Vol. 10 No. 2

The JOURNAL of the AMERICAN ACADEMY of GOLD FOIL OPERATORS

SEPTEMBER 1967

THE JOURNAL

OF THE

AMERICAN ACADEMY OF GOLD FOIL OPERATORS

Vol. X September 1967 No. 2

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Printed in U.S.A. by the Premier Printing Company, Fullerton, California

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President's Message

DR. DONALD K. PHILLIPS

ANOTHER YEAR IS ROLLING BY AND we are rapidly approaching the next Annual Meeting of the Academy. The locale is good and I know the hospitality will be all that can possibly be desired.

The Program Committee and local arrangements committee have been working hard to finalize a program of interest to all. I know they have succeeded.

Our Interim Meeting, in spite of unfavorable weather, was well attended and those who were there will never forget the hospitality and courtesies shown us by the Great Lakes Naval Training Station. The Dental Department had almost as perfect a set-up as could be asked for, with a good selection of lesions and excellent working conditions.

The 1968 Interim Meeting is being shaped up and the 1968 Annual Meeting looks like a sure winner. The response to advance questionnaires regarding attendance to the meeting in Puerto Rico for 1968 was far beyond our expectations and our prospective hosts are making plans now for us. I hope the trip can become a reality. It will be a distinctive meeting for the Academy, and I am sure most interesting to the members and dentists of the Caribbean area.

This is my last President's Message and I would like to express my sincere appreciation to the officers and members who, through their cooperation and help, have kept the Academy moving forward. Prospects for future activities of the Academy are good, and I know you will support your next officers in their endeavors as you have me.

Have a good summer and I am looking forward to seeing you at Bethesda this fall. &

Recipients of the 1967 Student Achievement Awards

The following recent graduates were presented the Gold Foil Achievement Award by the American Academy of Gold Foil Operators:

Harold E. Fuller, University of the Pacific, College of Physicians & Surgeons, San Francisco
Wallace W. Hancock, University of the Pacific, College of Physicians & Surgeons, San Francisco
Hermino Martin Rosa, University of California, San Francisco Medical Center
Samuel Ernest Bleakley, Loma Linda University, California
William M. DuPont, Georgetown University, Washington, D.C.
Cleo Wellsley Smith, Howard University, Washington, D.C.
Richard L. Saunders, Loyola University, Chicago
Keith C. Harada, Northwestern University, Chicago
Ronald M. Milnarik, University of Illinois, Chicago
Thomas B. Zimmerman, Indiana University, Indianapolis
Donald G. Burks, State University of Iowa
Marion Denver Miniard, University of Kentucky
Vincent John Rea, University of Maryland
Gordon J. Steuck, University of Detroit
Vincenzo John Castaldo, Tufts University, Boston
Wayne D. Pierce, University of Michigan
Miss Cordelia E. Coltvet, University of Minnesota
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Joseph H. Harmon, The Creighton University, Nebraska
Richard G. Kann, The University of Nebraska
Gary Charles Claman, Fairleigh Dickinson University, New Jersey
Juan C. Valdes, New Jersey College of Medicine & Dentistry
Joseph A. Papa, Columbia University, New York
Emilio N. Cappellucci, State University of New York at Buffalo
Riley Clyde Pleasants, Jr., The University of North Carolina
C. Gale Alderman, Ohio State University
Craig Edsel Graham, University of Oregon
Ralph Hutchinson Francis, Temple University, Philadelphia
John H. Bell, Jr., University of Pennsylvania
Elisha Greenfield, Meharry Medical College, Tennessee
James C. Fitzpatrick, The University of Tennessee
William Klare MacTavish, Baylor University, Texas
Roy A. Hammond, University of Washington
Randall V. Stark, West Virginia University
John H. Prey, Marquette University, Wisconsin
Dale William Dohm, University of Manitoba, Winnipeg

It is the sincere hope of the Academy that the recipients of this Award will continue to seek additional knowledge and training in the use of gold foil. In that manner they will be able to perform this procedure with greater facility and satisfaction, and they will be able to render a more comprehensive treatment to their patients.

Application of Rubber Dam In Pedodontics

GENE SARGENT, D.M.D.

MANY DENTISTS RECOGNIZE the rubber dam as an integral part of gold foil procedures, but fail to apply its principles to other phases of operative dentistry. Particularly neglected in this matter is the field of pedodontics.

The use of the rubber dam is as indispensible in pedodontics as in any phase of sound restorative dentistry. It has a remarkable effect on the behavior of children. It gives them confidence and relieves anxieties. New patients may fuss at the beginning of a dental procedure, but almost invariably relax when the rubber dam is in place. Children who have their dental work accomplished with a rubber dam rarely need premedication.

The control of moisture, visibility, and protection of the patient is no less important for children than for adults. Management of the child can also be facilitated by the use of rubber dam. The technique, however, is much less complicated. Only five instruments are necessary for applying the rubber dam in pedodontics: a punch, forceps, rubber dam, Young's frame,* and one retainer. (We prefer the term retainer to that of clamp).

The rubber dam of choice is extra heavy or special extra heavy pre-cut five inch dam (preferably, special extra heavy, dark, five inch). The heavier rubber eliminates the need of wedges to depress interproximal tissue because it has the strength to retract the papillae and surrounding gingiva, exposing more tooth structure. Heavier dams adapt themselves securely to the necks of the teeth, eliminating the need for ligatures, even on primary cuspids. Ligating teeth takes time, interferes with the work, and traumatizes tissues.

* Young Dental Mfg. Co., 4958-60 Suburban R-W, St. Louis, Mo.

Dr. Gene Sargent was born and raised in Vancouver, Washington. He attended Clark College and subsequently received his D.M.D. degree from the University of Oregon in 1956. He has been in private practice in Burlington, Washington for some time, and is active in the D. A. Spratley Gold Foil Study Club. He is currently President of the Mt. Baker District Dental Society. Dr. Sargent enjoys golf, hunting, fishing and other outdoor activities.

The extra heavy and special extra heavy rubber dam materials are very resistant to abrasion by rotary and hand instruments. They help retract the lips and prop the mouth open, providing more comfort for the patient. The heavier rubber may require slightly more effort in passing it through the interproximals, but since it does not tear as easily on rough restorations and the sharp edges of carious lesions, it is easier to successfully apply. Dental tape is kinder to the fingers than floss and many times will carry the dam through the contacts more efficiently. If dental students were taught to use the heavier dam, many more dentists would be using rubber dam in general practice today.

To prepare a dam for isolation of first and second primary molars, space the holes an average of 5½ mm. apart, center to center. This will provide an adequate band of rubber dam to retract the interproximal tissue, even for deep Class II restorations. Placing the holes too close together impedes the gingival seal and strangulates the interproximal tissue.

It takes a well designed retainer to adequately clasp the tooth while using special heavy rubber dam. The Ivory W8A,* designed by Dr. Arthur Schultz of Seattle, will fit any primary second molar or first permanent molar, upper or lower, left or right. (Figs. 1 & 2) The relatively flat jaws of this retainer allows the matrix band

* J. W. Ivory, Inc., 308-12 N. 16th St., Philadelphia, Pa.

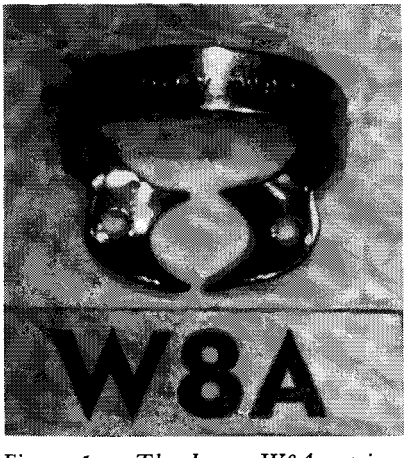

Figure 1 — The Ivory W8A retainer can be used on any primary second molar and many permanent first molars.

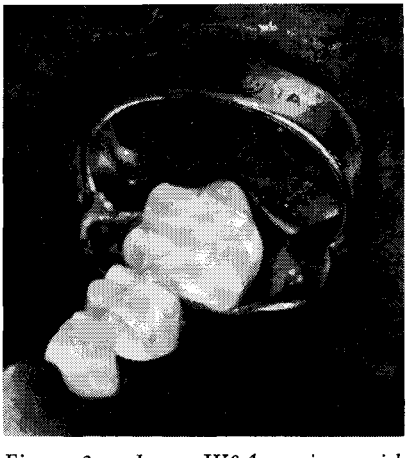

Figure 2 — Ivory W8A retainer with special heavy rubber dam. The W8A makes a four point contact. The special heavy dam retracts the gingiva and lips. No ligatures or wedges are required.

to be placed on top of the retainer, therefore, the operator may prepare the cavity, condense and finish a restoration without removing the retainer. Because of its small jaws and four point contact, the W8A can be rotated or placed in various positions on a tooth. It is easy to reduce selective points on the retainer to adapt it to oddly shaped teeth. The W8A is very flexible and can be expanded with the forceps for large teeth and compressed with pliers for small teeth.

The Young's frame (Fig. 3) is most valuable in pedodontics. It is simple to apply without the aid of an assistant since the holder does not require straps or dental napkins. It retracts the lips from the teeth and provides adequate access for the dentist to the dental operating area. In this regard, there is less tendency of pinching the lower lips while using the teeth as finger rests. The Young's frame reduces the feeling of confinement and suffocation that holders going around the head produce in pedodontic patients. Children readily accept the use of the rubber dam with a Young's frame and seldom need rubber dam napkins or saliva ejectors.

In applying the rubber dam, the dam is placed over the retainer while it is on the forceps. The rubber dam and the retainer are then seated on the tooth and the pressure released slowly. Next, the dam is slipped off the jaws of the retainer and around the neck

Figure 3 — Young's frame, special heavy dam, and W8A retainer.

of the tooth. The Young's frame is immediately applied and the remaining teeth isolated. As soon as the dam is passed over all the teeth, saliva is washed away with a stream of water and aspirated into an evacuator. The teeth are dried with an air stream and margins tucked under with a dull instrument.

The teeth are now ready for dental treatment and the success of the procedure is almost assured. A wash field or a dry technique can be used and both techniques are easier, faster, and produce better results with a rubber dam.

Historically, parents remain in the waiting room while children are in the operatory. Once the rubber dam is in place and a rapport established with the patient, as it almost invariably is, the accompanying parent may be invited into the operatory. It is understood that if the child should fuss, the parent must leave. Under these circumstances, it is only natural to discuss with parents caries, their cause and prevention and to talk about tooth brushing, diet, fluorides and related subjects. These occasions provide an opportunity to evaluate the parents and their attitude toward dentistry, and in return give the parent an understanding of the dentist's task and an appreciation of his efforts.

Can you imagine a parent, or anyone else, observing you work without a rubber dam?

It is our obligation to our patients and to ourselves to work under the most optimum conditions we can provide. With that thought in mind, the use of the rubber dam is mandatory.

Biologic Implications of Dental Restorations

GORDON J. CHRISTENSEN, D.D.S., M.S.D.

THE AMERICAN ACADEMY OF GOLD FOIL OPERATORS has among its membership many of the leaders in restorative dentistry. The influence of this organization is felt not only by its members but by dental schools throughout the world. Restorative dentistry has advanced to its present high degree of clinical excellence because of organizations of this type and because of the interest which fine clinical teachers and devoted study club leaders have stimulated within each new generation of dentists.

In spite of the development and popularity which restorative dentistry has had, there is increasing concern on the part of educators that many of the most talented young dentists leave restorative dentistry for other clinical areas. High quality young dentists who select restorative dentistry as their careers are becoming more difficult to find. Why has restorative dentistry lost its appeal? Is there a reason for this apparent diminishing supply of leadership and ability? What can be done to improve the situation? The following discussion of some of the possible reasons for this decreasing interest in restorative dentistry will lead to some suggestions for its improvement.

Dental education in the past consisted mainly of technical training. Students learned dentistry by preceptorships with experienced practitioners and a small amount of classroom instruction. Basic science subjects were taught to a limited degree, and clinical subjects occupied the majority of the student's time.

As many recall, in recent times there has been little opportunity for a student to question an instructor's decision in any area of restorative dentistry. Courses were taught as being factual, even

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Dr. Gordon J. Christensen was born and raised in Logan, Utah. He attended Utah State University and the University of Southern California, where he obtained his D.D.S. degree, following which he received a M.S.D. degree in Restorative Dentistry at the University of Washington. Dr. Christensen taught operative Dentistry at the University of Washington from 1962 until 1965. He subsequently joined the faculty of the University of Kentucky and is Chairman and Associate Professor of Restorative Dentistry. He was active in the Fort Lewis Gold Foil Study Club and the George Ellsperman Gold Foil Seminar, and is currently a member of the Blue Grass Academy of Restorative Dentistry.

though they were not. A questioning attitude on the student's part was discouraged and often penalized. As the years passed, an evolution took place in all education. Universities, which originally had as a major role only the teaching of students, began to take on other responsibilities. Research and public service started to share the educator's time. Because of the emphasis on research, many of the dogmas of the past began to change. Students were encouraged to ask questions. Instructors had to have answers. Dental education changed also and gradually split into seven speciality groups; the biologic sciences became an important part of most of these specialities, and with additional education came a new attitude about learning in dentistry. Students found that there were still unanswered questions, which they were encouraged to pursue. Existing theories and techniques were questioned and often changed. Talented students began to enter these fields, which had unanswered questions and presented challenges to them. Restorative dentistry comprised a major part of dental education, therefore, students felt better qualified in this area, and post-graduate and graduate education were very slow in developing. Many restorative dentistry departments remained purely technical in their teaching approach. Dental caries, preventive dentistry, occlusion, dental pulp, drug therapy, and other biologic factors were only mentioned. In spite of innumerable, stimulating questions and begging opportunities in restorative dentistry, young dentists selected other clinical areas. The image of restorative dentistry is that of a technical phase of dentistry; although, in fact, it should be far from that.

The purpose of this paper is to suggest how this Academy and restorative dentistry can enhance the image of restorative dentistry by changing from a field which stresses technical excellence only, to one which cooperates with colleagues in other clinical areas and accepts research, preventive measures, and biologic principles and also practices clinical excellence.

PREVENTION

This Academy practices what the author terms preventive restorative dentistry, or the initial treatment of patients with high quality, long-lasting dental restorations. The nature of the Academy allows the encouragement of this type of dentistry. It should be emphasized, however, that a virgin tooth is better than a restored one. The true goal of restorative dentistry remains the prevention of carious lesions. When it has failed to achieve this initial goal, then preventive restorative dentistry is the alternative. Dental caries experimentation, fluoride therapy, dental health education, and other preventive areas have not had the stress by restorative dentistry that

they rightfully deserve. (Fig. 1) How can a restorative dentist treat a disease, dental caries, without knowing the maximum amount of information that is available about the disease? Diet, oral hygiene, and other factors which the restorative dentist has responsibility for, are directly related to the disease he treats. Certainly restorative dentists should possess a high caliber of operating ability, but a sound knowledge of the nature and prevention of dental caries is essential.

RESEARCH ORIENTATION

One major, fundamental problem in academic restorative dentistry and dental practice is the generalized lack of concern about biologic research. There has been a prevailing attitude of toleration of researchers, but few have cooperated with them or accomplished any individual research. New information is being found daily, and dental research interest is increasing. One day the true cause or causes of dental caries and periodontal disease will be found. The explosion of research information in most fields since 1900 has made the quantity of available research information in restorative dentistry appear very small. Clinicians have hesitated to participate in research projects. As a result, their valuable experience and ability have been used only partially. Additional interest in biologic research is a necessity for restorative dentistry, if it is to achieve its

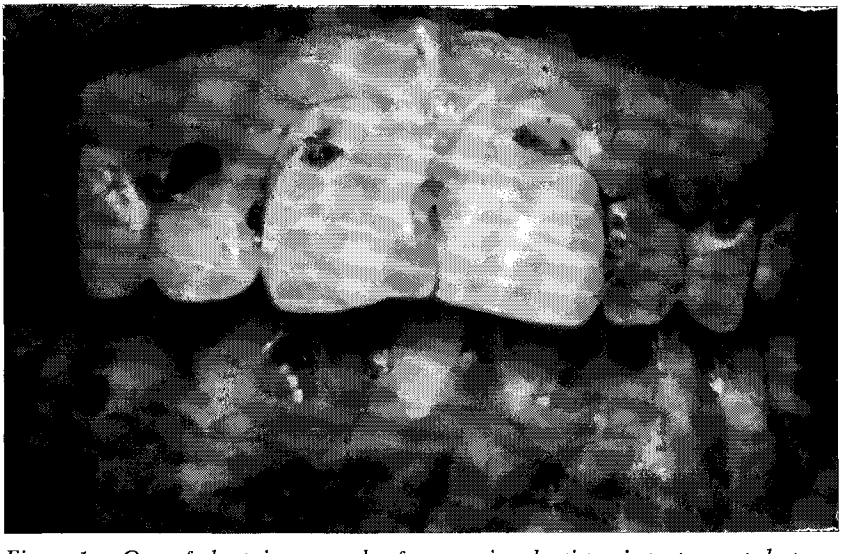

Figure 1 — One of the primary goals of restorative dentistry is to prevent destruction of teeth by dental caries. Too little emphasis has been placed on prevention of such an irreversible situation as is shown here, and too much emphasis may have been placed on technical skills.

true potential in the current scientific world. Clinicians may contribute to the body of biologic research information in a significant way. As an example, this Academy supports the use of rubber dam as a routine procedure and advocates the treatment of teeth with gold foil restorations. Within the realm of these two procedures, there are hundreds of unanswered questions for investigation. Study clubs have existed for years and many have never answered a single basic question. They may do a fine job of teaching the techniques and philosophies of years ago, but they often fail to inquire about the need or practicability of a given step or procedure. Blind obedience to philosophies of the past has retarded current dental practice. Conversely, it has been said that "he who forgets the past often repeats it." A blend of the knowledge which has come with experience and the progressive inquisitiveness of the present is needed.

Restorative dentistry requires documented, research answers. An enormous source of research information is available in dental schools and study clubs. If study club members feel that they need help in setting up a clinical research project, they should contact a dental school in their environment. If this is not available, statisticians in local colleges may be invaluable consultants in research design. *Study groups should study something!* The twenty year repetition of the same clinical technique by a study club member is a great loss of his potential creative thinking and mental ability. No technique in dentistry is closed to criticism. In fact, few can stand up to criticism. If study clubs were to collect organized data and photographs of clinical situations, many of the following biologic questions could be answered by the members of this academy in a few years.

DENTAL CARIES AND CAVITY PREPARATIONS

Each study club favors a given type or form of Class V cavity preparation for gold foil. (Figs. 2 & 3) The Ferrier trapezoidal form is supported by many. The Black kidney bean is favored by some, and a round conservative penetration is advocated by others. Which is right? Can anyone offer research evidence showing that one form is better than another? The author can state, as others can, empirical reasons for favoring one type. As an example, a critical study of Class V carious involvement on human teeth will show that the greatest carious involvement occurs at the gingival margin. The pH of the dental plaque in the periodontal pocket is less acidic than the supra-gingival plaque.[1] The micro-organisms are different above and below the gingiva. From these bits of information, a prediction of the best possible form of Class V cavity design can be made. However, the fact remains that until several dental researchers document

a hundred or more restorations of different types, there will be no conclusive answer to this question.

The same type of situation is present concerning Class III gold foil preparations. Is Black's Class III cavity form better than Ferrier's or Woodbury's or True's or Jones'? Nobody has statistical evidence showing that any one form is better than the other. Personal opinions and empirical evidence are the rule. Does this appear to be part of the scientific age? How does dental caries relate to these cavity preparation forms? Is oral hygiene a contributing factor in the recurrent carious involvement? *Study clubs can answer these questions.*

RUBBER DAM

All members of the Academy use the rubber dam in varying degrees. According to a study,[2] these members must be a rejected minority of the profession. Could a study club, with the help of a behavioral scientist, attempt to develop a method to present the rubber dam to the profession in a less irritating manner? Obviously, the need for greater use of the rubber dam is extreme.

Rubber dam is manufactured in several sizes, thicknesses, and colors, and practitioners prefer different types. Is one type better than the other? Does one type retract the cheeks, protect the patient,

Figure 2 — The Ferrier style of Class V cavity preparation for gold foil has gained acceptance by many operators. Because of its extensions under the gingiva, it appears to retard recurrent carious involvement. Courtesy Blue Grass Academy of Restorative Dentistry, Dr. C. D. Rietz.

Figure 3 — Conservative restorations such as this are practiced by some operators. Clinical experience has shown recurrent dental caries, but some doubt this experience. A study relating the caries reoccurrence, pulpal trauma, gingival health, and other factors to the style of Class V restorations is needed. Courtesy Blue Grass Academy of Restorative Dentistry, Dr. C. D. Reitz.

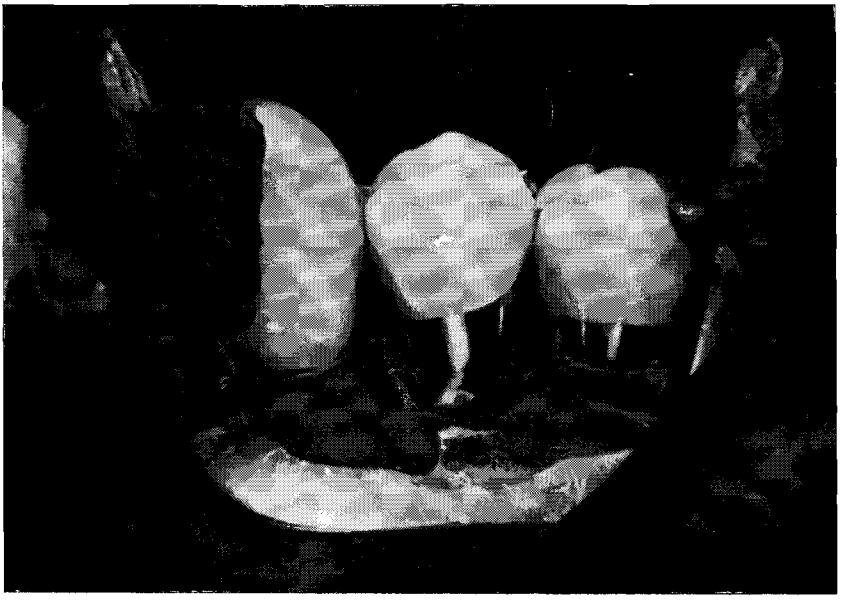

Figure 4 — A Class V pure gold restoration placed with an Electromallet.

Figure 5 — A Class V pure gold restoration placed with a hand mallet. Each method of compaction has been shown to be acceptable clinically.

or retract the gingiva better, or tear less easily? Each dentist has empirical answers to these questions, but nobody knows the factual answer. These would be simple, but valuable, projects for a study club.

The effect of drying the teeth while the rubber dam is in place for long periods of time is mentioned often. There is very little research evidence showing the effect of this dehydration. Do teeth fracture easier, pulps die faster, or are teeth more sensitive after this procedure? These are important, but unanswered questions.

PULPAL TRAUMA

It is interesting to note the degree of discussion concerning the effect of cutting teeth with and without an air or water coolant. Some investigators[3-5] state that cutting teeth with ultra-high speed and air coolant alone is detrimental to the pulps of teeth, while others[6,7] claim that it is a clinically sound procedure. Experienced clinicians using supervised experimental designs could evaluate this problem in their practices. The accumulation of data could be made by their study seminar. Study club dues may finance the statistical analysis of the data.

Many clinicians over-emphasize the pulpal trauma caused by the compaction of pure gold into teeth. It has been shown[8] that under student operating conditions at the University of Washington, slightly over one percent of 8,425 dental pulps showed degeneration because of gold foil operations or other previous trauma to the tooth. In view of the inexperience of the operators, this is a small percentage. Other similar clinical studies could be developed easily by study clubs.

Is hand, pneumatic or Electromallet compaction of gold the least traumatic? Several investigators have attempted to answer this question, but it is still debatable. What is the optimum density for a pure gold restoration? All methods seem to produce clinically acceptable results. (Fig. 4-5) All of these questions relate directly to operations which most of the members of this Academy accomplish each day.

SEPARATORS

What is the maximum amount of atraumatic tooth separation that can be obtained in an adult or a child? (Fig. 6) Orthodontics provides some information in this area. Restorative dentists need additional information. A research project of this form would be a valuable contribution to the body of knowledge available to the practitioner. Perhaps dental pulps are being sacrificed by unknowing operators.

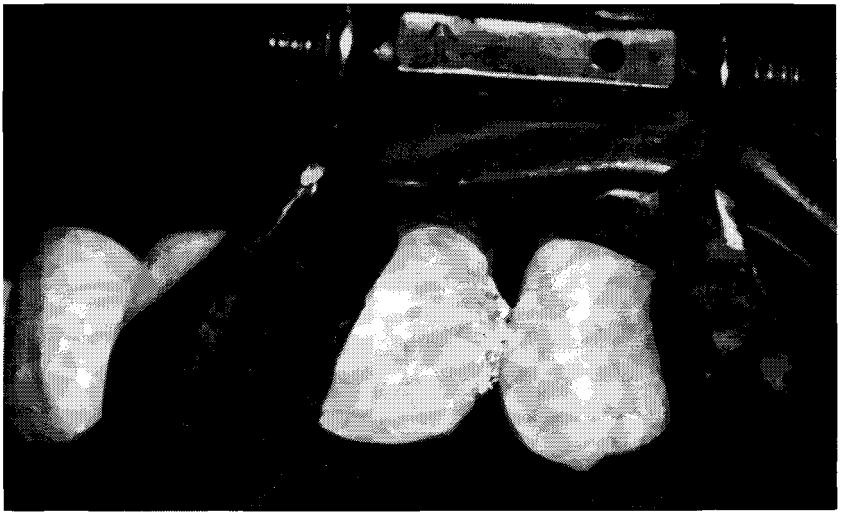

Figure 6 — Separators have been used for many years. Experienced clinicians know what amount of separation is acceptable. An average maximum amount of separation should be determined by bone and periodontal ligament studies. Courtesy Blue Grass Academy of Restorative Dentistry, Dr. D. A. Welk.

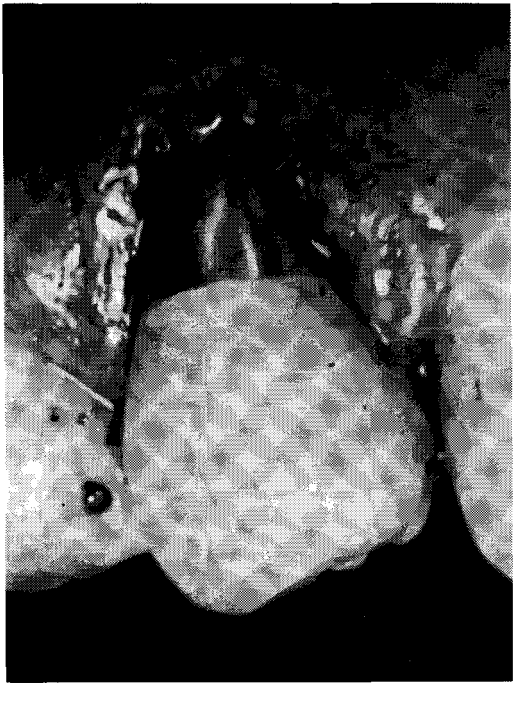

Figure 7 — The most perfect restoration may be a failure when the supporting tissues are as damaged as this picture shows. Additional histologic study of gingival healing and gingival response to restorative materials is needed.

GINGIVAL DAMAGE

What amount of damage may be caused to the gingival tissue without causing a failure of the operation? (Fig. 7) Restorations of this type are easy to photograph and show clearly the problems associated with improper application of rubber dam clamps. A series of documented restorations, evaluated by a periodontist, may show that damage caused by gingival rubber dam clamps is too severe to continue their use. It may also show that they usually cause little irreparable damage. Currently there is no factual answer, and arguments between periodontists and restorative dentists continue on this subject.

CAVITY MEDICAMENTS

A few published articles state controversial reasons for using cavity medicaments. Some others show detrimental effects caused by these agents. A significant contribution would be a published report by a study club, stating that the use of a certain cavity medicament in 100 restorations caused less thermal discomfort and other ill effects than 100 restorations without that medicament. A study of this type would be easy to accomplish.

Questions about procedures used by restorative dentists have been presented. Answers to these questions are needed. Organized study groups are excellent clinical research units, and there is no reason why these study seminars could not produce valid, usable research information. It is suggested that the operators in a study club, who have achieved clinical proficiency in the accepted range of techniques of that group, be allowed to pursue the research interests of the group's choice.

Additional research emphasis is being placed upon biologic, restorative dentistry research in some dental schools. Fortunately, several outstanding academic, military, and private practice researchers have contributed in the past. However, much more investigation will be required in the future as dental knowledge includes and demands more of the biologic sciences and requires answers to many of the clinical questions which are present. Restorative dentistry must provide these answers. The change in restorative dentistry's image is overdue and perhaps mandatory.

COOPERATION

A reluctance to participate with other dental specialities is present on the part of restorative dentists in some environments. Certain phases of dentistry are inseparable. Restorative treatment without sound periodontal treatment cannot succeed, and these two fields

must cooperate closely. Restorative dentistry should not be started until periodontal treatment has been completed.

Many fine restorative dentists will not listen to one another. Often study groups and schools will not cooperate. The inability to evaluate and accept the knowledge of others has retarded the development of restorative dentistry. Jealousy among study clubs or schools should have no place in professional life, and the ability to be open minded and to cooperate with others is an important key to progression and learning.

SUMMARY

A number of problems facing restorative dentistry have been discussed. It has been suggested that restorative dentistry's lack of concern for preventive measures, biologic principles, and research have limited its progression and given it a technical image. Suggestions have been made to cooperate with other clinical areas, develop research interests, show more leadership in preventive and other biologic principles, and retain excellence in clinical treatment. &

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Current Concepts Regarding The Etiology and Prevention of Dental Caries

DAVID BIXLER, D.D.S., PH.D.

IT NOW SEEMS CLEAR that dental caries is a multi-factorial disease in which there are at least three essential parameters. These essential components may be listed as: a particular oral microflora; refined carbohydrates in the diet; and a susceptible tooth.

Figure 1 indicates that bacteria, refined carbohydrates, and the susceptible tooth are the essential components for the disease process and show their interrelationships. When any one of these elements is missing it is not possible to have the disease dental caries and they are thereby considered the essential elements of dental caries; however, there are a great many factors which may modify the progression of the caries process once it has been initiated.

In order to maintain proper perspective on the etiology of dental caries, it is necessary to briefly review some of the factors modifying caries. It must not be assumed that this is a complete presentation of such factors, for it is not. Hopefully, a review of a few of the more important factors will impress the reader with their range and magnitude.

The factors to be presented may be briefly summarized under the following headings: the physical properties of saliva; the chemical properties of saliva; the biology of microorganisms that are involved in the carious process; the bacterial metabolic substrates; the formation of plaque; and finally, the enamel structure itself. Since considerable amount of work has been expended in dental research in defining enamel structure and the susceptible tooth, a most important purpose of reviewing the other elements of dental caries is to demonstrate that we are not achieving the maximal desirable effect

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A resume of the paper presented before the American Academy of Gold Foil Operators, Dallas, Texas, 1966.

in our attack on the carious process by concentrating on only one of the three essential factors involved in dental caries initiation. The other two important elements, that is the microflora and their substrates (refined carbohydrates), are equally as important since only with a concerted attack upon all three etiologic elements can we hope to completely control the carious process.

PHYSICAL PROPERTIES OF SALIVA

Both salivary flow and salivary viscosity have been studied in an attempt to correlate them with the prevalence of dental caries. A review of the literature shows that an increased salivary flow is typically associated with a decrease in caries experience and a decreased flow with an increased caries experience,[1-5] although not all reports agree with this finding.[6,7] Since removal of the salivary glands produces an almost complete xerostomia, in animals this condition has been shown to be highly correlated with a greatly increased susceptibility to dental caries in experimental animals.[8] Conversely, the administration of sialogogues, which will increase the salivary flow, has also been shown to produce a lessened caries experience in experimental animals.[9]

However, practically nothing is known of the effects of small, but perhaps important, changes in salivary flow. For example, does a small increase in flow relate to a small decrease in caries experience? Only at the extremes do we have direct evidence bearing on saliva flow and dental caries experience. The problem with respect to vis-

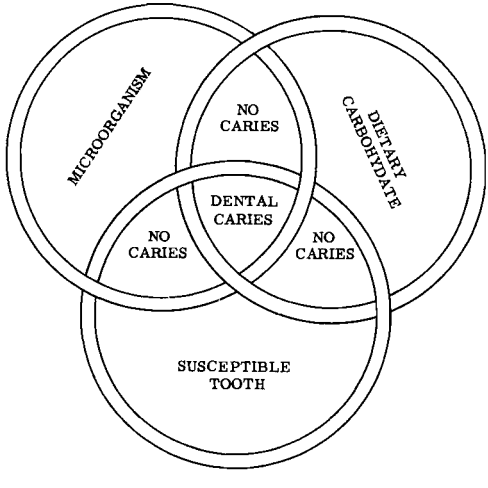

Figure 1 — Interrelationship of the three essential elements in the carious process (Modified from Keyes, Paul H.)

cosity of saliva is somewhat similar. It has been proposed that increased viscosity is associated with a very thick ropy saliva, and several investigators have unsuccessfully attempted to relate this type of saliva with an increased susceptibility to dental caries.[6,10,11] Even though most clinicians associated a thin, free flowing saliva with lesser caries experience, the literature is by no means clear on the relationship of viscosity to dental caries and contradictions may be found.[5]

CHEMICAL PROPERTIES OF SALIVA

In this section, only four of the chemical properties of saliva will be reviewed. There are obviously many more which have been correlated with dental caries and which ultimately may prove to have an important relationship to the caries process.

Considerable research has gone into the investigation of the buffering capacity, and a consistent relationship between buffering capacity and dental caries in the individual has yet to be established, although several investigators have shown an increase in buffering capacity in low caries individuals.[12-15] Certainly, one of the difficulties in demonstrating this relationship resides in the fact that one is looking at chemical properties of saliva which are very likely too remote to the carious process itself. Dental plaque is certainly a much more fruitful area of investigation and in fact Kleinberg and Jenkins[16] have shown that fasting plaque pH is often higher than that of the surrounding saliva.

Another area of great interest to dental researchers has been the study of post-eruptive enamel maturation in relationship to the concentration of calcium and phosphate ions in saliva and plaque. This process was first suggested to be an important process in development of caries resistance by Fanning et al.[17] It has been demonstrated that chemical changes occur in the enamel surface after the developing tooth has already calcified and has erupted into the mouth.[18] Thereby, the acid solubility of the freshly erupted tooth is decreased[19] and continues to decrease with age.[20] Such exchanges of these ions or remineralization are most likely a function of plaque metabolism as has been suggested by Dawes and Jenkins[21] and Leung and Draus.[22] Nevertheless, it seems likely that the calcium and phosphate concentrations in saliva have an important relationship to their presence in plaque and hence to maturation. In fact, some of the current research in dentistry is specifically aimed at bringing increased amounts of these ions to the enamel surface by means of certain dietary constituents or topically applied solutions. The reader is referred to Backer Dirks most recent discussion of post-eruptive changes in dental enamel.[23]

Another chemical constituent of saliva which is of more recent

interest is the mucoprotein content of saliva. These carbohydrate-protein complexes undoubtedly play a unique and very important role both in determining the viscosity of saliva[10] and also in the formation of plaque on the teeth.[24-26] Little is known about them chemically, and it has been only in the last few years that attempts have been made to characterize these materials. One of the better known mucoproteins is salivary mucin.

The final group of chemical substances in saliva to be mentioned at this time are the factors which may be associated with resistance to dental caries. At least three different chemical substances have been described in saliva, which have the specific properties of being able to lyse or breakdown bacterial cells. Since bacteria are one of the essential factors in dental caries, it is easy to understand the research interest in these materials. The first of these is lysozyme.[26] This enzyme has the property of being able to break down the cell walls of micrococcus lysodeikticus, but its relationship to dental caries is not established. Another of these resistant factors is bactericidin. This protein requires thiocyanate as a co-factor and appears to be active against lactobacilli[27]. The third factor, described by Green[28] has a specific action on lactobacilli and there is limited evidence that it may even be inherited. Although all of these factors have antibacterial properties, none of them has ever been specifically correlated with the carious process and an important relationship for lysozyme has even been specifically denied,[30] so it is difficult to speculate at this time how important they may be in the natural prevention of dental caries.

BIOLOGY OF MICRO-ORGANISMS

There are numerous variable factors in the microorganism-dental caries relationship, but only two will be discussed at this time. For further information the reader is referred to the review article of Jordan.[31] These two factors have to do with competitive inhibition between different bacterial strains and different rates of acid production of different bacteria.

Ecologic competitive inhibition exists between microorganisms just as in all living species, and may well play an important role in determining which organisms will be established in a community. It has recently been reported that the inoculation into the human oral environment of large numbers of streptococci not indigenous to the oral cavity did not result in their maintenance within the environment and the inoculated organisms were almost completely gone by the end of the first hour. Such a result shows that certain types of organisms are in direct competition and may never be established in a given environment. This observation may have considerable

meaning in considering the problem of establishing a dental caries-producing flora. Fitzgerald and Keyes[32] have demonstrated that caries-producing microorganisms in the hamster may be transmitted from one young animal to another and subsequently produce dental caries. Apparently, under the right environmental conditions and oral flora, dental caries might become a transmissible disease.

One of the interesting biologic aspects of different microorganisms is their differential ability to produce acid. Acid production has been strongly implicated as the *modus operandi* of the carious process, that is, bacteria produce acids and these in turn produce the incipient carious lesions at the enamel surface. At present, two different kinds of organisms have been specifically implicated in the carious process in experimental animals and humans. These are strains of streptococci and lactobilli.[32,33] The acid producing ability of these two organisms, however, is quite different. Streptococci are typically rapid fermenters of refined carbohydrates and may lower the pH in dental plaque where they reside by as much as two units in a matter of seconds. On the other hand, lactobacilli are much slower in their production of acid from refined substrates, but given the correct substrate conditions they may produce a pH considerably below that produced by streptococci alone. In fact, they may produce a pH so low as to destroy streptococci and other microorganisms. In terms of acid production then, we might athletically look at streptococci as the hundred yard dashmen and lactobacilli as the distance runners.

BACTERIAL SUBSTRATES

The next review topic for brief consideration, in the area of factors modifying the progression of dental caries, concerns the specific carbohydrate to be metabolized by the bacteria. Both the physical and the chemical nature of the carbohydrate are of importance here.

Numerous reports have appeared in the literature describing the relationship between the physical state of ingested carbohydrate and the incidence of dental caries. The classic human study made on this relationship was the Vipeholm study performed in Sweden.[34] In this study, subjects residing in an institution, and thereby consuming very similar diets, were supplemented with sucrose in various physical forms. The findings indicated that fermentable carbohydrate ingested in a liquid form (such as a glass of sucrose water) is much less cariogenic than the consumption of the same amount of carbohydrate in the form of toffees or sticky sweets which are retained in the oral cavity for prolonged periods of time. Thus, the physical nature of ingested carbohydrate is extremely important

when one attempts to assess its cariogenicity. In general, foods that clear the oral cavity rapidly are minimally cariogenic.

The chemical nature of the carbohydrate being consumed is also of great importance. A great amount of research has been done in experimental animals, and even some in humans to show that it is refined carbohydrate which is most readily acted upon by the oral flora. In an extensive series of studies with animals, Dalderup has shown that polysaccharides such as starch, glycogen and dextrins are essentially not cariogenic compared to disaccharides such as maltose and lactose. However, the most cariogenic disaccharide in various studies has routinely been found to be sucrose. Sucrose consists of 1 molecule of glucose and one molecule of fructose, and when these two monosaccharides were added to the diet, they too were shown by Dalderup to be highly cariogenic. These observations lead directly to a discussion of plaque, its formation and microflora since this is the location of utilization of these simpler sugars.

PLAQUE

Plaque is an extremely important aspect of the carious process. Considerable attention is presently being focused on the rate of its formation, but first it is appropriate to make a few preliminary comments on what plaque actually is. If a tooth in the mouth is cleaned and polished thoroughly so that its surface is quite smooth and completely free of all debris and material, it can be observed that within a matter of minutes, a thin film will be formed on the surface of this tooth.[26] This film is given the designation, pellicle. Chemically, the pellicle that forms on teeth is mucoprotein in nature, and its origin appears to be the mucoprotein fraction of saliva. There are many theories as to how pellicle may form on teeth. However, the one point that all researchers agree on is that all teeth have pellicle formed on them, and at a very rapid rate. It has been suggested that this pellicle may be "organized" by bacteria in the mouth into plaque.[35] Others, however, have presented evidence that plaque is actually formed by polysaccharide materials synthesized by the plaque-forming bacteria. Gibbons[36] has shown that a dextran type polysaccharide is synthesized by both human and rodent cariogenic (but not non-cariogenic) bacteria. He has further shown that this dextran is maximally synthesized in 10% sucrose solutions and that it has a number of physical properties desirable for a matrix in the initiation of dental caries. These observations suggest an important physiologic difference in cariogenic and non-cariogenic organisms. At any rate, we may define plaque as consisting of the following elements: 1) mucoproteins from the saliva; 2) bacteria; 3) food debris which may be trapped in this gelatinous mass, and 4) possibly epi-

thelial cells which may be trapped in this material. Plaque, at least in its early stages of development, is a translucent, mucinous chemical substance covering the surface of the tooth. In it reside the bacteria which metabolize the substrates previously described into acids.

It has been shown that the rate of formation of plaque is quite variable both in the same individual at different times, on different tooth surfaces and even between different individuals. By applying a vital staining dye, its presence can be demonstrated on almost all surfaces of the teeth.[37] Once it has been formed, and "organized," the consumption of so-called detergent foods will not completely remove it.[37] Abrasive materials must be used to completely remove it. If plaque is allowed to accumulate on teeth and to build up large amounts of food debris, it becomes what is commonly described as *materia alba.*

Once this living plaque has been formed, a number of substances may pass in or out of it. At the tooth surface-plaque interface, the accumulation of acid leads to the decalcification of the surface enamel. At the saliva-plaque interface, a number of ions may pass back and forth. In fact, it appears that plaque may have a very selective permeability for ions such as fluoride, calcium, and phosphate.[35] All of these ions are found in plaque at increased concentrations compared to their concentration in saliva.

Considerable research is being concentrated on plaque, its metabolism and its microflora, and it appears certain that this kind of information will eventually lead us to a better understanding of the carious process and how to control it.

ENAMEL STRUCTURE

Finally, a few points relative to the structure of the enamel itself are pertinent. The problem of post-eruptive enamel maturation has already been presented.[23] Such a concept certainly emphasizes the dynamic aspect of the enamel surface and should immediately dispel any remaining archaic concepts regarding enamel as a static and non-changing structure. In fact, it is quite probable that caries prevention diets of the future will be specifically designed to correct deficiencies in the apatite structure which are present prior to and at the time of tooth eruption. Ever since the classic public health studies of Dean and his co-workers in the 1930's concerning the relationship of fluoride in the communal water supply and the incidence of dental caries, numerous workers have attempted to devise new methods and techniques to get increased amounts of fluoride into the apatite structure. The administration or fluoride in optimal amounts of communal water as a systemic supplement during

the period of tooth calcification has been dentistry's greatest tool to fight the problem of dental caries. Another means of producing acid-resistant enamel structure involves the topical application of fluoride to the enamel surface. The use of various fluoride solutions either painted on the teeth from aqueous solution, or burnished into the tooth surfaces by prophylaxis paste mixtures, has received considerable attention and these techniques have been shown to be effective anticariogenic measures. As previously mentioned, most of the research and treatment attack on the carious process has taken place at this level. That is, the administration of either systemic or topical fluoride in an attempt to eliminate "deficiencies" in the enamel structure.

In this superficial review of both etiologic factors and factors modifying the progression of dental caries, an attempt has been made to illustrate the extreme complexity of the disease, dental caries. As just illustrated, the principal research attack on this disease has been aimed primarily at just one part of this entire process, the strengthening of the susceptible tooth. Let us now examine some of the evidence which has accumulated in this one area to see just how efficient this approach has been in preventing dental caries.

Currently, four different methods of fluoridation are well recognized: 1) administration of systemic fluorides by fluoridation of the communal water supply; 2) topical application from an aqueous solution; 3) topical application from a prophylaxis paste; 4) topical application by means of a dentifrice. Numerous reports have appeared in the literature attesting to the effectiveness of all these methods of fluoridation, and, it would have to be emphasized here that fluoridation of the water supply still remains the most effective method of bringing fluoride to the developing tooth for the prevention of dental caries.

The other approach involves different techniques for bringing topical fluoride to the tooth surface. Since each of the three topical methods just listed has been shown to have anticarogenic effects,[38-40] it seemed logical that combinations of these methods might very well produce a total combined effect greater than any of the observed single effects. A series of human clinical studies has been performed testing this multiple fluoride treatment technique.

Table 1 summarizes some of the findings obtained in a study specifically designed to elucidate multiple treatment effects of fluoride when used in various combinations. This study was conducted on grade school children between the ages of 7 and 15, and the data summarized in this table represent a 24 month period. It can be seen

TABLE 1

EFFECT OF MULTIPLE FLUORIDE TREATMENTS ON DENTAL CARIES INCIDENCE*

	DMFT Increment			DMFS Increment		
COMPARISONS	MEAN	S.E. (DIFF.)	P	MEAN	S.E. (DIFF.)	P
Control	3.80			8.06		
P_F	2.66	.291	.00007	5.30	.592	<.00001
$P_F + D_F$	2.78	.292	.00042	5.30	.582	<.00001
$P_F + T_F$	2.24	.280	<.00001	4.77	.584	<.00001
$P_F + T_F + D_F$	1.60	.259	<.00001	3.00	.537	<.00001

* Bixler, D. and Muhler, J. C., JADA, 72:392-396, 1966.

that the group receiving a prophylaxis paste treatment that contained SnF_2, designated P_F, had a significant reduction in caries as measured by both the DMFS and DMFT indices. A similar result was noted for the group receiving a combined treatment of the SnF_2 prophylaxis paste plus a SnF_2 dentifrice for home use (designated P_F and D_F). The group receiving a SnF_2 prophylaxis paste treatment following by a SnF_2 topical application (P_F and T_F) also showed a significant caries reduction. The three-treatment combination, $P_F + T_F + D_F$, was also significantly different from the control group. It was now of interest to compare the various treatment groups to each other to see if multiple treatments are different.

Table 2 shows that the addition of the dentifrice (D_F) to P_F treatment did not result in any significantly greater benefit than the prophylaxis paste with fluoride alone. The p value for this difference was greater than 0.5. Similarly, the prophylaxis paste treatment plus the topical fluoride treatment produced a very similar 40.8% reduction. When the three treatments were combined, a 62.8% reduction was obtained which was significantly different from all of the other groups. These results indicated the caries experience of children

TABLE 2

COMPARISON OF VARIOUS MULTIPLE FLUORIDE TREATMENTS ON DENTAL CARIES*

	DMFT Increment			DMFS Increment		
COMPARISONS	MEAN	S.E. (DIFF.)	P	MEAN	S.E. (DIFF.)	P
P_F	2.66			5.30		
$P_F + D_F$	2.78	.268	.50	5.30	.486	.50
$P_F + T_F$	2.24	.255	.0990	4.77	.488	.2802
$P_F + T_F + D_F$	1.60	.231	.00001	3.00	.431	.00001
$P_F + D_F$	2.78			5.30		
$P_F + T_F + D_F$	1.60	.232	.00001	3.00	.417	.00001
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TABLE 3

SUMMARY OF DENTAL CARIES INCREMENTS (DMFS) FROM TABLES 1 AND 2

Control 8.06		
	P_F 5.30 34.2%	$P_F + D_F$ 5.30 34.2%
	$P_F + T_F$ 4.77 40.8%	$P_F + T_F + D_F$ 3.00 62.8%

can be reduced almost ⅔ by treatment of the child with all three topical forms of stannous fluoride application. Although these results are quite good, they are certainly not the 100% caries reduction which is striven for.

It now became of interest to determine whether or not lesions that were treated with stannous fluoride in the three-treatment form would continue to progress at the same rate, or would they actually be arrested in their progression? In order to do this, a large group of adult subjects (dental students) was divided into two groups. One group received the multiple stannous fluoride treatment, and the other received placebo treatment with no fluoride. In Table 4 can be seen the results obtained after 24 months of treatment on semi-annual basis. It is apparent that the treatment group experienced a 65.9% reduction in DMFS over this period of time. The difference

TABLE 4

EFFECT OF MULTIPLE FLUORIDE TREATMENTS UPON DEVELOPMENT OF INCIPIENT DENTAL CARIES IN ADULTS

GROUP	TREATMENT	STUDY PERIOD (MOS.)	NO. SUBJECTS	MEAN DMFS	MEAN % REDUCTION	P
I	Multiple SnF_2	12	84	0.82 ± 0.12	72.6	0.001
II	Placebo (NaCl)	12	84	2.99 ± 0.17		
I	Multiple SnF_2	24	45	1.22 ± 0.17	65.9	0.001
II	Placebo (NaCl)	24	43	3.58 ± 0.23		

TABLE 5

INCIPIENT DENTAL CARIES STUDY

Caries Progression During Indicated Interval

GROUP	TREATMENT	STUDY PERIOD (MOS.)	CUMULATIVE TOTAL OF % PROGRESSION IN SIZE	DECREASE IN RATE OF CARIES PROGRESSION DUE TO SnF_2 THERAPY
I	Multiple SnF_2	12	30.50	77.1
II	Placebo (NaCl)	12	132.64	
I	Multiple SnF_2	24	65.94	79.8
II	Placebo (NaCl)	24	327.01	

was highly significant and of the same order of magnitude as that observed in the studies on children just described.

In order to evaluate the rate of progression of such treated lesions, radiographs, which were taken using carefully standardized techniques, were mounted in a slide projector and projected on the board at an approximate distance of 50 feet (this gave an approximate magnification of these lesions of about 100 times). At each examination period, the lesions noted on these projected radiographs were traced onto acetate tracing paper with surrounding dental structures and restorations traced in also for points of orientation. In this way, by superimposing tracings from previous periods, the rate of progression of these lesions could be followed. Table 5 shows that the treatment group which was experiencing a 65.9% decrease in caries experience was also experiencing a 79.8% decrease in the rate of caries progression. This indicates a marked arrestment in the rate of progression of such treated lesions, but not a complete arrestment. Thus, the multiple stannous fluoride treatment appears to be quite effective in reducing the incidence of new cavities as well as decreasing the rate of progression of those already present. Again, the maximal effect is short of 100%.

Recently, a considerable amount of interest has been shown in the use of fluoride-phosphate combinations in an acidulated mixture

TABLE 6

FLUORIDE IN SURFACE ENAMEL OF PERMANENT TEETH EXPOSED TO 1.6 PER CENT FLUORIDE, AS SODIUM FLUORIDE IN 0.1 M SODIUM PHOSPHATE AT pH 2.8, AND AS STANNOUS FLUORIDE AT pH 2.6.*

LAYER	$NAF-PO^4$ (1.6% F)	SNF^2 (1.6% F)	CONTROL
1	2229	650	582
2	1254	370	316
1	2813	1066	881
2	987	623	451

* Brudevold, F., et. al., ARCH. ORAL BIOL. 8:167, 1963.

TABLE 7

DENTAL CARIES INCREMENTS IN PERMANENT TEETH OF CHILDREN IN STUDY TESTING ACIDULATED FLUORIDE-PHOSPHATE TOPICAL APPLICATION*

	MEAN DMFT INCREMENT	% DIFF.	MEAN DMFS INCREMENT	% DIFF.
12 Month Obs.				
113 Control Cases	0.66 (1.10)		2.15 (2.14)	
115 Test Cases	0.30 (0.72)	55	0.62 (1.04)	71
24 Month Obs.				
113 Control Cases	2.30 (2.41)		5.69 (4.26)	
115 Test Cases	0.77 (1.29)	67	1.72 (2.06)	70

Figures in parentheses are standard deviations of the observations.

* Wellock, W. D. and Brudevold, F., ARCH. ORAL BIOL. 8:179, 1963.

for reducing dental caries. Brudevold and his co-workers have shown that the uptake of fluoride from mixtures of sodium fluoride and phosphate is considerably higher than that from stannous fluoride mixtures containing the same amount of fluoride (Table 6). In fact, three to four times as much fluoride is deposited in the enamel surface from acidulated fluoride-phosphate mixtures compared to stannous fluoride. When such mixtures were tested clinically (Table 7) it was found that caries reductions, as measured by the DMFS index, of the order of magnitude of 70% were observed. It has also been recently reported that fluoride-phosphate mixtures of a somewhat different composition from Brudevold's were highly effective in reducing caries incidence in school age children.[41] These data are summarized in Table 8.

It can be seen that the fluoride-phosphate group experienced approximately a 50% reduction in dental caries. This caries reduction was of the same order of magnitude as that observed for the 8% stannous fluoride topical. When a sodium dihydrogen phosphate solution was added to the 8% stannous fluoride mixture, and this was given as a single topical application, a 68% DFMS caries reduction

TABLE 8

EFFECT OF FLUORIDE-PHOSPHATE MIXTURES ON DENTAL CARIES INCIDENCE IN CHILDREN

	N	MEAN	% RED.	MEAN	% RED.
Control	227	1.68		2.97	
SnF_2 8%	246	0.76	54.8	1.43	51.9
NaF 3.6% + KH_2PO_4 1.8%	249	0.82	51.2	1.44	51.5
SnF_2 8% + NaH_2PO_4 8%	239	0.58	65.5	0.98	67.0

* Muhler, J. C., et. al., J. DENT. CHILD. 32:154, 1965.

TABLE 9

THE EFFECT OF TOPICALLY APPLIED SnZrF6 UPON DENTAL CARIES IN CHILDREN

GROUP	TREATMENT	STUDY PERIOD (MOS.)	NO. SUBJECTS	MEAN DMFS INCREMENT	MEAN PERCENT REDUCTION	P
1	8% SnF_2	6	273	0.71 ± 0.10	55.1	<.00001
2	24% $SnZrF_6$	6	250	0.27 ± 0.09	82.9	<.00001
3	24% $SnZrF_6$**	6	254	0.33 ± 0.09	79.1	<.00001
4	0.85% NaCl	6	248	1.58 ± 0.15		
1	8% SnF_2	12	252	1.41 ± 0.12	55.7	<.00001
2	24% $SnZrF_6$	12	233	0.77 ± 0.11	75.8	<.00001
3	24% $SnZrF_6$**	12	231	3.18 ± 0.22	65.1	<.00001
4	0.85% NaCl	12	231	3.18 ± 0.22		

** Treatment at initial exam only.

was observed. This result was significantly better than that observed in the other two fluoride treatment groups. Thus, with a single topical application of SnF_2 + phosphate, a caries reduction was achieved which was the same order of magnitude as that observed with the multiple stannous fluoride treatment. Such a result could mean a considerable savings in time and effort for the dentist in controlling dental caries in his practice. On the more gloomy note, though, it should be noted that this finding has not appreciably altered the maximum caries reductions which have already been reported.

Turning now to new fluoride compounds which are not available commercially, the Preventive Dentistry Department at Indiana University School of Dentistry has been involved in evaluating a compound, $SnZrF_6$, for its anticariogenic properties in children. A summary of some test results is shown in Table 9. It can be seen that the single application of a 24% solution of stannous hexafluorozirconate ($SnZrF_6$) produced a caries reduction of approximately 80% at 6 months and about a 65% reduction at 12 months. The treatment group receiving the semi-annual topical applications had a somewhat greater caries reduction than the group receiving only the single application (75%). Again, these results were most encouraging, but did not seem to bring us appreciably closer to the point that we were hoping to achieve, complete control of dental caries.

SUMMARY

The purpose of this presentation has been to emphasize some of the published findings relative to the control of dental caries by the most effective means presently known. These results, although quite good, still only approach the complete control that research is aiming for. In the initial discussion in this paper a number of the factors that affect the progression of dental caries were considered, and it

was emphasized that most of the clinical studies have dealt only with the alteration of the enamel surface in an attempt to produce a less acid-soluble crystal. Since the susceptible tooth is only one of the three essential factors in dental caries, it seems obvious that a complete control of dental caries will not be achieved until more effort is concentrated on the other areas involved in the biology of dental caries. Specifically, investigations in those areas relating to the biochemistry of saliva and plaque will certainly yield valuable information and, hopefully, the answer to the problem of prevention of dental caries.

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Dam Gems

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 or 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, CO's Mail, U.S. Naval Hospital, San Diego, Calif. 92134.

ATTACHING HOLDER

The importance of fully training and utilizing a dental assistant cannot be over-emphasized. There must be a standardized procedure in the application of the rubber dam, in which the assistant assists the operator to the fullest extent possible. Following place-

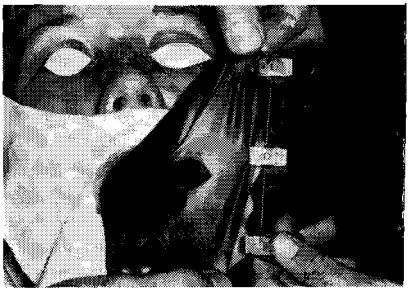

Figure 1

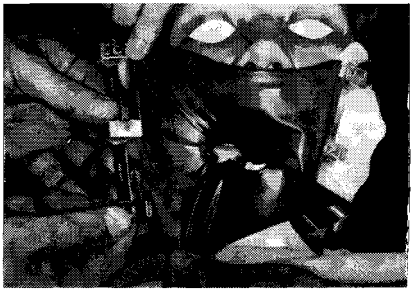

Figure 2

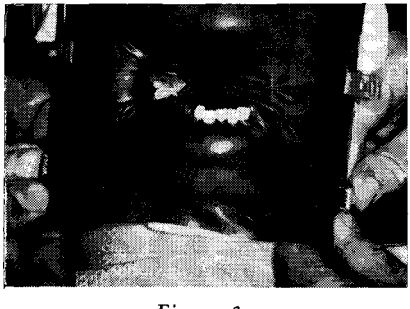

Figure 3

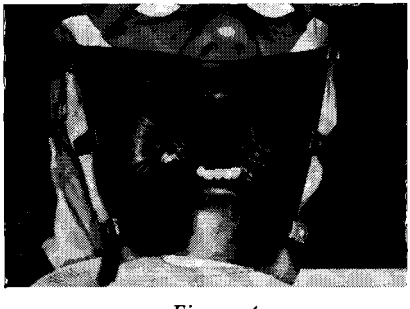

Figure 4

ment of the rubber dam clamp, anchoring the anterior teeth, and placing the rubber dam napkin (Dam Gems, JAAGO, Sept. 1964), the operator holds the left edge of the dam for the assistant to attach the holder. (Fig. 1) The process is then reversed, with the assistant holding the right edge while the operator attaches his side of the holder. (Fig. 2) After the holder has been tightened there is normally excess rubber dam over the lower lip and chin, as is seen in Figure 2. The operator and the assistant refasten the lower clips of the holder on their respective sides with a fold in the dam (Fig. 3) to take up this excess. This provides a neater rubber dam application and also removes the excess dam from the operative field. (Fig. 4) At this point the remaining contacts are passed with the double floss procedure, as illustrated in Dam Gems, JAAGO, April 1964.
Suggested by: Dr. James P. Vernetti, Coronado, California

STABILIZING 212 CLAMP

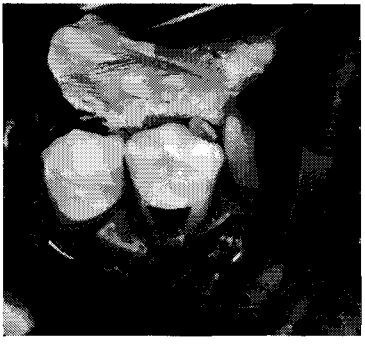

Figure 1

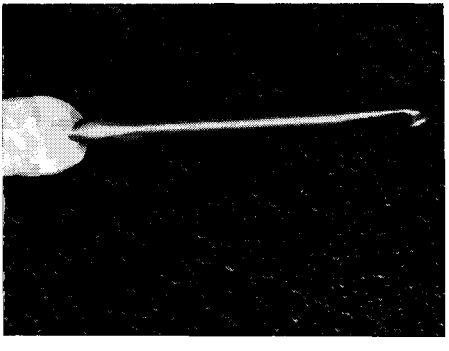

Figure 2

Additional support for the tooth to dissipate the condensing forces over several teeth is provided by placing compound between the lingual bows of the 212 clamp and the tooth. (Fig. 1) To facilitate removal of the clamp, a No. 2 Boye crochet hook (Fig. 2) is fitted with a quick-curing acrylic handle.

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Rear Admiral Frank M. Keyes, DC, USN, was awarded Honorary Membership in the American Academy of Gold Foil Operators at the Interim Meeting held at Great Lakes in February. Admiral Keyes is the Chief of the Dental Division, Bureau of Medicine & Surgery in Washington. Academy membership is generously represented with Navy dental officers. Pictured with Admiral Keyes are President and Mrs. Donald K. Phillips.

In Memorium

The Academy mourns the passing of one of its most active and loyal members, Dr. Walter Sproule of Vancouver, Washington. He was one of the founders and a charter member of the Vancouver Ferrier Study Club and was mentor of the Inter-City Gold Foil Study Club of Vancouver, B.C. for many years. Walter was a Fellow of the American College of Dentists, and an Honorary Member of the American Academy of Restorative Dentistry. All Academy members can remember the flawless restorations which he made to the great pleasure and satisfaction of Academy members and guests at many of our professional meetings.

Program
Annual Meeting

AMERICAN ACADEMY OF GOLD FOIL OPERATORS

Thursday, October 26, 1967

Executive Council Meeting
Shoreham Hotel, Washington, D.C.

Friday, October 27, 1967

U.S. Naval Dental School, Bethesda, Maryland

8:00 a.m. Registration

8:45 a.m. Opening Ceremonies

Call to Order	Dr. Donald Phillips, President
Invocation	Dr. Ralph Boelsche
Greetings	Cdr. Julian J. Thomas, Jr.
Announcements	Lt. Cdr. James D. Enoch Local Arrangements Chmn.
Introduction of Essayists	Dr. Gerald D. Stibbs, Program Chairman

Essay Program

9:00 a.m. Human Pulpal Response — Recent Findings
Dr. Harold R. Stanley, *Bethesda, Maryland*

9:35 a.m. Isolating Complicated Class V Cavities
Capt. Theodore R. Hunley, *Camp Le Jeune, N.C.*

10:00 a.m. The Adolescent Class III
Dr. James P. Vernetti, *Coronado, California*

Question and Answer Period

Intermission

10:50 a.m. Interdependence of Operative Dentistry and Periodontics
Dr. B. O. A. Thomas, *Palo Alto, California*

11:20 a.m. Indium Alloy as a Dental Restorative Material
Dr. Lloyd Baum, *Loma Linda, California*

11:50 a.m. Question and Answer Period

12:30 p.m. Luncheon
Commissioned Officers Mess, Medical Center

1:30 - 4:30 p.m. Chair Clinics
Table Clinics
Exhibitors

6:00 p.m. Social Hour, Commissioned Officers Mess

7:00 p.m. Banquet
Guest Speaker
Business Meeting

Saturday, October 28, 1967

8:00 a.m. Registration

Essay Program

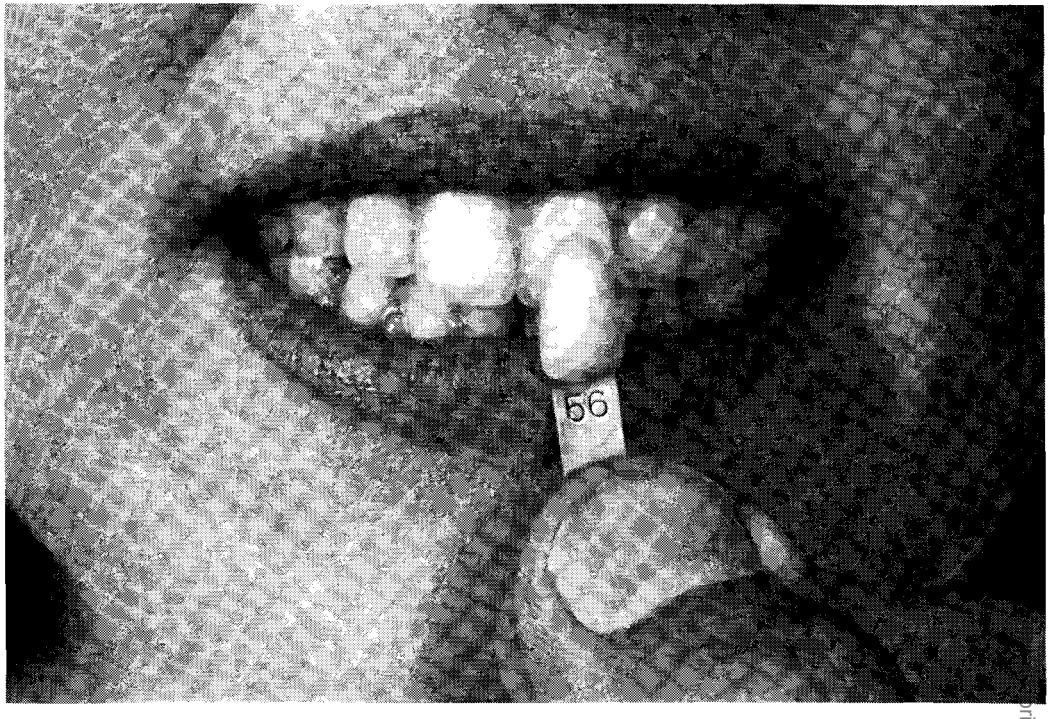
8:30 a.m. Why Gold Foils
Dr. Norwood E. Lyons, *Mountain View, California*

8:55 a.m. An Appraisal of Ultrasonic Compaction of Gold Foil
Mrs. Jean T. Hodson, *Seattle, Washington*

9:25 a.m. A Challenge to the Future of Gold Foil
Dr. Robert E. Nelsen, *Bethesda, Maryland*

10:15 - 1:00 p.m. Chair Clinics
Table Clinics
Exhibitors

1:00 p.m. Adjourn



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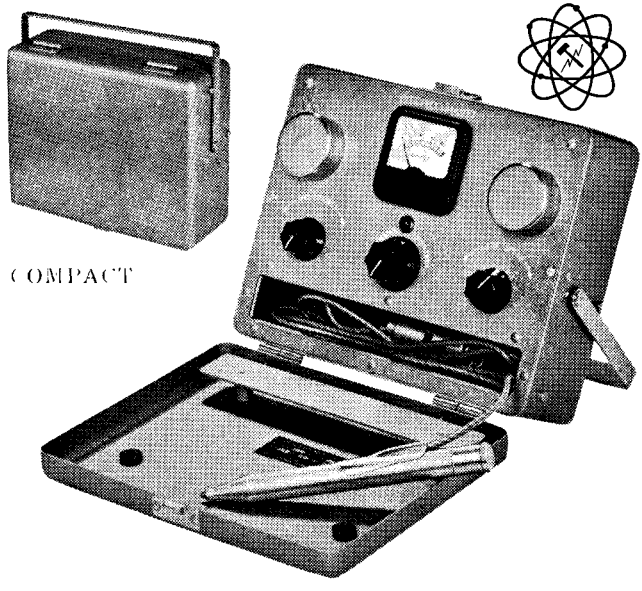

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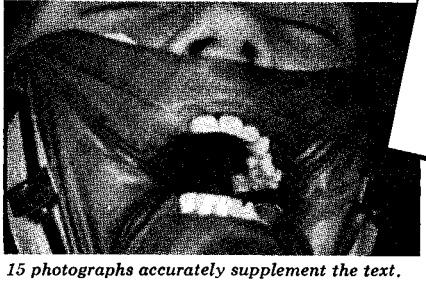

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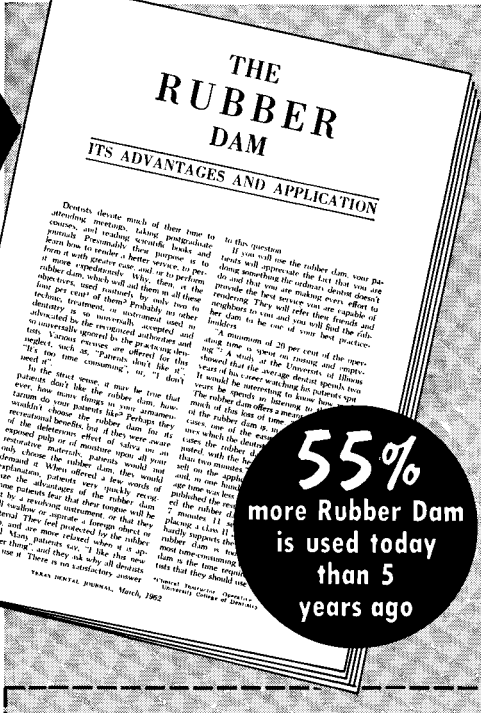

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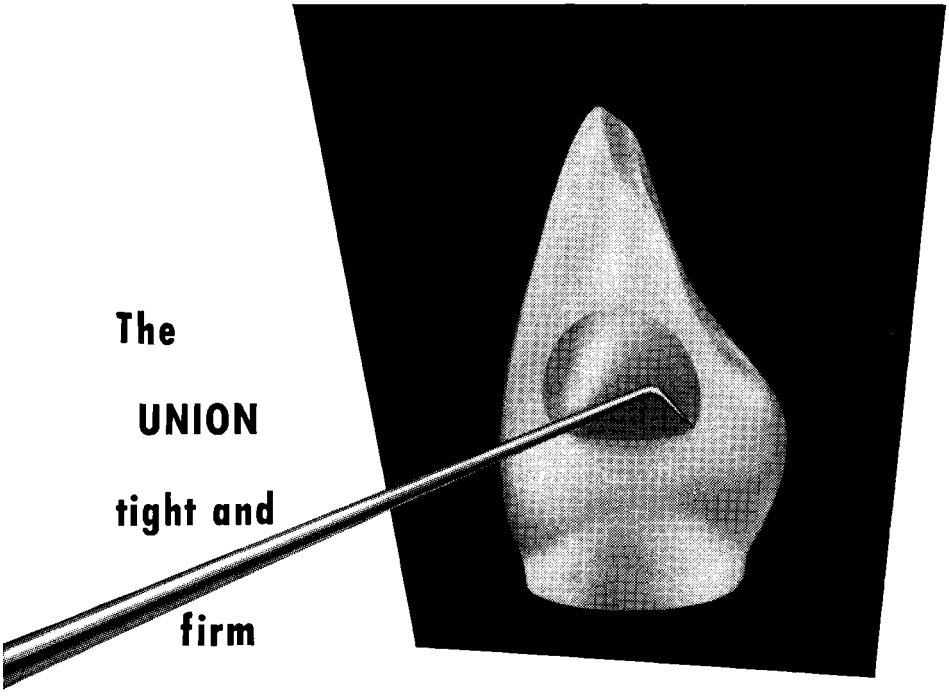

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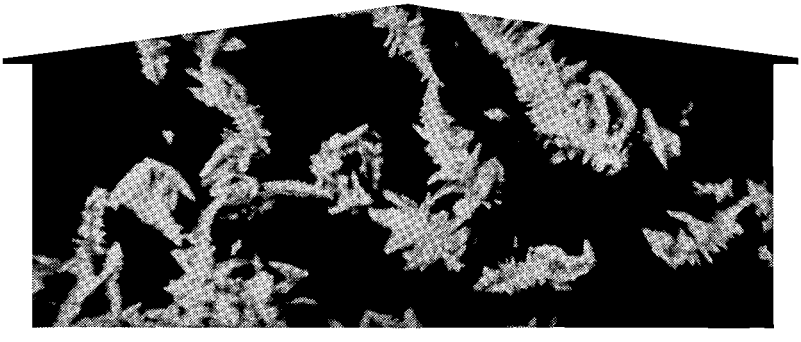

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