LifeLong Learning

CE Course: The A, B, Cs, and I, II, and IIIs of Periodontitis Staging and Grading

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Learning Outcomes:

- Classify the stages and grades of Periodontal and Peri-Implant Diseases and Conditions.
- Apply the 2018 proposed Classification of periodontal disease to patient cases.
- Defend the value of a classification system that reaches beyond severity of past destruction and includes complexity of the disease and risk for future disease progression.

Periodontal disease diagnosis and classification has been undergoing modifications and changes for decades. As the body of research and amount of evidence pertaining to periodontal disease pathogenicity, progression and etiology has expanded over years, the experts in the field have found revision of periodontal disease case classification inevitable. The latest periodontal and peri-implant disease diagnosis and classification proposal in 2017, is the result of collaboration, debate, and coalition amongst Periodontists worldwide.

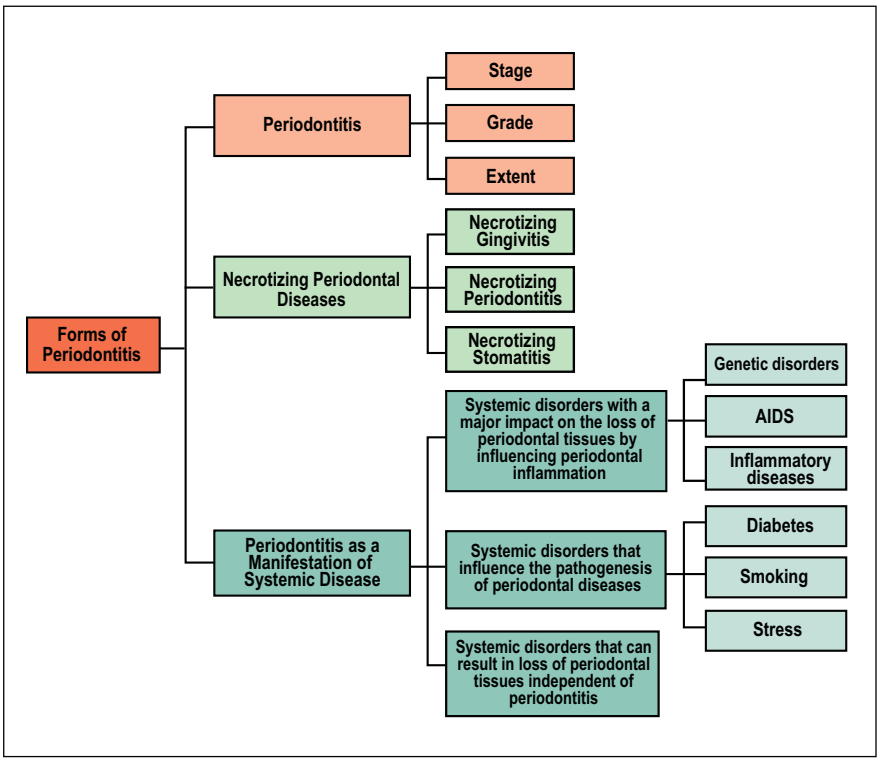
This course will introduce and discuss the new classifications of periodontal diseases and conditions. The new framework of severity and complexity of periodontitis is described as a system of Staging and Grading. Stage I through Stage IV defines the severity, complexity and extent of the disease, while Grades A, B, or C estimate the rate and likelihood of progression of the disease through direct and indirect evidence of patient risk factors.

According to the new proposal, the periodontal diseases and conditions are classified into three main and broad categories of periodontal health and gingival diseases, periodontitis, and other conditions affecting the periodontium.[1]

Peri-implant diseases and conditions include peri-implant health, peri-implant mucositis, peri-implantitis and peri-implant soft and hard tissue deficiencies.

Three major forms of periodontitis are categorized according to the microbial etiology and thus are periodontitis, necrotizing Periodontal diseases, and Periodontitis as a Manifestation of systemic disease.[2] Figure 1. Showcases forms of Periodontitis.

Figure 1. Forms of Periodontitis



Periodontitis

Periodontitis is described as an inflammatory disease leading to permanent loss of periodontium due to bacterial challenge and the host response. Periodontitis as a complex chronic inflammatory and multifactorial condition has been in need of more detailed and accurate representation of its complexity[2].

According to Tonetti, Greenwell and Kornman the criteria for periodontitis includes:

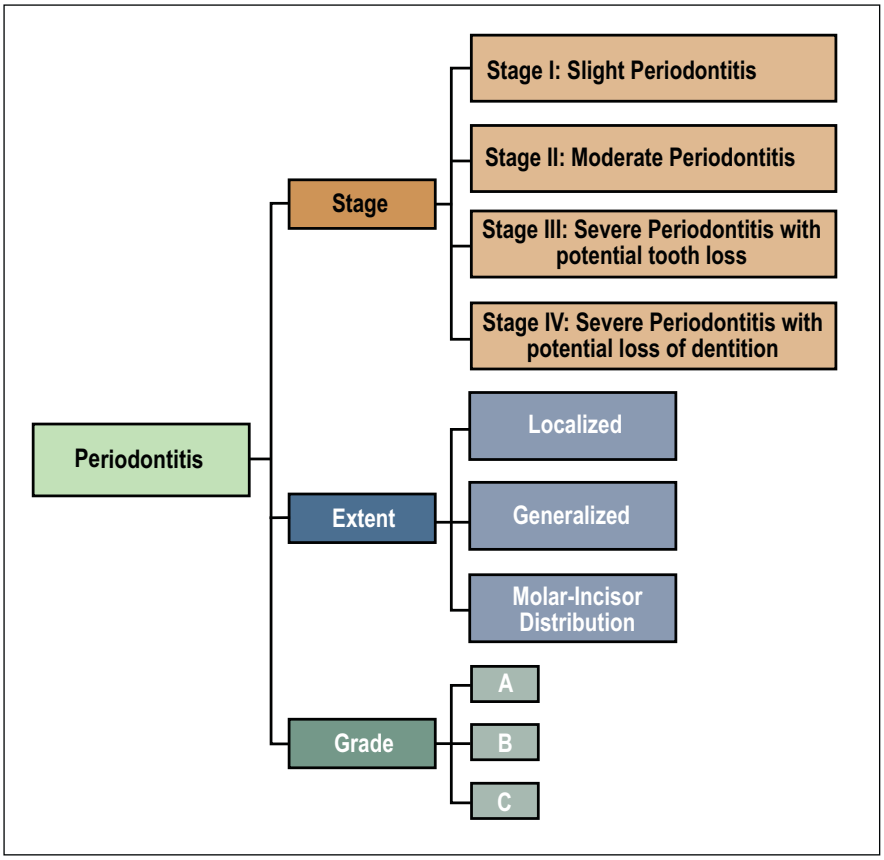
- Interdental Clinical Attachment Loss (CAL) detectable at 2 or more non-adjacent teeth.
- Buccal or lingual CAL of 3mm or more with pocketing greater than 3mm detectable at 2 or more teeth.[2]

It is important to note the CAL cannot be due to:

- Gingival recession caused by trauma (e.g. recession caused by oral piercing)
- Cervical carious lesions
- Presence of CAL on distal aspect of a second molar as a result of 3rd molar extractions or malposition
- Periapical-periodontal combination lesion
- Vertical root fracture.[2]

Periodontitis is classified based on its degree of advancement (stage), its extent (localized, generalized or molar incisor distribution), and its' complexity (grade). The periodontitis development is categorized in stages I through IV, while disease complexity is classified in Grades A, B, or C. Figure 2 exhibits classification of periodontitis according to stage, extent and grade.

Figure 2. Periodontitis classification according to Stage, Extent and Grade



Periodontitis Staging:

In order to determine stage of periodontitis, the inter-dental clinical attachment loss, loss of dentition due to periodontitis, vertical versus horizontal trend of bone loss, furcation involvement as well as radiographic bone loss must be determined.

Stage I periodontitis depicts a patient with slight disease, on which interdental CAL does not exceed 2mm, while stage II represents moderate periodontitis in a patient that has not lost any dentition due to periodontal disease with interdental CAL 3-4 mm.[2]

Stage III and Stage IV periodontitis represent severe cases of periodontitis with an interdental CAL of 5 mm or more and are differentiated according to the number of teeth lost due to periodontal disease.[2] A patient with stage III periodontitis is at risk of tooth loss or has lost fewer than 5 teeth due to periodontitis, presents with grade II or III furcation areas with areas of vertical bone loss.[2] A patient suffering from stage IV periodontitis has lost 5 or more teeth due to periodontal disease.[2] Criteria for periodontitis staging is depicted in Table 1.

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Table 1. Periodontitis Staging

	STAGE	*Interdental Clinical Attachment Loss	Probing Depth	Tooth Loss due to periodontitis	Bone Loss trend	Furcation	RBL (Radiographic Bone Loss)
Slight Periodontitis	I	1-2mm	≤4 mm Max 4mm	None	Horizontal loss	Class I	15% <
Moderate Periodontitis	II	3-4mm	≤ 5mm Max 5 mm	None	Horizontal Loss	Class I	15%-33%
Severe Periodontitis	III	5 ≥ mm	≥ 6mm 6mm and more	Risk of tooth loss or Maximum loss of 4 teeth	Vertical Bone loss	Class II, III	Extending to middle 3rd of root and beyond
	IV	5 ≥ mm	6mm and more	Loss of 5 or more teeth	Vertical Bone loss	Class II-III	Extending to middle 3rd of root and beyond

Table 2. Criteria for Periodontitis Grading

	Direct evidence	Indirect Evidence	Disease modifying factors		Indirect Evidence
	Radiographic Bone Loss or CAL within 5 years period	% bone loss/ Age	Smoking	HbA1c	**Biofilm**
Grade A	None	< 0.25	Non-Smoker	None Diabetic	Heavy biofilm Destruction low
Grade B	< 2mm	0.25-1.0	< 10 cigarettes /day	HbA1c < 7.0%	Destruction proportionate to biofilm
Grade C	≥2mm	>1.0	10≥ cigarettes/day	HbA1c ≥ 7.0%	Destruction exceeds biofilm deposits Rapid progression Early onset

Periodontitis Grading:

Periodontitis is affected by risk factors such as tobacco use and diabetes. Studies, however, indicate emerging factors such as obesity, improper nutrition, lack of physical activity and certain genetic factors may have potential effect on the health of periodontium.

Periodontal disease progresses at a different rate for individuals with various risk factors. In the past the emphasis of classification has been placed on identifying the type of periodontal diseases while the emphasis is now on the factors that contribute to periodontitis. The goals of periodontitis grading are to assess all evidence available and determine the likelihood of the progression of the disease at a greater rate or as unresponsive to standard therapy.

Periodontitis grade is classified as Grade A, a slow rate of progression, Grade B a moderate rate of progression or Grade C exhibiting a rapid rate of progression.[3] The periodontitis Grade determining factors include the amount of biofilm deposit present, smoking status, HbA1c levels, changes in radiographic bone loss or CAL within five years, as well as the age of the patient.[3] Criteria for periodontitis grading is exhibited in Table 2.

The direct evidence utilized to determine periodontitis grading is changes in radiographic bone loss and/or clinical attachment loss within 5 years' period. Indirect evidence employed to determine periodontitis grading are percentages of bone loss as compared to the age of the patient, as well as periodontal destruction and progression as it relates to the amount of biofilm. The new periodontitis classification does not recognize aggressive periodontitis as a separate entity. As seen in Table 2, the degree of periodontal destruction, rapid progression and early onset may exceed the amount of biofilm present and, therefore, classify the patient with Grade C periodontitis.[4]

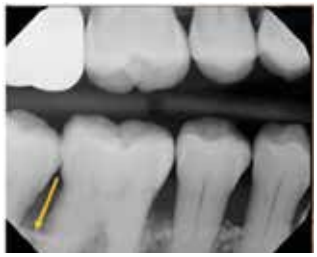
The modifying risk factors to be considered in the grading process are smoking status and HbA1c levels. It is important to note presence or changes of modifying factors will affect the periodontitis grading status. Table 2 displays key factors affecting periodontitis grading.

Age of the patient, as compared to percentage of bone loss, has been proven as an indirect evidence of disease progression.[4] A 30-year-old with

40% bone loss at the site with the greatest destruction is at higher risk of progression of periodontitis when compared to a 70-year-old with the same percentage of bone loss. Figure 3 demonstrates steps in determining percentage of radiographic bone loss considering the age of the patient. Table 3 displays Periodontitis Staging and Grading when applied to a case study.

Figure 3. Periodontitis Stage and Grade Case study

1.
Measure the length of the root from the Cemento-Enamel Junction (CEJ) to the Apex. (CEJ-Apex)



2.
Measure the Cemento-Enamel Junction (CEJ) to the Alveolar Crest (AC). (CEJ-AC)

BL: % of bone loss=(CEJ-AC)÷(CEJ-Apex) x 100
RBL = % of bone loss/Age = BL÷Age

Table 3. Periodontitis Stage and Grade Case study

Age	63 years	Dental History: Last comprehensive dental and periodontal examination was five years ago. #15, #30 were extracted 10 years ago due to decay Social History: Patient likes to drink 6 beers a night to relief stress.	Periodontitis Stage indicators: Furcation class I on tooth #19 Localized interproximal CAL (1-2) mm Horizontal trend of bone Stage I Periodontitis Grade Indicators: Type II DM HbA1c level 10% Grade C Localized Periodontitis: Stage I, Grade C
Gender	Male		
Height	6'0 ft		
Weight	260 lbs		
B/P	140/78 mmHg		
Chief Complaint	"I want white teeth"		
Under Care of Physician	Yes	**Radiographic findings:** Full set of radiographs indicates localized horizontal bone loss *#29: distance from CEJ to Alveolar Crest is 4 mm* *#29 root length: 12 mm*	
Smoking status :	Ex-Smoker >20 years ago		
Medical History Type II Diabetes Mellitus (DM) and hypertension HbA1c level: 10% Current Medications: Lisinopril (200 mg PO qDay) Metformin (850 mg PO qDay with meals) Ibuprofen (400 mg as needed for back pain)		Periodontal Assessment: Buccal and Lingual Class I furcation # 19 No mobility No recession 25% of total sites present with interproximal CAL 1-2 mm Generalized bleeding on probing BOP Plaque index: 75%	

Peri-implantitis and peri-implant mucositis

Implant therapy has become the treatment of choice for edentulous areas. A clear guideline for assessment, diagnosis, and management of peri-implant tissue health and disease has been a long time in the making. The 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions has aimed to create a frame work in which clinicians can classify peri-implant diseases based on clinical signs and symptoms.

In order to recognize peri-implant disease, periodontal health around an implant must be defined. As noted by Berglundh et al. implant tissue is considered healthy when there are no clinical signs of inflammation, profuse bleeding upon probing, suppuration, edema and erythema.[4] It is important to note that probing depths around an implant may be greater than a natural tooth due to difference in adaptation of gingival tissue around an implant.[5] Peri-implant tissue is considered healthy with probing depths ≤ 5mm, with variable levels of bone supporting the implant post initial healing.[5] Slight bleeding upon probing may be present due to trauma (laceration) of the mucosal wall, versus an inflammation due to presence of biofilm.[5]

Peri-implant mucositis is inflammation of gingival structure of peri-implant tissue without any radiographic evidence of bone loss when compared to initial healing of bone post implant placement. Peri-Implantitis, is characterized by inflammation of mucosal tissue around the implant associated with bone loss, and

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compromised osteointegration. Increased pocket depths accompanied with radiographic evidence of bone loss post initial healing are indication of peri-implantitis.[4]

Peri-implant hard and soft tissue deficiency, including recessions around the implant or lack of adequate keratinized tissue, negatively affects biofilm control by the patient, increasing the chance of peri-implant diseases.

Periodontitis as a manifestation of systemic disorders

According to Jepsen et al., the periodontium can be affected by numerous systemic conditions that can be classified into three main categories:

1. Systemic conditions that impact the loss of periodontal attachment by influencing periodontal inflammation
2. Systemic conditions that influence the pathogenesis of periodontal disease and
3. Systemic conditions that result in the loss of periodontal attachment not related to dental plaque biofilm.[3]

An example of systemic disorders that impact the loss of periodontal attachment by influencing periodontal inflammation are genetic disorders such as Down syndrome, leukocyte adhesion deficiency syndromes, Papillon-Lefevre syndrome, cyclic neutropenia and Chediak-Higashi, to name a few.[3] Diseases affecting the oral mucosa and gingiva (ex. Epidermolysis bullosa), diseases affecting the connective tissues (ex. Systemic lupus erythematosus), metabolic and endocrine disorders (ex. Glycogen storage disease), acquired immunodeficiency diseases (ex. HIV infection) and inflammatory diseases (ex. inflammatory bowel disease) are also included in this category.[3]

The second category of periodontitis as a manifestation of systemic disorders include conditions that influence the pathogenesis of periodontal disease. Jepsen (2017) states this category includes diabetes mellitus, obesity, osteoporosis, osteoarthritis and rheumatoid arthritis, stress, smoking, medications and depression.[3] Diabetes and smoking, as discussed earlier, are highly associated with the pathogenesis of periodontal disease and are considered as modifying risk factors in the Grading of periodontitis.

The final category of periodontitis as a manifestation of systemic disorders is a result of attachment loss independent of dental plaque biofilm induced inflammation. Examples of this category are neoplastic diseases of the periodontium such as oral squamous cell carcinoma and odontogenic tumors or other disorders that affect the attachment apparatus such as systemic sclerosis (scleroderma).[3]

Necrotizing Periodontal Diseases.

The third category of Periodontitis in the new classification system is necrotizing periodontal diseases (NPD). NPD includes necrotizing gingivitis, necrotizing periodontitis and necrotizing stomatitis. Medically comprised patients with severe or moderate chronic condition associated with impaired immune system such as HIV, AIDS, smoking, stress or malnourishments are more at risk of developing NPD.[6]

Necrotizing gingivitis (NG) is an acute infection of gingival connective tissue due to impaired host immune response. The three criteria necessary to diagnosis NG are gingival pain, bleeding, and necrosis of the interdental papillae. The symptoms may be accompanied by fever, lymphadenopathy, pseudomembrane, and fetid odor.

Necrotizing periodontitis (NP) is another form of necrotizing periodontal disease with the same signs and symptoms of NG however is associated with periodontal attachment and interdental bone necrosis.[7]

Necrotizing stomatitis (NS) is a severe inflammatory condition and presents soft and hard tissue necrosis extending beyond the mucogingival line into buccal mucosa and alveolar bone. Extensive ostitis, leading to formation of sequestrum, is often associated with this form of NPD.[6]

Adopting staging and grading of disease, as it has been utilized in oncology, provides a thorough portrayal of the disease complexity, prognosis, as well as a clear treatment plan pathway tailored to the patient's needs. Dental hygienists will find adaptation to the new staging and grading system is a more effective way of communicating the advancement and progression of periodontal disease with other healthcare professionals and patients.

About the Authors

Fran Soderling, RDH, MA has served as the Dental Hygiene Academic Administrator at West Coast University in Anaheim, California since 2013. She was Senior Clinic Coordinator and an Instructor at West Coast University from 2009 until 2013. Before that Fran was an instructor in the dental hygiene department at Cerritos College in Norwalk, California for eight years, as well as a part-time lecturer in the Department of Professional Studies at California State University, Long Beach, California from 1998 – 2010. She is a member of the American Dental Hygienist Association, California Dental Hygienist Association, Western Society of Periodontology and Sigma Phi Alpha Honor Society. She is a WREB examiner, serving on the WREB Dental Hygiene Committee. Fran was a clinical practicing dental hygienist for over 50 years.

Her education includes a Bachelor of Science in Dental Hygiene from University of Baylor, in Texas, and a Master Degree in Professional Studies from California State University Long Beach.

Jila Torabi, RDH, MPH has been in the field of Dentistry for the past 16 years. She graduated from Cerritos College dental hygiene program in 2008, and has worked in private practice ever since. She completed a baccalaureate degree in Dental Hygiene Education from Loma Linda University and Masters in Public Health from West Coast University. She is a full-time faculty member at West Coast University Dental Hygiene Program, at which she directs the Introduction to Periodontology course. She is a member of CDHA, ADHA, Western Society of Periodontology and an active component member of the Long Beach Dental Hygiene Society.

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Home Study Correspondence Course

"The A, B, Cs, and I, II, and IIIs of Periodontitis Staging and Grading"

Circle the correct answer for questions 1-10

1. Which of the following describes the severity or advancement of periodontal disease?
   a. Stage I, II and III
   b. Grade A, B and C
   c. Stage I, II, III and IV
   d. Grade A, B, C and D

2. Three major forms of periodontitis which are classified according to etiology include Periodontitis (natural teeth and implant) and _____ and _____.
   a. Systemic and caries related diseases
   b. Necrotizing and systemic related diseases
   c. Necrotizing and socio economic status related diseases
   d. Gastrointestinal and systemic related diseases

3. The latest periodontal disease and classification is the result of international collaboration amongst periodontists.
   a. True
   b. False

4. Which of the following describes the rate and likelihood of disease progression through patient risk factors?
   a. Stage I, II and III
   b. Grade A, B and C
   c. Stage I, II, III and IV
   d. Grade A, B, C and D

5. One of the main criteria for Periodontitis is:
   a. Bleeding on probing
   b. Plaque/biofilm accumulation
   c. Clinical attachment loss (CAL)
   d. Age of onset

6. Determinants for grading levels of periodontitis include:
   a. Biofilm, smoking status, and HbA1c levels or diabetes
   b. Changes in radiographic bone loss or CAL within 5 years and age of patient
   c. Decayed, missing and filled teeth within the last five years
   d. Both a and b

7. Besides clinical attachment loss (CAL) and furcation, what other factors are considered in staging periodontitis?
   a. Tooth loss due to periodontitis
   b. Radiographic bone loss
   c. Probing depth
   d. All of the above

8. Probing depths around an implant may be greater than a natural tooth due to adaptation of gingival tissue around an implant.
   a. True
   b. False

9. Clinical attachment loss (CAL) cannot be due to:
   a. Vertical root fracture
   b. Periapical-periodontal combination lesion
   c. Third molar extractions
   d. All of the above

10. Which of the following describes the extent of Periodontitis?
    a. Slight, moderate and/or severe
    b. Localized or generalized
    c. Stage I, II, or III
    d. Grade A, B, or C

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