

**Advanced  
Restorative  
Dentistry  
modern  
materials  
and  
techniques**

Lloyd Baum,



# **Advanced Restorative Dentistry modern materials and techniques**

**Lloyd Baum D.M.D., M.S., F.A.C.D.**

Professor and Chairman  
Department of Restorative Dentistry  
School of Dental Medicine  
at Stony Brook  
State University of New York

**1973**

**W. B. SAUNDERS COMPANY**  
Philadelphia / London / Toronto

W. B. Saunders Company: West Washington Square  
Philadelphia, Pa. 19105

12 Dyott Street  
London, WC1A 1DB

833 Oxford Street  
Toronto 18, Ontario

Advanced Restorative Dentistry: Modern Materials and Techniques

ISBN 0-7216-1598-8

© 1973 by W. B. Saunders Company. Copyright under the international Copyright Union. All rights reserved. This book is protected by copyright. No part of it may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without written permission from the publisher. Made in the United States of America. Press of W. B. Saunders Company. Library of Congress Catalog card number 72-86444.

Print No.: 9 8 7 6 5 4 3 2 1

# Contributors

LEIF BAKLAND, D.D.S.

*Dental Staff, University Health Service, Harvard University, Cambridge, Massachusetts.*

THOR BAKLAND, M.B.A., D.D.S.

*Assistant Professor, Department of Restorative Dentistry, School of Dental Medicine, State University of New York at Stony Brook, New York.*

JOHN A. BARTLETT, D.D.S., F.A.C.D.

*Private Practice, Detroit, Michigan.*

LLOYD BAUM, D.M.D., M.S., F.A.C.D.

*Professor and Chairman, Department of Restorative Dentistry, School of Dental Medicine, State University of New York at Stony Brook, New York.*

MICHAEL A. COCHRAN, D.D.S.

*Lt., DC, USN; Assistant Dental Officer, United States Naval Station, FPO, New York.*

HUGH COOPER, Jr., D.D.S., M.S., F.A.C.D., F.I.C.D.

*Former Assistant Professor, Crown and Bridge Prosthodontics, School of Dentistry, The University of Michigan, Ann Arbor, Michigan.*

JAMES D. ENOCH, D.D.S., M.S., F.A.C.D.

*Capt., DS, USN; Assistant Director, Dental Department, NTC, Great Lakes, Illinois.*

DANIEL FREDERICKSON, D.D.S., M.S.

*Chairman, Department of Dentistry, Illinois Masonic Medical Center, Chicago, Illinois.*

ROBERT L. KINZER, D.D.S.

*Professor and Chairman, Department of Restorative Dentistry, School of Dentistry, Medical College of Georgia, Augusta, Georgia.*

JUDSON KLOOSTER, D.D.S., M.M.S., F.A.C.D.

*Dean, School of Dentistry, Loma Linda University, Loma Linda, California.*

E. E. LA FRIENIER

*Ceramist, Beverly Hills, California.*

RALPH L. LAMBERT, D.M.D., M.S.

*Lt. Col., DC, USAF; Assistant Chairman for Resident Education, Department of General Dentistry, Wilford Hall, United States Air Force Medical Center, San Antonio, Texas; Clinical Assistant Professor, Department of General Practice, University of Texas Dental Branch, Houston, Texas.*

MELVIN R. LUND, D.M.D., M.S., F.A.C.D.

*Professor and Chairman, School of Dentistry, Indiana University—Purdue University, Indianapolis, Indiana.*

GEORGE E. LYMAN, D.D.S., M.S.D.

*Former Assistant Professor and Chairman, Department of Pedodontics, School of Dentistry, Loma Linda University, Loma Linda, California; Dental Staff, Goleta Valley Hospital, Goleta, California.*

DAVID B. LYNN, D.D.S.

*Guest Lecturer, Department of Periodontics, Baylor College of Dentistry, Dallas, Texas.*

KAZUHIRO MIZUKAWA, D.D.S., D.D.Sc.

*Associate Professor of Prosthetic Dentistry, Nihon University School of Dentistry at Tokyo and Matsudo, Japan; Nihon University Dental Hospital at Tokyo and Matsudo, Japan.*

RONALD J. NICHOLSON, D.D.S., F.A.C.D.

*Associate Professor, Department of Operative Dentistry, School of Dentistry, University of California, San Francisco, California.*

DOUGLASS B. ROBERTS, D.D.S.

*Assistant Professor, Department of Restorative Dentistry, School of Dentistry, Loma Linda University, Loma Linda, California.*

NELSON W. RUPP, D.D.S., M.S.

*Research Associate, American Dental Association Research Unit, National Bureau of Standards, Washington, D.C.; Consultant, Naval Graduate Dental School, Professorial Lecturer, Georgetown University College of Dentistry, Washington, D.C.*

WALTER R. SCHÖTTL, D.D.S.

*Instructor, Institute of Post-Graduate Rehabilitation, Erlangen, West Germany.*

LARRY V. SMITH, D.D.S., M.P.H.

*Assistant Professor, Department of Preventive Dentistry and Community Health,  
School of Dentistry, Loma Linda University, Loma Linda, California; Dental  
Staff, San Luis Obispo General Hospital, San Luis Obispo, California.*

KENNETH B. SOELBERG, D.D.S., F.A.C.D.

*Clinical Professor of Operative Dentistry, School of Dentistry, University of  
California, San Francisco, California.*

MARVIN M. STARK, D.D.S., F.A.C.D., F.I.C.D.

*Professor of Operative Dentistry and Oral Biology, School of Dentistry, Uni-  
versity of California, San Francisco, California.*



# Foreword

As with other professions, dentistry is undergoing many changes in its mode of practice and its treatment of patients. Some of these changes may not be apparent to the recent graduate, but they are quite obvious to the progressive practitioner with ten years or more of experience.

Evolutionary changes in practice have not been caused by changing patterns in dental disease, although the wide campaigns of fluoride therapy and prevention have had their effect in reducing the incidence of dental caries. Nor have these changes necessarily been the result of increased knowledge. From the standpoint of the restorative dentist, the important changes in dental therapy have been the indirect result of improved materials and mechanical devices. Whereas advances in the biologic sciences can take credit for improvement in medical practice, progress in the fields of engineering and materials can claim major responsibility for changes in dental therapy involving dentin and enamel.

Pneumatic engineering and the ability of industry to produce miniature ball bearings have resulted in the development of the air rotor handpiece. Elastic impression materials, composite resins, and miniature anchor pins are but a few of the other technological advances that have placed restorative dental therapy into a new era.

The development of the air rotor, diamond stones, and carbide burs has had one basic effect, the possibility of reducing tooth structure easily and rapidly at the will of the operator. Prior to the 1950's this was not possible. Crowns were extremely difficult to prepare using only slow speed with steel burs and mounted stones. Consequently, only carious and defective areas were removed and restored as "fillings." When grinding and cutting enamel were made easy, it became a simple matter to reduce unwanted enamel and dentin and to prepare a tooth for a full crown restoration.

It followed, therefore, that many teeth which had been "filled" heretofore could now be "crowned" with ease, and beneficial contours could be established which had not been present previously. This enabled the dentist to realign overlapped teeth and to reocclude tooth surfaces which had become worn or which did not correctly match opposing dentition. Single tooth dentistry was now replaced by quadrant units. New concepts of occlusion, full mouth reconstruction, and four-handed dentistry were the natural outgrowth of these technological advances.

Despite these advances, however, everything that is new is not necessarily good. With each new era come excesses and abuses untempered by long range observation and sound knowledge. Dentistry is no exception in this regard. Just because a central incisor can be reduced to a stump in short order and because the ceramist can fabricate a bonded crown for it, it is not always desirable that central incisors be restored in this manner.

As it pertains to hard tooth substance, dental disease requiring "surgical" intervention may occur in the form of caries, an abraded surface or a fractured incisal corner. Whether a hard tissue pathologic condition occurs as a simple entity or whether it is complicated by malalignment, malocclusion, or other factors, the young clinician is as constrained to diagnose and plan his treatment as is the experienced practitioner. A radical approach to restorative procedures may be more exciting and dramatic but does not necessarily ensure a safe, long-lasting period of service.

In this book authoritative and experienced clinicians who are aware of pitfalls and dangers as well as the benefits of the new technologies, have been selected to present progressive views in these areas. Of the contributing authors, some are inclined to follow more conservative established practice, whereas others will present a more innovative but practical clinical approach.

Throughout the book, however, one philosophy prevails: tooth conservation and enamel salvage. The author feels it is unwise to mutilate mouths indiscriminately by unnecessary crown reduction. In other words, a crown restoration is to be avoided if a simple restoration will serve the patient's needs as well.

This philosophic position has been taken for several reasons:

(1) Many current fads, particularly in areas of practice management, have proposed the need of "selling" the patient an "ideal" type of dentistry. Much of this "ideal" dentistry involves bonded porcelain crowns and bridges. While patient education is necessary and crowns and bridges are a part of the dentist's repertoire, they should be viewed in proper perspective. Whether or not patients need full mouth reconstruction is a matter of clinical judgment more than promotion and economic concern.

(2) Dental laboratories are playing a gradually more important role in the production of dental service. Availability of ceramic services is swaying the practitioner toward this type of treatment plan although it may not necessarily be indicated for the patient's best interest.

(3) Some dental schools are drifting away from sound instructional procedures in the basic fundamentals of operative techniques. Large student enrollments with insufficient supervisory instruction are resulting in graduates who do not have a working knowledge of conservative operative procedures. Unacquainted with and unable to perform these procedures, they cannot be expected to offer a full range of patient treatment plans.

(4) Patients are readily inclined to accept poor dentistry if it is cosmetic. It is easier to obtain patient approval of a properly colored but poorly fitting ceramic crown than a well-fitting gold-colored onlay. Frequently a patient's demand for esthetic dentistry does not harmonize with his needs and his best interests.

Outstanding authors and clinicians have combined their efforts to provide material for this book. Efforts have been made to present material which is usable in terms of current clinical practice. Although the spectrum of dental research is constantly changing, revision and changes will probably not be necessary for several years. Although some of the material may be controversial, the concepts and techniques portrayed within this book are accepted and practiced successfully by a large segment of the profession.

Cavity medication is a subject of interest which has been covered thoroughly by *Marvin Stark* and his associates at the University of California in San Francisco. Their use of 9-aminoacridine as a disinfectant and cleansing agent is well described along with the use of calcium hydroxide as a pulp capping agent. The technique he describes is successfully practiced at the University of California School of Dentistry.

To many patients pain or fear of pain is a deterrent to dental treatment. A patient who will submit himself for treatment of an abscessed tooth will not seek therapy for restorative procedures. *Thor and Leif Bakland* have described intravenous sedation and its role in the office of the general practitioner. As an adjunct to pain control, the recommendations and technique described in their chapter will be of help to the reader.

As one renders operative dental service he should not forget the needs of a child patient. Because of their past experience, *George Lyman* and *Larry Smith* are well qualified to write on this subject. Some excellent suggestions in philosophy of treatment are given, along with operative techniques for the primary dentition.



A dry operating field is a requirement of all operative and endodontic dental procedures. *Daniel Frederickson* has made an excellent presentation of the latest advances in rubber dam techniques. Of particular interest to the periodontist is his method of using the rubber dam to construct acrylic splints for stabilizing loose teeth. An additional chapter deals with the treatment of the gingival or Class V lesion. Isolation of this difficult and critical area is a requirement of any recognized restorative procedure. In this chapter attention is directed toward this end, although procedures themselves are discussed as well.

Cement bases and luting agents must always be given due consideration, particularly during an era when the practitioner is confronted with newer materials. As a definite authority in this field, *Woodrow Rupp*, of the National Bureau of Standards, deals with these subjects in a scholarly and useful manner.

For decades, amalgam has been a standard dental restorative material. With the advent of spherical alloy, different cavity designs, and mercury-alloy ratios, the dentist who does not understand them may be confused. *Ralph Lambert*, in a most orderly fashion, has explained and simplified most of these variables so the dentist can relate himself to them in a more intelligent manner.

In this same regard, *James Enoch* and *Michael Cochran* have aptly discussed the treatment of teeth by the use of reinforcing pins. Although the sophisticated use of the threaded pin made its debut with Dr. Markley many years ago, the friction lock and self-threading types have only recently come upon the scene. These authors have made an impartial evaluation of the literature and have provided the reader with valuable data pertaining to their use.

Despite its roots in antiquity, direct gold still has a definite place in the operative dental practice of the private practitioner. *Douglass Roberts*, of Loma Linda University, School of Dentistry, has discussed the current status of the modern filling golds and methods by which they are most effectively used. Particular emphasis has been placed on the Class V and Class III cavities.

*Melvin R. Lund*, a veteran teacher of operative dentistry and chairman of that department at Indiana University, has dealt with the newer composite resins and their role in clinical practice. No space has been provided in this book for acrylic resins and the silicate cements, inasmuch as they are tending to become obsolete materials.

More and more of the time spent by the restorative dentist is employed in the preparation, fabrication, and seating of the cast gold restoration. Although most of the castings are actually made by the laboratory technician, the dentist himself must be acutely aware of tooth preparations and tissue management. Because of a tendency in practice for the dentist to follow the path of least resistance and prepare all teeth for full crowns, an entire chapter has been devoted to the conservative cast gold restoration. Dean *Judson Klooster* of Loma Linda University not only has masterfully met the challenge and presented the reader with a scientific analysis of cavity preparations but also has described and illustrated in word and picture a comprehensive array of preparations for both anterior and posterior teeth.

Tipped teeth, rotated, and overlapped teeth pose special problems not ordinarily met by conventional cavity preparations. Another chapter dealing with some atypical cavity preparations gives the conservative dentist a new look at some innovative designs for abutment preparations.

*John Bartlett* leads the reader through a highly practicable procedure of tissue management and impression taking. Helpful hints in tissue retraction and laboratory aspects of crown fabrication are sprinkled throughout the body of this chapter. Regardless of whether hydrocolloid, silicone, or the mercaptan rubbers are used, the reader cannot help but benefit from this most informative presentation. The reader will also be pleased with Dr. Bartlett's clear and concise presentation of the process of silver plating dies.

The role of the restorative dentist has become increasingly important with recent

advances in endodontics. As more teeth are salvaged, he is faced with new problems; brittle roots must be brought back into function, and missing crowns must be replaced. In a most scholarly manner *Hugh Cooper* has approached this problem. He has classified restorative problems and outlined methods by which permanent anchorage can be achieved for each problem. Well-illustrated drawings make this chapter a most meaningful one for the practitioner in his efforts to provide his patients with this valuable service.

Casting directly to the die, although not new in the annals of dentistry, has taken on new proportions with the advent of Divestment, a new refractory product produced by The Whip-Mix Corporation. So important is this material in the casting process that two chapters have been devoted to its use. One by *Kazuhiro Mizukawa* of Japan describes the fundamental principles of its use. The other by *Walter Schöttl* of West Germany shows its applicability to crown and bridge and reconstructive techniques. For some reason the frontiers in this technique have advanced further in Europe than in the United States. Particularly has this been true in West Germany, as will be clearly evident from the chapter by Dr. Schöttl. The American dentist and laboratory technician will find his procedures new and exciting, particularly as they pertain to methods of full mouth reconstruction.

Although not new in crown and bridge procedures, the palatal strap or loop is used only occasionally by most dentists. This unusual method of engineering design and the cross-arch splinting that it provides should be utilized more frequently. A rationale pertaining to the use of strap connectors is described along with illustrations showing a variety of applications.

The discussion of porcelain remains an important part of a textbook of restorative dentistry. The baked porcelain inlay with retentive pins still has its place in the armamentarium of the sophisticated dentist. This subject is beautifully covered by *Robert L. Kinzer*, Chairman of the Department of Restorative Dentistry at the Medical College of Georgia. His practical approach to this subject embodies the use of new materials, particularly the refractory investment, which eliminate the need for the platinum matrix.

As esthetics in our culture become more and more a matter of concern to the dentist, the baked porcelain crown plays a progressively greater role as a restorative entity. Because the tooth preparation and crown placement do not necessarily require special care and treatment, a large number of crowns are carelessly prepared, resulting in permanent damage to gingival tissue. A most logical and rational approach to the prevention of tissue damage and gingival scarring is well presented by *David Lynn* of Dallas, Texas. His philosophy in this regard is most sound and will appeal to a large number of readers. The reader will also be pleased with Dr. Lynn's helpful hints on diastema closure and other esthetic considerations in crown contours.

Another ceramic problem involves the lack of teamwork between the dentist and the ceramic technician. Two aspects of this problem are evident: (1) the ceramist fails to reproduce what the dentist has in mind, and (2) the dentist fails to produce suitable crown preparations, impressions, and bite registrations for the ceramist. In an effort to resolve these problems, *E. E. La Frierier*, a ceramist and teacher of world renown, was chosen to write this chapter. With special emphasis upon the latter aspect of the problem, Mr. La Frierier cites several case studies which illustrate common problems that confront the technician. As will quickly be observed by the reader, virtually all of these problems could have been quickly corrected by the dentist at the chair had he been aware of difficulties he had inadvertently imposed upon the technician.

This chapter by Mr. La Frierier contains valuable information for even the best of operators, and the dentist who reads this chapter will subsequently view his preparations with a more critical eye.

While restorative dentistry is not an exact science, most restorative procedures can be accomplished with predictable accuracy. The conscientious practitioner will

strive toward providing his patient with a good service which considers permanency, function, and appearance. At the same time, he will not neglect expediency, ease of treatment, and practicable office routines so necessary in the operation of a dental practice.

Throughout the text an effort has been made to present the material in a practicable manner so that it will be most valuable to the clinician. It is the hope of the author that this book will stimulate the dentist to provide his patient with a health service which stresses the conservation of teeth and the permanence of restorations.

LLOYD BAUM

# Acknowledgments

The editor and author would like to express appreciation to all the contributing authors and clinicians who have made this book possible. Without their tireless efforts in preparing the manuscripts and illustrations, this book would not have been possible.

The author would like to express a debt of gratitude to the Graphics Department of Loma Linda University, School of Dentistry, particularly to its director, Ellis Jones, and the photographer, Bob Petterson. In any text of this sort a great deal of time and effort goes into the preparation of the drawings and duplication of transparencies into pictures suitable for publication.

The able secretarial assistance provided by Peggy Johnston and Connie Jackson is also deeply appreciated. Their willingness to copy and re-copy the written material and to correspond with the contributing authors has been a real asset.

# Contents

<b>Chapter 1</b>	
<b>PULP PROTECTION .....</b>	<b>1</b>
<i>Marvin M. Stark, Ronald J. Nicholson, and Kenneth B. Söelberg</i>	
<b>Chapter 2</b>	
<b>INTRAVENOUS SEDATION IN GENERAL DENTISTRY .....</b>	<b>8</b>
<i>Thor Bakland and Leif Bakland</i>	
<b>Chapter 3</b>	
<b>OPERATIVE PROCEDURES FOR PRIMARY TEETH.....</b>	<b>18</b>
<i>George E. Lyman and Larry V. Smith</i>	
<b>Chapter 4</b>	
<b>RUBBER DAM DENTISTRY.....</b>	<b>34</b>
<i>Daniel Frederickson and Lloyd Baum</i>	
<b>Chapter 5</b>	
<b>INTERMEDIARY BASE AND CEMENTATION .....</b>	<b>59</b>
<i>Nelson W. Rupp</i>	
<b>Chapter 6</b>	
<b>AMALGAM RESTORATIONS .....</b>	<b>73</b>
<i>Ralph L. Lambert</i>	
<b>Chapter 7</b>	
<b>PIN-RETAINED AMALGAM .....</b>	<b>88</b>
<i>James D. Enoch and Michael A. Cochran</i>	
<b>Chapter 8</b>	
<b>DIRECT GOLD IN RESTORATIVE DENTISTRY.....</b>	<b>99</b>
<i>Douglass Roberts and Lloyd Baum</i>	

**Chapter 9**

**COMPOSITE MATERIALS FOR DENTAL RESTORATIONS..... 132**

*Melvin R. Lund*

**Chapter 10**

**MANAGEMENT OF THE GINGIVAL LESION..... 144**

*Daniel Frederickson and Lloyd Baum*

**Chapter 11**

**CONSERVATIVE TOOTH PREPARATION FOR CAST RESTORATIONS..... 158**

*Judson Klooster*

**Chapter 12**

**IMPRESSION TECHNIQUES UTILIZING THE MERCAPTAN RUBBERS..... 183**

*John A. Bartlett*

**Chapter 13**

**RESTORATION OF THE DEVITALIZED TOOTH..... 207**

*Hugh Cooper, Jr.*

**Chapter 14**

**ATYPICAL PREPARATIONS FOR CAST GOLD RESTORATIONS..... 226**

*Lloyd Baum*

**Chapter 15**

**DIVESTMENT FOR SINGLE-UNIT CASTINGS ..... 237**

*Kazuhiro Mizukawa*

**Chapter 16**

**DIVESTMENT FOR RECONSTRUCTION PROCEDURES... 257**

*Walter Schöttl*

**Chapter 17**

**LINGUAL AND PALATAL STRAPS IN RESTORATIVE PROCEDURES..... 289**

*Lloyd Baum*

**Chapter 18**

**PORCELAIN INLAYS WITH RETENTIVE PINS ..... 298**

*Robert L. Kinzer*

**Chapter 19**

**THE RELATIONSHIP BETWEEN HEALTH AND  
ESTHETICS IN GINGIVAL TISSUE ..... 311**

*David B. Lynn*

**Chapter 20**

**THE ESTHETIC VENEER CROWN VIEWED BY  
THE TECHNICIAN ..... 324**

*E. E. La Frierier*

**INDEX ..... 337**



## Chapter

## 1

# Pulp Protection

Marvin M. Stark  
Ronald J. Nicholson  
and  
Kenneth B. Soelberg

Although numerous investigators have demonstrated that the dental pulp of human and animal teeth has the ability to repair itself following a traumatic injury, the method of treating exposed dental pulp and the grossly carious tooth presents a challenging problem for the clinician. The problem that confronts the clinician is the placement of a suitable protective medium over the exposed dentinal tubules following a cavity preparation or crown preparation.

This chapter will deal with the various preparations and techniques available for pulp protection, pulp capping, and for the treatment of deep carious lesions.

Over the years, much has been written about the effects of various preparations on the production of a calcific matrix over the surfaces of exposed pulps. It becomes obvious, in reviewing the literature, that we have progressed little from the calcium hydroxide preparation first suggested by Hermann in 1937.<sup>1</sup>

An impressive array of drugs and materials has been suggested at different times for encouraging the healing of exposed pulp wounds. In reviewing this list, one cannot help noting that not one of these can rightly be placed in the category of a true biologic wound dressing.<sup>2</sup>

Shroff suggests that the following mechanisms of tissue repair take place in the pulp:<sup>3</sup>

1. Inflammation during which irritants are a factor
2. Repair of the exposed surface.
3. Regeneration of the lost tissue.

Shroff also lists three clinical problems associated with the healing of pulp wounds.

1. Removal of existing irritants, mainly bacterial.
2. The provision of a seal which will protect the healing site from the oral environment.
3. The incorporation, either in or beneath such a seal, of a sound biologic wound dressing which will encourage the normal and natural growth and healing processes.

The literature is replete with descriptions of drugs used for pulp capping. The teaching at dental schools also incorporates a wide variety of pulp-capping methods.<sup>4</sup> Two common materials used in pulp-capping procedures are calcium hydroxide and corticosteroids.

**CALCIUM HYDROXIDE**

The rationale for the use of an effective antibacterial agent with good tissue tolerance in conjunction with calcium hydroxide to elicit a secondary dentin response has been well established both clinically and histologically.

Hydrated lime (slaked lime) is a common source of calcium hydroxide. The white powder is quite stable, as are its aqueous forms. The powder is only slightly soluble in water, and only a portion of the soluble fraction disassociates to form calcium ions and hydroxide ions. Aqueous suspensions are unstable; hence they must be agitated vigorously before use. Stable suspensions of calcium hydroxide are quite alkaline and exhibit a PH value from about 9 to 12.

In its sterile powdered form, calcium hydroxide is used infrequently to cover (cap) an exposed tooth pulp. Usually sterile distilled water, saline, or the solution from a local anesthetic carpule is added to the calcium hydroxide preparation to make a thin paste. This paste is then applied to the exposed pulp.

Gurney states that the properties of calcium hydroxide preparations can be improved by the addition of organic substances.<sup>5</sup> Hydroxyethyl cellulose and carboxymethyl cellulose are two of the most commonly used organic compounds. Slightly soluble organic salts such as barium sulfate, calcium sulfate, and magnesium oxide may also be used.

There are a number of proprietary preparations which are currently being used as pulp-capping agents and as liners and bases under restorative materials. These compounds are essentially calcium hydroxide preparations or zinc oxide-eugenol preparations.

A pulp-capping procedure in use at the University of California for twenty years has previously been reported by Sapone and Nicholson.<sup>6,7</sup> The high rate of success with this technique is attributed to a number of factors which will be discussed subsequently.

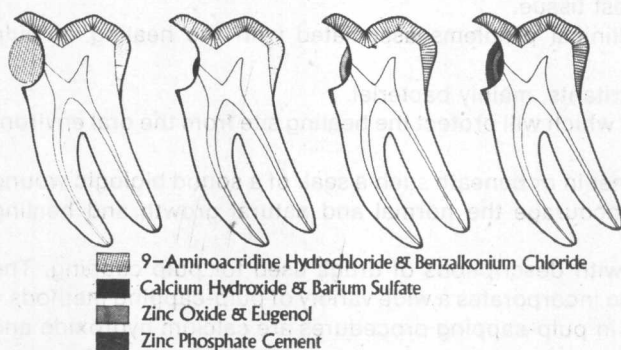
**DIRECT PULP CAPPING**

The University of California pulp-capping procedure is well illustrated in Figure 1-1. The tooth should be isolated with a rubber dam. When the exposure is made, a cotton pellet saturated with Acriphen\* is placed over the exposure and left in place for one minute. The antibacterial properties of Acriphen have previously been described by Stark.<sup>8</sup> Some hemostasis occurs when the Acriphen is applied in this manner. If hemorrhage is not controlled, a small section of resorbable oxycellulose† can be placed over the exposure site to initiate the clot.<sup>9</sup>

Following the application of Acriphen, calcium hydroxide is applied to the area of

\*9-aminoacridine hydrochloride and benzalkonium chloride. Available under the trade name of Acriphen from Obergfel Bros., 420 S. San Pedro St., Los Angeles, Calif. 90013.

†Surgicel, available from Johnson & Johnson Co., New Brunswick, N. J.



**Figure 1-1.**  
Pulp-capping procedure.