those interested in studying various aspects in depth.

In several instances the author has not used references listed in the additional reading list. For example, in discussing the controversy over the need for the intermediary bonding agent for the development of optimal tags for retention, he implies that only the Scandinavians claim that tag formation by the composite alone equals the tags formed using the bonding resin. However, Pahalavan & others (Ref 43) at the University of Michigan also show this equivalent tag formation. This oversight, however, should not detract from the validity of his technique or conclusion to recommend the use of the enamel bonding resin because, as he so aptly puts it, "The bonding layer does no harm, is quickly applied and has been demonstrated to be effective." A report by Jacobsen in the *Journal of Dental Research* (not referenced by Simonsen) shows that the gap between restoration and cavity wall increases as the time between mixing and placing the restoration increases. This rapid loss of plasticity and increasing loss of adaptation with time reinforces the author's recommendation to use the bonding resin.

Dr Simonsen does exceptionally well in explaining his technique and the reasons for each step. His constant reminder to protect the etched surface from any contamination is excellent. He repeats for emphasis because he is convinced that as operators increase their attention to the details of each step their success rate with acid etch technique will improve.

Other valuable aspects of his technique include: the preparation of a bevel in the enamel at the cavosurface to ensure bulk in the composite at the finish line; carefully protecting all cut dentin with calcium hydroxide so that no acid during etching will contact the dentin; polishing with the Soflex superfine disks (3M Dental Products, St Paul, MN 55101, USA); and the careful application of a glaze coating after cleaning the composite surface and re-etching the bordering enamel.

It is difficult to see how the author is able to remove the flash of composite from the tooth surface with a diamond point or carbide bur without damaging the tooth surface or leaving large defects in the composite. After the bulk of the excess has been removed with a diamond or carbide with water as a coolant, then, when there is a chance of touching the tooth surface the Shofu (Shofu Dental Corp, Menlo Park, CA 94025, USA) or Dedeco (Dental Development & Mfg Corp, Brooklyn, NY, USA) white resilient points or conventional polishing disks or strips can be used to refine the margin without damaging the composite or tooth.

Two applications—sealing of smooth surfaces and the replacement of load-bearing amalgams with composites—are, as the author recognizes, controversial. In this area he gets carried away by his enthusiasm for the acid etch resin technique. The smooth surface sealing pictured on page 41, with the sealant bridging the interproximal spaces, is completely unacceptable. Perhaps he intended this as an illustration of temporary sealant over a fluoride treatment. This possibility is implied in the caption, which should have been more specific to prevent any misunderstanding.

In the other area, the replacement of amalgams, the author compares the old amalgams prone to high creep and corrosion placed in

poorly prepared cavities with acid etch resin restorations which have been placed with utmost care and attention to detail. It is essential that studies and comparisons are made using comparable techniques. Dr Simonsen recognizes this because among the disadvantages he lists in the use of composites as preventive resin restorations is that "the long-term retention and wear, compared to well-placed amalgams, has yet to be determined." Nevertheless, he recommends the use of composites over amalgam for Class 2 cavities in primary teeth. All reports of clinical studies using composites in Class 2 cavities of permanent teeth show loss of contour in two years. Since many restorations in deciduous teeth will be in service longer than that, it is important to wait for reports of clinical studies before recommending such use. The mesiodistal dimension of deciduous teeth is every bit as critical as it is in permanent teeth. We must use materials which preserve the mesiodistal and also the occlusal dimensions of all teeth.

A weakness in the book is the author's heavy emphasis on 3M products. Although he states often that any of the composite materials will work, his repeated use of 3M, and only occasional use of two other brands, makes the book an advertisement for 3M. This could defeat the author's stated goal of promoting the applications of acid etching through the use of proper techniques.

The real strength of this book is in Dr Simmonsen's extensive experience with the acid etch technique. He presents the basic technique and the various clinical applications with clarity and sufficient detail so that the book should be a help to any dentist having difficulties with the acid etch technique or just beginning to use it. The reader must realize the truth in the author's statement in his preface: "Many techniques described here have evolved after changing the method each time it was attempted and hopefully the reader will see that the most important aspect of the technique is the operator's willingness to accept that the only way to improve a technique is to change it."

Nelson W Rupp, DDS
Dental Research Section
National Bureau of Standards
Washington, DC

Clinical Applications of the Acid Etch Technique provides a good example of how photography in dentistry can illustrate technical procedures. As no acknowledgments were made regarding the clinical photography, I assume the views were made by the author. The charts and graphs are large enough to read and are well laid out. The scanning electron microscope views show excellent reproduction and are an asset to the book.

It is fortunate that color was selected for the reproduction of all of the clinical views. If they had been reproduced in black and white they would have been very poor due to the lack of shadows, texture, and contrast caused by the use of a ring flash for lighting. Even reproduced in color they lack detail, texture, and contrast. When a ring flash is used for lighting, subjects such as teeth show no texture or shadow contrast in such vital areas as gingival margin, occlusal anatomy, proximal space, and most important, the enamel structure. It is unfortunate that a side-mounted point source of light was not used as the teeth would then have had the needed contrast and detail.

Most of the clinical views show evidence of some distortion of image or perspective. This is the broadening of the centrals in their relationship to the width of the laterals and cuspids. The cause of this is generally the use of a lens of short focal length, 50 or 55 mm instead of 100 or 105 mm, for close-ups.

The rubber dam views show more contrast and therefore the teeth stand out; but even here contrast is lacking in the occlusal cusps. The top three photographs on page 51 show the type of detail that would make all the color illustrations excellent. The author should be commended for his excellence in keeping the image straight, for filling the slide to show maximum size of image, and for the fact that most of the views are free of saliva.

Clifford Freehe, RBP-FBPA
Instructional Photography
School of Dentistry
University of Washington

Press Digest

Effect of the Water Pik® device on plaque accumulation and development of gingivitis. Hugoson, A (1978) *Journal of Clinical Periodontology* (5) 95–104.

At the end of an experimental period of 14 days it was found that patients using a Water Pik as the only means of oral hygiene had developed gingivitis and extensive deposits of plaque, but these were less than in patients with no oral hygiene whatsoever. For patients who continued to clean their teeth by brushing, the addition of the use of the Water Pik gave no further reduction of gingivitis or plaque.

Pressuring technique and cement thickness for cast restorations. Koyano, E, Iwaku, M & Fusayama, T (1978) *Journal of Prosthetic Dentistry* (40) 544-548.

Several methods were used to apply pressure to castings in cementing them to dies in the laboratory. The methods included both static and dynamic pressure and combinations of the two. Pressure was applied by weights, a Vicat needle, a spring-loaded mallet, a vertical vibrator used to condense amalgam, and a horizontal vibrator driven electromagnetically at 50 cycles per second. Thinner cement films were obtained with dynamic rather than static pressure and with vibratory rather than mallet pressure. The thinnest films were produced by static pressure followed by dynamic pressure. The optimal technique is to seat the casting with finger pressure and then use horizontal vibration under hand pressure.

Marginal integrity of amalgam alloy in relation to creep: A preliminary report. Jordan, R E, Suzuki, M & Mills, A R (1978) *Journal of Prosthetic Dentistry* (40) 299–303.

Four amalgam alloys (Dispersalloy, New True Dentalloy, Shofu Spherical, and Velvalloy) were placed in 308 class 1 and 2 cavities in 68 patients. The restorations were examined for marginal integrity at one year and a year and a half. At the longer interval the restorations of Dispersalloy exhibited the best margins. New True Dentalloy and Velvalloy were similar, and Shofu Spherical showed the most marginal fracture. Dispersalloy has the least creep of the alloys tested and New True Dentalloy the most. Shofu Spherical, with the most marginal fracture, has the second lowest creep. These results suggest that it may be risky to link good marginal integrity with low creep.

Cavity varnish and its application: 'Once is not enough'. Lund, N H, Mathews, J L & Miller, A W (1978) *Journal of Prosthetic Dentistry* (40) 534–536.

Copalite varnish of one, two, or three coats was applied to dentin with a cotton pellet and dried for 30 seconds with a gentle stream of air. When more than one coat was applied an interval of two minutes was allowed to elapse between applications. The specimens were examined in a scanning electron microscope. One coat of varnish did not cover all dentinal tubules. It required two coats to form an adequate seal.

Results from "PLEASE RATE THE JOURNAL"

Questionnaire, Winter 1978, p 39

	Good	Mediocre	Worthless
Editorials	9		2
Original Articles	11		
Dental Practice	8	2	
Dental Education	8	1	
Dental Politics	5	3	3
Point of View	7	3	1
Product Reports	9		
Press Digest	8	3	
Letters	4	5	1
Supplement	7	1	

Favorite feature:

- *Original articles and product reports. I am continually trying to update and improve and I use journals like yours to obtain ideas and material to do so.*
- *Your editorials are super.*
- *They're all good—a well balanced journal.*
- *Original articles are very well written and research is shown of significant value to practicing dentists. Keep it up!*

Least favorite:

- *Press Digest. If something is bad say so directly in your opinion. Don't beat around the bush.*
- *Editorials. They belong in a separate journal called "The Dental Conservative."*
- *None.*

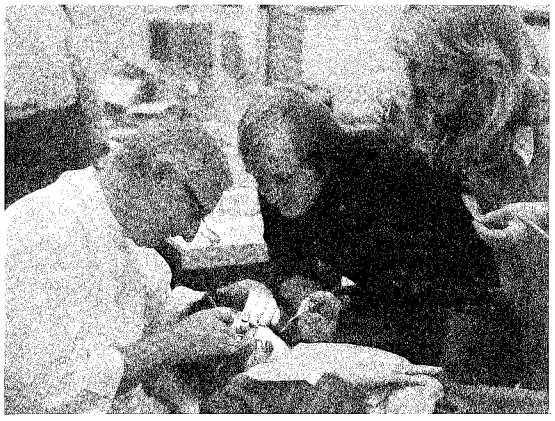
Other features you would like to see:

- *Gold foil preparations and variations.*
- *More information on materials but as current as possible. It changes so fast. Maybe polls of what materials your subscribers use.*
- *Just tell it as it is and continue with the same type articles.*

Additional suggestions for improvement:

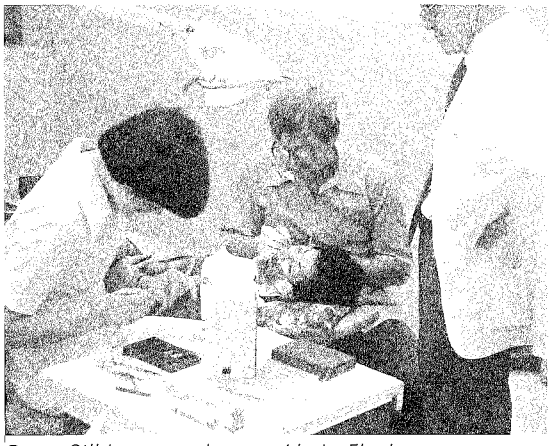
- *Increased size and number of articles when economically feasible.*
- *A little more Wit and Wisdom might be acceptable.*
- *Leave out Wit and Wisdom. No wit, less wisdom.*
- *I would like to see the journal more research oriented. Dental politics are important but should not take up so many valuable pages.*
- *Keep up the fine work!*

Editor's note: Thanks to all those who responded to our questionnaire. And to all our subscribers—let us know how we're doing from time to time. We do value your opinion.



Dick Tucker demonstrating the preparation of a class 3 cavity to John Sechena and his assistant Lee Anne Stevens.

Marty Anderson assisting Marc Tollefson with the condensation of gold in a class 2 cavity while Trudy Thoreleson selects a condenser.



Gerry Stibbs supervises as Linda Finch prepares noncohesive foil to line the walls of the cavity being filled by Ed Fenn.

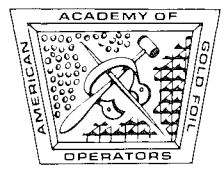
Report on Gold Foil Course

Ten dentists and their assistants participated in a course on gold foil sponsored by the Associated Ferrier Study Clubs during the last two weeks in September in Seattle.

Instruction was under the direction of Gerald Stibbs, assisted by Martin Anderson, Richard V Tucker, and Ian Hamilton. Each participant placed a foil for a patient each morning and afternoon, except for the first morning, which was given entirely to lectures. Lectures also preceded the operating session each morning.

Those taking the course were Robert L Doty, Seattle; Edward G Fenn, Richmond, BC; Edward L Kardong, Bainbridge Island, WA; Donald R Lewis, West Vancouver, BC; Matt Panar, Vancouver; John R Sechena, Seattle; Sam S Siew, Burnaby, BC; R Craig Spowart, Cranbrook, BC; David H Todd, Victoria, BC; and Marc D Tollefson, Tacoma.

OPERATIVE DENTISTRY



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ACADEMY OF OPERATIVE DENTISTRY

OPERATIVE DENTISTRY

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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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INSTRUCTIONS TO CONTRIBUTORS

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