What Should Dentists Know about Medicine...

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Learning Outcomes
1. Medical Conditions and Their Impact on Dental Care.
3. The Special Care Needs Patient.
7. Infections, Infectious Diseases and Dentistry.

Pharmacology & Therapeutics in Dentistry
• We are all dealing with an increasing ageing population who are retaining their teeth well into old age. A large proportion of this population will be taking one or two medicines to enable them to continue with their normal daily activities.
• Certain drugs are the mainstay of dental practice. These include antibiotics, analgesics, local anesthetics, and agents to control anxiety.

Pharmacology & Therapeutics in Dentistry
• Many of our patients are medically compromised and this raises three important issues with respect to the delivery of routine dental care:
  1. Can the patients medication cause an adverse reaction in the mouth and associated structures?
  2. Can the drugs that I wish to prescribe interact with their current medication?
  3. What medical emergencies are likely to arise in this population and how should they be dealt with?

Antibiotics
• Antibiotics are chemical substances produced by microorganisms, which have the capacity, in dilute solutions, to inhibit the growth of (bacteriostatic) or to destroy (bactericidal) bacteria and other microorganisms.
• They are hugely significant compounds in medical practice with lifesaving properties.
Antibiotics

- However, they are also the subject of intensive abuse, both over-prescription and also administration for inappropriate reasons. This has led to the worldwide problem of bacterial resistance.

- These drugs are used extensively in dentistry for two main reasons:
  1. to prevent an infection (chemoprophylaxis) and
  2. in the treatment of an infection.
  3. Their use in the management of periodontal diseases is often as an adjunct to conventional treatment.

Antibiotic Therapy in Managing Odontogenic Infections

- Chemotherapy is the use of synthetic, semi-synthetic, and naturally occurring chemicals that selectively inhibit specific organisms causing disease.

- The term antibiotic means "against life" (anti = against and bios = life).

- The clinician must first diagnose the cause of the infection and determine the appropriate dental treatment that may include multiple modalities: initiation of endodontic therapy and pulpectomy, odontectomy, or surgical or mechanical disruption of the infectious environment.

Antibiotic Therapy in Managing Odontogenic Infections

- The determination as to whether conjunctive antibiotic therapy is indicated is based on several factors, including:
  - host defence mechanisms,
  - host underlying medical condition,
  - severity of the infection,
  - magnitude of the extension of the infection, and
  - expected pathogen.

- Because of the lack of circulation within dental pulp, the normal host defences (inflammation and immunity) are compromised and the root canal system becomes a unique environment to harbour a limited group of bacteria.

Antibiotic Therapy in Managing Odontogenic Infections

- An abscess, a fibro-collagenous layer of tissue, may form around an accumulation of PMNs in the region of infection, isolating it from surrounding tissue.

- Because the host may be unable to resorb the abscess and resolve the infection, RCT, extraction, or other surgical therapy is needed to remove the cause.

- Recent studies demonstrate that a localized abscess may be an inflammatory/immunologic phenomenon and in some patients represents a non-bacterial cause for the periapical localized clinical symptoms (Turner et al. 1993, Letter et al. 1999).
**Antibiotic Therapy in Managing Odontogenic Infections**

- Oral antibiotic as **primary and sole treatment** for an infection of odontogenic aetiology is **highly questionable** because of the lack of effective circulation in a necrotic pulp system and an abscess.
- This concept reinforces that surgery of some kind is the **primary** treatment of an infection of odontogenic source, and antibiotic therapy is **adjunctive**.

**Mechanism of Action**

- Antibiotics have **various effects** on bacteria based on their pharmacologic action.
- The **most commonly used antibiotics** in dentistry (penicillins, cephalosporins, and vancomycin) work by attacking the cellular processes necessary for the bacterial cell wall synthesis while having no effect on host cells.
- Other **commonly used antibiotics** in dentistry exert their effect by inhibiting translation needed for bacterial **protein synthesis** (erythromycins, tetracyclines, aminoglycosides, and chloramphenicol).

**Antibiotic Therapy in Managing Odontogenic Infections**

- Many clinicians, however, do treat odontogenic infections primarily with antibiotics.
- Endorsement of a philosophy of care that antibiotic administration is **low risk and potential high yield cannot** be substantiated, especially with the current concern regarding bacteria that have developed resistance to current antibiotic therapy.
- **Antibiotics should not be prescribed as a substitute for proper dental treatment!**

**Mechanism of Action**

- **Metronidazole**, indicated in dentistry for anaerobic bacterial infections, is a direct-acting agent that binds and degrades DNA in bacteria.
- Still other antibiotics (ampicillin B, polymixins) act by inhibiting cell membrane function.
- Further development in determining the difference between host and bacterial protein synthesis may lead to the development of alternative sensitive and specific antibiotic therapeutics.

**Mechanism of Action**

- **New synthetic antibiotics** for potential use in dental-related infections are the quinolones (ciprofloxacin, nalidixic acid, and methenamine) and the fluoroquinolones (ciprofloxacin, merofloxacin, and ofloxacin).
- These agents should be considered when culture results have revealed that these antibiotics are warranted.
- They have a broader spectrum of action and inhibit bacterial DNA replication (fluoroquinolones inhibit DNA gyrase that inhibits the uncoiling of DNA for replication).
- The **limited indication and the high cost** of these drugs is a serious consideration before prescribing.
- They are rarely used in the management of odontogenic infections!

**Mechanism of Action**

- The emergence of resistant bacteria is growing.
- The microbial ecosystem is engaged in trying to remain opportunistic and by mutating and adapting, RESISTANT STRAINS DEVELOP:
  - Specific enzymes can destroy the antibiotic once it has entered the bacteria,
  - permeability into the cell wall can become difficult, and
  - an alteration of certain targets that the drug attaches to become apparent.
- Mutations in any of these functions can result in loss of sensitivity and specificity to any antibiotics.
**Mechanism of Action**

- Bacteria have **two major advantages** that allow them to **survive and prosper** in the host system.
- They replicate quickly and can **produce multiple mutations spontaneously** — once a mutation is present, all bacteria offspring generally acquire the new trait.
- Genetic transfer is another process through which bacteria possess — it allows families of bacteria to share desirable traits with a wide range of microbial species.
- It has recently been found that antibiotic-resistant genes can be passed among **EVERY** species of bacteria!

**Indications for Culturing**

- Rarely required in managing odontogenic infections, but is necessary to resolve a progressive infection.
- Culturing methods have improved over the years; however, bias may occur during the isolation and culturing of bacteria.
- Many anaerobic microbes are killed quickly when exposed to oxygen.
- Needle aspiration techniques and transfer under inert gas should be used when culturing for aerobic and anaerobic bacteria in the oral cavity.
- The antibiotic is then chosen to treat the predominant microbe found in the culture if empiric therapy has failed.

**Indications for the Use of Antibiotics**

- Clinical effectiveness in treating an infection is based on **correct diagnosis**.
- Once the source has been established, **dental procedures should be used immediately to disrupt the microorganisms involved**.
- Antibiotic therapy should be used as an **adjunct** to dental treatment and never used alone as the first line of care.

**Indications for the Use of Antibiotics**

- The choice of an antibiotic should be based on **knowledge of the usual causative microbe**.
- The empiric approach usually results in **favourable outcomes**.
- **Penicillin is the first choice in managing odontogenic infections** because it is susceptible to gram-positive aerobes and intraoral anaerobes, organisms found in alveolar abscesses, periodontal abscesses, and necrotic pulps.
- Patients with **compromised host defence systems** may indicate antibiotic therapy in conjunction with their dental treatment — organ transplant patients and patients with poorly controlled diabetes.
Antibiotics of Choice

- **Penicillin** is still the gold standard in treating dental infections.
- Penicillin has contributed to a dramatic decrease in mortality in serious odontogenic infections such as Ludwig's angina and diffuse orofacial cellulitis.
- Aerobic and anaerobic microorganisms are susceptible to penicillin (Sabesan C et al. 1995).
- Pen VK is the obvious choice over Pen G because of the greater oral absorption by Pen VK.
- Pen VK is bactericidal and active against replicating bacteria often encountered in odontogenic infections (Smith CH et al. 1992).
- The side effect encountered most often in penicillin is hypersensitivity, which is found in roughly 1–5% of the population.

Antibiotics of Choice

- If an antibiotic is warranted, providing adequate blood levels is essential.
- A loading dose of 2000 mg Pen VK approximately 1 hour before beginning surgical therapy followed by 500 mg every 6 hours for 5–7 days is optimal.
- If the infectious signs and symptoms continue beyond 5–7 days, additional antibiotic therapy may be indicated.

Antibiotics of Choice

- Another alternative to treat an infection that is not responding to penicillin is clindamycin.
- It MAY be used as a first-line antibiotic if the infection is deemed to be more mature and potentially has spread to bone.
- Indiscriminate use should be avoided.
- A loading dose of 600 mg may be administered approximately 1 hour before surgical therapy begins, followed with 300 mg every 6 hours for the duration of the infection (5–7 days).

Antibiotics of Choice

- Certain bacteria can develop resistance to the penicillin because of the β-lactamase enzymes that inactivate the penicillin.
- A combination antibiotic consisting of a penicillin and clavulanic acid, a β-lactamase inhibitor, or the use of clindamycin, an antibiotic specific for infections caused by staphylococci, streptococci, peumococci, and other bacterial species may be necessary in an infection not responding to penicillin alone.
- Cephalexin, cephadine, or cephadrin (first generation cephalosporin) provide a SLIGHTLY broader antibiotic spectrum, especially in gram-positive organisms are suspected.
  - Cephalosporins beyond the first generation are not indicated in most odontogenic infections!
  - Appropriate diagnosis and surgical therapy COUPLED with the empiric use of antibiotics and sound clinical judgment in assessing improvement is the STANDARD of care in the management of odontogenic infections.
**Antibiotic Preparations for Odontogenic Infections**

1. Pen VK 500 mg every 6 hours, tablets: 125 mg, 250 mg, and 500 mg
2. Amoxicillin 500 mg every 8 hours, tablets: 250 mg
3. Metronidazole 500 mg every 8 hours, tablets: 250 mg and 500 mg
4. Clindamycin 150–300 mg every 6 hours, capsules: 75 mg and 150 mg

**A Step-by-Step Approach for Diagnosing & Treating Odontogenic Infections**

5. Radiographic examination is an *adjunct* in determining dental disease. Most pathologic states in pulpal tissue are *not* visible on a radiograph. Only when the cortical plate has been resorbed does the dental radiograph become helpful in identifying disease.

6. Treatment planning is *discussed with the patient* once the nature of the pathosis has been identified. *Determine the difficulty of the case and whether handling it is within your comfort level or if the case should be referred.* The clinician should calculate a prognosis for each case including a *contingency prognosis* if problems are encountered after treatment has begun.

**A Step-by-Step Approach for Diagnosing & Treating Odontogenic Infections**

7. **Designing the appropriate dental treatment** should be rendered: *emergency* and *definitive treatment.*

8. **Case selection completed** and referral to a specialist if found that the patient’s needs are beyond the *capacity* of the clinician’s capabilities.

9. **Appropriate analgesics** and postoperative instructions given.

**Antibiotic Myths**

- There are many myths that pervade the clinical practice of dentists regarding the diagnosis and management of odontogenic infections.
- These behaviours have been *observed repeatedly in the course of clinical practice.*
- To dispel the continued improper use of antibiotics in the dental environment, these myths are exposed in this lecture.
**Myth #1: Antibiotics are Not Harmful**

- The unnecessary administration of antibiotics is not without risk. The risks for *pseudomembranous colitis* and *allergic reaction* must be taken into consideration before prescribing.

- Many antibiotics can *disturb the normal microbial flora of the gastrointestinal tract*, which may cause severe diarrhea and potentially fatal *pseudomembranous colitis*.

- These reactions occur more frequently when using *oral administration* of antibiotics versus *parenteral administration*, based on variation of hepatic circulation of the drug associated with the two mechanisms of administration.

**Myth #1: Antibiotics are Not Harmful**

- Various degrees of allergic responses have been reported with the use of *common* antibiotics used for odontogenic infections.

- *Dermatologic reactions* such as rash or hives represent *milder reactions* whereas life-threatening anaphylactic reactions have occurred.

- It has been estimated that 100-300 *FATAL allergic reactions to penicillin occur annually in the USA and UK* (Bigby AH et al, 1977; Turck M 1973).

- For an allergic reaction to have occurred, previous exposure to the drug is necessary. This may have occurred by the patient receiving the antibiotic in beef, milk, or poultry products where the uncontrolled use leaves a residue of the antibiotic in food products.

**Myth #2: Doses & Duration of Antibiotic Treatment Should be Nonspecific & Variable for Most Odontogenic Infections**

- *INAPPROPRIATE DOSING* of an antibiotic can result in *INADEQUATE CONCENTRATION* of the drug at the site of the infection.

- This practice can promote recurrence of infections and development of resistant bacterial strains:
  1. As vulnerable microorganisms die, the number of surviving microbes increases, making each successive bacterial generation *better equipped to resist future antibiotic challenges*.
  2. This selection process accelerates when the drugs are administered in *doses small enough to allow stronger bacteria to survive the antibiotic assault*.
  3. Eventually, strains of bacteria are created that can *resist antibiotic therapy*.

**Myth #2: Doses & Duration of Antibiotic Treatment Should be Nonspecific & Variable for Most Odontogenic Infections**

- *PATIENT COMPLIANCE* is another complication in effective treatment.

- The drug may be too expensive or not covered by a third party payer (insurance) or unavailable in Bahrain and the prescription remains unfilled.

- Dosing frequency may be complicated.

- The compliance issue most often observed is missed doses after *clinical symptoms have subsided*.

- Another challenge to compliance is the *untoward or unexpected side effects* that can occur when taking antibiotics.

- In all these cases, mutated microbes can flourish and cause serious consequences.
Myth #3: Antibiotics are Always Indicated When Treating Dental Pain (Odontalgia)

- Irreversible pulpitis is a result of severe inflammation of the pulp system.
- A large quantity of inflammatory mediators and neuropeptides are present, which results in vascular permeability and elevated capillary pressure.
- Because of the hard tissue in which the pulp is encased and its low-compliance environment, the pulp is unable to neutralize these mediators.

Myth #4: Clindamycin is a First Line Drug for Infections

- Clindamycin has less antigenic potential than penicillin, but has a slightly higher incidence of gastrointestinal adverse effects caused by the overgrowth of Clostridium difficile.
- Recent studies show that colitis is a possible adverse effect of most antibiotics, especially broad-spectrum penicillins and cephalosporins.
- This condition is often observed in recently hospitalized elderly patients who have had previous abdominal complaints and received high doses of an antibiotic.

Myth #5: If a Periapical Radiolucency, Sinus Tract, Fistula, or Localized Abscess is Present, Antibiotics are Always Indicated

- A periapical radiolucency, sinus tract, or fistula indicates a NECROTIC PULP – a vital pulp cannot exist with any of these objective signs.
- Because there is no significant vascularization to necrotic canals or abscesses, the effectiveness of antibiotic therapy is highly questionable – therapeutic concentrations of an antibiotic at the site of the infectious process cannot be obtained.
- A localized abscess (swelling) begins from the necrotic debris in the root canal and diffuses into the surrounding bone at the apex of the tooth, resulting in a swelling or sinus tract formation.

Myth #6: Antibiotics are Always Indicated When Treating Dental Pain (Odontalgia)

- Pain is often caused by the release of these mediators that lower pain thresholds and cause spontaneous firing of sensory nerves.
- Pain of irreversible pulpitis may be sharp, dull, localized, or diffuse, and may last minutes to days.
- Chemo-mechanical removal of the pulpal tissue is the treatment of choice.
- An old but often popular idea was the use of intra-canal medicaments to help alleviate the patient’s pain complaint. This concept can be dismissed as it is useless.

Myth #7: Antibiotics are Always Indicated When Treating Dental Pain (Odontalgia)

- Cleaning and shaping of the root canal with the use of sodium hypochlorite, a dry cotton pellet, and temporization of the access is the desired treatment (Hayashi & Kato, 1983).
- Odontectomy may be indicated if the tooth is deemed to be non-restorable.
- Appropriate analgesics may be indicated but antibiotics are not.
- The patient’s condition should improve rapidly once the source of the infection is eliminated. If the problem persists, consultation with a specialist may be warranted.

Myth #8: Clindamycin is a First Line Drug for Infections

- Clindamycin is an antimicrobial reserved for anaerobic, late stage odontogenic infections.
- It exhibits bacteriostatic activity, thereby inhibiting protein synthesis.
- Clindamycin should be considered ONLY as the first line of choice if the patient has had an allergic reaction to penicillin or if it can be determined that an osteomyelitis caused by anaerobic microbes is present – It is an excellent choice for treating serious intraosseous infections (Sabattini CR et al, 1974)
Myth #5: If a Periapical Radiolucency, Sinus Tract, Fistula, or Localized Abscess is Present, Antibiotics Are Always Indicated

- Controlled clinical trials using penicillin, placebo, and neither medication in patients presenting with pulpal necrosis and periapical pain or localized swelling showed no differences between groups in the course of recovery or symptoms after debridement of the root canal system (Fouad et al. 1996).

- Local dental treatment is most important in resolving the infection. Root canal treatment or extraction if the tooth is not restorable accomplishes the removal of the irritants and drainage of the swelling. Incision and drainage is indicated if there is no drainage obtained from the tooth or tooth socket.

Myth #6: Antibiotics Must Be Given for Several Days Before Implementation Of Surgical Treatment

- The polymicrobial environment of odontogenic infections persists until the source of the irritation is removed.

- Dental treatment establishes a favourable environment to the host to alleviate the disease.

- The key to successful resolution of the infection is initial drainage of the infection coupled with either thorough chemomechanical debridement of the root canal system or extraction of the tooth or as an emergency measure until such time that definitive dental therapy can be implemented.

Myth #6: Antibiotics Must Be Given for Several Days Before Implementation Of Surgical Treatment

- The vast majority of localized odontogenic infections can be SUCCESSFULLY treated by appropriate dental treatment ALONE.

- Even Medically compromised patients who present with dental pain, sinus tracts, radio-lucencies, apical periodontitis, or localized intraoral swellings DO NOT routinely require antibiotics (Fouad et al. 1996).

Myth #7: Indurated Soft Tissues Means Drainage is Not Indicated

- DO NOT wait until a swelling becomes soft or fluctuant before incising and draining.

- Diffuse fluctuant or indurated soft tissues are a more severe manifestation of the localized abscess.

- Surgical therapy (root canal treatment or extraction) is indicated primarily if the aetiology is a necrotic tooth. If adequate drainage is NOT accomplished, soft tissue incision and drainage may be indicated.

Myth #7: Indurated Soft Tissues Means Drainage is Not Indicated

- If soft tissue swellings (cellulitis) are left untreated, infection can spread to adjacent facial spaces resulting in serious consequences such as:
  - airway compromise,
  - sepsis, blindness,
  - mediastinal involvement, and
  - death.

- Fluctuant swellings usually emit purulence immediately when incised, whereas a more indurated swelling results in small quantities of blood and serous fluid.
Myth #7: Indurated Soft Tissues Means Drainage is Not Indicated

- Draining both types of swellings releases pressure from the area and facilitates good recovery by:
  - providing oxygen to an anaerobic environment,
  - increasing blood circulation, and
  - thereby optimizing host defense mechanisms.

- A culture and sensitivity should be obtained when draining an infection, not to guide the initial antibiotic selection, but to be available should the empiric antibiotic therapy used fail.

Myth #8: Over-prescription of Antibiotic Therapy Does not Occur in Dentistry

- Overuse and improper use of prescription drugs by dentists has been well documented.
- The USA national centres for Disease Control and Prevention estimate that approximately one third of all outpatient antibiotic prescriptions are unnecessary.
- Nearly 323 billion worldwide has been spent on antibiotics in the last year (Markoff H et al. 1997)
- Approximately 10% of antibiotics are now rendered IN EFFECTIVE (Markoff H et al. 1997)

Chemoprophylaxis

- Chemoprophylaxis is the use of antimicrobial agents to prevent an infection.
- In dentistry, this can arise in two contexts:
  1. the prevention of an infection at or near the site of a surgical operation or
  2. at a different site elsewhere in the body.

- With respect to the latter, the main issues relate to the prevention of infective endocarditis and infection in patients with hip and other joint prostheses.

Infected Endocarditis

- Infective endocarditis is a microbial infection of the endocardial surfaces usually involving the heart valves.
- The infective organisms are usually bacteria, but infective endocarditis can also be caused by fungal species.
- Infection on a compromised endocardial surface (especially damaged or prosthetic heart valves) gives rise to the formation of vegetations.
- These vegetations proliferate and eventually can destroy the valves.
- Embolism of fragments of the vegetations can damage organs and tissues including the brain, lung, and coronary arteries.
**Microbiology of Infective Endocarditis**

- Microorganisms most frequently cited include *S. aureus* and oral streptococci (especially α-hemolytic viridans streptococci).
- The primary event in the pathogenesis is bacterial adherence to damaged heart valves. This event is completed within minutes during transient bacteremia and involves valve tissue and bacterial factors.
- The second stage involves persistence and growth of the bacteria within the cardiac lesion and the formation of vegetations.
- After valve colonization, the infecting microorganisms must survive and avoid host defenses. A key event in this process is maturation of the vegetation within which the bacteria can become fully enveloped.

**Dental-Induced Bacteremia**

- For the dental procedure to be considered then this has to have been completed or carried out within 14 days of the diagnosis of infective endocarditis.
- Often dentistry is blamed for infective endocarditis because cardiologists just ask patients in whom infective endocarditis is suspected whether they have received or visited the dentist recently.
- It may well transpire that spontaneous bacteremia may be MORE responsible for infective endocarditis than dental treatment.

**Dental-Induced Bacteremia**

- Further evidence to support this finding comes from an analysis of cases whereby dental treatment has been implicated as the cause:
  - Oral streptococci cause approximately 90% of all infective endocarditis cases.
  - Similarly, only 15% of patients, where infective endocarditis has been diagnosed, report medical or dental treatment within the previous 3 months.
  - It has been estimated that 4% or less of all infective endocarditis cases are related to dental treatment induced bacteremia (Bakaeen G F, Greenland W, 1998).

  Whether such bacteremia arises from dental treatment or is spontaneous in nature is not discernible. It has been suggested recently that if spontaneous random bacteremia cause 90% of all cases of infective endocarditis, then these bacteremias, as opposed to those arising from dental treatment, may also have caused the remaining 4%.

**Dental-Induced Bacteremia**

- Many dental procedures, especially those involving dento-gingival manipulation, will give rise to a bacteremia.
- The more inflamed the gingival tissues, the greater the risk and magnitude of bacteremia.
- Many oral hygiene procedures and even chewing can result in significant bacteremia of similar magnitude to the occurrence after certain dental procedures (Roberts et al, 1999).
- Bacteremia arising from dental treatment, oral hygiene practices, or even chewing are of low-grade intensity (3 × 10^6 to 2 × 10^7 colony-forming units/ml of blood) and of short duration (30-600 seconds).

**Chemoprophylaxis and the at Risk Patient**

- There is debate between the various governing bodies as to what underlying cardiac condition requires chemoprophylaxis.
- Each country has slightly different guidelines, but many have followed those issued by the American Heart Association in 1989 and 1997.
- In 2000, the British Society of Antimicrobial Chemotherapy published their guidelines for the prevention of endocarditis and details.
- There are many similarities between the two sets of guidelines, in particular their recommendations for the cardiac conditions that require antibiotic chemoprophylaxis. Differences do exist with respect to the dose of amoxicillin.
American Heart Association Guidelines on Cardiac Conditions for when Chemoprophylaxis for Dental Procedures is Recommended

1. Prosthetic valve
2. Previous history of infective endocarditis
3. Congenital heart disease (CHD)
   a. Unrepaired cyanotic CHD, including palliative shunts and conduits
   b. Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by catheter intervention, during the first 6 months after the procedure (to allow for full endothelialization)
   c. Repair of CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device which are difficult to evaluate
4. Cardiac transplantation recipients who develop cardiac allograft vasculopathy

American Heart Association Guidelines for Dental Procedures for which Endocarditis Prophylaxis is Recommended

All dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa

American Heart Association have stated the following:

- Following procedures and events do not need prophylaxis:
  - Routine orthopedic procedures not involving the mouth
  - Placement of removable prosthetic or orthodontic appliances
  - Adjustment of orthodontic brackets
  - Shaving of facial hair
- Shaving of facial hair

American Heart Association Regimens For A Dental Procedure

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Agent</th>
<th>Regimen: single dose 30-60 min before procedure</th>
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<tbody>
<tr>
<td>Oral</td>
<td>Amoxicillin</td>
<td>2 g / 500 mg/kg</td>
</tr>
<tr>
<td>Allergic to penicillin or amoxicillin</td>
<td>Clindamycin</td>
<td>1 g IV or IM or PO 500 mg/kg or 75 mg/kg or 75 mg/kg</td>
</tr>
<tr>
<td>Allergic to penicillin or amoxicillin</td>
<td>Clindamycin or vancomycin</td>
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Thank You