Flowcharts for easy periodontal diagnosis based upon the 2018 new periodontal classification

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Key findings: User-friendly flowcharts were proposed for periodontal screening and diagnosis according to the 2018 periodontal classification.

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Abstract

Focused Clinical Question: How to simply and quickly perform a periodontal screening and make a proper periodontal diagnosis using the 2018 proposed new periodontal classification?

Summary: The 2018 periodontal classification has been released, however, it is challenging for clinicians especially for the dental students to apply the published information in practice. A diagnostic flowchart was created for 3 mostly common periodontal conditions; health, gingivitis and periodontitis. Additionally, flowcharts were proposed for diagnosis for periodontitis severity and risk of progression by staging and grading. Probing depth was the first clinical parameter to categorize the type of diseases. Subsequently, bleeding on probing, radiographic bone loss/clinical attachment loss and history of periodontal treatment were further added for making a proper diagnosis. Three clinical cases were given to demonstrate the use of the simplified proposed flowcharts.

Conclusions: The proposed diagnostic flowcharts are the user-friendly tool to assist clinicians to perform an initial screening and diagnosis based upon the 2018 newly proposed periodontal disease classification.

Key Words: Classification, Gingivitis, Periodontal diseases, Periodontitis

Background

The periodontal and peri-implant diseases and conditions classification aids clinicians to diagnose and properly treat patients. The 1999 periodontal classification[1] has been used widely for almost 20 years. During this period, advanced technologies and emerging evidences provide a better understanding of periodontal and peri-implant diseases, leading to an update in classification in the 2017 World Workshop.

The details of the new classification are thoroughly explained in the consensus report[2–4]. However, it is challenging for clinicians to adopt this 2018 newly developed

classification. Not only because it is new but also comprises of a lot of detailed information that is challenge to make a prompt diagnosis. Many clinicians expressed difficulty in applying these new periodontitis diagnosis in their daily practice. There was an attempt to develop a clinical guideline[5]. However, it is complex for a periodontal screening. The aim of this article was to propose user friendly flowcharts for easy periodontal diagnosis based upon the criteria proposed in the 2018 periodontal classification. The goal of these flowcharts was designed for quick initial screening in order to make proper diagnosis for 3 most commonly-found periodontal conditions; health, gingivitis and periodontitis, and to differentiate the types of periodontitis diagnosis by using staging and grading system.

Decision Process

The proposed flowcharts aimed to help clinicians distinguish and diagnose 3 common periodontal conditions. The diagnosis is not only for a new case, but also for cases that have been treated. In previously periodontal treated patient, once periodontal stability is achieved, health or gingivitis can exist even on a reduced periodontium with clinical attachment loss (CAL). When signs of active periodontitis remain after treatment, a diagnosis of recurrent periodontitis can be made due to the unsuccessful treatment.

Figure 1 shows the proposed periodontal diagnosis flowchart. Probing depth (PD) is the first clinical parameter used to categorize the patient. The patient will be classified based upon the maximum PD (e.g., ≤3 mm or >3mm) then full mouth BOP percentage (e.g., <10% or ≥10%) will be used to determine gingival inflammation. If PD is ≤3 mm with full mouth BOP <10%, the patient will be diagnosed as “periodontal health”. If PD is ≤3 mm and full mouth BOP is ≥10%, then the detection of radiographic bone loss (RBL) or CAL will be needed. In a case without RBL or CAL, the patient will be diagnosed as “gingivitis”. While, in a case with RBL and CAL, history of periodontal treatment is needed for the diagnosis. If the patient has been previously periodontal disease treated, the diagnosis is “gingivitis on a

reduced periodontium in a stable-periodontitis patient". In a case with no treatment, the diagnosis is then "periodontitis".

The similar process is also applied if the maximum PD is >3 mm. When PD is >3 mm and BOP <10% without RBL or CAL, the diagnosis is "periodontal health". In a case with RBL/CAL and BOP <10%, PD =4 mm with a history of periodontal treatment, the diagnosis is "health on a reduced periodontium in a stable-periodontitis patient". Usually, PD =4 mm can still present in a periodontitis case that has been successfully treated[2]. A case with PD =4 mm without history of periodontal treatment or PD ≥5 mm, the diagnosis will be "periodontitis". However, when PD is ≥5 mm and even with BOP <10%, the case is still diagnosed as "periodontitis". In cases with PD >3 mm and BOP ≥10%, "gingivitis" will be assigned if there is no RBL/CAL, while "periodontitis" will be assigned in cases with RBL/CAL.

Once a case is diagnosed as "periodontitis", a complete periodontal examination that includes full-mouth periodontal charting and radiographs as well as thorough history taking will be performed. The diagnosis can be confirmed with the case definition which is either 1. interdental CAL is detectable at ≥2 non-adjacent teeth or 2. buccal, or oral CAL ≥3 mm with pocketing >3 mm is detectable at ≥2 adjacent teeth. The observed CAL cannot be affected from non-periodontal causes[4]. A specific form of periodontitis; periodontitis, necrotizing periodontitis, or periodontitis as a manifestation of systemic disease will then be identified. If the case has neither the characteristics of necrotizing periodontitis nor a rare systemic disease with a second manifestation of severe periodontitis, it will be diagnosed as "periodontitis".

The second flowchart is proposed to identify the severity of periodontitis using the staging system[4] (Figure 2). First, tooth loss from periodontitis, including teeth planned for extraction due to periodontitis as part of active therapy (e.g., hygienic phase)[6] will need to be recorded. If tooth loss existed then the case is either stage III or IV. The differentiation of

stage III or IV is based upon the number of tooth loss and masticatory dysfunction. If the patient has tooth loss due to periodontitis of ≥5 teeth and/or less than 20 remaining teeth and/or need a rehabilitation because of masticatory dysfunction, periodontitis stage IV will be assigned. If there are <4 teeth loss due to periodontitis and no other masticatory dysfunction, then stage III is the diagnosis.

If the patient does not have any tooth loss or has tooth loss from reasons other than periodontitis or unknown cause of tooth loss, a combination of CAL, PD and RBL will be used to classify the patient. If the patient presents with CAL ≥5 mm and/or PD ≥6 mm and/or vertical bone loss ≥3 mm and/or furcation involvement grade 2 or 3, the case is either stage III or IV. As previously discussed, masticatory dysfunction and/or number of the remaining teeth will then be used to determine the stage. If CAL <5 mm and/or PD <6 mm, stage I or II is assigned, based upon CAL, the maximum PD and the amount of bone loss.

Finally, a periodontitis grade can be determined using the third flowchart (Figure 3). Grade B is usually the default for most periodontitis cases and a clinician will consider if it should be adjusted to grade A or grade C. A primary criteria for grade identification is the evidence of disease progression, either the direct evidence from a longitudinal data (over 5 years) of RBL or CAL, or the indirect evidence from a calculation of % bone loss per age. Other information such as a specific pattern of periodontal destruction, the response of standard bacterial control treatment can also be considered, however, this information may not be available in every cases. If there is an evidence of rapid progression or inconsistency of biofilm and periodontal destruction, grade C is assigned. However, if there is no evidence of periodontal disease progression or % bone loss per age <0.25, grade A is assigned. The presence or control of risk factors can also modify the grade assignments. For example, if the patient is a heavy smoker or uncontrolled diabetes, periodontitis grade B can be modified to grade C.

Clinical Scenarios

A 27 year-old female presented with periodontal condition shown in Figure 4. Generalized PD ranged from 2-4 mm with full-mouth BOP 45%, however, there was no RBL/CAL. Based upon our flowchart (Figure 1), the patient was placed to the PD ≥4mm category, with BOP >10% and no RBL/AL, the diagnosis was “gingivitis”.

Figure 5 demonstrated another case of 45 year-old female who presented for periodontal maintenance. Overall PD was 2-4 mm with full-mouth BOP 8%. From the flowchart (Figure 1), the patient was placed in the PD >3 mm category and BOP ≤10%. RBL/CAL could be identified. With the maximum PD of 4 mm and a history of periodontal treatment, the patient was diagnosed as “periodontal health on a reduced periodontium in a stable-periodontitis patient”.

The third case was a 50 year-old male (Figure 6) with a history of smoking 5 cigarettes/day for 20 years. PD was 2-5 mm on anterior teeth and 2-8 mm on posterior teeth with full-mouth BOP 84%. RBL presented and the upper left first molar was extracted due to dental caries. Using the diagnostic flowchart (Figure 1), the patient was placed in the PD >3 mm category. With BOP ≥10% and the presence of RBL/CAL, the patient was diagnosed as “periodontitis”. A comprehensive periodontal examination was performed, revealing Grade 1 and 2 furcation involvement on upper molars. The diagnosis of “periodontitis” was made, considering clinical presentation and patient’s medical history. Staging and grading of periodontitis was determined using the flowchart (Figures 2 and 3) as “stage III grade B”. Due to no tooth loss from periodontitis, the left side of the flowchart (Figure 2) was to be followed. Based on clinical and radiographic findings, and ≥20 remaining teeth, the patient was diagnosed as stage III. Being a smoker with 0.25-1.0 of % bone loss/age, grading score

would be grade B (Figure 3). However, if patient smoked ≥10 cigarettes/day, then grading could be modified to “C”.

All patients provided informed consent verbally.

Discussion

Periodontal classification is a tool for clinicians to identify diseased status so the proper treatment can be provided. The classification has been updated in the 2017 World Workshop and the consensus was released in 2018. Because it is new and there are many factors to consider, it soon becomes a challenge for clinicians especially dental students to apply this new classification in their practice. Hence, a simple, quick decision flowchart was developed to overcome this issue.

PD was selected to be the first clinical parameter for this diagnostic flowchart. Although CAL is the main clinical parameter to diagnose periodontitis in this 2018 classification, it has been previously discussed that the challenge of routine measuring CAL is not practical and often inaccurate in the daily practice due to improper identification of cemento-enamel junction[7]. This may result in the wrong diagnosis and possibly lead to improper treatment. In addition, measuring full-mouth CAL in every patient is time-consuming. Comparing to CAL, measurement of PD is a simple and easy to adopt since dentists routinely perform probing in their practice. Additionally, walking probe can be performed in oral examination for periodontal screening within a short period of time. Generally, deep PD is more concerned by dental practitioners than CAL. The PD was used as an active periodontal-diseased indicator[8]. Furthermore, deep pocket has a higher risk of disease progression when compared to shallower pocket[9]. Thus, in practice, we proposed to use PD as an initial screening tool along with RBL, instead of CAL.

History of periodontal treatment has become one of the criteria used for this new classification. In a patient has no history of periodontal treatment, although full mouth BOP is <10 % but if PD >3 mm with RBL or CAL, the diagnosis will be “periodontitis”. This may help

clinicians for early detection and treatment of the disease. However, in a case with history of periodontal treatment, the BOP <10 % and PD ≥5 mm or BOP ≥10 % and PD >3 mm, the patient can be diagnosed as “recurrent periodontitis”. To specify recurrent periodontitis from periodontitis may help clinicians more aware of patient susceptibility and the case complexity.

It is important to note that in a case that “periodontitis” is diagnosed from the flowchart but with no obvious RBL/CAL, clinicians must confirm the diagnosis again, considering the periodontitis case definition[4].

After excluding necrotizing periodontitis and periodontitis as a manifestation of systemic diseases based upon its distinct clinical presentation and associated medical history, periodontitis can be diagnosed. Staging and grading of periodontitis should be assigned to specify the disease severity and risk for future disease progression leading to patient management and treatment plan. Criteria for staging and grading of a periodontitis patient are already elaborated in the consensus report[4]. However, clinicians remain hesitant to adopt this widely in their current practice. Hence, we proposed these flowcharts to not only allow clinicians make a quick and proper periodontitis diagnosis but also minimize the confusion and inconsistent diagnosis.

The major benefit of the proposed flowcharts is to aid clinicians to a simple and quick screening so a correct periodontal diagnosis can be obtained. In contrast to the other decision tree[4], the proposed flowchart provides criteria to differentiate periodontal health, gingivitis and periodontitis according to the 2018 case definition in the same flowchart, which makes it easier to follow. Additionally, not all clinical parameters are needed to make a periodontal diagnosis in every case. In this flowchart, CAL measurement may be skipped in some cases or it can be done only when necessary. However, this flowchart only focuses on plaque-induced periodontal diseases. Attachment loss or bone loss from non-periodontitis

causes will be considered as “no RBL/CAL” to avoid false positive in a diagnosis of periodontitis.

In the flowchart for periodontal stage, information of tooth loss due to periodontitis was selected as the first criteria to separate patients with severe periodontal conditions, which can be stage III or IV. Clinicians can easily further differentiate stage III to stage IV by a number of tooth loss and masticatory dysfunction. A combination of CAL, maximum PD and level of bone loss of the worst affected tooth are the main criteria to categorize disease severity in case of no tooth loss or tooth loss from other causes. We proposed that these criteria used to identify disease severity and complexity should be evaluated together in order to diagnose periodontitis stage.

Periodontal grade is challenging to be assigned because it most likely depends on clinical experience and judgment. The proposed flowchart is in a check-list format. The primary criteria of direct or indirect evidence of progression may be the first parameter to consider. Factors that can modify the grade will be considered next. Hence, the periodontal grade flowchart provides the main criteria for grade assignment and also allows clinicians to consider other factors for possible grade modification.

Conclusions

The flowcharts were proposed to simplify the 2018 periodontal classification to a more user-friendly tool. However, it is just a guideline that certainly may possess some limitations in some cases. Therefore, judgement of clinicians is essential to make a definitive diagnosis. Clinical efficiency of the flowcharts should be evaluated in the future study.

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FIGURE 1 The quick and simple periodontal diagnostic flowchart.

PD, probing depth

BOP, full-mouth BOP

RBL, radiographic bone loss

CAL, clinical attachment loss

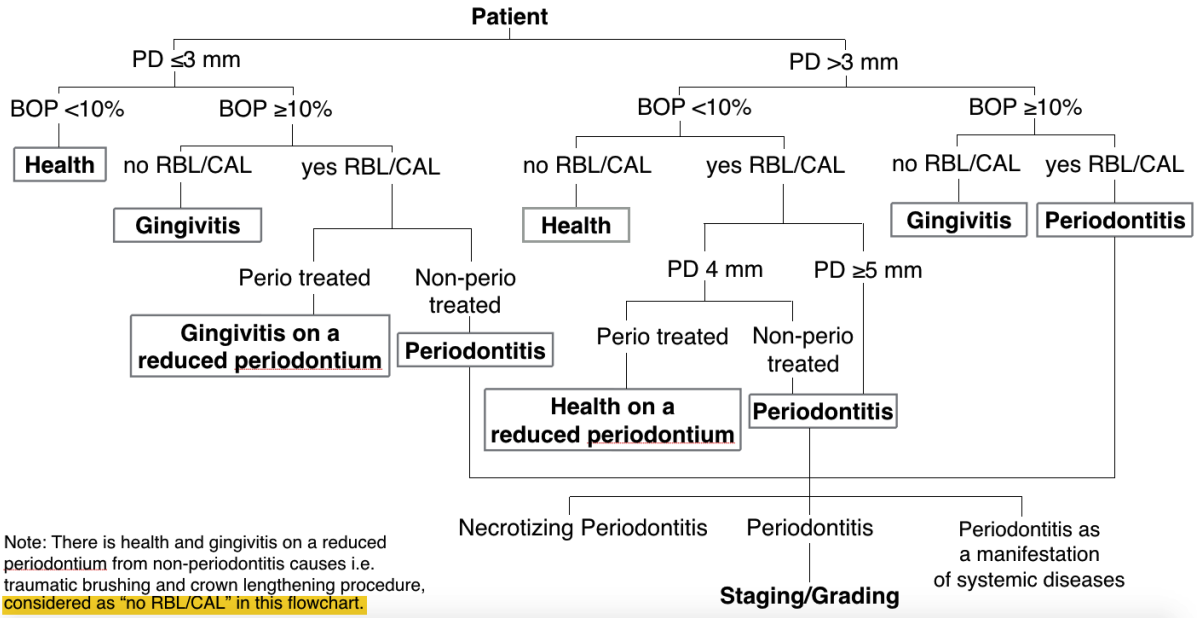

FIGURE 2 Staging for periodontitis.

One stage should be assigned per patient, based upon the worst tooth.

CAL, clinical attachment loss

PD, probing depth

RBL, radiographic bone loss

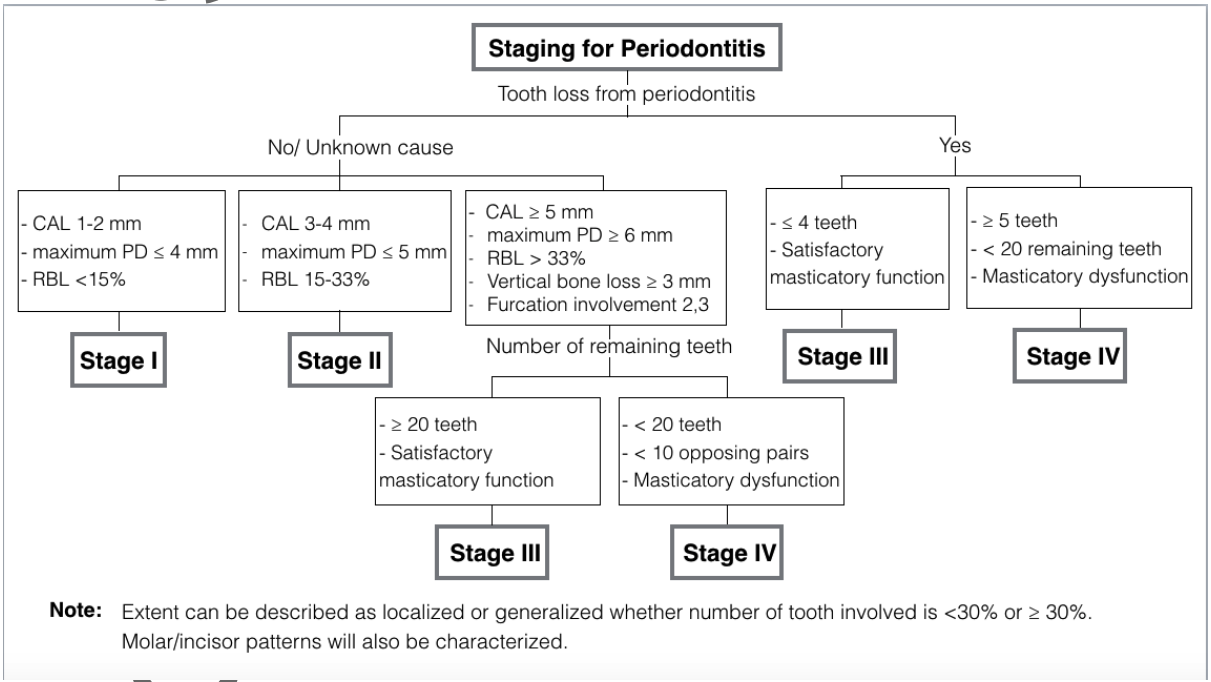

FIGURE 3 Grade scoring for periodontitis.

(+), primary criteria

(+/-), criteria that may or may not present

(-), criteria that must not present

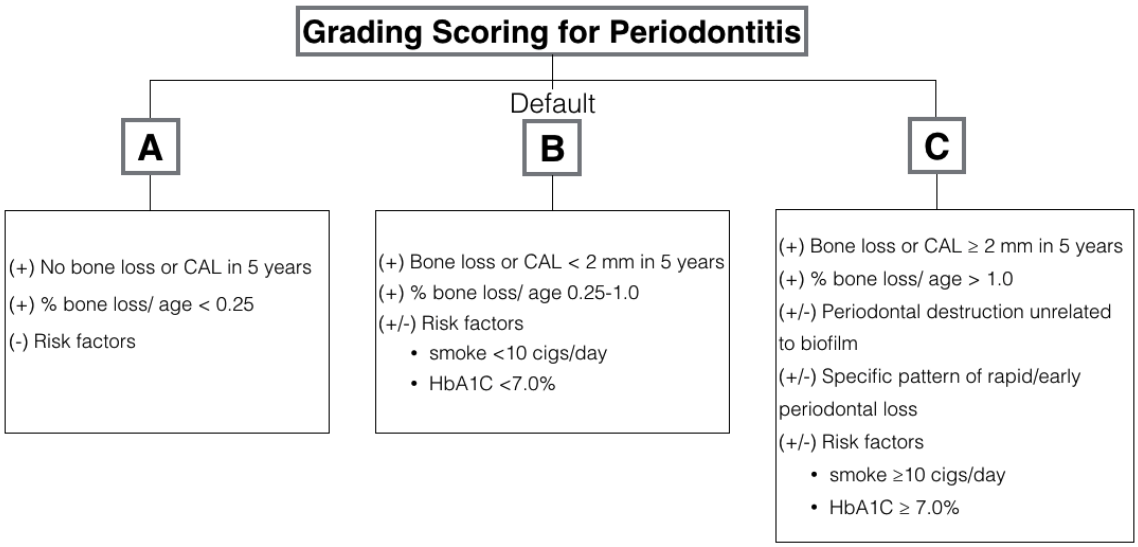

FIGURE 4 Gingivitis. A 27 year-old female with PD 2-4 mm, BOP ≥10% and no RBL/AL.

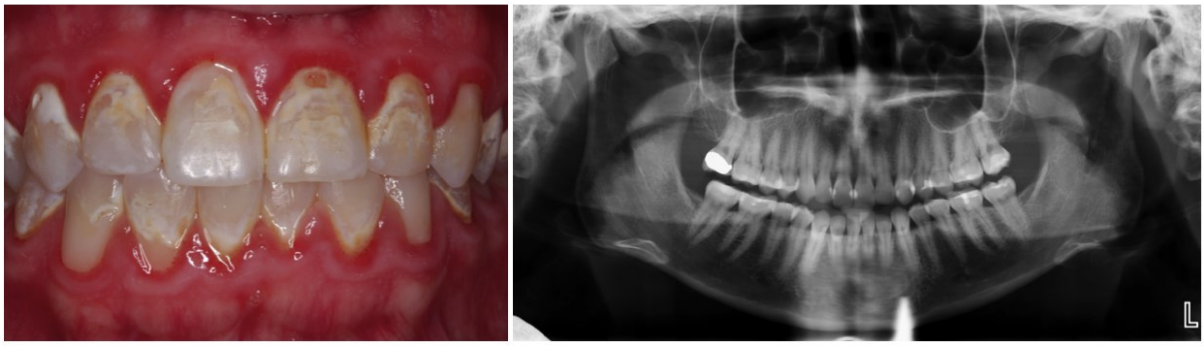

FIGURE 5 Health on a reduced periodontium. A 45 year-old female with history of periodontal treatment. PD 2-4 mm, BOP <10% with RBL/CAL.

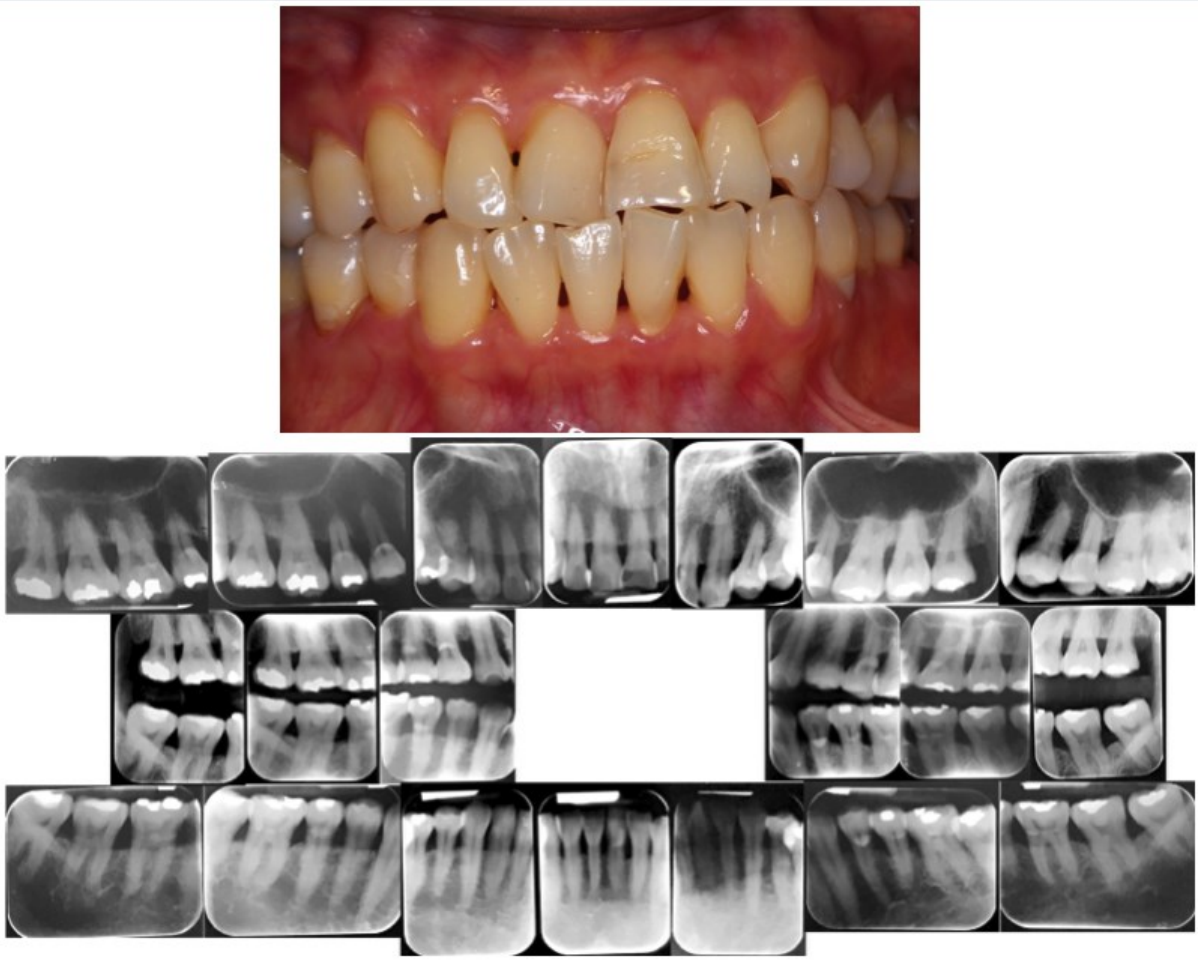

FIGURE 6 Generalized periodontitis: stage III grade B. A 50 year-old male who is a light smoker. PD ≥4 mm, BOP≥10 % with severe RBL and furcation involvement grade 1-2. History of tooth loss from dental caries but still have ≥20 remaining teeth.