PERIODONTAL ABSCESS – A LOCALIZED COLLECTION OF PUS
A REVIEW
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Abstract
A variety of inflammatory diseases affect the human periodontium. Mostly chronic but some being acute, which if untreated destroy the dental attachment apparatus resulting in tooth loss. The most common disease, chronic periodontitis, is characterized by relatively long periods of stability, during which little destruction occurs, interspersed with periods of acute exacerbation. These periods of increased disease activity may be precipitated by a change in the bacterial flora, host resistance, or by the blockage of the pocket orifice leading to an acute periodontal abscess.

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Introduction
The periodontal abscess has been defined as "an acute, destructive process 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. It is also known as lateral abscess or parietal abscess."

Its importance in clinical periodontal practice can be summarised by:

a. Its high prevalence amongst dental emergencies, and its high prevalence in periodontitis patients. 3,4,5
b. It is usually closely related with periodontitis and periodontal pockets, affecting not only untreated patients, but also patients during active treatment or during maintenance.6,7
c. Periodontal abscesses are one of the main causes of tooth extraction and tooth loss, mainly in maintenance patients.8
d. Periodontal abscesses may result in complications, due to bacteremia, that may cause infections in distant locations.9

Classification of periodontal abscess10,11
There are different types of abscess that can involve the periodontal tissues-

1) Classification based on etiological criteria
(a) Periodontitis related abscess: When acute infections originate from a biofilm in the deepened periodontal pocket.
(b) Non-Periodontitis related abscess: When the acute infection originates from another local source. eg. Foreign body impaction, alteration in root integrity.

2) Classification based on location
a) Gingival abscess- A localized, purulent infection involves only the soft gum tissue near the marginal gingiva or the interdental papilla.

b) Periodontal abscess- A localized, purulent infection involving a greater dimension of the gum tissue, extending apically and adjacent to a periodontal pocket.

c) Pericoronal abscess- A localized, purulent infection within the gum tissue surrounding the crown of a partially or fully erupted tooth. Usually associated with an acute episode of pericoronitis around a partially erupted and impacted mandibular third molar (lower wisdom tooth).
Figure 3 Pericoronal Abscess

3) **Classification based on course**
   a) **Acute 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 with lymph node enlargement may be present.
   
b) **Chronic 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 over lying the affected root. Pain is usually of low intensity.

4) **Classification based on number**
   a) **Single** - Abscess confined to a single tooth.
   b) **Multiple** - Abscess confined to more than one tooth.

**Etiology of periodontal abscess**

Periodontal abscesses have been either directly associated with Periodontitis or without the prior existence of a periodontal pocket.

*Periodontitis-related abscess* - When acute infection originates from bacteria present in the subgingival biofilm in a deepest periodontal pocket. This type of abscess is form due to-

I. Closure of margins of periodontal pockets may lead to extension of the infection into the surrounding tissue 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 gingival margin to the tooth surface.

II. Tortuous periodontal pockets especially associated with furcation defects.

Changes in composition of the microflora, bacterial virulence or in host defenses could also make the pocket lumen inefficient to drain the increased suppuration.

After procedures like scaling, where calculus is dislodged and pushed into the soft tissue. It may also be due to inadequate scaling which will allow 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 entrapment of the subgingival flora in the deepest part of the pocket then cause abscess formation.

Treatment with systemic antibiotics without subgingival debridement in patients with advanced periodontitis leads to a change in the composition of the subgingival microbiota, leading to superinfection and abscess formation.

*Non Periodontitis-related abscess* -

When the acute infection originates from bacteria originating from another local source, such as a foreign body impaction or from alterations in the integrity of the root leading to bacterial colonization. This type of abscess form due to

i. Impaction of foreign bodies, such as a toothbrush bristle, food (such as fish bone) into the gingival tissue.

ii. Perforation of the lateral wall of a tooth by an endodontic instrument during root canal therapy.

iii. Possible local predisposing factors for periodontal abscess formation:
   - External root resorption
   - Invaginated tooth
   - Cracked tooth
   - Local factors affecting morphology of roots

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

*a. General features*

Healthy or unhealthy features that may indicate ongoing systemic diseases, competency of immune system, extremes of age, distress, fatigue.

*b. Extra Oral features*

Symmetry of face, swelling, redness, fluctuant, sinus, trismus and examination of cervical lymph nodes.

*c. Intra Oral Features*:

Including subjective and objective variables

i. Gingival swelling, redness and tenderness, pain
ii. Suppuration either spontaneous, on pressure or from sinus.

iii. Mobility, elevation and tooth tender to percussion.

iv. Bleeding on probing

Following examination the next step is to confirm the clinical findings on the basis of radiographs, pulp vitality test, microbial test, and other findings.

**Radiographs**

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 periapical condition of the tooth which is involved. A gutta-percha point which is placed through the sinus might locate the source of the abscess.

**Pulp Vitality Test**

Thermal or electrical tests to assess the vitality of the tooth.

**Microbial Test**

Sample of pus from the sinus, abscess or pruluent material expressed from the gingival crevice could be sent for culture and sensitivity test.

**Others**

Assessment of diabetic status through blood glucose and glycosylated haemoglobin.

**Clinical features of periodontal abscess**

Common clinical features of periodontal abscess
- Presence of generalized periodontal disease with pocketing and bone loss.
- Tooth is usually vital
- Overlying gingival erythematous, tender and swollen.
- Painful at times
- Pus discharge via periodontal pocket or sinus opening
- Possible cervical lymphadenopathy

**Pathogenesis and histopathology**

The entry of bacteria into the soft tissue pocket wall could be the first event to initiate the periodontal abscess. Inflammatory cells are then attracted by chemotactic factors released by the bacteria, and the concomitant inflammatory reaction leads to destruction of the connective tissues the encapsulation of the bacterial infection and the production of pus.

Histologically, in initial phase, the central area of the abscess filled with neutrophils, in close vicinity with remains of tissue destruction and soft tissue debris. At a later stage, a pyogenic membrane, composed of macrophages and neutrophils, is organised. The rate of destruction in the abscess will depend on the growth of bacteria inside the foci and its virulence as well as on the local pH, since an acidic environment will favour the activity of lysosomal enzymes.12

De Witt et al. (1985)12 studied biopsy punches taken from 12 abscesses. The biopsies were taken just apical to the centre of the abscess. They observed, from the outside to the inside:

- a normal oral epithelium and lamina propria;
- an acute inflammatory infiltrate;
- an intense foci of inflammation(neutrophil-lymphocyte) with the surrounding connective tissue destroyed and necrotic;
- a destroyed and ulcerated pocket epithelium;
- a central region, as a mass of granular, acidophilic, and amorphous debris.

In 7 out of 9 specimens evaluated by electron-microscopy, gram-negative bacteria were seen invading the pocket epithelium and altered connective tissue.

![Figure 4](image)

**Microbiology of periodontal abscess**

Most frequent type of bacteria was gram-negative anaerobic rods and gram-positive facultative cocci. In general, gram-negatives predominated over gram-positive and rods over cocci.

The microbiota of periodontal abscess is not different from the microbiota of chronic periodontitis lesions. This microflora is polymicrobial and dominated by non-motile, Gram-negative, strict anaerobic, rod shaped species. *Porphyromonas gingivalis* is probably the most virulent and relevant microorganism. Other anaerobic species that are usually found include *Prevotella intermedia, Prevotella melaninogenica, Fusobacterium nucleatum, and Tannerella forsythia*. The majority of the Gram–ve anaerobic species are non-fermentative and display moderate to strong proteolytic activity. Strict anaerobic, Gram-positive bacterial species in periodontal abscesses include
2. Initial Management:
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. Basically, the initial therapy comprises of:\textsuperscript{27,28}

a. The irrigation of the abscessed pocket with saline or antiseptics
b. Removal of foreign bodies, when present
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\textsuperscript{11,15,22}

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

A. Drainage through the periodontal pocket
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:

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.

B. 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

a. Abscess is dried, isolated with gauze sponge
b. Local anaesthesia (nerve block is preferred)
c. A vertical incision is given 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 should be 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.

C. Periodontal surgery

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.

D. Systemic antibiotics with or without local drainage

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

a. Phenoxymethyl penicilln 250-500mg QID 7 – 10 days
b. Amoxycillin/ Augmentin 250- 500 TDS 7- 10 days
c. Metronidazole 250mg TDS 7 –10 days

3. Definitive Therapy

Definitive treatment following reassessment after initial therapy has to perform to restore, function, esthetics of periodontium & to enable patient maintain periodontal health. Gingivectomy or periodontal flap surgery with systemic antibiotics or local antibiotics (tetracycline) is indicated as definitive treatment of periodontal abscesses.

Complications of Periodontal Abscess: 29

1. Tooth loss-
Periodontal abscesses are associated with tooth loss in cases of moderate to advanced periodontitis and during the maintenance phase. Periodontal abscesses have been suggested as the main cause for extraction in the maintenance phase. A tooth with a history of repeated abscess formation is considered, together with other findings, a tooth with a “hopeless” prognosis.

Smith & Davies (1986) evaluated 62 abscesses: 14 (22.6%) were extracted as initial therapy, and 9 (14.5%) after the acute phase were controlled. Out of the 22 treated and followed abscessed teeth, 14 had to be extracted during the following 3 years.

2. Dissemination of the infection-
Two possibilities of infection have been described:

a. The dissemination of the bacteria during therapy (bacteremia)

b. The dissemination of the bacteria related with an untreated abscess.

Conclusion

The periodontal abscess depicts typical clinical and histopathological features. The most prevalent organism cultured from periodontal abscess are P. gingivalis, P. intermedia and Fusobacterium sp. Different therapeutic alternatives have been proposed for the treatment of the periodontal abscess. Among these, incision and drainage, scaling and root planning and different antibiotics, are the sole therapies for the treatment of periodontal abscesses. An infection has the possibility to spread micro-organisms to other body sites, with the possibility of causing serious diseases which can eventually be fatal. A tooth suffering
from a periodontal abscess has a worse prognosis and is at a higher risk of being lost.

References

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