Management of Acute Oral Infection – Part 1
A Peer-Reviewed Publication
Written by Jeff Burgess, DDS, MSD

Abstract
This is a two part course on the management of acute oral infections. The first part focuses on microbiology basics, triaging patients with dental infection, anatomic and laboratory basics that need to be considered when treating dental infection and the treatment of acute dental abscess including surgical, antibiotic and palliative measures. Section two focuses on the treatment of other oral infections caused by fungal, viral and bacterial organisms.

Educational Objectives
At the conclusion of this educational activity participants will be able to:
1. Describe the factors affecting oral microbiology.
2. Identify the clinical features associated with serious dental infection.
3. Describe the various strategies for treating acute dental abscess.
4. Implement appropriate antibiotic and pain medication management for the dental abscess patient.

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Author Disclosure
Jeff Burgess, DDS, MSD, has no potential conflicts of interest to disclose.

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Abstract
This is a two part course on the management of acute oral infections. The first part focuses on microbiology basics, triaging patients with dental infection, anatomic and laboratory basics that need to be considered when treating dental infection and the treatment of acute dental abscess including surgical, antibiotic and palliative measures. Section two focuses on the treatment of other oral infections caused by fungal, viral and bacterial organisms.

Introduction
Periapical abscess occurs frequently. Results of a nine year retrospective study (2000-2008) of hospital admissions indicates that over 61,000 hospitalizations in the United States were directly related to dental infection in the form of periapical abscess. Sixty-six patient deaths were attributed to these infections. In the year 2006 alone, there were a total of 403,149 hospital emergency department visits related to pulp or periapical infections with the average age of the patient 32.9 years. Although there is a current knowledge gap related to the global incidence of oral infection, the available literature indicates that other developing countries are experiencing significant numbers of disease. Given that dentists are often the first line of defense for patients with emerging odontogenic infections, it is imperative that they be prepared to evaluate and treat problems before they become serious enough to warrant hospitalization.

The Complexity of Oral Infection

Microbiology Basics
Oral mucous membranes are naturally colonized by a vast number of microbial organisms that include both pathogenic and non-pathogenic bacteria as well as fungal organisms. In addition, there are many transient organisms that can cause infection including several viruses. Some of the opportunistic microorganisms in the oral cavity that can also cause systemic versus oral disease include Streptococcus pneumoniae, Klebsiella pneumoniae, Escherichia coli and Staphylococcus aureus.

With respect to the teeth, bacterial interactions are complex within the various dental microenvironments and within each biofilm substrate. Biofilm, a combination of many types of bacteria, extracellular DNA, protein and polysaccharides, builds up quickly in the mouth. It may contain up to $10^{11}$ microorganisms/mL if not removed within several days. Interaction of bacterial types within a biofilm may either enhance or suppress metabolic activity that leads to dental infection. Apical periodontal infection and marginal periodontitis has been associated with 200 to 500 bacterial species.

Many factors regulate the number and types of oral bacteria within biofilm including; general exposure, saliva, hygiene, bacterial retention and interaction, the complexity of the flora, native resistance and diet. For example, a diet rich in carbohydrate (e.g. refined sugar) favors bacteria such as Streptococcus mutans, the organism that causes dental caries. Diet consistency is also important as coarser foods eliminate particles that can sustain microorganisms. Oral bacteria appear to prefer specific regions of the mouth in terms of tissue adherence; for example, Streptococcus mutans and Streptococcus sanguis typically adhere to hard surfaces, while Streptococcus salivarius is found primarily on the tongue.

Another factor impacting oral microbial population is systemic disease. Conditions such as malnutrition, alcoholism, diabetes, cystic fibrosis, renal failure, the lymphoproliferative disorders, heart failure and chronic lung disease can compromise host defense mechanisms. The compromising of immune function can lead to a reduction in phagocytic activity, pulmonary clearance and circulation, among other effects. Immunosuppressant medications that are cytotoxic, including steroids, also reduce host defense mechanisms and increase the risk of infection. Prolonged systemic antibiotic therapy reduces normal bacterial flora, resulting in the selection of resistant flora and/or the emergence of competing fungal organisms. Other factors associated with oral infection include; age, drug abuse, behavioral considerations, the family and social environment and the patient’s psychological status.

A further consideration related to oral infection is the concept of virulence. Virulence refers to the characteristics of the bacteria or virus that are harmful to the person including how invasive the organism is and whether harmful toxins or other enzymatic or metabolic products are produced in the course of the infective process. With infection there is an inter-play between microbe virulence, population and host defenses. The latter includes not only beneficial salivary constituents but what is termed the mucosal immune system. This includes several functions. One is the production of lymphoid cells producing immunoglobulins (predominantly IgA and with increasing inflammation, IgG). In addition there are serum proteins released as a result of inflammation such as histamine, prostaglandins and lymphokines, among others. There are also cellular defenses dependent on receptors, phagocytes, lymphocytes such as B and T cells and the oral mucosal innate lymphoid cells. The mucosal immune system is important in the prevention of oral and systemic infection. For more information about the mucosal immune system the reader is referred to the many published scientific reviews on the subject.
The importance of Triage

The dental clinician benefits from the fact that most acute oral infections are self limiting and can be managed with minimal intervention. However, some types of oral infection can be associated with significant morbidity and even mortality. Thus it is incumbent on the treating clinician to understand the importance of the history and clinical signs suggesting the possibility of serious disease and triage the patient appropriately. For example, a patient with facial paleness reporting a rapidly increasing swelling under the jaw and into the neck or superior into the eye (suggesting spread beyond the oral cavity) coupled with other local and systemic symptoms such as changing pain quality (e.g. change of pain from a mild ache to a severe throb), severe trismus, breathing and swallowing difficulty, voice changes, dehydration, fever (with chills or cold sweats), a thready pulse and lethargy or altered consciousness should be considered for immediate treatment and/or oral surgical or medical referral as these clinical signs and symptoms indicate systemic toxicity.

Some Anatomic and Laboratory Considerations

A basic understanding of head and neck anatomy including the location of lymph nodes and fascial spaces is useful in determining the relative risk associated with infection. Lymph nodes that are tender, enlarged, indurated or fixed suggest significant infectivity. Infection and swelling that involves the infratemporal or parotid space, the pterygomandibular, parapharyngeal (lateral pharyngeal and retropharyngeal), peritonsillar and cervical spaces is considered high risk and warrants referral. Ludwig’s angina is a term used to describe a life-threatening condition in which there is a massive cellulitis in multiple regions including the sublingual, submandibular, submental and pharyngeal fascial spaces. Clinical signs include displacement of the tongue upwards and backwards, bilateral submandibular swelling extending inferior into the anterior neck to the clavicles and swallowing difficulty. The patient will have a fever and appear ill.

Infratemporal space infection can result in meningeal irritation so patients with this type of involvement should be monitored carefully for signs of altered central nervous system function. A more complete review of anatomical data can be found in several texts devoted to infections of the oral and maxillofacial regions. 11

In principle, the treatment of any oral infection should begin with a confirmation of the involved microorganism(s) by way of laboratory assessment prior to initiation of therapy. This provides the greatest precision in selecting appropriate antibiotic coverage. However minor oral infections can be effectively managed empirically without culture information if attention is paid to three important considerations: where the infection came from, the involved anatomy and the most likely bacteria involved. For example, most oral bacterial infections are odontogenic, superficial in nature and are caused, in approximately 80 percent of patients, by Streptococcus bacteria; however, infection by Staphylococcus, Neisseria or other anaerobic bacteria can also occur, though with much less frequency. As a general rule, culture is considered essential if there has been spread of infection to one or more fascial planes of the head and neck, initial antibiotic treatment has failed to contain the infection, the patient’s underlying health is compromised by other health problems that affect immune response or the patient shows evidence of systemic toxicity. Of the various examination techniques that should be considered in assessing infective organisms in office, the Gram stain may be the most useful procedure as it provides immediate results and allows determination of the type and numbers of involved species. Techniques for assessing purulent material include opening into an infected tooth and collecting the emerging pus, transmucosal aspiration and tissue biopsy. Unless the treating clinician is competent with in-office collecting techniques it is best to refer to a specialist for collection, further lab evaluation and the subsequent dental/medical treatment of the bacterial infection.

The Management of Dental Abscess

The best management of a dental abscess is the prevention of caries that ultimately leads to inoculation of the dental pulp by invading bacteria. ADA practice parameters published in 1994 12 specify, among other things, that treatments designed to “reduce pulpal symptoms and/or protect the pulpal tissue of the tooth with pulpitis” should be utilized by the dentist. The document indicates that dental restoration, chemotherapeutic modalities, endodontic therapy, “nonsurgical approaches”, tooth extraction and surgery are those services that should be considered by a dentist for management of dental abscesses. Nonsurgical approaches include prescribing antibiotics. With acute infection, prior to the initiation of antibiotic, purulence must be eliminated via surgical drainage.

Incision and Drainage

Drainage of purulence from an infected region can be accomplished through penetration of the tooth, tooth extraction or via surgical incision. In the latter procedure the tissue is incised and spread with a hemostat (insert, open/spread and remove maintaining the spread). This is followed by placement of a small Penrose drain. With insertion, the tubing should be folded over and the fold grasped with the hemostat and placed into the wound. The ends can then be cut off. The Penrose drain is sutured into place to allow maintenance of the opening. The basic idea is to decompress, decontaminate and produce drainage. Decontamination can be accomplished by rinsing the abcessed region with saline solution (typically 60-100mls). Chlorhexidine can be combined with the saline if necessary. The patient should be advised not to touch the area after surgery, to apply firm direct pressure for 30-60 minutes using a moistened tea bag to control bleeding, to avoid the application of ice and not to apply heat until three days have passed to avoid spread of the infection.
Antibiotics

In most instances antibiotic should only be prescribed for dental abscess when infection has spread beyond the tooth apex and there is significant local involvement and/or systemic symptoms. The choice of antibiotic is largely empirical as at present the science supporting the efficacy of one antibiotic or treatment regimen over another is confused by a number of methodological problems associated with the published research. These include issues related to study design and choice of outcome measures. Once there is spread of infection the involved bacteria typically include both mixed anaerobic and aerobic organisms. This change in bacterial composition is a complication that can significantly alter the relative virulence of the infection and further cloud treatment decisions with respect to choice of antibiotic. As a general rule, bactericidal antibiotics should be utilized to treat dental abscess.

An important consideration when using antibiotic is potential resistance. The best approach for limiting antibiotic resistance is to prescribe a high dose of antibiotic for as short a course as possible. Historically, antibiotic usage has included prescription of the penicillins including penicillin V. Amoxicillin is favored as the drug of first choice in some localities. With respect to relative efficacy, in a study of 112 patients with dentoalveolar infection treated with penicillin V, amoxicillin or amoxicillin with clavulanate, no difference was observed in terms of outcome.

If there is a history of antimicrobial resistance, either metronidazole (although the drug itself has also been associated with increased resistance) or amoxicillin combined with clavulanic acid should be considered. For individuals allergic to the penicillin based antibiotics, clindamycin can be prescribed. Clindamycin is effective against both aerobic and anaerobic bacteria and is able to penetrate bone readily. Azithromycin (Zithromax®), a structural derivate of erythromycin that has a broader spectrum of activity, increased bioavailability and fewer GI effects, has also been recommended as an option for the treatment of mild to moderate bacterial infection. For the patient with identified cephalosporin or penicillin resistant Gram negative bacteria, cefoxitin (Mefoxin®) may be a good choice as it has also been shown to be effective.

Antibiotics may also need to be prescribed to children with infection, although the dosage will be less based on weight. The American Academy of Pediatric Dentistry has published prescription guidelines children needing antibiotic coverage. Problems that are considered reasonable to treat with systemic antibiotics include dental trauma such as that involving tooth avulsion, intraoral laceration contaminated by extrinsic bacteria, open fractures, TM joint injury and acute swelling associated with dental infection.

Published dosage literature indicates that in children under 12 with dental abscess, Penicillin VK should be prescribed in a dose of 25-50mg/kg body weight delivered every 6 to 8 hours for at least seven days. For adults the dose is 500mg dosed every six hours for seven days. For clindamycin, in children, the recommended dose is 8.25mg/kg body weight delivered in 3-4 equally divided doses. The adult dose is 150-450 mg q6h for at least seven days (maximum dose is 1.8g/day). The recommended child dosage for Cephalexin (Keflex®) when infection is not severe is 25-50 mg/kg/day in divided doses (q6h). When severe, the recommended dosage is 100mg/kg/day in divided doses (q6h) with the maximum dose 3 g in 24 hours. The adult dose is 250-1000mg q6h with maximum dosage of 4 g per day. For amoxicillin the dose for a child less than 40kg is 20-40mg/kg/day in divided doses (q8h) and for those children over 40kg, 250-500mg q8h or 875mg every twelve hours (q12h) for at least seven days with a maximum daily dose of 2 grams. The adult dose is the same as that recommended for children over 40kg. The recommended dose of amoxicillin/clavulanic acid (Augmentin®) prescribed in children that are under 40kg is 20-40mg per kilogram per day (kg/day) in divided doses (q8h). For children over 40kg and adults the recommended dose is 250-500 mg delivered every eight hours (q8h) or 875 mg q12h for at least 7 days (with the maximum daily dose 2 grams).

Another way to look at the management of dental infection is to treat based on time of involvement. For example, emergent infection can be treated with penicillin VK, amoxicillin, clindamycin or a first generation cephalosporin. If there is no improvement within the first 24 to 36 hours, clindamycin or amoxicillin/clavulanic acid combination (Augmentin®) may then be considered. Another consideration is to begin antibiotic therapy with a loading oral dose two times the standard maintenance dose so that a therapeutic blood level is achieved faster than what would be expected via the prescription of an initial maintenance dose.

The penicillin based antibiotics should be used cautiously in patients with compromised renal function or in those individuals with a history of seizures or significant GI hypersensitivity to antibiotics. Mild adverse GI reactions are not uncommon with the penicillin antibiotics and can include nausea and diarrhea. While allergy is relatively rare (estimated to be from 0.7-10 percent) it can take the form of minor skin rashes or more severe angioedema reactions or potentially life threatening anaphylaxis. Patients with reported history of allergy should not be prescribed a penicillin based antibiotic. In the patient with history of delayed hypersensitivity reactions (e.g. rash), a cephalosporin should be considered instead of penicillin. Clindamycin, recommended for use in patients with significant allergy, can cause nausea, vomiting, diarrhea and abdominal pain. It has also been associated with the development of pseudomembranous colitis. Hence it is not recommended in patients with the above condition as well as in patients with regional enteritis or ulcerative colitis. In addition, clindamycin should be used cautiously in the patient with liver disease. In the patient with severe kidney disease amoxicillin and the first and second generation cephalosporins (e.g. first: cefadroxil, cephalixin, and cephadine; second: cefaclor and
ciprofloxacin) should also be used cautiously. Another additional concern related to antibiotic coverage in females using oral contraceptives is the increased risk of pregnancy. A patient at risk (i.e. sexually active) should be told that antibiotics can reduce the effectiveness of oral contraceptives for up to one week beyond the last dose of antibiotic taken. Prolonged use of all of the antibiotics may produce an oral yeast infection. Listed precautions, contraindications, potential risks (e.g. in pregnant patients) and known drug interactions (e.g. NSAIDS reduce the bioavailability of some but not all antibiotics) should be reviewed prior to the prescription of an antibiotic. It should also be fully appreciated that improper prescription of antibiotic continues to be a prime contributor to the development of antibiotic resistance.

Palliative Care
In addition to surgery and antibiotics, the management of acute dental infection should incorporate palliative measures. No special precautions need to be considered for hydration or nutrition unless retropharyngeal swelling prevents intake; however, in this case the patient should already have been referred to hospital. A soft diet is recommended during recovery from incision and drainage or tooth extraction. Pain management includes OTC pain medication as well as prescribed medications. Unfortunately, with exception of a recent FDA drug safety warning related to acetaminophen, there are currently no published authoritative guidelines for managing post-procedural dental pain.

The analgesic effect of commonly prescribed pain medications has been evaluated in multiple Cochrane reviews. Drugs that are prescribed for acute pain include acetaminophen, aspirin, and NSAIDS. Cox-2 inhibitors are also effective in managing acute pain and are purported to reduce potential adverse reactions. Moderate pain can be controlled by opioids or tramadol combined with an acetaminophen or an NSAID. A recent systematic review indicates that a 50% or greater reduction in severe pain following oral surgery can be achieved by 400mg ibuprofen, 50mg diclofenac, 120mg etoricoxib, 60mg of codeine with 1000mg acetaminophen, 400 mg celecoxib (Celebrex®) and 500/550mg of naproxen. Pain relief greater than eight hours can be achieved with etoricoxib 120mg, diflunisal 500mg, oxycodone 10mg plus acetaminophen 650mg, naproxen 500/550mg, and celecoxib 400mg. The study authors note that adverse events were more likely to be associated with aspirin and the opioids.

Over the counter medications taken for pain are sometimes misused by patients. Prescribed medications combined with OTC medications can lead to toxicity. The FDA recently published (2014) a drug safety caution regarding the prescription of opioids containing acetaminophen because of possible liver toxicity (from the acetaminophen). The maximum amount of acetaminophen that is now recommended to be included in combination with the opioids is 325 mg when taken every four to six hours. Support for this alert comes in part from a study of unintentional acetaminophen overdose. In data collected by querying the French Pharmacovigilance database over a 9-month period, 13 patients were identified as having mild unspecific clinical symptoms and 4 of 10 had abnormal liver enzyme activity. The median dose of acetaminophen was 137mg/kg per 24 hours. Opioids also have potential for misuse. It is estimated that dentists prescribe approximately 12 percent of opioids in the United States. The potential for misuse and toxicity of all pain relievers can be reduced by limiting the amount prescribed, pre-assessment for potential drug interactions, careful prescribing in patients with co-existing medical problems (e.g. liver abnormality, kidney disease, stomach ulcers, alcoholism, anticoagulant therapy, hemorrhagic disorders, allergy, depression) and pregnancy, patient education, monitoring for substance abuse if opioids are prescribed and appropriate referral if abuse is suspected.

For the pregnant or nursing female patient with abscess, physician consult is recommended before prescription of ibuprofen, codeine, hydrocodone, oxycodone and propoxyphene. Aspirin and ibuprofen should be avoided throughout pregnancy. Acetaminophen can be prescribed any time during pregnancy. Penicillins, erythromycin (except the estolate form) and cephalosporins can be taken during pregnancy, but tetracyclines and clindamycin should be avoided. The prescription of sedative hypnotics should also be avoided.

Conclusion
This first part of this course on the management of oral infection has focused on general topics related to evaluating infection and the management of dental abscess. The treatment of infection in the oral and maxillofacial region is one of the more important responsibilities that a dentist faces clinically. An understanding of oral microbiology, laboratory assessment tools, head and neck anatomy, the importance of triage based on how a patient presents and treatment strategies including the appropriate prescription of medication is of paramount importance in avoiding potential morbidity and mortality.

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Author Disclosure
Jeff Burgess, DDS, MSD, has no potential conflicts of interest to disclose.
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Questions

1. Which of the following bacterial species found in the mouth are considered transients?
   a. Streptococcus pneumonia
   b. Klebsiella pneumonia
   c. Escherichia coli
   d. All of the above

2. Periodontal infection and marginal periodontitis has been associated with how many bacterial species?
   a. Less than 100
   b. 100 – 200
   c. 200-500
   d. 500-700

3. Which of the following factors is associated with regulation of the number and types of oral bacteria?
   a. The complexity of the flora
   b. Native resistance
   c. Both a and b
   d. Neither a or b

4. Streptococcus salivarius is found primarily on the:
   a. Hard surfaces
   b. Tongue
   c. Both a and b
   d. Neither a or b

5. Which of the following medical conditions is not likely to impact oral microbial populations?
   a. Skin disease
   b. Cystic fibrosis
   c. Renal failure
   d. Malnutrition

6. With oral infection there is an interplay between which of the following factors?
   a. Microbe virulence
   b. Microbe population
   c. Both a and b
   d. Neither a or b

7. Bacterial virulence refers to:
   a. The invasiveness of the bacteria
   b. The amount of growth of a bacterial organism
   c. The ability of the bacteria to replicate quickly
   d. All of the above

8. Systemic toxicity associated with bacterial infection is indicated by which of the following signs?
   a. Swelling under the jaw and into the neck
   b. Severe trismus
   c. A thready pulse
   d. All of the above

9. In the patient with signs and symptoms suggesting systemic toxicity the dentist should:
   a. Send the patient home with instructions for follow-up care
   b. Immediately refer the patient to hospital
   c. Treat the patient with antibiotic
   d. Extract the tooth immediately

10. Swelling in which of the following fascial planes is considered high risk?
    a. Pterygomandibular space
    b. Peritonsillar space
    c. Infra-temporal space
    d. All of the above

11. Ludwig's angina is a term used to describe:
    a. A problem associated with the heart that can impact infection
    b. A type of allergy associated with bacteria
    c. A life-threatening condition where there is massive swelling in several regions including the sublingual, submandibular and submental fascial spaces
    d. A swelling of the pterygomandibular, infratemporal, and periosteal fascial spaces

12. Which of the following statements is accurate?
    a. Minor oral infections can be effectively managed empirically without initial culture
    b. Culture is considered essential if there has been spread of infection to one or more fascial planes
    c. Both a and b
    d. Neither a or b

13. Bacterial culture is considered essential under which of the following conditions?
    a. Initial antibiotic treatment has failed
    b. The patient shows signs of toxicity
    c. The patient’s underlying health is compromised by other problems that impact immune response
    d. All of the above

14. Which of the following is considered the most useful in-office lab technique for confirming involved microorganisms?
    a. A blood culture
    b. The Gram stain
    c. Both a and b
    d. Neither a or b

15. Which of the following statements is most accurate?
    a. In cases of acute infection with localized swelling without signs of systemic toxicity, antibiotic should be prescribed only after the swelling has been reduced by incision and drainage
    b. In cases of acute infection with localized swelling without signs of systemic toxicity antibiotic should be prescribed initially followed by incision and drainage
    c. In cases of acute infection with localized swelling with signs of systemic toxicity antibiotic should be prescribed and follow-up scheduled
    d. Antibiotic should not be prescribed if tooth extraction results in drainage of acute infection

16. Which of the following should the patient be advised to do following placement of a Penrose drain?
    a. Avoid touching the surgical site
    b. Apply heat only after three days have passed
    c. Both a and b
    d. Neither a or b

17. Which of the following is thought to be the best approach in prescribing antibiotic for acute dental infection to avoid the development of resistance?
    a. Prescribing a high dose for as short a course as possible
    b. Prescribing antibiotic over a prolonged period of time
    c. Prescribing several antibiotics at one time
    d. Alternate day dosing of antibiotic

18. If a patient with an acute dental abscess has a history of antimicrobial resistance to penicillin antibiotic, the drug that is recommended is:
    a. Metronidazole
    b. Cefoxitin
    c. Neither a or b
    d. Both a and b

19. Which of the following statements is true?
    a. Clindamycin is effective against both aerobic and anaerobic bacteria and is able to penetrate bone readily
    b. Azithromycin is a structural derivate of erythromycin that has a broader spectrum of activity, increased bioavailability and fewer GI effects
    c. Both a and b
    d. Neither a or b

20. In prescribing penicillin VK for acute abscess in children the recommended dose is:
    a. 25-50mg/kg body weight dosed every 6-8 hours for seven days
    b. 50-75mg/kg body weight dosed every 6-8 hours for seven days
    c. 25-50mg/kg body weight dosed every 4-6 hours for five days
    d. 50-75mg/kg body weight dosed every 4-6 hours for five days

21. In prescribing penicillin VK for acute abscess in adults the recommended dose is:
    a. 100mg dosed every 6 hours for seven days
    b. 1000mg dosed every 4 hours for 10 days
    c. 500mg dosed every 6 hours for seven days
    d. 500mg dosed every 4 hours for 10 days

22. For clindamycin in children with acute abscess the recommended dose is:
    a. 25-50mg/kg body weight delivered in 3-4 equally divided doses
    b. 8-25mg/kg body weight delivered in 3-4 equally divided doses
    c. 25-50 mg/kg body weight delivered every 10 hours
    d. 8-25mg/kg body weight delivered every 10 hours

23. The recommended dose of clindamycin in adults with acute abscess is:
    a. 500mg q4h for at least seven days
    b. 150-450 mg q6h for at least seven days
    c. 500mg q6h for at least seven days
    d. 150-450 mg q6h for at least seven days

24. The recommended maximum daily dose of cephalaxin prescribed for adult patients with severe acute dental abscess is:
    a. 1 gram in 24 hours
    b. 2 grams in 24 hours
    c. 3 grams in 24 hours
    d. 4 grams in 24 hours

25. If a child under 40kg with an acute dental abscess is prescribed amoxicillin the dose should be:
    a. 20-40kg/day q8h for at least seven days
    b. 10-20kg/day q8h for at least seven days
    c. 250-500 mg q6h for at least seven days
    d. Neither a or b

26. Which of the following statements is accurate?
    a. Amoxicillin dosing is different than the dosing for amoxicillin/clavulanic acid
    b. Amoxicillin dosing is the same as the dosing for amoxicillin/clavulanic acid
    c. Amoxicillin dose for acute abscess in children under 40kg in 250-500 mg q6h
    d. Both amoxicillin and amoxicillin/clavulanic acid should be prescribed for 10 days

27. Which of the following statements is accurate?
    a. Clindamycin should not be prescribed to a patient with regional enteritis, ulcerative colitis or liver disease
    b. Amoxicillin and the first and second generation cephalosporins should be used cautiously in patients with kidney disease
    c. Some prescribed antibiotics can interfere with oral contraceptives
    d. All of the above

28. For the most prolonged pain relief associated with the management of acute abscess which of the following drugs is recommended?
    a. Ibuprofen 400mg
    b. Etoricoxib 135mg
    c. Diflunisal 500mg
    d. Naproxen 500 mg

29. The FDA recently published manufacturing guidelines for the amount of acetaminophen that should be delivered with opioid medication to reduce liver toxicity. This recommended dosage is:
    a. 525mg
    b. 400mg
    c. 150mg
    d. 500mg

30. Which of the following steps can be taken to reduce misuse and toxicity of prescribed pain relievers?
    a. Limiting the amount of drug prescribed
    b. Careful screening for possible drug interactions
    c. Careful prescribing in patients with comorbid medical problems
    d. All of the above
EDUCATIONAL OBJECTIVES

1. Describe the factors affecting oral microbiology.
2. Identify the clinical features associated with serious dental infection.
3. Describe the various strategies for treating acute dental abscess.
4. Implement appropriate antibiotic and pain medication management for the dental abscess patient.

COURSE EVALUATION

1. Were the individual course objectives met?
   Objective #1: Yes No
   Objective #2: Yes No
   Objective #3: Yes No
   Objective #4: Yes No

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.
1. To what extent were the course objectives accomplished overall?
   5 4 3 2 1 0
2. Please rate your personal mastery of the course objectives.
   5 4 3 2 1 0
3. How would you rate the author's grasp of the topic?
   5 4 3 2 1 0
4. How do you rate the instructor's effectiveness?
   5 4 3 2 1 0
5. Was the overall administration of the course effective?
   5 4 3 2 1 0
6. How do you rate the usefulness and clinical applicability of this course?
   5 4 3 2 1 0
7. Please rate the usefulness of the supplemental webliography.
   5 4 3 2 1 0
8. Please rate the usefulness of the course evaluation.
   5 4 3 2 1 0
9. Do you feel that the references were adequate?
   Yes No
10. Would you participate in a similar program on a different topic?
    Yes No
11. If any of the continuing education questions were unclear or ambiguous, please list them.
12. If any of the continuing education questions were unclear or ambiguous, please list them.
13. Was there any subject matter you found confusing? Please describe.
14. How long did it take you to complete this course?
15. What additional continuing dental education topics would you like to see?
16. What additional continuing dental education topics would you like to see?
17. What additional continuing dental education topics would you like to see?
18. What additional continuing dental education topics would you like to see?
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