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Periodontal Manifestations of Local and Systemic Diseases

Color Atlas and Text

Second Edition

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 Springer

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Foreword

Being familiar with the first edition of this *Color Atlas and Text* on periodontal manifestations of local and systemic diseases, I could not imagine seeing the appearance of an even more detailed and extended edition. Not surprisingly, several new disease entities have been added. A separate chapter is devoted to the dental biofilm as a risk factor for systemic diseases, such as cardiovascular diseases, pulmonary diseases, diabetes mellitus, and low birthweight infants. Ample attention has been paid to periodontal diseases that may be associated with a vast number of systemic diseases.

The structure of the book with 46 chapters is well chosen. The text is concise and supported by high-quality pictures. A selected list of references is provided at the end of each chapter. Altogether, the authors have to be congratulated with this unprecedented second edition.

At first sight, this scholarly Atlas and Text seems mainly to be useful for Periodontologists and specialists in the field of Oral Medicine. However, in view of the well-structured and accessible text, and the use of abundant clinical pictures, this masterpiece can also be strongly recommended for the general Dentists and all other healthcare workers who are involved in the diagnosis and management of periodontal diseases.

Professor Emeritus Oral Pathology, ACTA Dental School
Amsterdam, The Netherlands

Isaïc van der Waal

Foreword

Readers of this comprehensive atlas will gain invaluable practical knowledge of the systemic diseases that manifest to practitioners in the periodontal setting. Periodontists and student alike will have at their fingertips the most up-to-date information needed to understand the important relationship between periodontal and systemic health.

As providers of patient care, we constantly need to be aware of advances in knowledge to stay at the forefront of clinical practice. By gaining a solid understanding of how complex medical problems manifest in the oral cavity, and particularly the periodontium, we are better equipped to offer our patients the best evidence-based information to improve their oral and overall health.

Periodontal Medicine and Oral Medicine both have their roots in oral pathology. The forefathers of periodontics and oral medicine were physicians, including Gottlieb, Orban, and Goldman. With this in mind, Drs. Laskaris (Oral Medicine), Tatakis (Periodontology), and Stoufi (Oral Medicine) have focused on oral medicine issues that impact the periodontium. The second edition of this comprehensive atlas has been greatly expanded to cover a vast range of systemic disorders that present with gingival or periodontal lesions. The authors highlight, by example, the importance of the periodontal and oral medicine team in the diagnosis and management of patients with complex medical problems.

Professor George Laskaris and Professor Dimitris Tatakis are both active clinicians, teachers, and researchers in oral medicine and periodontology, respectively, who have extensive experience and a special interest in periodontal manifestations of systemic disease. Both are widely published experts in this field.

Now, more than ever, oral health practitioners need to keep up to date of new discoveries and developments in oral health management. This atlas greatly expands the possibilities for learning and teaching.

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Professor of Oral Medicine, Infection and Immunity,
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Cambridge, MA, USA

Thomas E. Van Dyke

In Memoriam & Dedication



Crispian Scully 1945–2017

It is with the deepest sorrow for the loss of **Professor Crispian Scully** an exceptional scientist, beloved friend, and invaluable collaborator.

I therefore dedicate this volume, as a tribute to his memory and as an expression of my admiration that goes well beyond words for the man and his work in the field of Oral Medicine. I bow with immense respect before the memory of a man who honored his country and who adorned with his achievements the edifice of international science; a true spiritual and intellectual leader.

We worked together for over 35 years and during this time an unbreakable golden bond of friendship and scientific collaboration developed that generated the inspiration for the first edition of this book in 2003. His participation in innumerable scientific activities such as lectures, seminars, congresses, research papers, books, and discussions of difficult clinical problems helped educate and inspire generations of young scientists in my home country. He was a motive force that helped Oral Medicine flourish in Greece and for this we owe him a great debt.

Crispian Scully was driven by and served in outstanding manner seven fundamental qualities. He was an exceptional **Scientist**, an inspiring **Teacher**, a prolific **Writer**, a remarkable **Clinician**, a worthy **Researcher**, an excellent **Manager** but above all a **Virtuous Man**, shining with the greatest blessing that can be bestowed on a man according to Aristotle (384–322 BC) His achievements and the memory of his perceptive, ever questioning mind will continue to guide us.

George Laskaris MD, DDS, PhD

Introduction to Oral Medicine

Oral Medicine is an important, rapidly developing dental specialty around the world that recognizes and cultivates the close relation between oral and systemic health. On the other hand, the spectrum of oral diseases is wide and includes diseases of oral mucosa and gingiva, lip disorders, salivary gland and jaw diseases, temporomandibular joint disorders, orofacial pain, taste changes, malodor, and mainly oral manifestations of systemic diseases. Oral diseases may be *common or rare, local or systemic, acute or chronic, innocent or serious, life-changing or life-threatening*. Oral Medicine Specialist should collaborate with several *Medical and Dental specialties* and the *general Dentists* as well.

A particular scientific relation exists between Oral Medicine and Periodontology, as in several local and systemic diseases the periodontal tissue can be involved in varying degrees of severity. It is important to keep in mind that periodontal lesions may be the earliest signs of systemic diseases. Early recognition of this fact expedites the diagnostic process and therapy of the disease to the benefit of the patients, including saving their lives in cases of life-threatening diseases.

The volume at hand was written, taking into account the complexity of the subject, with a two-fold purpose in mind:

- To aid the oral medicine and periodontology practitioner as well as the general dentists in making the correct diagnosis.
- To facilitate the planning and implementation of the optimal therapy for the clinical problem at hand, always adhering to the highest moral principles and standards of patient care.

The final aim is the prevention, diagnosis, and treatment of diseases of the mouth.

The Diagnostic Decision

From the point of view of clinical examination, the mouth presents several advantages to the examiner:

- It is an open cavity readily accessible and amenable to all modalities of clinical examination.
- Biopsies of lesions are easily obtained.
- The patient can do self-examination.
- Early diagnosis of oral lesions is achieved during visits to the dentist.

However, diagnostic difficulties occur for the following reasons:

- There is a great variety of lesions affecting the oral cavity that are associated with a wide spectrum of local and systemic diseases.

- There is overlapping and variety of expression of the elementary lesions themselves.
- There is frequent modification of the elementary oral lesions by local factors, such as foods, dentures, saliva, and teeth.

The diagnostic approach follows codified diagnostic and differential diagnostic rules.

Diagnosis

- Detailed medical history
- Clinical evaluation of oral lesions
- Examination and evaluation of skin and mucosal lesions elsewhere in the body
- Evaluation of symptoms and signs in other organs and systems
- Recording of medication intake prior to the beginning of the present illness
- Grouping of probable disease entities based on clinical criteria
- Re-evaluation of symptoms and signs in cases of doubt regarding the diagnosis
- If necessary, communication with the patient's family physician
- Performance of biopsy if necessary
- Study of the obtained tissue specimens by an experienced Pathologist
- Evaluation of the pathology report in light of the clinical diagnosis
- Repetition of the biopsy if necessary
- Laboratory workup as needed
- Confirmation of diagnosis
- Re-examination and repeat evaluation of the patient after initiation of therapy

Differential Diagnosis

- Beginning of symptoms and signs of the disease
- Duration (acute, subacute, chronic)
- General symptoms (fever, pain, malaise, anorexia, weight loss, arthralgias, etc.)
- Primary lesions (macule, papule, blister, bulla, pustule, plaque, nodule, etc.)
- Secondary lesions (erosion, ulcer, crust, scar)
- Color of the lesions (white, red, black, brown, yellow)
- Localization (tongue, buccal, palate, floor of the mouth, gums, lips)
- Coexistence with skin lesions, mucosa, and organs elsewhere in the body
- Biopsy and histopathology
- Other laboratory tests (microbiology, immunology, hematology, molecular, imaging studies)

Therapeutic Decision

The rules and principles that must be adhered to are presented below in codified form.

Therapeutic Approach

- Before the initiation of any form of therapy the diagnosis must be firmly established.
- Therapy without diagnosis is as a rule ineffective and on occasion may prove deleterious, even life-threatening to the patient.
- Medications are administered if and only if it is absolutely necessary and the expected benefits outweigh the probable risks caused by their use.

- A successful therapy depends heavily on the choice of the appropriate drug and the compliance of the patient with the instructions of use of the medication.
- For every medicine that the clinician uses, he must be thoroughly familiar with the mode of action, indications, and interactions with other drugs, side effects, contraindications for its use, form of the drug, precise dose, and schedule of administration. The clinician always chooses the drug with the best therapeutic effect, the least side effects, and the lowest cost.
- The clinician is extra careful when using new medications.
- Dentists should abstain from the treatment of oral diseases with a serious prognosis and refer patients to specialists in Oral Medicine or related specialty.
- The local therapy of oral lesions should be undertaken in collaboration with a specialist.
- Patients with oral diseases with a serious prognosis in the acute phase should always be hospitalized.

The Hippocratic (460–377 B.C.) aphorism “to benefit or do not harm” must always be the beacon of every physician before making a diagnostic or therapeutic decision.

George Laskaris

Introduction to Periodontology

Periodontology is the specialty of Dentistry which encompasses the prevention, diagnosis, and treatment of diseases of the supporting and surrounding tissues of the teeth or their substitutes and the maintenance of the health, function, and esthetics of these structures and tissues. The supporting tissues of the teeth, referred to as the periodontium, include the gingiva, alveolar bone, cementum, and the periodontal ligament. Dental implants, serving as tooth substitutes, are lacking periodontal ligament and cementum but are surrounded by alveolar bone and gingiva or alveolar mucosa.

Periodontal diseases and conditions, which include a wide spectrum of clinical entities, as this book attests, have been known to humankind for millennia. Periodontitis, the destructive form of disease identified exclusively in the periodontium, has been found in early humans from diverse prehistoric cultures and has been identified as one of the most common diseases affecting ancient and present-day populations. Many of the ancient cultures of the historical era described diseases such as necrotizing ulcerative gingivitis and periodontitis, practiced oral hygiene, and were aware of the importance of keeping teeth clean. However, meaningful progress towards characterization of periodontitis as a disease entity, its possible etiology, and effective treatment approaches did not materialize until the nineteenth century, a period of time when many scientific advances took place.

The mouth, despite being the subject of independent study and clinical practice, is not disconnected from the rest of the body. Just as many systemic diseases can manifest in the oral cavity, disease processes, whether infectious, inflammatory, or neoplastic in nature, that initiate in oral tissues may spread via vascular networks and non-vascular routes to distant sites in the body. The term “Periodontal Medicine” has been used to describe how periodontal infection and/or inflammation may impact extraoral health. In the last few years, significant new evidence has been presented that bolsters the contribution of periodontal diseases to systemic disease processes. These findings underscore the fact that keeping the mouth healthy is important for maintaining general health and well-being.

From a professional perspective, the specialty of Periodontology was organized and started to evolve in the USA after two pioneering female periodontists, Grace Rogers Spalding and Gillette Hayden, founded the American Academy of Periodontology in 1914. In the 1940s and 1950s, several national periodontal societies were established around the world. Periodontology was formally granted specialty status by the American Dental Association in 1949, when it recognized the American Board of Periodontology, incorporated in 1940, as the official specialty Board to certify periodontists. In the 73 years since this formal recognition, the specialty has seen tremendous advancements and progressive expansion of its scope to include dental implant placement and implant site development, among other procedures.

One aspect of the specialty that has remained constant over the years is the interest and involvement in the diagnosis and treatment of oral pathologies, clinical activities that many periodontists worldwide perform on a daily basis. Periodontology is historically considered to be the discipline that gave rise to the specialty of Oral Medicine. With this background, it is no surprise that the two specialties intersect, especially in the context of oral manifestations, and more specifically periodontal manifestations, of various systemic and oral diseases. The fact that the gingiva is often a primary site for such manifestations provides a sound basis for this

strong interdisciplinary interaction. Timely interdisciplinary care, exemplified by the active collaboration between the general dentist, the periodontist, and the oral medicine specialist, is the only way to offer our patients the best possible treatment and safeguard their oral and systemic health and well-being.

This textbook serves to emphasize this unique interface and to support the diagnostic and therapeutic efforts of practitioners who find themselves in this realm. By offering practical clinical information, this volume will allow readers to review what they have learned previously and to explore new knowledge. Because, as G.V. Black stated, “the professional person has no right to be other than a continuous student.”

Dimitris Tatakis

Preface to the Second Edition

Oral Medicine and Periodontology are two challenging clinical dental specialties whose respective scientific focus on diseases of the oral mucosa and of the periodontal tissues is maintained sharp and constant by the needs and expectations of our patients. However, the two individual specialties intersect where patients with periodontal manifestations of oral diseases are concerned. A strong scientific interaction between Oral Medicine and Periodontology is needed to allow us to keep properly serving the needs of patients and enhancing the care we provide, especially in the face of constantly emerging new biomedical information and an expanding knowledge base.

Although there are several excellent papers and chapters in Periodontology and Oral Medicine/Oral Pathology textbooks, no other books specifically focused on the periodontal manifestations of oral and systemic diseases had been available in this form. This book aimed to fill this gap.

Nineteen years have elapsed since the first edition of this book, wherein remarkable scientific advances have been made in this field, followed by fundamental changes, thus necessitating this new edition.

The latest classification scheme for periodontal and peri-implant diseases and conditions, published in 2018 and adopted by the American Academy of Periodontology and the European Federation of Periodontology, represents a strong impetus for the increased interest in this field. This new classification, which encompasses both dental biofilm-induced diseases and non-dental biofilm-induced periodontal conditions and diseases, has expanded the number of clinical entities previously considered and illustrates the broad spectrum of pathological processes that can manifest in the periodontium. The breadth and complexity of the scientific information concerning all these diseases can be challenging for the clinician and underscore the need for a concise and useful source that combines pertinent knowledge from Periodontology and Oral Medicine.

In this 2023 edition of the book, we closely followed both the classification of periodontal diseases related to dental biofilm and the vast spectrum of local and systemic diseases that affect the periodontal tissues, oral mucosa, and other organs and systems. This classification is schematically captured as a “tree” (Fig. 1). A concerted effort has been made to cover the broad range of local and systemic diseases that can affect the periodontal tissues.

In this context, the second edition of the book has been almost entirely rewritten, expanded, and updated to include new clinical information and to adapt to contemporary publishing and scientific standards. New chapters and types of diseases have been added and over 50% of the pictorial material has been renewed and enriched with high-quality color images. In addition, significant advances made over the last 20 years in diagnostic methods, for example, histopathology, immunology, biochemistry, genetics, and others, have been included. This provides the reader with a concise, comprehensive, and reliable book.

According to Hippocrates (460–377 B.C.), “...the wise should consider that health is the greatest of human blessings.”

It is certain that when one considers human health, the mouth commands a leading position, as it is associated with unique functions and fundamental pleasures of life: *taste, speech, love, every verbal expression of human affection, and social and professional interactions*. From this

Schematic Classification of Diseases & Conditions Affecting Periodontal Tissues

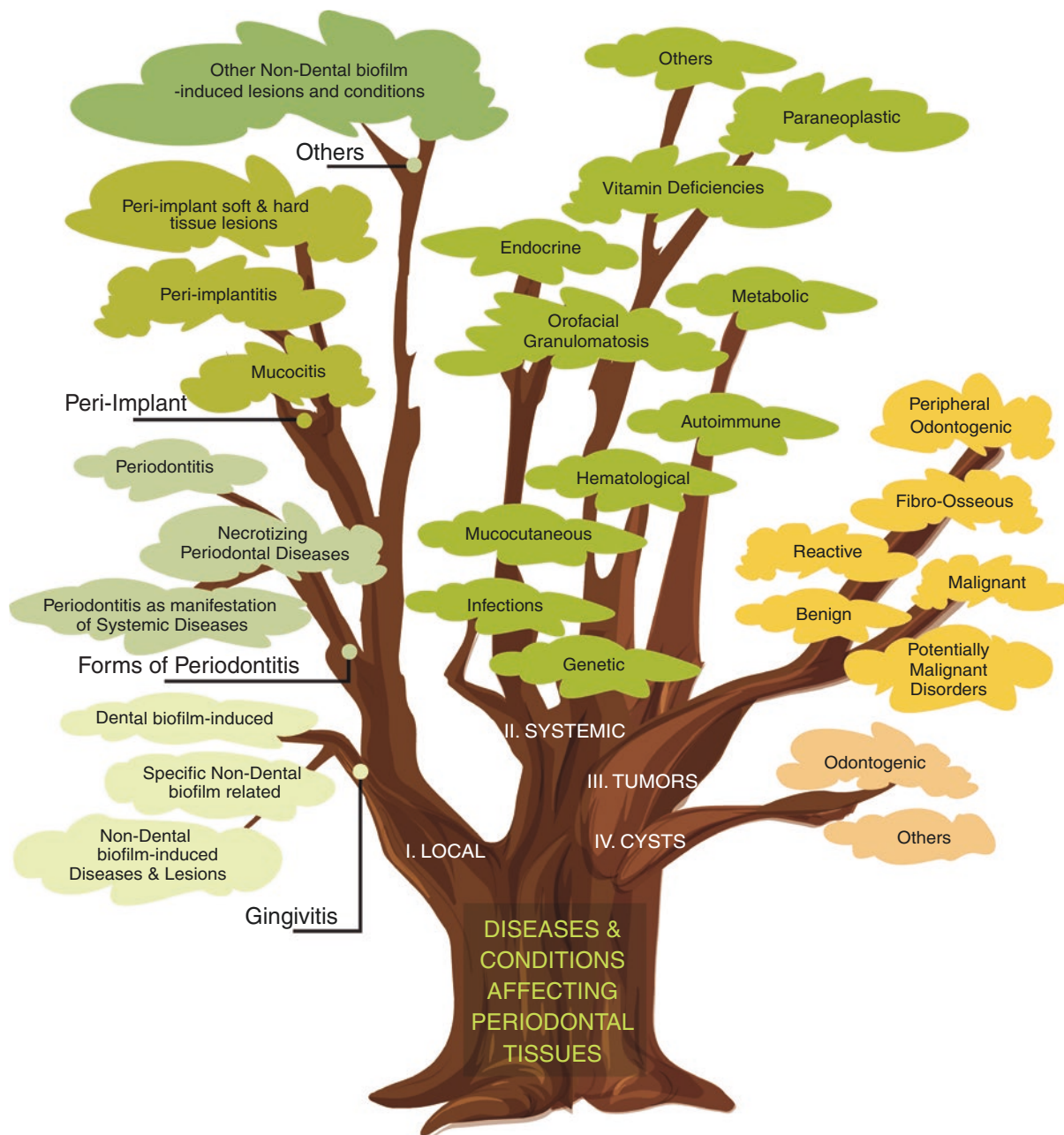


Fig. 1 A panoramic drawing of updated classification of diseases and conditions affecting the periodontal tissues in the form of a “tree,” providing a quick framework to the Periodontologists, specialists in Oral Medicine, general Dentists, and the students of Dentistry. © George Laskaris

viewpoint, general Dentists and Dental Specialists are placed in a prominent position and, at the same time, are being entrusted with the responsibility to ensure the key mission of *prevention-diagnosis-treatment* and finally *function restoration* of this critical organ, the *mouth*, whenever it is being affected.

We hope that the second edition of this book will make a valuable contribution to this mission, as it has the noble goal of helping to maintain oral and general health at the highest of standards. General Dentists, Periodontists, Oral Medicine Specialists, Dental students, and other healthcare providers can acquire basic and current information, which in combination with the high-quality clinical images constitute a practical and easy-to-use book.

It is our expectation that Oral Medicine and Periodontology, individually and combined, as in this textbook, will continue to offer new perspectives in the delivery of oral and general health services and further benefit the global community.

George Laskaris
Dimitris Tatakis
Eleana Stoufi

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Our special thanks go to Professor **Isaïc van der Waal** (the Netherlands) and to Professor **Thomas E. Van Dyke** (USA) for the excellent forewords.

The great majority of images come from the vast collection, of more than 130,000 color slides of Professor Laskaris and fewer from late Professor Scully's, Professor Tatakis' and Dr. Stoufi's archives.

Several colleagues, listed below, contributed to this edition by providing images from their own collection, which undoubtedly enhanced the quality of this book. We would like to express our sincere gratitude to all of them for their support.

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Part I

The Periodontium in Health

The Normal Periodontium

1

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This chapter will review the normal periodontium (anatomy and physiology), the etiology and pathogenesis of gingivitis and periodontitis, and the diagnosis of periodontal diseases.

Anatomy

Periodontal Tissues

The following tissues, in order of encounter from the vestibular or oral aspect, constitute the periodontium and support the teeth: gingiva, alveolar bone, periodontal ligament, and cementum. Under ideal healthy conditions, the gingiva is the only clinically observable periodontal tissue and the tissue on which most of the pathological manifestations occur. Cementum may be clinically observable under common conditions where the tooth root is exposed, such as in gingival recession. Clinical exposure of the alveolar bone occurs in pathological conditions or in the course of post-operative healing; in the latter cases, the exposure is temporary. Because of the significance of the gingiva as the tissue on which most diseases and conditions manifest themselves, the emphasis in this introductory chapter will be on the gingiva.

Clinical Features of the Gingiva

The gingiva, i.e., the keratinized mucosa that covers the teeth and the alveolar bone, is demarcated from the alveolar mucosa by the mucogingival junction (MGJ) (Figs. 1.1, 1.2, 1.3, 1.4 and 1.5). In health, the gingiva should have a light or salmon pink color, compared to a much darker or



Fig. 1.1 Normal periodontium. Gingiva appears with a typical salmon pink color



Fig. 1.2 Normal periodontium. Note stippling of attached gingiva



Fig. 1.3 Normal periodontium. The mucogingival junction is demonstrated by iodine staining of the alveolar mucosa (same case as Fig. 1.2)



Fig. 1.4 Normal periodontium. Normal pigmentation in an individual with moderate skin pigmentation. Note stippling of attached gingiva

red color for the alveolar mucosa (Figs. 1.1 and 1.2). Depending on the extent of skin pigmentation of the individual, the gingiva may also display significant pigmentation (Fig. 1.4), which may vary in color from light tan to dark brown.



Fig. 1.5 Normal periodontium. The free and attached gingiva and the gingival groove are evident, particularly on the incisors

The gingiva is divided into free, marginal, and attached gingiva (Fig. 1.5). The free gingiva constitutes the movable, most coronal portion of the tissue. The attached gingiva is the immovable portion that extends to the MGJ. In less than 50% of gingiva examined, a shallow groove runs parallel to the gingival margin and delineates the free from the attached gingiva (Fig. 1.5). This gingival groove is located 1–2 mm apical to the gingival margin and its formation appears to depend on the organization of the underlying connective tissue collagen fibers. The attached gingiva often exhibits stippling (orange peel-like appearance) of the surface, most evident on the facial aspect of maxillary anterior teeth (Figs. 1.2 and 1.4). In periodontally healthy subjects, the buccolingual dimension (thickness) of facial gingiva ranges between 0.8 mm (mandibular canines) and 1.5 mm (mandibular second molars). The apicocoronal dimension (width) of the attached gingiva ranges between 1 and 10 mm and varies by site. It is narrowest on the lingual aspect of mandibular incisors, the facial aspect of mandibular canines and first bicuspids, and the facial aspect of maxillary first bicuspids. It is the widest on the facial of maxillary incisors and the lingual of mandibular molars.

Histology of the Gingiva

The gingiva consists of epithelium and connective tissue (Fig. 1.6). The gingival epithelium, according to location and histological characteristics, can be divided into three types: oral, sulcular, and junctional epithelium.

The oral epithelium (OE) lines the surfaces facing the oral cavity. The OE is thick, stratified, orthokeratinized, or para-keratinized, with elongated, narrow rete pegs (projections). The epithelium is separated from and linked to the underlying connective tissue by a basement membrane (basal lamina). The underlying lamina propria is dense and firmly attached to the periosteum without distinct submucosa.