Glickman's

Clinical Periodontology

PREVENTION, DIAGNOSIS AND TREATMENT OF PERIODONTAL DISEASE IN THE PRACTICE OF GENERAL DENTISTRY

Fifth Edition

FERMIN A. CARRANZA

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W. B. SAUNDERS COMPANY
Philadelphia London Toronto

W. B. Saunders Company · West Washington Square
Philadelphia, PA 19105

1 St. Anne's Road
Eastbourne, East Sussex BN21 3UN, England

1 Goldthorne Avenue
Toronto, Ontario M8Z 5T9, Canada

Listed here is the latest translated edition of this book, together with the language of the translation and the publisher.

Italian (2nd Edition)—Editrice Scientifica, Milan, Italy

French (4th Edition)—Julien Prelat, Paris, France

Spanish (4th Edition)—NEISA, Mexico City, Mexico

Library of Congress Cataloging in Publication Data

Glickman, Irving.

Glickman's Clinical periodontology.

Includes bibliographies.

1. Periodontics. I. Carranza, Fermin A. II. Title. III. Title: Clinical periodontology. [DNLM: 1. Periodontal diseases. WU240 G559c]

RK361.G58 1978 617.6'32 77-16991

ISBN 0-7216-2440-5

Glickman's Clinical Periodontology ISBN 0-7216-2440-5

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

PREFACE
to the Fifth Edition

Dr. Irving Glickman was a distinguished researcher and teacher whose dynamic personality, clear judgment, and profound knowledge of all areas of periodontics and related fields marked him as a leader in the progress of our discipline for three decades. This revision of his major work *Clinical Periodontology* has attempted to respect his basic concepts and approaches to the problems while incorporating new information and including recent findings that have shed light on previously obscure subjects.

This new edition of *Clinical Periodontology* incorporates all the major advances that have taken place in periodontics since the last edition while remaining a text aimed at the student and the practitioner.

After careful consideration, a major rearrangement of chapters was done in an attempt to coordinate the existing material and the new being added. In many cases, the new material made extensive revisions and rewriting of chapters necessary.

Fortunately, I was able to obtain the valuable help of a group of periodontists with remarkable expertise and knowledge in different clinical and research areas, to whom I am extremely grateful. Their excellent work, reflected in their contributions to the fifth edition of *Clinical Periodontology*, has been brought to fruition on the rich soil offered by the monumental task accomplished by Irving Glickman.

The group of distinguished collaborators to this fifth edition of *Clinical Periodontology* have contributed to different degrees in the various chapters.

Dr. Alfred Weinstock revised and updated the section on "The Tissues of the Periodontium" and also assisted in rewriting Chapter 6 on "Gingivitis." *Dr. Gerald Shklar* revised the chapter on "The Oral Manifestations of Dermatologic Disease," which now includes chronic desquamative gingivitis. *Dr. Vladimir Spolsky* revised and largely rewrote the chapter on epidemiology.

Dr. Michael G. Newman contributed to Chapter 13 on "Classification of Periodontal Disease" and rewrote the chapters on host response, the role of microorganisms, saliva, calculus, etc. He also wrote the section on antimicrobial therapy, included in Chapter 45. *Dr. William K. Solberg* revised and rewrote the chapters dealing with principles of occlusion and occlusal adjustment. *Dr. J. J. Carraro* revised the section on diabetes in Chapter 29.

Dr. Henry H. Takei, in collaboration with *Anna* and *Gordon Pattison,* prepared the chapters in Section III, Part II, dealing with instrumentation. *Dr. John Flocken* rewrote the section on electrosurgery. *Dr. Max O. Schmid* revised the chapter on plaque control and contributed Chapter 42 on tooth surface preparation. *Dr. Thomas N. Sims* updated the bibliography on bone grafts and reattachment. *Dr. E. Barrie Kenney* revised and rewrote extensive parts of the chapter on "Restorative-Periodontal Interrelationships." *Dr. Robert Merin* wrote Chapter 59 on "Results of Periodontal Treatment" and revised with extensive additions the chapter on "Maintenance Care."

I am indebted particularly to Drs. E. Barrie Kenney, Michael G. Newman, Max O. Schmid, and Henry H. Takei for their constructive criticism and constant support.

I also gratefully acknowledge the collaboration of Dr. Russell J. Nisengard, who read the chapter on host response and offered valuable suggestions; Dr. Sigmund S. Socransky, whose advice and guidance in the microbiology chapter were most helpful; and Dr. Sidney Finegold, who offered constructive criticism on the section on antimicrobial therapy.

Thanks are also due to the following colleagues who have contributed unpublished information or illustrations: Drs. R. Barbanell, R. G. Caffesse, R. Genco, R. Gibbons, A. G. Hannum, T. Hansson, L. Hirschfeld, T. Inage, J. Klingsberg, M. Listgarten, T. Oberg, R. Page, M. Ruben, Z. Skobe, J. Smulow, J. Sottosanti, J. VanHoute, and J. Yee.

I am also indebted to Mr. Alfred Strohlein; to Ms. Irene Petravicius for her excellent art work and untiring efforts to follow our ideas; to Ms. Catherine Boris, Mr. Richard L. Friske, and Mrs. Liliane Kennedy for the photographic material; to Ms. Ana Silberman and to Ms. Rhoda Freeman and the UCLA Word Processing Center (Ms. Michelle Kirsch, Ms. Mickey Kluchnik, and Ms. Barbara Mersini) for their excellent typing assistance; to the Hu-Friedy Company for supplying us with the instruments used for the illustrations in the section on instrumentation.

Special appreciation goes to Dr. Violeta Glickman for her confidence and her support, and to Mr. Carroll Cann, Ms. Laura Tarves, and Mr. Raymond Kersey and the W. B. Saunders Company for their trust and expertise.

Last but not least, my thanks go to my wife, Rita, and my three children, Fersy, Patricia, and Laura, for bearing with me through the period during which this work was done.

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PREFACE
to the First Edition

This is a textbook for practitioners of general dentistry and students preparing to be general practitioners. It was the author's desire to create an analytical text, fostered by a critical objectivity. An effort has been made to differentiate between fact and unsubstantiated hypothesis. This constitutes a challenge, especially when it means parting with tradition. However, difficult though it may be, it is sometimes necessary to guard against the hampering influence of habit which tends to nudge us along the well-traveled pathways of thought.

This book is predicated on the premise that the periodontal care of the American public is primarily the concern of the practitioner of general dentistry. The establishment of periodontia as a specialty should be a stimulus for improved periodontal care by the general practitioner. The existence of a group of dentists who desire to limit their practices or specialize in periodontia cannot be hailed as a sign that the obligation of the general practitioner in regard to periodontal problems is diminished. If anything, the opposite is true. The existence of individuals with a primary interest in cardiology who limit their practices accordingly has not meant that medical schools have diminished their teaching of the anatomy and physiology of the heart and the diagnosis and management of cardiac dysfunction—or that practitioners of general medicine have discarded their stethoscopes.

The need for training the general practitioner so that he can fulfill his responsibility to provide periodontal care for all his patients has stimulated a reorientation in the philosophy of dental education and intensification in the teaching of periodontology at both the undergraduate and postgraduate levels. The general practitioner should know enough to handle most periodontal problems which confront him. The availability of a well-trained group of specialists for unusual problems should serve to supplement the dental care available to our population. The establishment of periodontia as a specialty and continued improvement in the ability of the general practitioner to cope with periodontal problems are interdependent movements—mutually dependent upon each other for continued stimulation and progress.

Much information is available regarding the nature of periodontal disease and its treatment. Many problems are as yet unsolved. The existing status of knowledge does not warrant an attitude of complacency. On the other hand, a sizable accumulation of knowledge has

resulted from the industry of clinicians and research workers. A considerable portion of this information is applicable in the practice of dentistry. It is the purpose of this textbook to present existing knowledge regarding periodontal problems in such a manner that it can be incorporated in the practice of general dentistry. It was planned with the following objectives in mind:

The application of basic principles of periodontology in the prevention, diagnosis and treatment of periodontal disease.

An appreciation of the extent to which the initiation of periodontal disease and tooth loss from pathological destruction of the periodontal tissues can be prevented.

An evaluation of the interrelation of local and systemic factors in the causation of periodontal disease.

An appreciation of the effect of treatment procedures upon the tissue changes underlying clinical disease.

The presentation of treatment techniques that can be performed with the degree of skill possessed by every qualified practitioner of general dentistry.

An explanation of the application of various treatment techniques to specific clinical periodontal problems.

The clarification of the interrelation of clinical periodontal procedures with the other aspects of general dentistry.

It has been the experience of the author that the type of preparation which dental students and dentists engaged in graduate and postgraduate training find most useful in the clinical management of periodontal problems is an understanding of clinical phenomena in terms of underlying tissue changes. All clinical periodontal problems are basically gross expressions of microscopic tissue changes. The microscopic changes underlying clinical periodontal disease are essentially manifestations of the composite effects of disease-causing factors. The effectiveness of treatment procedures is reflected in terms of microscopic tissue changes. It is understandable why the interpretation of clinical phenomena in terms of tissue changes is of such practical value in the periodontal field. Crystallization of the clinical management of periodontal problems in terms of microscopic tissue changes is therefore the keynote of this book.

Terminology in the periodontal field is still in a somewhat unsettled state. Conscientious efforts are in progress to clarify this situation. Disagreement over terminology tends to divert attention from more basic considerations. Emphasis is therefore placed upon the explanation of the nature of various conditions, rather than upon the terms by which they are designated. Recommendations of the Terminology Committee of the American Academy of Periodontology which appeared in the Journal of Periodontology in nineteen hundred and fifty are presented and indicated in italics.

IRVING GLICKMAN
Boston, Massachusetts
1953

Introduction
THE HISTORICAL BACKGROUND OF PERIODONTOLOGY

THE PAST

Periodontal disease is a major problem in modern dental practice. Paleopathological studies indicate that man has been subject to periodontal disease since prehistoric times, and our earliest historical records reveal an awareness of periodontal disease and the need for treating it.

Periodontal disease was the commonest of all diseases of which there was evidence in the embalmed bodies of the **Egyptians** of 4000 years ago.[6] Much of the present-day knowledge of Egyptian medicine comes from the Ebers and Edwin Smith Surgical Papyri.[1] The Ebers papyrus contains many references to gingival disease and prescriptions for strengthening the teeth, and also makes mention of specialists in the care of the teeth.

Oral hygiene was practiced by the **Sumerians** of 3000 B.C., and elaborately decorated **golden toothpicks** found in the excavations at Ur in Mesopotamia suggest an interest in cleanliness of the mouth.[7] The **Babylonians and Assyrians** following the earlier Sumerian civilization apparently suffered from periodontal conditions, and a clay tablet of the period tells of treatment by gingival massage combined with various herbal medications. Medicinal mouthwashes were also used, and Jastrow[4] refers to a tablet where six different drugs are suggested for the treatment of "sickness of the mouth," presumably periodontal disease.

In the oldest known **Chinese** medical work, written about 2500 B.C. by **Hwang-Fi**, oral disease is divided into three types, as follows: (1) Fong Ya, or inflammatory conditions. (2) Ya Kon, or diseases of the soft investing tissues of the teeth. (3) Chong Ya, or dental caries.[7] Gingival inflammations, periodontal abscesses, and gingival ulcerations are described in accurate detail. One gingival condition is described as follows: "The gingivae are pale or violet red, hard and lumpy, sometimes bleeding; the toothache is continuous." Herbal remedies, "Zn-hine-tong," are mentioned for the treatment of these conditions. The Chinese were among the earliest people to use the "chew stick" as a toothpick and toothbrush to clean the teeth and massage the gingival tissues.

The importance of oral hygiene was recognized by the early **Hebrews**. Many pathologic conditions of the teeth and their surrounding structures are described in the Talmudic writings. Vestiges of the **Phoeni-**

cian civilization include a specimen of wire splinting apparently constructed to stabilize teeth loosened by chronic destructive periodontal disease.

Among the ancient Greeks, Hippocrates of Cos (460–335 B.C.) was the father of modern medicine, the first to institute a systematic examination of the patient's pulse, temperature, respiration, excreta, sputum, and pains. He discussed the function and eruption of the teeth and also the etiology of periodontal disease. He believed that inflammation of the gums could be produced by accumulations of pituita or calculus with gingival hemorrhage occurring in cases of persistent disease. He described different varieties of splenic maladies, to one of which he assigned the following symptoms: "The belly becomes swollen, the spleen enlarged and hard, the patient suffers from acute pain. The gums are detached from the teeth and smell bad."[7]

The Etruscans, much before 735 B.C., were adept in the art of constructing artificial dentures, but there is no evidence of their awareness of the existence of periodontal disease or its treatment.

Among the Romans, Aulus Cornelius Celsus (first century A.D.) referred to diseases which affect the soft parts of the mouth and their treatment as follows: "If the gums separate from the teeth, it is beneficial to chew unripe pears and apples and keep their juices in the mouth." He described looseness of the teeth caused by the weakness of their roots or by flaccidity of the gums and noted that in these cases it is necessary to touch the gums lightly with a red hot iron and then smear them with honey. The Romans were very interested in oral hygiene. Celsus believed that stains on the teeth should first be removed and the teeth then rubbed with a dentifrice. The use of the toothbrush is mentioned in the writings of many of the Roman poets. Gingival massage was an integral part of oral hygiene. Paul of Aegina during the seventh century differentiated between epulis, a fleshy excrescence of gums in the neighborhood of a tooth, and parulis, which he described as an abscess of the gums. He wrote that tartar incrustations must be removed either with scrapers or a small file, and that the teeth should be carefully cleansed after the last meal of the day.

Rhazes (850–923), an Arabian of the Middle Ages, recommended opium, oil of roses, and honey in the treatment of periodontal disease. To strengthen loosened teeth he recommended astringent mouth washes and dentifrice powders. He described a procedure of scarification of the gingiva, and strong counterirritants in the treatment of disease of the gums. A voluminous writer, he has seven chapters in his "Al-Fakkir" on the teeth. They are entitled *"The Teeth, Teeth on Edge, Decay of the Teeth, Looseness of the Gums, Suppuration of the Gums, Pyorrhea and Bleeding Gums,* and *Halitosis."* Avicenna (980–1037) discussed the filing of elongated teeth and reported that "in order to have loosened teeth become firm again, one must avoid using same in mastication." He wrote extensively on diseases of the gingiva such as ulcers, suppuration, recession, and fissures.

Albucasis (936–1013) stressed the care and treatment of the supporting structures. He recognized an interrelation between tartar and disease of the gums. Albucasis referred to the treatment of periodontal disease as follows:[3] "Sometimes on the surface of the teeth, both inside and outside, as well as under the gums, are deposited rough scales, of ugly appearance, and black, green or yellow in colour; thus corruption is communicated to the gums, and so the teeth are in the process of time denuded. It is necessary for thee to lay the patient's head upon thy lap and to scrape the teeth and molars, on which are observed either true incrustations, or something similar to sand, and this until nothing more remains of such substance, and until also the dirty colour of the teeth disappears, be it black or green, or yellowish, or of any other colour. If a first scraping is sufficient, so much the better; if not, thou shalt repeat it on the following day, or even on the third or fourth day, until the desired purpose is obtained. Thou must know however, that the teeth need scrapers of various shapes and figures, on account of the very nature of this operation. In fact the scalpel with which the teeth must be scraped on the inside, is unlike that with which thou shalt scrape the outside; and that with which thou shalt scrape the interstices between the teeth shall likewise have another shape. Therefore thou must have all this series of scalpels ready if so it pleases God."

A set of instruments was designed by

Albucasis for scaling the teeth. These instruments were crude but their role in the heritage of the modern periodontal instrumentarium is quite apparent.

In the fifteenth century, **Valescus of Montpellier (1382–1417)** stated that in order to treat disease of the gums tartar must be removed little by little either with iron instruments or with dentifrices. In the fourteenth and fifteenth centuries reference is also made to white wine, roasted salt, and aromatic substances as adjuncts in periodontal therapy.

Bartholomeus Eustachius, in a book published in **Venice (1563),** explained the firmness of teeth in the jaws as follows: "There exists besides a very strong ligament, principally attached to the roots by which these latter are tightly connected with the alveoli." The gums also contribute to their firmness, and here he compares it to the joining of the skin to the finger nails.

With the beginning of the eighteenth century dentistry developed the early signs of scientific curiosity which were the precursors of present-day research disciplines. **Pierre Fauchard (1678–1761),** the father of modern dentistry, in the first and second editions of his epochal treatise *"Le Chirurgien Dentiste"* discussed many aspects of the subject of periodontology. He described chronic periodontal disease as a "kind of scurvy" which attacked the gums, the alveoli, and the teeth. The clinical acuity of the observation of Fauchard is shown by his statement, **"Not only are the gums affected by it (periodontal disease) which are livid, swollen, and inflamed, but those which do not show these symptoms as yet are not immune from this affliction. It is recognized by a yellowish almost white pus and by a little glutinous material which is emitted from the gums when a rather heavy pressure is applied by the finger."*** Fauchard believed that internal remedies were not effective in treating periodontal disease. He recommended careful scaling of the teeth to remove the calculus deposits, and he developed many instruments for this purpose; dentifrices, mouthwashes, and splinting of loose teeth were included in his therapeutic procedures.

John Hunter, the eighteenth century English physiologist and surgeon, published two books on dentistry in which he discussed diseases of the alveolar process which he believed to be the site of suppurative periodontal disease. The nineteenth century brought new names and developments to the periodontal field, such as **Kunstmann** and his surgical measures for the treatment of periodontal disease, and **Robiscek** and the "flap operation." **John M. Riggs,** the first of many North American contributors, was credited by his contemporaries with "originating and first publicly describing a new treatment for the cure of... absorption of the alveolar process ... thereby saving and restoring to firmness the loosened teeth." His treatment consisted of **subgingival curettage.** He described periodontal disease in detail, and chronic destructive disease of the supporting tissues was for many years called "Riggs' disease."[5]

With the beginning of the twentieth century there developed a prolific group of clinicians and scientists throughout the world with a major interest in the periodontal field. Their names and contributions are documented throughout the pages of this book.

PRESENT-DAY PERIODONTICS IN THE PRACTICE OF DENTISTRY

Before undertaking a detailed study of periodontal disease, it is important to have a proper perspective regarding the role of periodontics in the practice of dentistry.

Periodontal disease is the major cause of tooth loss in adults, and for many years periodontics was thought of as a conglomeration of treatment techniques for the purpose of trying to save teeth suffering from advanced disease.

It gradually became apparent that the periodontal disease which caused tooth loss in adults was the terminal stage of processes which started, but were untreated, in youth. Attention shifted to early treatment because it is simpler, produces more predictable results, and spares the patient unnecessary loss of tooth-supporting tissues.

Today the emphasis is upon preventing periodontal disease, because most periodontal disease is preventable. No longer confined within the limitations of an

*Darby, quoted in Weinberger.[7]

autonomous branch of dentistry, periodontics has become a philosophy underlying all dental practice.

Every dental procedure is performed with concern for its effect upon the periodontium, and effective chairside measures for preventing periodontal disease are part of the total dental care of all patients. In addition, educational programs are being developed to alert the public to the importance of periodontal disease and to motivate them to take advantage of available methods of preventing it. **The priority of periodontics in the practice of dentistry has shifted from repairing damage done by preventable disease to keeping healthy mouths healthy.**[2]

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Section 1

THE TISSUES OF THE PERIODONTIUM

The periodontium is the investing and supporting tissues of the tooth, and consists of the *periodontal ligament*, the *gingiva*, *cementum*, and *alveolar bone*. The cementum is considered a part of the periodontium because, with the bone, it serves as the support for the fibers of the periodontal ligament. The periodontium is subject to morphologic and functional variations as well as changes with age. This section deals with the normal features of the tissues of the periodontium, knowledge of which is necessary for an understanding of periodontal disease.

CONTENTS

Part II **Instrumentation**

Part III **Treatment of Emergencies**

Part IV **Phase I Therapy**

Part V **Surgical Phase**

Part VI **Reconstructive Phase**

Part VII **Maintenance Phase**

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The Gingiva

The *oral mucosa* consists of the following three zones: the gingiva and the covering of the hard palate, termed the masticatory mucosa; the dorsum of the tongue, covered by specialized mucosa; and the oral mucous membrane lining the remainder of the oral cavity. The *gingiva* is that part of the oral mucosa that covers the alveolar processes of the jaws and surrounds the necks of the teeth.

NORMAL CLINICAL FEATURES

The gingiva is divided anatomically into the marginal, attached, and interdental areas.

The Marginal Gingiva (Unattached Gingiva)

The marginal ("unattached") gingiva is the terminal edge or border of the gingiva surrounding the teeth in collar-like fashion (Fig. 1–1) and demarcated from the adjacent attached gingiva by a shallow linear depression, the *free gingival groove.*[1] Usually slightly more than a millimeter wide, it forms the soft tissue wall of the gingival sulcus. It may be separated from the tooth surface with a periodontal probe.

THE GINGIVAL SULCUS. The gingival sulcus is the shallow crevice or space around the tooth bounded by the surface of the tooth on one side and the epithelium lining the free margin of the gingiva on the other. It is V-shaped and barely permits the entrance of a periodontal probe. The average depth of the normal sulcus has been reported as 1.8 mm., with a variation of from 0 to 6 mm.[93] Other studies show 2 mm.,[12] 1.5 mm.,[149] and 0.69 mm.[38] Gottlieb considered the "ideal" sulcus depth to be zero.[46]

The Attached Gingiva

The attached gingiva is continuous with the marginal gingiva. It is firm, resilient,