

Periodontal Abscess: A Review

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ABSTRACT

Periodontal abscess is the third most frequent dental emergency, representing 7–14% of all the dental emergencies. Numerous aetiologies have been implicated: exacerbations of the existing disease, post-therapy abscesses, the impaction of foreign objects, the factors altering root morphology, etc.

The diagnosis is done by the analysis of the signs and symptoms and by the usage of supplemental diagnostic aids. Evidences suggest that the micro-flora which are related to periodontal abscesses are not specific and that they are usually dominated by gram-negative strict anaerobe, rods, etc.

The treatment of the periodontal abscess has been a challenge for many years. In the past, the periodontal abscess in periodontal diseased teeth was the main reason for tooth extrac-

tion. Today, three therapeutic approaches are being discussed in dentistry, that include, drainage and debridement, systemic antibiotics and periodontal surgical procedures which are applied in the chronic phase of the disease.

The localization of the acute periodontal abscess and the possibility of obtaining drainage are essential considerations for successful treatment.

Several antibiotics have been advocated to be prescribed in case of general symptoms or if the complications are suspected. Antibiotics like Penicillin, Metronidazole, Tetracyclines and Clindamycin are the drugs of choice.

Key Words: Periodontal abscess, Incision and drainage, Antibiotics, Gingival pain

INTRODUCTION

Periodontium¹ is the general term that describes the tissues that surround and support the tooth structure. The periodontal tissues include the gums, the cementum, the periodontal ligament and the alveolar bone. Among several acute conditions that can occur in periodontal tissues, the abscess deserves special attention. Abscesses of the periodontium are localized acute bacterial infections which are confined to the tissues of the periodontium. Abscesses of the periodontium have been classified primarily, based on their anatomical locations in the periodontal tissue. There are four types [1] of abscesses which are associated with the periodontal tissues: 1) a gingival abscess which is a localized, purulent infection that involves the marginal gingiva or the interdental papilla; 2) pericoronal abscesses which are localized purulent infections within the tissue surrounding the crown of a partially erupted tooth; 3) combined periodontal/ endodontic abscesses are the localized, circumscribed abscesses originating from either the dental pulp or the periodontal tissues surrounding the involved tooth root apex and/or the apical periodontium and 4) periodontal abscesses which are localized purulent infections within the tissue which is adjacent to the periodontal pocket that may lead to the destruction of the periodontal ligaments and the alveolar bone. These are also known as lateral periodontal abscesses or parietal abscesses.

Among all the abscesses of the periodontium, the periodontal abscess is the most important one, which often represents the chronic and refractory form of the disease [1]. It is a destructive process occurring in the periodontium, resulting in localized collections of pus, communicating with the oral cavity through the gingival sulcus or other periodontal sites and not arising from the tooth pulp. The important characteristics of the periodontal abscess include: a localized accumulation of pus in the gingival wall of the periodontal pockets; usually occurring on the lateral aspect of the tooth; the appearance of oedematous red and shiny gingiva; may have a dome like appearance or may come to a distinct point.

Depending on the nature and course of the periodontal abscess, an

immediate attention is required to relieve pain and systemic complications. Moreover, the presence of an abscess may also modify the prognosis of the involved tooth and in many cases, may be responsible for its removal. Therefore, accurate diagnosis and the immediate treatment of the abscesses are the important steps in the management of patients presenting with such abscesses. This review focuses on the classification of periodontal abscesses and discusses their aetiology and clinical characteristics with management in clinical practice.

[Table/Fig 1]



[Table/Fig 1]: Periodontal abscess in relation to upper left central incisor

PREVALENCE

The prevalence of periodontal abscess is relatively high, which is often the reason why a person seeks dental care. Periodontal abscess accounts for 6% - 14% of all dental emergencies [2].

It is the third most common [2] dental emergency [1st is Pulpal infection (14%-25%), followed by pericoronitis (10%-11%)]. Among all emergency dental conditions, periodontal abscesses represent approximately 8% of all dental emergencies in the world [2], and up to 14% in the USA.[3-5]

CLASSIFICATION [1],[2]

Classification based on aetiological criteria

1. **Periodontitis related abscess:** When acute infections originate from a biofilm (in the deepened periodontal pocket)
2. **Non-Periodontitis related abscess:** When the acute infections originate from another local source. eg. Foreign body impaction, alteration in root integrity

Classification based on the course of the disease

1. **Acute periodontal abscess:** The abscess develops in a short period of time and lasts for a few days or a week. An acute abscess often presents as a sudden onset of pain on biting and a deep throbbing pain in a tooth in which the patient has been tending to clench. The gingiva becomes red, swollen and tender. In the early stages, there is no fluctuation or pus discharge, but as the disease progresses, the pus and discharge from the gingival crevice become evident. Associated lymph node enlargement may be present.
2. **Chronic periodontal abscess:** This is the condition that lasts for a long time and often develops slowly. In the chronic stages, a nasty taste and spontaneous bleeding may accompany discomfort. The adjacent tooth is tender to bite on and is sometimes mobile. Pus may be present as also may be discharges from the gingival crevice or from a sinus in the mucosa overlying the affected root. Pain is usually of low intensity.

Classification based on number

1. **Single abscess:** Abscess confined to a single tooth.
2. **Multiple abscesses:** Abscess confined to more than one tooth.

MICROBIOLOGY

Streptococcus viridans is the most common isolate in the exudate of periodontal abscesses when aerobic techniques are used. It has been reported that the microorganisms that colonize the periodontal abscesses are primarily Gram negative anaerobic rods. Although they are not found in all cases of periodontal abscesses, high frequencies of *Porphyromonas gingivalis*, *Prevotella intermedia*, *Fusobacterium nucleatum*, *Campylobacter rectus*, and *Capnocytophaga* spp have been reported [13].

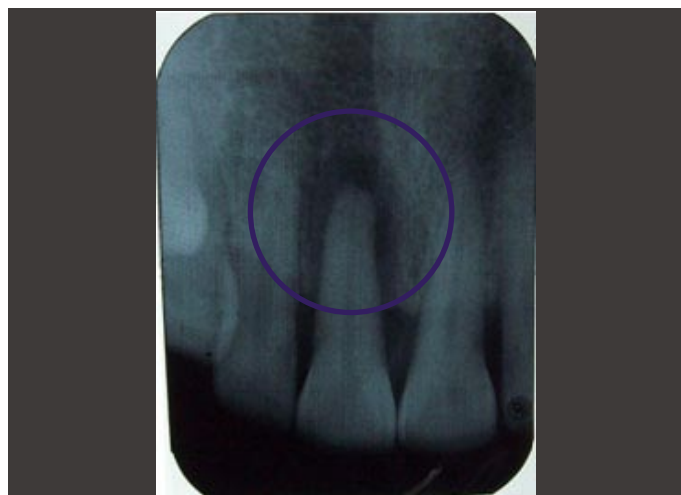
Actinobacillus actinomycetemcomitans is not usually detected. The disappearance of *Porphyromonas gingivalis* from the abscessed sites after treatment suggests a close association of this microorganism with abscess formation.

Spirochetes have been found as the predominant cell type in periodontal abscesses when assessed by darkfield microscopy. Strains of *Peptostreptococcus*, *Streptococcus milleri* (*S. anginosus* and *S. Inter medius*), *Bacteroides capillosus*, *Veillonella*, *B. fragilis*, and *Eikenella corrodens* have also been isolated.

Overall, studies have noted that the microbiotas found in abscesses are similar to those in deep periodontal pockets.

The culture studies of periodontal abscesses have revealed a high prevalence of the following bacteria:

1. *Porphyromonas gingivalis*-55-100% (Lewis et al [6])
 2. *Prevotella intermedia*- 25-100% (Newman and Sims [7])
 3. *Fusobacterium nucleatum* -44-65% (Hafstrom et al [8])
 4. *Actinobacillus actinomycetemcomitans*-25% (Hafstrom et al[8])
 5. *Campylobacter rectus*- 80% (Hafstrom et al [8])
 6. *Prevotella melaninogenica*-22% (Newman and Sims [7])
- [Table/Fig 2].



[Table/Fig 2]: Radiographic evidence of periodontal abscess involving lateral and periapical area of involved tooth

PATHOGENESIS

After the infiltration of pathogenic bacteria to the periodontium, the bacteria and/or bacterial products initiate the inflammatory process, consequently activating the inflammatory response. Tissue destruction is caused by the inflammatory cells and their extracellular enzymes. An inflammatory infiltrate is formed, followed by the destruction of the connective tissue, the encapsulation of the bacterial mass and pus formation. The lowered tissue resistance and the virulence as well as the number of bacteria present, determine the course of infection. The entry of bacteria into the soft tissue wall initiates the formation of the periodontal abscess.

[Table/Fig 3]



[Table/Fig 3]: Draining exudate after application of digital pressure

PREDISPOSING FACTORS [1]

Different predisposing factors have been proposed, that may act to develop an abscess. The factors are as follows:

1. Changes in the composition of the microflora, bacterial virulence or in host defences could also make the pocket lumen inefficient to drain the increased suppuration.[11]
2. Closure of the margins of the periodontal pockets may lead to the extension of the infection into the surrounding tissues, due to the pressure of the suppuration inside the closed pocket. Fibrin secretions leading to the local accumulation of pus, may favour the closure of the gingival margin to the tooth surface.[12]
3. Tortuous periodontal pockets are especially associated with furcation defects. These can eventually become isolated and can favour the formation of an abscess
4. After procedures like scaling where the calculus is dislodged and pushed into the soft tissue. It may also be due to inad-

equate scaling, which will allow the calculus to remain in the deepest pocket area, while the resolution of the inflammation at the coronal pocket area will occlude the normal drainage, and the entrapment of the subgingival flora in the deepest part of the pocket and then cause abscess formation.[13]

5. Periodontal abscesses can also develop in the absence of periodontitis, due to the following causes:
 - a. Impaction of foreign bodies (such as a piece of dental floss, a popcorn kernel, a piece of a toothpick, fishbone, or an unknown object)
 - b. Infection of lateral cysts,
 - c. Local factors affecting the morphology of the root may predispose to periodontal abscess formation. (The presence of cervical cemental tears has been related to rapid progression of periodontitis and the development of abscesses).

The iatrogenic factors which are associated with periodontal abscess

1. Post non-surgical therapy periodontal abscess (Abscess may occur during the course of active non-surgical therapy)
 - a. Post scaling periodontal abscess. eg. Due to the presence of a small fragment of the remaining calculus that may obstruct the pocket entrance or when a fragment of the calculus is forced into the deep, non-inflamed portion of the tissue
2. Post surgical periodontal abscess
 - a. When the abscess occurs immediately following periodontal surgery. It is often due to the incomplete removal of the subgingival calculus
 - b. Perforation of the tooth wall by an endodontic instrument.
 - c. The presence of a foreign body in the periodontal tissue (eg. Suture / pack)
3. Post antibiotic periodontal abscess [14]
 - a. Treatment with systemic antibiotics without subgingival debridement in patients with advanced periodontitis may cause abscess formation.

DIAGNOSIS

The diagnosis of a periodontal abscess is usually based on the chief complaint and the history of the presenting illness. Usually, the severity of the pain and distress will differentiate an acute from a chronic abscess. The relevant medical and dental history is mandatory for the proper diagnosis of such cases.

The important point to be considered while taking the history includes:

1. Whether the patient is under the care of a physician or a dentist
2. Whether the patient is presently on any medication or whether he/she has any medical condition that may affect the periodontal diagnosis or treatment.
3. Any previous dental treatment that may affect the diagnosis or the treatment plan
4. The smoking history is important because heavy smokers can develop a more severe periodontal disease and they do not respond very well to treatment.

Following taking the proper history, the next important step is to examine the patient and the lesion. The steps in examination include:

a. General examination

- i. Systemic status of the patient
- ii. Examination of features that may indicate on-going systemic diseases, competency of the immune system, extremes of age, distress, and fatigue.

b. Extra oral examination includes

- i. Checking the symmetry of the face, for swelling, redness, fluctuance, sinus, trismus and examination of cervical lymph nodes.

c. Intra oral examination includes

- i. Examination of the oral mucosa and dentition

- ii. Checking for gingival swelling, redness and tenderness.
- iii. Checking for suppuration, either spontaneous or draining on pressure or from the sinus.
- iv. Checking for mobility and elevation and for tooth which is tender to percussion.
- v. Evaluation of the status of the oral hygiene
- vi. Examination of the periodontium including periodontal screening.

Following examination the next step is to confirm the clinical findings and the findings can be confirmed by supplemental 'a' diagnostic method that includes radiographs, pulp vitality test, microbial test, lab finding and others.

[Table/Fig 4]



[Table/Fig 4]: Placement of sulcular incision using #11 surgical blade

RADIOGRAPHS [2],[13],[15]

There are several dental radiographical techniques which are available (periapicals, bitewings and OPG) that may reveal either a normal appearance of the interdental bone or evident bone loss, ranging from just a widening of the periodontal ligament space to pronounced bone loss involving most of the affected cases.

Intra oral radiographs, like periapical and vertical bite-wing views, are used to assess marginal bone loss and the perapical condition of the tooth which is involved. A gutta percha point which is placed through the sinus might locate the source of the abscess.

THE PULP VITALITY TEST [2],[13],[15]

The Pulp vitality test, like thermal or electrical tests, could be used to assess the vitality of the tooth and the subsequent ruling out of the concomitant pulpal infections.

MICROBIAL TESTS [2],[12],[15]

Samples of pus from the sinus/ abscess or that which is expressed from the gingival sulcus could be sent for culture and for sensitivity tests. Microbial tests can also help in implementing the specific antibiotic courses.

LAB FINDINGS [2],[15]

Lab tests may also be used to confirm the diagnosis. The elevated numbers of the blood leukocytes and an increase in the blood neutrophils and monocytes may be suggestive of an inflammatory response of the body to bacterial toxins in the periodontal abscess.

OTHERS

Multiple periodontal abscesses are usually associated with increased blood sugar and with an altered immune response in diabetic patients.

Therefore, the assessment of the diabetic status through the testing of random blood glucose, fasting blood glucose or glycosylated haemoglobin levels is mandatory to rule out the aetiology of the periodontal abscess.

[Table/Fig 5], [Table/Fig 6]



[Table/Fig 5]: Performing curettage using surgical curette to remove granulation tissue from subgingival pocket



[Table/Fig 8]: Post-operative view after 3 months. Note the receded and shrunk gingiva after complete healing of gingival tissue.



[Table/Fig 6]: Post-operative (7 days) view after surgical drainage and application of topical antimicrobial agent (ozonated oil)

DIFFERENTIAL DIAGNOSIS

The differential diagnosis of the periodontal abscess is a clinically important step that allows the dentist to: more clearly understand the condition or circumstance; assess reasonable prognosis; eliminate any imminently life-threatening conditions (Ludwig's angina, space infections of the orofacial regions); plan treatment or intervention for the condition or circumstance and enable the patient and the family to integrate the condition or circumstance into their lives, until the condition or circumstance may be ameliorated, if possible. The periodontal abscess should be differentiated (ruled out) from the following similar conditions and lesions.

[Table/Fig 7], [Table/Fig 8]



[Table/Fig 7]: Post-operative view after 2 weeks. Note the receded and shrunk gingiva in healing gingival tissue

GINGIVAL ABSCESS

Features that differentiate the gingival abscess from the periodontal abscess are:

- i. History of recent trauma;
- ii. Localisation to the gingiva;
- iii. No periodontal pocketing

PERIAPICAL ABSCESS

Periapical abscess can be differentiated by the following features:

- i. Located over the root apex
- ii. Non-vital tooth, heavily restored or large filling
- iii. Large caries with pulpal involvement.
- iv. History of sensitivity to hot and cold food
- v. No signs / symptoms of periodontal diseases.
- vi. Periapical radiolucency on intraoral radiographs.

PERIO-ENDO LESION

The Perio-endo lesion usually shows:

- i. Severe periodontal disease which may involve the furcation
- ii. Severe bone loss close to the apex, causing pulpal infection
- iii. Non-vital tooth which is sound or minimally restored

ENDO-PERIO LESION

Endo-perio lesion can be differentiated by:

- i. Pulp infection spreading via the lateral canals into the periodontal pockets.
- ii. Tooth usually non-vital, with periapical radiolucency
- iii. Localised deep pocketing

CRACKED TOOTH SYNDROME

Cracked tooth Syndrome can be differentiated by:

- i. History of pain on mastication
- ii. Crack line noted on the crown.
- iii. Vital tooth
- iv. Pain upon release after biting on cotton roll, rubber disc or tooth sleuth
- v. No relief of pain after endodontic treatment

ROOT FRACTURE

Root fracture can be differentiated by the presence of

- i. Heavily restored crown
- ii. Non-vital tooth with mobility
- iii. Post crown with threaded post
- iv. Possible fracture line and halo radiolucency around the root which are visible in periapical radiographs
- v. Localised deep pocketing, normally one site only
- vi. Might need an open flap exploration to confirm diagnosis

TREATMENT

The treatment of the periodontal abscess does not differ substantially from that of other odontogenic infections. The principles for

the management of simple dental infections are as follows: [2],[13]

1. Local measures

- i. Drainage
- ii. Maintain drainage
- iii. Eliminate cause

2. Systemic measures in conjunction with the local measures

The management of a patient with periodontal abscess can be divided into three stages: [2],[13],[15]

- i. Immediate management
- ii. Initial management
- iii. Definitive therapy

IMMEDIATE MANAGEMENT

Immediate management is usually advocated in life-threatening infections which lead to space infections of the orofacial regions or to diffuse spreading infections (facial cellulites). Hospitalization with supportive therapy, together with intravenous antibiotic therapy, is usually recommended. However, depending on the severity of the infection and the local signs /symptoms, the clinical examination and the investigations and the initial therapy can be delayed to some extent. In non-life threatening conditions, systemic measures such as oral analgesics and antimicrobial chemotherapy will be sufficient to eliminate the systemic symptoms and severe trismus, if present.

Antibiotics are prescribed empirically before the microbiological analysis and before the antibiotic sensitivity tests of the pus and tissue specimens. [2],[13],[14],[15],[16] The empirical regimens are dependent on the severity of the infection.

The common antibiotics which are used are:

1. Phenoxymethylpenicillin 250 -500 mg qid 5/7 days
2. Amoxicillin 250 - 500 mg tds 5-7 days
3. Metronidazole 200 - 400 mg tds 5-7 days

If allergic to penicillin, these antibiotics are used:

1. Erythromycin 250 -500 mg qid 5-7 days
2. Doxycycline 100 mg bd 7-14 days
3. Clindamycin 150-300 mg qid 5-7 days

INITIAL THERAPY

The initial therapy is usually prescribed for the management of acute abscesses without systemic toxicity or for the residual lesion after the treatment of the systemic toxicity and the chronic periodontal abscess. [2],[13],[16] Basically, the initial therapy comprises of:

- a. The irrigation of the abscessed pocket with saline or antiseptics
- b. When present, the removal of foreign bodies
- c. Drainage through the sulcus with a probe or light scaling of the tooth surface
- d. Compression and debridement of the soft tissue wall
- e. Oral hygiene instructions
- f. Review after 24-48 hours; a week later, the definitive treatment should be carried out.

The treatment options for periodontal abscess under initial therapy

1. Drainage through pocket retraction or incision
2. Scaling and root planning
3. Periodontal surgery
4. Systemic antibiotics
5. Tooth removal

1. Drainage through the periodontal pocket

Drainage through the pocket is the treatment of choice if the abscess is not complicated by other factors. The steps in surgical drainage through the periodontal pocket have been demonstrated in the figures 1 to 8. In general, the steps in the drainage through the pocket include: [2],[13],[15],[16]

1. Topical / local anaesthesia (nerve block is preferred)

2. The pocket wall is gently retracted with a probe / curette in an attempt to create an initial drainage through the pocket entrance
3. Gentle digital pressure is applied
4. Irrigation may be used to express the exudates and to clear the pocket
5. If the lesion is small and has good access, scaling and curettage may be undertaken
6. If the lesion is large and drainage cannot be established, scaling/curettage and surgery is delayed until the major clinical signs have been resolved after antibiotic therapy.
7. In such patients, the use of systemic antibiotics with short term, high dose regimens is recommended
8. Antibiotic therapy alone, without subsequent drainage and subgingival scaling is contraindicated

2. Drainage through an external incision

However, if the lesion is sufficiently large, pin-pointed and fluctuating, an external incision can be made to drain the abscess. The steps are as follows[2],[13],[15],[16]

- a. Abscess dried, isolated with gauze sponge
- b. Local anaesthesia (nerve block is preferred)
- c. A vertical incision done through the most fluctuant centre of the abscess with a #15 or # 11 surgical blade
- d. The tissue which is lateral to the incision is separated with a periosteal elevator / curette
- e. Light digital pressure applied with moist gauze pad
- f. In patients with abscess, with marked swelling, tension and pain, it is recommended to use systemic antibiotics as the only initial treatment in order to avoid the damage to the healthy periodontium
- g. In such conditions, once the acute condition has receded, mechanical debridement including root planning is performed
- h. Once the bleeding and the suppuration have ceased, the patient may be dismissed

Post treatment instructions [2],[13],[15],[16]

- a. Frequent rinsing with warm salt water
- b. Periodic application of chlorhexidine gluconate (either rinsing/ cleaning locally with a cotton tipped swab)
- c. Reduce exertion and increase fluid intake
- d. Analgesics for patient comfort
- e. Repair potential for acute periodontal abscess is excellent
- f. Gingiva returns to normal within 6 to 8 weeks
- g. Gentle digital pressure may be sufficient to express the purulent discharge.

3. Periodontal surgery [2],[12],[16]

1. Surgical therapy (either gingivectomy or flap procedures) has also been advocated mainly in abscesses which are associated with deep vertical defects, where the resolution of the abscess may only be achieved by a surgical operation.
2. Surgical flaps have also been proposed in cases in which the calculus is left subgingivally after the treatment.
3. The main objective of the therapy is to eliminate the remaining calculus and to obtain drainage at the same time.
4. A therapy, with a combination of an access flap with deep scaling and irrigation with chlorhexidine, has also been proposed.
5. As an adjunct to conservative treatment, soft laser therapy could be used to decrease the pain and swelling of the gingiva

4. Systemic antibiotics with or without local drainage[2],[13],[15],[16]

Antibiotics are the preferred mode of treatment. However, the local drainage of the abscess is mandatory to eliminate the aetiological factors. The recommended antibiotic regimen usually follows the culture and the sensitive tests. In general, the empirical antibiotics can be implemented as listed below:

- a. Phenoxymethyl penicillin 250-500mg qid 7 - 10 days
- b. Amoxicillin/ Augmentin 250- 500 tds 7- 10 days
- c. Metronidazole 250mg tds 7 -10 days (Can be combined with

amoxicillin. The use of metronidazole is contraindicated in pregnant patients/ consumption of alcohol)

- d. Tetracycline HCl 250mg qid 7-14 days
- e. Doxycycline 100mg bd 7-14 days (the use of tetracycline is contraindicated in pregnant patients and in children below 10 yrs)

5. Extraction of the teeth

Extraction of the tooth is the last resort to treat the periodontal abscess. However, there are certain guidelines for assessing poor/ hopeless prognosis before extracting the tooth. [2],[15],[16] The guidelines are as follows

- a. Horizontal mobility more than 1mm.
- b. Class II-III furcation involvement of a molar.
- c. Probing depth > 8 mm.
- d. Poor response to therapy.
- e. More than 40% alveolar bone loss.

DEFINITIVE TREATMENT

The treatment following reassessment after the initial therapy is to restore the function and aesthetics and to enable the patient to maintain the health of the periodontium. Definitive periodontal treatment is done according to the treatment needs of the patient.

CONCLUSIONS

The occurrence of periodontal abscesses in patients who are under supportive periodontal treatment has been frequently described. Early diagnosis and appropriate intervention are extremely important for the management of the periodontal abscess, since this condition can lead to the loss of the involved tooth. A single case of a tooth diagnosed with periodontal abscess that responds favourably to adequate treatment does not seem to affect its longevity. In addition, the decision to extract a tooth with this condition should be taken, while taking into consideration, other factors such as the degree of clinical attachment loss, the presence of tooth mobility, the degree of furcation involvement, and the patient's susceptibility to periodontitis due to the associated systemic conditions.

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DECLARATION ON COMPETING INTERESTS: No competing Interests

Date of Submission: **Dec 24, 2010**
Peer Review Completion: **Jan 05, 2011**
Date of Acceptance: **Jan 10, 2011**
Date of Final Publication: **Apr 11, 2011**