Dental Abscess

Background

A dentoalveolar abscess is an acute lesion characterized by localization of pus in the structures that surround the teeth. Most patients are treated easily with analgesia, antibiotics, drainage, and/or referral to a dentist or oral-maxillofacial surgeon. However, the physician should be aware of potential complications of simple dentoalveolar abscess.

Pathophysiology

The term dentoalveolar abscess comprises 3 distinct processes, as follows:

- A periapical abscess that originates in the dental pulp and is usually secondary to dental caries is the most common dental abscess in children. Dental caries erode the protective layers of the tooth (ie, enamel, dentin) and allow bacteria to invade the pulp, producing a pulpitis. Pulpitis can progress to necrosis, with bacterial invasion of the alveolar bone, causing an abscess.
- A periodontal abscess involves the supporting structures of the teeth (periodontal ligaments, alveolar bone).[1] This is the most common dental abscess in adults but may occur in children with impaction of a foreign body in the gingiva.
- Pericoronitis describes the infection of the gum that overlies a partially erupted third molar.

Odontogenic infections are polymicrobial, with an average of 4-6 different causative bacteria. The dominant isolates are strictly anaerobic gram-negative rods and gram-positive cocci, in addition to facultative and microaerophilic streptococci. Anaerobic bacteria outnumber aerobes 2-3:1.[2] In general, strictly anaerobic gram-negative rods are more pathogenic than facultative or strictly anaerobic gram-positive cocci.

Generally, a nonpathologic resident bacterium gains entry when the host's defenses are breached, rather than when a nontypical microorganism is introduced. The predominant species include those of *Bacteroides, Fusobacterium*, *Peptococcus*, and *Peptostreptococcus*, as well as *Streptococcus viridans.*

Dental abscess is rare in infants because abscesses do not form until teeth erupt. In children, periapical abscess is the most common type of dental abscess. This is because of the combination of poor hygiene, thinner enamel, and the primary dentition having more abundant blood supply, which allows for an increased inflammatory response. In adults, periodontal abscess is more common than periapical abscess.

History

The following may be reported in patients with dental abscess:

- Localized pain and swelling (may progress over a few hours to days)

- Thermal sensitivity (periapical abscess)
- Fever
- Gingival bleeding (on occasion with periodontal abscess)

- Gingiva
    - Swelling
    - Warmth
    - Erythema
    - Fluctuant mass that usually extends toward the buccal side of the gum and to the gingival-buccal reflection
- Teeth: The tooth that is most frequently involved is the lower third molar, followed by other lower posterior teeth; upper posterior teeth are involved much less frequently, and anterior teeth are rarely involved.
    - Increased mobility (mostly periapical abscess)
    - Pressure or percussion tenderness (mostly periapical abscess)
    - Extrusion
- Regional lymph node involvement
- More severe infection
    - Trismus
    - Difficulty swallowing (dysphagia)
    - Respiratory difficulty
    - Necrotizing fasciitis[3]
- Neck or facial swelling

Causes

- Pulpitides are dental caries caused by the following:
    - Baby-bottle tooth decay (BBTD): Early-childhood caries is replacing this term because the description also includes dental caries in breastfed babies.
    - Plaque: This is a precipitate of denatured salivary proteins that allow bacteria to adhere to the enamel of teeth.
- In immunocompromised patients, bacteria may hematogenously spread to invade the pulp of the tooth.
- Gingivitis is an inflammation of the gingiva.
- Posttraumatic infection or postsurgical infection may also cause dental abscess.

Laboratory Studies

- Uncomplicated (ie, simple) dental abscess: No laboratory studies are required.
- Complicated abscess (accompanying cellulitis)
    - The CBC count may reveal leukocytosis with neutrophil predominance.
    - Obtain a blood culture (aerobic and anaerobic) before initiating parenteral antibiotics.
    - Needle aspirate is indicated for Gram stain and culture.

Imaging Studies

- Depending on severity of abscess based on clinical presentation the following is recommended:
    - Periapical radiography is the first level of investigation. It provides a localized view of the tooth and its supporting structures.
    - Panoramic radiography (pantomography) is most helpful in emergency situations because it provides the most information for all teeth and supporting structures.
- If cellulitis swelling extends beyond local area then the following is indicated:
    - Lateral and anteroposterior neck views may reveal a soft tissue neck mass that impinges on the airway.
    - CT scanning with intravenous contrast is the most accurate method to determine the location, size, extent, and relationship of the inflammatory process to the surrounding vital structures.

Procedures

- Confirm presence of the abscess via needle aspiration.
    - If pus is obtained, do not aspirate more than 1-2 drops. Leave the abscess as large as possible to make the area easier to find for further management.
    - If pus cannot be aspirated, manage medically until a more localized infection develops.
- Incision and drainage may be performed only if pus can be aspirated.
- Packing a periapical abscess is generally not necessary.

Histologic Findings

- The flora at different oral sites varies.
- Anaerobes usually outnumber aerobes and facultative anaerobes.
- Most odontogenic infections involve plaque organisms.

Supragingival plaque mainly consists of gram-positive facultati**Medical Care**

- In patients with dental abscess, assess the airway upon respiratory distress, oropharyngeal tissue swelling, or inability to handle secretions; then, secure the airway via endotracheal intubation or tracheostomy.
- Properly collect specimen for Gram stain and culture.
- Administer empiric antibiotic therapy.
- Administer analgesia.
- Hydrate the patient.

Surgical Care

- The primary therapeutic modality is surgical drainage of any pus collection. Incision and drainage or spontaneous rupture of the abscess quickly accelerates resolution of the infection.
- Emergent surgery is indicated in the operating room if the airway is threatened or if the patient's condition is rapidly deteriorating.
- Third molar removal is a common surgical procedure.[4]

Consultations

- Consult a dentist if the patient has an uncomplicated abscess.
- Consult a maxillofacial oral surgeon if the patient has a complicated abscess.

Diet

- Diet is as tolerated. However, a soft bland diet is usually preferred.

Activity

- Activity is as tolerated.

Medication

When drainage cannot be achieved or the patient shows signs of systemic involvement, antibiotic therapy is indicated; in addition, an increasing number of immunocompromised patients require antibiotic therapy.

Antibiotics

Empiric antimicrobial therapy must be comprehensive and should cover all likely pathogens in the context of the clinical setting.

Penicillin

DOC; effective against most aerobes and anaerobes. Penicillin has traditionally been considered the DOC for odontogenic infections. The efficacy of penicillin is a concern because of the emergence of beta-lactamase – producing organisms, which confer resistance to penicillins. Penicillin still remains the antibiotic of choice for mild-to-moderate infections.
Inhibits the biosynthesis of cell wall mucopeptide. Bactericidal against sensitive organisms when adequate concentrations are reached and most effective during the stage of active multiplication. Inadequate concentrations may produce only bacteriostatic effects. Penicillin V (phenoxymethyl penicillin) is administered PO, whereas aqueous penicillin G is administered IV or IM.

- ve anaerobes or microaerophilic cocci and rods.

Subgingival plaque consists of anaerobic gram-negat

Further Inpatient Care

- Criteria for hospital admission in patients with dental abscesses include the following:
    - Unable to handle secretions
    - Airway compromise
    - Involvement of facial spaces of head and neck
    - Systemic involvement
    - Failure of outpatient therapy

Further Outpatient Care

- Follow-up care should be obtained as recommended by a physician.

Deterrence/Prevention

- The most effective preventive measure against dental caries and, thus, dentoalveolar abscess is fluoridation of communal drinking water.
- In fluoride-deficient areas, prevention can be obtained with dietary fluoride supplements. The American Academy of Pediatrics and the American Dental Association recommend administration of fluoride if the concentration of fluoride in the drinking water is less than 0.3 parts per million (ppm). Administer fluoride according to the following age-appropriate schedule (all doses are per day):
    - Age birth to 6 months - 0 mg
    - Age 6 months to 3 years - 0.25 mg
    - Age 3-6 years - 0.5 mg
    - Age 6-16 years - 1 mg

- The other effective preventive measure against dental caries and dentoalveolar abscess is proper dental hygiene. This includes brushing teeth after meals and regular dental check-ups.

Complications

- Dentocutaneous fistulae arise from chronic dental infections. The fistulous pathway develops as the chronic inflammation erodes through the alveolar bone, perforates the periosteum, and spreads into the surrounding soft tissues. The diagnosis is often missed because a chronic asymptomatic dental infection is usually present and the skin lesion is mistakenly thought to arise locally.
- Osteomyelitis was common before the era of antibiotic therapy. Osteomyelitis is an inflammation of the medullary cavity and adjacent cortex of bone. The mandible is more commonly involved than the maxilla because the maxilla has a better blood supply.
- Cavernous sinus thrombosis (CST) may be a complication. Approximately 10% of patients with CST have an odontogenic focus. Spread of infection from dental abscesses to the cavernous sinus is believed to occur via the valveless pterygoid venous plexus by way of the retromandibular vein. Patients often present with headache, unilateral retro-orbital pain, periorbital edema, fever, proptosis, chemosis, and ptosis. Treatment consists of antibiotics, anticoagulants, and, occasionally, surgery.
- Ludwig angina is an infection of the submandibular region. Abscesses of the second and third mandibular molars may perforate the mandible and spread into the submandibular and submental spaces. Ludwig angina is manifest by swelling of the floor of the mouth and elevation and posterior displacement of the tongue. A rapidly spreading gangrenous cellulitis produces a brawny edema of the suprahyoid region of the neck. The infection begins unilaterally but quickly spreads to include the entire neck. The most common presenting symptoms are oral, neck, and dental pain; neck swelling; odynophagia; dysphagia; dysphonia; trismus; and tongue swelling. Airway patency is the main concern. Ludwig angina is unusual in children.
- Maxillary sinusitis may occur from direct extension of an odontogenic infection or from perforation of the floor of the sinus during extraction.
- Facial-space swelling most often involves the following areas:
    - Submandibular swelling is caused by dental abscesses from the second or third molars. A firm, ill-defined, and often significant-sized swelling is present below the mandible. The inferior border and angle of the mandible are difficult to palpate.

- Sublingual swelling is caused by any lower tooth whose apex is above the mylohyoid muscle attachment (ie, incisors, canines, premolars, mesial roots of the first molar). Infections produce a unilateral elevation of the floor of the mouth near the offending tooth but can spread across the midline, causing pain, dysphagia, and an elevation of the base of the tongue, leading to potential airway compromise.
- Buccal swelling originates from infected maxillary or mandibular molars. Clinically, infection produces a large tender swelling of the cheek without trismus. Boundaries for this type of infection may extend from the philtrum of the lip, to the border of the parotid, and up to the eye.
- Less frequently involved facial-space swellings include submental, masticator, canine, lateral pharyngeal, and retropharyngeal.

Prognosis

- The prognosis is excellent with proper incision, drainage, antibiotic therapy, tooth extraction, root canal therapy and follow-up care.

Patient Education

- Most dentoalveolar abscesses are preventable.
  - Inquire if drinking water is fluorinated. If not, counsel parents about fluoride supplementation

Instruct patients about proper dental hygiene, including brushing teeth after meals, flossing, and regular dental check-ups.