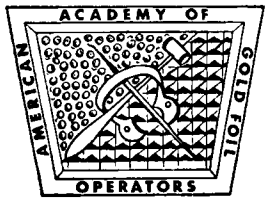
THE JOURNAL

OF THE

AMERICAN ACADEMY OF GOLD FOIL OPERATORS



Vol. VIII April, 1965 No. 1

The Journal of the American Academy of Gold Foil Operators is published biannually by the American Academy of Gold Foil Operators. The opinions expressed in this publication by individual authors do not necessarily express the views of the Academy, unless they are based upon reports adopted by the organization. The Academy reserves the right to reject, condense, revise and edit any article submitted for publication if it does not conform to the standards and objectives established by the Editorial Board. In order to be considered for publication all articles must be submitted typewritten and double spaced, at least three months prior to the date of publication. Papers presented before any of the Academy meetings will become the property of the Academy and will be published in the Journal as time and space will permit.

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

Officers and Committees 1964-1965

Jose' E. Medina, *President*
Alex W. Jeffery, *President-Elect*
H. William Gilmore, *Secretary-Treasurer*

EXECUTIVE COUNCIL

Jose' E. Medina, *Chairman*
Arne F. Romnes, *Vice-Chairman*

Alex W. Jeffery
Ralph J. Werner ('67)
Paul A. Moore ('65)
Gerald Stibbs ('66)

Membership Committee

Charles E. Carara, *Chairman*
Glenn A. Sutton (1966)
Donald K. Phillips (1967)
Charles F. Bouschor (1968)
Melvin F. Rugg (1969)

Rubber Dam Committee

Loren V. Hickey, *Chairman*
Paul A. Moore
George W. Ferguson
Michael J. Murray
Merryl D. Schulke

Program Committee

Alex W. Jeffery, *Chairman*
Ralph J. Werner
Rene W. Eidson
B. K. Braum
Clayton Swanson, Jr.
James Jensen

Study Club Committee

Frederick A. Hohlt, *Chairman*
Jan Diepenheim
Carl J. Monacelli
D. Edward Neil
Ralph A. Boelsche

School Committee

George A. Brass, *Chairman*
Paul T. Dawson
Howard I. Gilbert
James P. Vernetti
Kenneth V. Randolph

Constitution and Bylaws Committee

James P. Vernetti, *Chairman*
Robert B. Wolcott
Eugene Ziegler

Nominating Committee

Herbert D. Coy, *Chairman*
William M. Walla, Sr. (1966)
Floyd E. Hamstrom (1967)

Necrology Committee

George A. Ellsperman
Merle B. McGee
Carl L. Boyles

State Board Committee

D. Jackson Freese, *Chairman*
Joseph B. Lenzner
Michael J. Del Balso
Kenneth C. Washburn

Visual Education Committee

Paul T. Dawson, *Chairman*
Paul H. Loflin
Robert E. Hampson
Arthur J. Montagne
H. William Gilmore

Dental Research Committee

Lloyd Baum, *Chairman*
George M. Hollenback
Harry Rosen
Robert E. DeRevere
Bruce B. Smith

Literature and Publicity Committee

Clifford H. Miller, *Chairman*
Herbert J. Underhill
Charles M. Stebner
Ray E. Stevens, Jr.

Special Committee on the Future of the Academy

William M. Walla, Sr., *Chairman*
Ralph A. Boelsche
Hunter A. Brinker
D. Jackson Freese
H. William Gilmore
Gerald D. Stibbs
James P. Vernetti
Benjamin P. Wrbitzky

President's Message

JOSE E. MEDINA
President

My having been honored with the privilege of serving the Academy as its President will always be remembered as a highlight in my professional career. I hope that during my term of office I will be able to merit the confidence and trust you have bestowed upon me. I have accepted the challenge with great pride and at the same time with sincere humility. My primary concern is that the Academy will continue to move forward in its efforts to accomplish its objectives.

On February 19 the Interim Meeting was held at the University of Minnesota in Minneapolis. To those of you who were unable to attend may I report that this meeting was an outstanding event with scientific and clinical sessions of unsurpassed quality. The essayists and the clinicians excelled in their efforts to provide excellent scientific information and practical clinical demonstrations for those attending the meeting. The School of Dentistry was a gracious host, and we are most appreciative of the cordial welcome which we received. Our sincere thanks must be expressed to Dr. Alex W. Jeffery and Dr. Ralph J. Werner for their enthusiasm and zeal in arranging this Interim Meeting and thereby enhancing the image of the Academy.

The success of a term of office of any President is usually evaluated by the accomplishments of the organization during that specific year. No single President can execute all the responsibilities and duties inherent of such office. He must rely heavily upon the other officers, the Executive Council, the committees and the members. May I take this opportunity to offer my sincere thanks to all those individuals whom I have asked to serve on committees and in other capacities to further Academy undertakings. Without their unselfish assistance and cooperation the Academy could not continue to progress in its field of endeavor.

I would like to extend to all the members of the Academy a cordial invitation to attend the Annual Meeting at the University of Southern California in Los Angeles on Friday, November 5, 1965.

May I also take this opportunity to make the members aware of the 1966 Interim Meeting which will be held at the State University of Iowa in Iowa City on the Friday preceding the Chicago Mid-Winter Meeting. We are indeed looking forward to a large attendance and participation at both of these Academy functions.

Even though it may sound repetitious, I wish to again express my thanks to you, the members, for the honor and privilege of being elected President of this wonderful Academy. I sincerely hope that I will be able to serve you in at least the same manner of service and leadership that the previous Presidents demonstrated during their terms of office. The Academy has reached another milestone in its history, and it is my hope that during my term of office we can successfully outline a course of action which will enable us to more effectively meet the ever-changing demands of the dental profession.

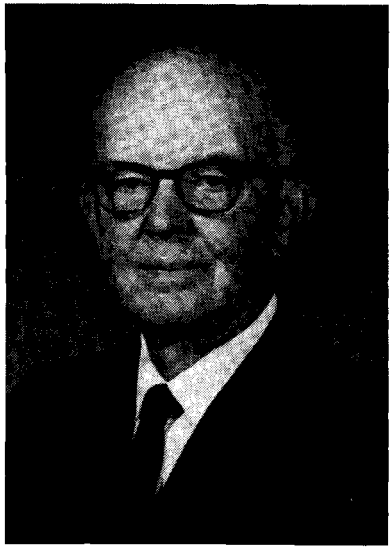
JOSE' E. MEDINA

* * * * *

NOTICE

The Fourteenth Annual Meeting of the American Academy of Gold Foil Operators will be held in Los Angeles, California on November 5th and 6th, 1965 at the University of Southern California School of Dentistry. Announcement of choice of hotels will be made at a later date.

President-Elect: Alexander W. Jeffery, D.D.S.



Alex Jeffery spent his early childhood in Chicago, his birthplace, and in Minneapolis. His family moved to Washington State when he was still a young boy, and there he attended elementary school.

A few years as a haberdasher convinced him to seek more education. He worked his way through the first year at the University of Washington by developing and printing photograph film. This same work provided him the opportunity to obtain his dental education at Northwestern University where he graduated in 1919.

Dr. Jeffery returned to Washington to set up his practice — aided by some of the senior dentists who sent him their overflow — and eventually to marry.

President-Elect Jeffery's active career has included positions in numerous dental organizations. Among these have been president of the Seattle District Dental Society, the Washington State Dental Association and the Seattle Dental Study Club, and chairman of Operative Section for the American Dental Association.

Among the honors conferred on Dr. Jeffery are: Fellow, American College of Dentists (1941); honorary memberships in the Associated Gold Foil Study Clubs of Oregon, Loma Linda Gold Foil Seminar, Associated Gold Foil Study Clubs of Southern California, and Omicron Kappa Upsilon.

Dr. Jeffery has written a number of articles for the *Journal of the American Dental Association* on the restoration and use of gold foil. He has also been Director of the Portland Dental Study Research Club, the Salem Gold Foil Research Society and the Capitol City Gold Foil Research Society.

Retired from active practice since January 1962, Dr. Jeffery now lives in Sun City, California.

A Study of Certain Mechanical Properties and the Density of Condensed Specimens Made From Various Forms of Pure Gold

JEFFEREY MAHAN AND GERALD T. CHARBENEAU, D.D.S., M.S.

PURE GOLD IN THE FORM OF FIBROUS FOIL, the finely divided crystalline mat, and more recently, the "powdered" gold are provided to the dental profession. A variety of materials, manipulative techniques, armamentarium and cavity preparation modifications are thus available with which to work. It would appear that certain combinations of these factors may yield a more logical restoration sequence for specific cases. Since all of the materials have been used rather extensively at the University of Michigan, some subjective clinical comparison of the relative merits of these factors have been made. It was the purpose of the present study to evaluate certain properties of these materials achieved under conditions simulating clinical usage in order that these data might further aid in the selection of appropriate materials and techniques.

Review of Pertinent Literature: Values previously reported for the tensile strength of gold foil specimens differ markedly. Rule's values of 36,000 and 47,500 psi for pure gold foil and gold-platinum foil[9] respectively were obtained from condensed and machined specimens loaded in the same axis as the direction of the layers of foil. Baum, Hollenback and Collard[2] found the mean tensile strength values of three specimens each of gold foil, mat gold and powdered gold to be 8,000, 6,853 and 14,986 psi respectively. Their specimens were formed in such a manner that they could be loaded in an axis perpendicular to the condensed layers of the material.

Dr. Charbeneau was born, raised, and educated in the State of Michigan. He is an Associate Professor at the University of Michigan, School of Dentistry, where he received his D.D.S. in 1948 and M.S. in 1949. Active in a number of organizations, he has served in the various offices including the presidency of both Omicron Kappa Upsilon and The Washtenaw District Dental Society. He is currently a member of the Test Construction Committee of the Operative Dentistry Section of the National Board of Dental Examiners. In his spare time, he enjoys woodworking, fishing and golf.

Coleman[4] and Rule[9] reported Brinell hardness values which varied greatly depending upon the manner of condensation and the mold material, as well as the form of the gold. An average BHN of 46 (range 18 to 61) was observed by Coleman from gold foil specimens condensed into steel dies by six different operators. Rule found an average BHN of 54 (range 38 to 68) for pure gold and a range of 35 to 57 for the mat gold. Brinell, Knoop, Rockwell and Vicker's hardness values have been reported by Cartwright,[3] Koser and Ingraham,[7] Strosnider,[10] Kramer, et. al[8] and Hodson and Stibbs[6]. Collard and Baum[5] obtained Rockwell superficial hardness which was converted to BHN, on the base surface of specimens condensed against a tungsten carbide disc. The average of two specimens of gold foil was 72 while the average of three specimens each of mat gold and powdered gold was 81 and 85 respectively.

The density of condensed gold specimens has received considerable study with a wide range of values reported. Baum[1] has recently

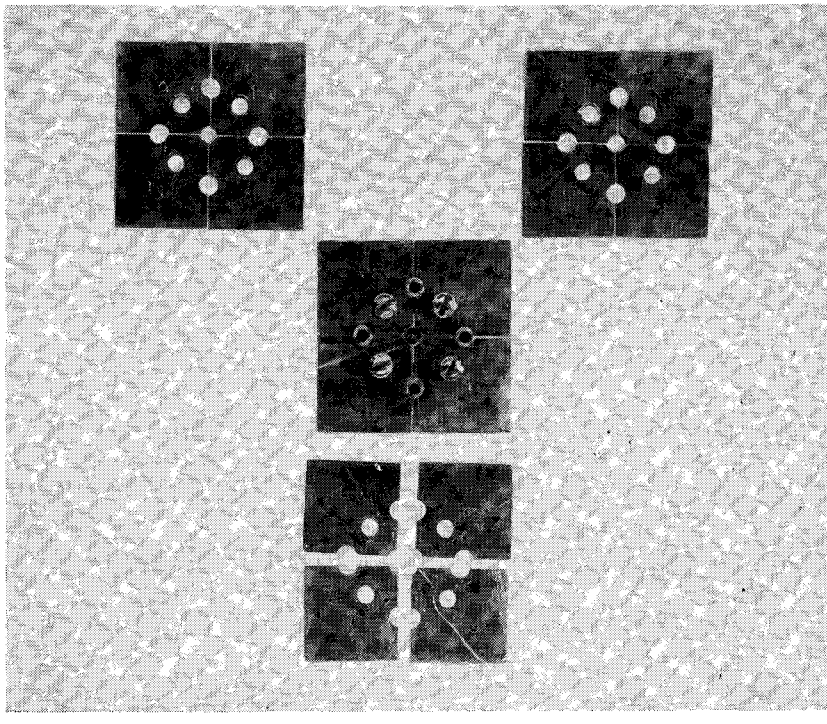


Figure 1. Four section, four-way split mold for making condensed gold tensile strength specimens.

reported the average values of three specimens of each of the following: gold foil-18.8, mat gold-18.4, powdered gold-18.4 and cast gold-19.3.

Method of Study: A four section, four-way split mold* shown in Figure 1 was used to develop a dumbbell-shaped specimen. The condensers seen in Figure 2 were used in forming these specimens in a manner to be described. A Rhiele Universal Testing Machine applied the tensile load through the circumferential grasp of the specimen holder shown in Figure 3.

The Brinell hardness values were determined upon an appropriately finished *external* surface (600 metallographic paper) of the specimen. The density was determined by calculation from the weight of the specimen in air and its weight in water.

The mat gold and powdered gold specimens were condensed with a combination of the Clevedent #32 and Loma Linda #25 hand condensers using approximately 8 pounds load and a rocking

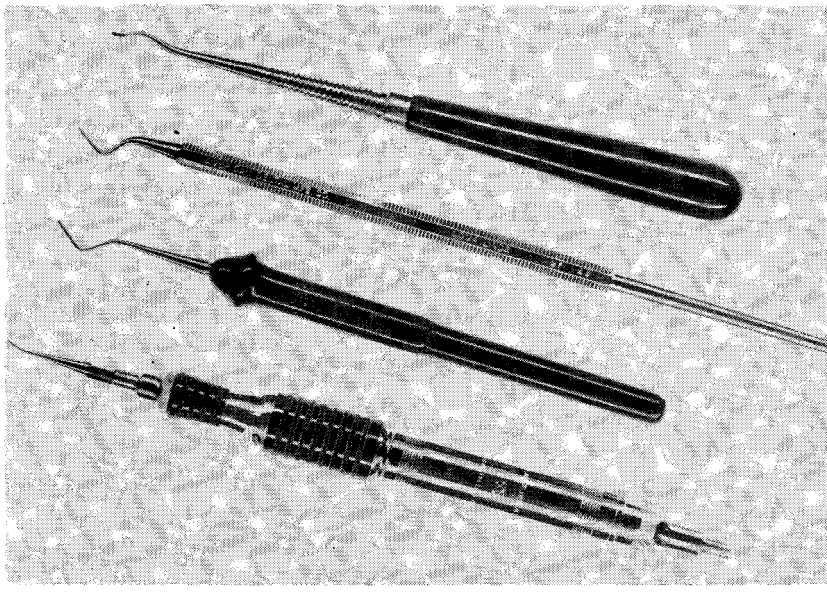


Figure 2. Condensers used in this study, from top to bottom: Clevedent No. 32; Loma Linda No. 25; Williams No. 8; S.S. White Automatic with No. 2 point.

* Mold and specimen holder designed and built by Mr. Joseph Eder whose assistance is gratefully acknowledged.

action. Three mat gold specimens, whose mean values are included in Table 1, were condensed using the Williams number 8 small round condenser. The gold foil was condensed with an S.S. White automatic mallet set to deliver a light blow using a number 2 round point. It required from 5 to 6 hours to condense each gold foil specimen, 1 to 1½ hours for each powdered gold specimen, and about 1 hour for each mat gold specimen.

Results and Discussion: The values for tensile strength, Brinell hardness and density are seen in Table 1 and are the mean values of at least five samples of each group. Standard deviations are shown in parenthesis. An analysis of variance of the data shows no significant differences of strength between the specimens of the gold foil, powdered gold and mat gold-gold foil veneer under the conditions of this test as seen in Table II. Mat gold, however, exhibits a strength significantly different from the other groups of specimens as seen from its inclusion in the analysis of variance shown in Table III.

Seven of the eight mat gold specimens failed in tension "at a layer" as indicated by distinct condenser serration marks on one surface; the eight mat specimen failed "partially at a layer."

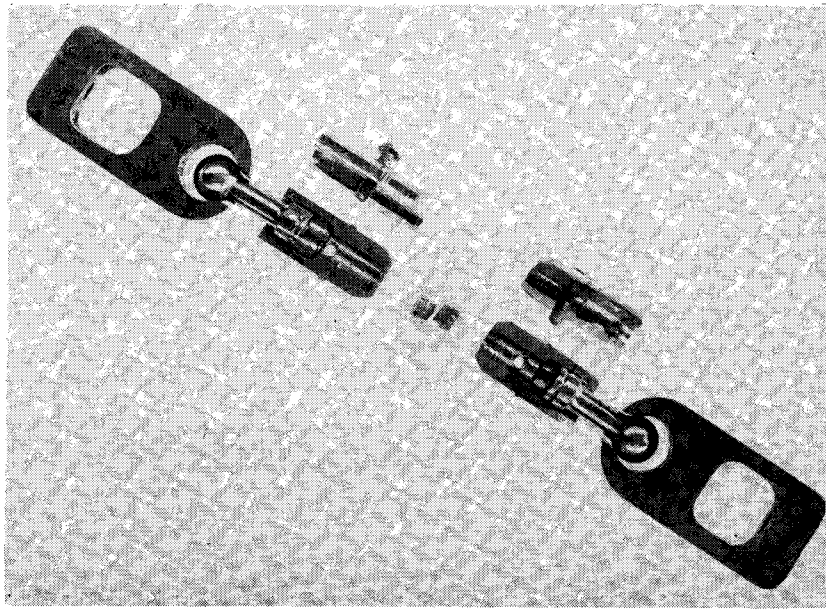


Figure 3. Tensile strength specimen holder with broken specimen. Loaded at a speed of 0.01 in./min.

Table I

MEAN VALUES FOR CONDENSED GOLD SPECIMENS
Standard Deviations Shown Parenthetically

	Tensile Strength psi	Hardness BHN	Density
Mat gold	3603 (603)	40 (10)	16.44
	4503*	50*	18.08*
Gold Foil	7350 (1710)	69 (8)	17.22
Powdered gold (Goldent)	6755 (1493)	46 (10)	17.36
Mat gold-gold foil veneer	6372 (2105)	Included in gold foil	—

* Three specimens condensed with small round Williams condenser.

The five mat gold-gold foil veneer specimens were formed by condensing mat gold into the first half of the mold using the hand condensers as described, followed by gold foil condensation with the automatic mallet. Three of these specimens showed failure "at a layer" and two "partially at a layer," always in the mat gold region. None of the specimens, however, failed at the plane of the veneer. Those specimens showing failure "partially at a layer" exhibited higher strength values than those failing completely "at a layer."

None of the gold foil specimens appeared to fail "at a layer" although one specimen indicated failure "partially at a layer". One of the powdered gold specimens failed "at a layer" yielding the lowest tensile strength value of the group. Two specimens failed "partially at a layer" and three not "at a layer."

It would appear from the foregoing observations that greater strength is demonstrated by an entangled gold mass, while the weakest plane appears between layer of increments. Uniformity of the mass, that is, the entanglement of layers seems most difficult to accomplish with the bulkier increments of mat gold, under the conditions imposed by these condensation methods.

Table II

ANALYSIS OF VARIANCE FOR TENSILE STRENGTH SPECIMENS
GOLD FOIL, POWDERED GOLD AND MAT GOLD – GOLD FOIL VENEER

Source of Variation	Sum of Squares	d.f.	Mean Square
Specimens (Columns)	26,465	2	13,232
Experiment Error (Residuals)	343,167	14	24,405
Sample F = 0.54			
F 0.05 = 3.74			

Table III

ANALYSIS OF VARIANCE FOR TENSILE STRENGTH SPECIMENS MAT GOLD, GOLD FOIL, POWDERED GOLD AND MAT GOLD — GOLD FOIL VENEER

Source of Variation	Sum of Squares	d.f.	Mean Square
Specimens (Columns)	558,506	3	186,169
Experimental Error (Residuals)	346,700	16	21,669
Sample F = 8.59			
F 0.05 = 3.24			

An interesting and consistent observation was the failure of the mat gold-gold foil veneer specimens at the mat layer, but at the higher values than those observed with the full mat gold specimen. Perhaps this indicates the effect of the different type of condensation used with the foil on top of the mat gold and/or the different stress pattern developed within the specimen during loading.

The surface hardness of the specimens as determined by the Brinell method indicate that the gold foil, although condensed with a relatively light blow, has values significantly greater than the mat gold or powdered gold. The mat and powdered gold values are similar. The use of a smaller condenser point of three of the mat specimens appeared to enhance the hardness as well as the strength and density on the basis of the limited evidence.

The density of the specimens showed wide variations within groups with ranges of 15 to 18.8 for the gold foil, 16.3 to 18.6 for the powdered gold and 14.6 to 18.4 for the mat gold. Comparison between groups, therefore, is not warranted on this evidence.

The tensile strength and Brinell hardness values observed in this study for gold foil are not unlike those reported by Baum. The limited data for strength of mat gold and powdered gold reported by Baum are about twice as great as seen in the present study. There is rather good evidence from the statistical evaluation that the strength values for gold foil, powdered gold and the mat gold-gold foil veneer obtained in this study under the conditions described have great similarity. Undoubtedly, a further change in the manner of manipulation and condensation would alter these values. Measurement of the density of the small condensed pure gold specimens in order to make meaningful comparisons has certain inherent problems. The variation which appears to exist between specimens within groups, the potential error involved in such weighings and the actual clinical significance of the data discourages any attempt to make a comparison.

In this study certain clinical implications may be found as well as stimulus for continued investigation:

1. The manner in which the tensile strength is tested, as suggested by Baum, Hollenback and Collard, provides data signifying greater clinical importance than did the method used previously by Rule.
2. Brinell hardness obtained upon appropriately finished external surfaces, the last to be condensed (surface exposed to the oral environment of the clinical restoration) are probably more meaningful in assessing the clinical value of this property.
3. The true significance of density and the manner of measurement makes questionable the usefullness of such data for condensed gold specimens.
4. The strength of the gold foil, powdered gold and mat gold-gold foil were similar under the conditions of this study. Since it is more time consuming, and to some extent more traumatic, to condense a complete gold foil restoration, it would seem logical to consider the veneer technique from the standpoint of efficiency where operating convenience permits.
5. The significantly higher hardness values of gold foil used either as a veneer or a total restoration may indicate the desirability of this material at the restoration surface.

University of Michigan
School of Dentistry
Ann Arbor, Michigan

REFERENCES

1. Baum, Lloyd. The Use of Powdered Gold in Restorative Dentistry: A Preliminary Report. *J. of So. Calif. State Dental Assn.*, 30:392-399, December, 1962.
2. Baum, Lloyd, Hollenback, G.M. and Collard, E.W. A Method of Testing Tensile Strength of Compacted Gold Specimens. Paper No. 3, Dental Materials Group. *I.A.D.R. Meeting March, 1963*. Microfilm.
3. Cartwright, C. B. A Study of Gold Foil and Mat Gold Restorations Using Different Methods of Condensation. University of Michigan School of Dentistry, 1960. Typed Thesis.
4. Coleman, R. L. Physical Properties of Dental Materials. *Bureau of Standards J. Res.* 2:907, December 1928, U.S. Gov't Res. Paper No. 32.
5. Collard, E. W. and Baum, Lloyd. A Description of a New Type of Compacted Gold Filling Material and a Preliminary Report on Some of its Physical and Mechanical Properties. Paper No. 4, Dental Materials Group, *I.A.D.R. Meeting*, March 1963.
6. Hodson, J. T. and Stibbs, G. D. Structural Density of Compacted Gold Foil and Mat Gold. *J. Dent. Res.* 41:339-344, March-April 1962.
7. Koser, J. R. and Ingraham, Rex. Mat Gold Foil With a Veneer Cohesive Gold Foil Surface for Class V Restorations. *J.A.D.A.* 52:714-727, June 1956.
8. Kramer, W. S, Trandall, T. R. and Diefendorf, W. L. A Comparative Study of the Physical Properties of Variously Manipulated Gold Foil Materials. *Journal of the American Academy of Gold Foil Operators*. 3:8-24, May 1960.
9. Rule, R. W. A Further Report on Physical Properties and Clinical Values of Platinum-Centered Gold Foil as Compared to Pure Gold Filling Materials. *J.A.D.A.* 24:583-595, April 1937.
10. Strosnider, C. W. Comparison of Specific Gravities and Hardness of Cohesive Gold Foil Malleted With Various Types of Condensers. *J. Dent. Res.* 24:61-63, April 1945.

The Rubber Dam: A 100 Year History

ALAN Z. BARBAKOW

PRIOR TO 1800 THE DENTAL LITERATURE does not mention methods of moisture exclusion during operative procedures. At that time restorative materials included gums, lead, and tin, and moisture contamination of these materials was not considered deleterious. However, with the introduction of gold restorations it became necessary to consider moisture exclusion.

It is the purpose of this paper to present an historical review of the development of the rubber dam.

Preliminary Efforts: The first appliance used for excluding moisture during operative procedures was the napkin. Its acceptance was not overwhelming because many practitioners had not yet adopted gold foil as a restorative material. However, by 1835 when gold was more generally accepted, the necessity for the maintenance of a dry operative field was realized.

Many means of achieving this were attempted and hopes prevailed that an easy solution could be found. By 1840 cavities were being wiped with "locks of cotton," dried flax, pieces of muslin sponges, strips or pellets of linen or cotton cloth. The shortcomings inherent in these methods led to subsequent utilization of highly absorbent bibulous and tissue paper. Also the "coffer dam," a matrix-like device, was developed to isolate the tooth from the surrounding fluids. In 1836 Dr. J. B. Rich used this principle in fabricating a dam consisting of a gold band encircling the neck of the tooth. In 1850 Dr. William H. Swinell presented a modification of the coffer dam fabricated in wax, but manipulation of the wax proved too difficult to be practical. In 1862 a coffer dam developed by Dr. G. A. Mills had been refined to a plaster funnel which surrounded the tooth and was sealed at the cervix. This method appeared to have a very limited acceptance.

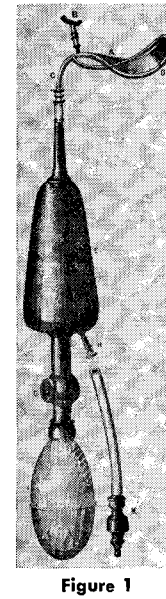


Figure 1

By 1863 the trend was directed toward the exclu-

This article is republished with the permission of the Editor, J. Southern California State Dental Assn.

sion of saliva from the entire oral cavity rather than merely from one tooth. Many types of duct depressors, saliva ejectors and collectors, and pumps appeared on the market, some of which were quite effective. The pump constructed by Dibble[1] (Fig. 1) kept the oral cavity free from saliva by means of a partial vacuum, held the tongue away from the teeth and supported the upper jaw. However, a completely dry field was still unobtainable.

Rubber Dam: In May of 1864 the rubber dam, a modern advancement utilizing the elasticity of rubber, was developed by Dr. S. C. Barnum. Initially its acceptance was limited. Gradually, the rubber dam gained support, and by 1867 the use of the rubber dam became widespread. Although opposition did exist, constructive opposition stimulated efficient alternative methods, whereas others reverted to "submarine techniques."

> "How did Badger, Chapin, Harris and many other unrivaled operators, long before any such contrivance (the rubber dam) was invented, manage to do such work as they did which today may be found in multitudes of mouths as perfect as the day it was done? The best operators today do not do a better job than this with the rubber dam. A little bibulous paper and a napkin fills the bill."[2]

Those who offered alternative methods recognized the inadequacies of the rubber dam. Dr. W. H. Dibble found that the dam often "snapped off" during operative procedures. In 1866 Allan[3] noted that the prevention of dam slippage necessitated the removal of all tartar and mucous deposits from the teeth. He recommended prepared flax, spunk and bibulous paper as alternatives.

An avalanche of inventions accessory to the rubber dam was developed. "The value of dam or the appreciation of its value as an appliance in operative dentistry was shown as much as in any other way by the efforts constantly being made to devise ways and means to improve those already present for making it applicable to a greater variety of cases."[4]

Holes for Teeth: Various techniques for punching holes in the rubber developed. Initially, a hollow punch was used under hand pressure on a piece of box wood or a block of tin, but hand pressure was soon replaced by a mallet. Many dentists preferred a hot instrument to the hollow punch. Calder[5] believed that the contact of a hot instrument on a rubber sheet caused the dam to exhibit an adhesive quality. He stated in 1874 that a hot excavator was more efficient than a punch in accomplishing the same results. He argued that the roughened edges of the burned holes, being thicker than any other part of the dam, would impart greater strength and be more impervious to fluids.

Dentists became increasingly aware of the need for a punch of variable sizes. Babcock[6] demonstrated that apertures of various sizes could be punched by varying the tensions on the rubber sheet since an inverse ratio existed between the tension and the size of the holes. In 1882 S. S. White developed a punch consisting of a rotating circular plate containing holes of various sizes on one arm and a conical steel die beveled to a point on the other arm. With this device perfect holes of the desired size could be obtained.[7]

Attachment: The following were used for rubber dam placement on the teeth: wedges, thread and silk ligatures (white and colored, plain and waxed), rubber tubing, silver wire, gilling twine, cotton spunk, bibilous paper (alone or moistened with sadarac varnish or gutta-percha), and an endless variety of clamps.

The earliest means of attachment, a dental cement referred to as os-artificial, did not afford adequate retention and was replaced by ligatures and wedges. However, when it became known that these ligatures and wedges could cause absorption of the alveolus, the dental periosteum, and the alveolar dental periosteum, other means of attachment were sought.[8]

By 1868 many practitioners used a string of beads which fitted interproximally and hung from the mouth to retain the dam. In 1870 Latimer[9] developed a procedure which involved waxing a piece of floss silk about 18 inches in length, tying the two ends together, placing it over the teeth enclosed by the rubber and allowing the patient to hold it down with his thumb in the pendant portion of the silk.

In the 1870's many types of clamps were utilized. Maximum retention of tooth structure and minimal pain imposed on the patient were the criteria for a successful clamp. The set of 32, one for each tooth, devised by Dr. Delous Palmer was considered the most useful of those available in 1882.[10] (Fig. 2). These clamps adapted well to the ordinary forms of teeth but occasionally were found to be useless, especially for partially erupted molars and teeth of conical or abnormal form.

In 1900 Harvey developed a new type of clamp which fitted mesio-distally rather than buccolingually. Due to the anatomy of the tooth, the orientation afforded sufficient retention without the necessity of placing the clamp as far cervically as before.[11]

New clamps were continually being developed, the acceptance of one being replaced by the acceptance of another. A great number of clamp types glutted the market—these included: the "rubber dam screw clamp," "root clamp," "lever clamp," "H.C.," "festooned," "broad flange," "beaked molars," "dens-sap," "reach-o-rounds," "hinge and

joint," and "the universal."[12] Reflectors, tongue depressors and tongue guards were even added to some of the clamps.

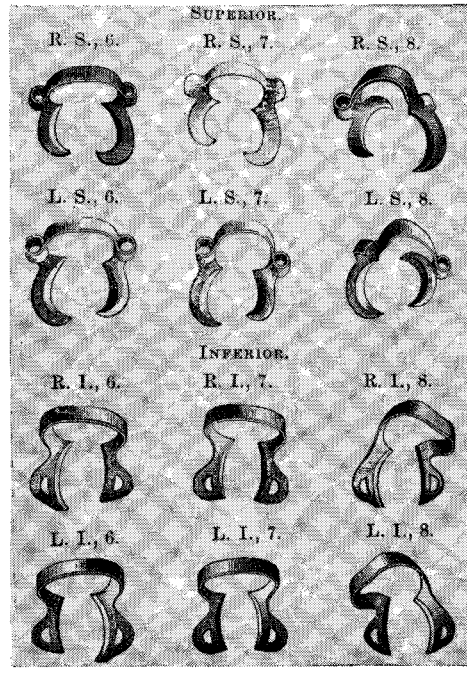


Figure 2

During the 1920's, as the fervor of the dam declined, this stream of inventions diminished considerably. The advent of silver alloy as a restorative material probably influenced this decline. Papers appeared questioning the necessity of the rubber dam. Smedley[13] stated that there was little place for the dam in modern dentistry. He argued that it shuts out more light, sometimes fails to keep moisture out and can cause injury to the periodontal attachments. He recommended isolating the tooth with cotton rolls, wiping the preparation with alcohol and changing the rolls as frequently as necessary. He did not attempt isolation during pulp therapy until the pulp was removed from the pulp chamber. He concluded his article by asking the views of other operators.

Although the use of the dam decreased, its importance remained increasingly apparent. In 1923, the section of endodontia of the First District Dental Society of New York established a resolution with regard to the rubber dam. They pointed out the necessity for surgical cleanliness at all times. The diversity of method in treatment of pulpless teeth deemed it imperative that the best means of isolating the field of operation should be employed. At the New York Academy of Medicine in the city of New York on April 16, 1923 it was resolved that failure to employ the rubber dam as a protective measure during the operative procedures on pulpless teeth is prejudicial to the best interest of the patient.[14]

As the focal theory of infection gained support, endodontic treatment became increasingly rare, and to a great extent as endodontic treatment lost its appeal so did the use of the rubber dam.

The necessity for reiterating the value of the rubber dam was

acknowledged by the gold foil operators. The spokesmen for rubber dam continued to propose improved techniques for placement and retention of the dam, and exclaimed that good dentistry could not be performed without its aid. Literature favoring the use of the dam appeared in all dental journals but to little avail. Bodecker wrote in September 1927, "I cannot understand why such a simple procedure as the application of the rubber dam has been abandoned by so many operators unless it is the fact that they are not pursuing the correct techniques, making a simple operation difficult. The application of the rubber dam should be easy for the operator and comfortable for the patient."[15]

During the 1930's the rubber dam was supported by many dentists primarily for sanitary reasons. "In these days when we are going to such extremes for eliminating foci of infection are we not a great deal to blame in that we do not keep out cavities free from infection between the time when the cavity is excavated and sterilized and the filling is permanently sealed in place?"[16] Rule[17] questioned whether there were more pulps dying through infection via the dentinal tubules through careless cavity preparations than there were teeth being saved through satisfactory root canal treatment. A knowledge of histology and pathology of the dentin and pulp should promote an awareness of the great importance of protecting freshly cut dentinal tubules from infection or irritation which may be caused by saliva. Rule stated that when the dentin becomes exposed to infection the pulp also becomes infected. Those who favored the use of the dam became increasingly aware of the need to reteach techniques for its insertion and retention, to promote a stimulating argument to convince students of the necessity of the dam, and to belittle those practitioners who did not use the dam. Prime stated that an argument against the use of the rubber dam by any man stamps his operative work in a class with his argument. The purpose, importance and advantages of the dam were stated by many and elaborated upon intensely. Prime listed some 57 advantages to the use of the dam. Rule attempted to prove that no substitute would keep preparations dry, clear, provide freedom to the operator to work in a field under the most favorable conditions of asepsis, eliminate pain of the patient, provide for better vision, and serve as a time saver as well. Bodecker pointed out the ability of an operator to distinguish between carious and noncarious dentin is one of the most valuable assets of the rubber dam.

Objections to the use of rubber dam exist. However, is this only true when ligatures are crudely used and clamps carelessly placed? Patients supposedly complained of the uncomfortable feeling of clammy, wet rubber against the face, but are napkins not available to keep the face dry? Patients are said to have difficulty in disposing of saliva; however, could not saliva ejectors be slipped through a hole in the dam?

Patients often object to the dam because of the associated discomfort, but could this be attributed to awkward technique? Wolcott and Goodman[18] have enumerated the thirteen greatest problems encountered in rubber dam placement:

1) determining the hole position
2) tearing dam during placement
3) inverting edges of dam
4) preventing saliva leakage
5) application of Class V caries
6) preventing tears during operative procedures
7) ligating isolated teeth
8) passing dam through tight contacts
9) choosing proper clamp
10) application to third molars
11) application for bridges
12) application for crown cementation
13) patient objections

It is somewhat ironic that patient complaints were found to be among the least objectionable.

Operators who were concerned about the time that must be allotted for placing and adjusting the dam, failed to see its use would save time. Ireland[19] has stated that the most time-consuming thing about the rubber dam is to convince dentists that they should use it. Operators complaining of the annoyance of working on patients who become fidgety due to the presence of the dam, were unwilling to attribute this fidgety condition to their own lack of experience and poor technique.

In 1955 an extensive and systematic study of the modern use of the rubber dam as an adjunct in the practical phases of operative dentistry was undertaken by McGee, True, and Inskipp for the fourth edition of *A Textbook of Operative Dentistry*. They found eight major advantages derived from the use of the rubber dam: 1) It makes a near surgically clean cavity. 2) It aids in the reduction of pain. 3) It makes for a better view of the field of operation. 4) It protects the patient. 5) It protects the dentist from infection from diseased or unclean mouths. 6) It aids in a more thorough execution of the operative procedures. 7) It is a great economic aid in the practice of dentistry.

Recent advancements in the quality of the rubber have made the dam a more desirable aid. Prior to 1943, the rubber dam was made from crude rubber, sheeted to thickness between steel rollers known as a calender. However, the disadvantages of short shelf life and rela-

tively poor tear resistance combined to give the dentists some degree of trouble. The introduction of a new type of rubber in 1943, manufactured from concentrated liquid rubber latex containing 62% rubber solids and 38% water, overcame the disadvantages.

In contrast to the severe mastication that crude rubber underwent, the rubber latex is cast into sheets with each tiny rubber globule exactly in the same natural form that it came from the tree, imparting long shelf life, great tensile strength, and very high tear resistance.[20]

In 1964 Wolcott and Goodman[21] investigated the reasons for resistance to the use of rubber dam in clinical practice. They were able to determine, through a questionnaire sent to all graduates of dental schools in the years 1961 and 1962, that the use of the rubber dam increased as the amount of teaching increased.

Conclusion: In conclusion it might be well to state that two dental procedures which have rarely, although never adequately, been challenged in the literature are 1) the use of the rubber dam and 2) proper periodic scaling of the teeth.

REFERENCES

1. Dibble, W. H. Saliva Pump. *Dental Cosmos*, 8:38, 1866-1867.
2. Cuttler, S. P. The Rubber Dam. *Dental Cosmos*, 16:21-22, 1874.
3. Allen, C. D. Keeping Cavities Dry. *Dental Cosmos*, 7:622, 1866.
4. ADA 4th Day, Morning Session. The Rubber Dam - Gold Medal Voted for S. C. Barnum. *Dental Cosmos*, 12:532, 1870.
5. Calder, I. Holes in the Rubber Dam. *Dental Cosmos*, 16:443, 1874.
6. Babcock, J. Frederic. Rubber Dam Punch. *Dental Cosmos*, 16:278, 1874.
7. White, S. S. New Rubber Dam Punch. *British Journal of Dental Sciences*, 25:1205, 1882.
8. King, Edward J. Inserting the Rubber Dam. *Dental Cosmos*, 12:517, 1870.
9. Latimer, J. S. Barnum's Rubber Dam. *Dental Cosmos*, 6:13, 1865-1866.
10. Well, M. H. Application of the Rubber Dam and Special Clamps and Preparations of Gold Foil. *Dental Cosmos*, 24:460, 1882.
11. Harvey, H. F. A New Forum of a Clamp. *Dental Cosmos*, 42:258, 1900.
12. Ottofg, L. Rubber Dam. *Dental Review*, 5:28-36, 1891.
13. Smedley, V. G. Rubber Dam Not Necessary. *Dental Record*, 34:433, 1914.
14. Resolution with Regard to the Rubber Dam. *Items of Interest*, 45:646, 1923.
15. Bodecker, C. F. The Most Sensitive Area of the Teeth. *JADA* 14:1646, Sept. 1927.
16. Woodbury, C. E. Operative Dentistry. *Pacific Dental Gazette*, 38:484, 1930.
17. Rule, R. W. Rubber Dam: It's Use and Adjustment. *Pacific Dental Gazette*, 39:483-489, 1931.
18. Wolcott, R. B. and Goodman, Frederick. A Survey of the Rubber Dam, Part II, Problems in Usage. *Personal Communication*, in April, 1965, *J.A.A.G.F.O.*
19. Ireland, L. The Rubber Dam. *Texas Dental Journal*, 80:6-15, March, 1962.
20. Product Information Sheet, The Hygienic Dental Mfg. Co. The Rubber Dam, January 1, 1958.
21. Wolcott, R. and Goodman, F. A Survey of Rubber Dam, Part I. Instruction. *American Academy of Gold Foil Operators*, 7:28, April, 1964.

A Survey of Rubber Dam
Part 2 - Problems in Usage*

ROBERT B. WOLCOTT, D.D.S., M.S.**
and FREDRIC GOODMAN, D.M.D., M.S.D.†

IT WAS REVEALED IN THE PREVIOUS REPORT that the time necessary to apply the rubber dam did not materially affect the average length of appointment in dental offices throughout the country. Those graduates who used dam routinely made appointments which were not significantly longer than appointments made in offices in which dam was seldom used.

This report is primarily intended to point out the problems associated with the use of rubber dam and the requests by recent graduates for additional training. The traditional resistance to the use of rubber dam is generally rationalized by calling attention to three alleged disadvantages: 1) the time required for its application; 2) objections registered by patients, and 3) tearing of the dam during its placement. These will be discussed and, in each instance, the effects of various teaching methods will be emphasized.

Problems Associated with the Use of Rubber Dam: Thirteen problems in the use of rubber dam were rated in order of difficulty by over 5000 recent graduates. Their responses were evaluated and a weighted mean (Wolcott and Goodman, 1964) was calculated for each problem. The data were subjected to an analysis of variance which indicated that significant differences existed between the means calculated for the various problems. The "t" test indicated that the means fell within five groupings, each of which is significantly different from the others at the 1% probability level. In Table I the data are grouped according to the results of the "t" test.

It is interesting to note the problems associated with the rubber dam which are most frequently encountered in newly established dental offices are those concerned with the passage of rubber dam through tight contacts and its application to the third molars. The fact that patient objections are of less concern to the practitioner is of real

*This investment was supported by an appropriation from the American Academy of Gold Foil Operators and in part by USPHS Research Grant 1-SO1-FR-05004.

**Professor of Operative Dentistry, University of California School of Dentistry, The Center for the Health Sciences, Los Angeles 24, California.

†Assistant Professor of Oral Biology, University of California School of Dentistry, The Center for the Health Sciences, Los Angeles 24, California.

TABLE 1

Problem	Score & Standard Deviation
Tight contacts	566 ±12
Third molar	553 ±19
Operative tears	517 ±12
Class V caries	505 ±30
Placement tears	492 ±24
Bridges	482 ±42
Cementing crowns	447 ±45
Saliva leakage	431 ±28
Inverting	382 ±37
Isolated teeth	365 ±28
Patient objections	342 ±21
Clamp selection	304 ±14
Hole Position	281 ±28

interest since it conflicts with the opinion generally held by the profession. It is obvious that patients can and do accept the rubber dam as an integral part of the total operation, whether it is needed for the routine silicate, foil, inlay or bridge placement.

From our data it is apparent that increased emphasis should be placed on instruction for (a) passage of tight contacts, (b) application and stabilization of dam round bridges, crown preparation and third molars, and (c) prevention of tears of rubber dam during placement and during operative procedures.

We must recognize the possibility that fewer problems were encountered with certain phases of the dam technique because these procedures were not taught or are not used in clinical practice. In contrast one might wonder if certain problems would become more prominent if dam were employed more generously.

The following manipulations of rubber dam became *less* difficult as dentists used rubber dam more frequently in their offices (See Figure 1): Hole position, patient objections, isolated teeth, inverting edges, preventing saliva leakage, placement tears and Class V caries.

This could be predicated *a priori* except in the case of patient objections. Normally, one would expect that as dam is used more often, the dentist would encounter more objections to it. This apparent paradox may have only two explanations: 1) The motivation to use the dam may be reflected in the dentist's presentation of it to his patients or, 2) Dentists may rationalize their failure to use dam by claiming patient resistance.

The following manipulations of rubber dam became *more* difficult as dentists used it more frequently in their offices (See Figure 2): Choice of proper clamp, application for cementation, application for bridges, operative tears, application to 3rd molars and tight contacts.

These findings could be predicted *a priori* since extended use of the

dam in difficult operative procedures would provide ample opportunity for difficulties in choosing clamps and for encountering operative tears, while high usage would also involve applications to malposed teeth and to crown and bridge procedures. This would account for increased difficulties encountered in cementation, bridges, 3rd molars and tight contacts.

On the surface it appears that increased application of the dam uncovers additional problems. It is possible, however, that as certain manipulations become easy through increased usage other manipulations become relatively (rather than actually) more difficult.

Geographical Differences: The differences in dam placement problems between various geographical areas are quite limited. Few of the graduates of Area 6 encountered very much difficulty with tight contacts, Class V cavities or with tears during operative procedures. However, most reported considerable difficulty in the application to bridges and for the procedures concerned with cementation. On the other hand, Area 3 encountered more problems with saliva leakage during restorative procedures, and Area 2 reported that fewer graduates were concerned with difficulties in the application of rubber dam for cementation procedures.

Reflecting upon the percent of time that rubber dam was used for various restorative procedures according to locations (Wolcott & Goodman, 1964) one might expect that graduates from Area 6 would encounter greater problems with the more difficult types of applications, such as bridges and cementation procedures, since graduates from this area used dam more often. In the previous report it was noted that Area 2 placed less emphasis upon the teaching and application of rubber

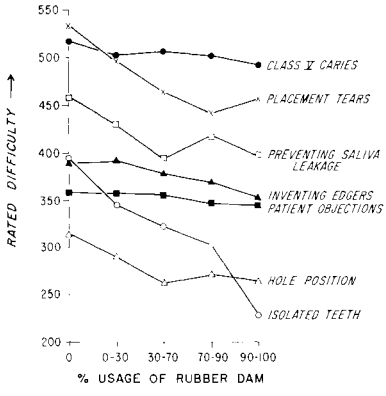


Figure 1. Problems associated with rubber dam application which became less difficult as usage of dam increased.

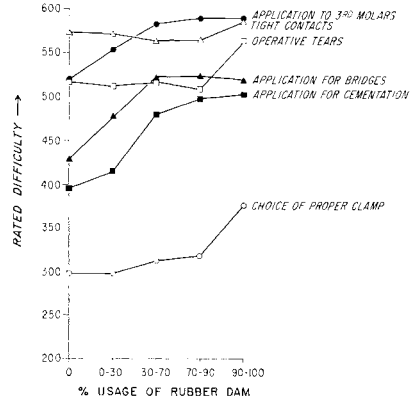


Figure 2. Problems associated with rubber dam application which became more difficult as usage of dam increased.

dam in conjunction with bridges and cementation. Consequently, graduates from this area encountered fewer problems because they were not exposed to applications of dam in these procedures.

Request for Additional Instruction: Significant differences existed between locations ($P < .05$) when comparisons were made between the requests for additional instruction in the preparation and placement of rubber dam. No significant differences were found between locations in the other three categories (Table 2).

A large percentage of graduates from Locations 1 and 3 felt a need for additional instruction in preparation and placement of the dam while graduates from locations 2 and 6 felt little need for additional instruction.

Overall, Locations 1 and 3 made the greatest number of requests for additional instruction while Location 6 made the fewest.

It is not surprising that the greatest number of graduates felt the need for additional instruction in unusual applications of rubber dam.

The next most frequent request for additional instruction was concerned with the procedures related to the selection and placement of clamps and those related to the actual seating of the rubber dam. These requests are in keeping with the ranking of difficulties by recent graduates which was discussed in the previous section. It may be remembered that the most common problems were the passage of dam through tight contacts and the tearing of dam during placement. It is obvious, therefore, that instructors in restorative dentistry in the various dental schools should give greater attention to these specific problems.

Table 3 indicates the effectiveness of the three teaching techniques in reducing the number of requests for additional instruction. From the data it would appear that group demonstration was most effective in teaching equipment choice, preparation of dam and clamp selection, while individual demonstrations were most effective in teaching placement of the dam. Individual demonstrations were also useful in teaching preparation techniques. Interestingly, group demonstration was quite effective in instilling in the students a desire for additional instruction in unusual applications.

TABLE 2

PER CENT OF GRADUATES REQUESTING ADDITIONAL INSTRUCTION IN VARIOUS AREAS CONCERNING RUBBER DAM USAGE

(Multiple Choices were Permitted)

Equipment	14.9%
Preparation	9.7%
Placement	30.6%
Unusual Applications	69.9%
Clamps	33.4%

Requests for Additional Instruction vs. Percentage of Time Dam is Used in Practice: As the percentage of time the dam is used increased, the need for additional instruction in preparation and placement decreased significantly ($P < .02$). No change, however, was noted in the number of requests for additional instruction in choice of equipment, unusual applications, or in clamp selection and stability.

Conclusions: This Survey of Rubber Dam has dealt primarily with the technique of rubber dam instruction and with problems encountered in its clinical use. Only those findings which illustrated significant differences in response between graduates have been reported. It is of real interest to note that over 60% of the 6,298 questionnaires distributed to recent graduates were completed and returned.

The following conclusions have been drawn from the analysis of the data provided by the questionnaires:

A. Instruction in the use of rubber dam varied in the different geographical areas of the United States.

B. Clinical teaching of rubber dam usage varied more than did the didactic instruction.

C. The clinical use of rubber dam did not materially affect the average length of appointment time. Only a 5.1 minute difference was noted between the average appointment lengths given by graduates who reported high usage and those reporting low usage.

D. The more emphasis that was given to the teaching of rubber dam, the greater was its clinical use.

E. Patient objection to rubber dam usage is minimal.

F. Tight contacts, tearing of dam and application to 3rd molars, bridges and crowns are frequent problems to young practitioners.

G. More frequent use of dam resulted in fewer problems associated with determining the hole position, patient objections, and inverting edges, application to isolated teeth and Class V cavities and the prevention of leakage and tears.

H. In geographical areas where more dam was used, young dentists encountered difficulties which were of a more complex nature, such

TABLE 3

REQUEST FOR ADDITIONAL INSTRUCTION VS. TEACHING METHODS

Request for Additional Instruction	TEACHING METHOD: Individual Demonstration Yes	No	P	Group Demonstration Yes	No	P	Lectures Yes	No	P
Equipment	15	14	NS	14	16	<.05	15	14	NS
Preparation	9	12	<.02	9	15	<.001	10	13	<.02
Placement	27	38	<.001	30	39	<.001	29	43	<.001
Unusual	71	69	NS	70	63	<.001	71	68	NS
Clamps	30	33	NS	30	36	<.002	31	30	NS

Entries are the % of graduates requesting additional instruction.

as dam usage for cementation and other crown and bridge procedures. In areas of low dam usage these manipulations of dam were not considered to be important problems.

I. Most graduates requested additional instruction in unusual applications of rubber dam. Next in frequency were requests for instruction related to the selection and placement of clamps, and then requests for instruction related to passing tight contacts and tearing dam during placement.

J. Individual instruction is a more effective method for teaching placement techniques. Group methods suffice in the instruction of dam preparation, clamp selection, and such unusual applications.

K. The practice that comes from the routine use of dam in clinical practice reduced the requests for additional instruction in preparation and placement aspects.

REFERENCES

Wolcott, R. B. and Goodman, F., A Survey of Rubber Dam, Part I – Instruction, *JAGFO*, 7: 28-34, April 1964.

* * * * *

Florida Gold Foil Study Club in Guatemala

The Central Florida Gold Foil Study Club participated in the program for FOCAP (La Federacion Odontologica de Centra America y Panama) at the University of San Carlos, Guatemala City, Guatemala, September 5-12, 1964.

The group gave chair-side clinics for two days and a lecture for one evening during the conference. Director of the Club, Dr. Jose Medina, presented many lectures during the conference on restorative dentistry as well as acting interpreter for the group.

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 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, USS Constellation, CVA 64, FPO, San Francisco, California.

Stabilizing #212 Clamp

Properly stabilizing of the #212 clamp is an important factor in determining the success or failure in the preparation, insertion, and finishing of a Class V restoration. The desired position of the clamp must be rigidly maintained throughout the procedure, and concomitantly this must be accomplished without excess compound to hinder access for the operative procedures. As in most other dental procedures, this is best achieved by teamwork with the assistant.

While the operator is placing and maintaining the clamp in its desired position, the assistant has softened the green stick compound. He wets his thumb and first two fingers in a cup of warm water and she momentarily tempers the compound in the water. Then the operator removes the desired amount and anneals over the bunsen burner that portion which will contact the teeth.

Figure 1 illustrates how the compound is placed under the bow toward the clamped tooth. The annealed surface of the compound is in contact with the teeth, and while still maintaining the clamp in position, the material is adapted into the buccal and lingual embrasures of the teeth under the bow. The compound is prevented from contacting the clamped tooth and also from covering the vertical facial aspect of the bow, roughly forming a triangle with its blunt apex under the bow and the base against the axial surfaces and interproximal embrasures of the teeth.

A fold of compound sufficient to prevent incisal movement is then formed over the horizontal-incisal section of the bow. At this point the assistant cools the compound with compressed air. Figure 2 illustrates the blocked mesial bow without compound covering its facial aspect. The clamp is very stable at this point and the distal bow is blocked in a like manner without danger of dislodgement.

Fig. 1

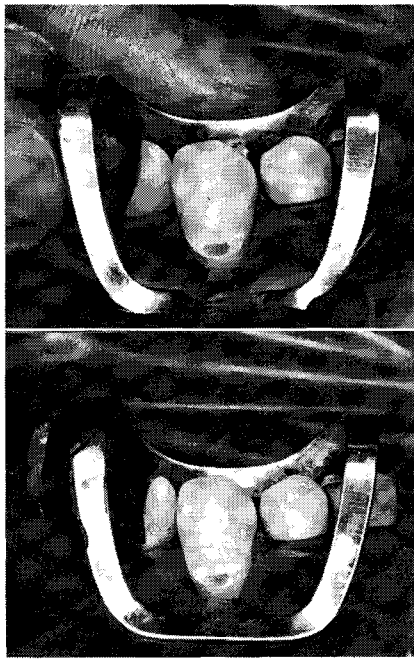


Fig. 2

Fig. 3

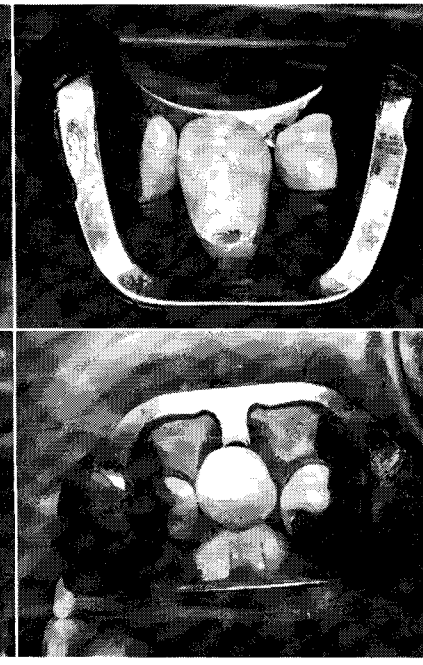


Fig. 4

Figure 3 shows the stabilized #212 clamp which will not dislodge during the preparation, insertion, or finishing procedures. Note that the access is not impaired for instrumentation by the compound in the area of the tooth or over the facial aspect of the bow.

Figure 4 is an incisal view of the stabilized clamp showing the compressed cotton pellet between the lingual jaw and the tooth to provide less trauma to tooth and tissue.

* * * * *

Academy Memberships Awarded

Active

Dr. Norman L. Beyer
Dr. Hunter Brinker
Dr. Leroy D. Cagnone
Dr. Lawrence R. Ludwigsen, Jr.
Dr. C. Patterson
Dr. Johan E. Wold
Dr. Kenneth M. Ray

Associate

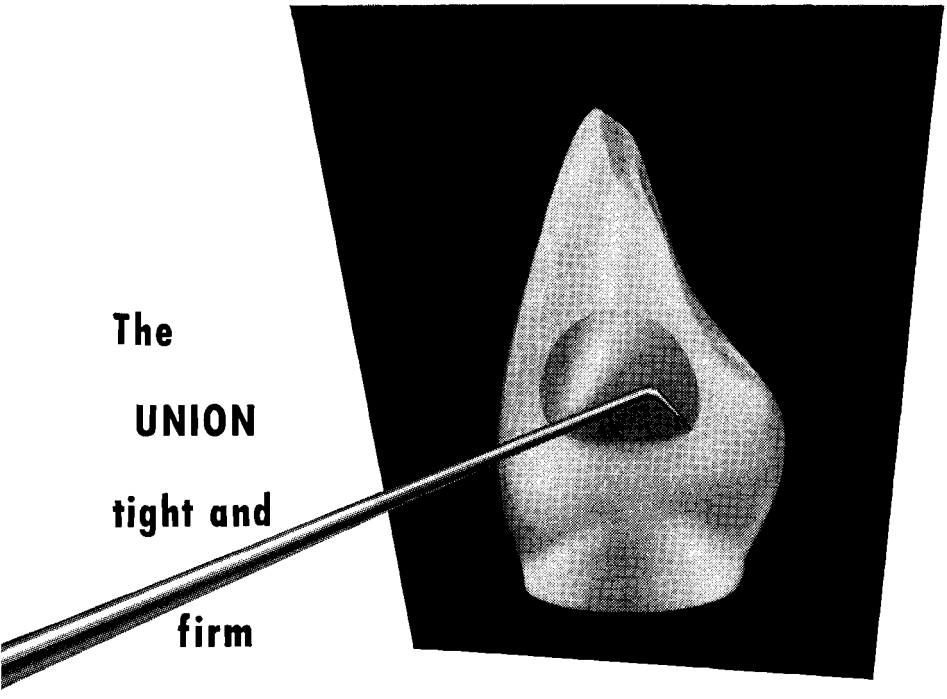
Dr. Richard Adelson
Dr. James F. Alexander
Dr. Bruce H. Bell
Dr. Ray Boelstler
Dr. James H. Brenner
Dr. Lawrence D. Brucker
Dr. Joseph L. Burke
Dr. Robert Wm. Stuart Cannon
Dr. Gordon H. Cooley
Dr. Fletcher Marbury Crait
Dr. Daniel C. Cryan
Dr. Perry W. Dungey
Dr. Earle D. Eshelman
Dr. Don Jack Fong
Dr. Donald Frederick Fournier
Dr. Chester J. Gibson
Dr. Robert E. Going
Dr. Carl T. Grazzini
Dr. James D. Haberman
Dr. Archie Harry Haljun
Dr. Alan Barrett Homan
Dr. Ronald E. Jordon
Dr. Joseph Kanter
Dr. Joseph J. Krajewski
Dr. Harold R. Laswell
Dr. Dan Loving
Dr. George V. Lyons
Dr. David Marmer
Dr. D. Blake McAdam
Dr. Gordon W. McPhee
Dr. Irwin W. Mindell
Dr. William A. Monroe, Jr.
Dr. Joseph Napaila Morris
Dr. Harold A. Nordeng
Dr. Donald L. Pape
Dr. John E. Pritz
Dr. Marvin G. Schmidt
Dr. Alfred Seip Schuchard
Dr. Benjamin David Silverstein
Dr. Harris Silverstein
Dr. Clayton A. Swanson, Jr.
Dr. Duane B. Warr
Dr. Donald A. Welk
Dr. Wade B. Winnett
Dr. Charles Roger Wold

Honorary

Dr. Ralph Phillips

Life

Dr. Lester Myers
Dr. J. M. Sheldon
Dr. Harry True
Dr. Victor Westin



FOR A LONG LIFE!

Only the Gold Foil can last for the longest lifetime because only the Gold Foil forms with the natural tooth a union that is *interlocked* and tight! And such a union is made best with "M-H" Extra Pliable Cylinders.

A perfect balance of cohesiveness and softness makes them the *easiest-working* Foil ever offered to the dental profession. Responding to the condenser instantly, they pack easily and rapidly into a dense, resistant restoration of great edge-strength and unsurpassed hardness. They do not balk at the condenser, but follow pliantly, going true to the mark the very first time they are condensed to place.

Feel their responsiveness under your own condensing point. Enjoy thrilling delight you never experienced before!

MORGAN, HASTINGS & CO.
2314 Market Street, Philadelphia 1, Pa.

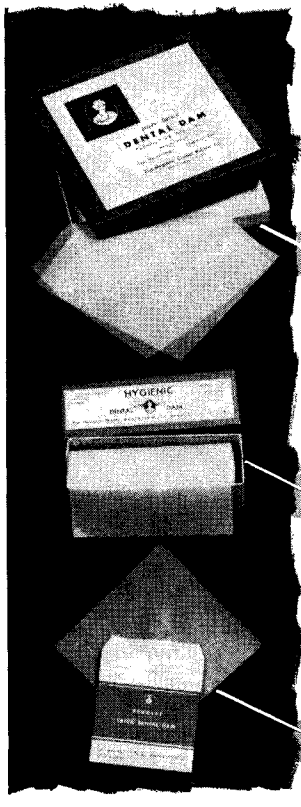
Please send, through my dealer, 1/40 oz. of "M-H" Extra Pliable Cylinders — price, $3.10.

Doctor .....

Address .....

Dealer .....

HYGIENIC offers Pure Latex DENTAL DAM



in cuts and thicknesses to meet the requirements of every gold foil operation

★ READY CUT DAM

Available in:
5" squares — 52 pieces per box
6" squares — 36 pieces per box
Light or Dark Color
Thin, Medium, Heavy or Extra Heavy Gauge

★ DAM IN ROLLS

Available in:
½ sq. yd. roll — 5" or 6" wide
1 sq. yd. roll — 5" or 6" wide
Light or Dark Color
Thin, Medium, Heavy or Extra Heavy Gauge

★ STERILE DAM

Each piece individually packaged to keep it sterile until used.

Available in:
5" squares — 30 pieces per pkg.
6" squares — 30 pieces per pkg.
Light or Dark Color
Medium Gauge only

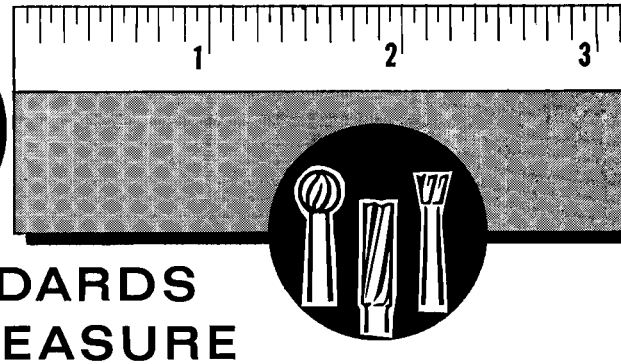
GAUGES & TOLERANCES

Thin	— .005" ± .001"
Medium	— .0075" ± .001"
Heavy	— .010" ± .001"
Ex. Heavy	— .0125" ± .001"

STRONG, TEAR-RESISTANT Hygienic Latex Dam, together with modern accessories (from other manufacturers), now combine to render the recognized advantages of the rubber dam readily available for easy application by all. See your dealer or write us. New technics for application of the rubber dam would be welcome for our file.

another quality product by the manufacturers of
PERM • MICROLON FLEXIBOLES

THE HYGIENIC DENTAL MANUFACTURING CO.
AKRON 10, OHIO, U. S. A.



STANDARDS FOR MEASURE

test your supplies against this rule

NEW TRUE DENTALLOY®

True to its reputation: the best.
Easier to manipulate, carves smoothly, polishes readily, lasting service!

NEW FILLING PORCELAIN

Unequalled in esthetics, physical properties: color harmony, fluorescence, and simplicity of technique. A pleasure to use.

Proved more efficient.
Run true, cut fast, last long.
Cost less to use.

SSW CARBIDE BURS

PATIENT SATISFACTION ASSURED

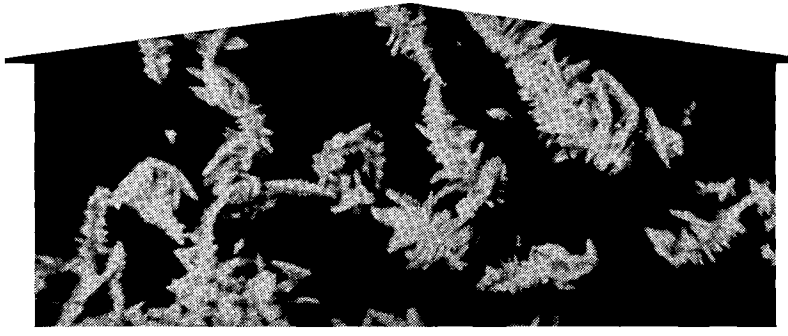
Order from your local S. S. WHITE dealer.

THE S. S. WHITE DENTAL MANUFACTURING CO., Philadelphia, Pa. 19105

2 RECOGNIZED AND ACCEPTED AIDS TO SUCCESSFUL AND ENDURING TOOTH RESTORATION

WILLIAMS MAT GOLD is an interlaced, interlocked, crystalline product of the highest purity ever marketed commercially. After proper annealing to expel air-borne cohesion impairing surface deposits, it may be condensed by standard methods into masses of a density and hardness comparable to a Type A gold casting. For ease of working, and where indicated, there is no superior filling material.

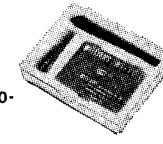
WILLIAMS MAT-FOIL is Mat Gold with a thin overlay of gold foil covering the surfaces. It has been developed for ease of handling and results in a restoration of outstanding density.



Mat crystals magnified about 100 times. This shows the "pine tree" effect which makes it possible for the interlocking of particles. Also, this configuration gives a greater surface area to enhance cold welding.

WILLIAMS-JUSTI

Your special introductory outfit supplies Mat Gold or Mat-Foil, serrated Plugger Points, and Handle. Contact your dealer for your introductory kit.



WILLIAMS GOLD REFINING COMPANY, INC.

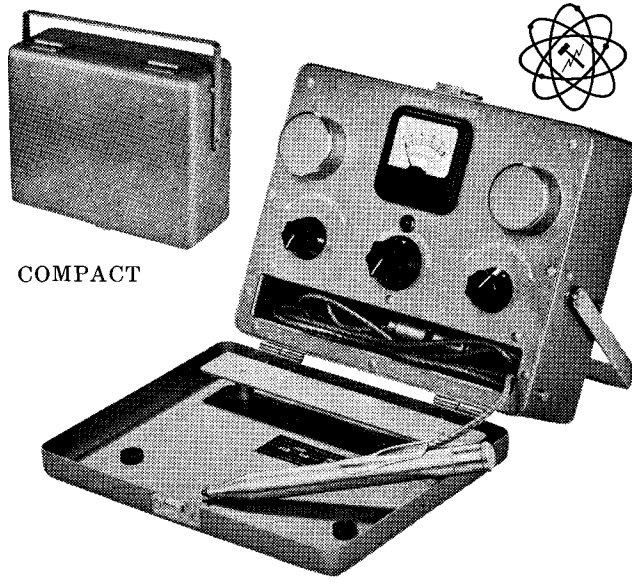
2978 MAIN STREET BUFFALO 14, NEW YORK

and WILLIAMS GOLD REFINING CO. OF CANADA, LTD.

FORT ERIE ONTARIO

ELECTRO - MALLET

The Electronic Foil Condenser



COMPACT

Operates on the new principle of high-frequency malleting at reduced intensity without sacrifice of foil density. Recognized as superior by leading dental schools and nationally known foil operators.

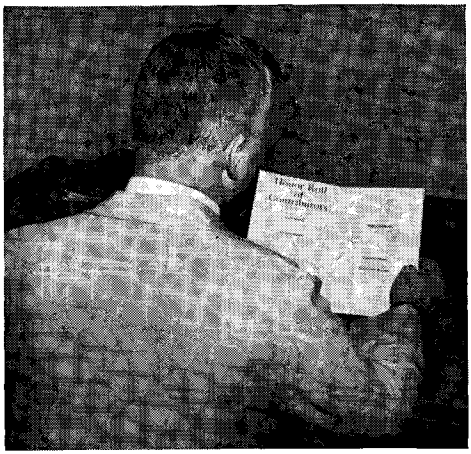
The **Electro - Mallet** is equally advantageous for condensing **amalgam.**

A 30-day trial without obligation to purchase is available. Please write for details.

McShirley Products

6535 SAN FERNANDO ROAD GLENDALE 1, CALIF.

All Dentistry Honors This Man ...He Could Be You



He's reading his name on the Honor Roll of Contributors to the American Fund for Dental Education.

This man's name, or his company's, appears on the AFDE Honor Roll published annually at this time of year by THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION and the JOURNAL OF DENTAL EDUCATION. This honor is an expression of a much greater recognition from every person concerned with our nation's dental health. The Honor Roll is also given special prominence in the Fund's Annual Report which receives wide distribution each year.

This man knows that dollars soundly invested in scientific research can lead to greater progress. Such investments in the future have their counterparts in dental health. A stepped-up investment in dental education must start now to meet the nation's future dental needs.

His name is on the AFDE Honor Roll of Contributors—is yours? The programs of the Fund offer a worthwhile opportunity to invest in the future of the nation's dental health. Join this far-sighted man in making an annual contribution to the Fund. *You* have a vital stake in the progress which dental education will make in the years just ahead.

AF DE

AMERICAN FUND FOR DENTAL EDUCATION

410 N. Michigan Avenue, Chicago, Illinois 60611

...your avenue for giving to enhance, nationally, the performance and prestige of Dentistry, through education

(This space contributed by the publisher)