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REVIEW ARTICLE

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.

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[12]

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.[13] 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.[14,15] 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.[16] 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

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

Table 2: Principles of managing odontogenic infections

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

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

Antibiotics	Adult	Child	Timing
Amoxicillin	Orally 2 g	Orally 50 mg/kg	1 h before the procedure
Ampicillin	Intramuscularly/intravenous 2 g	Intramuscularly/intravenous 50 mg/kg	30 min before the procedure

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

Clindamycin	Orally 600 mg	Orally 20 mg/kg	1 h before the procedure
Cephalexin or Cefadroxil	Orally 2 g	Orally 50 mg/kg	1 h before the procedure
Azithromycin or Clarithromycin	Orally 500 mg	Orally 15 mg/kg	1 h before the procedure

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

Clindamycin	Intravenously 600 mg	Intravenously 20 mg	30 min before the procedure
Cefazolin	Intramuscularly/intravenous 1 g	Intramuscularly/intravenous 25 mg/kg	30 min before the procedure

Table 6: Locally used antibiotics in endodontics

Antibiotics in endodontics	Uses
Triple antibiotic paste	Intracanal medicament, regenerative endodontics
MTAD	Irrigant
Tetraclean	Irrigant
Ledermix paste	Pulp capping, intracanal medicament
Odontopaste	Intracanal medicament
Pulpomixine	Pulp capping
Septomixine forte	intracanal medicament
Medicated gutta percha	Iodoform and tetracycline impregnated gutta-percha, recent-nanosilver, and nanodiamond coated gutta-percha

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.[17] Table 6 represents the Locally used antibiotics in endodontics.

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. Systematic 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

1. Jayakaran TG, Rekha CV, Annamalai S, Baghkomeh PN. Antibiotics and its use in pediatric dentistry: A review. Int J Appl Dent Sci 2018;4:310-4.
2. Naveen N, Suhas PG, Vanishree N, Patnaik S, Bharath C, Prasad KS, *et al*. Current Trends in prescription of antibiotics among dentists working in various dental colleges of Bangalore city, India-a cross sectional study. Int J Oral Health Med Res 2015;2:8-14.
3. Peedikayil FC. Antibiotics: Use and misuse in pediatric dentistry. J Indian Soc Pedod Prev Dent 2011;29:282-7.
4. Dar-Odeh NS, Abu-Hammad OA, Al-Omiri MK, Khraisat AS, Shehabi AA. Antibiotic prescribing practices by dentists: A review. Ther Clin Risk Manag 2010;6:301-6.
5. Garg AK, Agrawal N, Tewari RK, Kumar A, Chandra A. Antibiotic prescription pattern among Indian oral healthcare providers: A cross-sectional survey. *J* Antimicrob Chemother 2014;69:526-8.
6. Cherry WR, Lee JY, Shugars DA, White RP Jr., Vann WF Jr. Antibiotic use for treating dental infections in children: A survey of dentists' prescribing practices. J Am Dent Assoc 2012;143:31-8.
7. Aidasani B, Solanki M, Khetarpal S, Pratap SR. Antibiotics: Their use and misuse in paediatric dentistry. A systematic review. Eur J Paediatr Dent 2019;20:133-8.
8. Al-Johani K, Reddy SG, Al Mushayt AS, El-Housseiny A. Pattern of prescription of antibiotics among dental practitioners in Jeddah, KSA: A cross-sectional survey. Niger J Clin Pract 2017;20:804-10.
9. Goud SR, Nagesh L, Fernandes S. Are we eliminating cures with antibiotic abuse? A study among dentists. Niger J Clin Pract 2012;15:151-5.
10. Al Harooni M. Bacterial resistance and the dental professionals' role to halt the problem. J Dent 2008;36:95-103.
11. General Principles of Antimicrobial Therapy. The Pharmacological Basics of Therapeutics. Goldman and Gilman's. 11th ed., Ch. 42. McGraw Hill Education: 2005.
12. Swift JQ, Gulden WS. Antibiotic therapy-managing odontogenic infections. Dent Clin North Am 2002;46:623-33, 7.
13. Evidence-based clinical practice guideline on antibiotic use for the urgent management of pulpal-and periapical-related dental pain and intraoral swelling: A report from the American dental association. J Am Dent Assoc 2019;150:906-21.
14. Cortelli JR, Barbosa MD, Westphal MA. Halitosis: A review of associated factors and therapeutic approach. Braz Oral Res 2008;22:44-54.
15. Brincat M, Savarrio L, Saunders W. Endodontics and infective endocarditis-is antimicrobial chemoprophylaxis required? Int Endod J 2006;39:671-82.
16. Gilad JZ, Teles R, Goodson M, White RR, Stastienko P. Development of a clindamycin-impregnated fiber as an intracanal medication in endodontic therapy. J Endod 1999;25:722-7.
17. Balasubramaniam R, Jayakumar S. Antibiotics in endodontics-a concise review. Int J Appl Dent Sci 2017;3:323-9.

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