

Differences between Gingivitis and Periodontitis

Yahya A Alogaibi^{1*}, Faleh Alshammari², Fayez Alanazi³, Yousef Alziyadi³, Bader Alziyadi³, Fahad Aldawood³, Nassar Alshammari³, Tariq Alojaim³, Hassan Jamal³, Mohammed Alamri³ and Yosef Hatan⁴

¹Orthodontist, Bisha Dental Center, Ministry of Health, Bisha, KSA

²Endodontist, Ministry of Health, Hafrabatin Dental Center, KSA

³General Dentist, KSA

⁴Prosthodontist, Aser Dental Center, KSA

***Corresponding Author:** Yahya A Alogaibi, Orthodontist, Bisha Dental Center, Ministry of Health, Bisha, KSA.

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Abstract

Gingivitis and periodontitis are two ends of a disease spectrum. It's necessary for the clinician to identify the presence of both gingivitis and periodontitis, so that he may come up with treatment to prevent gingivitis from progressing to periodontitis or to prevent periodontitis from progression further.

Keywords: *Gingivitis; Periodontitis; Plaque*

Introduction

Plaque induced periodontal disease, the major cause of morbidity, is primarily classified into gingivitis and periodontitis. Over the past decades, major advances have been made in our understanding of gingivitis and periodontitis; especially into why gingivitis progresses into periodontitis [1].

While we try to gain a better understanding on the progression of gingivitis and periodontitis, it's imperative that the clinician and the dental hygienist gain a better understanding of the clinical scenario that makes gingivitis and periodontitis; so that he may identify the break from reversible gingivitis and irreversible periodontitis, to better prevent further periodontal destruction.

Aim of Study

This work is performed to give the periodontist, general dentist and dental hygienist a better idea of the clinical tissue changes, associated with gingivitis and periodontitis so that they may actively participate to prevent the progression of gingivitis and periodontitis.

Material and Methods

This study was done at Bisha Dental Center, on 20 patients with the provisional diagnosis of gingivitis and 20 patients with the provisional diagnosis of periodontitis and 10 patients without any periodontal disease were taken as control.

All cases were subjected the following studies:

1. Full history including: name, age, sex and personal history including plaque control methodology employed.

2. Clinical dental examination with emphasis to examination of the periodontium:
 - a. Gingiva: color, contour, consistency, size, surface texture, position and exudation.
 - b. Probing attachment level: probing pockets, mobility furcation involvement, problems and radiographic examination.
3. The periodontal screening and recording index (PSR) was used to let the dental hygienist assess the periodontal status fast and easily, also to grade the progression of periodontal disease:
 - In the PSR index cases especially designed probe, that has 0.5 mm ball tip and a color-coded mark from 3.5 to 5.5 mm is used.
 - The patient's mouth was divided into 6 sextants: maxillary right, anterior and left, mandibular right, anterior and left. The highest was recorded in each sextant:
 - a. Code 0: The probes color code remains completely visible in the deepest part of sulcus (Normal).
 - b. Code 1: The colored band remains completely visible but there is bleeding on gentle probing (Mild gingivitis).
 - c. Code 2: The colored band is completely visible but there is bleeding on gentle probing with calculus (advanced gingivitis).
 - d. Code 3: The colored band is part submerged (Mild periodontitis).
 - e. Code 4: The colored band completely disappears (Advanced periodontitis).

Results

This study was done to bring out the differences between gingivitis and periodontitis. The three groups of gingivitis patients, periodontitis patients and normal patients were assessed for similarities and differences based on their clinical features and their screening on the periodontal screening recording index (PSR) index.

For case of examination and completion of the study, patients taken up in either of the three groups were provisionally diagnosed with gingivitis, periodontitis or with normal features in the lower anterior segment and were examined for the study in relation to the lower anterior teeth only.

Plaque control methodology

The patients taken up in the gingivitis and periodontitis group, when asked about their plaque control methodology-5 out of 20 in the gingivitis group and -7 out of 20 in the periodontitis group, said they only occasionally have time to undertake plaque control procedures.

The others in the gingivitis and periodontitis group said they undertook plaque control procedures regularly but occasionally didn't have time.

In contrast all the normal group patients said they regularly undertook plaque control procedures; with 12 out of 20 saying that they brushed once a day while the others said they brushed twice or more per day.

Only 2 out of 20 in the periodontitis group and 7 in the gingivitis group said they used a toothbrush. The others said they used chew stick (miswak).

Among the normal patients 18 out of 20 patients said they used a toothbrush while 2 said that they used a chew stick.

Examination of the periodontium

Gingiva

Color

18 out of the 20 gingivitis patients and all of the periodontitis patients have a pinkish red to bright red to bluish red color of the marginal gingiva. this change in color was not very apparent in the 4 out of the 20 gingivitis patients and 2 out of the periodontitis patients who showed a dark brown color of gingiva due to greater melanin pigmentation. In contrast, the normal patients showed gingiva which was coral pink in color except for 2 patients who showed a dark brown color of gingiva due to increased pigmentation.

Contour

All the patients in the periodontitis group showed a rounding of the marginal gingiva with a blunting of papillary tips of the gingivitis patient, 18 showed a rounding of the marginal gingiva with blunting of interdental papillae tips. In the normal patients, the marginal gingivae were knife edged with pointed interdental papillae.

Consistency

All of the patients in the periodontitis group had a soft consistency with 4 out of these patients showing friability and fragmentation of the marginal gingivae. Among the gingivitis patients, 18 showed soft consistency. The consistency of the gingiva of the normal group of patients was firm resilient.

Surface texture

All of the normal patients had stippled appearance to the attached gingiva. Among the periodontitis patients, 7 showed decreased stippling while the other patients showed loss of stippling. 18 of the gingivitis patients showed a decreased stippling while the other 2 patients showed no changes in surface texture.

Size

There was no increase in size of any of the patients in the gingivitis and periodontitis group.

Position

The position of the marginal gingiva in normal patients and in the gingivitis patients was coronal to the cemento-enamel junction. Among the periodontitis patients 12 out of 20 patients had an apical shift of the crest of the marginal gingiva.

Exudation

Periodontal probe was passed gently to the base of gingiva sulcus and moved around the gingival sulcus. All the patients in the gingivitis and periodontitis group presented with bleeding on probing of the gingival sulcus. 4- patients out of the gingivitis group and 7-out of the periodontitis group also presented with purulent exudation from the gingival sulcus. 4- patients out of the gingivitis group and 7 in the periodontitis group also presented with purulent exudation from the gingival sulcus.

Probing attachment levels

A blunt calibrated probe was used to identify the position of the attachment epithelium in relation to the cemento enamel junction. All of the patients in the gingivitis group and normal patients showed no apical displacement of the attachment epithelium. Among the patients in the periodontitis group all of the patients exhibited an apical displacement of the attachment epithelium.

Periodontal pockets

The probing depth of the gingival sulcus in the normal patients were varied from 1 to 2 mm. Among the gingivitis patients had a probing sulcus depth of 4 mm. The increase in the sulcus depth in these 3 patients was due to a coronal shift of the crest of the marginal gingiva. The level of the attachment epithelium in these 3 patients was coronal to the cemento-enamel junction. Among the periodontitis patients 15 had an increase in the probing depth of the gingival sulcus. The increase in the probing depth or the gingival sulcus was due to an apical shift of the junctional epithelium, a displacement of the junctional epithelium, apical to the cemento-enamel junction.

Mobility

The patients were examined for degree of mobility of teeth based on millers index for tooth mobility. The patients in the normal group exhibited only slight mobility of teeth < 0.1 mm. Among the gingivitis patients 2 patients exhibited grade I degree of mobility. Among the periodontitis patients all patients examined exhibited a greater degree of mobility. 7 of the periodontitis patients exhibited grade I mobility. 9 patients exhibited grade II mobility. The remaining 4 patients exhibited grade III mobility.

	Normal	Grade I mobility	Grade II mobility	Grade III mobility
Group I	20	-	-	-2
Group II	18	2	-	-
Group III	-	7	9	4

Muco-gingival problems

None of the patients examined in the normal patients or gingivitis patients group had any muco-gingival problems. 4 out of 12 patients examined in the periodontitis group had muco-gingival problems (gingival recession, pocket etc).

Radiographic examination

None of the patients examined in the normal patients or gingivitis patients group had any radiographic evidence of crestal Bone loss. All the patients examined under the periodontitis group showed evidence of crestal bone loss.

Furcation involvement

Furcation involvement is not included in the results of discussion, because as mentioned in the beginning of the results, the teeth examined in this study were the lower interior lower teeth which are single rooted and therefore didn't present with an involvement of the bifurcation or trifurcation area with periodontal disease.

The periodontal screening and recording index (PSR)

PSR index is to be used to let the dental hygienist assess the periodontal status fast and easily and to grade the progression of periodontal disease.

In the PSR index cases a specially designed probe that has 0.5 mm ball tip and a color-coded mark from 3.5 to 5.5 mm is used.

All of the patients in the normal category scored code 0 when examined on the PSR index. Of the patients in the gingivitis group, 4 out of 20 were categorized as code 1. 13 other patients were categorized under code 2 for the lower anterior segment. 3 patients were assigned a score of code 3.

In the periodontitis category 10 of the patients examined had a code of 3. 6 of the patients examined had a code of 4. Another 4 patients had a code of 2 with an asterisk (*) in addition to the code.

	Code 0	Code 1	Code 2	Code 3	Code 4
Group I	20	-	-	-	-
Group II	-	4	13	13	-
Group III	-	-	4 (2*)	10	6

The results were not subjected to any statistical analysis, because the reason for the study was to bring out the many variables among gingivitis and periodontitis patients. The reasons for the many variables are discussed in the following discussion.

Discussion

Plaque induced periodontal disease comprises a group of inflammatory condition of the supporting tissues of the teeth, as such their clinical manifestations have many similarities. This study was done to bring out the differences between gingivitis and periodontitis so that the student of dental hygiene may definitively make a provisional diagnosis of gingivitis or periodontitis. There are several different diseases that involve the tooth supporting tissues. Plaque has been identified as the most common etiologic factor in the development and progression of periodontal diseases [3]. Initially it is confined to the gingiva and is called marginal gingivitis. Later the deeper periodontal tissues are involved and the disease is termed periodontitis. The accumulation of cervicular microorganisms adjacent to the gingiva elicits gingival inflammation, which causes changes in the connective tissue and epithelium [4]. The clinical signs seen in gingivitis can be related to the changes associated with inflammation in general.

Color

One of the first clinical changes in gingivitis is a change of color. The color of normal gingiva where there is no excessive melanin pigmentation is coral pink. In gingivitis, the first change in color is due to increased formation of capillary loops between rete pegs and ridges which causes a reddish due to the marginal gingiva. In long standing gingivitis the blood vessels become engorged and congested causing a decreased venous return with localized gingival anoxemia, which causes a bluish due to the reddened gingiva [5].

In this study 18 of the 20 patients in the gingivitis group and all of 20 patients in the periodontitis group showed a change in color ranging from pinkish red to bluish red due to the marginal gingiva.

Contour

All of the periodontitis patients and 18 of the gingivitis patients showed a change in contour from the normal with a rounding of the marginal gingiva and blunting of the interdental papillae. This change in contour is due to increased capillary proliferation which is also associated with an increased amount of collagen destruction in the connective tissue with inflammatory exudate [6].

Consistency

The change in consistency to a soft and friable consistency seen in most of the patients in the periodontitis group and most of the gingivitis patients is once again due to the degeneration of connective tissue and epithelium associated with injurious substances that provoke the inflammation and inflammatory exudate [6].

Surface texture

The surface texture of the gingiva is a function of the amount of stippling present on the surface of the gingiva. Stippling refers to the minute projection and depressions on the gingival surface due to the protuberance of the papillary portions of the connective tissue into the overlying epithelium. Loss of surface stippling is an early sign of gingivitis [7].

In chronic inflammation, the surface is either smooth and shiny or firm and nodular. This once again depends on the changes in the epithelium and connective tissue. When there is a greater loss of collagen fibers with inflammatory exudate, there is a smooth texture. When there is a greater laying down of collagen fibers in long standing inflammation, there is a firm and leathery texture.

All the patients in the periodontitis group and 18 patients in the gingivitis group showed a decrease in the amount of stippling.

Exudation

Bleeding on probing of the gingival sulcus occurs due to the following reasons [7]. In the gingival inflammation there is engorgement of capillaries in the connective tissue with thinning or ulceration of the sulcular epithelium because the capillaries are engorged and closer to the surface and thinned, degenerated epithelium is less protective. Stimuli that ordinarily do not cause bleeding cause rupture of the capillaries and bleeding from the gingiva.

All of our patients in the gingivitis and periodontitis category presented with bleeding on probing of gingival sulcus.

The above mentioned changes in color, contour, consistency, surface texture, exudation are present in both the gingivitis and periodontitis group of patients. Though not all the patients show an equal degree, changes were present equally in the gingivitis and periodontitis patients.

Of all the changes that were discussed above only bleeding on probing of gingival sulcus was present in all of the patients diagnosed with gingivitis and periodontitis. This is because bleeding on probing appears earlier these change in color or other visual signs of inflammation [8].

Probing attachment level

Probing attachment level refers to the position at which the junctional epithelium is attached to the tooth. In gingivitis, just apical to the junctional epithelium, an area of destroyed collagen fibers develops and becomes occupied by inflammatory cells and edema [9].

As a consequence of the loss of collagen, the apical portion of the junctional epithelium proliferates along the root. The coronal portion of the junctional epithelium detaches from the root as the apical portion migrates. This is these after followed by resorption of marginal alveolar bone thus resulting in attachment loss.

Unlike gingivitis where removal of local factors results in the gingiva returning to normal, alveolar bone resorption periodontal disease is not reversible following removal of local factors. This therefore is the primary cause for tooth loss in periodontal disease.

In the patients examined, these in normal and the gingivitis categories did not exhibit any probing attachment loss and their levels of attachment were at the or coronal to the cemento-enamel junction. In the periodontitis group of patients all of the patient exhibited an apical displacement of the junctional epithelium.

Pockets

Pocket is a pathologically deepened gingival sulcus. This deepening of the gingival sulcus may occur by coronal movement of the gingival margin or due to an apical displacement of the junctional epithelium [10].

The normal probing depth of the gingival sulcus is around 2 to 3 mm. When a deepening of the gingival sulcus occurs due to a coronal shift of the crest of the marginal gingiva its called a gingival pocket or a false pocket. When the deepening of the gingival sulcus is due to an apical displacement of the junctional epithelium its called a periodontal or a true pocket.

Three of the patients in the gingivitis category had a greater probing sulcus depth. This greater probing depth was due to a coronal shift of the crest of the marginal gingiva and the pockets were gingival pocket.

Among the patients categorized in the periodontitis group 15 patients had an increase in probing sulcus depth. The other 5 through they had an apical displacement of the junctional epithelium did not have a pocket. These other 5 patients did not have a greater probing sulcus depth because the crest of the marginal gingiva had also migrated apically along with an apical displacement of the Junctional epithelium, resulting in the clinical scenario of gingival recession. This is evidence by looking at the position of the gingiva, where 12 of the patients in the periodontitis group had an apical shift or the crest of the marginal gingiva - gingival recession.

Out of these 12 patients 7 had gingival recession and periodontal pockets were as 5 of these patients did not have periodontal pocket but Rad receded gingival margins.

Mobility

All teeth have a slight degree of physiologic mobility, which varies for different teeth and at different times of the day. The normal range of mobility elicited is of the order of 0.05 to 0.10 mm [11].

Pathological mobility could occurs due to one or more of the following reasons [13]:

- 1- Loss of tooth support - marginal bone loss that occurs in periodontal disease.
- 2- Trauma from occlusion - due to excessive occlusal forces which causes resorption of the cortical layer of bone.
- 3- Extension of inflammation from the gingiva periapex to the periodontal ligament.
- 4- Pathologic processes of the jaws that destroy the alveolar bone and root of teeth.

In patients examined for this study those in the normal category did not show any increase in tooth mobility. Among the gingivitis patients 2 patient exhibits greater amount of mobility. Among the periodontitis patients all patients examined showed a greater degree of mobility ranging from grade I to grade III.

That all the patients in the periodontitis group showed greater degree of mobility would be due to the fact that lower incisors which were used in this study are normally more mobile than the other teeth, due to its slender root form and short roots.

Muco-gingival problems

Muco-gingival problems refer areas with inadequate width of attached gingiva or areas with aberrant frenal or muscle attachment.

The present of an area with a muco-gingival problems could in an area with periodontal attachment loss. Contrarily the presence of deep periodontal pocket extending close to the muco-gingival junction could also result in a muco-gingival problems.

In the patients examined in this study four (4) of the 20 patients in the periodontitis group had muco-gingival problems.

As can be seen in the above elaborate discussion a whole lot of variables used to be examined and assessed to come to a proper diagnosis and to formulate a treatment plan. It also involves a lot of valuable chairside time [1].

The periodontal screening and recording index is designed for easier and faster screening and recording of the periodontal status of the patient.

It takes into consideration the following:

- 1- Presence of bleeding on gentle sensing of the gingival sulcus with periodontal probe.
- 2- Presence of plaque and calculus.
- 3- The depth of the gingival sulcus.

When these are associated either with gingival recession, tooth mobility, muco-gingival problems or furcation involvement, the patient is given an asterisk alongside the score. Those patients whose score with code 3 or code 4 or those who have an asterisk alongside their score are allotted for comprehensive examination and charting in relation to that sextant or for comprehensive full mouth charting.

Gingivitis and periodontitis are chronic bacterial infections of the periodontium. While gingivitis affects the gingiva primarily, periodontitis also involves the deeper periodontal tissues.

Therefore, gingivitis and periodontitis have many similarities. They are both plaque induced diseases. (In this study we had shown that those affected by gingivitis and periodontitis did not intake regular plaque control procedures).

They are associated with factors that promote plaque attachment and maturation. Plaque bacterial causes change to epithelial and connective tissue cells and to intercellular constituents such as collagen, ground substance and glycocalyx. The microbial products act on the leukocytes which in turn produces various vasoactive such as prostaglandin, interferon, tumor necrosis factor or interleukin [13].

These reactions result in the development of clinically discernible inflammation. In gingivitis these inflammatory changes are confined to the gingiva. In periodontitis gingival inflammation extends along the collagen fiber bundles and follows the course of the blood vessels through the loosely arranged tissues around them, into the alveolar bone [14]. After inflammation reaches the bone by extensive from the gingiva it spreads into the marrow spaces. In the marrow spaces resorption proceeds from within causing first a thinning of the surrounding bone trabeculae and enlargement of the marrow spaces, followed by distraction of bone and reduction in bone height.

The most important difference between gingivitis and periodontitis is this fact that there is resorption of alveolar bone associated with periodontitis which if left untreated to progress, would result in loss of the tooth due to loss of the structures to which the tooth is enclosed [15]. The other primary difference between gingivitis and periodontitis is the fact that in periodontitis the periodontium does not regress back to its normal from once the etiologic factors are removed - as happens in gingivitis. Periodontitis is diagnosed clinically where there is attachment loss co-existent with marginal gingival inflammation. It then presents clinically with periodontal pockets or with gingival recession.

Attachment level as stated previously is assessed by determining the level of the base of the gingival sulcus (coronal portion of junctional epithelium) with cemento-enamel junction.

The presence of pockets does not indicate the presence of periodontitis due to the fact that a pathological deepening of the gingival sulcus could be due to coronal shift of crest of marginal (gingival pocket) or due to an apical shift of the junctional epithelium (periodontal pocket). While periodontitis may be associated with mobility, mobility may be seen with other clinical condition as discussed previously.

As stated earlier gingival inflammation is associated with various clinical findings like change in color, contour, consistency, surface texture etc. But none of these changes are seen consistently in clinical gingivitis. The one important clinical sign that may be used to identify clinical gingivitis reliably is bleeding on probing which is the earliest clinical sign of gingivitis [15].

This study used the P.S.R. index which identifies areas where there is bleeding on probing gingival sulcus, it also identifies the presence of calculus and plaque and the presence of deepening of gingival sulcus. It also identifies the presence of gingival recession, tooth mobility, furcation involvement and muco-gingival problems.

This index is designed to be used by the dental hygienist to give the score for each sextant and identify if there is a need for comprehensive charting and treatment planning.

This index while using gingival bleeding as an indicator of gingival inflammation also identifies the presence of deepening of gingival sulcus and identifies presence of conditions such as gingival recession, so that the particular sextant or entire mouth as the case may be could be comprehensively examined.

Summary and Conclusion

Gingivitis and periodontitis are two ends of a disease spectrum. It is necessary for the clinician to identify the presence of both gingivitis and periodontitis, so that he may institute treatment to prevent gingivitis from progressing to periodontitis or to prevent periodontitis from progression further.

This study brings out the clinical signs of gingivitis and periodontitis and brings out the differences between gingivitis and periodontitis to help the clinician differentiate between gingivitis and periodontitis.

This study also highlights the usefulness of an index like the periodontal scoring and recording index to quantitate the differences between gingivitis and periodontitis to facilitate in comprehensive evaluation and treatment planning.

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