# **Table of Contents**

#### **Fundamentals**

- 1 Introduction
- 1 Periodontal Diseases
- The Clinical Course of Untreated Periodontitis
- 4 Periodontitis—Concepts of Therapy
- 7 Structural Biology
- 8 Gingiva10 Epithelial Attachment
- 12 Connective Tissue Attachment
- 14 Root Cementum
- **16** Osseous Support Apparatus
- 18 Blood Supply of the Periodontium
- 19 Innervation of the Periodontium
- The Coordinated Functions of the Periodontal Structures
- 21 Etiology and Pathogenesis
- 22 Periodontitis—A Multifactorial Disease
- 23 Microbiology
- 24 Biofilm—Plaque Formation on Tooth and Root Surfaces
- 25 Supragingival Plague
- Natural Factors Favoring Plaque Retention
- 27 latrogenic Factors Favoring Plague Retention
- Subgingival Plaque
- 29 Bacterial Invasion Into Tissue?
- **30** Classification of Oral Microorganisms
- 31 Cell Walls of Gram-Positive and Gram-Negative Bacteria
- 32 Periodontitis—Classical or Opportunistic Infection?
- 33 Putative Periodontopathic Bacteria
- 34 Virulence Factors
- 34 Virulence Transfer
- 36 Marker Bacteria in Periodontitis
- 37 Pathogenic "Single Fighters" vs. Pathogenic Complexes?
- 38 Endotoxins—Lipopolysaccharide (LPS)
- 38 Interaction Between LPS and the Host

## 39 Pathogenesis—Reactions and Defense Capabilities of the Host

- **40** New Concepts of Pathogenesis
  - Therapeutic and Diagnostic Consequences
- 41 Host Response—Mechanisms and "Participants"
- 42 Non-specific, Congenital Immunity—the First Line of Defense 43 Specific, Acquired Immunity—the Second Line of Defense
- Components of the Immune System—Summary
- 45 Interactions Between Non-specific and Specific Immunity
- 46 Regulatory Cell Surface Molecules: Markers, Receptors
- 47 Cytokines
- 49 Eicosanoids—Prostaglandins and Leukotrienes
- Enzymatic Mechanisms—Matrix Metalloproteinases
- Risk for Periodontitis—the Susceptible Host
- Genetic Risk Factors—Diseases, Defects, Variations
- **54** Alterable Risk Factors, Modifying Co-Factors
- Pathogenesis I—Initial Inflammatory Reactions
- 56 Pathogenesis II—Histology58 Pathogenesis III—Molecular Biology
- **60** Attachment Loss I—Destruction of Connective Tissue
- **61** Attachment Loss II—Bone Resorption
- **62** Pathogenesis—Clinical Features: From Gingivitis to Periodontitis
- Cyclic Course of Periodontitis
- Periodontal Infections and Systemic Diseases
- **65** Etiology and Pathogenesis—Summary
- 67 Indices
- **70** Papilla Bleeding Index—PBI
- 71 Periodontal Indices
- 72 Community Periodontal Index of Treatment Needs—CPITN
- 73 Periodontal Screening and Recording—PSR
- 74 Epidemiology
- 74 Epidemiology of Gingivitis
- **75** Epidemiology of Periodontitis
- **76** WHO Studies

## **Disease Entities and Diagnosis**

- 77 Types of Plaque-associated Periodontal Diseases
- Gingivitis—Periodontitis
- 78 Classification of Periodontal Diseases—Nomenclature

- 79 Gingivitis
- Histopathology
- Clinical Symptoms
- Mild Gingivitis
- Moderate Gingivitis 83
- Severe Gingivitis
- **Ulcerative Gingivitis/Periodontitis**
- Histopathology 86
- Clinical Symptoms—Bacteriology
- 88 Ulcerative Gingivitis (NUG)
- Ulcerative Periodontitis (NUP)
- Ulcerative Gingivoperiodontitis—Therapy

## 91 Hormonally Modulated Gingivitis

- Severe Pregnancy Gingivitis—Gravid Epulis
- Pregnancy Gingivitis and Phenytoin
- Periodontitis
- 96 Pathobiology—The Most Important Forms of Periodontitis
- 96 Type II
- 96 Type III B
- Type III A 97
- 97 Type IV B
- 98 Pathomorphology—Clinical Degree of Severity
- **99** Pockets and Loss of Attachment
- 100 Intra-alveolar Defects, Infrabony Pockets
- 102 Furcation Involvement
- **104** Histopathology
- **105** Additional Clinical and Radiographic Symptoms
- 108 Chronic Periodontitis—Mild to Moderate
- 110 Chronic Periodontitis—Severe
- 112 Aggressive Periodontitis—Ethnic Contributions?
- 114 Aggressive Periodontitis—Acute Phase
- **116** Aggressive Periodontitis—Initial Stage
- 118 Prepubertal Periodontitis—PP (Aggressive Periodontitis)

## 119 Oral Pathologic Alterations

## of Gingiva and Periodontium\*

- Primarily Gingival Alterations (Type I B)
- Gingival and Periodontal Alterations (Type IV A/B) 120
- 121 Phenytoin-Induced Gingival Overgrowth122 Dihydropyridine-induced Gingival Overgrowth
- Cyclosporine-induced Gingival Overgrowth 123
- Gingival Hyperplasia Following Combined Drug Therapies 124
- 125 Benign Tumors—Epulis126 Benign Tumors—Fibrosis, Exostosis 127
- Malignant Tumors 128 Gingivosis / Pemphigoid
- 128 Pemphigus vulgaris
- 129 Lichen planus: Reticular and Erosive
- 130 Leukoplakia, Pre-Cancerous Lesions—Oral Granulomatoses
- Herpes—Herpetic Gingivostomatitis
- Periodontitis with Systemic Diseases (Type IV)—Diabetes Type I and Type II
- Periodontitis Associated with Systemic Diseases (Type IV B) Down Syndrome, Trisomy 21, "Mongolism"
- Pre-pubertal Periodontitis Associated with Systemic Disease Papillon-Lefèvre Syndrome (Type IV B)
- Papillon-Lefèvre Syndrome—"An Exception for Every Rule"
- 139 HIV Infection—AIDS
- **140** HIV Disease—Epidemiology
- Classification and Clinical Course of HIV Disease 141
- 142 Oral Manifestations of HIV Disease
- 143 Bacterial Infections in HIV
- 144 Fungal Infections 145 Viral Infections
- 146 Neoplasms
- HIV-Associated Lesions of Unknown Etiology
- Invasion and Replication of the HI Virus-Hurdles for Systemic Medical Treatment
- Treatment of the HIV Patient—Pharmacologic Aspects
- **150** HIV—Treatment of Opportunistic Infections
- Infection Prevention and Post-exposure Prevention—The Dental Team
- Treatment of HIV-Periodontitis
- Gingival Recession
- **156** Fenestration and Dehiscence of the Alveolar Bone
- 157 Clinical Symptoms
- 158 Recession—Localized
- 159 Recession—Generalized

#### **Table of Contents** X

- 160 Clinical Situations Resembling Recession
- 161 Recession—Diagnosis
- **162** Measurement of Recession (Jahnke)
- 162 Classification of Recession (Miller)
- 164 Consequences of Recession

#### 165 Data Collection—Diagnosis—Prognosis

- 166 Data Collection—Examinations
- **167** General Patient Health History
- 167 Special Patient Health History
- **168** Classic Clinical Findings
- 169 Pocket Probing—Probing Depth, Clinical Attachment Loss
- 170 Pocket Probing—Periodontal Probes
- 171 Pocket Probing Depths—Interpretation of the Measured Values
- 172 Furcation Involvement—Horizontal and Vertical Furcation Invasion
- **174** Tooth Mobility—Functional Analysis
- 176 Radiography

## 178 Additional Diagnosis—Tests

#### 179 Microbial Diagnosis—Test Methods

- 180 Microbial Pocket Diagnosis—Dark Field and Phase Contrast Microscopy
- **181** Microbial Pocket Diagnosis—Cultures
- 182 New Diagnostic Tests—Evaluation183 Molecular Biological Tests
- **184** Bacterial Probe Test—Practical IAI PadoTest
- 185 DNA/RNA Probe Tests—IAI PadoTest 4.5
- 186 Immunological Tests—Antigen-Antibody Reactions
- 187 Enzymatic Bacterial Tests—BANA Test

## 188 Tests of the Host Response—Risks

- 189 Genetic Risk—Test for IL-1 Gene Polymorphism
- 190 IL-1 Gene Test—Technique, Evaluation
- 191 Risk Factor IL-1-positive Genotype—Additional Risk Factors
- 192 Poor Oral Hygiene as a Risk Factor—Bleeding on Probing (BOP)
- 193 Periodontal Risk Assessment—Individual Risk Profile
- 194 Diagnostic Data Collection—Periodontal Charting, I and II
- 195 Computer-Enhanced Charting—the Florida Probe System
- 196 Diagnosis
- 197 Prognosis

#### 198 Prevention—Prophylaxis

- 198 Definition: Prevention—Prophylaxis
- 199 Prevention of Gingivitis and Periodontitis

## Therapy

## 201 Treatment of Inflammatory Periodontal Diseases

- Therapeutic Concepts and Techniques
- 203 Therapy—Problems
- **204** Periodontitis—Therapeutic Goals, Therapeutic Outcomes

## 205 Periodontal Wound Healing

- 206 Wound Healing and Regeneration—Possibilities
- **208** Treatment Planning—Sequence of Treatment

Pre-phase—Systemic Health, Oral Hygiene

Phase 1—Causal, Antimicrobial, Anti-infectious

Phase 2—Surgical, Corrective

Phase 3—Preventive, Anti-infectious, "Life Long"

210 General Course of Therapy—Individual Planning

## 211 Systemic Pre-phase

- **212** Evaluation—Can the Patient be Safely Treated?
- 213 Bacteremia—Endocarditis Prophylaxis
- 214 Dental Procedures Carrying the Risk of Bacteremia
- 215 Diabetes mellitus (DM)—Risk Factor for Periodontitis
- 216 Smoking—An Alterable Risk Factor

## 217 Emergency Treatment

## 221 Phase 1 Therapy

222 Case presentation—Motivation—Information

## 223 Initial Treatment 1—

## Oral Hygiene by the Patient

- 224 Motivation—Gingival Bleeding
- **225** Plaque Disclosing Agents
- 226 Toothbrushes
- 228 Toothbrushing Technique
- 229 The Solo Technique—A Different Way to Brush Your Teeth
- 230 Electric Toothbrushes
- **231** Interdental Hygiene 234 Dentifrices
- 235 Chemical Plaque Control—"Soft Chemo" Prevention
- 236 Irrigators

- 237 Oral Hygiene for Halitosis
- 238 Possibilities, Successes and Limitations of Oral Hygiene

#### 239 Initial Therapy 1—

#### Creating Conditions that Enhance Oral Hygiene

- 240 Supragingival tooth cleaning—Power-driven Instruments ...
- 241 ... and their Use
- **242** Supragingival Tooth Cleaning—Hand Instruments, Prophy Pastes ...
- 243 ... and their Use
- 244 Creating of Conditions that Enhance Oral Hygiene—Removal of latrogenic Irritants
- 246 Correction of latrogenic Irritants—Bridge Pontics
- 247 Removal of Natural Plaque-retentive Areas—
  - Odontoplasty of Grooves, Depressions, Irregularities
- 248 Reduction of Natural Plaque-retentive Areas—Crowding: Morphologic Odontoplasty
- 249 Treatment of Plaque-elicited Gingivitis
- **252** Gingivitis Treatment

## 253 Phase 1 Therapy

- 253 Definitions
- 254 Non-Surgical, Anti-Infectious Therapy—Goals of Treatment
- **255** Antimicrobial Therapy—Combating the Reservoir
- **256** Root Planing—With or without Curettage?
- **257** Closed Therapy—Indication, Instrumentation
- 258 Hand Instruments for Scaling and Root Planing—Curettes
- 259 Powered Instruments for Debridement
- 260 Gracey Curettes—Areas of Use
- 262 Hand Instruments for Special Problems—Curettes
- **263** Practical Scaling Technique with Gracey Curettes—Systematic Approach
- 268 Instrument Sharpening
- **269** Manual Sharpening of Hand Instruments
- Automated Sharpening 270
- Subgingival Debridement—Closed Root Cleaning
- Closed Therapy in Quadrant 1 ...
- ... and in the Rest of the Dentition?
- 278 Limitations of Closed Therapy
- **280** Possibilities and Limitations of Closed Therapy ...

## 281 FMT—"Full Mouth Therapy"

- 282 FMT—Instrumental/Mechanical and ...
- 283 ... Pharmacologic Therapy
- **284** FMT—Radiographic Results 285 FMT—Statistical/Numerical Results

## 287 Medication

- 287 Anti-Infectious Supportive Therapy—Antibiotics in Periodontitis Therapy
- 288 Decision-Making Criteria—When to Use Antibiotics?
- 290 Antibiotics—Bacterial Sensitivity and Resistance
- Systemic Versus Local (Topical) Antimicrobial Therapy
- 292 Local (Topical) Antimicrobial Therapy—"Controlled Release Drugs" (CRD)
- 294 Host Response/Reaction—Modulating Substances

## 295 Phase 2 Therapy

## Periodontal Surgery—Corrective Phase

- 296 Purposes and Goals of Periodontal Surgery
- **297** Patient Selection
- 298 Factors that Influence the Treatment Result
- **299** Methods of Periodontal Surgery and their Indications
- 300 Principles of Various Treatment Modalities—Advantages and Disadvantages
- **302** Pre-operative Treatment—Post-operative Care

## 303 Flap Procedures—Open Treatment

- **304** Flap Design—Incisions
- 305 Instruments for Flap Surgery
- 306 Needles and Suture Materials
- **307** Sutures and Knots
- 308 Frequently Used Suture Placements

## 309 "Access Flap" Surgery, Open Flap Debridement (OFD)-Modified Widman Flap (MWF)

- 310 Principles of the Modified Widman Procedure—Ramfjord Technique
- 312 Principles of the MWF—Occlusal View
- 313 "Access Flap"/Modified Widman Procedure—Case Presentation
- "Access flap"/Modified Widman Procedure 318 Long-term Results Following Various Treatment Modalities
- **319** Wedge Excision Distal to a Lone-standing Tooth—Principles 320 Wedge Excision—Most Distal Tooth

## 323 Regenerative Methods

- **324** Intra-Alveolar Pockets—Anatomy of the Defect
- 326 Bone Regeneration without "Transplantation"
- 327 Filling Materials for Intra-Alveolar Pockets—Transplants/Implants
- 328 Instruments for Harvesting Autogenous Bone. ... and Their Use
- 330 Implantation (Transplantation?) of Autogenous Bone
- 332 Bone Replacement Materials—"Fillers"

- 334 Alloplastic Implant—Combined Surgical Procedure
- 337 Combined Procedure—Intra-Osseous Implant
- 338 Guided Tissue Regeneration—GTR
- 340 Selection of Membranes and Barriers
- **341** GTR Using Non-resorbable Membranes
- 345 Individual Immediate Membrane—Atrisorb/Atrigel Technology
- **346** GTR with Membrane and Filler—"Atrisorb Free Flow," "Bio-Oss Collagen"
- 348 GTR with Filling Material and a Membrane—"Bio-Gide" and "Bio-Oss Collagen"
- **351** Regeneration Using Proteins, Growth Factors and Differentiation Factors
- 352 Flap Surgery Combined with Enamel Matrix Proteins—Emdogain
- **354** Regeneration Using Emdogain
- **354** Regenerative Therapy—Quo Vadis?

#### 355 Resective Methods

- Pocket Elimination—Osseous Surgery 356 Instruments for Osseous Surgery ...
- ... and Their Use
- 358 Evaluation of Various Resective Methods
- Resective Therapy
  - Apical Flap Repositioning—Pocket Elimination
- **366** Combined Flap Surgical Techniques

- 367 Gingivectomy and Gingivoplasty368 Instruments for Gingivectomy/Gingivoplasty ...
- ... and Their Use
- 370 Tissue Dressings and Tissue Adhesives
- **371** Gingivectomy/Gingivoplasty
- 377 GV/GP, Maxilla: Facial and Palatal
- 378 GV/GP—Minor Surgical Procedures, Corrective Operations Exposing the Margins of Restorations and Cavity Preparations
- 379 GV/GP-Phenytoin-Induced Gingival Overgrowth
- 380 Limitations of GV/GP—Cyclosporine-Induced Gingival Overgrowth

## Furcation Involvement—Furcation Treatment

- **382** Embryologic Development of Multi-Rooted Teeth—Furcation
- **383** Furcation Involvement—Classifications
- **384** Treatment Planning—Problems—Long-Term Results
- **385** Furcation Treatment—Aids for Decision Making
- **386** Therapeutic Possibilities for Various Cases
- 388 Furcation Involvement (F1) in the Mandible—Odontoplasty and Scaling
- **389** Furcation Involvement, F2, in the Maxilla—Furcation plasty
- 390 Furcation Involvement, F2, in the Mandible—GTR Technique
- **392** Furcation Involvement, F3, in the Mandible—Hemisection with Extraction
- 394 Furcation Involvement, F3, in the Maxilla—Root Resection with Reconstruction
- 396 Maxillary Furcation Involvement, F3—Trisection with Maintenance of all Roots

## 397 Mucogingival, Plastic Surgery

- 398 Mucogingival Problems ...
- ... and Possibilities for Resolution
- 400 Frenotomy-Frenectomy
- 401 Free Gingival Graft—Autogenous Transplant—with Epithelium
- **402** Instruments for Harvesting the Transplant ...
- 403 ... and Their Use
- 404 Free Gingival Graft—Thickness and Shape
- **405** Free Gingival Graft—Halting Recession
- 410 FGG-Wound Healing, Clinically ...
- ... and via Fluorescence Angiography
- 412 Advantages and Disadvantages of FGG

## 413 Covering Areas of Recession

- 414 Shape of the Defect—Selection of Surgical Technique
- **415** Pedicle Flap Techniques
- 416 Direct Coverage with a Free Gingival Graft
- 418 Coronal Repositioning after Free Gingival Grafting—2-Stage Surgical Procedure

## 419 Covering Areas of Recession with a Connective Tissue Graft

- **421** Harvesting Graft Tissue from the Palate
- 422 Harvesting the Graft from the Palate—Schematic and Clinical
- 424 Additional Methods for Harvesting Connective Tissue Grafts
- 425 Free Connective Tissue Graft—Nelson Technique
- **429** Free Connective Tissue Graft—Nelson Technique
- **430** Connective Tissue Graft ... and Dealing with Complications

## 435 Covering Areas of Recession via "Guided Tissue Regeneration"—GTR

- Covering Gingival Recession Using Resorbable Membrane Treating Recession after Orthodontic Therapy
- 440 Covering Areas of Recession on Several Teeth—Possibilities
- 441 Coronally Repositioned Flaps and Papilla Rotation
- **442** Esthetic Improvement through Mucogingival Surgery and Prosthetic Restoration
- Summary—Mucogingival, Plastic Surgery

## 445 Periodontics—Endodontics

- Class I—Primarily Endodontic Problem 446
- Class II—Primarily Periodontal Problem 446
- 447 Class III—Combined Perio-Endo Problems

#### 449 Phase 3 Therapy

## Periodontal Maintenance Therapy—Recall

- Recall in the Dental Practice—Recall Effect
- Recall—Continuous Risk Management
- **452** The "Recall Hour"—Practical Periodontal Maintenance Therapy
- **454** Dentist and Dental Hygienist—The "Preventive Team"
- **454** Auxiliary Personnel and Treatment Needs
- **455** Failures—Lack of Periodontal Maintenance Therapy
- **456** Negative Results of Therapy
- **458** Hypersensitive Dentin

## **Supporting Therapies**

#### 459 Function—Functional Therapy

- 459 Normal Function
- 460 Physiologic Tooth Mobility
- **461** Occlusal Periodontal Trauma
- 462 Occlusal Bite Guard—The Michigan Splint

#### 463 Orthodontics

- 464 Maxillary Anterior Segment Space Closure Following Periodontal Therapy
- Uprighting the Mandibular Second Molar
- Maxillary Anterior Esthetic Correction Following Periodontitis Treatment
- Treatment of the Malpositioned Canine

## Splinting—Stabilization

- 473 Temporary Splinting
- 474 Semi-Permanent Splinting—Anterior Area
- 475 Permanent Splinting—Adhesive Technique
- 476 Prosthetic Stabilization—Long-Term Temporary

## Perio-Prosthetics 1

## Standard Techniques

- Temporaries—Removable or Fixed?
- Adhesive Bridge in the Mandible—Long-Term Temporary
- Fixed Temporary—Problem Zones
- Fixed Acrylic Temporary—Practicality 481
- Fixed, Metal-Reinforced Long-Term Temporary 482 Definitive Fixed Reconstruction—Total Bridgework 484
- Molar Loss—What Now? 486
- Telescope ("Coping") Bridgework with Few Remaining Teeth Cast Framework Prostheses—"Social Solution" 487
- 488

#### 489 Perio-Prosthetics 2

## Supplemental Measures, Esthetics

- Goals, Problems and Solutions in Esthetic Perio-Prosthetics
- 490 Crown Margins—Biologic Width—Dentogingival Complex (DGC)
- 491 Esthetic Width—Umbrella Effect—Transparency
- **492** Smile Line—Red-White Proportions Crown Lengthening—Principles
- 494 Surgical Crown Lengthening—Step-by-Step
- 496 Papilla Loss—Classification, Rules
- Papilla Loss—Prosthetic Rehabilitation with Veneers 500 Papilla Loss—Prosthetic Treatment Using Crowns
- **502** Edentulous Arch Segments—Pontics
- 503 Alveolar Ridge Defects—Classifications **504** Alveolar Ridge Defect—Prosthetic Solution
- Alveolar Ridge Defects—Surgical Corrections—Methods 505
- 506 Ridge Augmentation Using Partially Epithelialized Connective Tissue Graft Ridge Defect—Build-up with Connective Tissue Graft—Summary
- 511

## **Dental Implants—Implant Therapy**

- 512 Determinative Diagnostic Criteria
- 513 Therapeutic Concepts—Therapeutic Results Recall—Management of Implant Problems

## **Appendices**

## 515 Geriatric Periodontology?—The Periodontium in the Elderly

518 Age-Related Changes—Influence Upon Treatment Planning

## 519 Classification of Periodontal Diseases

- 519 New Classification of Periodontal Diseases (1999)
- 522 Changes—Comparing the 1989 and 1999 Classifications
- **523** Recall—"Personalized Periodontology"
- 524 Acknowledgments for Figures
- 525 References
- 528 Index