

The periodontal abscess: A review

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Abstract : A periodontal abscess is a localized, purulent infection involving a greater dimension of the gum tissue, extending apically and adjacent to a periodontal pocket. The periodontal abscess is the third most common dental emergency, representing 6-14% of all dental emergencies. The periodontal abscess can be classified depending on their course, number, location and etiological criteria. Etiology of the periodontal abscess have been either directly associated to periodontitis or to sites without prior existence of periodontitis. Local and systemic predisposing factors make patient prone to the periodontal abscess. Microorganisms that colonize the periodontal abscess have been reported to be primarily gram-negative anaerobic rods. Common clinical features of the periodontal abscess are presence of generalized periodontal disease with pocketing and bone loss, usually associated with a vital tooth, overlying gingival erythematous, tender and swollen, pus discharge via periodontal pocket or sinus opening. The periodontal abscess should be differentiated/ ruled out from similar conditions and lesions as gingival abscess, periapical abscess, perio-endo lesion, endo-perio lesion, cracked tooth syndrome and root fracture. Diagnosis of a periodontal abscess is usually based on the chief complaint and the history of the presenting illness, clinical findings and investigations. The management of the periodontal abscess can be divided into three stages: immediate management, initial management and definitive therapy. Early diagnosis and prompt treatment are extremely important for the management of a periodontal abscess, since this can lead to loss of involved tooth. In this review article, all aspects of the periodontal abscess were described.

Keywords: Abscess, antibiotics, drainage, microorganisms, periodontal abscess.

I. INTRODUCTION

An abscess is a localized collection of pus that has built up within the tissue of the body [1]. An abscess is so called because there is an *abscessus* (Latin word means “a going away or departure”) of portions of the tissue from each other to make room for the suppurated matter lodged between them. Empyema is the accumulation of pus in a preexisting rather than a newly formed cavity. The process of abscess formation is known as suppuration and the bacteria which cause suppuration is known as pyogenic bacteria. Pus is a purulent exudate, creamy or opaque in appearance, composed of dead and living neutrophils, red cells, fragments of tissue debris and fibrin. In old pus, macrophages and cholesterol crystals are also present [2]. An abscess is a defensive reaction of the body tissue to prevent the spread of infectious materials to other parts of the body. Abscess is lined by pyogenic membrane [3]. The pyogenic membrane is formed by the neutrophils and macrophages in an attempt to keep the pus from infecting neighboring structures. However, such membrane tends to prevent immune cells from attacking bacteria in the pus, or from reaching the causative organism or foreign body.

Abscess of the periodontium is a localized collection of pus (i.e. an abscess) within the tissues of the periodontium. Abscesses of the periodontium have been classified primarily, based on their anatomical locations into three types: gingival abscess, pericoronal abscess and periodontal abscess [4]. Gingival abscess is a localized, purulent infection involving only the soft gum tissue near the marginal gingiva or the interdental papilla [5]. Pericoronal abscess is a localized, purulent infection within the gum tissue surrounding the crown of a partially or fully erupted tooth [5]. A periodontal abscess is a localized, purulent infection involving a greater dimension of the gum tissue, extending apically and adjacent to a periodontal pocket [5]. A periodontal abscess is also known as lateral abscess or parietal abscess [6]; however, when marginal soft tissues are affected in isolation, it is called a gingival abscess [7]. Periodontal abscess and gingival abscess are identical histologically and differ only in location [8].

II. Prevalence of the periodontal abscess

Among all the abscesses of periodontium, the periodontal abscess is the most important one. The periodontal abscess is the third most common dental emergency (6-14 %), first is the dentoalveolar abscess/pulpal infection (14-25 %) followed by pericoronitis (10-11 %) [9]. The periodontal abscess is more prevalent in periodontitis patients. A periodontal abscess is more likely to occur in presenting pockets [6]. Pockets presents are deeper than 6mm in 62.1% cases while 4-6mm in 34.4% cases [9]. Molars are most commonly involved teeth in 69% of cases [9]. McLeod *et al.* showed 65% of affected teeth are multirrooted [10]. The periodontal

abscesses were seen 41% associated with first molar, 24% with second molar, 17% with upper premolars, 7% with lower premolars, 7% with incisors and 3.5% with upper third molars [9].

III. Classification of the periodontal abscess

The periodontal abscess can be classified depending on their course, number, location and etiological criteria.

3.1 Depending on course [11]:

3.1.1 Acute periodontal abscess:

The abscess develops in short period of time and lasts for a few days or 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 progress, the pus and discharge from the gingival crevice become evident. Associated lymph node enlargement may be present.

3.1.2 Chronic periodontal abscess:

The abscess develops slowly and lasts for a long time. In the chronic stages, a nasty taste and spontaneously 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.

3.2 Depending on number [12]:

3.2.1 Single periodontal abscess: The abscess confined to a single tooth.

3.2.2 Multiple periodontal abscesses: The abscess confined to more than one tooth.

3.3 Depending on location [6]:

3.3.1 The periodontal abscess in the supporting periodontal tissues along the lateral aspect of root.

3.3.2 The periodontal abscess in the soft tissue wall of a deep periodontal pocket.

3.4 Depending on etiological criteria [9, 13]:

3.4.1 Periodontitis related periodontal abscess: When acute infection originates from a biofilm in the deepened periodontal pocket.

3.4.2 Non-periodontitis related periodontal abscess: When acute infection originates from another local source, e.g. foreign body impaction, alteration in root integrity etc.

IV. Etiology Of The Periodontal Abscess

Etiology of periodontal abscess has been either directly associated to periodontitis or to sites without prior existence of periodontitis.

The causes of the periodontal abscess associated with periodontitis are extension of infection or inflammation from pocket [6], presence of tortuous pocket with cul-de-sac [6], after scaling and or after routine oral prophylaxis [14], inadequate scaling [6, 14], marginal closure of pocket [15], pocket lumen insufficient to drain [16], treatment with systemic antibiotics without subgingival debridement [12, 17], nifedipine therapy [18] and treatment with GTR membrane both resorbable and non-resorbable [19]. The periodontal abscess in periodontitis may occur at various stages: acute exacerbation of untreated periodontitis [14], during periodontal treatment [6, 14], refractory periodontitis and during periodontal maintenance [10, 20].

The causes of the periodontal abscess in absence of periodontitis are infected lateral cyst [16], perforation of tooth by endodontics instrument [6], dislodged calculus fragment deep into tissue [14] and impaction of foreign body as toothbrush bristle, food (such as fish bone) [16] and piece of floss [21]. Periodontal abscess caused by foreign body related with oral hygiene aids have been termed oral hygiene abscess [22].

Local predisposing factors for the periodontal abscess formation are external root resorption [23], invaginated tooth [24], cracked tooth [25], furcation involvement [26] and cemental tears [27] which affect morphology of roots. Diabetes is the systemic predisposing factor which makes patient prone to acute periodontal abscess [28].

5. Microbiology of the periodontal abscess

Purulent oral infections are polymicrobial and usually caused by endogenous bacteria. However, very few studies have investigated the specific microbiota of the periodontal abscess [29]. The microorganisms generally associated with the periodontal abscess are similar to those found in subgingival plaque [30]. The periodontal abscess may occur as a direct response to an increase in virulence of the commensal organisms and the release of their associated toxins. Alternatively, it may occur secondarily to reduce host resistance [31]. The

microorganisms that colonize the periodontal abscess have been reported to be primarily gram-negative anaerobic rods [14]. About 63% of cultured bacteria were strict anaerobes [30]. Most frequent type of bacteria were gram-negative anaerobic rods and gram-positive facultative cocci. In general, gram-negatives predominated over gram-positives and rods over cocci [30]. Culture studies of periodontal abscesses have revealed high prevalence of black pigmented bacteria: 55-100% *Porphyromonas gingivalis*, 25-100% *Prevotella intermedia*, 0-22% *Prevotella melanogenica* [30]. Lewis *et al.* showed that high percentage of periodontal abscesses harbor lactamase-producing bacteria [32]. Hafstrom *et al.* reported 80% *Camphylobacter rectus*, 44-65% *Fusobacterium nucleatum*, 25% *Actionobacillus actinomycetumcomitans* [33].

V. Histopathology of the periodontal abscess

De Witt *et al.* in 1985 studied 12 punch biopsies taken from just apical to the area of major fluctuance of acute periodontal abscess and found from outside to inside: (1) a normal oral epithelium and lamina propria; (2) an acute inflammatory infiltrate; (3) an intense focus of inflammation (neutrophil-lymphocyte) with surrounding connective tissue destroyed and necrotic; (4) a ulcerated and destroyed pocket epithelium; (5) 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. Bacteria inside the abscess were immersed in tissue exudate and surrounded by necrotic tissues. Fungi were also present inside the abscess [15].

VI. Pathogenesis Of The Periodontal Abscess

Entry of bacteria into pocket wall could be the first event. Inflammatory cells are then attracted by chemotactic factors released by bacteria and the inflammatory reaction leads to tissue destruction[15]. There is subsequent encapsulation of bacterial infection and production of pus[34]. The rate of destruction in abscesses will depend on growth of bacteria inside the foci and its virulence as well as local pH, since acidic environment will favour activity of lysosomal enzyme[15].

VII. Clinical Features Of The Periodontal Abscess

Generally patient may be healthy or unhealthy with features that may indicate ongoing systemic diseases, competency of immune system, extremes of age, distress and fatigue[35]. Presence of systemic toxicity as increase in body temperature and malaise may be present[36]. Extra-oral features include asymmetry of face, swelling redness, fluctuant, sinus, trismus and regional/cervical lymphadenopathy can be detected in some patients[35, 36].

Intra-oral features in case of acute periodontal abscess include ovoid elevation of gingiva along lateral aspect of root, redness, mobility, elevation of tooth in socket and tenderness to percussion or mastication[35, 37]. Regarding mobility 56.5% to 79% of teeth showed mobility[9, 26]. 10-40% patients show regional lymphadenopathy[9, 26]. Symptoms may vary from slight discomfort to severe pain and swelling[26], 55% of acute periodontal abscesses in upper jaw, 48% on buccal aspect, 24% on distal aspect, 13.8% on lingual/palatal aspect and 62% on mesial aspect complained severe pain[9].

Chronic periodontal abscess generally associated with sinus tract. Orifice of tract may be covered by small granulation pink mass. Patient is usually asymptomatic although can refer mild symptoms as dull or gnawing pain, slight elevation of tooth and a desire to bite down on and grind the tooth[38].

Common clinical features of periodontal abscess are presence of generalized periodontal disease with pocketing and bone loss, usually associated with a vital tooth, overlying gingival erythematous, tender and swollen, pus discharge via periodontal pocket or sinus opening[9, 26, 38]. When a periodontal abscess is associated with bifurcation or trifurcation of premolars or molars, a sinus may track to a site distant from the area of infection. In such cases, the sinus track follows a long, narrow and tortuous path[39].

VIII. Investigations Of The Periodontal Abscess

9.1 Radiographs:

Intra-oral or dental radiographs as periapical, bitewings and OPG are used to assess marginal bone loss and periapical condition of involved tooth. Gutta percha point placed through sinus might locate the source of the abscess[40, 41].

9.2 Pulp vitality test:

Thermal or electrical test could be used to assess the vitality of tooth[42].

9.3 Microbial test:

Pus sample from sinus or abscess could be sent for microbial culture and antimicrobial sensitivity test[38].

9.4 Lab findings:

Blood test may also use to confirm the diagnosis. An increase in number of leukocytes, neutrophils and monocytes may be suggestive of an inflammatory response of body to bacterial toxins in the periodontal abscess[9].

9.5 Others:

Assessment of diabetic status through random, fasting or post-prandial blood glucose and glycosylated haemoglobin level, if indicated is mandatory[38].

IX. Differential Diagnosis Of The Periodontal Abscess

The periodontal abscess should differentiated/ ruled out from similar conditions and lesions as gingival abscess,periapical abscess,perio-endo lesion, endo-perio lesion,cracked tooth syndromeand root fracture.

Gingival abscess has history of recent gingival trauma, localized to the gingiva and no periodontal pocketing[38].

Periapical abscess is located over root apex, associated with non-vital, heavily restored or large filling, large caries with pulpal involvement and periapical radiolucency tooth, but no signs/ symptoms of periodontal disease [43].

Perio-endo lesion is associated with non-vital tooth which is sound or minimally restored and have sever periodontal disease which may involve the furcation with sever bone loss close to apex causing pulpal infection[44].

In endo-perio lesion, pulp infection spreading via lateral canals into periodontal pockets, causing localized deep pocketing. Tooth is usually non-vital with periapical radiolucency [45].

Cracked tooth syndrome is associated with crack line on the crown of a vital tooth and has history of pain on mastication, pain upon release after biting on cotton roll, rubber disc or tooth sleuth. There is no relief of pain after endodontic treatment [39].

Root fracture have fracture line and halo radiolucency around the root in a periapical radiographs of non-vital tooth with heavily restored, mobility, localized deep pocketing normally one site only which might need an open flap exploration to confirm diagnosis[46].

X. Diagnosis Of The Periodontal Abscess

Diagnosis of a periodontal abscess is usually based on the chief complaint, history of the presenting illness, clinical findings and investigations. Usually, the severity of 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[47].

XI. Treatment Of The Periodontal Abscess

The management of periodontal abscess can divided into three stages: immediate management, initial management and definitive therapy[9, 14].

12.1 Immediate management

Immediate management is indicated for acute periodontal abscess with or without life-threatening infections. Life-threatening infections lead to space infections of the orofacial region or diffuse spreading infections (facial cellulites) which requires hospitalization, supportive therapy and intravenous antibiotic therapy. Depending on severity of the infection and local signs/ symptoms, the clinical examination, investigations and initial therapy can be delayed[36]. In non-life threatening conditions, oral analgesics and antimicrobial chemotherapywill be sufficient to eliminate the systemic symptoms and sever trismus (surgical access is difficult)[32]. Antibiotics are prescribed empirically before microbiological analysis and antibiotic sensitivity of pus and tissue specimen. The empirical regimens are dependent on the severity of the infection. The common antibiotics used are: phenoxymethylpenicillin or amoxicillin 250-500 mg qid 5-7 days, metronidazole 200-400 mg tds 5-7 days.The use of metronidazole is contraindicated in pregnant patients/ consumption of alcohol. If allergy to penicillin, then: erythromycin 250-500 mg qid 5-7 days, doxycycline 100mg bd 7-14 days, clindamycin 150-300 mg qid 5-7 days[9, 14, 17, 26].

12.2 Initial therapy

Initial therapy is prescribed for management of residual lesion after treatment of systemic toxicity, acute abscess without systemic toxicity and chronic periodontal abscess. Initial therapy comprises irrigation of abscessed pocket with saline or antiseptics, removal of foreign body if present, drainage through pocket with a probe or light scaling of tooth surface, compression and debridement of soft tissue wall and irrigation with saline and oral hygiene instructions[21, 48, 49]. Review after 24-48 hours, a week later definitive treatment

should be carried out[49]. Alternative treatments include extraction of teeth with poor prognosis, basic treatment (incision, drainage and debridement) with systemic antibiotics and gingivectomy or flap surgery with systemic antibiotics or local antibiotics[26, 49, 50]. Extraction of tooth is done in case of poor/ hopeless prognosis which includes: horizontal mobility > 1 mm, class II-III furcation involvement of a molar, probing depth >8 mm, poor response to therapy, alveolar bone loss > 40 % [9,26].

Drainage is made through a vertical incision at most fluctuant part of the abscess, extending from the mucogingival fold to the gingival margin. Treatment by flap operation is done by reflecting a full-thickness flap. Sorrin's operation is a type of flap approach in the treatment of a periodontal abscess, especially suitable when the marginal gingiva appears well adapted and gives no access to the abscess area. A semilunar incision is made below the involved area in the attached gingiva, leaving gingival margin undisturbed. A flap is raised, allowing access to the abscessed area for curettage[51].

12.3 Definitive treatment

Definitive treatment is done following reassessment after initial therapy to restore function, esthetic and enable patient to maintain health of periodontium according to treatment needs of patient (in accordance with CPITN Index)[39].

XII. Complications Of The Periodontal Abscess

The periodontal abscess has possibility to spread microbes to other parts of body which can results into bacteremia, Ludwig's angina, space infection of orofacial region, pulmonary actinomycosis or brain abscess. The risk of bacteremia during drainage of an abscess can be reduced if, before incision a needle aspiration of content of abscess is done. Tooth loss is seen cases of advanced to moderate periodontitis [10, 20]. Tooth with history of repeated abscesses is considered with other findings, a tooth with hopeless prognosis[52].

XIII. Conclusion

Early diagnosis and prompt treatment are extremely important for the management of a periodontal abscess, since this can lead to loss of involved tooth.

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