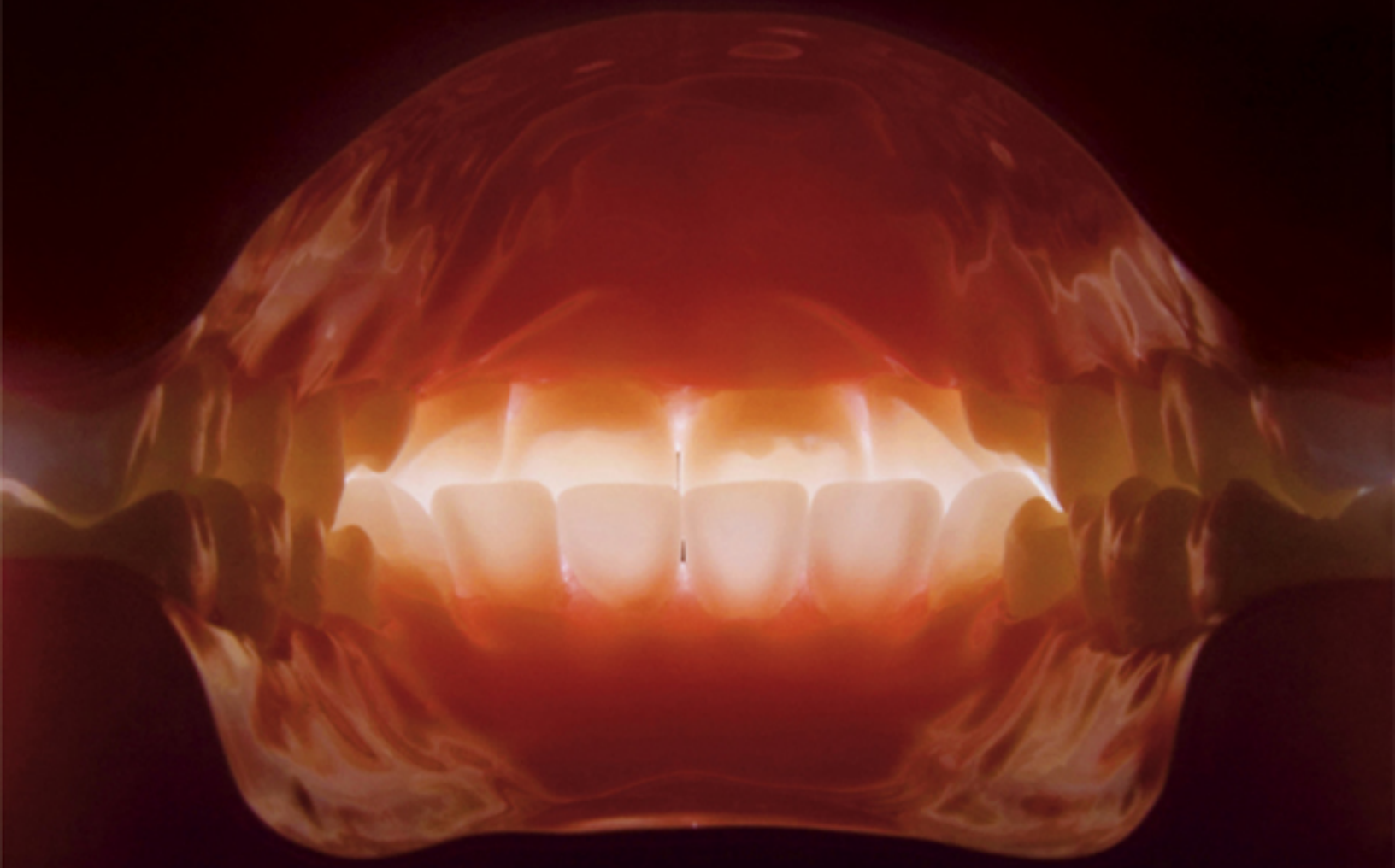
Periodontology at a Glance

Valerie Clerehugh, Aradhna Tugnait and Robert Genco



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Preface

Periodontology is the specialty of dentistry concerned with diseases of the supporting tissues of the teeth. Periodontal disease in its most severe forms affects between 5% and 15% of the population in industrialised countries, while disease presenting at the early and intermediate stages is widespread, as is the reversible condition of gingivitis. As such any practitioner of dentistry or dental hygiene will be confronted with patients presenting with periodontal problems on a daily basis. Current research suggests that periodontal disease is also linked to other general health problems including diabetes, cardiovascular disease and strokes. Thus periodontal diseases and their management may have effects beyond that of the oral cavity.

In the UK and USA, as in other countries, periodontal care is delivered in general dental practice, specialist periodontal practice and the dental hospital setting. Perhaps more than any other area of dentistry at the time of writing, the management of periodontal patients is often achieved by an integrated dental team. The continuing development of the roles of professions complementary to dentistry can only enhance the scope for the delivery of effective patient care.

Periodontology at a Glance is the latest title in the widely known At a Glance series. It is designed to provide a concise review of the field of periodontology and includes the underpinning principles of the subject and their clinical applications. It is designed as a study aid and revision guide for students of dentistry, hygiene and therapy. It is also a useful tool for dental practitioners, hygienists and therapists

to update their knowledge of this continually developing subject.

In the typical visual At a Glance style, this book uses a double-page spread for each topic. Salient information has been distilled from the literature and presented in easy to read notes, tables, diagrams and figures. Where teeth are referred to in the text and figures the following notation is used: UR, upper right quadrant; UL, upper left quadrant; LR, lower right quadrant; and LL, lower left quadrant. The permanent teeth are referred to as ‘1’ (indicating central incisor) to ‘8’ (indicating third molar), to give UR1 as the upper right permanent central incisor and UR8 as the upper right permanent third molar.

The chapters are self-contained and can therefore be read in any order. Cross referencing will direct the reader to additional relevant chapters in the book. Each chapter ends with a box of key points to present the reader with the essential take-home messages for a particular topic. References and further reading for each chapter are provided in the Appendix at the end of the book.

We hope you enjoy using this book.

Acknowledgements and dedications

Professor Iain L. C. Chapple, Professor of Periodontology, University of Birmingham is credited with writing Chapter 31, ‘Non-plaque-induced gingival conditions and lesions’. We are very grateful to him for his contribution to our book and for the figures he provided in other chapters: Figs 38.5 and 40.9. Thanks are due to Quintessence for permission to publish images in the following Figures in Chapter 31: Fig 31.3b, Fig 31.4, Fig 31.5, Fig 31.7, Fig 31.8 and Fig 31.9.

We thank Quintessence for permission to publish Figs 35.5 (b), (d) and 35.6 (c), and Wiley-Blackwell for permission to use Fig 5.5.

We extend our thanks to the Photography Department at Leeds Dental Institute for their expertise in the clinical photographs they supplied. We would also like to acknowledge the following colleagues for providing the figures listed:

- Mr Paul Gregory: Fig. 37.7.
- Dr Margaret Kellett: Fig. 41.1.
- Dr Susan Kindelan: Figs 40.7 and 40.8.
- Professor Phil Marsh: Fig. 4.3.
- Mr Peter Nixon: Figs 25.4c, 26.5, 27.3, 28.3, 28.7, 30.10 and 32.5.
- Mr Adam Steel for the artwork in Fig. 7.4.
- Dr Bob Turner: Fig. 5.1.
- Dr Simon Wood: Fig. 4.4.
- Ms Victoria Yorke: Fig. 18.6
- Mr Paul Franklin: Fig. 14.9.

This book was originally inspired in collaboration with Caroline Connelly. We are very grateful to the Wiley-Blackwell team for bringing this book to fruition, and Katrina Chandler deserves a particular mention in this regard. More recently we have enjoyed working with Sophia Joyce, Mirjana Misina and Jane Andrew, amongst others. A huge amount of hard work has gone into the preparation of *Periodontology at a Glance* and we acknowledge the dedication and craftsmanship of all involved.

Dedications

Professor Val Clerehugh wishes to thank her husband, Tony, daughter, Mary, and parents, Mary and Bas, for their unconditional love and support in the preparation of this book and dedicates this book to them.

Dr Aradhna Tugnait would like to dedicate this book to Keith, Adella, Torrin and Anuja whose dependable love gives purpose to every endeavour.

Professor Robert Genco wishes to thank Rose Parkhill for her excellent assistance with the book, and his wife Frances, for her support and encouragement.

1

Anatomy of the periodontium

Figure 1.1 Longitudinal section through part of a tooth showing healthy periodontal tissues.

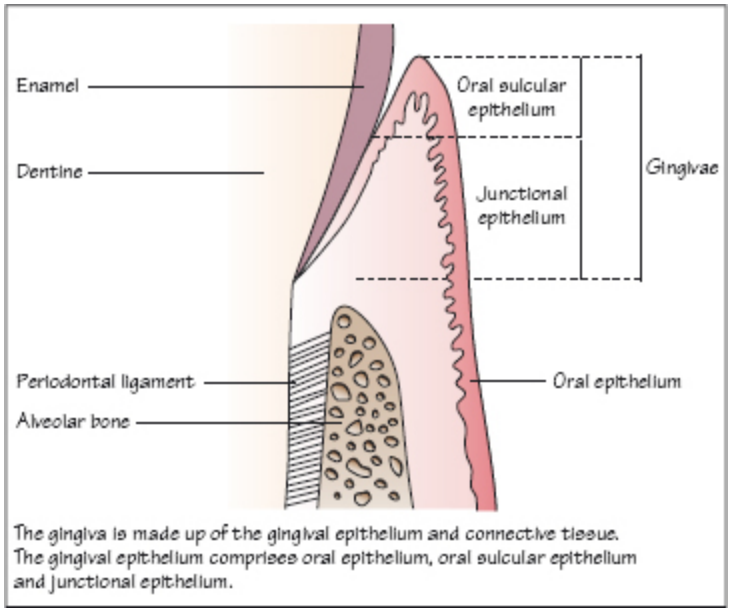


Figure 1.2 Dentogingival fibres, alveolar crest fibres and circular fibres in the gingival connective tissue.

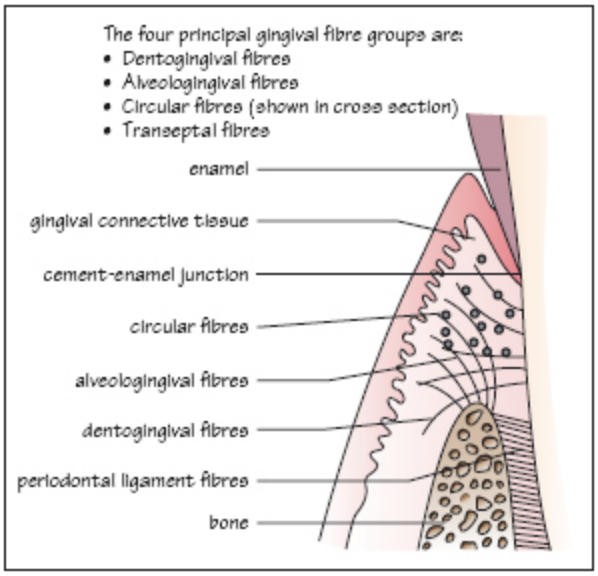


Figure 1.3 Interdental area showing transeptal and circular fibre groups in the gingival connective tissue.

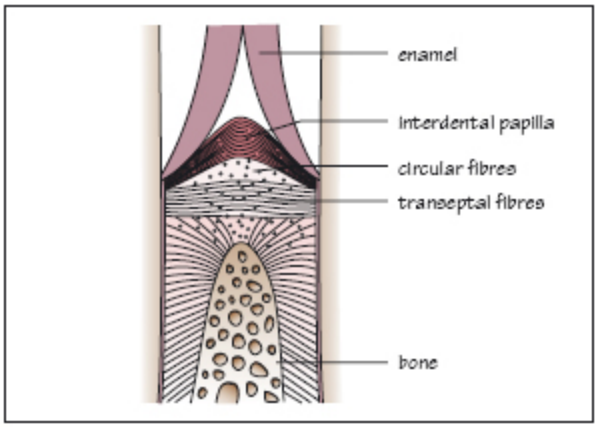


Figure 1.4 The periodontal ligament.

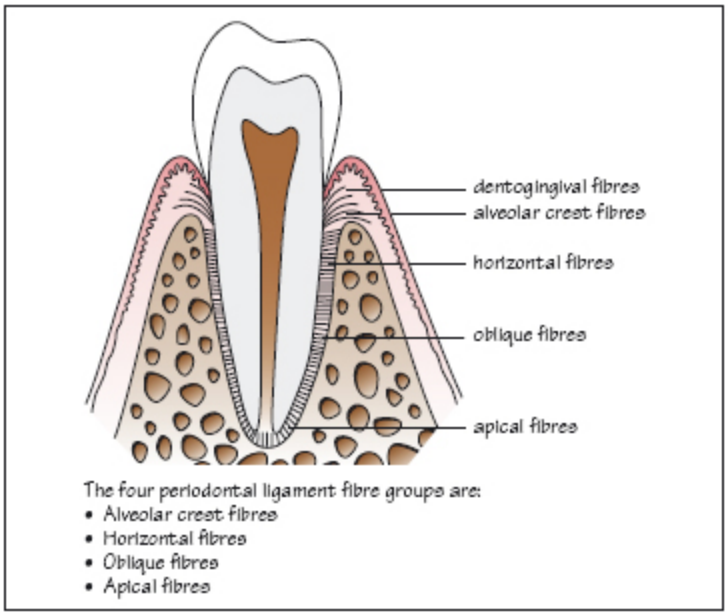
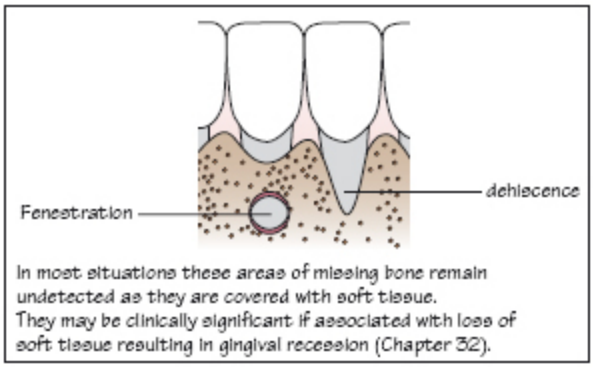


Figure 1.5 Bony fenestration and dehiscence.



The periodontal tissues form the supporting structures of the teeth. The principal components of the periodontium are shown in Fig. 1.1:

- Gingivae (including epithelium and connective tissue).
- Periodontal ligament.
- Cementum.
- Alveolar bone.

Gingivae

The gingivae in health are pink and firm with a knife-edge appearance, scalloped around the teeth. In certain ethnic groups the gingivae may be pigmented. In health, the gingival margin is a few millimetres coronal to the cement–enamel junction. The gingival sulcus (or crevice) is a shallow groove which may be between 0.5 and 3 mm in depth around a fully erupted tooth. The gingival tissues are keratinised and appear paler pink than sites of non-keratinised oral epithelium.

Gingival epithelium

The gingival epithelium comprises (Fig. 1.1):

- Oral epithelium (OE).
- Oral sulcular epithelium (SE).
- Junctional epithelium (JE).

The gingival sulcus is lined by SE and JE.

Oral epithelium

- The OE is an orthokeratinised, stratified, squamous epithelium.
- Surface cells lose their nuclei and are packed with the protein keratin.
- It presents an impermeable physical barrier to oral bacteria.

The basal layer of epithelial cells is thrown up into folds overlying the supporting connective tissue. These folds increase the surface area of contact between the epithelium and connective tissue and are known as rete ridges or rete pegs.

Oral sulcular epithelium

- There are no rete ridges.
- Cells are keratinised but still have nuclei (parakeratinised).

Junctional epithelium

- The JE forms a specialised attachment to the tooth via:
  - a hemidesmosomal layer within the JE cells;
  - a basal lamina produced by the epithelial cells.
- The JE is non-keratinised and has a very fast turnover of cells (2–6 days compared to 1 month for OE).
- The most apical part of the JE lies at the cement-enamel junction in health.
- The JE at its widest point is 20–30 cells thick coronally.
- The JE tapers until it is only one cell in width apically.
- The JE is permeable with wide intercellular spaces through which cells and substances can migrate (such as bacterial toxins or host defence cells).
- Migration of the JE from its position in health apically onto the root cementum indicates a loss of periodontal attachment and progression to the disease state of periodontitis.

Gingival connective tissue

The gingival connective tissue (or lamina propria) is made up of collagen fibre bundles called gingival fibres, around which lie ground substance, fibroblasts, blood and lymph vessels and neural tissues. The four fibre groups are shown in Figs 1.2 and 1.3.

Periodontal ligament

The periodontal ligament forms the attachment between the cementum and alveolar bone. It is a richly vascular connective tissue within which lie bundles of collagen fibres;

these are divided into four groups based on their position (Fig. 1.4).

Within the ligament are mechanoreceptors that provide sensory input for jaw reflexes. Cells from the periodontal ligament are involved in the formation and remodelling of alveolar bone and cementum. The periodontal ligament acts to dissipate masticatory forces to the supporting alveolar bone and its width, height and quality determine a tooth's mobility.

Cementum

Cementum is a mineralised tissue overlying the root dentine. It does not undergo physiological remodelling but is continuously deposited throughout life. Cementum is classified into two types:

- Acellular.
- Cellular.

Acellular cementum

Acellular cementum forms on root dentine during root formation and tooth eruption. Fibres inserted from the periodontal ligament are mineralised within the cementum and are known as Sharpey's fibres and are abundant in acellular cementum.

Cellular cementum

Cellular cementum lies over the acellular cementum. It contains cells called cementocytes which lie in lacunae. The cellular cementum layer is thicker in the apical region of the root where it is between 0.2 and 1 mm thick.

Alveolar bone

• The walls of the sockets are lined with a layer of dense bone called compact bone, which also forms the buccal and lingual/palatal plates of the jaw bones.

• In between the sockets and the compact jaw bone walls lies cancellous bone that is made up of bony trabeculae.

• The compact bone plates of the jaws are thicker on the buccal aspect of the mandibular molars and thinnest on the labial surface of the mandibular incisors.

The thickness of the compact bone layer is relevant to the choice of local analgesia techniques as the anaesthetic solution passes through bone to reach the nerve supply. The thin bone, particularly in the lower incisor region, can manifest as incomplete bony coverage in the form of fenestrations and dehiscences (Fig. 1.5).

The tooth sockets are lined with compact bone within which the principal fibres of the periodontal ligament are inserted. This area of bone can appear as a dense white line called the lamina dura on a radiograph.

Key points

- Gingivae
  - JE forms the specialised attachment to the tooth
  - The most apical part of JE lies at the cement–enamel junction in health
  - Supported by connective tissue containing collagen fibre bundles
- Periodontal ligament
  - Forms attachment between the cementum and bone
- Cementum
  - Mineralised and deposited continuously
- Alveolar bone
  - Compact and cancellous bone
  - Periodontal ligament fibres inserted into compact bone lining the tooth sockets

2

Classification of periodontal diseases

Figure 2.1 Classification of gingival diseases.

A. Dental plaque-induced gingival diseases*
1. Gingivitis associated with dental plaque only
   a. Without other local contributing factors
   b. With other local contributing factors
2. Gingival diseases modified by systemic factors
   a. Associated with the endocrine system
      1) puberty-associated gingivitis
      2) menstrual cycle-associated gingivitis
      3) pregnancy-associated
         a) gingivitis
         b) pyogenic granuloma
      4) diabetes mellitus-associated gingivitis
   b. Associated with blood dyscrasias
      1) leukaemia-associated gingivitis
      2) other
3. Gingival diseases modified by medications
   a. Drug-influenced gingival diseases
      1) drug-influenced gingival enlargements
      2) drug-influenced gingivitis
         a) oral contraceptive-associated gingivitis
         b) other
4. Gingival diseases modified by malnutrition
   a. Ascorbic acid-deficiency gingivitis
   b. Other

*Can occur on a periodontium with no attachment loss or on a periodontium with attachment loss that is not progressing

B. Non-plaque-induced gingival lesions
1. Gingival diseases of specific bacterial origin
   a. *Neisseria gonorrhoea*-associated lesions
   b. *Treponema pallidum*-associated lesions
   c. Streptococcal species-associated lesions
   d. Other
2. Gingival diseases of viral origin
   a. Herpes virus infections
      1) primary herpetic gingivostomatitis
      2) recurrent oral herpes
      3) varicella-zoster infections
   b. Other
3. Gingival diseases of fungal origin
   a. *Candida* species infections
      1) generalised gingival candidosis
   b. Linear gingival erythema
   c. Histoplasmosis
   d. Other
4. Gingival lesions of genetic origin
   a. Hereditary gingival fibromatosis
   b. Other
5. Gingival manifestations of systemic conditions
   a. Mucocutaneous disorders
      1) lichen planus
      2) pemphigoid
      3) pemphigus vulgaris
      4) erythema multiforme
      5) lupus erythematosus
      6) drug-induced lesions
      7) other
   b. Allergic reactions
      1) dental restorative materials
         a) mercury
         b) nickel
         c) acrylic
         d) other
      2) reactions attributable to
         a) toothpastes/dentifrices
         b) mouthrinses/mouthwashes
         c) chewing gum additives
         d) foods and additives
      3) other
6. Traumatic lesions (factitious, iatrogenic, accidental)
   a. Chemical injury
   b. Physical injury
   c. Thermal injury
7. Foreign body reactions
8. Not otherwise specified (NOS)

Classification

- An up-to-date classification:
  - allows the clinician to be aware of the full range of periodontal diseases and conditions that can affect the patient
  - provides a basis for the diagnosis and subsequent management of the patient
- The classification in Figs 2.1–2.8 derives from the 1999 International Workshop for the Classification of Periodontal Diseases and Conditions, which was convened to reclassify these diseases and conditions due to a previous lack of consensus
- The new categories added to the 1999 classification were:
  - gingival diseases
  - necrotising periodontal diseases
  - abscesses
  - periodontitis associated with endodontic lesions
  - developmental or acquired deformities and conditions

Figure 2.2 Classification of chronic periodontitis.

Figure 2.3 Classification of aggressive periodontitis.

Figure 2.4 Classification of periodontitis as a manifestation of systemic diseases.

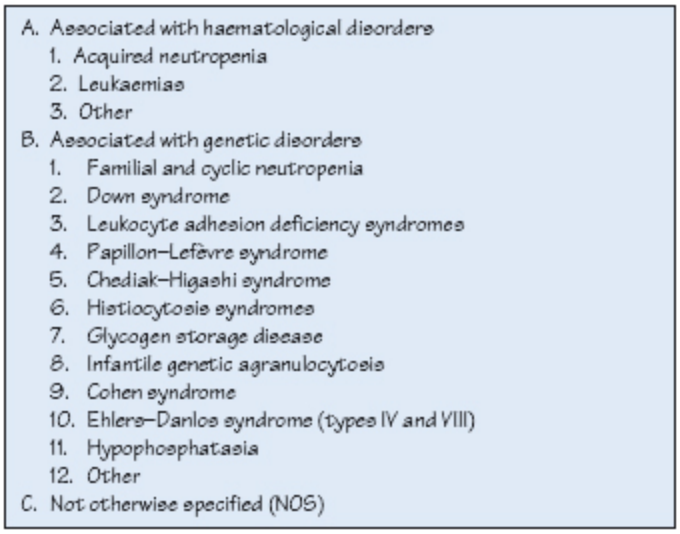


Figure 2.5 Classification of necrotising periodontal diseases.

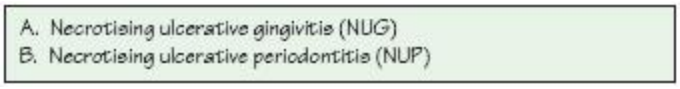


Figure 2.6 Classification of abscesses of the periodontium.

Figure 2.7 Classification of periodontitis associated with endodontic lesions.

Figure 2.8 Classification of developmental or acquired deformities and conditions.

A. Localised tooth-related factors that modify or predispose to plaque–induced gingival diseases/periodontitis
   1. Tooth anatomical factors
   2. Dental restorations/appliances
   3. Root fractures
   4. Cervical root resorption and cemental tears
B. Mucogingival deformities and conditions around teeth, including gingival recession and gingival overgrowth
   1. Gingival/soft tissue recession
      a. Buccal or lingual recession
      b. Interproximal (papillary)
   2. Lack of keratinised gingiva
   3. Decreased vestibular depth
   4. Aberrant frenum/muscle position
   5. Gingival excess
      a. Pseudopocket
      b. Inconsistent gingival margin
      c. Excessive gingival display
      d. Gingival enlargement
   6. Abnormal colour
C. Mucogingival deformities and conditions on edentulous ridges
D. Occlusal trauma
   1. Primary occlusal trauma
   2. Secondary occlusal trauma