Periodontitis

Periodontitis is a chronic multifactorial inflammatory disease associated with plaque biofilms and characterized by progressive destruction of the tooth-supporting apparatus. Its **primary features** include the loss of periodontal tissue support, manifested through clinical attachment loss (CAL) and radiographic bone loss (RBL), presence of periodontal pocketing and gingival bleeding. Periodontitis is a major public health problem due to its high prevalence, as well as because it may lead to tooth loss and disability, negatively affect chewing function and aesthetics, and impair quality of life.

In 1999 the periodontitis was classified into:

Chronic periodontitis: Chronic periodontitis can be characterized by extent and severity. **Extent** is the number of the sites involved and can be described as localized or generalized. As a general guide, extent can be characterized as localized if ≤30% of the sites are affected and generalized if >30% of the sites are affected.

Severity can be described for the entire dentition or for individual teeth and sites. As a general guide, severity can be categorized on the basis of the amount of clinical attachment loss (CAL) as follows:

- ✓ **Slight =1-2 mm CAL,**
- ✓ **Moderate =3 - 4 mm CAL,**
- ✓ **Severe = ≥5 mm CAL.**

The clinical features and characteristics of chronic periodontitis can be summarized as follows:

- ❖ Most prevalent in adults, but can occur in children and adolescents;
- ❖ Amount of destruction is consistent with the presence of local factors;
- ❖ Subgingival calculus is a frequent finding;
- ❖ Associated with variable microbial pattern;
- ❖ Slow to moderate rate of progression
- ❖ Can be associated with local predisposing factors (e.g. tooth-related or iatrogenic factors); or may be modified by and/or associated with systemic diseases (e.g., diabetes mellitus).
- ❖ Can be modified by factors other than systemic diseases such as cigarette smoking and emotional stress.

Aggressive periodontitis: (A.P.)

A. Localized (confined to molars and incisors)

B. Generalized

The term aggressive periodontitis replaced the previous name early-onset periodontitis (prepubertal, juvenile periodontitis & rapidly progressive periodontitis).

The common features of localized and generalized forms of aggressive periodontitis:

- ❖ Except for the presence of periodontitis, patients are otherwise clinically healthy;
- ❖ Rapid attachment loss and bone destruction;
- ❖ Familial aggregation;
- ❖ Amounts of microbial deposits are inconsistent with the severity of periodontal tissue destruction;
- ❖ Elevated proportion of *aggregatibacter actinomycetemcomitans* and, in some populations, *porphyromonas gingivalis*, may be elevated;
- ❖ Phagocyte abnormalities
- ❖ Progression of attachment loss and bone loss may be self-arresting.

Recently, based on pathophysiology, three clearly different forms of periodontitis have been identified according to new classification system proposed by the American Academy of Periodontology (AAP) and the European Federation of Periodontology (EFP) in 2017:

1. **Periodontitis**
2. **Periodontitis as a manifestation of systemic disease**
3. **Necrotizing periodontal diseases**

1. Periodontitis: Classified according to different form of **staging and grading**.

☒ **Staging** aims to classify the severity and extent of a patient's disease based on the measurable amount of damaged tissue as a result of periodontitis. Initial stage should be determined by using **clinical attachment loss (CAL)**. If CAL is not available, **radiographic bone loss (RBL)** should be used **(Table 3).** Tooth loss due to periodontitis may modify the stage . The extent and distribution for each stage described as molar/ incisor pattern or localized if the involved sites < 30% or generalized if the involved site ≥30%.

	Periodontitis	**Stage I**	**Stage II**	**Stage III**	**Stage IV**
Severity	Interdental CAL **(at site of greatest loss)**	1 – 2 mm	3 – 4 mm	≥5 mm	≥5 mm
	RBL	Coronal third (<15%)	Coronal third (15% - 33%)	Extending to middle third of root	Extending to apical third of root

	Tooth loss **(due to periodontitis)**	No tooth loss	No tooth loss	≤4 teeth	≥5 teeth
Extent and distribution	**Add to each stage descriptor**	**For each stage, describe extent as:** ☒ Localized (<30% of teeth involved); ☒ Generalized; or ☒ Molar/incisor pattern			

☒ **Grading** aims to indicate the rate of periodontitis progression, responsiveness to standard therapy, and potential impact on systemic health. Grading or rate of progression can be estimated by measurement the percentage of radiographical bone loss divided by the age of patient **(% bone loss / patient's age)**.

1. Grade A (slow): **<0.25** (**0.5)**
2. Grade B (moderate): **0.25– 1 (0.5 – 1)**
3. Grade C (rapid): **>1**

(Grade is assessed on the worst affected tooth).

Grade A periodontitis: if the result was less than 0.5 so the grade is A (**for example**, bone loss 25% in a 60-year-old or less than 30% in an 80-year-old)

Grade C periodontitis: if the result was more than 1 (**for example**, bone loss more than 30% in a 28-year-old or more than 50% in a 49-year-old)

Grade B periodontitis: all other situations (the result between 0.5-1)

Important note: Clinically the radiographic bone loss in percentage can be calculated (in case there is no radiograph) if we have clinical attachment loss by measuring **(recession + pocket depth)** using the worse tooth with the interproximal recession, adding the biological width (~2 mm) to give an estimate of the distance that the bone crest is from the CEJ, if an average root length assumed 15 mm, the percentage of bone loss calculated by using the following formula. **Percentage of bone loss = (clinical attachment loss +2) *100/ root length by doubling the length of the clinical crown**, the result can be used to estimate percentage bone loss for grading. A summary of how this is calculated can be seen

☒ **Distribution**

- Molar– incisor pattern (added in 2017 classification).
- Localized <30% of teeth.
- Generalized ≥30% of teeth.

☒ **Assessment of current periodontal status**

- ☒ **Currently stable:** BOP <10%, PPD <4mm, no BOP at 4mm sites.
- ☒ **Currently in remission:** BOP >10%, PPD <4mm, no BOP at 4mm sites.
- ☒ **Currently unstable:** PPD >5mm or PPD >4mm and BOP.

Status of periodontitis

Stable periodontitis patient: the clinical gingival health in stable periodontitis patients is characterized by an absence (or minimum) bleeding on probing (less than 10%), *in the presence of interproximal clinical attachment loss*. while probing pocket depth ≤4 provided that there is no pseudo pockets and no bleeding on probing at site with 4mm pocket depth. However, it should be recognized that successfully treated and stable periodontitis patients remain at increased risk of recurrent progression of periodontitis.

Remission periodontitis (Gingival inflammation on in a successfully treated periodontitis patient)

Gingival inflammation associated with BOP score ≥10%, probing pocket depth ≤ 4mm assuming no pseudo pocket, no BOP at 4mm pocket , with presence of attachment loss and radiographic bone loss**,** the patient will be diagnosed as remission periodontitis (Note that recurrent periodontitis cannot be ruled out in this case).

Unstable periodontitis : Probing pocket depth more than 5 mm or BOP at 4mm pocket

Risk factors:

☒ Diabetes mellitus
☒ Smoking
☒ Family history

Example of a diagnosis statement

Generalized periodontitis stage III grade B currently unstable with smoking as a risk factor.

II. Periodontitis as a manifestation of systemic diseases:

A variety of systemic diseases and conditions can affect the course of periodontitis or have a negative impact on the periodontal attachment apparatus

Classification of systemic diseases and conditions that affect the periodontal supporting tissues: -

A. Systemic disorders that have a major impact on the loss of periodontal tissues by influencing periodontal inflammation: -

1-Genetic disorders

1.1-Diseases associated with immunologic disorders:

Down syndrome
Leukocyte adhesion deficiency syndromes

Papillon-Lefèvre syndrome
Chediak-Higashi syndrome
Severe neutropenia
Primary immunodeficiency diseases
Cohen syndrome

1.2 -Diseases affecting the oral mucosa and gingival tissue:

Epidermolysis bullosa

Plasminogen deficiency

1.3- Diseases affecting the connective tissues:

Ehlers-Danlos syndromes (types IV, VIII)

Systemic lupus erythematosus

1.4- Metabolic and endocrine disorders:

Glycogen storage disease

Hypophosphatasia

2-Acquired immunodeficiency diseases:

Acquired neutropenia

HIV infection

3- Inflammatory diseases:

Inflammatory bowel disease

B. Systemic disorders that influence the pathogenesis of periodontal diseases :

- ☒ Diabetes mellitus
- ☒ Obesity
- ☒ Osteoporosis
- ☒ Arthritis (rheumatoid arthritis, osteoarthritis)
- ☒ Emotional stress and depression
- ☒ Smoking (nicotine dependence)
- ☒ Medications

C. **Systemic disorders that can result in loss of periodontal tissues independent of periodontitis**:

1-Neoplasms

1.1-Primary neoplastic diseases of the periodontal tissues

- ☒ Oral squamous cell carcinoma
- ☒ Odontogenic tumors

1.2-Secondary metastatic neoplasms of the periodontal tissues

2-Other disorders that may affect the periodontal tissues

Langerhans cell histiocytosis

Hyperparathyroidism

Systemic sclerosis (scleroderma)

III. Necrotizing periodontal diseases:

A. Necrotizing gingivitis

B. Necrotizing periodontitis

C. Necrotizing stomatitis

Necrotizing gingivitis: This is an infection characterized by gingival necrosis presenting as 'punched-out' papillae, with gingival bleeding, and pain. Fetid breath and pseudomembrane formation may be secondary diagnostic features. *Fusiform bacteria, prevotella intermedia, and spirochetes* have been associated with gingival lesions. Predisposing factors may include: emotional stress, poor diet, cigarette smoking, and HIV infection.

Necrotizing periodontitis: This is an infection characterized by necrosis of gingival tissues, periodontal ligament, and alveolar bone. These lesions are most commonly observed in individual with systemic conditions including HIV infection, severe malnutrition, and immunosuppression.

Necrotizing stomatitis : is a very severe and aggressive form of necrotizing periodontal disease showing extensive damage in the oral cavity tissue and bone destruction. In necrotizing stomatitis, after the oral mucosal membranes are destroyed, the entire mouth is involved due to spread of infection.

Fig.: - Necrotizing gingivitis.

Other condition affecting the periodontium

a. Periodontal abcesses and endodontic periodontal lesion

Periodontal abscesses (PA):

Periodontal abscesses represented approximately 7.7–14.0% of all dental emergencies, being ranked the third most prevalent infection demanding emergency treatment, after dentoalveolar abscesses and pericoronitis.

1. **Periodontal abscess in periodontitis patients**

In periodontitis patients, a PA could represent a period of disease exacerbation, **favored by** the existence of tortuous pockets, presence of furcation involvement or a vertical defect, in which the marginal closure of the pocket could lead to an extension of the infection into the surrounding periodontal tissues. In addition, changes in the composition of the subgingival microbiota, with an increase in bacterial virulence, or a decrease in the host defense, could also result in an inefficient capacity to drain the increased suppuration.

Different subgroups could be distinguished:

a. Acute exacerbation:

- ✓ In untreated periodontitis.
- ✓ In "refractory" periodontitis.
- ✓ During maintenance phase after periodontal therapy.

b. After different treatments:

- ☒ Scaling and root planing or professional prophylaxis: dislodged calculus fragments could be pushed into the tissues, or inadequate scaling could allow calculus to remain in deep pocket areas, whereas the coronal part would occlude the normal drainage.
- ☒ Surgical periodontal therapy: associated with the presence of foreign bodies such as membranes for regeneration or sutures.
- ☒ Systemic antimicrobial intake, without subgingival debridement, in patients with severe periodontitis could also cause abscess formation, probably related to an overgrowth of opportunistic bacteria.
- ☒ Use of other drugs: e.g., nifedipine.

2. Periodontal abscess in non- periodontitis patients(previously called gingival abscess)

PA can also occur in previously healthy sites because of

- **Impaction of foreign bodies:** dental floss, orthodontic elastic, toothpick, rubber dam, or popcorn hulls.
- **Harmful habits** (biting wire, nail biting, clenching) could favor abscess formation because of subgingival impaction of foreign bodies or to coronal closure of the pocket.
- **Orthodontic factors,** such as inadequate orthodontic forces or a cross-bite, have been reported to favor PA development.
- **Gingival enlargement.**
- **Alterations of the root surface, including:** Severe anatomic alterations, such as invaginated tooth, dens evaginatus (grooves) or odontodysplasia. Minor anatomic alterations, such as cemental tears, enamel pearls or developmental grooves. Iatrogenic conditions, such as perforations. Severe root damage: vertical root fracture or cracked tooth syndrome extending through the root. External root resorption.

PA may be associated with various combinations of **the following clinical features**: Pain, swelling, color change, tooth mobility, extrusion of teeth, purulence, sinus tract formation, fever, lymphadenopathy, and there may be aradiolucency of the affected alveolar bone. The **acute periodontal abscess** characterized by slight discomfort to severe pain and swelling. **Chronic periodontal abscess** is usually asymptomatic or with dull pain with a history of intermittent exudate.

The periodontal abscess need to be differentiated from the periapical abscess in the followings:

Periodontal abscess		Periapical abscess
1.	The tooth is vital.	Tooth is not vital.
2.	The lesion lateral to the root surface.	The lesion is most likely periapical.
3.	X-ray finding shows area of radiolucency along the lateral surface of the root.	X-ray finding shows apical radiolucency.
4.	The tooth is tender to lateral percussion.	Tooth tender to vertical percussion.

Endodontic periodontal lesions (EPL): Are clinical conditions involving both the pulp and periodontal tissues and may occur in acute or chronic forms. When they are associated with a recent traumatic or iatrogenic event (e.g. root fracture or perforation), the most common manifestation is an abscess accompanied by pain. The **most common** signs and symptoms associated with a tooth affected by an endo-periodontal lesions are deep periodontal pockets reaching or close to the apex and negative or altered response to pulp vitality tests. The other signs and symptoms reported, in order of prevalence, are: bone resorption in the apical or furcation region, spontaneous pain or pain on palpation and percussion, purulent exudate, tooth mobility, sinus tract, crown, and gingival color alterations

The main and obvious routes of communication are

1.the apical foramina 2. Lateral canals 3. Dentinal tubules

Etiology and risk factors

The primary etiology an established EPL is always associated with varying degrees of microbial contamination of the dental pulp and the supporting periodontal tissues. Nonetheless, the primary etiology of these lesions might be associated with: -

1. Endo-periodontal lesions **associated with** endodontic and periodontal infections They might be triggered:

- ☒ By a carious lesion that affects the pulp and, secondarily, affects the periodontium.
- ☒ By periodontal destruction that secondarily affects the root canal.
- ☒ Or by both events concomitantly.

2. Endo-periodontal lesions **associated with** trauma and iatrogenic factors: -

These conditions usually have a poor prognosis as they affect the tooth structure. The most common lesions in this category were:

- ☒ Root/pulp chamber/furcation perforation (e.g. because of root canal instrumentation or to tooth preparation for post retained restorations)
- ☒ Root fracture or cracking (e.g., because of trauma or tooth preparation for post-retained restorations)
- ☒ External root resorption (e.g., because of trauma)
- ☒ Pulp necrosis (e.g., because of trauma) draining through the periodontium.

Mucogingival deformities or conditions around teeth:

Gingival biotype

- ☒ Thin scalloped
- ☒ Thick scalloped
- ☒ Thick flat

Gingival/soft tissue recession

- ☒ Facial or lingual surfaces
- ☒ Interproximal (papillary)
- ☒ Severity of recession
- ☒ Gingival thickness
- ☒ Gingival width

Lack of keratinized gingiva

Decreased vestibular depth

Aberrant frenum/muscle position

Gingival excess

- ☒ Pseudopocket
- ☒ Inconsistent gingival margin
- ☒ Excessive gingival display
- ☒ Gingival enlargement

Abnormal color

Mucogingival: Term used to describe that portion of the oral mucosa that covers the alveolar process including the gingiva (keratinized tissue) and the adjacent alveolar mucosa.

Gingival biotype, which includes in its definition gingival thickness (GT) and keratinized tissue width (KTW);. A recent systematic review using the parameters reported previously, classified the "biotypes" in three categories:

• **Thin scalloped biotype** in which there is a greater association with slender triangular crown, subtle cervical convexity, interproximal contacts close to the incisal edge and a narrow zone of KT, clear thin delicate gingiva, and a relatively thin alveolar bone.

• **Thick flat biotype** showing more square-shaped tooth crowns, pronounced cervical convexity, large interproximal contact lo- cated more apically, a broad zone of KT, thick, fibrotic gingiva, and a comparatively thick alveolar bone.

• **Thick scalloped biotype** showing a thick fibrotic gingiva, slender teeth, narrow zone of KT, and a pronounced gingival scalloping.

Gingival recession: Is location of the gingival margin apical to the cemento-enamel junction.

The causes of gingival recession:

1. Plaque accumulation will cause destruction of the junctional epithelia as a result of the inflammatory process.
2. Traumatic gingival recession:
   - ☒ Fault tooth brushing
   - ☒ Tooth malposition
   - ☒ High frenal attachment
   - ☒ Overhanging fillings
   - ☒ Prosthetic appliances
   - ☒ Habits as nail biting.

Tooth and prosthetic related factors :

A.Localized tooth-related factors that modify or predispose to plaque-induced gingival diseases/periodontitis

- ☒ Tooth anatomic factors
- ☒ Root fractures
- ☒ Cervical root resorption, cemental tears
- ☒ Root proximity
- ☒ Altered passive eruption

B. Localized dental prosthesis-related factors

1. Restoration margins placed within the supracrestal attached tissues

2. Clinical procedures related to the fabrication of indirect restorations

3. Hypersensitivity/toxicity reactions to dental materials.

Several conditions exist in teeth that may predispose the periodontium to disease. In certain cases these factors may contribute to the initiation of periodontal disease. While the etiology of periodontal disease is bacterial, factors that enhance bacterial accumulation or allow ingress of bacteria into the periodontium should be considered in the classification of periodontal diseases.

Traumatic occlusal force

1. Primary occlusal trauma
2. Secondary occlusal trauma
3. Orthodontic force

Occlusal trauma: Injury resulting in tissue changes within the attachment apparatus as a result of occlusal force(s).

Primary occlusal trauma: Injury resulting in tissue changes from traumatic occlusal forces applied to tooth or teeth with normal support. It occurs in the presence of:

1) Normal bone levels, 2) Normal attachment levels, and 3) Excessive occlusal force(s).

Secondary occlusal trauma: Injury resulting in tissue changes from normal or traumatic occlusal forces applied to a tooth or teeth with reduced support. It occurs in the presence of:

1) Bone loss, 2) Attachment loss, And 3) "Normal"/excessive occlusal force(s).

Peri-implant diseases and conditions

1-Peri-implant health

In health, the peri-implant site is characterized by absence of erythema, bleeding on probing, swelling and suppuration.

2-Peri-implant mucositis

The diagnosis of peri-implant mucositis requires: Visual inspection demonstrating the presence of periimplant signs of inflammation: red as opposed to pink, swollen tissues as opposed to no swelling. Presence of profuse bleeding and/or suppuration on probing, an increase in probing depths compared to baseline; and absence of bone loss beyond crestal bone level changes resulting from the intial remodeling.

3-Peri-implantitis

The diagnosis of peri-implantitis will involve radiographic bone loss associated with gingival recession or increased probing depth in addition to signs associated with peri-implant mucositis.