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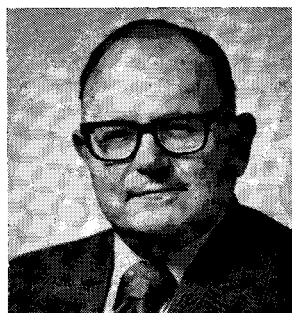
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President's Message

Today the American Academy of Gold Foil Operators is beset by many problems which threaten not only our Academy but the general practice of dentistry as well. Our main objective was, and will continue to be, how we can best enlighten teachers and practitioners of general dentistry in the art of quality dentistry.

Many of us seek changes not knowing whether they are right or wrong, while others steadfastly resist any change at all. Changes will come, however, and we must decide which is the best course for us to follow in this ever-changing society. We would do well to heed former U.S. Secretary of Health, Education and Welfare J. W. Gardner, when he wrote, "We cannot stand still; there must be renewal and innovation". The recent report of the National Advisory Commission on Health Manpower states that more of the same is not enough.

I feel that we must somehow exert more influence on the general practitioner. He is the moving force of dentistry. He will be the teacher of quality dentistry. He will influence his patients to demand the best that we have to offer. I believe that our Academy is being offered the challenge of preserving quality dentistry. Our membership has the nucleus of qualified teachers and influential practitioners to accept this challenge. We must seek new ways to spread our concepts.

Our membership continues to show increased strength, and the newly elected officers and committeemen will give us a strong base from which we can operate.

I have visited many of the local study clubs during the past year and will continue to visit many others. My thinking on the best course for our Academy to follow has been affected by these local visits.

Many of our past presidents have given me invaluable help in my decisions. Some of the ideas expressed in this message were taken from our past president, Gerry Stibbs, in his address to the CDA National Convention in Vancouver in 1968. These men, our past presidents, certainly have the best interests of the Academy at heart. My old friends, William Walla and Floyd Hamstrom, have also contributed much for a well run Academy.

We should all give thanks for the many years of unselfish service that our business manager, Ralph Boelsche, and our secretary-treasurer, Bill Gilmore, have given to our Academy. These men have made the transition of officers to our new business manager, James Newman, and our new secretary-treasurer, Hunter Brinker, a smooth procedure. I want to also cite Gordon Christensen for his difficult role as chairman of the Constitution and By-Laws Committee. I believe that many worthwhile innovations will come from this committee.

We, the officers and members of the Executive Council, hope that 1970 shall prove a year of continued growth and influence, and that all factions of our Academy will work together to promote our concepts of quality dentistry.

Dr. Werner graduated from the University of Minnesota and received postgraduate training in prosthodontics, periodontics and gnathology in various schools in the United States and Canada. He is an assistant professor of operative dentistry at the University of Minnesota and is engaged in general practice of dentistry in Menomonie, Wisconsin. Dr. Werner is a member of numerous professional associations and societies, among which are: G. V. Black Study Club, Minnesota Academy of Prosthodontics, Minnesota Academy of Gnathological Research, Academy of General Practice, American Academy of Gold Foil Operators, Academy of Childrens Dentistry, and a Fellow of the International College of Dentists. He has presented a number of papers and clinics in dental schools and meetings in the United States and is active in many civic organizations.

Peter R. Cunningham, D.D.S.
George W. Ferguson, D.D.S., M.Sc.

The instruction of rubber dam technique

An examination of the literature associated with usage of the rubber dam reveals numerous pleas for increased use of this technique. In spite of the fact that the benefits from using the dam are well established, widespread use of the technique is unfortunately not the case. Most operators will agree that dental restorations can be completed more easily and with better quality in an ideal operating field. Since the oral cavity is not an ideal operating field, various devices and materials have been devised to provide a clean and dry field of operation. Cotton rolls, saliva ejectors, caustics, styptics, and drugs all have their shortcomings. The rubber dam technique is the best method of creating an ideal field in 85-90 percent of the cases involved in operative dentistry.

Those who are members of the Academy are committed to this technique through the Academy's constitution. The Constitution states that we will encourage by practice and by teaching the performing of restorative procedures in the best possible field in respect to operative cleanliness, and in this phase of the Academy's program we will utilize the rubber dam as the medium and as the criterion of other materials and techniques.

Yet, with all this encouragement from respected members of the profession, the rubber dam remains one of the greatest enigmas in dentistry. Although its use is taught in all dental schools and it is required in testing of operative procedures by most state board

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This paper was presented in part at the American Academy of Gold Foil Operators Interim Meeting, Chicago, Illinois, January 1969.

profession, the rubber dam remains one of the greatest enigmas in dentistry. Although its use is taught in all dental schools and it is required in testing of operative procedures by most state board examiners, the rubber dam is not used by most dentists in private practice.

A survey of rubber dam usage by Going and Sawinski¹ in 1967 demonstrated this lack of use by practitioners. Their results indicated that for operative procedures the rubber dam was never or seldom used 82.4 percent of the time, occasionally used 12.3 percent of the time, and most or always used 5.3 percent of the time. What is most important to we who teach in the Operative Department at Buffalo is that the Middle East region showed the least use of the rubber dam for operative and endodontic procedures. In fact, the returns indicated a 90.1 percent "never or seldom used" tabulation in operative procedures for New York state. Although these figures appear very bleak for the advocates of rubber dam, the picture is not as dark as it appears. National market research figures for the last five years indicate a steadily increasing rate in the sale (and we must assume in the use) of rubber dam. For the period from 1963 through 1968, rubber dam sales have increased 67 percent.* This must mean that more schools are doing a better job of teaching rubber dam technique.

The question at this point is obvious, "Why don't more dentists use the rubber dam?" This is *especially true* when authoritative sources advocate greater use of the dam than is indicated in studies such as that conducted by Going and Sawinski. Non-users would have us believe that patients dislike the dam. Perhaps there is some truth to this statement, but how many patients enjoy injections or surgery in any of its forms, including cavity preparation? In fact, from x-ray to final appointment there is little that we do that patients *like*.

The true basis for non-use of the dam may lie outside of any criticisms leveled at patient dislike, inconvenience, or other techniques being sufficient. Wolcott and Goodman² published a study in 1964 which attempted to correlate the degree to which the rubber dam is used in private practice with the quality of undergraduate training. The results of their survey revealed that the effectiveness of teaching techniques had a direct relationship to rubber dam usage in dental practice. It was noted that in those geographic areas where rubber dam usage was at its highest, greater emphasis had been given to individual instruction in rubber dam at the undergraduate level.

The results of the Wolcott-Goodman study are most logical when one considers the fact that the dentist is introduced to the rubber dam during the clinical years in dental school. If the student is attempting application of a rubber dam with little background, poor

* Figures supplied by the Hygienic Dental Manufacturing Co., Akron, Ohio.

instruction, and no help it often consumes more time than preparing and restoring a cavity. It is not in the least surprising that such a time consuming procedure is not utilized to a greater extent in private practice where time means money. The rubber dam can be considered a time-saver only when it is applied in an efficient manner.

Since this distinct correlation exists between the degree of clinical use of the rubber dam after graduation and the character of undergraduate training in rubber dam technique, teachers and clinicians have a frank challenge to improve teaching methods in this area.

This conclusion, the necessity of improving instruction in rubber dam, has been evident for more than a few years. A possible solution evolved two years ago, when we received a programmed operative course prepared for the United States Public Health Service by the Case Western Reserve School of Dentistry.³ After reviewing this course we began investigating the possibility of using new methods of instruction for teaching rubber dam technique.

To help us in our investigation, we enlisted the aid of Dr. Taher Razik of the Education Department at our University. The following is the result of the collaboration between Dr. Razik and our staff.

The problem defined to Dr. Razik was our desire for more effective methods of instruction in rubber dam technique. The objectives included our desire for the student to accept and learn rubber dam technique such that his disposition toward its use would continue after he left the University clinic.

We were certain that attitude as well as knowledge and skill was essential to the objectives. We believed that instruction offered under conditions optimal to the learning of the objectives would result in not only effective but efficient instruction. In other words, if the student enjoys the learning experience, a situation which is most likely to occur under effective and efficient conditions, he will then be likely to have a more positive attitude toward use of the rubber dam. If the objectives were only more effective instruction it could perhaps have been met simply through increased exposure and practice in using the dam.

To repeat, the problem was not only one of more effective instruction, but one of developing a positive attitude toward use of the rubber dam. We feel that if these objectives can be met we will accomplish long and short range goals, *i.e.*, immediate improvement of rubber dam technique in the clinic by our students and continued use of the dam after the students become practitioners.

It was decided to direct instruction to the beginning sophomore

student in order to provide him with an adequate background in this area prior to his entering the clinic later in the sophomore year. The clinical instructors would then be more effective in their instruction by being able to cover more complex and varied applications of the rubber dam *after* a basic technique had been mastered. Moreover, the instructor would be able to devote more time to the students who exhibited need for more individualized instruction. It is also felt that with some modification the unit of basic instruction might be adapted to continuing education.

The learning task was the next point under scrutiny. It was agreed that our objectives could be broken down into distinct categories: 1) the factual knowledge associated with the rubber dam; 2) the development of manual skills; and, primarily 3) the development of a positive attitude and definite desire to use the rubber dam based on its advantages.

As was previously agreed, a positive attitude would be best developed under the conditions presented by effective *and* efficient instruction in the other two areas of concern. With the *staff* personally committed to teaching the superiority of the rubber dam, we were next faced with the task of designing an optimal method of instruction in the application and use of the rubber dam technique.

Early in the preparation it was decided to employ whatever instructional aids or techniques best suited the type of learning involved. For example, visualizing tasks where motion is involved helps the learner acquire concrete examples of the different skills he needs to gain. A situation of this nature is perhaps best conveyed via the motion picture or television medium where an individual demonstration may be impractical and verbal or written description inadequate.

Programmed instruction was chosen as the primary basis of instruction. Since we had reviewed the programmed operative course and were favorably impressed with this method of instruction it was decided to utilize this medium as the core of instruction, supplemented with other forms of media as necessary.

The characteristics of programmed instruction justified its selection for teaching the factual information involved with the rubber dam. The term "programmed instruction" means a carefully arranged sequence of material requiring active participation by the student at each step of the learning process. Students can study a program at any time they wish, not being governed by a lecture schedule. Each learner proceeds at his own rate which allows the slow learner to repeat items as often as is necessary for understanding without holding back the more rapid learners. The learning is carefully designed in an orderly sequence of small steps, each step building on some bit of

knowledge gained in the previous steps. The student is led from A to B to C, etc., again at *his* pace. No specific amount of material needs to be covered in any specific amount of time thus there is no pressure on the learner "not to miss a word" as in a lecture or similar presentation. In contrast to lectures, programmed instruction requires that the student be actively involved. In a lecture the learner may be day-dreaming or otherwise distracted but in a programmed course he must be responding in some manner (filling in blanks, answering questions, etc.) or he cannot proceed. This active participation by the learner eliminates outside distractions to a great extent for the student can study the program when he wishes and in the environment of his choosing.

Finally, immediately after the learner responds to a step in the program, he is given the correct responses. This immediate knowledge of learning increases the amount of learning retention,⁴ and makes the process more enjoyable. We all enjoy learning, especially when a subject is presented in a systematic manner which makes it easy for us to learn.

The final design selected was a series of integrated programmed units.⁵ Each unit presents a single concept to be studied. Motion pictures are used to supplement the written programmed materials. The units are as follows:

- I. a. Introduction — Why Use the Rubber Dam
- b. Determining the Operating Field
- c. The Selection and Placement of Clamps
- d. Preparation of the Patient
- e. Preparation of the Rubber Dam
- f. Application of the Rubber Dam
- g. Removal of the Rubber Dam

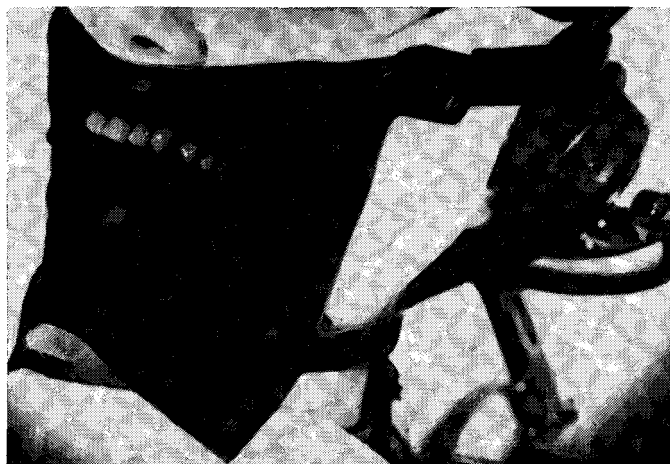
A second sequence, ancillary to the above, will be developed for advanced study in the area. It will be as follows:

- II. a. Special Application of the Rubber Dam
 1. Clamp Modification
 2. Use of the Ferrier 212 Clamp
 3. Isolation Around Fixed Bridges

The following series of frames illustrates the step-by-step development of part of the unit on determining the operating field. This material is for presentation to a student who has no previous knowledge about the rubber dam. In the programmed text a 6 x 6 inch sheet of rubber dam is affixed to the page opposite the first frame. Each frame occupies one page, therefore the answer is not visible while the student is responding.

Determining the Operating Field for Application of a Rubber Dam

- 1-1. A rubber dam is a thin sheet of rubber which is used to isolate teeth in the operating field. The material attached to the opposite page is called a _____.
(ANSWER: rubber dam)

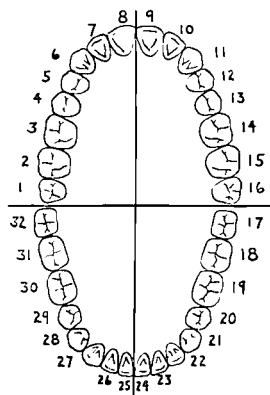


- 1-2. This photograph shows the rubber dam in use. The teeth in the operating field are isolated by the _____.
(ANSWER: rubber dam)
- 1-3. The operating field consists of the tooth under treatment and all other teeth which are to be _____.
(ANSWER: isolated)
- 1-4. The principle use of the rubber dam is to isolate teeth in the _____.
(ANSWER: operating field)
- 1-5. Enough teeth should be isolated to give a good _____.
(ANSWER: operating field) in which to work.
- 1-6. The tooth under treatment determines the area to be _____.
(ANSWER: isolated) by the rubber dam.

- 1-7. Additional teeth are isolated to provide adequate access to and visibility of the _____ under treatment.
(ANSWER: tooth)

To let the student know that he is making progress, criterion or testing frames are used at periodic intervals in the program. Here the student can test himself on the knowledge he has gained thus far. If he finds that a point is not clear or that he misses some of the responses, he is encouraged to return to the portion of the program covering that point. A criterion frame for the section on determining the operating field looks like this:

1-35.



Specify the ideal operating field for the following teeth:

- Central incisor (8),
No. _____ to _____
- Second premolar (29),
No. _____ to _____
- Cuspid (22),
No. _____ to _____
- Cuspid (6),
No. _____ to _____
- First molar (3),
No. _____ to _____
- Central incisor (25),
No. _____ to _____

1-35. (a) 6-11; (b) 24-31; (c) 20-27; (d) 4-11; (e) 1-9; (f) 22-28

Unique to this programmed course is the selection of clamps made available to the student. We feel that one part of the armamentarium which generally confuses the beginning user is the vast assortment of clamps available. To avoid this confusion, only seven clamps are used in the programmed sequences. These consist of five molar clamps, one bicuspid clamp, and in the unit on special application of the rubber dam, the use and modification of the Ferrier 212 gingival retractor will be taught. We have found that students who are learning to use the rubber dam are able to handle the majority of applications with these clamps. As experience is gained the student is better able to select and use other clamps to suit special needs. These are available in the operative clinic.

As previously mentioned, it was decided to employ a text and a movie to teach the rubber dam technique. The written program serves as the basis for instruction and motion pictures supplement the text.

The application of the rubber dam is primarily a manual skill involving motion and coordination on the part of the learner, and although the text serves as a basis for teaching the necessary facts, such as the step-by-step procedure, this certainly does not constitute the entire learning task involved. A 16 mm motion picture was produced which shows the learner motions involved in application of a rubber dam. The motion picture shows close-up sequences where visual cues are extremely important, such as when knifing the dam between teeth and the process of inverting the dam. This film was later converted into cartridge loaded Super 8 mm film sequences for use by individual students. They are able to view or review the film individually as necessary on a small rear-screen projector.

In conclusion, the results of using programmed instruction supplemented with motion pictures to teach rubber dam technique have been gratifying for the effort extended. A statistical analysis is being conducted to determine the degree of effectiveness of the program but for we who are associated with this project, statistical confirmation is secondary. The members of the operative department have ventured the opinion that the sophomore groups exposed to the experimental program are better prepared to use rubber dam than a great majority of the senior students who have used the dam in the clinic for two years. Most important is that the experimental groups have a far more positive and confident attitude toward use of this important dental technique.

Although we prepared this text and film at the State University of New York at Buffalo, we hope that other persons or groups will make use of them. We will make them available on loan or at cost to other schools, study clubs, the armed forces, or to individuals. This will not only allow more people to use these materials, but would give us a broader evaluation of the text and film.

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Effective organization of study groups

Study groups long have been a source of postgraduate education for many dentists, both specialists and general practitioners. They have provided many with an inspiration for excellence and a clinical capability that could not have been obtained elsewhere. Some groups have provided a place for the testing of ideas and the solution of problems.

In other instances, study clubs have been used to perpetuate rigid adherence to a doctrine. On occasion, little clinical research is accomplished, and a comparison of methods advocated by the club with other methods is not suggested.

It is the purpose of this paper to outline a type of organization that would allow clinical research and evaluation within the study group and still not compromise any technical skills.

This proposed organization would be divided into four phases: 1) evaluation of the existing situation; 2) technical performance; 3) research and creative development; and 4) re-evaluation. These phases vary in scope, but each should help provide stimulation and incentive to the members.

Evaluation of the Existing Situation

This is best accomplished by all members within the study group. During this time, assets and liabilities can be determined and priorities for the group established. Some questions to be considered should be:

Dr. Wittrock was born and raised in Kansas, where he attended both Kansas State University and Kansas City University. He is now on the faculty of the University of Kentucky School of Dentistry in the Restorative Department; prior to this he taught in the Operative Division at the College of Physicians and Surgeons in San Francisco.

1. What clinical objectives have already been attained?
2. What research and development capability is available within the group?
3. What research and development objectives should be established, or are feasible within the present organization?
4. Do any members feel that they have reached the point of diminishing returns?
5. What changes would be necessary if reorganization were to be accomplished?

Answers to the above questions might shed some light on the present status of the group. Free expression should reign supreme during this evaluation. All opinions should be heard to insure proper evaluation. Once the present status is determined, the group may evaluate its future potential in clinical areas.

Clinical Potential and Technical Performance

Most study club members can perform very well and should be in an excellent position to rate the clinical potential of the group. Some possible questions are:

1. Should there be different objectives for members with varying degrees of ability? For example, should the more proficient members attain objectives which are more difficult and require more experience?
2. Should the objectives strike a balance between the practical and the academic?
3. Should the clinical operations be expanded? (Should new objectives be attained?)

Answers to these questions can help determine the clinical competence the group desires of its members, as well as provide some objective to be accomplished.

Research and Creative Development

After the technical objectives of the group are clarified, the research and creative phase of development can be planned. It is this phase in the development of a member that initiates change and brings in new ideas which keep the group stimulated. Some key questions the group might ask are:

1. Do we have members who are interested in finding a better way to do our present procedures?

2. What clinical research projects would the group be interested in?
3. Do any of the proficient members of the group feel this would add a new challenge?

Answers to these questions are critical because they indicate if there is a desire to change. If only a few members wish to change they can form the nucleus for a trial group. Since they are motivated, they will make the best effort and most progress.

If and when members are motivated to reorganize, the new structure of the group could be as follows:

SECTION 1 — *Initial Clinical Development.* This would be a group of the newer members who have demonstrated advanced skills and are working toward the higher levels of technical excellence prescribed by the group, and those in Section 3 who are working on clinical problems.

SECTION 2 — *Advanced Clinical Development.* This group would consist of members who have demonstrated advanced skills and are working toward the higher levels of technical excellence prescribed by the group, and those in Section 3 who are working on clinical problems.

SECTION 3 — *Research and Creative Development.* Those eligible for this group would be members in Section 2 who have attained the advanced clinical skills prescribed. The objective of this section would be to research the methods advocated by the group, develop new methods and try creative approaches to problems. It is assumed there would be continual oscillation between Sections 2 and 3 because of the change in clinical technique induced by the problem to be solved.

SECTION 4 — *Re-evaluation.* The objective of this section would be to inform members of the club's progress, note trends and try to promote development of members. It would be the responsibility of this section to see that the discoveries of the group become a part of its methods.

Conclusions

An organization such as the plan presented would insure the technical progress of its members by setting up four separate sections with specified levels of competence. This would recognize that there are different levels of skills, help stimulate the new members and provide a sustained motivation for those who become highly skilled. A section for research development and creativity should aid the group in their continual improvement and also help prevent stereotyping. Many

study clubs could make changes in their organization that would enhance both the development of their members and the group by providing a continual challenge.

Summary

The following plan for study group organization is recommended:

1. Evaluation of the present status of the group.
2. Evaluation of possible future objectives.
3. Organization of the group into four sections: *Section 1* — new members; *Section 2* — members with advanced technical competence; *Section 3* — members who have progressed through *Section 2* and are working on problems involving research and creative development; and *Section 4* — Re-evaluation. This section keeps the group informed on its progress.

ANNUAL MEETING

The 1970 Annual Meeting has been planned for November 5-6 at the University of California, Los Angeles, California. This will precede the ADA meeting to be held in Las Vegas, Nevada on November 8-12. A detailed announcement and hotel registration cards will be mailed soon.

Members will enjoy the fine facilities offered by the Century Plaza Hotel during their visit to Los Angeles. Tours for families can be arranged to visit Disneyland, Universal Studios, Knotts Berry Farm, and many other interesting excursions.

Frida A. Xhonga, D.D.S.

Direct golds — part 1*

Dentistry has never ceased to search for better restorative materials with regard to strength, adaptation, duration, harmony with tooth structure, and ease of manipulation. Gold can be such a desirable material, if improved in each of these respects, and then its usefulness would be increased.

Pure gold was one of the first restorative materials used in dentistry, and has become more popular in recent years. Some of the characteristics of this noble metal are: high ductility, elasticity, and cold weldability. On the other hand, its disadvantages are: the color, the high coefficient of thermal conductivity, and the difficulty of manipulation.

Gold, being highly malleable, can be rolled into sheets so thin that it can transmit light. Its ability to weld at room temperature, when free of impurities, makes it possible to be used as a direct restorative material. Complete cohesion can be established between the space lattices of two different pieces of gold foil, a property which is usually displayed by metals and alloys only at higher temperatures. Brinell hardness of pure gold is 25, which is too soft for use as a restorative material, except in the form of a well-condensed gold foil, where hardness is substantially increased.

Mat gold, produced by an electrolytic process, is another form of pure gold. It is a fern-like crystalline structure and is employed in

Dr. Xhonga is assistant professor of operative dentistry at the University of California, Los Angeles, School of Dentistry. She is a graduate of the University of Minnesota (1956), and of the University of Munich, Germany, where she received her Dr. Med. Dent. degree in 1949. Currently she is president of the UCLA Gold Foil Study Club, and an active member of the American Academy of Gold Foil Operators, and the American Dental Association. This paper was presented before the American Academy of Gold Foil Operators, Annual Meeting, Buffalo, N.Y., October 10, 1969.

* This paper consists of two parts: Part One summarizes the essential physical characteristics and properties of Direct Golds, whereas Part Two deals mainly with the Direct Gold Alloys.

certain types of prepared cavities as a base, and then veneered with gold foil.

Powdered metallurgy, known for over half a century, is the technology of transforming metal powders into finished or semi-finished products by mechanical and thermal operations, which is carried out at temperatures below the melting point of the larger metal component. This technique was adopted also in dentistry by developing powdered gold, and it is manufactured by the following methods: 1) Granulation or pulverization; 2) Chemical precipitation; and 3) Atomizing the molten metal into minute globules.

In a powdery state the material is difficult to handle in a cavity, due to the lack of coherency.¹ This difficulty has been overcome by placing it into a gold foil envelope, with an average diameter of 1 to 3 mm. It consists of thousands of individual powder particles, ranging from 2 to 150 microns in diameter, mostly averaging 15 microns. Each envelope or pellet contains approximately 10 times more metal by volume than a comparable size of rolled gold foil pellet.

In order to improve the physical characteristics of gold, it is essential to understand its structure and behavior when altered. All metals are crystalline in character,² which are composed of atoms arranged in an orderly, regular and recurring pattern. This array of atoms makes up a space lattice. X-ray diffraction methods are employed to study the lattice structure of metals, which have been of great success in substantiating the theories about them. The lattice structure of gold is cubic, face-centered, having at each corner one atom, and another atom positioned at the center of each face, a total of 14 atoms (Fig. 1).

The crystalline structure of some metals can be observed by visual means, as in brass and galvanized metals, which often exhibit a large

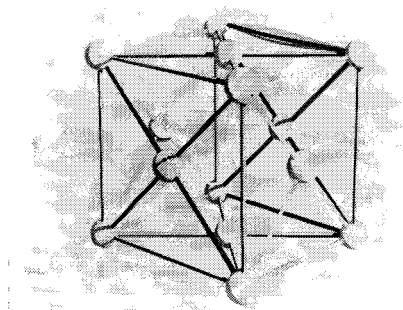


Fig 1 — Face-centered gold lattice structure.

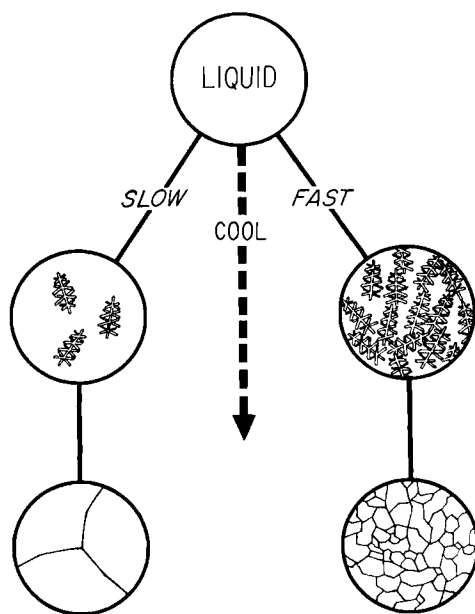


Fig. 2 — The speed of cooling determines the grain size of the metal.

crystalline texture on the surface; others can be seen by microscopic examination only. Crystalline structure varies and its grain size may be controlled by the manner in which the metal is cooled. For example, slow cooling of a gold casting, from the liquid state, will assure much larger crystalline structure than fast cooling, which produces small grains (Fig. 2). The individual crystals or grains are formed as the metals solidify from the liquid state. Each of these grains in a polycrystalline mass develops a regular three dimensional crystal structure. The first indication of grain formation is noticed as nuclei are formed in the liquid mass of metal. A good number of these nuclei develop dendrites or ramifications as they enlarge. When the nuclei are evenly spaced, the resulting grains will be of similar size. As these grains meet at their borders, they form grain boundaries. A fine grained texture, produced by fast cooling, is preferred because it imparts higher strength to the metal. Crystallization does not always occur in a regular fashion from nucleus, but random growth instead is likely to develop, with some lattice places left empty, and others overcrowded with atoms, and not in straight line with the principal lattice planes.

By heating a metal consisting of small grains one can cause grain growth, and the metal loses its strength. During annealing, care must be taken to avoid overheating the metal, since recrystallization can occur and it will be rapidly succeeded by grain growth³ (Fig. 3). There is a diffusion of atoms across the grain boundaries, and eventually one large grain replaces several smaller ones. The resulting coarse-grained structure will have mechanical properties inferior to a fine-grained material, and the metal possesses a lower tensile strength and hardness.

Sintering is the process of transforming individual particles into a mass where the particles lose their identity (Fig. 4). This technique can control the grain size of the gold, and can affect its mechanical properties.⁴ It is carried out at a temperature below the melting point of the metal, yet the particles, at their several points of contact, melt and infiltrate into each other, forming a metal bond. This procedure of heat treatment permits the formation of a loose collection of gold particles into shapes that can be mechanically handled. Recrystallization and grain growth may occur across the former particle boundaries.

During the condensation of direct gold, the planes of atoms line up to create resistance to acting forces. As the gold is condensed, stresses are created wherever the atoms of a space lattice are displaced, so that the interatomic forces get out of equilibrium. It is an important factor that in any type of deformation, whenever stresses are present, an irregularity of the space lattice develops. In permanent deformation one layer of atoms moves over the surface of another, thus taking up a relationship with new opposing atoms (Fig. 5). This movement is

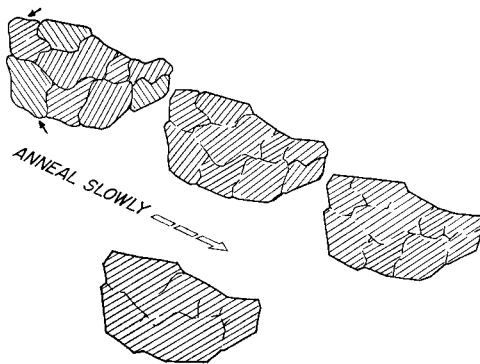


Fig 3 — Overheating and fast annealing causes grain growth.

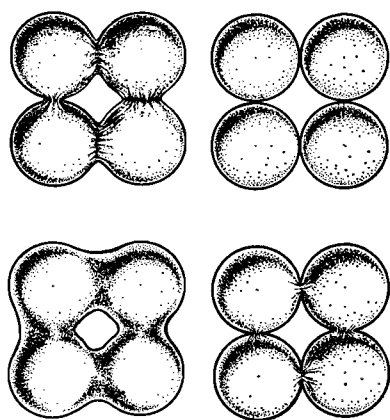


Fig. 4 — Sintering is the process of transforming individual particles to a mass.

called slip.⁵ Normally, crystals display lattice defects where the atom planes are incomplete. An incomplete plane is known as a dislocation. Slip is the result of a dislocation along a slip plane, which takes place by displacement or propagation. In a space lattice, where the boundaries are irregular, this slip becomes more difficult, because of the internal friction developed by the irregularity.

In actuality, metal crystals contain an intricate network of dislocations. When these crystals are exposed to exterior forces, such as cold-working, the said dislocations obstruct each other's motion, since some parts of them are held by other sections of the network. The presence of a great number of dislocations in a metal, generally will restrict the slip and thus increase the hardness of the metal⁶.

Figure 5 taken from: Guy, A. G., Elements of Physical Metallurgy, Addison-Wesley Publishing Co., Inc.

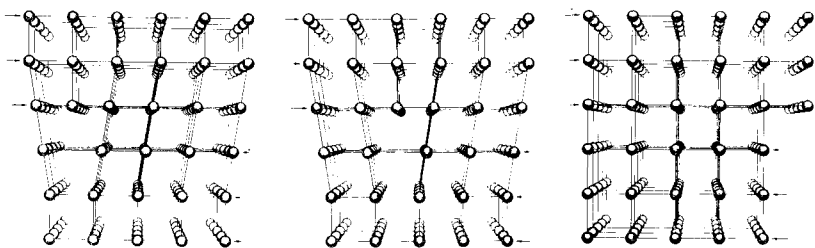


Fig. 5 — Slip is the result of displacement of some atoms along a principal plane.

The additive possibility⁷ of combining gold with other metals, that can change its microstructure, and increase the hardness of the metal is another valuable factor. An addition of .1 to 5 wt percent of other metals like calcium, palladium, platinum and silver alloyed with gold will provide increased strength and hardness, yet its ability to resist tarnish and corrosion is not diminished.

Since our objective is to seek improved restorative materials, great consideration should be given to factors influencing the physical characteristics and properties of gold: 1) Grain size — small grains yield a harder product; 2) Thoroughness of condensation and work hardness; 3) Slip interferences — dissimilar atoms and precipitates introduced into the crystal structure of gold constitute an alloy with increased hardness.

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Hunter A. Brinker, D.D.S.

Not to see is to guess

Since the time of Hippocrates, one of the fundamental principles of surgery has been to gain proper access to the site of the operation. This is true whether we are performing surgery on hard or soft tissues. In 1864, Dr. Sanford C. Barnum of New York gave the dental profession the rubber dam, a method of gaining this necessary accessibility. This method has never been improved upon and gives maximum protection to the soft tissues. It also creates a field of vision that is unsurpassed by any other technique.

James Mark Prime lists fifty-seven different reasons for use of the rubber dam.¹ I would like to suggest one more reason for its use. The purpose of this paper is to show how the rubber dam can aid in the initial preparation of the mouth.

Historically, and in present-day practice, the beginning phase of periodontal treatment is the initial preparation of the mouth. "The objectives essentially consist of the elimination or reduction of the local etiology and environmental influences prior to the operative procedures devoted to therapy of the marginal lesions, as well as lesions of the attachment apparatus."²

Supragingival and subgingival calculus and debris should be removed, and the roots thoroughly planed. When a carious lesion is present in the gingival area it should be removed, and at least a temporary restoration placed. If there are any restorations that have overhanging margins, improperly placed contact points, or which simply fail to restore the tooth to proper anatomic and functional form,

Dr. Brinker is a member of many professional organizations and study clubs and is vice chairman of the Florida State Board of Dentistry. He is the newly appointed secretary-treasurer of the American Academy of Gold Foil Operators.

This paper was presented before the Academy of Gold Foil Operators, January 31, 1969 at the University of Illinois Dental School, Chicago, Illinois.

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then these restorations must be corrected. Ill-fitting crowns should be removed, and properly contoured temporary crowns placed. And finally, if there are any teeth that are quite loose and movable, they should be splinted temporarily. All this falls within the category of the initial preparation of the mouth.

Advantages

In order to properly complete this form of treatment, it may be necessary to have the patient return a number of times. However, if the rubber dam is used, this phase of the treatment plan can be completed effectively in two or three long appointments.

Besides shortening the treatment time for the initial preparation of the mouth, there are many other advantages to this form of therapy. This is a one-treatment procedure. Starting at the most posterior tooth of one quadrant of the arch, the operator works his way around to the other quadrant on the opposite side of the arch, while concentrating on only one tooth at a time. Since the tissue around each tooth must be properly retracted prior to treatment, the operator is disciplined to concentrate on a particular tooth. This enables the operator to be more thorough.

Because the soft tissues are isolated from the tooth surface and the bacterial impregnated calculus, there may be less opportunity for bacteria to enter the blood stream. If this is true and there is a reduction in bacteremia, then patients with diseases such as diabetes or rheumatic fever could be better treated.

Frequently there is a carious lesion at the cemento-enamel junction of the root surface. This lesion can be removed and a temporary restoration placed. By doing this in conjunction with removing all the calcareous deposits and planing the root, healing is enhanced. When the tooth is dry, as it is under the rubber dam, the operator is able to see fine calcareous deposits and minute imperfections in the cementum. Therefore, more thorough root planing can be performed.

In a dry field, the teeth serve as excellent finger rests during instrumentation. One does not worry about the cheeks and lips contracting, causing fingers to slip off.

Because the rubber dam has automatically retracted these tissues as well as the tongue, the hands of both the doctor and the assistant are freed for other purposes.

Retraction by rubber dam creates better access than retraction by the mouth mirror. Direct vision and access to such inaccessible areas as the distal of the second molar can be created easily.

With the rubber dam in place, the patient is more relaxed; he has less fear of aspirating a foreign object. He has less postoperative discomfort, because tissues have not been lacerated by the periodontal instruments. Thus, the operator, assistant, and patient are more relaxed at the completion of the visit.

Disadvantages

The most outstanding disadvantage is the frequent inability of the operator and assistant to place the rubber dam properly. Both must work as a team to achieve an easy placement in a minimum time.

Direct access and proper retraction can be gained only in pockets that are not deeper than five or six millimeters. However, in pockets that are deeper than this, or in infrabony pockets, the rubber dam can further aid instrumentation to the base of these pockets. Although there will not be direct vision in this area, instrumentation can be accomplished just the same as when the rubber dam is not placed; and the operator still realizes all of the other advantages of the rubber dam.

Tray Setup

In recent years, great strides have been made in improving the application efficiency of the rubber dam. Instruments have been changed, retainers have been redesigned, and the technique of rubber dam application has been reviewed and simplified. It is not only possible to use the rubber dam efficiently for restorative dentistry, but also to use it for periodontal therapy.

The rubber dam tray setup should be simple—all extra instruments eliminated. The majority of all dental treatment can be done with four or five retainers. The rubber dam, the face napkin and dental floss are all rolled together in one neat package. Five or six of these packages are stacked on the right side of the tray. Next to them is the Ivory rubber dam punch, the Ivory rubber dam retainer holder,* an S. S. White Tarno #2 plastic instrument** (frequently referred to as a “beaver tail”), a three-pronged Woodbury strap holder*** and a magnet holding only those retainers used most of the time (Fig. 1).

The rubber dam that is used should be fresh, dark in color for contrast, and as heavy as possible. The extra-heavy dam is strong and will reduce tearing when trying to go through the interproximal and

* J. W. Ivory Co., Philadelphia, Pa.

** S. S. White Co., Philadelphia, Pa.

*** Clev-Dent, Division of Cavitron Corp., Cleveland, Ohio.



Fig. 1 — Simplified rubber dam tray setup.

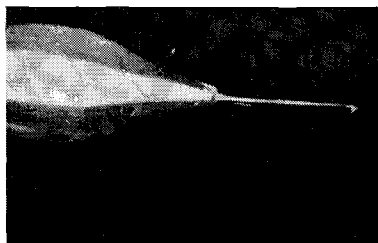


Fig. 2 — No. 2 crochet needle imbedded in plastic handle, used to seat retainers.

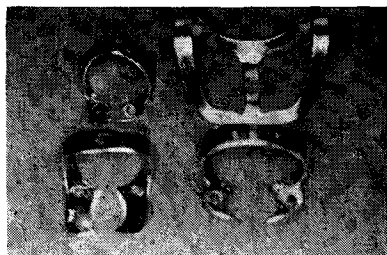


Fig. 3 — The four most generally used retainers: upper left, Ivory W00; upper right, SSW 212; lower left, SSW 26; and lower right, Ivory W8A.

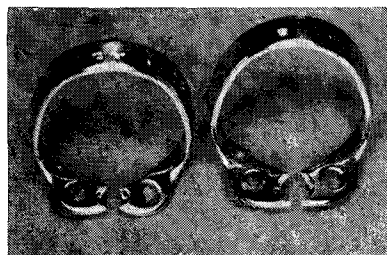


Fig. 4 — Left, Recontoured Ivory W00 retainer; Right, Ivory W00 retainer.

contacting areas of teeth that are heavily laden with rough calculus deposits and broken-down restorations. The rubber dam comes in rolls of precut squares of 6 x 6 or 5 x 5 inches. Utilizing the principle of simplification, use only the 6 x 6 precut rubber dam. By having the larger piece, the operator has greater freedom in the placement of the holes. Excess rubber dam is simply turned under and engaged in the retainer holder.

The beaver tail is a small plastic instrument which has on one end a thin, flat rounded blade that is the shape of the Beaver's tail. It is an excellent instrument to aid in inverting the dam. It also acts as a hand retractor to retract the rubber dam when scaling to the bottom of the periodontal pocket. (This includes the infrabony pockets.) (Figs. 8, 9)

The only other instrument which should be placed on the rubber dam tray is a homemade instrument made of a #2 crochet needle imbedded in a plastic handle. The hook of the needle can be further accenteduated with a carborundum disk. This instrument proves invaluable in the final seating of the rubber dam retainers (Fig. 2).

The principle of "Four Point Contact" should be understood. To select a retainer exactly contoured to fit the tooth architecture on the labial and lingual surfaces means that hundreds of different retainer styles would have to be available. Efficiency cannot be maintained with this number of retainers. A retainer to retract the gingival tissue properly, must have only two points of contact on the buccal or labial surface and two points of contact on the lingual surface. This principle of "Four Point Contact" reduces greatly the number of retainers necessary for proper tissue retraction. With this in mind, the selection of retainers has been limited to basically four. They are as follows: The Ivory Wingless oo utility retainer (Woo), the SSW 212 cervical retainer, the Ivory Wingless 8A Universal retainer (W8A), and the SSW 26 Universal retainer (Fig. 3). The SSW 212 cervical retainer and the SSW 26 Universal retainer will not be considered at this time, because they are used little (if any) during the initial preparation phase of the treatment.

The Ivory Wingless oo retainer has very small jaws and is useful for retraction of the dam on anterior and bicuspid teeth. It is modified by narrowing the jaws and bending the horizontal plane of the jaws to give more access. By modifying the retainer, the operator is able to properly seat the retainer to the depth of the gingival attachment and anchor the bow of the retainer with compound for stabilization without having the compound interfere with the operation site. On the magnet, there is a minimum of two regular Woo retainers and two modified ones (Fig. 4).

The Ivory Wingless 8A is a universal retainer for all molar teeth, but it must be modified for better retraction. The jaws should be thin and on a more horizontal plane where they attach to the tooth. The normal anatomy of upper molars places the lingual root in a more distal direction to the buccal roots. Therefore, the 8A retainer must be bent

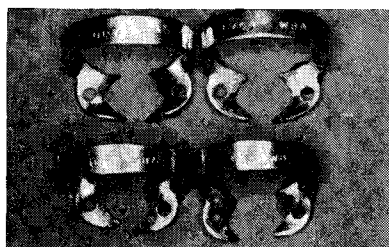


Fig. 5 — Upper left, Ivory W8A, upper right, Recontoured Ivory W8A; bottom, Recontoured Ivory W8A retainers, right and left, for upper molars.



Fig. 6 — Left, Ivory W8A; right, Recontoured Ivory W8A. Note the change in contour of jaws.

so that the lingual jaw accommodates this distal direction of the lingual root. This modification is easily done by bending the retainer to fit a stone cast of the maxillary first, second and third molars. On the magnet there are two W8A's that are modified but not bent, two that are modified and bent for the upper molars (distinguished as 8A right and 8A left) and one without any modification (Figs. 5, 6).

Application of Rubber Dam

Successful isolation of the teeth largely depends upon the manner in which the holes are punched in the dam. If they are punched too far apart, excess rubber will bunch up around the teeth and interfere with the field of vision. If the holes are punched too close together, an inadequate seal around the necks of the teeth results.

As a general rule, the dam should be punched to include the opposite cuspid and at least two teeth distal to the one under treatment. Before punching the holes, it is important to observe the teeth that will be included in the rubber dam. Usually, the spacing between the holes should be the spacing between the vertical axis of the teeth. The general alignment of the teeth and missing teeth should be noted. The holes should be positioned in the dam in exactly the same relationship as the position of the individual teeth in the arch. When there has been gingival recession and there is less interseptal tissue between the teeth, the holes between the teeth on the dam should be slightly closer together.

For scaling or root planing procedures, or for a Class V restoration, there should be a slight amount of additional space left between the holes punched in the dam. This will provide the necessary amount of additional rubber for proper retraction.

If a full-arch dam is to be placed, the holes are punched first for one quadrant and extended around the curvature of the arch to include the cuspid on the opposite side of the mouth. Anesthesia is given for this quadrant, the dam is applied and treatment begun. When it is time to treat the opposite quadrant of the same arch, anesthesia is given for that quadrant; and the dam is stretched by the assistant over the teeth to be included. While the assistant stretches the dam over these teeth, the operator marks the vertical axis of the teeth on the dam with a pen. With the dam still in place, holes are punched where the markings were made. A retainer is placed on the most distal tooth in the arch, and the rubber dam is slipped over it. The remainder of the teeth in the quadrant are included, and a full-arch dam is in place. When a full-arch dam is placed by first applying a dam to one quadrant, including the opposite cuspid, and later punch-

ing the holes and applying the dam to the opposite quadrant, the operator will virtually eliminate any possibility of excessive folding or of having too little dam.

It is highly advantageous to have the holes punched in the dam in proper position in relation to the upper and lower lip lines. Approximately one inch of rubber dam material is necessary between the edge of the dam and the holes punched for the maxillary central incisors. Approximately two inches of dam material are necessary between the edge and the holes punched for the mandibular central incisors. Mesio-distally, or horizontally, the dam should be divided into thirds. Inciso-gingivally, or vertically, the dam should be divided in half.

In a 6 x 6 precut piece of dam, the hole for the mandibular first molar should start at the junction of the halfway mark to the junction of the first third of the dam, measuring mesio-distally. The hole for the maxillary third molar should start at this same junction. Use of direct vision seems to be far superior in positioning the holes than use of a conventional template. No one arch is exactly the same as another.

To achieve routine placement proficiency of the rubber dam, it is quite important that the dentist and his assistant have a definite sequential procedure. With the rubber dam in proper position, the assistant can then wash the saliva, blood and food debris from the teeth and rubber dam. It is then helpful to wipe the teeth and surrounding area with an alcohol sponge, quickly removing all moisture from the teeth and eliminating any odors that might be present.

Scaling Procedure

The first tooth treated is the tooth that is clamped for the initial application of the dam...the most distal tooth in the arch. With finger pressure on both sides of the jaws of the retainer, seat it firmly again to ensure that the retainer is as far apically as possible and has not slipped occlusally during the dam application (Fig. 7). When the operator is certain that the retainer is seated properly, there should be direct visual access to all surfaces of the tooth.

The gross calculus is removed. The assistant is then able to flush the debris away in the aspirator and to redry the area by blowing intermittent blasts of air. The small flakes of calculus still present and the small imperfections in the cementum will then show. With direct visual access, the operator can thoroughly plane the root smooth. The distal tooth is the most difficult tooth in the arch to treat in this fashion.

Several aids are available to help the operator. Sometimes it is impossible to obtain direct vision and access to the distal part of the tooth. In these situations, it is helpful to reflect the dam by seating a



Fig. 7 — Rubber dam retainer being seated with finger pressure to bottom of gingival sulcus.

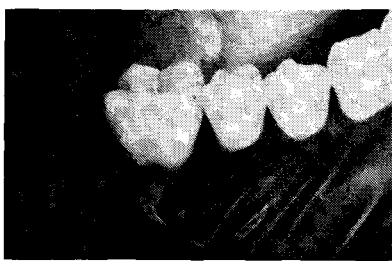


Fig. 8 — S.S. White, Tarno #2 (or beaver tail) aiding in retracting rubber dam in bifurcation area of buccal surface of the lower right first molar.

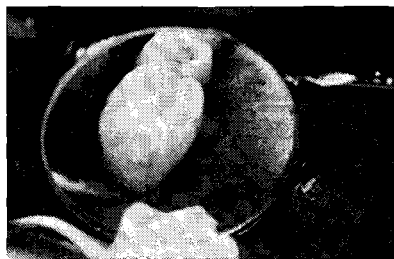


Fig. 9 — S.S. White, Tarno #2 (or beaver tail) aiding in retracting rubber dam on distal surface of lower right first molar.

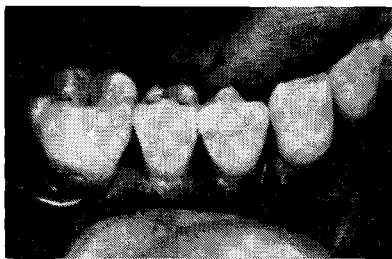


Fig. 10 — Rubber dam retracted by operator and assistant so that gingival tissue surrounding second bicuspid can be seen.

beaver tail or similar instrument, to the depth of the periodontal or infrabony pocket. The beaver tail is held with the left hand, while the right hand controls the scalers or root planing instruments. Meanwhile the assistant is working with intermittent air and spray, along with aspiration, to keep the area clean (Figs. 8, 9).

Secondly, because the traction and compression of the dam on the cheek musculature is constant, more direct access to the distal areas appears after 10 or 15 minutes than when the dam was first applied. Therefore, one should wait for ten or fifteen minutes before final checking of this area.

Thirdly, a furcation involvement often exists. When the retainer is properly placed, it does not impinge on the furcation area. Direct access can be obtained by gently teasing a small piece of gingival retraction string into this area.

If the next tooth is a second bicuspid on the lower arch, a Woo retainer is the one of choice. To properly seat this retainer, several

things must be done. With the left hand, the operator stretches the rubber dam on the buccal surface, so that he can completely see the gingival tissue surrounding that surface. With the right hand, he is ready to seat the retainer, which is engaged in the retainer forceps. The assistant, with her right forefinger, stretches the dam on the lingual surface of the tooth, so that she able to see the complete lingual tissue. With her left hand, she is blowing away blood and debris which interfere with vision. Both operator and assistant must be able to see the surrounding tissue completely (Fig. 10). The operator then seats the retainer carefully as far apically as possible (Fig. 11). He releases the retainer forceps gradually and allows the dam to retract around the retainer, as the assistant releases the dam on the lingual. With very cautious pressure, both buccally and lingually, the operator presses on the retainer to force it as far apically as possible. The assistant then heats one end of a cylinder of modeling compound just enough so that it is workable and not sticky. The operator molds the workable mass to the form of a cylinder, glazes one end, and stabilizes the bow of the retainer distal to the bicuspid. The glazed surface of the compound touches the tooth surface first and is carefully molded to engage the retainer bow. It is important that the compound is out of the way of the operation field. An excessive amount of compound interferes with the field of operation and causes visual problems. With gentle pressure, the operator again seats the retainer while the assistant chills the compound. She should take the other end of the beaver tail and test the compound for hardness. (It can take as long as 30 seconds to properly chill compound.) (Fig. 12)

Before starting treatment on the second bicuspid, the operator and assistant should stabilize a retainer on the first bicuspid. The only difference is that this time the bow of the retainer should be pointing to the mesial of the arch and the jaws of the retainer pointing to the distal, directly opposite to the way the retainer bow is located on the second bicuspid.

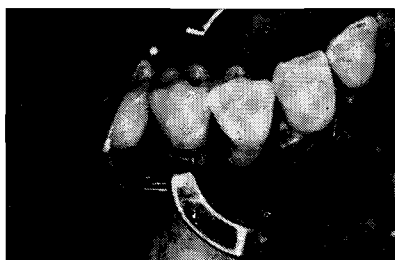


Fig. 11 — Rubber dam retainer being seated on second bicuspid.

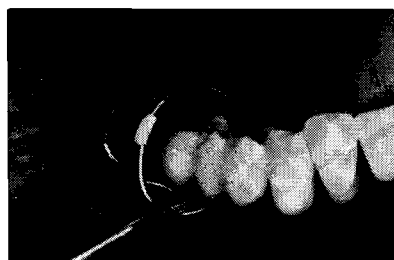


Fig. 12 — Jaws of rubber dam retainer further seated with finger pressure and crochet instrument and stabilized with compound.

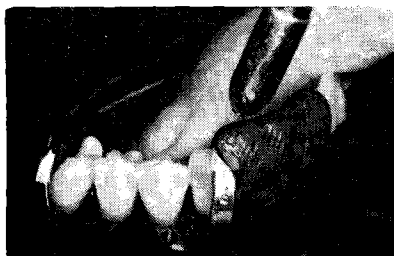


Fig. 13 — Jaws of rubber dam retainer of first bicuspid seated under pressure and stabilized with compound.



Fig. 14 — Lingual view lower right cuspid and lateral incisor showing proper tissue retraction. Note how far apically the retainers have been positioned.



Fig. 15 — Lingual view of right cuspid and lateral incisor showing their roots thoroughly planed smooth.



Fig. 16 — Five millimeter pocket depth of the lower right cuspid prior to initial preparation of the mouth.



Fig. 17 — Healing two weeks after treatment. Treatment consisted of thorough root planing with the rubber dam retracting the tissues, above Fig. 14. Oral physiotherapy instructions were given following treatment.

Compound is heated, placed on the teeth anterior to the retainer and very gently teased to engage the retainer bow. The operator presses both buccal and lingual jaws of the retainer to ensure that it is in position; no more than a quarter of an inch of compound should surround the mesial bow of this retainer. The assistant then chills the compound thoroughly (Fig. 13).

By having the two Ivory Woo retainers back-to-back in this position, several advantages are noted. Two teeth can be treated at one time. The interseptal tissue between the two bicuspid teeth is under constant pressure by the dam, producing an excellent visual field for scaling and root planing procedures. Because the dam is taut, there is less chance of it being caught or torn by the instruments (Figs. 14, 15).

Once the operator is assured that the teeth are completely clean and that the roots are thoroughly planed, the next two teeth are treated. If there is a flake of calculus where the retainer is touching the tooth surface, this can be removed simply by taking the retainer off and retracting the tissues with the beaver tail instrument, placing the beaver tail to the bottom of the gingival sulcus.

From the second bicuspid around the arch to the second bicuspid on the other side, this procedure of placing the Woo retainers back-to-back can be practiced.

Any caries hindering the healing processes should be removed, and temporary restorations placed. Reinforced amalgams can be placed to build up and reinforce badly broken down teeth. Endodontia can be done and temporary crowns placed. Each tooth may be treated on an individual basis. It is possible to treat only one quadrant or a whole arch. This will depend on the appointment time allowed and the conditions that are present.

Summary

To See Is To Know—Not To See Is To Guess. It is not fair to the patient nor to the operator when one is not absolutely sure of the complete removal of calculus during root planing procedures. The use of the rubber dam is an indispensable tool in the initial preparation of the mouth. It also makes it possible to employ all phases of dentistry in one appointment. Endodontics, periodontics, and restorative procedures are all combined to attain a degree of excellence that is surpassed by no other technique. Certainly, more definitive treatment may be needed at a later date, but the initial preparation phase is complete. A careful application of the rubber dam allows a conservative and more biologically accepted form of treatment of both hard and soft tissues. You Don't Have To Guess — You Know!!

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Harold Drucker, D.D.S.

Robert B. Wolcott, D.D.S., M.S.

Gingival tissue management with Class V restorations

During Class V restorative procedures, surgical tissue retraction may be necessary to protect the gingiva from tearing and laceration or prolonged compression. Some clinicians have successfully used a gingival flap to prevent such injury. This paper will discuss the indications, considerations, preferences, hazards, and methods of its use.

Very little information concerning flap management during restorative procedures is available. Spratley¹ prefers "stretching" the gingiva for a few minutes using the #212 clamp, then moving the clamp further apically. Krajewski, et al,² state that the danger of injury with a flap procedure far outweighs its usefulness unless the operative procedure is short; if adequate attached gingiva is present, the excess marginal tissue might be best removed by a gingivectomy technique either before or at the time of the operative appointment. Xhonga³ reveals the results of the use of a gingival flap in a controlled study in the UCLA School of Dentistry to be extremely favorable.

The gingival flap is indicated when:

1. The carious lesion extends below the gingival margin;
2. The gingival wall of the cavity preparation is to be placed apical to the gingival margin;
3. The placement of a properly contoured rubber dam clamp⁴ may traumatize the gingiva;
4. The rubber dam cannot be kept out of the cavity preparation because of the proximity of the gingival tissue to the cavity wall.

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Dr. Wolcott is coordinator of the Restorative Dentistry Department and director of clinics at the University of California School of Dentistry, Los Angeles, Calif.

Gingival flaps may be reflected using:

1. A single vertical incision made over the long axis of the root;
2. A double vertical incision made interproximally;
3. An envelope design.

The flap choice requires consideration of blood supply^{5,6,7} (Fig. 1), wound healing at the site of incision,⁸ reattachment problems,^{9,10} the morphological type of periodontium and prominence of the root in the arch.^{11,12}

The main blood supply to the buccal and labial gingiva comes from the suprapariosteal vessels overlying the alveolar process.^{6,7} A secondary supply arises at the alveolar crest from the anastomosis of these suprapariosteal vessels with the coronal branches of the periodontal ligament vessels.^{6,7} Interproximally, the suprapariosteal vessels also anastomose with the alveolar crest perforating vessels.^{5,6,7}

Both the envelope and double vertical flap designs interfere mini-

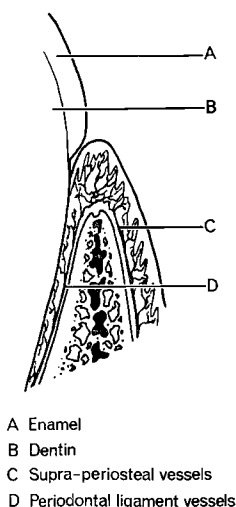


Fig. 1 — Blood Supply: The main blood supply to the buccal and labial gingiva comes from the supra-periosteal vessels overlying the alveolar process. A secondary supply arises at the alveolar crest from the anastomosis of these supra-periosteal vessels with the coronal branches of the periodontal ligament vessels.

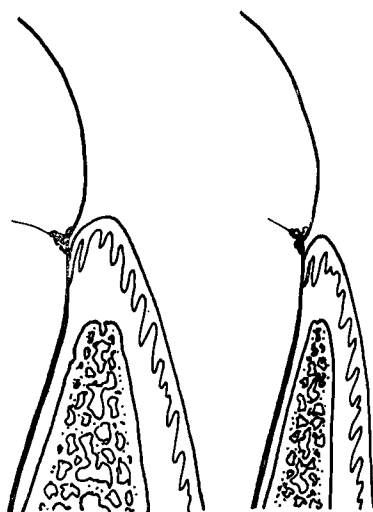


Fig. 2 — Thick vs. Fragile Periodontium: When the periodontium is thin, fragile and delicate, there may not be adequate thickness of connective tissue for adequate wound healing if a single vertical incision flap is used.

mally with the main blood supply. The single vertical flap creates a dual problem. It interferes with the blood supply and also superimposes the need for wound healing of the cut edges over the root surface at the same time and place reattachment must occur.

The single vertical incision flap is particularly dangerous when the periodontium is thin, fragile, and delicate (Fig. 2). Usually the root is prominent in the arch. There may not be adequate thickness of connective tissue between the sulcular and oral epithelium to enable both wound healing of the cut edges and reattachment to occur. Cleft formation, pocket formation, or recession may result.

The presence of minimal attached gingiva creates another problem. Great care must be used to avoid detaching all the gingiva from the root. Otherwise, a muco-gingival pocket may result postoperatively.

Materials and Methods

The periodontium must be healthy or treated to attain good periodontal health.¹² Use a #15 scalpel for making all incisions and a beaver tail burnisher for reflecting the gingiva. Keep incisions as short as possible. While reattachment to previously unexposed cementum is predictable, unnecessary epithelial detachment and cementum exposure should be avoided. To minimize crestal resorption the bone should not be exposed over the root surface.

Blood clots should be removed and flaps pushed back firmly against the tooth. No sutures or dressings are necessary. If a dressing is used over the single vertical incision site, it may be forced into the incision, resulting in cleft formation.

1. *Single Vertical Incision (Fig. 3)*

Make a 3 mm long incision in the center of the long axis of the root. Reflect the flap to the extent needed.

2. *Double Vertical Incision (Fig. 4)*

Make the incisions coronal enough to provide adequate access to the proximal cavity outline. Slant the incisions interproximally to end on bone instead of root to facilitate reattachment. Make the incisions just long enough to provide access to the gingival cavity outline.

3. *Envelope Flap (Fig. 5)*

Incise the papillae on the buccal or labial aspect on both sides of the tooth. Make the incisions coronal enough to provide adequate access to the proximal cavity outline. Extend the incisions laterally over the adjacent teeth or further if greater access is needed.

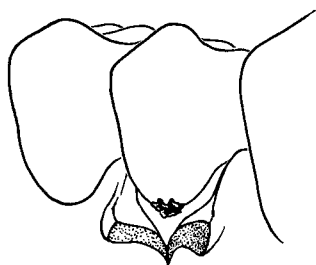


Fig. 3 — Single Vertical Flap: A 3mm long incision is made in the center of the long axis of the root. Reflect the flap to the extent needed.

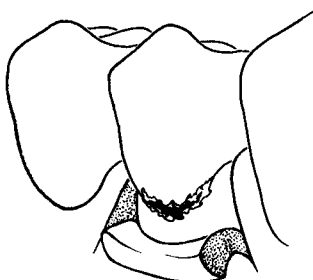


Fig. 4—Double Vertical Flap: Two vertical incisions coronally positioned provide adequate access to the proximal cavity outline. The incisions slant to end interproximally on bone, and are long enough to provide access to the gingival cavity outline.

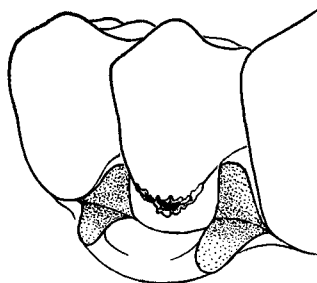


Fig. 5 — Envelope Flap: The papillae are incised on the buccal or labial aspect, on both sides of the tooth, and coronally to provide adequate access to the proximal cavity outline. The incisions extend laterally over the adjacent teeth.

Summary

1. Use the double vertical incision flap in the majority of cases. It provides the greatest access and most safety.

2. Use the single vertical flap incision under the following circumstances:
 - a. where the periodontium is "thick" rather than thin and fragile;
 - b. when caries does not extend interproximally; and
 - c. the procedure will be of short duration.
3. Do not use any type of gingival flap for molar teeth if furca exposure may result.
4. Use utmost caution if the attached gingiva is minimal.
5. Keep incisions short. Debride thoroughly. No sutures or dressings are necessary. Freshen wound edges by stimulating bleeding.

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Rita Virmani, B.D.S., M.S.D.
Ralph W. Phillips, M.S., D.Sc.
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Displacement of cement bases by condensation of direct gold

The cement base under the direct gold restoration protects the pulp from thermal shock. In the deep cavity preparation it provides the firm foundation upon which the restoration is to be built. If the base does not have adequate strength, it may be fractured or displaced. In such a case the gold will contact the dentin floor, thereby preventing the cement base from providing the required thermal insulation. Furthermore, if the layer of dentin at the floor of the cavity is very thin or if microscopic pulpal exposures exist, the foil may actually be forced through the cement and into the pulp.

Therefore, the strength of the base is of considerable importance. Although the behavior of proprietary base materials has been investigated as related to the condensation of the amalgam,¹ parallel research with direct gold has not been published. That was the purpose of this study.

Procedure

The base materials employed are shown in Table I. They are representative of the popular zinc oxide-eugenol, calcium hydroxide and zinc phosphate cements which are used for this purpose. B & T was included since it is typical of the newer reinforced zinc oxide-eugenol cements which have considerably higher strength than the conventional mixtures. All of the cements were mixed according to the ratios and consistencies advocated by the respective manufacturers.

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Standardized Class V cavities were prepared in extracted teeth that had been stored in water. The cement was mixed and placed in the floor of the cavity preparation, following which the teeth were stored for 7 minutes in a humidor. The bases were then trimmed so that 1.5 ± 0.5 mm. thickness of cement remained. Seven specimens were used for each base material.

In order to provide a firm support for compaction of the foil, the teeth were mounted in a split cork held in a vice. Hand rolled gold foil was compacted into the cavity preparations with an electro-mallet,* using 0.4 mm. diameter condenser point. In order to prevent the foil restoration from falling out when the teeth were sectioned, the restoration was covered with an epoxy resin.

The sectioning procedure has been described.¹ Briefly, the longitudinal sections through the foil and the base were carefully made with a diamond wheel on a Hamco sectioning machine under a continuous flow of water. The continuity of the base was examined under a microscope.

Results and Discussion

Representative sections are shown in the following figures.

Microscopic examination of the sections showed no discontinuity when the cement was Tenacin, B & T or Temrex, as illustrated in Figures 1 and 2. With some mixes of Dycal, even from the same batch of material, although it was possible to compact the foil without a

* *Electro-mallet, McShirley Products, Glendale, Calif.*

TABLE I

MATERIALS	COMPRESSIVE STRENGTH — 7 MIN.
Cavitec (Kerr Mfg. Co., Detroit)	400 psi
Temrex (Interstate Dental Co., New York)	2300 psi
ZOE & B & T (L. D. Caulk Co., Milford, Del.)	3900 psi
Dycal (L. D. Caulk Co., Milford, Del)	1100 psi
Tenacin (L. D. Caulk Co., Milford, Del)	1100 psi

gross fracture or displacement of the cement, a discontinuity was evident. This is illustrated by the arrow in Figure 3. In other mixes of Dycal, the condenser point was pushed into the base, making it impossible to compact the foil (Figure 4). Likewise, it was impossible to compact foil in cavities where Cavitec was used as a base (Figure 5). In the case of these two cements, the base invariably flaked during compaction and thereby contaminated the gold.

Mat gold and powder gold were also compacted against the cements, since these forms of gold require a different type of condensing force from that employed in the compaction of hand rolled gold foil. The behavior of the base was similar to that noted previously for gold foil. Bases of zinc phosphate, B & T and Temrex remained intact while deformation and flaking occurred in bases of Cavitec and Dycal. Representative results are shown in Figures 6 and 7.

Hollenback's pneumatic condenser* and hand condensing techniques were also used to see if the different techniques of force application had any effect on the base. These methods of compaction produced comparable results to that found with the electro-mallet.

From the laboratory data on the compressive strengths of the various materials utilized in this study, there appears to be some correlation between the compressive strength of the cement and the ability to support the compaction of a direct gold restoration. The data in Table I shows the strength of the various materials at 7 minutes. Actu-

* Hollenback pneumatic condenser, Clev-Dent, Cleveland, Ohio.

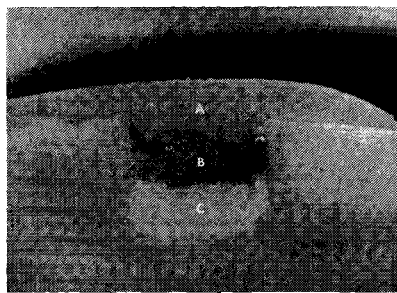


Fig. 1 — Section through gold foil restoration condensed against a representative zinc phosphate cement. A, Resin which was placed over the gold foil in order to prevent dislodgment during sectioning; B, Gold foil; C, Cement base.

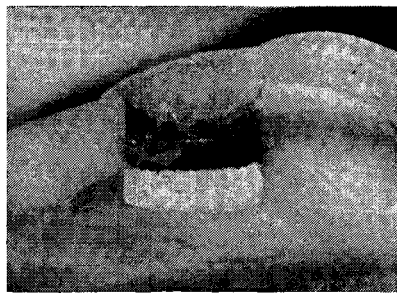


Fig. 2 — Section through gold foil restoration condensed against B & T.



Fig. 3 — Section through gold foil restoration condensed against Dycal.

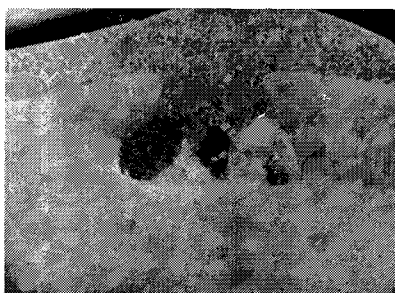


Fig. 4 — Section through gold foil restoration condensed against Dycal. In this specimen, the cement has not supported the condensation.

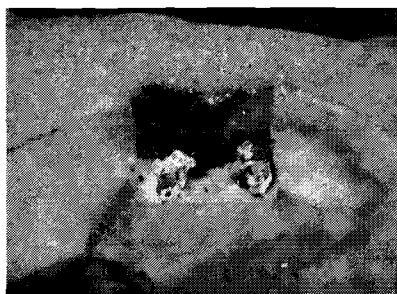


Fig. 5 — Section through gold foil restoration condensed against Cavitec.

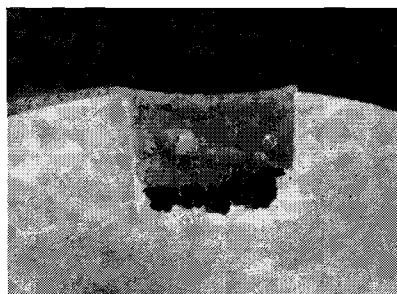


Fig. 6 — Section through powdered gold restoration condensed against Dycal.

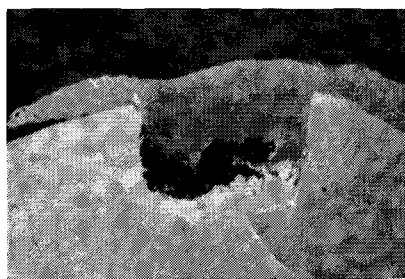


Fig. 7 — Section through mat gold restoration condensed against Dycal.

ally under clinical conditions these values are indicative of the strength of the cement at approximately 3 minutes since these tests

were made at room temperature, not 98° F. The three cements which proved satisfactory (Tenacin, Temrex and B & T) had the highest compressive strength while Cavitec was the lowest. Although the strength of Dycal is in the same range as that of zinc phosphate cement, it does vary somewhat from mix to mix, and the behavior in this study corresponded accordingly.

The results of this research have not defined exactly the minimum strength requirements of a base which is to support the compaction of a direct gold restoration. However, it would appear that this strength requirement may be somewhat higher than that necessary for the cement when it is to be used as a base for the amalgam restoration. That minimum strength has been established as approximately 170 psi.¹ The reason that the minimal strength value is higher for a cement base when it is used under the compaction of a direct gold as compared to that required for the condensation of an amalgam is probably related to factors such as the magnitude and dynamics of the applied force and the amount of energy which may be absorbed by the two metallic materials.

Conclusions

Five dental cements were evaluated in regard to their ability to resist the force applied during the compaction of a direct gold restoration. Cohesive, mat and powdered gold were employed in conjunction with hand, pneumatic and electric condensers. Displacement and flaking of the base was evaluated by the microscopic examination of sections made through the specimens.

Three of the materials, one a representative zinc phosphate cement and two zinc oxide-eugenol cements, had adequate strength to resist the forces of condensation. The other two cements, a calcium hydroxide containing base material and a popular zinc oxide-eugenol formulation, did not consistently provide a strength adequate to prevent displacement or flaking of the base. No difference in results was detected in the behavior of the cement as related to either the types of gold or the methods of condensation.

These data suggest that the strength requirement of a cement to be used as a base during the compaction of a direct gold restoration may be higher than that needed for the amalgam restoration.

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Dam gems

Modification of the 212 Retainer

There are several modifications to facilitate the use of the No. 212 retainer for different situations often encountered.

To Prevent the Cementum and Dentin From Being Grooved—Remove all sharp points and edges of the jaws. This can be done with a small carborundum stone followed with a $\frac{3}{8}$ " sulci disc.

To Prevent the Retainer from Slipping During Its Application or Removal—The retentive grooves for the retainer forceps are deepened with a fissure bur in the air rotor handpiece.

To Prevent Impingement of the Lingual Jaw on Lingual Tissue—bend the lingual jaw up 2 to 3 mm after removing its temper. The lingual jaw will be at right angles to the tooth. Do not bend the facial jaw down because it will reduce access to the preparation. The temper is removed by grasping the retainer mesial and distal to the lingual jaw with pliers, (to confine the heat to the jaw and preserve the temper of the bows) heating to a light red and allowing it to bench cool.

To Reduce Eyestrain and Improve Vision—the retainer is sand-blasted to remove the shine. This procedure eliminates glare and improves the operator's view of the preparation, condensation and finishing procedures.

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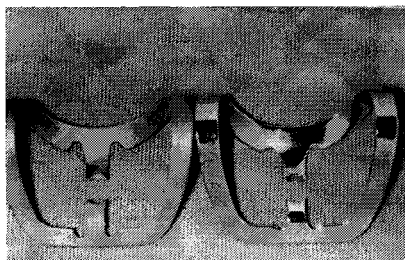


Fig. 1—Illustrates a new Ferrier 212 retainer and one modified with the above four modifications.

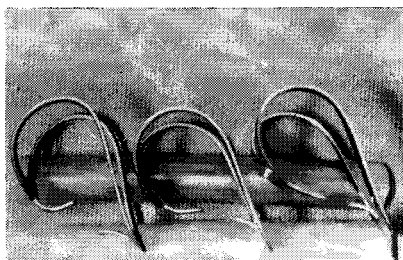


Fig. 2—Illustrates a new retainer, another with the lingual jaw raised 2 mm for average cases and a third raised about 5 mm for cases with extreme gingival recession or caries.

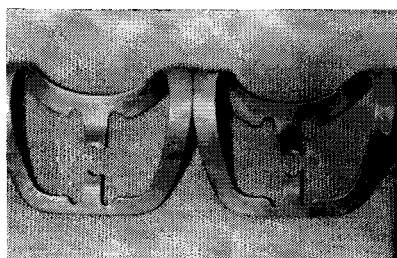


Fig. 3—Illustrates a modification for rotated teeth. The labial jaw is cut at an angle, right or left. The retainer will now engage the tooth squarely even though it is not in alignment with the rest of the teeth. For mandibular incisors, the labial jaw can often be narrowed to conform to the anatomy of these teeth.

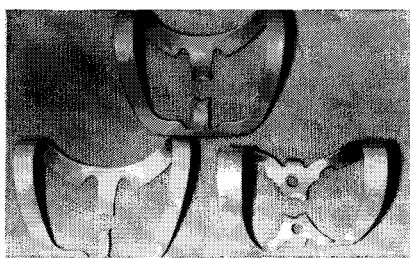


Fig. 4—Illustrates a normal jaw width, another in which it has been narrowed, and a SSW #9 for teeth which require a wider mesial-distal jaw.

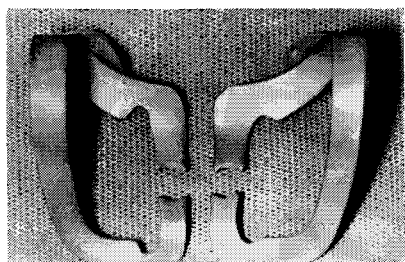


Fig. 5—Illustrates the 1/2 No. 212 (right and left) which are made by cutting off the opposite bows of two standard No. 212 retainers. This pair of retainers is used to isolate for adjacent Class V restorations or for the preparation and cementation of mesial and distal abutments of fixed prosthetic appliances.



Fig. 6—A close-up view of the 4 standard modifications, i.e., the rounded jaw edges, the raised lingual jaw, the deepened lingual grooves and the sand-blasted retainer.

It is the intent of the Rubber Dam Committee to publicize, at regular intervals, various techniques that will be of use to students and practitioners. Some of these will be time-proven and others will be new. Your comments, suggestions and ideas for assisting others with various steps of dam techniques will be appreciated. If photographs are necessary, the Committee will make every effort to be of assistance to you. Please send your ideas to CDR. Loren V. Hickey, DC, USN, Naval Dental School, National Naval Medical Center, Bethesda, Maryland 20014.

A tribute to Dr. Nathan H. Smith



Dr. Nathan Harvey Smith was one of the early pioneers of dentistry, and his death on November 16, 1969 brought to an end a colorful life which spanned a century filled with enthusiasm for his profession.

Dr. Smith traveled west with his family in a covered wagon train at the age of 11 and settled in Ione, Oregon in 1880. As a young man, he drove herds of horses from the Eastern Oregon ranges over the Snoqualmie Pass into Washington, worked and managed lumber mills and drove horse-drawn combines in harvesting wheat. His interest in dentistry was aroused when he assisted his brother, Dr. Frank Smith, in laboratory work, and prompted him to attend North Pacific College. After graduation in 1903, he opened his first office in Seattle's Alaska Building. Several years later, Nathan married Joy Brownfield, a member of a Seattle pioneer family, and raised a daughter and two sons.

Dr. Smith's zeal for his profession led him to design and make several instruments, some of which are manufactured today. He was a meticulous operator and did a great deal in furthering the cause of gold foil study clubs and fine operative dentistry. He was a charter member of the G. V. Black Gold Foil Study Club in Seattle and an Honorary Member of the American Academy of Gold Foil Operators. He was a Life Member of the Arctic Club, the American Dental Association, Washington State Dental Association and the Seattle District Dental Society.

Survivors are two sons, Dr. Bruce Brownfield Smith, a member and past-president of the American Academy of Gold Foil Operators, and Colonel R. H. Smith, U.S. Army, retired; a daughter, Mrs. Grace H. Lewis; five grandchildren and one great-grandchild.

Our profession has lost a great and good man whose sterling qualities will long live in the memory of all who were fortunate to know him and had the privilege of his council and inspiration.

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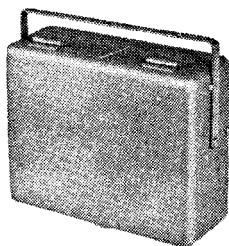
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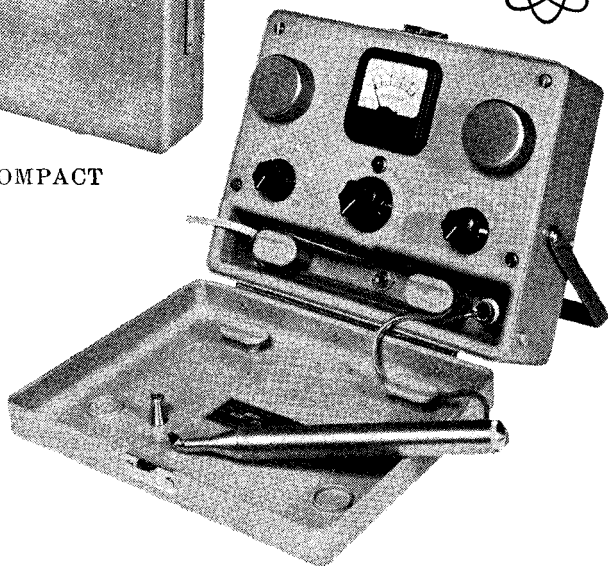


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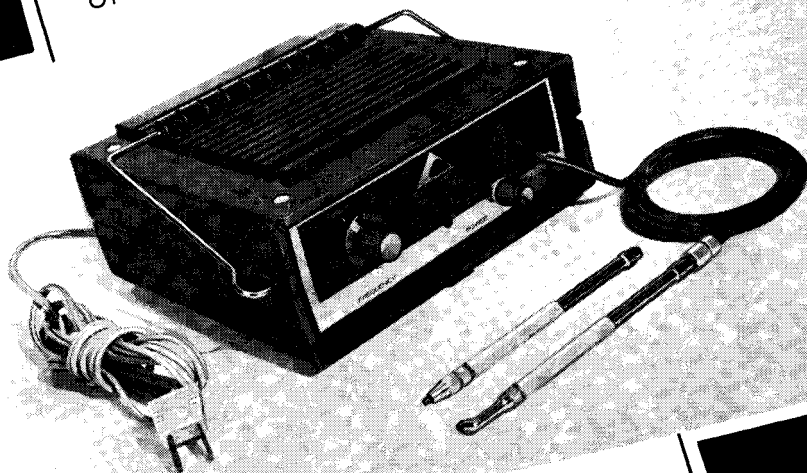
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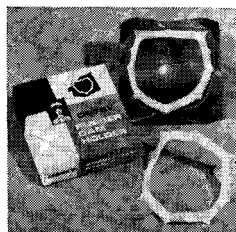
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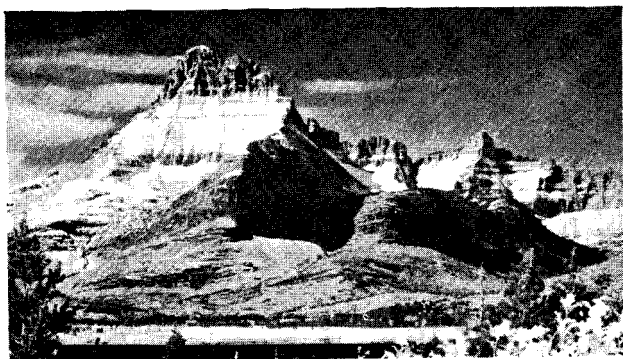
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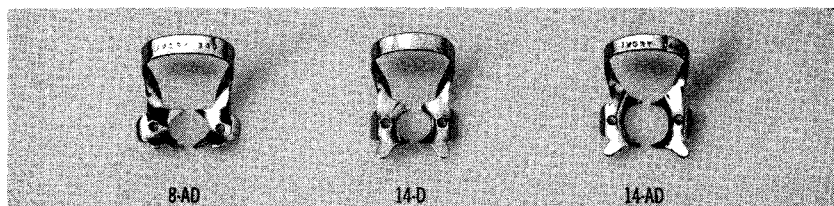
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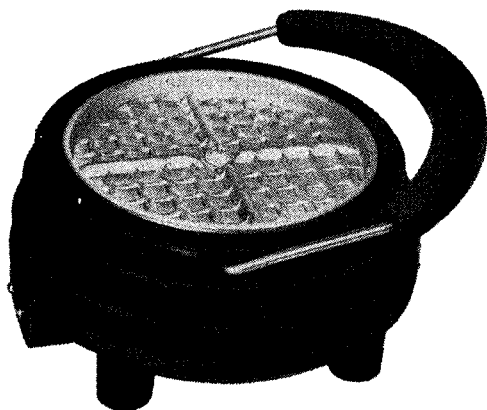
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