Antibiotic usage in dentistry

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Abstract

Antibiotics are chemical substances that can destroy and inhibit the development of specific microorganisms, such as infectious bacteria and fungi. Since antibiotics do not directly affect the host cells, they are often prescribed on a just-in-case basis. In conjunction with antibiotic resistance, the occurrence of health consequences with sensitization response alongside super infection has generally been reported with antibiotic usage. The current study explores the use of antibiotics in dental practice and offers components to facilitate the ethical use of such medications.

Keywords:
Antibiotic, hypersensitivity, infection, prophylactical regimen, resistance

Introduction

Illness has been man’s heritage from the beginning of his existence and the search of remedies to combat it is perhaps equally old.[1] Antibiotics are chemical substance that is capable of destroying and inhibiting the growth of specific microorganisms such as infectious bacteria and fungi.[2]

For therapeutical purposes, antibiotics are prescribed in dentistry. In most circumstances, systemic antibiotics are supposed to cure hard and soft tissue infections in the oral cavity after local debridement has failed.[³]

About 7% and 11% of all traditional antibiotics are administered by dentists,[⁴] For oral and dental infection control, general dental doctors administer antibiotics therapeutically and prophylactically.

Dental prescription antibiotics accounted for 8% of Norway’s overall national intake of antibiotics in 2007.[⁵]

As antibiotics do not cause a direct effect on host cells, they are often prescribed on a just in case basis.[⁶] Good outcomes happen as antibiotics enable the host immune system take control of the infection and eradicate it.[⁷]

The occurrence of adverse reactions and hypersensitivity reactions along with super infection has been widely reported with antibiotic use in combination with antibiotic resistance. An intact and implicit association between early childhood use of antibiotics and the threat of allergic asthma has been established.[⁸]

The 2014 WHO Global Antimicrobial Resistance Surveillance Report reported that antibiotic resistance is not any more a forecast for the long run; it is occurring globally right now and has put the ability to treat common infections in the population and in the hospital at great risk.[⁹]

Fighting drug resistance is the objective of World Health Day 2011. No intervention today, no remedy tomorrow.[¹⁰]

Three general strategies should always be followed to prevent resistance to antibiotics they are as follows: The first approach is to stop infection, which reduces the need for the use of antibiotics. The second when these drugs are required, optimum use of antibiotics must be established. The third optimal central infection steps should be used to avoid the spreading of resistant clones or predictors.[¹¹]

The current study explores the use of antibiotics in dental practice and offers components to facilitate the appropriate use of such medications. Table 1 signifies Drugs and their indication.

Characteristics of Ideal Antibiotic

There are drawbacks and benefits of all clinically active drugs, but the optimal antimicrobial agent has the following characteristics.
1. Is hazardous to the microorganism specifically, but non-toxic to multicellular organisms
2. Rather than bacteriostatic, bactericidal is
3. Even when extremely diluted in body fluid, it remains relatively insoluble and active
4. Stays engaged large enough to succeed
5. Does not quite immediately lead to resistant bacteria
6. Complements and facilitates the hosts’ defensive efforts
7. May not cause host reactions
8. Does not destroy, to a large degree, the commensal microflora
9. Has little to no drug reactions or negative impacts.

**Interaction between Two Antimicrobial Agents**

In some infections, a single antibiotic therapy may not be sufficient to control the disease, requiring the combining of two antimicrobial agents. However, one must remember that two antibiotics do not always kill a pathogen better than one agent alone.

**Interaction between Two Antimicrobial Agents**

Bacteriostatic + Bacteriostatic: Usually results in additive effects (1+1= 2).
Bactericidal + Bacteriostatic: Often results in antagonist effects (1+1 < 1).
Bactericidal + Bactericidal: May result in synergistic effect (1+1 > 2).

**Summary for Selection of Antibiotics against Odontogenic Infections**

The majority of odontogenic infections are polymicrobial and consist of at least two predominant microbes. Most oral flora microbes are non-pathogenic and have not been seen to propagate and expand in host tissue. When the dental pulp is overwhelmed by the microbial attack, there is a local acute inflammatory reactions accompanied by imprecise and complex immunological reflex with the involvement of lymphocyte and monocytes. A fibrocollagenous layer of tissue may develop an abscess around an aggregation of polymorphonuclear lymphocytes in the area of infection that isolates it from the surrounding tissue. The infection will begin to travel into the soft tissues around the jaw through and through the alveolar bone (that is, localized acute apical abscess). Since the host may not be able to resorb the abscess and overcome the root canal infection, the source must be removed by extraction and surgical therapy. The debridement and/or drainage for a periapical or periodontal abscess are irreplaceable by antibiotic therapy. Table 2 signifies the Principles of managing odontogenic infections.

**Prophylactic Regime**

To avoid a potential infection, antibiotic prophylaxis can be characterized as the use of an antimicrobial agent before any infection occurs. Tables 3-5 represents the Prophylactic regime for dental, oral, procedures, and standard-general prophylaxis.

**Principles of antibiotic prophylaxis**

1. The advantages of prophylactic treatment outweigh the downsides of allergies associated with antibiotics, poisoning, superinfection and drug-resistant microbial strain growth
2. It is important to go for an antibiotic loading dose
3. The antibiotic should be chosen on the basis of the organism most potential to trigger an infection
4. Antibiotics must be present in the blood and target tissues until the microbe spreads
5. Antibiotic prophylaxis should be carried out as far as contamination from the operating site remains.

**Table 1: Drugs and their indications**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Indications</th>
<th>Inference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillin V</td>
<td>Gateway drug for most odontogenic infections that are mild to moderate</td>
<td>Bactericidal</td>
</tr>
<tr>
<td>Clarithromycin</td>
<td>Mild odontogenic infections in immuno compromised patients who are allergic to penicillin</td>
<td>Bacteriostatic</td>
</tr>
<tr>
<td>Cephalosporin’s</td>
<td>Use with caution in case of penicillin allergy: May produce allergic reactions in 5–15% of patients</td>
<td>Bactericidal</td>
</tr>
<tr>
<td>Tetracycline</td>
<td>Mild odontogenic infection in a patient who has severe allergy to penicillin and cephalosporin and cannot tolerate erythromycin</td>
<td>Bacteriostatic</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>Chronic low grade infections that have been resistant to previous treatment with penicillin or erythromycin</td>
<td>Bacteriostatic</td>
</tr>
<tr>
<td>Metronidazole</td>
<td>Chronic infections that are caused primarily by obligate anaerobes Very effective in combination with penicillin in mixed infections</td>
<td>Bactericidal</td>
</tr>
</tbody>
</table>

**Table 2: Principles of managing odontogenic infections**

<table>
<thead>
<tr>
<th>Step</th>
<th>Substeps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determine severity</td>
<td>Access history of onset and progression. Perform physical examination of area; determine character and size of swelling, establish presence of trismus</td>
</tr>
<tr>
<td>Evaluate host defenses</td>
<td>Evaluate; diseases that compromise the host, medications that may compromise the host</td>
</tr>
<tr>
<td>Perform surgery</td>
<td>Remove the cause of infections drain pus and relieve pressure</td>
</tr>
<tr>
<td>Select antibiotic</td>
<td>Determine most likely causative organism based on history host defenses status allergy history previous drug history to prescribe properly (route, dose, and drug)</td>
</tr>
<tr>
<td>Follow-up</td>
<td>Confirm treatment response evaluate side effects and secondary infections</td>
</tr>
</tbody>
</table>
Antibiotics in dentistry

Procedures Not Recommended for Antibiotic Prophylaxis
1. Restorative dental procedures with or without retraction cord
2. Placement of rubber dam
3. Post-operative suture removal
4. Taking oral impression
5. Fluoride treatment
6. Taking oral radiograph
7. Shedding of primary teeth
8. Orthodontic appliance adjustment
9. Local anesthetic injection.

Antibiotics Use in Endodontics
Antibiotics may be administered both systemically and locally during the endodontic treatment. Systemic antibiotics on the grounds of specified criteria must be recommended or used for dental infections. The local use of antibiotics in endodontics is an important mode of disinfection because systemic antibiotics do not penetrate the necrotic pulp. Table 6 represents the Locally used antibiotics in endodontics.

Table 3: Prophylactic regime for dental, oral, procedures, and standard-general prophylaxis

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>Adult</th>
<th>Child</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin</td>
<td>Orally 2 g</td>
<td>Orally 50 mg/kg</td>
<td>1 h before the procedure</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>Intramuscularly/intravenous 2 g</td>
<td>Intramuscularly/intravenous 50 mg/kg</td>
<td>30 min before the procedure</td>
</tr>
</tbody>
</table>

Table 4: Prophylactic regime for dental, oral, procedures, and sensitive to penicillin

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>Adult</th>
<th>Child</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clindamycin</td>
<td>Orally 600 mg</td>
<td>Orally 20 mg/kg</td>
<td>1 h before the procedure</td>
</tr>
<tr>
<td>Cephalexin or Cefadroxil</td>
<td>Orally 2 g</td>
<td>Orally 50 mg/kg</td>
<td>1 h before the procedure</td>
</tr>
<tr>
<td>Azithromycin or Clarithromycin</td>
<td>Orally 500 mg</td>
<td>Orally 15 mg/kg</td>
<td>1 h before the procedure</td>
</tr>
</tbody>
</table>

Table 5: Prophylactic regime for dental, oral, procedures, sensitive to penicillin, and unable to consume orally

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>Adult</th>
<th>Child</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clindamycin</td>
<td>Intravenously 600 mg</td>
<td>Intravenously 20 mg</td>
<td>30 min before the procedure</td>
</tr>
<tr>
<td>Cefazolin</td>
<td>Intramuscularly/intravenous 1 g</td>
<td>Intramuscularly/intravenous 25 mg/kg</td>
<td>30 min before the procedure</td>
</tr>
</tbody>
</table>

Table 6: Locally used antibiotics in endodontics

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triple antibiotic paste</td>
<td>Intracanal medicament, regenerative endodontics</td>
</tr>
<tr>
<td>MTAD</td>
<td>Irrigant</td>
</tr>
<tr>
<td>Tetraclean</td>
<td>Irrigant</td>
</tr>
<tr>
<td>Ledermix paste</td>
<td>Pulp capping, intracanal medicament</td>
</tr>
<tr>
<td>Odontopaste</td>
<td>Intracanal medicament</td>
</tr>
<tr>
<td>Pulponixine</td>
<td>Pulp capping</td>
</tr>
<tr>
<td>Septomixine forte</td>
<td>intracanal medicament</td>
</tr>
<tr>
<td>Medicated gutta percha</td>
<td>Iodoform and tetracycline impregnated gutta-percha, recent-nanosilver, and nanodiamond coated gutta-percha</td>
</tr>
</tbody>
</table>

Antibiotics Used in Periodontics
It is worth exploring the importance of prescribing antimicrobial agents as a fast and cheap way to increase mechanical periodontal debridement. Systemic antibiotics, topical antibiotics, and topical antiseptics can help patients with periodontitis.

Local delivery agents
It provides long-term retention of a highly concentrated drug at the base of the periodontal pocket.
- Tetracycline
- Doxycycline
- Minocycline
- Metronidazole
- Moxifloxacin
- Azithromycin
- Chlorhexidine.

Systemic therapy
Antibiotics which are bacteriostatic (e.g., tetracycline) usually involve the efficacy of rapidly dividing microbes. If a bactericidal antibiotic (e.g., amoxicillin or metronidazole) is administered simultaneously, they may not work well. If both types of medication are needed, they are best administered serially, not in combination, to prevent unfavorable interaction, but to extract the advantage of both.

Combined therapy
Since subgingival microbiome is made up of different putative microbes in periodontal disease that may vary in antimicrobial susceptibility, the use of a combination of two or more antibiotics may be a useful approach to periodontal chemotherapy.

Conclusion
Once an infection occurs, prescribing of antibiotics is nonelective that is, it is principally the doctor’s decision rather than a decision...
of both doctor and the patient. Antibiotics should be prescribed judiciously rather than zealously. Judicious use of antibiotics mandates restrained rather than indiscriminate prescribing. When a dentist prescribes an antibiotic, he or she is obligated to possess the knowledge of the drugs risks. Careful and prudent practice in prescribing antibiotics is the best principle to be.

References
