STAGES OF A PERIODONTAL CLINICAL EXAMINATION: FROM ANAMNESIS TO DIAGNOSIS

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ABSTRACT

Introduction: The treatment of periodontal diseases can be a challenge that primarily requires a correct diagnosis. For this, basic parameters must be analyzed and basic steps followed. Objective: The objective of this literature review was to develop a booklet/guide on the important aspects to be evaluated during the periodontal clinical examination. Materials and methods: A search was performed in the Pubmed/Medline database with the keywords *clinical examination, dentistry; importance of clinical examination, parameters, clinical periodontal examination, periodontitis, anamnesis, dentistry, diagnosis of periodontal disease.* We included 26 studies comprising clinical studies, literature reviews, and book chapters that presented guidelines and guidelines on periodontal clinical diagnosis. Results: The studies showed that a detailed anamnesis followed by extraoral clinical examination, intraoral and periodontal examination is essential for an assertive diagnosis. During periodontal examination, parameters such as probing depth, gingival margin, clinical attachment level, probing bleeding, mobility, and furcation exposure should be evaluated. Marginal bleeding index and plaque index can inform the presence of gingival inflammation and quality of oral hygiene, respectively. Periapical radiographs may be requested as a complementary exam when appropriate. Conclusion: The need for a complete periodontal and radiographic clinical examination combined with information collected during the anamnesis are the pillars to define the presence or absence of periodontitis and its level of progression.

Keywords: Gum Diseases. Periodontitis. Oral Health. Dental X-ray. Anamnesis

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INTRODUCTION

Periodontal disease (PD) is a disease that affects more than one billion people worldwide (WHO, 2022). Initially characterized by inflammation of the gum tissue due to the accumulation of biofilm on the tooth surface, called gingivitis, PD can progress to periodontitis, resulting in bone loss around the teeth (Carranza, 2012). Clinical signs such as gingival bleeding, inflammation, edema, redness, loss of attachment can often be observed in the early phase of the disease (Chapple, 2018). Combined with this, furcation injury, tooth mobility, and even tooth loss can be consequences of advanced PD (Preshaw, 2015; Salvi *et al.*, 2023).

The diagnosis and treatment of PD should be carried out individually, considering the local and systemic characteristics of the patient, such as genetic factors and pre-existing systemic diseases (Chapple, 2018). Systemic diseases such as diabetes may require specific clinical conducts and even in conjunction with the physician for successful treatment (Wu *et al.*, 2020). For effective therapy, an accurate diagnosis with detailed information on the degree of PD progression is essential, if present (Salvi *et al.*, 2023). This requires a thorough evaluation, including anamnesis, extraoral clinical examination, intraoral examination, periodontal examination, and radiographs (Carranza, 2012; Salvi *et al.*, 2023). With this, the differences between the various types of periodontal diseases such as gingivitis, periodontitis, necrotizing periodontal disease will be evidenced and the periodontal diagnosis can be correctly determined (Caton *et al.*, 2018; Steffens & Marcantonio, 2018; Dietrich *et al.*, 2019; Salvi *et al.,* 2023).

The use of the 2018 classification of periodontal and peri-implant diseases and conditions is essential to guide the diagnosis and treatment of PD (Marin, 2020; Salvi *et al.*, 2023). Three categories are presented in the manual: gum health, gum diseases and conditions, periodontitis, and other conditions that affect the periodontium (Caton *et al.*, 2018; Steffens & Marcantonio, 2018). Knowledge of these classifications and the parameters that should be observed in each category is also important for periodontal diagnosis (Salvi *et al.,* 2023).

To date, there is a lack of studies in the literature that address a complete clinical sequence involving anamnesis, clinical and radiographic examination aimed at periodontal diagnosis. Therefore, the objective of this literature review is to elaborate a guide on the important aspects to be evaluated during the periodontal clinical examination.

METHODOLOGY

In January 2024, a search was performed in the Pubmed/Medline database with the following keywords: *clinical examination, dentistry; importance of clinical examination,*

parameters, clinical periodontal examination, periodontitis, anamnesis, dentistry, diagnosis of periodontal disease. The selection of papers was carried out without restriction of language and year of publication. Next, a search was made for the references used in the previously selected articles that addressed the theme of work. We included 26 studies comprising clinical studies, literature reviews, and book chapters that presented guidelines and guidelines on periodontal clinical diagnosis.

LITERATURE REVIEW
SEQUENCE OF CLINICAL PROCEDURES

Below is a suggestion for a clinical sequence for performing the complete periodontal clinical examination.

ANAMNESIS

The first step towards a quality clinical examination is to carry out a detailed anamnesis of the patient (Sal, 2023). General data, medical history, oral history, and information that can be decisive in the prognosis of the patient's periodontal condition are sought (Carranza *et al*, 2012; Salvi *et al*, 2023). It is important to know if the patient has a systemic disease, which, in some cases, can directly or indirectly affect the periodontal tissue, such as diabetes (Carranza *et al*, 2012; Stöhr *et al*, 2021; Kalhan *et al*, 2022). The use of medications is another piece of information that the dentist should be aware of, as there are medications that interact directly with periodontal tissue, such as some anticonvulsants such as cyclosporine (Schmalz *et al*, 2023). Smoking is a factor that is directly linked to the risk of development and severity of periodontal disease, so it is of paramount importance that dentists are aware of this habit (Warnakulasuriya *et al*, 2010; Carranza *et al*, 2012; Preshaw, 2015). Finally, any systemic or local changes, and allergies that require precautions or modifications to treatment procedures, should be informed by the patient (Schmalz *et al*, 2023).

EXTRA-ORAL CLINICAL EXAMINATION

An evaluation of the facial muscles, presence of asymmetry, palpation of TMJ and lymph nodes should be performed (Carranza *et al*, 2012; Salvi *et al*, 2023). Protruding lymph nodes can be indicative of acute inflammation, which is often related to oral tissues (Carranza *et al*, 2012). During the extraoral examination, it is recommended to measure the patient's blood pressure, since abnormal changes contraindicate dental care (Valtellini & Ouanounou, 2023). Special attention is dedicated to hypertensive patients who are not

under medical monitoring, since they may have variations in blood pressure. (Valtellini & Ouanounou, 2023).

INTRA-ORAL

Palatine mucous membranes, jugal mucosa, gingiva, tongue and dental condition must be rigorously evaluated by the dentist (Carranza *et al*, 2012). Poorly adapted and overcontoured restorations can be responsible for generating gingival inflammation in the tooth in question (Jepsen *et al*, 2018).

EXAME PERIODONTAL

This exam clinically evaluates the condition of the gingival tissues, and is essential to close the patient's periodontal diagnosis. It should be performed and properly completed at various stages of periodontal therapy, as an initial diagnostic test, at the beginning of treatment, during the reassessment of non-surgical periodontal therapy, and at periodontal maintenance visits, in order to monitor the progress of treatment (Carranza *et al*, 2012). An improvement in periodontal clinical parameters reflects the success of therapy (Ribeiro *et al*, 2013).

Choosing the appropriate instruments for performing the exam facilitates the process and minimizes possible errors. The periodontal probe should always be present on the dentist's table during periodontal examination (Carranza *et al*, 2012; Preshaw, 2015). There are numerous brands and designers of periodontal probes on the market, among them, North Carolina, WHO and Williams stand out (Buduneli *et al*, 2004; Preshaw, 2015) (Figure 1), the latter being the most used by dentists.
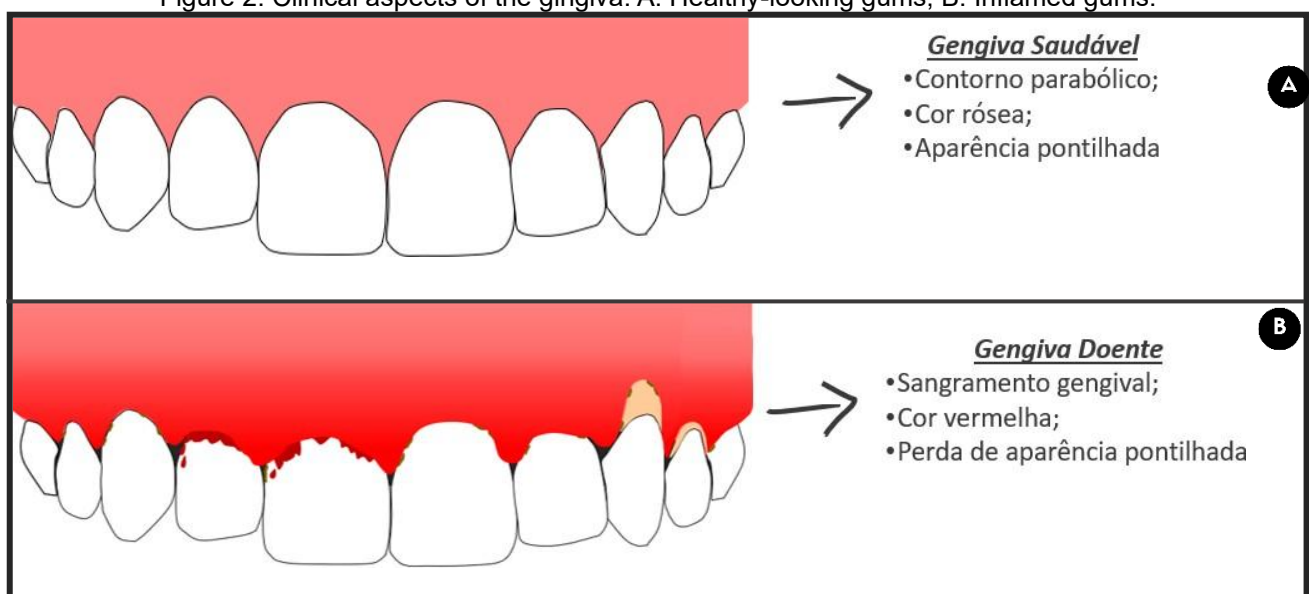
Figure 1: Periodontal Williams probe
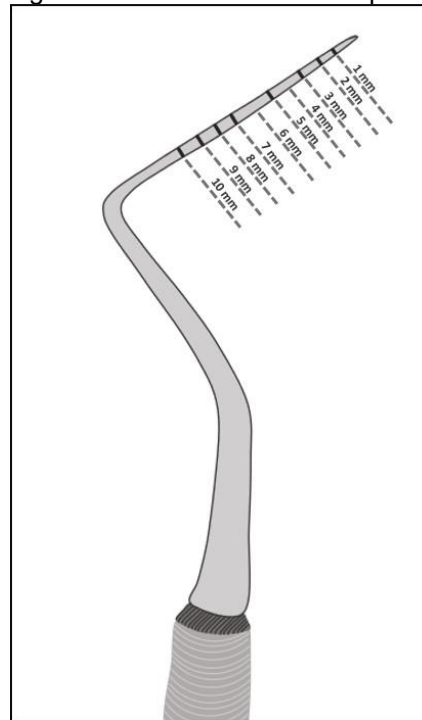
Source: Authors

VISUAL EXAMINATION AND PALPATION

Pink color, firm consistency, parabolic shape, and dotted appearance are characteristics that should be observed in a healthy gum (Figure 2A) (Carranza *et al*, 2012). Changes in these aspects, such as red color, tender to the touch, flaccid consistency, and loss of dotted appearance, are considered to be inflamed gums (Figure 2B) (Carranza *et al*, 2012; Lang & Lindhe, 2015). This exam only reveals the healthy or unhealthy appearance of the gums, and cannot be used alone for diagnosis.

Figure 2: Clinical aspects of the gingiva. A: Healthy-looking gums; B: Inflamed gums.

Gengiva Saudável
• Contorno parabólico;
• Cor rósea;
• Aparência pontilhada

A

B

Gengiva Doente
• Sangramento gengival;
• Cor vermelha;
• Perda de aparência pontilhada

Source: Authors

Plate Index

It refers to the amount of biofilm present on the tooth surface (Lindhe, Karring, Lang, 2010). The presence of biofilm on the 4 surfaces (distal, buccal, mesial, lingual/palatine) of each patient's tooth is evaluated and noted (Figure 3) (O'leary, 1972; Lang & Lindhe, 2015). This examination can be performed by pointing out the visible plaque, when the presence or absence of the plaque is visualized with the naked eye, or by the stained plaque, when the plaque is evidenced with a dye (fuchsin) (O'leary, 1972; Ainamo & Bay, 1975). Both techniques are efficient, however, identifying the visible license plate can be difficult for beginners.

Figure 3: Form of recording the presence of plaque by face.
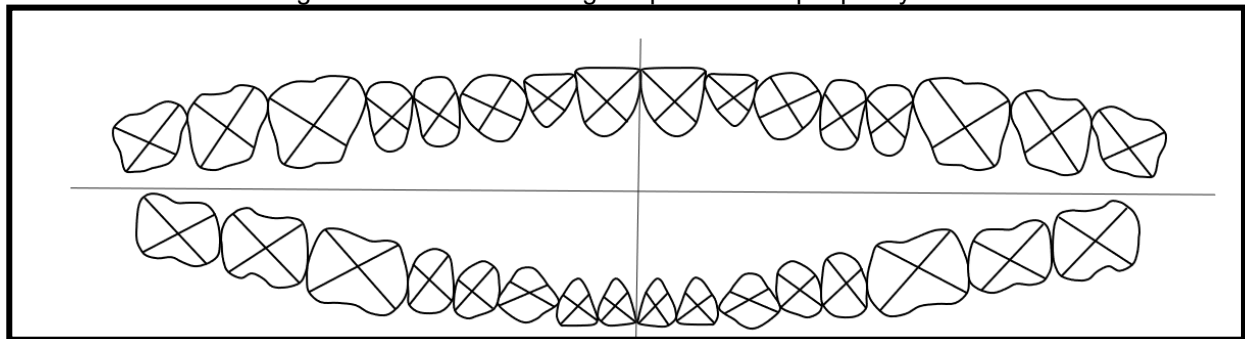
Source: Authors

Accompanied by the information on the faces with the presence of plaque, a mathematical equation is performed that results in an overall percentage of the amount of plaque present in all teeth (O'leary, 1972) (Figure 4). This examination reveals the quality of the patients' oral hygiene, where the higher the index, the more precarious the patient's oral hygiene condition is (O'leary, 1972), and, therefore, instructive measures must be adopted (O'leary, 1972; Preshaw, 2015; Tonetti & Sanz, 2019.

Figure 4: Mathematical formula used to calculate the plaque index

$$\text{Plaque Index} = \frac{\text{Number of Faces with Plate}}{\text{total number of faces of all the patient's teeth present}} \times 100$$

Source: Authors

Marginal Bleeding Index

It initially identifies gingivitis (Carranza *et al.*, 2012). The presence of bleeding through the insertion of the millimeter probe into the marginal gingiva, superficially and

without pressure, is noted on the 4 surfaces (distal, buccal, mesial, lingual/palatine) of each patient's tooth (Preshaw, 2015).

The percentage of marginal bleeding is calculated similarly to the plaque index. The higher the bleeding rate, the greater the chance that the patient will have gingivitis or periodontitis (Carranza *et al.*, 2012) (Figure 5).

Figure 5: Mathematical formula used to calculate the marginal bleeding index.

$$\text{Marginal Bleeding Index} = \frac{\text{Number of faces with marginal bleeding}}{\text{total number of faces of all teeth present of the patient}} \times 100$$

Source: Authors

Gingival Level / Gingival Margin

It comprises the distance from the gingival margin to the cemento-enamel junction (Barbosa *et al.,* 2016) (Figure 6). This measurement is responsible for revealing the presence of gingival recession or hyperplasia, and on which face and tooth it is found (Barbosa *et al.,* 2016). 6 sites are evaluated per tooth (disto-vestibular, vestibular, mesio-vestibular, disto-palatine/lingual, palatine/lingual, disto-palatine/lingual) (Eke *et al,* 2012).

There are 3 possible scenarios to be found: 1) No hyperplasia or recession; 2) Gingival recession and 3) Gingival hyperplasia.

1) No hyperplasia or recession: Occurs when the gingival margin coincides with the cemento-enamel junction (Carranza, 2012). It is considered as a scenario of normality of the gingival margin. In this case, the gingival level is equal to zero (Figure 5A).

2) Gingival hyperplasia: The gingival margin is more coronal in relation to the cemento-enamel junction (Barbosa *et al.,* 2016). It is necessary to note this distance in negative values (Figure 5B).

3) Gingival recession: The gingival margin is more apical in relation to the cemento-enamel junction (Barbosa *et al.,* 2016). It is necessary to note this distance in positive values (Figure 5C).

In cases in which the patient presents gingival recession, it is necessary to seek the cause of this alteration, which varies from the presence of calculus in the region to malocclusion (Caton *et al.*, 2018; Steffens & Marcantonio, 2018). In cases of gingival hyperplasia, the cause may be related to the use of medications, such as cyclosporine or plaque accumulation (Caton *et al.*, 2018; Steffens & Marcantonio, 2018; Chojnacka-Purpurowicz).

Figure 6: Measurement of the gingival margin. A: Gums do not show hyperplasia or recession; B: Gingival hyperplasia; C: Gum recession.
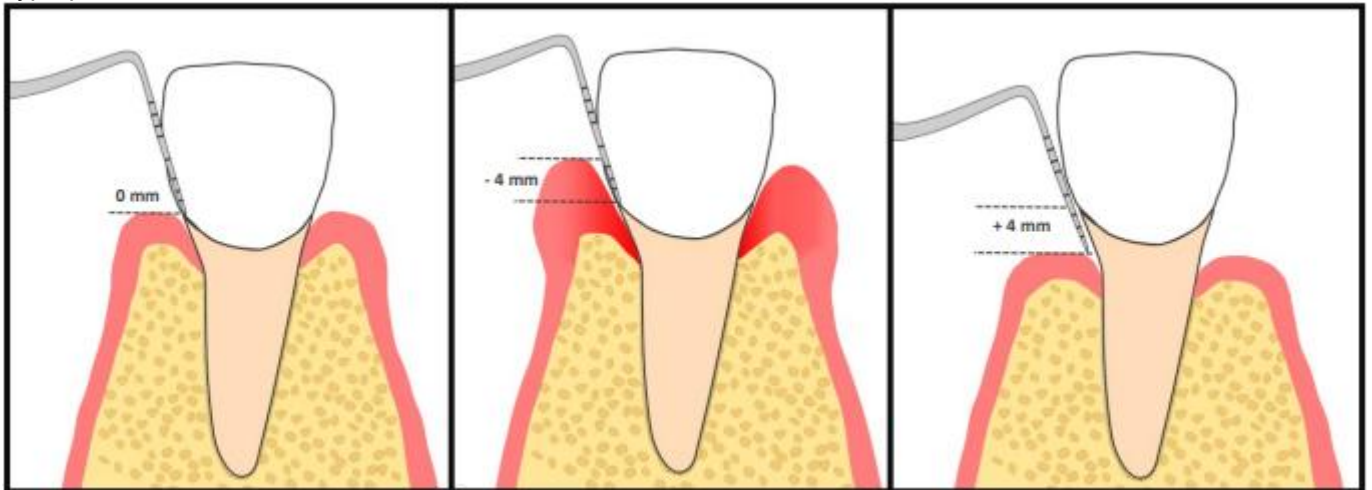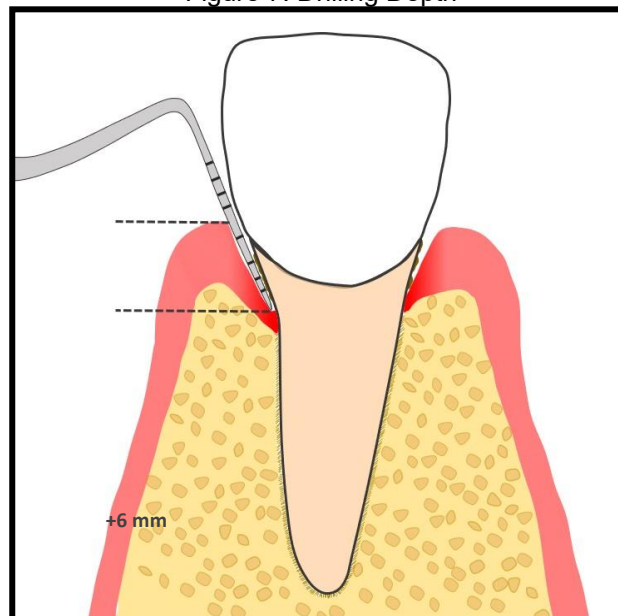

Source: Authors

Depth of Drilling

It is the measure of the distance from the gingival margin to the bottom of the periodontal pocket (Figure 7) (Salvi *et al.*, 2023). The probe should be introduced internally to the gingival margin until it encounters resistance (periodontal pocket bottom) (Preshaw, 2015).

Figure 7: Drilling Depth

Source: Authors

6 sites are evaluated per tooth (disto-vestibular, vestibular, mesio-vestibular, disto-palatal/lingual, palatine/lingual, disto-palatine/lingual) (Preshaw, 2015). It is necessary to carry out several probing points on the same face in search of a localized periodontal pocket (Figure 8) (Carranza *et al.*, 2012).

Figure 8: Several polling points on the same face, due to localized losses.
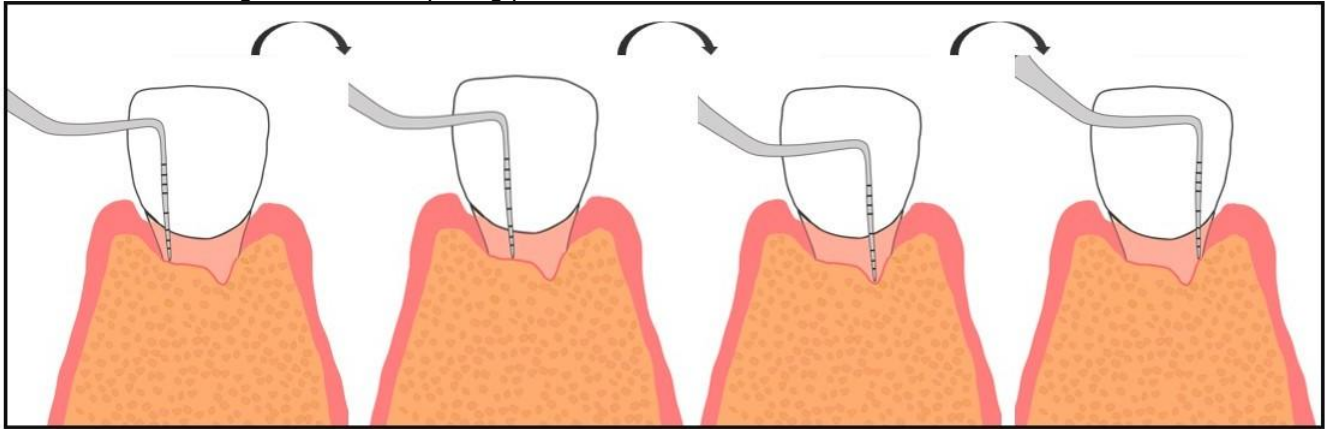
Source: Authors

For a reliable poll, certain precautions are essential. The probe should be inserted parallel to the long axis of the tooth (Figure 9) and without excessive pressure so that it does not compromise the periodontal tissue (Carranza *et al*., 2012).

Figure 8: Probe positioning. A: Probe positioned along the axis of the tooth, allowing measurement of the depth of probing; B: Probe positioned at an upper angle along the tooth axis, allowing an inadequate measurement of the actual measurement of the depth of probing.
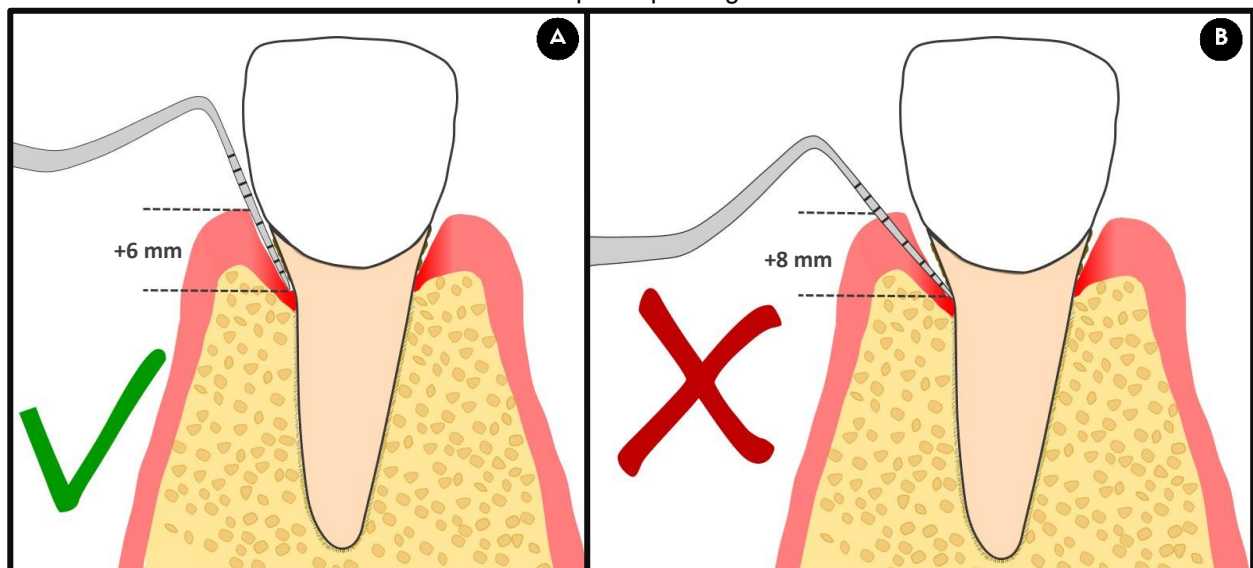
Source: Author

Bleeding on Probing

It is considered one of the most objective parameters for identifying gingival inflammation (Chapple *et al*., 2018) and periodontal disease activity (Salvi *et al*., 2023). During the examination of the probing depth, the sites that presented bleeding with the stimulus of the probe inside the periodontal pocket are noted (Salvi *et al*., 2023).

Studies indicate that negative bleeding on probing may indicate a halt in the progression of periodontal disease (Preshaw, 2015). While, positive bleeding on probing is directly linked to the chance of periodontal disease progression (Lang *et al*, 1986).

Clinical Insertion Level

It consists of the distance between the bottom of the periodontal pocket and the cemento-enamel junction (Figure 10) (Carranza *et al.*, 2012; Salvi *et al.*, 2023). In a practical way, they are the gingival margin values added to the depth of probing (Figure 10, Figure 11, Figure 12) (Preshaw, 2015; Salvi *et al.*, 2023). This measurement indicates the amount of periodontal clinical attachment loss that the patient has (Carranza *et al.*, 2012). The higher the value found, the greater the periodontal destruction (Carranza *et al.*, 2012). Clinical attachment loss is a valuable analysis for the diagnosis and staging degree of periodontitis (Salvi *et al.*, 2023; Tonetti & Sanz, 2019).

The clinical attachment level of patients who do not have gingival recession or hyperplasia will be equal to the value found at the probing depth (Figure 10) (Carranza *et al.*, 2012; Salvi *et al.*, 2023).

Figure 10: Example of the attachment level of a patient who does not have gingival recession or hyperplasia.
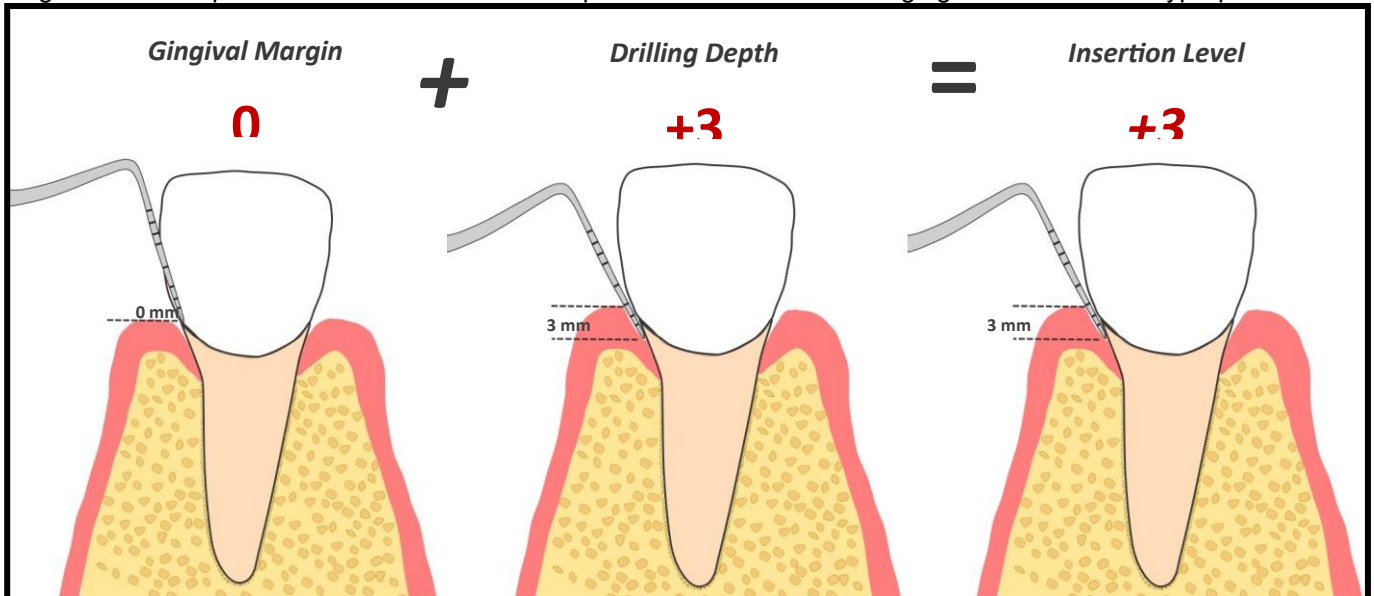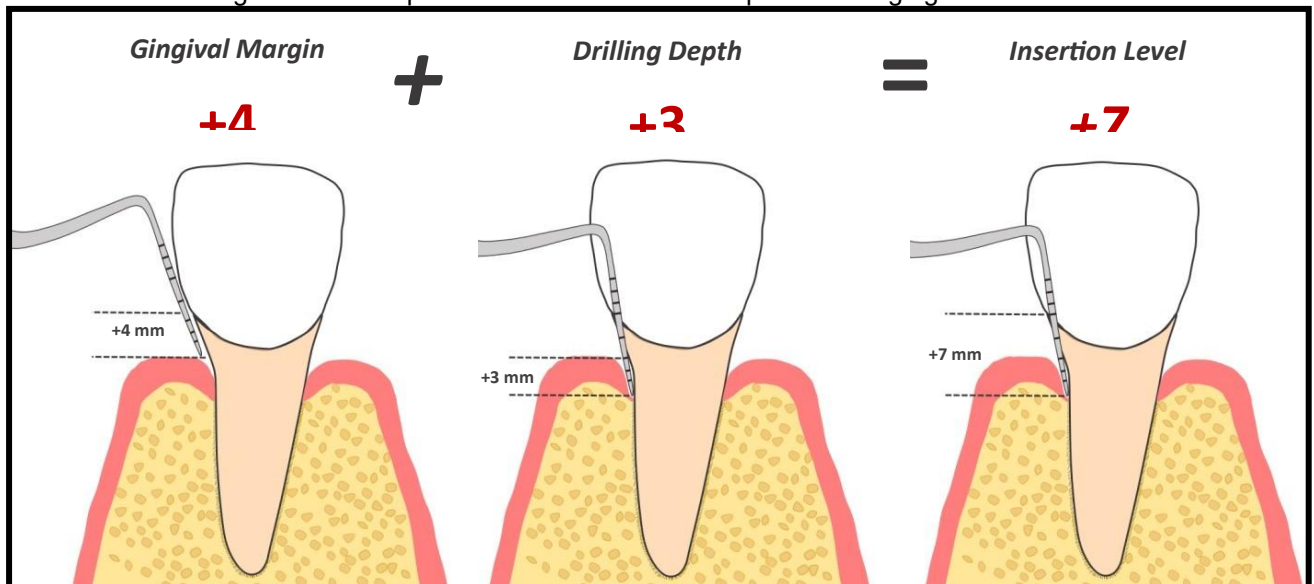

Source: Authors

Figure 11: Example of the insertion level of a patient with gingival hyperplasia.

Gingival Margin	+	Drilling Depth	=	Insertion Level
-4		+7		+3
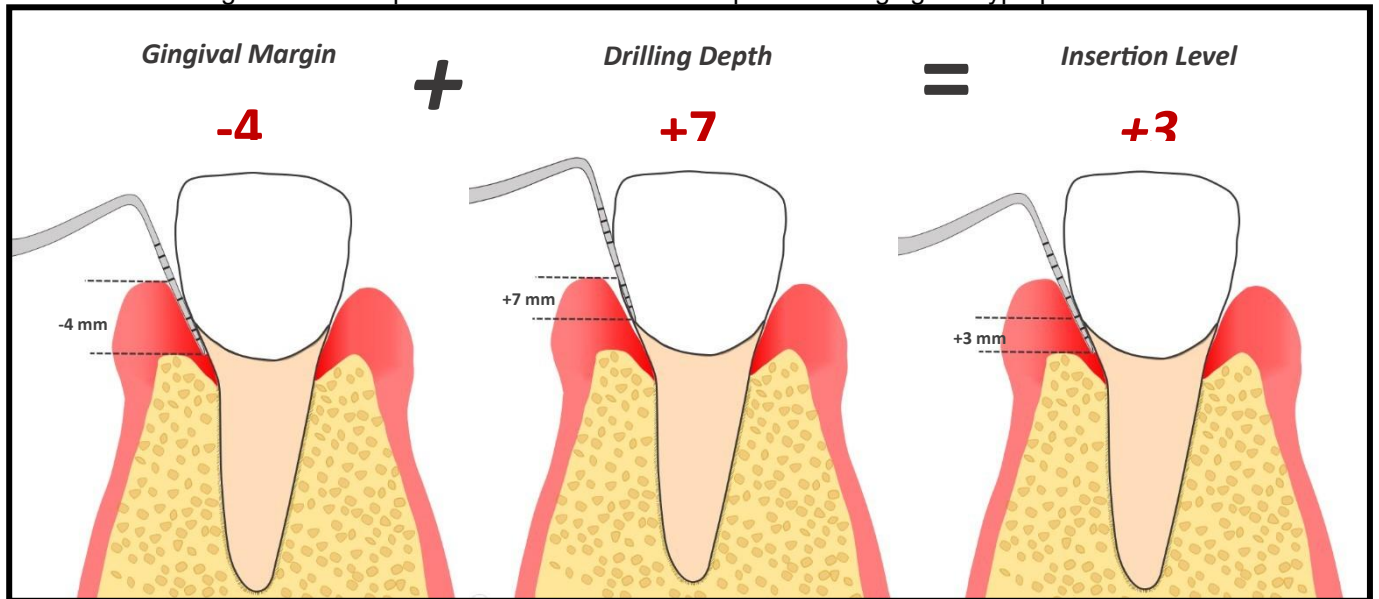
Source: Authors

Figure 12: Example of the insertion level of a patient with gingival retraction.

Gingival Margin	+	Drilling Depth	=	Insertion Level
+4		+3		+7

Source: Authors

Furca

This parameter is used to identify furcation lesions (Preshaw, 2015). Performed only on biradicular or multiroot teeth (Preshaw, 2015; Salvi *et al.*, 2023). Teeth that have 3 or more roots should be analyzed for all possible furcations (Preshaw, 2015). The Nabers probe (Figure 13A) is a facilitator of this measurement (Preshaw, 2015; Salvi *et al.*, 2023). It has a curved angle and a suitable shape to be introduced into the furcation region and has markings that allow the correct classification of the degree of the lesion, when present (Preshaw, 2015).

1975): Furcation lesions are divided into 3 grades (Figure 13B, 13C, 13D) (Hamp, Nyman, & Lindhe, Grade I: Loss of 1/3 of furcation insertion of the interradicular area (< 3 mm); Grade II: Loss greater than 1/3 of furcation insertion, but without reaching the total interradicular area (> 3 mm); Grade III: Loss of furcation insertion exceeds the total interradicular area.

This type of evaluation is important because, when there is a furcation lesion, it is necessary to involve this region in the treatment plan (Carranza *et al.*, 2012). An advanced degree of furcation lesion often disfavors the prognosis of the affected tooth (Wang *et al*, 1994).

Figure 13: Evaluation of the furcade. A: Nabers probe; B: Grade I furcation lesion; C: Grade II furcation lesion; D: Grade III furcation injury.
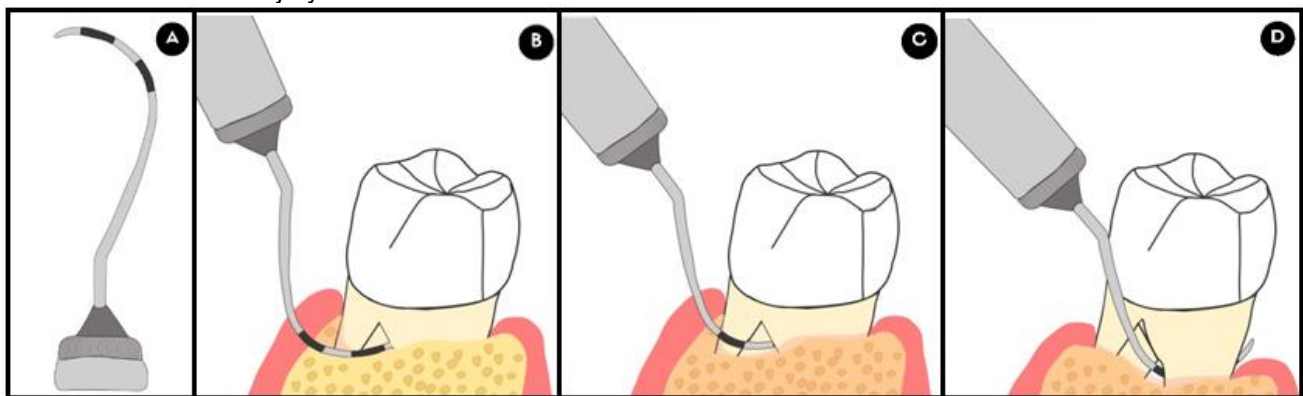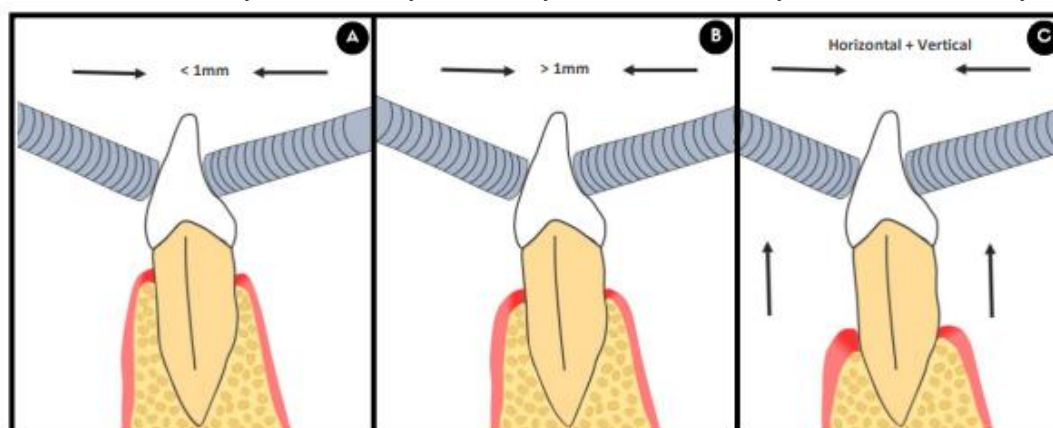

Source: Authors

Mobility

With the help of 2 blunt instruments, one positioned in the buccal and the other in the lingual/palatine of the tooth, through the performance of mesio-distal, vestibulo-lingual/palate, and vertical movements, it is possible to observe and classify tooth mobility (Preshaw, 2015; Rose, 2004).

The lesions are divided into 3 grades (Figure 14) (Rose, 2004): Grade I: presents subtle mobility (< 1mm) in the mesio-distal and/or vestibulo-lingual direction; mm) ; Grade II: Moderate mobility in the mesio-distal and/or vestibulo-lingual direction (> 1 Grade III: Has great mobility in the mesio-distal and/or vestibulo-lingual direction, in addition to presenting mobility in the vertical direction (from root to incisal).

The presence of mobility is not an indicator of periodontal disease activity, it needs to be combined with other characteristic clinical findings (Lang & Bartold, 2018). This is because occlusal trauma and dento-alveolar trauma are also possible causes of tooth mobility (Carranza *et al.*, 2012; Preshaw, 2015).

Source: Authors

COMPLEMENTARY EXAMS

Once the periogram form is completed, complementary exams, such as radiographs and photographs, may be requested (Carranza *et al.*, 2012). Photographs can be used to show the patient before and after treatment, but for diagnostic purposes, it may not be effective (Carranza *et al.*, 2012). Periapical radiographs are important, especially to classify the degree of disease through the visualization of bone loss, however, it does not dispense with periodontal clinical evaluation (Tonetti & Sanz, 2019).

Periodontal diagnosis and treatment planning

With the anamnesis, clinical examination, periodontal and complementary examination in hand, it is possible to accurately diagnose the patient's periodontal and finally outline the appropriate treatment plan (Preshaw, 2015).

The last internationally recognized classification of periodontal diseases was released in 2018 (Caton *et al.*, 2018). Diagnosis can be carried out in stages (Tonetti & Sanz, 2019):

Presence of periodontal health, gingivitis, or possible periodontitis

Periodontal health: When there are less than 10% of the sites with positive bleeding on probing and with probing depth of up to 3 mm (Caton *et al.*, 2018; Steffens & Marcantonio, 2018). This condition can occur in both an intact periodontium (without insertion loss) and a reduced periodontium (with insertion loss).

Gingivitis: Occurs when there are more than 10% of the sites with positive bleeding on probing and with probing depth of up to 3 mm (Caton *et al.*, 2018; Steffens & Marcantonio, 2018). It covers intact periodontium and reduced periodontium. It is still possible to classify gingivitis according to the causal agent: gingivitis only by biofilm;

systemic or local factor-mediated gingivitis and drug-associated gingivitis that results in modification of gum tissue (Caton *et al.*, 2018; Steffens & Marcantonio, 2018).

Periodontitis: When there is a probing depth ≥4 mm with bleeding on probing combined with loss of attachment in two or more nonadjacent sites (Caton *et al.*, 2018; Steffens & Marcantonio, 2018).
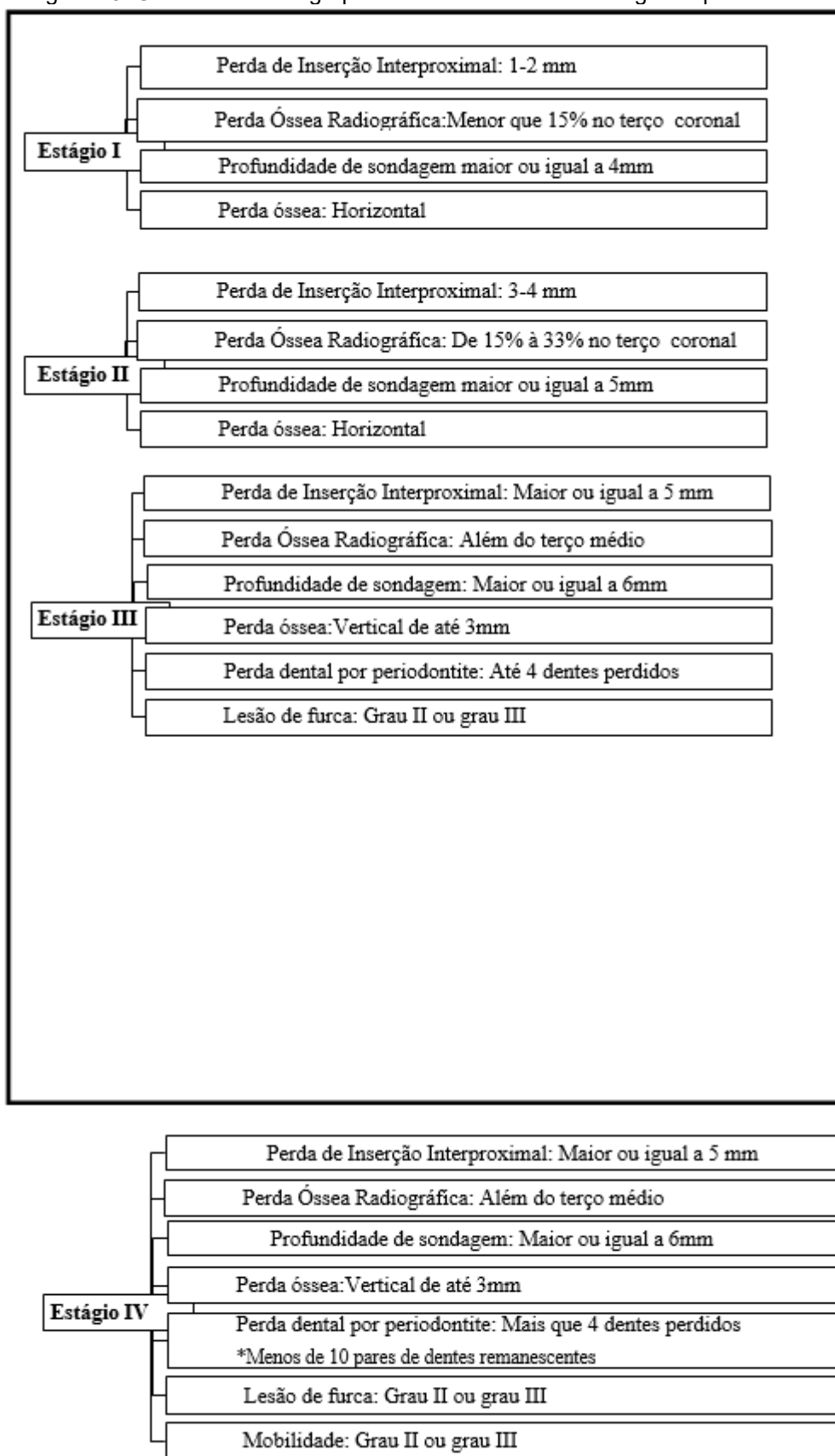
Differential diagnosis of periodontal disease

Once the insertion loss, probing depth greater than or equal to 4 mm with bleeding on probing is observed, it is necessary to rule out other pathologies or traumas that may present similar conditions (Preshaw, 2015). Cervical caries, endoperium lesions, vertical root fractures, gingival recession, loss of insertion in the distal second molar due to third molar extraction (Caton *et al.*, 2018; Steffens & Marcantonio, 2018).

Assessment of periodontitis severity

First, the stage and extent (localized [up to 30% of the affected sites] or generalized [more than 30% of the affected sites]) of the periodontitis is defined. Next, the degree of progression is defined, which, in turn, can be influenced by patient risk factors such as smoking and diabetes (Caton *et al.*, 2018; Steffens & Marcantonio, 2018). The characteristics of each stage are listed in Figure 15 (Caton *et al.*, 2018; Papapanou *et al.*, 2018; Steffens & Marcantonio, 2018).

Figure 15: Clinical and radiographic characteristics of the stages of periodontitis

Estágio I
- Perda de Inserção Interproximal: 1-2 mm
- Perda Óssea Radiográfica: Menor que 15% no terço coronal
- Profundidade de sondagem maior ou igual a 4mm
- Perda óssea: Horizontal

Estágio II
- Perda de Inserção Interproximal: 3-4 mm
- Perda Óssea Radiográfica: De 15% à 33% no terço coronal
- Profundidade de sondagem maior ou igual a 5mm
- Perda óssea: Horizontal

Estágio III
- Perda de Inserção Interproximal: Maior ou igual a 5 mm
- Perda Óssea Radiográfica: Além do terço médio
- Profundidade de sondagem: Maior ou igual a 6mm
- Perda óssea: Vertical de até 3mm
- Perda dental por periodontite: Até 4 dentes perdidos
- Lesão de furca: Grau II ou grau III

Estágio IV
- Perda de Inserção Interproximal: Maior ou igual a 5 mm
- Perda Óssea Radiográfica: Além do terço médio
- Profundidade de sondagem: Maior ou igual a 6mm
- Perda óssea: Vertical de até 3mm
- Perda dental por periodontite: Mais que 4 dentes perdidos *Menos de 10 pares de dentes remanescentes
- Lesão de furca: Grau II ou grau III
- Mobilidade: Grau II ou grau III

Source: Authors

With the recognition of the stage of periodontitis, the next step is to define the grade based on the evidence and risks of disease progression (Figure 16) (Caton *et al.*, 2018; Papapanou *et al.*, 2018; Steffens & Marcantonio, 2018).

Figure 16: Clinical and radiographic characteristics of the degrees of periodontitis.

Grade	Grade	Grade
• No insertion loss in the last 5 years; • Bone loss/year: Up to • Patient:↑Biofilm accumulation ↓ Destruction • Diabetic No smoker patient.	• Less than 2mm insertion loss in the last 5 years; • Bone loss/year: 0.25 to 1.0 • Patient: Biofilm accumulation compatible with the level of periodontal • Smoker: < 10 cigarettes/day	• More than 2mm insertion loss in the last 5 • Bone loss/year: Greater than 1mm; • Patient:↓Biofilm accumulation • Smoker: ≥ 10 cigarettes/day

Source: Authors

Treatment planning

With the diagnosis defined, it is possible to draw up an individual treatment plan, considering the systemic characteristics and risk factors of each patient (Salvi *et al.*, 2023).

CONCLUSION

A detailed periodontal and radiographic clinical examination of the patient, combined with accurate information obtained during the history, are essential for the correct diagnosis of periodontitis and its level of progression.

ACKNOWLEDGMENTS

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