Dental Auxiliary Practice

Biological basis and clinical application

module 6

PERIODONTICS

Stephen Stone, D.M.D.
Paul J. Kalis, D.M.D.

a multi-module series

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Periodontics

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Preface

The basic philosophy of this modular series and a general outline of the contents of the six individual modules have been adeptly explained in the Foreword, immediately following, by Wilma Motley, R.D.H., currently editor of *Dental Hygiene, the Journal of the American Dental Hygienists Association.* I am appreciative of Mrs. Motley's enthusiastic comments on the series.

My first and largest debt of gratitude goes to each of the contributing authors for their conscientiousness and generosity in giving of their effort and time.

My appreciation to Mr. Paul Gramer for his many hours of accurate and fastidious typing of the preliminary and final manuscript and to Ms. Darlene Lindoerfer for her extreme care in helping to organize the abundant manuscripts, galley proofs, and illustrations, as well as her careful attention to the detail of the legends and bibliography.

My gratitude to Mr. Jerry Glickman, a medical illustrator who was able to reproduce the anatomy of the body in a unique manner and to his assistant illustrators, Ms. Gayanne De Vry and Mrs. Harriet Greenfield.

My thanks to Mr. John Sanders and Mr. Robert Turner, medical photographers from Forsyth Dental Center, who with the approval of Dr. John Hein, the Director, were able to produce all of the photographs in the series.

A special thanks to Ms. Barbara Schulze, Dr. John Keefe, and Dr. Gerald Thornell who kindly reviewed respectively the sections on dental anatomy, the cardiovascular system, and drug abuse.

And finally the end product of this modular series could not have been accomplished without Mrs. "Pete" Hughes, of Williams & Wilkins, whose editing genious was able to develop a consistent and correct style throughout all of the books or Mr. James Gallagher, Editor-in-Chief, whose endurance and perseverance throughout the five years in the production of the series were able to bring it to fruition.

M.J.D.

Foreword

"Give a man a fish and you feed him for a day; teach him how to fish and you feed him for a lifetime" is an old proverb, the wisdom of which should be the ultimate goal of education. Presenting material to students is not enough; anyone can learn and return facts to the instructor for course credit. The main objective should be to provide a broad background which will allow the individual to assess information, transfer learning, and assume decision-making responsibilities. This, I believe, is Doctor Dunn's teaching philosophy and his intent in writing and editing this multimodular series of textbooks, *Dental Auxiliary Practice: Biological Basis and Clinical Application.*

Textbooks are quite likely to be written in response to a demonstrated lack of available material in the particular field of interest. No single book can be all-inclusive of dentistry or dental hygiene, nor does this series attempt the impossible. Each module, however, does make every effort to be all-inclusive of the subject matter it covers. The texts have been designed to present augmented as well as fundamental detailed scientific, yet practical, information to dental hygienists and dental assistants in school, in clinical practice, or in other professional settings. Just as one book cannot cover all subjects, one author cannot have in-depth knowledge of all subjects. Martin J. Dunn, D.M.D., highly qualified in his field, has written parts of this series and has wisely chosen other qualified practitioners with expertise in teaching and in private practice within their own fields to supplement and complement his work and concepts.

A series of books in paperback, rather than a large hard cover volume, offers a new kind of flexibility to the student and the practicing dental auxiliary. While some people may contend that a paperback volume is not as sturdy and long lasting as a hard cover book, it does have exactly the same content, and is within everyone's means. Books that are found to be useful and become prized for their intrinsic value will be replaced later in more durable form. Students must acquire texts for courses as outlined, but the practicing dental hygienist or dental assistant may postpone such acquisition. A series of paperback books should offer encouragement to the purchaser to begin with one module, adding others to the personal library from time to time. The public and the profession will necessarily benefit from this continual flow of new or upgraded knowledge and techniques.

Each module of *Dental Auxiliary Practice* has been written in a factual, logical and interesting manner. The authors have kept the prospective audience in mind, neither overestimating nor underestimating its basic knowledge and abilities but stimulating further learning. Contributing authors, selected for their balance between teaching and private practice, were not given page limitations but were encouraged to incorporate all written and illustrative material they believed the dental auxiliary should require to be knowledgeable in the assigned subject. The result is a comprehensive treatise. Illustrations make any text more interesting, re-enforce learning processes and are very real aids in clarifying written descriptions. All sections of the series contain an unusually large number of fine illustrations, either photographs or careful line drawings, some in color.

Doctor Dunn, senior author and editor of *Dental Auxiliary Practice*, is a Diplomate of the American Board of Oral Surgery; Associate Clinical Professor, Forsyth School of Dental Hygiene; Associate Clinical Professor of Oral Surgery, Boston University School of Dentistry; Director, Oral Surgery Assistants Program, Boston University; and Staff Associate, Boston University School of Dental Assisting. He has taught at Forsyth for approximately 10 years. In addition he has had many other teaching appointments and has presented innumerable courses and papers for dentists and/or dental auxiliary personnel. Subjects have included temporomandibular joint dysfunction syndrome; anesthesia; management of patients with a medical problem; maxillofacial injuries; dental radiology; role of the oral surgery assistant; management of acute systemic reactions in the dental office; postoperative oral surgery care; internal medicine as it pertains to the dental patient; osteoplastic lengthening of the articular eminence for temporomandibular dislocation; and orthognathic surgery.

Module 1 covers dental and head and neck anatomy. Part One, "Dental Anatomy," is most ably and meticulously done by Cindy Shapiro, R.D.H., a former student of Doctor Dunn. The section begins with a general definition of descriptive dental anatomy terms and is followed by chapters which delineate all distinguishing characteristics of each primary and permanent tooth of the human dentition. Miss Shapiro, now in private practice of dental hygiene, is obviously well trained in this phase of dental science.

In Part Two, "Head and Neck Anatomy," Doctor Dunn has taken a new approach to teaching this subject. Instead of starting with the skull and dividing it into its component parts, he starts with the mandible and builds a skull around it. Moving from cranial bones the musculature, glands, nerves, and vascular supply of the head and neck are added. Oral cavity functions and a review of the skin of this area conclude the module. The result is a readable reference volume as well as a learning text.

Dentofacial growth and development and orthodontics is the subject of Module 2. Vincent DeAngelis, D.M.D., author of this portion of the sereis, is an orthodontist nationally known for his original research on growth and development. He is Assistant Clinical Professor of Orthodontics, Harvard School of Dental Medicine; Staff Associate in Orthodontics, Children's Hospital Medical Center, Boston; and Staff Associate in Orthodontics, Forsyth School of Dental Hygiene. His knowledge and interest in his assigned subject make him well qualified to present the material. Part One covers embryology, basic to the profession and necessary to the understanding of growth patterns, both normal and deviate. Part Two discusses orthodontic diagnosis, principles of treatment, and responsibilities of auxiliary personnel in the office. This subject is of deep and vital interest to auxiliaries since some orthodontic functions are included in proposed expansion of services of dental auxiliary personnel.

John Giunta, M.S., D.M.D., responsible for Module 3, is a Diplomate of the American Board of Oral Pathology; Staff Associate in Oral Pathology, Forsyth School of Dental Hygiene; and Assistant Professor in Oral Pathology, Tufts School of Dental Medicine. The factual information on clinical examination, principles of pathology, inflammation and repair mechanisms within the body, abnormalities both benign and malignant, and oral manifestations of systemic diseases is extensive and detailed and is augmented by many illustrative photographs. It is imperative that the dental hygienist be able to recognize deviations from the normal in the head and neck examination of patients and this chapter supplies the needed information.

The next unit, Module 4, is concerned with patient management and was written by Doctor Dunn. Often the dental auxiliary is the first person in the office to see and examine the patient. If diseases can be recognized, or discovered through a comprehensive health history taken by the auxiliary, the dentist's time can be conserved. In order to recognize signs and/or symptoms, the auxiliary must have a fundamental knowledge of the disease process, and in order to safely serve the patient must have some knowledge of prophylactic measures, or other precautions, which should be taken before treatment begins. This chapter is a review of the various body systems and their diseases and how to deal with them from a dental standpoint. Another chapter is devoted to drug abuse, a common problem in today's society. Brad Littleton, C. R. N. A., uses a realistic approach to psychosocial considerations in dealing with drug users. Drugs of various types are classified, and their physical properties, action, effect on the user and his behavior are described. Mr. Littleton, Staff Anesthetist, Medical College of Georgia, and Advisor to Community Drug Halfway House, has had considerable experience in drug rehabilitation and has a good understanding of the subject.

Part Two of Module 4 is a cooperative effort of Doctor Dunn and Donald F. Booth, D.M.D., a Diplomate of the American Board of Oral Surgery; Professor and Chairman, Department of Oral Surgery, Boston University School of Dentistry; Chief of Oral Surgery, Boston University Medical Center. This chapter discusses the emergencies which may occur in the dental office and prepares the dental auxiliary to administer therapy or to assist the dentist in instituting immediate care for the patient. Routine emergency drill procedure is recommended so that the office team will always be alert to impending emergencies and requisite skills will be utilized instantly. Photographs taken

in a dental office are included here to graphically illustrate the described role of the dental auxiliary in cardiopulmonary resuscitation and other emergency conditions.

Module 5 is another composite work of Doctors Dunn and Booth in conjunction with Marie Clancy, R.N., Operating Room Supervisor of Carney Hospital, Boston. The first part of this module is a clinically practical evaluation of drugs which patients might be taking when they present themselves for dental care, and an evaluation of drugs which might be prescribed by the dentist. No chemical formulas are included, but the effect on treatment is clearly outlined. Part Two deals with anesthesia, both local and general. This subject is of current interest to dental hygienists as the administration of local anesthesia is often permitted in revised state dental practice acts. An overview of pain control agents is given along with a detailed presentation of techniques for the administration of local anesthesia. Part Three, done by Marie Clancy, deals with sterilization and gives step by step preparation of operator and patient in assuring a sterile field for surgical procedures. There are many excellent photographs which clearly illustrate these methods. The conclusion of this module is assigned to oral surgery—the examination, instruments used, procedures to be followed, and specific responsibilities of the surgical assistant in minor and major surgeries. Methods of obtaining a detailed health history are outlined and there is some discussion of the relationships of various complaints listed by the patient.

Periodontics is the subject of Module 6, the concluding module of this series. Stephen Stone, M.S., D.M.D., and Paul J. Kalis, D.M.D., were responsible for preparing the information it contains. Doctor Stone is Assistant Clinical Professor of Periodontics, Harvard University School of Dental Medicine and Consultant in Periodontics, Veterans Administration Hospital, Brockton, Massachusetts. Doctor Kalis is Assistant Clinical Professor of Periodontics, Harvard University School of Dental Medicine, and Head Chief Evaluator of the Harvard Tooth Implant-Transplant Section. Appropriately, since the dental hygienist's major concern is within the field of periodontics, this section has the greatest number of photographs and illustrations, many of them in fine detail. Clinical examination, scaling, curettage, oral physiotherapy, and instrument sharpening are thoroughly discussed and related to the future role of dental auxiliaries. Normal and pathological periodontal problems, both acute and chronic, diagnosis and treatment planning, plaque control, surgical procedures, prevention, and expanded functions for dental auxiliary personnel are all contained in this important module.

This series of six modules demonstrates the basic philosophy of comprehensively teaching dental auxiliaries in a stimulating manner. It promises to be well received and used extensively. I offer my congratulations to the authors on an assignment well done.

Wilma Motley, R.D.H.
Editor, *Dental Hygiene,*
the Journal of the American Dental
Hygienists Association

Dedication

To my wife Carol and my daughter Tracy who have freely loaned me the time during the past five years for the writing and editing of this modular series. I do not think I can ever adequately repay them.

MODULE

CONTENTS

chapter 1

NORMAL PERIODONTIUM

This text is written during an exciting and dynamic era of dentistry. It has been documented in history that for many generations the science of dentistry was concerned primarily with therapy directed toward existing pathology. Now, with almost universal acceptance, dental science deals with prevention of initial dental disease or reoccurrence of treated pathology. It must not be interpreted from the spontaneous and active interest in preventive dentistry that this is the birth of a new concept. As early as 1900, men of the stature of Doctors G. V. Black, D. D. Smith, and A. C. Fones were all strong advocates of a concept dedicated toward the prevention of dental disease. Through the interim years, only a few voices have been heard belonging to such men of vision as Doctors C. C. Bass and Sumter Arnum. It is difficult to evaluate the tremendous and almost universal acceptance of preventive dentistry after almost a century of relative indifference.

Much of the material presented here will be directed toward the dental hygienist from a treatment viewpoint, but the dental assistant should also understand the material presented if she is to function as a member of the dental team. It is interesting to note that the dental hygiene movement, which began in the latter part of the 19th and beginning of the 20th centuries, was specifically directed toward prevention of dental disease and eliminating etiologic factors which were causing insipient periodontal disease. The perfection of many aspects of dental therapy, the significant expansion of dental research, the extensive developments of dental diagnosis, as well as an overwhelming need for dental care, are all components which have precipitated the acceptance of preventive dentistry as not only desirable, but completely necessary. It is at the threshold of this new and most exciting era of clinical dentistry that the dental auxiliary finds herself in a unique position. With general acceptance of the need and value of dental hygiene, considerable interest and study are now being directed toward expanded duties for the dental auxiliary. There are many varied opinions concerning which paths of extended therapy should be developed. It is our personal bias that the entire history, education, and clinical development for the dental auxiliary logically leads her to assume a greater role in prevention of dental disease.

Based upon our assumptions that preventive dentistry is here to stay, that the duties of the dental auxiliary will be considerably expanded, and that she is best trained to fulfill a vital role in the prevention and treatment of periodontal disease, this module has been written with the intent of providing the necessary information which will be commensurate with her future role.

Considerable information has been provided concerning not only the normal clinical periodontium, but the microscopic aspects as well as the related physiology of the dental supporting structures. This information is basic to the clinical examination and radiographic evaluation which the dental hygientist should be able to perform upon her patients.

The etiology of periodontal disease as related to initiating factors and modifying components is dealt with to provide a necessary background toward understanding pathophysiology and various types of periodontal disease. Emphasis is directed toward proper diagnosis after analysis of the history, clinical examination, and radiographic evaluation. Each type of variation of periodontal pathology is discussed as to its clinical signs and symptoms. References to differential diagnosis and commonly mistaken conditions are also presented. The expectation that periodontal diagnosis will be included in

the expanded role of the dental hygienist has prompted placement of a related section within this text.

The dental hygienist already practices certain aspects of periodontal treatment. It is anticipated that the dimensions of her therapy range will expand to include elimination of some modifying etiological factors as well as less complicated surgical procedures. To provide a sequential and logical development of therapy, periodontal treatment has been divided into the chronological phases with discussion directed toward indications, objectives, specific techniques, evaluation of results, and, in conclusion, the challenge to the dental auxiliary in this era of expansion of former duties and creation of new roles.

In contrast, however, to these positive and exciting aspects of dental hygiene, there are the disturbing statistics which unavoidably have directed dentistry toward the realization that needs for treatment were far outpacing ability to provide the necessary therapy. Some disturbing statistics are now available. In 1920, life expectancy of an American was 50 years, while most adults at age 50 were edentulous. In 1970, life expectancy was 72 years while a preponderant part of the population was edentulous by 55 years. This simple comparison demonstrates a lag in dental health which relegates an increasing amount of the population to live longer without a natural dentition.

Toothbrush sales in the United States in 1972 demonstrated that only one brush was sold for every three persons. Three of every four teenagers exhibit clinical gingivitis. Four of every five adults demonstrate clinical periodontitis. About 20 million Americans are partially edentulous and 25 million are fully edentulous.

To these statistics we note that a 1971 survey conducted by the American Dental Association showed that only 15.8 percent of all dental practitioners utilize the professional services of a full time hygienist while 15.4 percent employ a part time hygienist. In 1971, only 15,800 full time dental hygienists and 16,300 part time dental hygienists were available to 91,000 dental practitioners. The ideal ratio, on a full time basis, is thought to be two dental hygienists per dental practitioner. The present statistics demonstrate the actual figures to be far below the optimal ratio.

Other surveys indicate that less than 20 percent of patients receiving dental care are afforded instruction in oral hygiene techniques. Of patients who are seen on a regular dental basis, 18 percent receive routine and thorough dental prophylaxis on an annual basis. While much interest and literature are directed toward preventive dentistry, only 10 percent of surveyed offices practice the prevention of dental disease.

Lastly, one of the most discouraging findings was noted in a 1971 article by Zaki and Stallard who surveyed 80 dental hygiene students from the University of Minnesota School of Dental Hygiene. In a questionnaire prior to graduation, 60 percent of the students expressed a desire to practice clinical dental hygiene for a minimum of 5 years. Yet, a follow-up report demonstrated that 42 percent had already left full time practice within the first year after graduation. Their investigation indicated that 86 percent of the hygienists would leave practice, on a full time basis, within the first year after graduation. A trend toward increasing this percentage was evident.

It seems obvious that recent reports demonstrating only 17 percent of the practicing dentists employ a full time hygienist and that 91 percent of her time is involved in routine prophylaxis, seeing an average of 12 patients per day, is less that an encouraging picture.

The conclusions made by Zake and Stallard, in part, could represent a preface to this book. There must be a fundamental change not only within dental education, but dental auxiliary education, and dental practice philosophy to expand, to utilize, and to incorporate the dental auxiliary into the practice of dentistry at all levels. "The dental hygienist cannot really be effective without the full cooperation and understanding of the dentist, her employer. The dentist must regard her less as a financial necessity in his practice and welcome her as a vital part of a preventive dental practice." To this we can add only that the material offered in this textbook is an attempt from a didactic standpoint to elevate the dental auxiliary to a level at which we believe she should properly function.

Structure and Function of Periodontium

To understand how disease develops, it is necessary to know normal structure and function. The tissues constituting the periodontium

differ in origin and character, but they combine to form a functional, biologic unit serving to surround, support, and anchor the teeth in the jaws.

The periodontium is composed of the gingiva and the attachment apparatus, the latter consisting of the alveolar bone, periodontal ligament, and cementum. This is the anatomic entity which holds the teeth within their sockets.

At the inception of the periodontal examination, the clinician views the clinical crowns of the teeth. The clinical crown is that portion of the tooth visible in the oral cavity; it may be larger or smaller than the anatomic crown which consists of that portion of the tooth covered by enamel. If the gingiva is enlarged, the clinical crown will be smaller than the anatomic crown; if there has been some destruction of the periodontium, the clinical crown may be larger than the anatomic crown thus consisting of the anatomic crown plus root structure.

Clinical Features

Gingiva

The gingiva can be divided into the following anatomic subdivisions (Fig. 1):

1. Free gingival margin

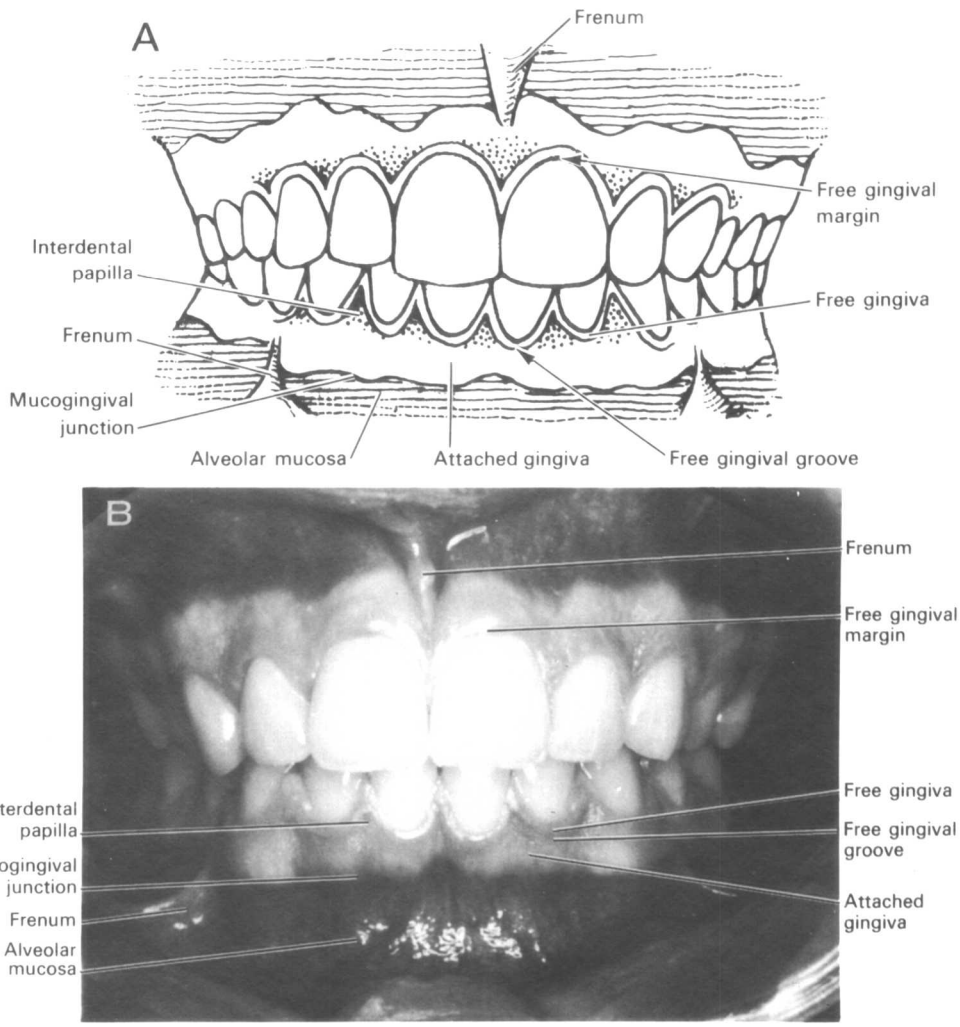

Fig. 1. (A) Normal periodontium; (B) clinical photograph of normal periodontium.

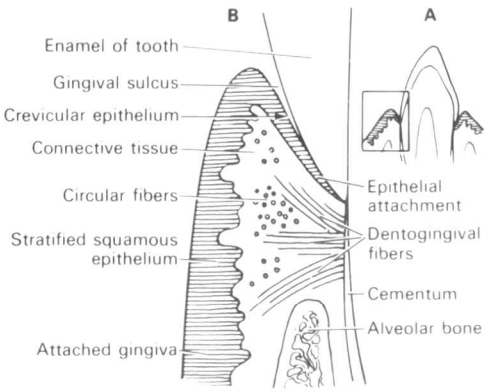

Fig. 2. (A) Relationship of gingiva to a tooth; (B) magnification of outlined area of A.

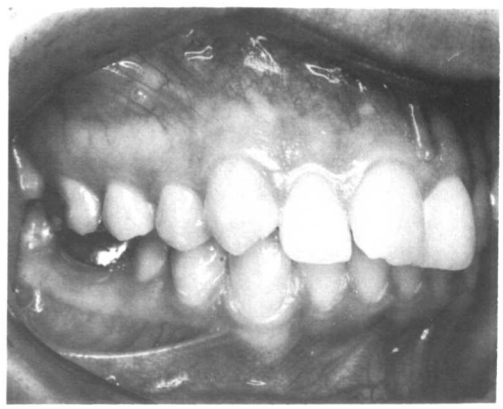

Fig. 3. Gingival scalloping becoming progressively flatter going from the anterior to the posterior portions of both arches.

2. Free gingival groove
3. Free gingiva or marginal gingiva
4. Attached gingiva
5. Mucogingival junction (discussed under "Clinical Findings")
6. Alveolar mucosa
7. Interdental (interproximal) papilla
8. Dentogingival junction (Fig. 2)
   a. Gingival sulcus
   b. Epithelial attachment

Free Gingival Margin

The free gingival margin is that portion of the gingiva immediately adjacent to the tooth surface; it is usually knife-edged and closely adapted to the neck of the teeth. The free gingival margin is scalloped (which refers to the wave-like architecture of the marginal gingiva and interdental papilla which becomes progressively flatter as one proceeds posteriorly in both arches) (Fig. 3).

Free Gingival Groove

The free gingival groove is present in about 33 to 50 percent of patients and courses parallel to the free gingival margin. The groove is usually 1 to 1½ mm apical to the free gingival margin and follows the scalloped configuration of the gingival margin.

Free Gingiva

The free gingiva is also termed the marginal gingiva and is that tissue between the free gingival margin and the free gingival groove. The free gingiva is reflectable with a blunt instrument such as a periodontal probe. Internal to the free gingiva is the gingival sulcus, discussed in further detail later.

Attached Gingiva

The attached gingiva is continuous with the free gingiva and extends apically for varying distances to the mucogingival junction. It is normally coral pink in color and is firmly bound down to the underlying bone in order to resist masticatory forces. Varying degrees of stippling create a so-called "orange peel" appearance. Stippling refers to pinhole depressions on the surface of the attached gingiva. There is a great deal of variation in both degree and amount of stippling with the stippling ending at the free gingival groove (Fig. 4). The width of the attached gingiva varies considerably with the greatest amount being present in the maxillary incisor region and the least width in the mandibular premolar region (Fig. 5). The attached gingiva extends from the free gingival groove to the mucogingival junction which can be seen as a demarcation line between the attached gingiva and the alveolar mucosa apical to this junction. On the lingual aspect of the mandible, the attached gingiva terminates in the loose tissue which forms the floor of the mouth. The palatal aspect of the attached gingiva is continuous with the masticatory

Fig. 4. Stippling ended at the free gingival groove.

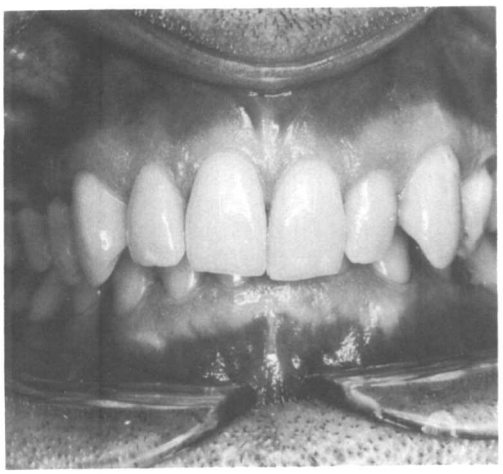

Fig. 5. Varying amounts of attached gingiva with the greatest amount being present in the incisor area and the least amount in the lower premolar area.

mucosa of the rest of the palate and no mucogingival junction is present.

Alveolar Mucosa

The alveolar mucosa is situated just apical to the mucogingival junction. This tissue is freely movable and elastic in nature. The color of the alveolar mucosa is reddish because the underlying blood vessels are visible through the thin epithelial surface. This tissue cannot effectively withstand direct masticatory forces.

Interdental Papilla

The interdental papilla or gingiva is the triangular shaped tissue filling the embrasure space between adjacent teeth. Throughout the text it will also be referred to as interproximal papilla. The terms are interchangeable. The shape of the interdental papilla is determined by the following: (1) location—anterior versus posterior part of the mouth—the papillae become progressively flatter as one proceeds posteriorly (see Fig. 3); (2) the placement of the contact point; and (3) location in the arch—that is, whether the tooth is in buccal or lingual placement. For example, the papillae tend to be enlarged on the buccal aspect of lingually placed teeth (Figs. 6 and 7).

Where normal contact relations exist, the shape of the interdental papilla is that of a col or "valley-like depression." One can see in Figure 8 that the interdental papilla actually consists of a buccal papilla, a lingual papilla, and a central depression or col in between.

The contours of adjoining teeth create interproximal embrasures and form a canopy housing the interdental papilla. These surfaces are flattened and in some instances concave. The flattened contours permit sufficient room for the interdental papilla to reside in health and at the same time to protect this area from food and debris retention. The interproximal embrasure space created by adjacent proximal contacts should have the following properties: (1) contact areas should be in the occlusal one-fourth and slightly closer to the buccal surface in posterior teeth; (2) proximal surfaces of adjacent teeth tend to have mirror images of each other so that a symmetric canopy is created; (3) marginal ridges are at the same heights; and (4) contact is sufficiently tight so as to prevent food impaction or food retention.

Gingival Sulcus

The gingival sulcus is bounded on one surface by the crevicular epithelium and on the other by the enamel and/or cementum. The marginal gingiva is joined to the tooth at the base of the sulcus by the epithelial attachment or cuff. The sulcus is lined with thin, nonkeratinized, stratified squamous epithelium. Because of the absence of keratinization, the crevicular epithelium only provides minimal protection to the

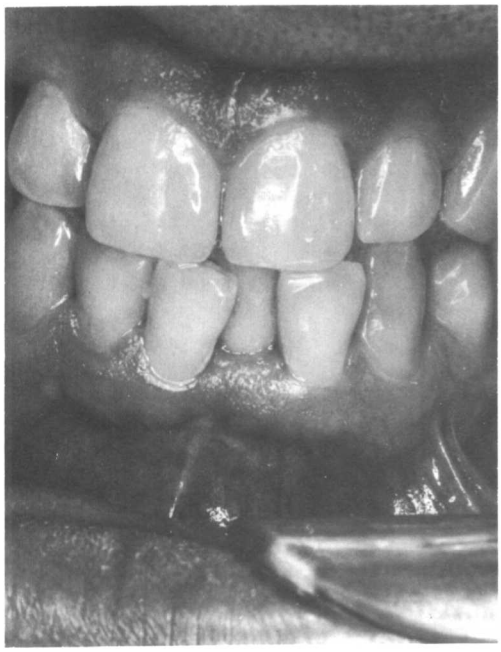

Fig. 6. Enlarged gingiva on the labial aspect of the lingually placed lower incisor.

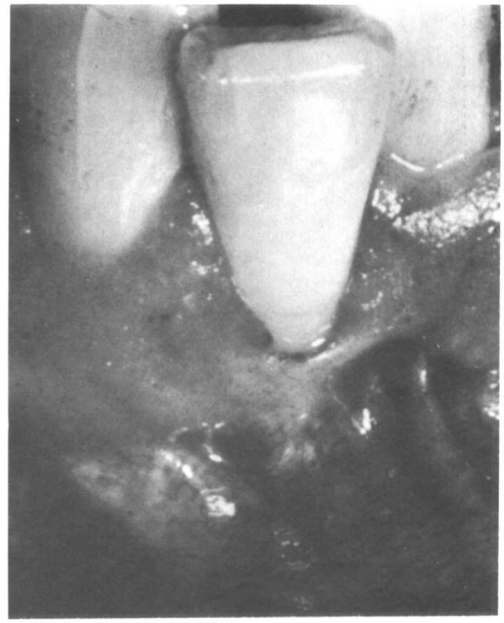

Fig. 7. Reduced amount of attached gingiva on labial aspect of labially placed lower incisor.

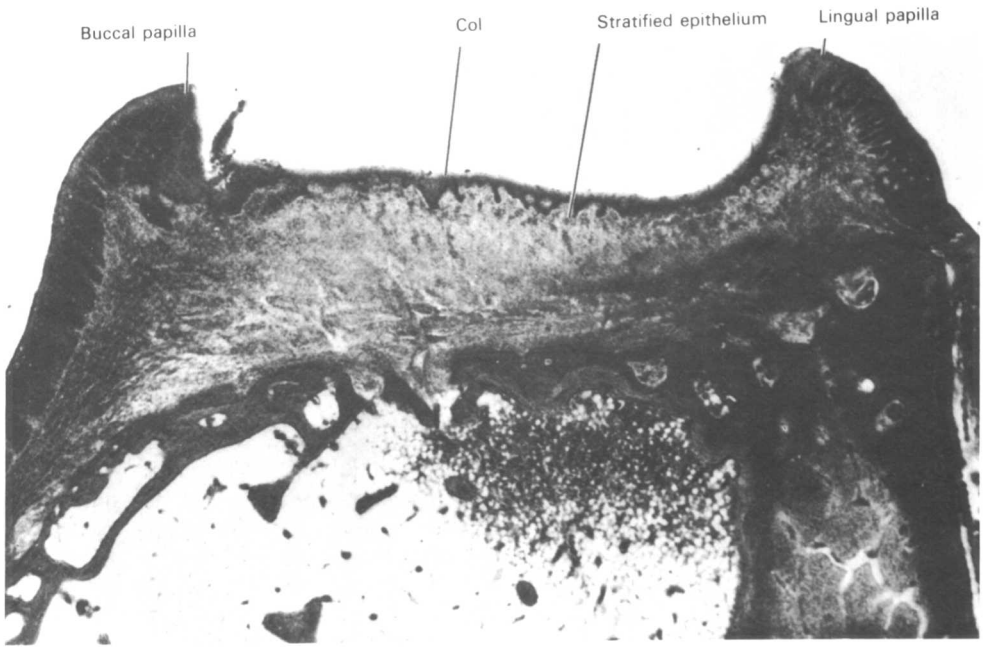

Fig. 8. Microscopic col configuration of interdental papilla with buccal peak, lingual peak, and central depression covered by thin stratified, nonkeratinized squamous epithelium.