

Research Article

The Periodontal Abscess: Clinical and Microbiological Characteristics

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Abstract: Periodontal Abscess is a localized purulent infection in the periodontal pocket that may lead to the destruction of periodontal ligament, alveolar bone and eventually loss of tooth. The areas of more information and knowledge needed include, Etiology and categorization, knowledge on the micro flora, evidence based therapeutic approach. Therefore the aim of the study was to assess clinically and microbiologically characterize the well define cohort of acute periodontal abscesses. 30 patients with periodontal abscess in CGP (Chronic generalized Periodontitis) and CLP (Chronic Localized Periodontitis) patients screened in the Department of Periodontology, Rajarajeswari Dental College and Hospital Bangalore. The results showed the frequency of detection of periodontal pathogens in CGP and CLP patients, *F. nucleatum* (Fn) was the most prevalent bacterial species (68.4% and 73.2%) followed by *P. micros*(Pm) (66.4% and 71.9%), *P. gingivalis*(Pg) (55.1% and 60.1%), *P. intermedia*(Pi) (46.3%and 51.3%) and *B. forsythus*(Bf) (41.2% and 46.4%) respectively. In conclusion periodontal abscess in periodontitis patients are characterized by well defined clinical and microbiological features.

Keywords: Periodontal abscess, Microbiology, Chronic generalized periodontitis, *F. nucleatum*, Chronic localized periodontitis, Pocket depth, Bleeding on probing.

INTRODUCTION

Gingival and periodontal diseases in various forms have affected the human population since the dawn of history. The term periodontium originates from the greek word “Peri” meaning around, and “odont” meaning tooth. Thus it is the functional unit of tissues supporting the tooth including gingiva, the periodontal ligament, the cementum and the alveolar process.

Periodontal abscess is a localized accumulation of pus within the gingival wall of periodontal pocket/localized purulent inflammation in the periodontal tissues. The periodontal abscess microbiota is usually indistinguishable from the microflora found in subgingival plaque in adult periodontitis [1].

The most prevalent bacterial species identified in periodontal abscesses, using culture-based or molecular- based diagnostic techniques, is *Porphyromonas gingivalis*, with a range in prevalence of 50–100% [2, 3, 4, 5].

Other strict anaerobes frequently detected include *Prevotella intermedia*, *Prevotella melaninogenica*, *Fusobacterium nucleatum*, *Tannerella forsythia*, *Treponema* spp. *Parvimonas micra*,

Actinomyces spp. and *Bifidobacterium* spp. Among the facultative anaerobic gram-negative bacteria, *Campylobacter* spp., *Capnocytophaga* spp. and *Aggregatibacter actinomycetemcomitans* have been reported as well as gram-negative enteric rods [3, 6].

Periodontal abscess are acute lesions that may result in very rapid destruction of the periodontal tissues. These are purulent infections localized to the gingival, Periodontal / pericoronal regions. The importance of periodontal abscess in clinical periodontal practice can be observed by:

High prevalence amongst dental emergencies and its high prevalence in periodontitis patients[7, 8, 9, 10].

- a) It is very closely and commonly related with periodontitis and periodontal pockets affecting not only untreated patients but also patients during active treatment or maintenance [11, 12].
- b) It is one of the main causes of tooth extraction and tooth loss mainly in maintenance patients are caused by periodontal abscess [11].
- c) It is observed that periodontal abscess may result in complications due to bacteraemia

which may cause infection in distant locations [12, 13, 14, 15].

In spite of its high prevalence and importance, the scientific information available on this condition is very limited. The areas of more information and knowledge needed include

- a) Etiology and categorization
- b) Knowledge on the micro flora
- c) Evidence based therapeutic approach.

This in turn helps in better understanding of the various causes, thus help in classifying the periodontal abscess, which in turn assist in treatment and prognostic decision making. The knowledge on the micro flora leads to the understanding the bacterial mechanisms leading to the formation of the pus collection.

Based on the available literature it highlight two clinical types of periodontal abscesses.

- a) Periodontal abscesses related to pre existing periodontal pocket.
- b) Those not necessarily associated with periodontal pockets, in which the impactation of foreign objects, or alterations in root integrity or morphology, could explain the formation of the abscess.

Moreover, periodontal abscesses occurring in periodontal pockets have been explained by different etiological theories: exacerbation of a pre-existing periodontitis [12]; inappropriate periodontal therapy, mainly prophylaxis or scaling, which can leave calculus in the deeper parts of the pockets [1]; re-occurrence of the disease [11]; or the occurrence of super infections, after systemic antibiotic therapy [17].

Although with all these etiological reasons may exist, very little effort has been made to analyze each one separately, which in turn led to confusion in etiology, diagnosis and choice of treatment options. The aim of the study was to clinically and microbiologically characterize the well define cohort of acute periodontal abscesses.

MATERIAL AND METHODS

Patient Population

Twenty four consecutive patients with a provisional diagnosis of an acute periodontal abscess in patients with CGP (Chronic generalized periodontitis) and CLP (chronic localized periodontitis) were identified during the period from January 2014 to September 2014 in the Postgraduate Clinic of Periodontology at Rajarajeswari Dental College and Hospital, Bangalore. And included on the basis of the following criteria

- a) Localised pain, swelling and tenderness related to a periodontal area.

- b) Edema, Redness and swelling. Commonly associated with, a deep periodontal pocket, showing bleeding and suppuration on probing.

- c) Endodontal abscesses were excluded based on vitality test and radiographic examination.

The patients were excluded based on the following criteria

- a) Endodontal abscesses based on radiographic examination
- b) Vitality tests. Non-vital teeth
- c) Use of antibiotic drugs in the previous 4 weeks

Once selected according to the above mentioned criteria, the clinical variables were recorded and microbial samples from the abscess were taken.

Microbiological Study

Prior to the clinical evaluation microbiological samples for anaerobic culture analysis were taken. Two consecutive paper point (Diadent, number 30, cellpacked, Maillefer, Korea) were inserted in the periodontal pocket till they reach the abscess, and were kept in place for 10sec. The paper points were transferred in 1.5 ml RTF (Reduced Transport Fluid), and transported to the laboratory within 2 hrs, where the samples were dispersed (30 s of Vortex), serially diluted and plated on Blood agar medium Blood agar plates were studied after 7 and 14 days of anaerobic incubation (80% N₂, 10% H₂, 10% CO₂ at 37³/₄C); and TSBV plates after 3–5 days of incubation at 37³/₄C in air with 5% CO₂.

Total microbial counts were evaluated on blood agar plates On these plates, *Porphyromonas gingivalis*, *Prevotella intermedia*, *Bacteroides forsythus*, *Peptostreptococcus micros*, *Campylobacter rectus*, *Fusobacterium nucleatum* and *Prevotella melaninogenica* were identified, primarily based on colony morphology, and the use of different tests to confirm the initial identification. Colonies were counted and the percentage respective of the total flora for each pathogen was calculated.

Actinobacillus actinomycetemcomitans was identified on TSBV plates, based on colony morphology and positive catalase reaction. Every colony, identified as being one of the studied periodontal pathogens, was isolated on blood-agar plates (or TSBV) in order to preserve the strains for additional tests. In addition, in the first 10 patients, aerotolerance, gram-staining and morphotype study (coccioid or rod) were performed on every distinct colony, in order to add information regarding total flora composition.

Clinical Evaluation

2 types of clinical variables were assessed.

Subjective clinical variables included

- a) evaluation of pain,
- b) edema, redness and

c) Swelling.

They were assessed using a semi-quantitative scale ranging from values

- a) 1 (none)
- b) 2 (mild)
- c) 3 (moderate), and
- d) 4 (severe).

We had assessed all the subjective clinical variables, except for pain that was self assessed by the patient, using the same semi-quantitative scale described above.

Objective clinical variables included such as

- a) Bleeding on probing,
- b) Suppuration,
- c) Cervical lymphadenopathy,
- d) Tooth mobility.
- e) Probing depth associated with the abscess site was also recorded using a manual periodontal probe (Hu Friedy) to the closest millimeter.

Data Analysis

Data from subjective clinical variables are expressed as percentage of abscesses/patients in each category. Quantitative clinical variables, as probing pocket depth, are expressed. Qualitative clinical variables (bleeding, suppuration, lymphadenopathy and tooth mobility) are presented as percentage of abscess positive for each variable. For microbiological variables, for each bacterial species, both the frequency of occurrence and the mean proportion of flora in positive sites were calculated. Laboratory parameters were averaged, and the value of each patient was

compared with the normal ranges; when the value was over the maximum of the normal range, the patient was considered upranged; the percentage of patient's upranged for each variable was obtained.

RESULTS

Study Population

Thirty patients suffering from acute periodontal abscesses and diagnosed with CGP and CLP were included in the study. Six female patients (40%) and eighteen male patients (60%). The mean age was 48 ranging from 26–65.

Clinical Results

Upon recording the case history, Patients were asked to report the approximate date of onset of swelling 67% reported that swelling had occurred 1week before. 20% between 1 week and 10days and 13% were not aware. When the abscess condition was linked to patient's periodontal condition abscesses occurred in untreated periodontitis patients.

In relation to the location of the abscess in oral cavity 24 (80%) abscesses were associated with molar teeth and distributed in the upper and lower jaw.

Among abscesses in molar teeth, 10 (42% of the total sample) were associated with 1st molars, 9 (37%) with second molars (Fig. 1), and 5 (21%) with third molar (Fig. 2).

Other affected teeth were: 3 (10%) upper premolars, 1 (3%) lower premolars, and other 2 (7%) incisors (fig 3).



Fig.1: Abscess with 2nd molar



Fig.2: Abscess with 3rd molar



Fig.3: Abscess in lower anterior

Sample collection with sterile paper points

65% of CGP patients complained of moderate to severe pain. 73% of CLP patients complained of moderate pain. (Table 1 & 2).

Swelling observed in all patients with score from moderate to severe in 69% in CGP and 88% in CLP and edema in 63% in CGP and 80% in CLP individuals (Table 1& 2).

Bleeding on probing was observed in 100% of abscesses while suppuration was detected in 61% cases with CGP and 70% with CLP and mobility in 60% with CGP and 63% in CLP of the cases (Table 3 & 4). A mean probing pocket depth was 2mm, Ranging from 4mm to 6mm. In 40% (12patients) of abscesses the associated pocket was deeper than 7mm.

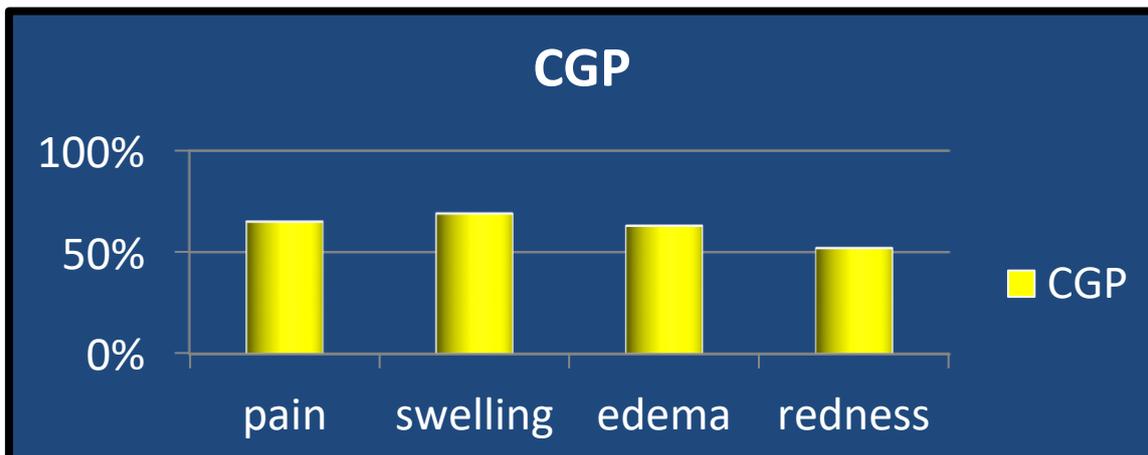


Table.1: % of abscesses in each category for each subjective clinical variable in CGP

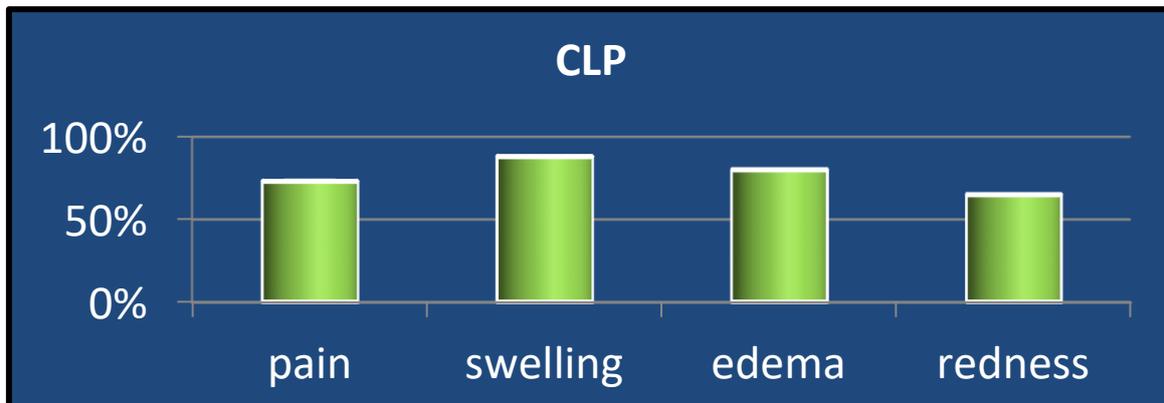


Table.2: % of abscesses in each category for each subjective clinical variable in CLP

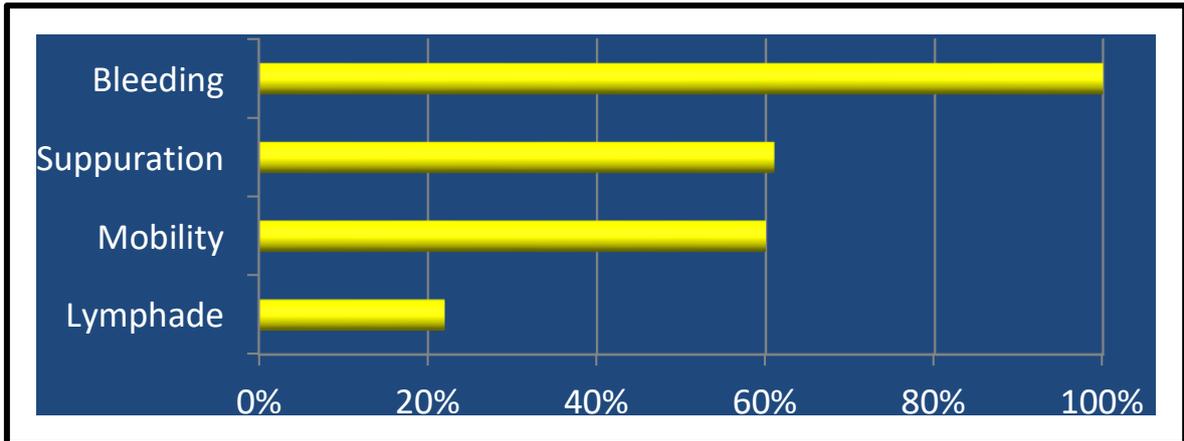


Table: 3- % of abscesses positive for each clinical variable in CGP.

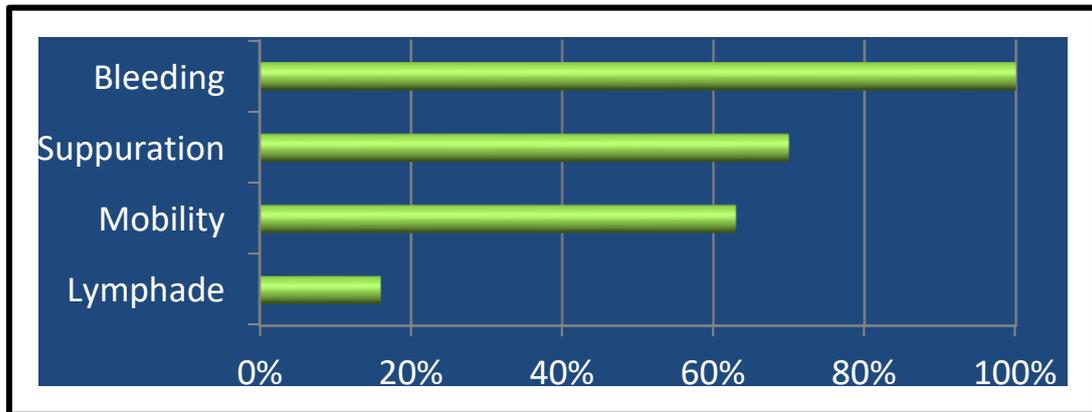


Table: 4- % of abscesses positive for each clinical variable in CLP.

Regarding the frequency of detection of periodontal pathogens in CGP and CLP, *F. nucleatum* was the most prevalent bacterial species (68.4% and 73.2%) followed by *P. micros* (66.4% and 71.9%), *P.*

gingivalis (55.1% and 60.1%), *P. intermedia* (46.3% and 51.3%) and *B. forsythus* (41.2% and 46.4%) respectively (Table 5 & 6).

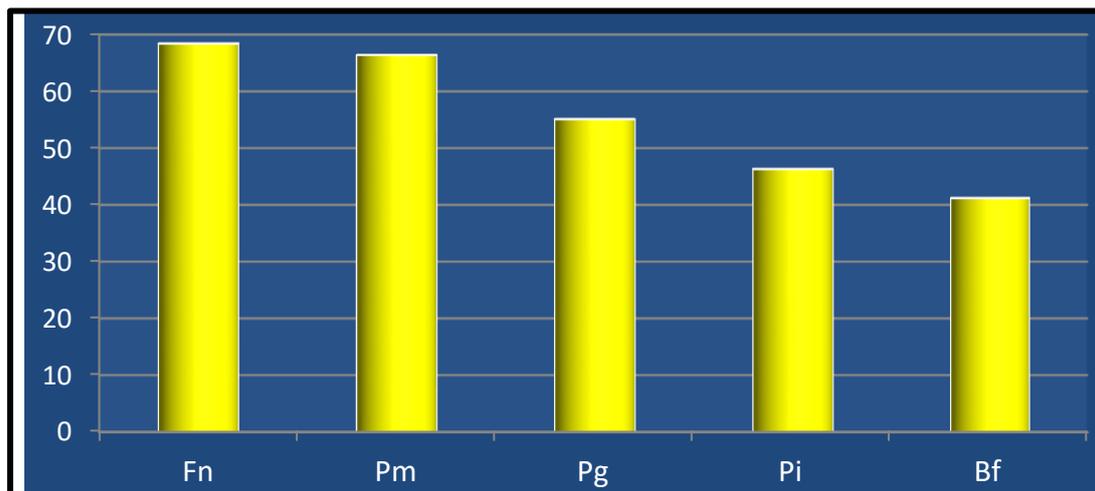


Table: 5 - %Prevalence of each studied pathogen in periodontal abscesses in CGP

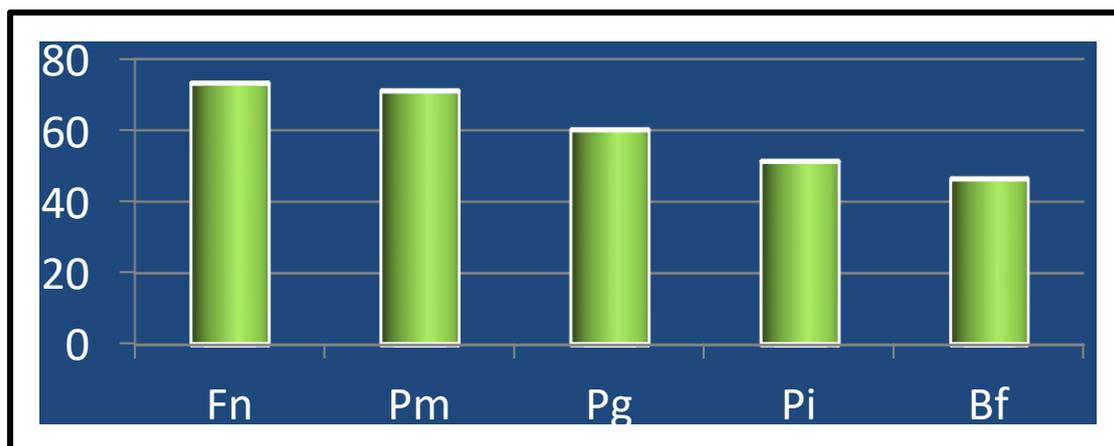


Table: 6 - %Prevalence of each studied pathogen in periodontal abscesses in CLP.

DISCUSSION

The periodontal abscess is not a homogeneous clinical entity. The causes for development of abscess are multitude in nature. Hence it is important to analyze and characterize properly the type of abscess involved for studying this clinical condition. We investigated 30 periodontal abscess from CGP and CLP with moderate to severe cases. All the effected patients suffered from untreated periodontitis.

On evaluation of the literature available two similar studies were available. This study [18] included 62 periodontal abscesses in 55 patients, and this study [3] followed 20 periodontal abscesses, both clinically and microbiologically. But in these studies, no data was available on diagnostic criteria or on the type of abscess selected.

In the clinical diagnosis of a periodontal abscess, according to study [18], swelling and/or pain were the most frequent complaints. In their study, they found that most of the abscesses (69.9%) were diagnosed in a clear acute stage. The rest presented as diffuse swelling or just redness, but never related with a sinus tract. Our study also agrees with these findings and was diagnosed after onset of symptoms.

The bleeding on probing was detected on all abscesses which are in agreement with the study [3]. The same was found with the level of suppuration, which was 61% in CGP and 70% in CLP and 68% in the mentioned study. The associated pockets in our study were deeper than 6mm (62%), and 4-6mm (38%) reported similar proportions (55% and 35.5%, respectively) [18].

Regarding tooth mobility we found 60% in CGP and 63% in CLP. While Smith and Davies reported 56.5%, May be due to more severe periodontal destruction as we only included periodontitis patients

The molars were most commonly involved teeth in abscesses ranging 42% of the cases. A similar percentage was found in this study [7], and slightly

lower (53.8%) in another study [18]. In a retrospective study on abscesses developing during the maintenance phase, it showed that 65% of affected teeth were multi-rooted. One reason for this high prevalence in molars could be the furcation involvement, 89% of multirooted teeth in this study had furcation involvement. In our study 16% in CGP and 22% in CLP had regional Lymphadenitis, where as it was found lower than 40% in the other study [18].

There are only few studies analyze the microbiology of periodontal abscess. Authors studied 9 abscesses and found that 63.1% of the flora was strict anaerobes. Other studies analysed 20 abscesses in 10 patients who had taken antibiotics prior to the study, and reported 59.5% of strict anaerobes [17, 19]

All the studies the microflora of periodontal abscess is characterize of periodontal pathogens. Among them the most prevelant group of bacteria *Fusobacterium. nucleatum* ranging between 68.4% to 73.2%, *P. intermedia* between 25–100% and *P. melaninogenica* (and other black-pigmented *Prevotella*) between 0–22% [3,5,17,19,20]. Our data of prevalence for these species were 50%, 62.5% and 16.7%, respectively, demonstrating similar presence of these pathogenic bacteria.

And our data shows the prevalence the species *Fusobacterium. nucleatum* (73.2%), *Peptostreptococcus. Micros* (71.9%), *Porphyromonas. gingivalis* (60.1%), *Prevotella. Intermedia* (51.3%), *Bacteroides. Forsythus* (46.4%) in CLP individuals and *Fusobacterium. nucleatum* (68.4%), *Peptostreptococcus. Micros* (66.4%), *Porphyromonas. gingivalis* (55.1%), *Prevotella. Intermedia* (46.3%), *Bacteroides. Forsythus* (41.2%) exhibiting similar pathogens [3,5,17,19,20].

Another study [21] showed that *Fn* as high prevalence in periodontal pockets. We found that 68.4% in CGP and 73.4% in CLP of the abscess. We could not find *A. actinomycetemcomitans* in our samples, while other study reported a prevalence of 25% [3].

We have also detected *B. forsythus* in 41.2% and 46.4% of the patients in CGP and CLP respectively. While authors found it in a 14.3% of abscesses, using Polymerase Chain Reaction [20]. Regarding the relative proportion of the microflora, *Fusobacterium nucleatum* represented the highest percentage. Lower proportions are reported for *P. intermedia* with 8.3% and 7.1% in CLP and CGP patients in our study. The role of proteinase producing bacteria, such as *P. intermedia*, could be important in the nutritional chain relation [22].

The aim was to characterize periodontal abscesses in periodontitis patients. The Periodontal abscess is a moderately painful clinical condition which requires emergency treatment in most patients. We found that molar teeth were most frequently affected may be due to the influence of a multi-radicular anatomy. All the abscesses were diagnosed in untreated periodontitis patients. In all cases we were able to detect localized area of redness, swelling, tenderness and edema. It was found that abscesses involved teeth with severe inflammation, deep probing depth, and periodontal destruction as evidence by the bleeding and suppuration.

Regional lymphadenitis is possible but not common, while an associated increase of leucocytes can be detected in approximately 1/3 of the patients. The periodontal abscess microflora is composed mainly of periodontal pathogens, specially *P. gingivalis*, *P. intermedia*, *F. nucleatum*, *P. micros* and *B. forsythus*

CONCLUSION

Periodontal abscess in periodontitis patients has clear clinical and microbiological characteristics. The periodontal abscess depicts typical features, and in this study was associated with untreated chronic periodontitis. The more prevalent organisms cultured from periodontal abscesses were *Fusobacterium* spp., *P. intermedia*/ *Nigrescens*. However, the presence of Gram-negative enteric rods may be of clinical importance. More studies are needed in order to characterize other types of abscesses and to define efficient treatment modalities.

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