Periodontal Diseases in children and adolescents

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Objectives

• Discuss the clinical and radiographic features of healthy gingival and periodontal tissues in children and adolescent
• Differentiate between clinical features of healthy periodontal tissues in children and adults
• Discuss the etiology and risk factors of periodontal disease
• Explain the periodontal examination in young patients
• Discuss the various forms of periodontal diseases in young patients
• Discuss the important clinical features of periodontal diseases in young patients
Growth and development

<table>
<thead>
<tr>
<th>Growth period</th>
<th>Chronological age</th>
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</thead>
<tbody>
<tr>
<td>Late childhood (prepubertal)</td>
<td>7 to 12 years</td>
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<tr>
<td>Adolescence (puberty)</td>
<td>13 to 20 years</td>
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<tr>
<td>Young Adult</td>
<td>21 to 40 years</td>
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<tr>
<td>Middle Aged (Adult)</td>
<td>41 to 60 years</td>
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<tr>
<td>Elderly</td>
<td>&gt;60 years</td>
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(Lowrey, 1973 and Kippers, 1999)
The clinical and radiographic features of healthy gingival and periodontal tissues in young patients
Periodontal tissues in children

• The component of the gingival and periodontal structure are the same in children, adolescence and adult
• Clinical and radiographic images differ from adults
• Treatment: the inherent healing and potential benefit from growth and developmental changes

(Bimstein and Matsson, 1999)
Periodontium
Free and attached gingiva
Normal

- pink or may be red and inflamed (during eruption)
- thinner epithelium
- less keratinized
- greater vascularity of connective tissues
- less variation in the width of the attached gingiva.
Figure 21-27. Width of attached gingiva, Step 1—measure the total width of the gingiva from the gingival margin to the mucogingival junction. This measurement is taken on the external surface of the gingiva.

Figure 21-28. Width of attached gingiva. Step 2—measure the probing depth. Calculate the width of the attached gingiva by subtracting the probing depth from the total width of the gingiva.

Figure 21-24. Calculating the clinical attachment level (CAL) when the gingival margin covers the CEJ. Ask students to determine the probing depth and the gingival margin level. Then ask them to calculate the CAL for this tooth.
Free and attached gingiva

Normal

During tooth eruption

• the gingival sulcus depths can reach 5 mm, normal 2 mm

• gingival margins will be at different levels on adjacent teeth.

• persistent hyperaemia, swollen and rounded interproximal papillae, thus giving an appearance of gingivitis.
Gingival morphology

In the primary teeth

- contact areas are broad, flat, and low
- the papillae is shorter and rounder

than in the permanent dentition
Interdental saddle area and attached gingiva:
(a) interdental spacing, common in the primary dentition, results in the formation of gingival saddle areas are more resistant to the initiation of periodontal disease than are cols formed in areas of proximal dental contact.
(b) pigmentation in attached gingiva
Attached gingiva

- Thinner, less keratinized epithelium and greater vascularity
- Less dense and redder
- More flaccid, less stippled
- The width is lesser than adult
Alveolar mucosa

• Its width increases with chronological age and dental eruption
Periodontal membrane and alveolar bone

• The periodontal space is wider and less dense (fewer fibers/unit area) in children

• Alveolar bone
  – Less calcified, more vascular and having fewer but thicker trabeculae.
  – Larger marrow spaces, thinner lamina dura, and flatter interdental crests
Normal Radiographic features

- In the primary dentition, the distance between the CEJ and the alveolar crest is 0-2 mm.
- Greater variation (0-4 mm) is observed at sites adjacent to erupting permanent teeth and exfoliating primary teeth.
Normal Radiographic features

- The periodontal membrane space is wider in children because of the thinner cementum, immature alveolar bone and a more vascular periodontal ligament.
Comparison children and adults?

- Free gingiva: Redder, thinner epithelium, greater vascularity, contact areas are broad, flat, and low, papillae is shorter and rounder, interdental spacing, pigmentation
- Attached gingiva: thinner, less keratinized epithelium and greater vascularity, less dense and redder, more flaccid, less stippled, the width is lesser than adult
- Alveolar mucosa: its width increases with chronological age and dental eruption
- During eruption: sulcus depths, margins position, persistent hyperaemia, swollen and rounded interproximal papillae
- The periodontal space is wider and less dense
- Alveolar bone: Less calcified, more vascular and having fewer but thicker trabeculae, Larger marrow spaces, thinner lamina dura, and flatter interdental crests
- Radiographic: Greater variation (CEJ to Alveolar crest: 0-4 mm), periodontal membrane space is wider in children
Periodontal diseases in children

**Figure 21-1.** Cross section of the periodontium in health.

**Figure 21-2.** Cross section of the periodontium in disease.
Periodontal diseases in children

- Epidemiologic studies indicate that gingivitis of varying severity is nearly universal in children and adolescents.
- In US, epidemiologic studies indicate that the prevalence of severe attachment loss on multiple teeth among children and young adults is approximately 0.2% to 0.5%.

(American Academy of Periodontology, 2006)

- Despite this low prevalence, children and adolescents should receive periodic periodontal evaluation as a component of routine dental visits.
Etiology and risk factors of periodontal disease
(Clerehugh and Tugnait, 2001)

• Main etiology: Dental plaque/microbial plaque
• Local risk factors:
  – Calculus
  – Restorations
  – Frenal attachments
  – Tooth anatomical factors, such as root grooves
  – Malocclusion, crowding and irregular teeth
  – Orthodontic appliance
  – Mouthbreathing, incompetent lips
  – Xerostomia
  – Local trauma
Fig 4-3  (a,b) High fraenol attachments impeding tooth brushing. (b) Note plaque deposits in association with localised gingival recession in 11-year-girl.
Fig 4-4 Plaque around fixed orthodontic appliance, disclosed in the lower arch to aid visibility.
Fig 4-6 Fibrous epulis related to chronic irritation from subgingival calculus acting as a plaque retention factor.
Local trauma
Tooth anatomical factors, such as root grooves
Etiology and risk factors
(Clerehugh and Tugnait, 2001)

• Systemic risk factors:
  – Hormones
  – Drugs (phenytoin, cyclosporin and nifedipine)
  – HIV/AIDS
  – Leukemia
  – Vit C deficiency
  – Diabetes mellitus (type I)
  – Smoking
  – Leukocyte disorders
  – Papillon Lefevre syndrome
  – Down’s syndrome
  – Hypophosphatasia
  – Ehlers-Danlos Syndrome

Clinical examination in young patient

• Extra oral
• Intraoral
  – Soft tissue
  – Dental charting
  – General description of periodontal condition: colour, contour, swelling, recession, suppuration, OH, calculus, occlusal problems
  – Identification of local periodontal risk factors
  – Screening using BPE
  – Others investigation: Radiographic
Radiographic information

- Degree and pattern of bone loss
  - Horizontal bone loss: may indicate chronic periodontitis
  - Vertical (infrabony) bone loss: may indicate aggressive disease or occlusal trauma
  - Percentage bone loss against root length
- Root morphology
- Progression of bone loss using serial films
- Position of normal, healthy bony crest:
  - 0.4-1.9 mm from CEJ around permanent teeth
  - May be >2 mm in deciduous teeth
  - May also increase with facial growth, lost or eruption adjacent tooth
- Furcation defects
- Subgingival calculus
- Restoration
- Others pathology: retained root, etc
Periodontal disease in children

• In 1999, the American Academy of Periodontology announced a new classification.
• Some periodontal infections that can affect young individuals include:
  – dental plaque-induced gingival diseases;
  – chronic periodontitis;
  – aggressive periodontitis;
  – periodontitis as a manifestation of systemic diseases; and
  – necrotizing periodontal diseases
Dental plaque-induced gingival diseases

- Gingivitis Associated with Dental Plaque Only and Gingival Diseases Modified by Systemic Factors Associated with the Endocrine System

- Gingivitis characterized by the presence of gingival inflammation without detectable loss of bone or clinical attachment is common in children.

- increased subgingival levels of
  - *Actinomyces* sp., *Capnocytophaga* sp., *Leptotrichia* sp., and *Selenomonas* sp.
  - have been found in experimental gingivitis in children when compared to gingivitis in adults.
  - These species may therefore be important in its etiology and pathogenesis.
Dental plaque-induced gingival diseases

• Conditions that can modify the gingival inflammatory response to dental plaque:
  – Fluctuation in hormone levels, during puberty
  – Alterations in insulin levels in patients with diabetes

• However, the gingival condition usually responds to thorough removal of bacterial deposits and improved daily oral hygiene.
Fig 2-11 Established gingivitis – the cellular and tissue level.
Periodontitis
Aggressive Periodontitis, Chronic Periodontitis, and Periodontitis as a Manifestation of Systemic Diseases

• Children and adolescents can have any of the several forms of periodontitis
• However, chronic periodontitis is more common in adults, while aggressive periodontitis may be more common in children and adolescents
Features of aggressive periodontitis

• The primary features of aggressive periodontitis include
  – a history of rapid attachment and
  – bone loss with familial aggregation.
• Secondary features include
  – phagocyte abnormalities and
  – a hyperresponsive macrophage phenotype.
• Aggressive periodontitis can be localized or generalized.
• Localized aggressive periodontitis (LAgP) patients have interproximal attachment loss on at least two permanent first molars and incisors, with attachment loss on no more than two teeth other than first molars and incisors.
• Generalized aggressive periodontitis (GAgP) patients exhibit generalized interproximal attachment loss including at least three teeth that are not first molars and incisors.
• In young individuals, the onset of these diseases is often circumpubertal.
• Some patients initially diagnosed as having LAgP were found to have GAgP or to be periodontally healthy at a 6-year follow-up exam.
Features of aggressive periodontitis

- LAgP occurs in children and adolescents without clinical evidence of systemic disease and is characterized by the severe loss of alveolar bone around permanent teeth.
- Frequently, the disease is localized to the permanent first molars and incisors. However, some retrospective data obtained from LAgP patients suggest that bone loss around the primary teeth can be an early finding in the disease.
- There may be genetic and/or etiologic heterogeneity.
- Prevalence of LAgP in geographically diverse adolescent populations range from 0.1% to 15%.
Features of aggressive periodontitis

- Many reports suggest that patients with LAgP generally form very little supragingival dental plaque or calculus. In contrast, other investigators find plaque and calculus at levels similar to other periodontal diseases.
- Bacteria of probable etiologic importance include highly virulent strains of *Actinobacillus actinomycetemcomitans* in combination with *Bacteroides*-like species.
- In some populations, *Eubacterium* sp. have been associated with the presence of LAgP.
- To date, however, no single species is found in all cases of LAgP.
Chronic periodontitis

- is most prevalent in adults, but can occur in children and adolescents.
- It can be localized (less than 30% of the dentition affected) or generalized (greater than 30% of the dentition affected) and
- is characterized by a slow to moderate rate of progression that may include periods of rapid destruction.
- the severity of disease can be mild (1 to 2 mm clinical attachment loss), moderate (3 to 4 mm clinical attachment loss), or severe (≥5 mm clinical attachment loss).
Periodontitis as a manifestation of systemic disease

- In patients with one of several systemic diseases that predispose to highly destructive disease of the primary teeth
- As with adults, periodontitis associated with systemic diseases occurs in children and adolescents.
- Such diseases include Papillon-Lefèvre syndrome, cyclic neutropenia, agranulocytosis, Down’s syndrome, hypophosphatasia, and leukocyte adherence deficiency.
- It is probable that defects in neutrophil and immune cell function associated with these diseases play an important role in increased susceptibility to periodontitis and other infections.
- In Down’s syndrome, for example, the amount of periodontal destruction has been shown to be positively correlated with the severity of the neutrophil chemotaxis defect.
- In some cases, specific genes have been associated with these diseases. Examples include the cathepsin C gene and Papillon-Lefèvre syndrome and the tissue non-specific alkaline phosphatase gene and hypophosphatasia.
Periodontitis as a manifestation of systemic disease

- The consensus report of the 1999 Workshop specifically excluded diabetes-associated periodontitis as a specific form of periodontitis associated with systemic disease.
- Participants concluded that diabetes is a significant modifier of all forms of periodontitis.
- In a survey of 263 type 1 diabetics, 11 to 18 years of age, 10% were found to have overt periodontitis often localized to first molars and incisors, although periodontitis was also found in a generalized pattern. Affected subgingival sites harbored A. actinomycetemcomitans and Capnocytophaga sp.
Periodontitis as a manifestation of systemic disease

- in children is a rare disease that often begins between the time of eruption of the primary teeth up to the age of 4 or 5.
- The disease occurs in localized and generalized forms.
- In the localized form, affected sites exhibit rapid bone loss and minimal gingival inflammation.
- In the generalized form, there is rapid bone loss around nearly all teeth and marked gingival inflammation.
- The neutrophils in these patients having LAD (leukocyte adhesion deficiency) are likely to have a decreased ability to move from the circulation to sites of inflammation and infection.
- Affected sites harbor elevated percentages of putative periodontal pathogens such as:
  - *A. actinomycetemcomitans*,
  - *Prevotella intermedia*,
  - *Eikenella corrodens*, and
  - *Capnocytophaga sputigena.*
Necrotizing periodontal diseases (necrotising ulcerative gingivitis (NUG) and necrotising ulcerative periodontitis (NUP))

• Less than 1% in North American and European children.
• 2% to 5% in certain populations of children and adolescents from developing areas of Africa, Asia, and South America.

• The two most significant findings used in the diagnosis of NPD are the presence of interproximal necrosis and ulceration and the rapid onset of gingival pain.
• Patients with NPD can often be febrile.
• Necrotizing ulcerative gingivitis/periodontitis sites harbor high levels of spirochetes and *P. intermedia*, and invasion of the tissues by spirochetes has been shown to occur.
• Factors that predispose children to NPD include viral infections (including HIV), malnutrition, emotional stress, lack of sleep, and a variety of systemic diseases.

• Treatment involves mechanical debridement, oral hygiene instruction, and careful follow-up.
• Debridement with ultrasonics has been shown to be particularly effective and results in a rapid decrease in symptoms.
• If the patient is febrile, antibiotics may be an important adjunct to therapy. Metronidazole and penicilllin have been suggested as drugs of choice.
Diagnostic features of Gingival Abscess

• Localised, painful, rapidly expanding swelling
• Acute inflammatory response to foreign agents
• Red, shiny, smooth swelling
• Fluctuant within 24-48 hours
• Points and discharge spontaneously
Diagnostic Features of Periodontal Abscess

Early periodontal abscess formation, pus not draining yet:

- Pain (may be severe, throbbing)
- Vital pulp response
- Clinical and radiographic evidence of periodontal involvement:
  - pockets
  - attachment loss
  - bone loss
  - furcation may be involved in molars.

Periodontal abscess with pus to drain:

- Ovoid elevation of gingiva on lateral aspect of root
- Gingiva red and swollen with smooth, shiny surface; feeling of “pressure in gums”; discomfort eases when swelling points and abscess discharges
- Suppuration from pocket (gentle pressure)
- Mobile tooth
- Tooth slightly extruded from socket
- Sensation of “wanting to grind tooth”
- Vital pulp response
- Clinical/radiographic evidence of periodontal involvement (see above).

Periodontal abscess with systemic involvement — additional features that may present:

- Extraoral swelling
- Lymphadenopathy
- Malaise, elevated temperature
- Cellulitis (rarely).
Diagnostic features of Pericoronal Abscess

• Partially erupted tooth
• Mandibular third molar common site
• Re and swollen gingival flap
• Infection may spread
• Possible systemic involvement
Periodontitis Associated with Endodontic Lesions (Perio-endo Lesions)

Periodontal features:

- Increased probing depths adjacent to root surface
- Swelling
- Bleeding on probing
- Increased mobility
- Suppuration
- Sinus formation

Endodontic features:

- Non-vital pulp response
- Painful
- Tender on percussion
- Angular bone loss; may extend around apex; may occur around furcation
- May relate to perforations during endodontic root canal therapy
- May relate to vertical root fractures
Which one?
Gingivitis
Fibrous epulis
Gingival abscess
Periodontal abscess
Conclusion

• Although there is a much lower prevalence of destructive periodontal diseases in children than in adults, children can develop severe forms of periodontitis.

• In some cases, this destructive disease is a manifestation of a known underlying systemic disease.
• In other young patients, the underlying cause for increased susceptibility and early onset of disease is unknown.
• These diseases are often familial, suggesting a genetic predisposition for aggressive disease.

• Since early diagnosis ensures the greatest chance for successful treatment, it is important that children receive a periodontal examination as part of their routine dental visits.
Patient plaque control

- Child <7yrs does not have manual dexterity to brush their teeth effectively.
- Scrub tooth brushing technique is effective in children and adolescent
- Modified bass in older age
- Powered toothbrush: rotary more effective; less abrasive than manual, useful for pt with fixed ortho
- Interdental cleaning: flossing, electric toothbrush more effective, interdental toothbrush
- Mouth rinses are not indicated in very young children
References

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• Heasman, P: Master Dentistry, 1st ed, Churchill, 2003
• Lindhe, J, et.al: Clinical Periodontology and Implant Dentistry, 4th ed, Munksgaard, 2003
• Clerehugh V, et.al: Periodontal management of children, adolescent and young adults, Quintessence, 2004
Thank you
Acute Necrotizing Ulcerative Gingivitis (ANUG)
Fig 5-18 Necrotising ulcerative gingivitis in a young male smoker.

Fig 5-19 Young adult male with AIDS presenting with necrotising ulcerative periodontitis.
Sulcus

Pseudopocket (Gingivitis)
Clinical features

- The gingiva become red, shiny, swollen, and soft or spongy in texture.
- Sulcus depths increase (false/pseudo pockets)
- Bleeding on probing
  - thin and ulcerated junctional epithelium
- The interdental papillae and marginal gingiva are initially involved.
Tissue destruction leads to epithelial ulceration
Scanning Electron Micrograph of ulcerated gingival sulcus epithelium

Ulcer
Intact Epithelium
Chronic periodontitis

• is bacterially induced inflammation of the periodontium.
  – Extent
    • Localized <30% of sites affected
    • Generalized >30% of sites affected
  – Severity:
    • Slight: 1-2 mm CAL
    • Moderate: 3-4 mm CAL
    • Severe: >5 mm CAL
Slight or mild periodontitis

- Incipient alveolar bone loss, typically horizontal and suprabony
- Connective tissue attachment level is 1-2 mm apical to cemento-enamel junction (i.e., 1-2 mm loss of attachment)
- Most apical extent of junctional epithelium is 1-2 mm apical to cemento-enamel junction
- Deep inflammatory infiltrate - plasma cell density >50% in active, progressing lesion
- Polymorphonuclear leukocytes subgingival calculus covered by plaque
- Subgingival calculus migration into pocket
- Supragingival plaque formation of 4-5 mm
- Shallow pocket formation of 4-5 mm
- Enamel
Moderate periodontitis

- Enamel
- Supragingival plaque extending subgingivally
- Deep periodontal pocket formation of 6mm or more
- Heavy inflammatory infiltrate (plasma cells density >50% in a progressing lesion)
- Subgingival calculus covered by plaque
- Pocket epithelium (ulcerated and leaky)
- More advanced alveolar bone loss (may be infrabony as shown)

Pocket of 6mm or more

Loss of connective tissue attachment of 3mm or more

Cemento-enamel junction
Fig 5-10 A 13-year-old boy with localised aggressive periodontitis: little clinical evidence of severe periodontal problems to the untrained eye.

Fig 5-11 (a) PCP10 pocket measuring probe. (b) 8mm probing pocket depth – LR6.
Fig 5-12 Periapical views of first molars showing typical arc-shaped bone loss in the patient shown in Figs 5-10 and 5-11. Relatively early diagnosis was made by the patient’s general dental practitioner.

Fig 5-13 Periapical view of mandibular incisors in another 13-year-old boy who was diagnosed late as having localised aggressive periodontitis. Note the advanced bone loss and poor prognosis.
Figure 5.6

Screening and treatment strategy for children and adolescents.