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Milward, Michael; Roberts, Anthony

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Assessing Periodontal Health and the British Society of Periodontology Implementation of the New Classification of Periodontal Diseases 2017

Milward MR[1]. &. Roberts A[2]

1. Birmingham Dental School and Hospital, Birmingham, United Kingdom*.

2. Cork University Dental School and Hospital, University College Cork, Ireland.

*   Corresponding author: Professor Mike Milward

The School of Dentistry,

College of Medical & Dental Sciences,

University of Birmingham.

5 Mill Pool Way

Edgbaston

Birmingham

B5 7EG

Introduction

Periodontal disease is a chronic inflammatory disease that affects approximately 45% of the adult population[1]. The disease is driven by development of a plaque biofilm but the majority of periodontal tissue damage is as a result of an exaggerated host inflammatory response[2]. A number of risk factors impact on periodontal disease resulting in initiation or exacerbation of the disease process, examples include smoking, poor plaque control and unstable diabetes.

The importance of periodontal disease cannot be underestimated; it has a major impact on patients' self-esteem and can result in tooth loss which compromises aesthetics and dietary intake[3]. Periodontal disease management is labour intensive and time consuming requiring long term maintenance following successful treatment, resulting in a significant healthcare burden[4]. The impact of periodontal disease on a range of systemic conditions has further raised the profile of this prevalent and debilitating disease[5].

Periodontal disease cannot be cured but can be successfully managed and treatment outcomes are significantly affected by early diagnosis and prompt therapeutic intervention[6]. Key to early diagnosis is adequate screening using the Basic Periodontal Examination (BPE) to identify patients that require further investigation. The accumulated clinical and radiological findings (alongside the results from any special investigations) assist the clinician in the process of determining an accurate periodontal diagnosis.

In order to arrive at an accurate diagnosis, a classification scheme needs to be utilised which will in turn lead to appropriate treatment options and then, following discussion with the patient, an agreed treatment plan or strategy.

There have been a number of classification schemes for periodontal disease developed over the years (Table 1), these have been introduced as our understanding of the aetiology of disease has advanced. These changes can be frustrating for the busy practitioner but are important to ensure we fully understand what drives disease development and progression.

This article aims to summarise the key aspects in detecting periodontal disease, the importance of disease classification and to introduce the new Classification for Periodontal Disease 2017[7], including the British Society of Periodontology implementation plan[8] which was designed to help its introduction into general dental practice.

Assessing periodontal disease

This stimulus for this publication is primarily the publication of the new 2017 Classification of Periodontal Diseases[7]. Of course, a new Classification scheme does not alter the clinical presentation and features of patients with periodontal disease, rather the framework for the process is affected. It remains an unfortunate fact that for many patients, the signs and symptoms of periodontal disease either go un-noticed or are ignored by patients and it is only when key aspects of the patient's history and the subsequent examination are undertaken that the significance of their condition is realised. When periodontitis is allowed to progress unnoticed, regrettably many of the features of advanced disease such as tooth mobility and tooth drifting prompt the patient to seek dental care but by that time the ideal window of opportunity may well have passed. The term 'periodontal disease' is often misunderstood or misinterpreted across the profession to mean 'periodontitis'. In fact, periodontal disease is an umbrella term that is used to describe both gingivitis and periodontitis and this potential confusion is further compounded by the fact that gingivitis and mild to moderate periodontitis are often indistinguishable from a patient's perspective. From a clinician's perspective, the use of a

periodontal probe in the clinical assessment process is essential and fundamental. This key clinical examination will be discussed further below.

The acquisition of information for clinical assessment starts with the patient history and the chief complaint of the patient which can assist the clinician in determining the diagnosis and management priorities for the patient. Given the aforementioned potentially 'silent' nature of periodontal diseases, there may be a need for the clinician to prompt the patient about any gingival bleeding when brushing, mobile teeth or swellings that they may have experienced.

Risk factors may be local, systemic or indeed both, and the medical, dental, family and social history are opportunities to explore these in greater depth. Medications, diabetic status and glycaemic control, smoking habits, brushing and interproximal cleaning habits/regimes, previous extractions etc. may all give a useful insight into what might be contributing to their condition, identifying therapeutic opportunities and provide an indication of success (or otherwise) of treatment. Indeed, addressing risk factors for periodontal diseases should be at the forefront of the clinician's mind when outlining treatment strategies as failure to address these is likely to bode poorly for treatment outcome. In terms of the new classification system, these risk factors are termed 'grade modifiers' and relate to the progression rate of the disease, responsiveness to standard therapy and potential impact on systemic health.

Table 2 is a list of clinical features that should be considered when undertaking an examination of the periodontal tissues which, if significant issues are found, would also lead to a radiographic assessment of the teeth affected. In day-to-day clinical practice, the Basic Periodontal Examination (BPE, formerly CPITN) is the screening tool used by clinicians to alert them to those patients who require further investigations in the form of detailed periodontal charting and radiographic assessment (Table 3).

The BPE has never attempted to be a diagnostic tool, rather a periodontal alert mechanism for practitioners; however, the British Society of Periodontology (BSP) has recently produced an 'implementation in clinical practice' paper[8] which grapples with the difficulty of integrating the new classification system into a useful scheme for practitioners. A useful algorithm has been produced in the paper which has been further supplemented by an info-graphic produced by the BSP (Figure 6) which has the BPE embedded within its content. The primary purpose of the BPE remains unchanged and its integration within the practitioners guide still ensures that it is an assessment gateway.

Why and how do we classify?

The vast majority of diseases have classification schemes associated with them. Classification systems are useful in assisting clinicians utilise appropriate treatment strategies for their patients based on clinical trials which provide evidence for the best treatment regimen. This equally applies to the management of periodontal disease. Disease classification also provide important frameworks to study the aetiology and pathogenesis of a specific disease thereby allowing for development of new therapeutic strategies for disease management. In addition a classification system allows for the use of a common international language allowing practitioners to discuss patient management and the underpinning research in order to help provide the best patient outcomes.

An ideal classification scheme would involve use of the specific aetiological agent for a specific disease. An example of this would be tuberculosis (TB); this disease is caused by a bacterial infection with *Mycobacterium tuberculosis*. So in this case classification is straightforward and specifically relates to the causative factor. Unfortunately it is not as straightforward in the case of periodontal disease, which has a multifactorial aetiology initiated and driven by a complex microbial biofilm but the

majority of the tissue damaged is caused by an exaggerated host inflammatory response. So classifying periodontal diseases proves a harder challenge.

The History of Periodontal Classification:

Looking back in the literature the first recorded classification system for periodontal disease was by Joseph Fox in 1806, who offered the first attempt to classify 'gum disease.' Since then, a number of different systems have been proposed. The first classification scheme to be accepted by the American Academy of Periodontology (AAP) was by Orban in 1942[9]. Nearly 25 years later in 1966 the AAP convened a workshop which resulted in a new classification, this was further revised in 1986[10]. In 1989 an additional AAP meeting was held and further amendments made including rate of disease progression, presence / absence of systemic disease, local risk factors and the patients response to therapy[11]. However this classification omitted a classification of gingivitis and didn't include the implications of systemic disease. The next landmark in periodontal disease classification was in 1993 when a European Workshop[12] convened, this group considered the 1989 classification too complex, and simplified it, allowing clinicians to exercise more clinical judgement. This workshop introduced a number of proposals, which met with worldwide approval, but it was subsequently felt that it lacked sufficient detail to enable classification of the range of periodontal diseases that a practitioner may encounter and need to treat. As a result a worldwide workshop met in 1999[13] and based on the literature at the time proposed a new classification with key features including 'Aggressive Periodontitis' which replaced 'Early onset disease' and 'Chronic periodontitis' which replaced 'Chronic Adult Periodontitis'. In addition a classification of gingivitis was introduced for the first time. This has worked well over the last 18 years but research and understanding of periodontal disease and its pathogenesis has expanded in this time meaning a new more appropriate classification was required. A summary of the history of periodontal disease classification can be seen in Table 1.

Why is the new system being introduced?

The aim of the 2017 World Workshop[7] was to introduce a new classification that was driven by our better understanding of periodontal disease since the last classification workshop in 1999. The aims of the 2017 workshop were set out by the management committees of the European Federation of Periodontology (EFP) and the American Academy of Periodontology (AAP) were to produce a new evidence based classification that could be implemented in general practice and that breaks down a complex disease process into key components that are important in determining disease severity, extent, and susceptibility to further disease progression, something the previous classifications have failed to achieve. In addition patients who have experienced periodontal disease have a greater risk of further disease progression so we need to be able to identify the current periodontal status as well as any previous history of periodontal disease. For the first time the 2017 classification offers clear definitions of health and gingivitis for:

- Patients with an intact periodontium

- Patients with a reduced periodontium due to causes other than periodontitis

- Patients with a reduced periodontium due to periodontitis

The details and rationale that underpin these definitions are beyond the scope of this article but can be found in the paper published as a result of the 2017 World Workshop[7].

The New Classification:

The 2017 classification of periodontal disease has a number of key changes and extra detail that allows for better definition of our patients' diseases. The new system also includes details which are important in ensuring appropriate management strategies. One of the key changes from the 1999 classification is that 'Aggressive' periodontitis no longer appears in the new classification. This reasoning behind this is that clinical & biological research fails to clarify aggressive periodontitis as a distinct disease entity from chronic periodontitis, but rather part of the same disease process. Other key elements include:

- Introduction of 'Staging' & 'Grading'

- 'Necrotising Periodontal Diseases' remains as a distinct category.

- Endodontic-periodontal lesions – classified based on signs and symptoms that directly impact on prognosis & treatment.

- Periodontal abscess are defined as acute lesions characterised by localised pus accumulation within the gingival wall.

So classifying periodontal disease requires a number of steps (Figure 1):

1. **Indicative Diagnosis of Periodontitis**

   Arriving at a final diagnosis for a patient continues to involve a comprehensive history, which include identification of any systemic risk factors and a thorough clinical examination including the BPE and radiographic examination where appropriate. The importance of the BPE cannot be overstated, as it is a fundamental gateway examination that indicates potential periodontal disease and has been discussed earlier in this article. One of the key clinical additions to the BPE examination in the new classification is the identification of interdental attachment loss, which is a key clinical indicator of previous periodontal disease experience. Even if the clinical examination identifies BPE scores of 0, 1, 2 or 3 if there is evidence of interproximal attachment loss this will result in a final diagnosis of 'Periodontitis'. Once an indicative diagnosis of periodontitis has been identified the pattern of bone loss from radiographs is determined. If the bone loss is isolated to molar and incisor then the pattern is 'Periodontitis molar/incisor pattern'. If less than 30% of teeth have periodontal disease associated bone loss the pattern is 'Localised periodontitis'. If the bone loss exceeds 30% of teeth then the pattern is 'Generalised Periodontitis'. Once periodontitis has been identified the next step is to 'stage' the patient.

2. **Disease 'Staging'**

   Staging aims to indicate the severity of disease, which will reflect the complexity of patient management. Staging utilises the percentage bone loss at the worst site due to periodontal disease. (Figure 2)

The ability to stage and grade a patient requires access to radiographs and this is not an issue with cases who score 3 or 4 BPE where there is justification and indeed a requirement to take radiographs. However where this becomes an issue is in relation to cases with a BPE of 0, 1 or 2 where radiographs cannot be justified on periodontal grounds. If radiographs are taken for other reasons or recent radiographs are available these can be used for staging or grading. However if this is not the case then Stage 1 (mild disease) can be determined if there is <2mm attachment loss from the CEJ. The assessment of cases Stage 2 – 4 however become problematic, one solution is to clinically estimate the bone level. We propose this can be achieved by measuring recession & pocket depth using the worse tooth with interproximal recession, adding the biological width (~2mm) to give an estimate of the distance the bone crest is from the CEJ. If we take an average root length as 15mm (canines with be around 15mm and incisors closer to 12 mm) we can estimate whether the tooth has Stage 2 (coronal third), Stage 3 (mid third) or Stage 4 (Apical third bone loss). In addition this can be used to estimate % bone loss for grading. A summary of how this is calculated can be seen in Figure 3;

An example of how this might work would be a patient that has a BPE code 1 but obvious interproximal recession. The worst site of interproximal recession is chosen and this measures 4mm, the pocket is 2mm, the biological width is 2mm (average standard measurement of the biological width) this makes the bone level estimated at 8mm from the cemento-enamel junction (CEJ); the average root length is 15mm, so in this situation the bone loss extends to the middle third i.e. a Stage 3. (This would also equate to approximately 50% bone loss – which can be used in Grading of this case).

Obviously if radiographs are required (BPE code 3 & 4) or already available then an assessment of the worst bone loss due to periodontal disease can be made and an appropriate grading determined.

3. **Disease 'Grading'**

Grading aims to help identify how susceptible a patient is to periodontal disease by using the worst site of bone loss due to periodontal disease along with the patient's age. This will give an assessment of the rate of progression. The BSP implementation group looked at a range of thresholds of age versus bone loss to determine the most appropriate cut off. These are arbitrary but allow for easy calculation and were deemed clinically appropriate. (Figure 4)

In order to determine a grade for your patient the worst site of bone loss due to periodontal disease is calculated as a percentage (if radiographs aren't justified as previously discussed estimate bone loss as described in the previous staging section), then divide this by the patient's age. This gives a ratio, with <0.5 indicating a slow rate of progression, 0.5-1.0 moderate rate of progression and >1.0 a rapid rate of progression.

4. **Assessment of Disease Status**

It is important to determine the patient's current disease status. A patient may have historic periodontal disease, which the new classification identifies but may be currently stable. In

previous classifications a BPE screen did not identify this situation, this was a concern as patients who have had a history of periodontal disease are at higher risk of further periodontal disease progression and require long-term maintenance. The new classification allows such cases to be correctly identified and utilises probing pocket depth (PPD) and % whole mouth bleeding scores in order to determine stability. If the patient has a PPD less than or equal to 4mm and less than 10% bleeding on probing (BOP) then the case is 'currently stable', a patient with PPD less than or equal to 4mm greater than or equal to 10% BOP and no BOP at 4mm site is 'currently in remission' and if there is PPD greater or equal to 5mm or PPD greater than or equal to 4mm with BOP then the case is 'currently unstable' (Figure 5).

5. **Identification of 'Risk Factors'**

We are aware of the importance of risk factors that have the potential to directly impact development and progression periodontal disease. Therefore it is important that these are incorporated into the classification of disease and indeed this is the case with the new classification system. It is outside of the remit of this article to go into detail about risk factors but examples include poorly controlled type 2 diabetes, family history of periodontal disease and smoking amongst others. Any specific risk factors are included as the final part of the diagnostic statement. (Figure 1)

The BSP have developed a flow diagram based on the implementation of the 2017 Classification of Periodontal disease to help support practitioners in using the new classification. This is available to download from www.bsperio.org and can be seen in Figure 6.

What Additional Clinical information is required in applying the New Classification?

One of the important aspects of implementing a new classification is to try and ensure that it as easy as possible to use in general practice where around 95% of periodontal treatment takes place. As can be seen the new classification is a significant departure from the 1999 system, but at a practical level requires little additional information to classify disease. The key components are (a) Risk Assessment, (b) Basic Periodontal Examination, (c) Radiographic assessment, all of which are part of a routine patient assessment. There are two pieces of additional information required (a) Evidence of interdental recession and (b) Full mouth bleeding on probing. Evidence of interdental recession is easily identified during the clinical examination and BOP can be assessed during the BPE examination for BPE codes 0,1,2 & 3 as full mouth probing is required to locate a code 4, if a code 4 is identified then BOP forms part of the routine baseline indices required in patient management. So in practical terms this should not impact too heavily on patient assessment.

Clinical Cases:

In order to illustrate how this new classification should be utilised in clinical practice we will now apply this to two clinical cases

Case 1:

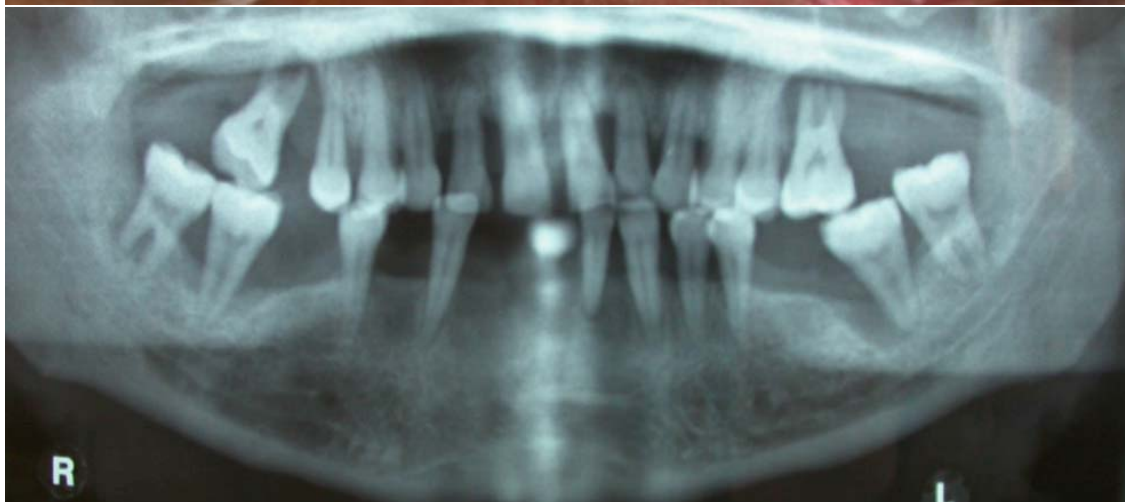| HISTORY	70 year old male, regular attender Poorly controlled diabetic, never smoker Manual brushes x2/day, no interdental cleaning Previous tooth loss due to periodontal disease Poorly controlled type 2 diabetic
EXAMINATION	Plaque Score 20% BoP <10% of sites Obvious interdental recession affecting 80% of teeth BPE - / 2 / - 2*/ 2 / 2*
RADIOGRAPH	No radiographs indicated (based on BPE code 2) or available

HEALTH	INTACT PERIODONTIUM
GINGIVITIS	REDUCED PERIODONTIUM-NON-PERIO SUCCESSFULLY TREATED PERIO

PERIODONTITIS (based on interproximal recession)	STAGING	I EARLY II MODERATE III SEVERE **IV VERY SEVERE**	Radiographs not available, but based on estimation of bone level – 8mm recession (worst site interproximal recession) + 2mm probing pocket depth + 2mm biological width = 12mm bone loss from CEJ. Average root length 15mm, so apical third bone loss (also equates to approx. 80% bone loss)
	EXTENT	LOCALISED **GENERALISED** MOLAR-INCISOR	>30% of teeth affected
	GRADING	A SLOW B MODERATE **C RAPID**	Maximum bone loss in this 70 year old is 80% (determined by calculation above) 80% bone loss ÷ 70 years old = >1.0 and so rapid rate of progression
	DISEASE STATUS	**STABLE** REMISSION UNSTABLE	Probing pocket depths 2mm and less than 10% sites BoP
	RISK FACTORS	**POORLY CONTROLLED DIABETES**	
GENERALISED PERIODONTITIS, STAGE 4, GRADE C, CURRENTLY STABLE, UNSTABLE DIABETIC			

Case 2.

HISTORY	30 year old female, symptomatic attender Pregnant with no other relevant medical history, never smoker Manual brushes x1/day Previous loss of teeth due to excessive mobility

EXAMINATION	Poor oral hygiene
	Plaque Score 70%
	BoP 80%
	Obvious loss of interdental paplillae
	BPE <u>4*/ 4 / 4*</u>
	4*/ 4 /4*
	All teeth with pocket depths >5mm
RADIOGRAPH	Supplied by referring practitioner
	No other radiographs taken – patient pregnant

HEALTH	INTACT PERIODONTIUM

GINGIVITIS	REDUCED PERIODONTIUM-NON-PERIO		
	SUCCESSFULLY TREATED PERIO		
PERIODONTITIS	STAGING	I EARLY II MODERATE III SEVERE IV VERY SEVERE	Radiograph of the worst site is showing bone loss into the apical third (and in some cases to the apices)
	EXTENT	LOCALISED GENERALISED MOLAR-INCISOR	>30% of teeth affected
	GRADING	A SLOW B MODERATE C RAPID	Bone loss in this 30 year old is in excess of 90% in some areas = Grading ration of 3 (90/30) – which is >1.0 and so rapid rate of progression
	DISEASE STATUS	STABLE REMISSION UNSTABLE	Probing pocket depths ≥5mm
	RISK FACTORS	NO SPECIFIC RISK FACTORS IDENTIFIED	
GENERALISED PERIODONTITIS, STAGE 4, GRADE C, CURRENTLY UNSTABLE, NO SPECIFIC RISK FACTORS			

These two cases help to illustrate how the new classification should be implemented using the BSP implementation plan. These two cases result in a similar diagnosis one of which is currently stable with a code 2 BPE the other being unstable. As previously indicated with the old classification the first patient would have been classified as chronic gingivitis. There would have been no indication of the history of severe disease this patient has experienced and the potential for relapse, especially in view of the unstable diabetes. This case obviously needs careful maintenance and this is clearly highlighted in the new classification system.

Discussion:

The key to successful management of periodontal disease is early detection of disease and instigation of suitable management regimes. The gateway to diagnosing disease is accurate utilisation of the BPE examination. This article summarises the importance and interpretation of this essential gateway examination and how it relates to the new 2017 classification.

The new classification has been developed based on current literature and our better understanding of the natural history of periodontal disease. It is a significant change from the 1999 scheme but offers a more detailed approach that gives detail of the patient's current disease exposure and rate of progression, both important features in determining prognosis and management strategies. As illustrated it is able to capture historic disease that although may be currently stable such cases are at higher risk of future disease progression. The new classification also offers future proofing so it is envisaged that future modifications will not require major changes from the 2017 system set out in this article. The ramifications of a change in the classification system for any disease are significant and periodontal disease is no exception. Since 2017, great effort has been expended by the BSP, and its associated clinicians, teachers and researchers to ensure that patient management remains optimal and that the potential negative impact caused by any change is overcome by efforts to communicate the change in a clear and effective way. In this manner, the new classification system provides a positive step forward. This paper aspires to add a further piece of the 'communication jigsaw' to the profession and no doubt further publications will follow. Indeed during the preparation of this paper, further toolkits have been published by the European Federation of Periodontology, which we would encourage this readership to review, which further assist the clinician in their management of periodontal diseases[14].

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TABLES

Table 1 The History of Periodontal Disease Classification

Year Proposed	Responsible Body	Key Changes
1806	Joseph Fox	• First recorded classification of 'Gum Disease'
1942	Orban	• First classification recognised by the American Academy of Periodontology
1966	American Academy of Periodontology	• Chronic Marginal Periodontitis introduced
1977	American Academy of Periodontology	• Juvenile Periodontitis introduced
1986	American Academy of Periodontology[10]	• Prepubertal Periodontitis • Localised Juvenile • Generalised Juvenile • Adult Periodontitis • Necrotising Ulcerative • Periodontitis • Refractory Periodontitis
1989	Nyman & Lindhe, via 'Textbook of Clinical Periodontology	• Periodontitis levis • Periodontitis gravis
1989	American Academy of Periodontology[11]	• Early Onset Periodontitis • Periodontitis associated with • systemic disease • Refractory periodontitis
1993	European Workshop on Periodontology[12]	• Early Onset Periodontitis • Adult Periodontitis • Necrotising Ulcerative • Periodontitis
1999	International Workshop on Periodontal Classification[13]	• 'Chronic Adult periodontitis replaced with 'Chronic Periodontitis' • Early onset disease replace with localised or generalised Aggressive disease' • Gingivitis Classification Introduced

Table 2 Periodontal features to consider during clinical assessment

Clinical Feature	Assessment Measure
Gingival colour & contour	Visual assessment
Gingival phenotype (previously known as biotype)	Visual transparency of tissues on probing
Pocket depth & Recession	Visual use of probe
Attachment Loss *	Visual use of probe &/or calculated from probing depth and recession measurements
Bleeding on probing §	Visual use of probe Performed as part of BPE, Marginal Bleeding Score or Detailed Periodontal Chart
Tooth Mobility (or hypermobility)	Visual assessment using Index e.g. Millar's mobility Index
Furcation involvement of tooth	Visual assessment & use of probe using Score (e.g. BPE) or Index (e.g. Hamp *et al*[15])
Levels of plaque, presence & location of calculus	Visual assessment & use of probe
Presence & location of plaque retention factors	Visual assessment & use of probe
Presence or absence of pus	Visual assessment & use of probe

*A particular focus on interdental attachment loss when assessing buccal recession defects and identifying historic periodontitis.

§ Determines criteria for health vs. gingivitis, current periodontal status (stability/remission/unstable)

Table 3 Basic Periodontal Examination[16]

Scoring Code	BPE Probing Depth	First Black Band on Probe	Actual Pocket Depth Range	BOP	Calculus / Overhangs
0	Pockets <3.5mm,	Entirely visible	$\leq$3mm	No	No
1	Pockets <3.5mm,	Entirely visible	$\leq$3mm	Yes	No
2	Pockets <3.5mm,	Entirely visible	$\leq$3mm	Possible	Yes
3	Probing depth 3.5-- 5.5mm	Partially visible	4-5mm	Possible	Possible
4	Probing depth >5.5mm	Disappears	$\geq$6mm	Possible	Possible
*	Furcation involvement If identified (visibly or on probing) this should be recorded in addition to the numerical score				

FIGURES

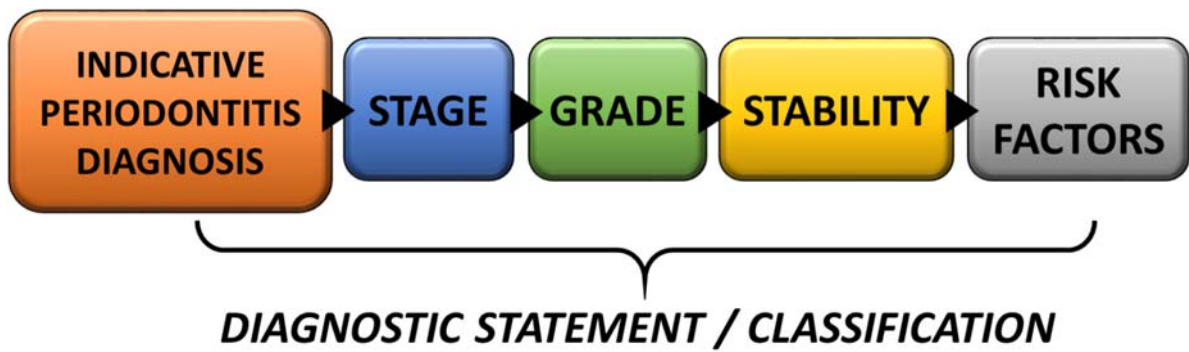**Figure 1 Component parts of the New Classification of Periodontal Disease**

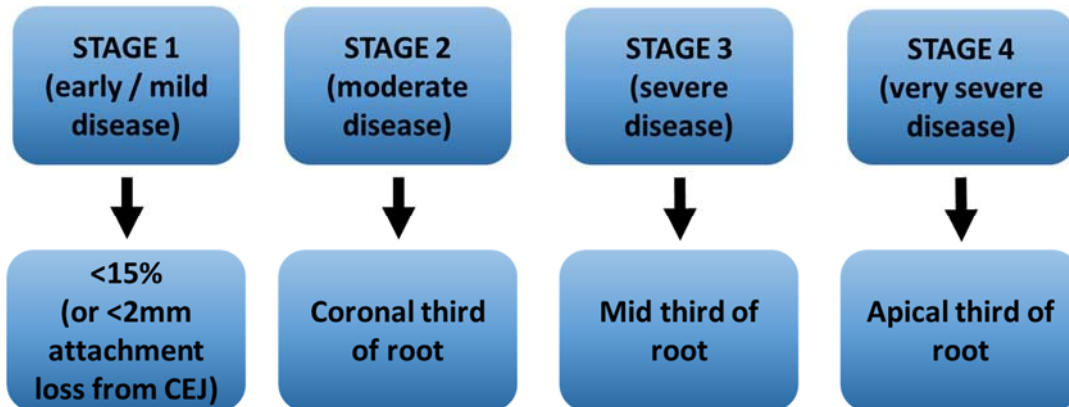**Figure 2 'Staging' of Periodontal Disease**

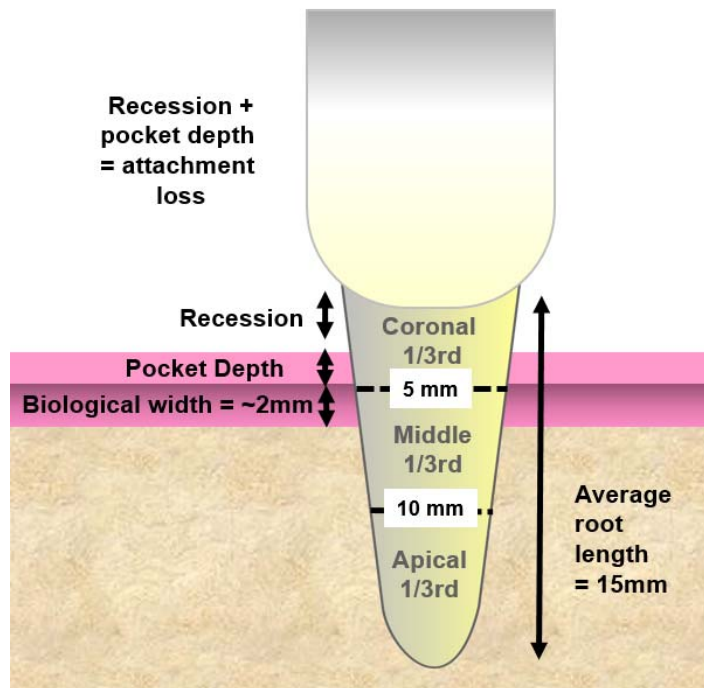**Figure 3 Estimating level of bone loss when radiographs not available**

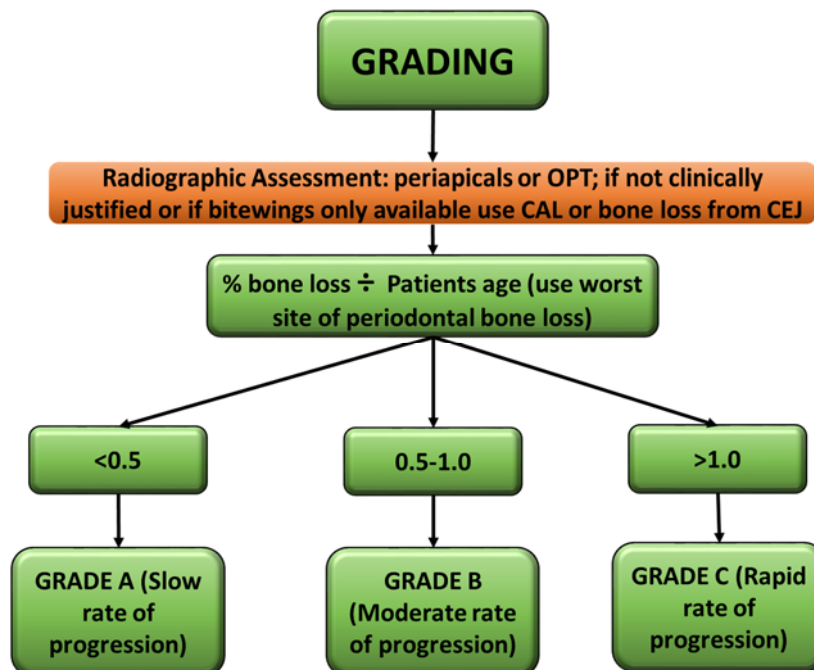**Figure 4 'Grading' of Periodontal Disease**

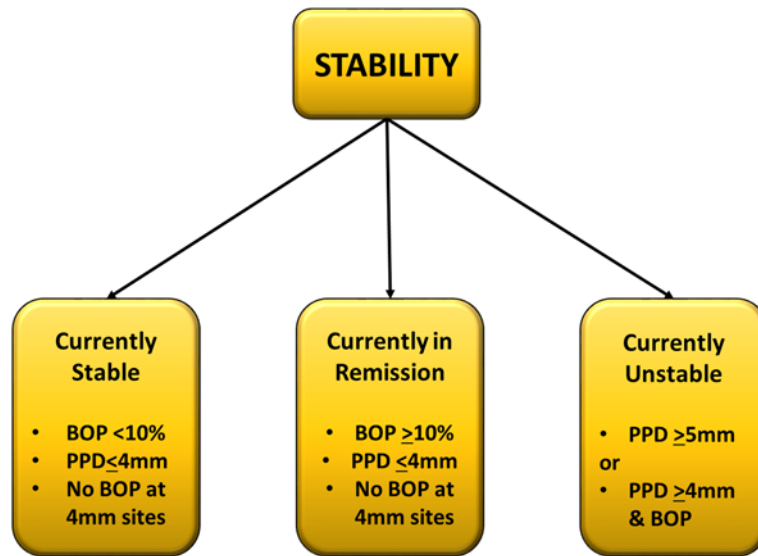**Figure 5 Assessment of Disease Stability**

Figure 6 The British Society of Periodontology Implementation of the 2017 Classification of Periodontology Flow Diagram (Published courtesy of the BSP)