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PROPHYLACTIC USE OF ANTIBIOTICS IN DENTISTRY – A REVIEW

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ABSTRACT

Antibiotics are commonly used in dental practice. They are used for both prophylactic and therapeutic treatment. The use of antibiotics in dental practice is characterized by empirical prescription based on clinical and bacteriological epidemiological factors, with the use of broad spectrum antibiotics. Antibiotics are indicated in odontogenic infections, non-odontogenic infections, as prophylaxis against focal infection, and as prophylaxis against local infection and spread to neighboring tissues and organs. Special precaution should be taken when prescribing antibiotic treatment. The present study review prophylactic use of antibiotic in dental practice, and contributes elements to favor the rational use of such medicines.

KEYWORDS: Antibiotics; infection; dental prophylaxis

INTRODUCTION

Antibiotics are substances produced by microorganisms that selectively suppress the growth or kill other microorganisms at very low concentration. Antibiotic treatment is an aspect of pharmacotherapy with the particularity of affording both etiological and curative action. It was introduced in the mid-twentieth century in the form of sulfa drugs (1935), penicillin (1941), tetracyclines (1948) and erythromycin (1952). Since then, antibiotics have focused much clinical and pharmacological research, in response to the progressive challenges posed by bacterial infections: identification of new pathogens, the development of resistances to antibiotics, the consolidation of new diseases, and novel clinical situations (increase in chronic processes, survival of patients with disorders considered to be fatal until only recently, etc.).^[1] Bacterial infections are common in dental and oral clinical practice; as a result, antibiotic use prescribed for their treatment

is also frequent. Antibiotics are used for both prophylactic and therapeutic treatment.^[2] As studies of the need for and the effectiveness of antibiotics in the dental field continue, there is an ongoing debate over their role in prophylaxis.^[3] Although the American Heart Association (AHA) issues recommendations, the most recent in 1997,^[4] the applicability of these recommendations is continually being re-evaluated. It is the responsibility of the medical and dental communities to be aware of the latest protocols and to prescribe appropriately. The present study reviews prophylactic use of antibiotics in dental practice, and contributes to favor the rational use of such medicines.

INDICATIONS FOR ANTIBIOTICS

Rational antibiotic use is thus required in dental and oral clinical practice, to ensure maximum efficacy while at the same time minimizing the side effects and the appearance of resistances. Antibiotics are typically prescribed in dental practice for some of the following purposes:

- as treatment for acute odontogenic infections;
- as treatment for non-odontogenic infections;
- as prophylaxis against focal infection in patients at risk (endocarditis and joint prostheses); and
- as prophylaxis against local infection and systemic spread in oral surgery.^[5]

ODONTOGENIC INFECTIONS

Despite the high incidence of odontogenic infections, there are no uniform criteria regarding the use of antibiotics to treat them. Bascones *et al.*,^[6] in a consensus document on the subject, suggested that treatment should be provided in some acute situations of odontogenic infection of pulp origin as a complement to root canal treatment, in ulcerative necrotizing gingivitis, in periapical abscesses, in aggressive periodontitis, and in severe infections of the facial layers and deep tissues of the head and neck. There is considerable agreement that the beta-lactam

Table 1: Antibiotics recommended for various dental treatments according to the specialization

S. No.	Speciality	RECOMMENDED	NOT RECOMMENDED
1.	Oral surgery	<ul style="list-style-type: none"> Dental extractions Minor oral surgery Intraligamentary LA injection 	<ul style="list-style-type: none"> Suture removal Routine LA injection
2.	Periodontics	<ul style="list-style-type: none"> Subgingival scaling Root planning Periodontal surgery 	<ul style="list-style-type: none"> Supragingival scaling
3.	Conservative & Endodontics	<ul style="list-style-type: none"> Periapical endodontic procedures Reimplantation of avulsed tooth 	<ul style="list-style-type: none"> Restorative treatment Intracanal endodontic therapy Rubber dam application
4.	Prosthodontics	<ul style="list-style-type: none"> Dental implant replacement 	<ul style="list-style-type: none"> Impression taking Removable prosthetic appliances
5.	Orthodontics	<ul style="list-style-type: none"> Initial placement of orthodontic bands but not brackets 	<ul style="list-style-type: none"> Placement of removable orthodontic appliance Orthodontic appliance adjustment
6.	Oral Medicine & Radiology		<ul style="list-style-type: none"> Taking radiographs
7.	Pedodontics	<ul style="list-style-type: none"> Primary tooth extraction Pulpotomy Pulpectomy 	<ul style="list-style-type: none"> Shedding of primary teeth Fluoride treatment

Table 2. Antibiotics commonly used to treat odontogenic infections

Drugs	Administration route	Dosage	Side effects
Amoxicillin	o*	500 mg/8 hours 1000 mg/12 hours	Diarrhea, nausea, hypersensitivity reactions
Amoxicillin-clavulanic acid	o or iv **	500-875 mg/8 hours* 2000 mg/12 hours* 1000-2000 mg/8 hours**	Diarrhea, nausea, candidiasis, hypersensitivity reactions
Clindamycin	o or iv	300 mg/8 hours* 600 mg/8 hours**	Pseudomembranous colitis
Azithromycin	O	500 mg/24 hours 3 consecutive days	Gastrointestinal disorders
Ciprofloxacin	O	500 mg/12 hours	Gastrointestinal disorders
Metronidazole	O	500-750 mg/8 hours	Seizures, anesthesia or paresthesia of the limbs, incompatible with alcohol ingestion
Gentamycin	im*** or iv	240 mg/24 hours	Ototoxicity Nephrotoxicity
Penicillin	im or iv	1.2-2.4 million IU/24 h*** Up to 24 million IU/24 hours**	Hypersensitivity reactions, gastric alterations

*o:oral route; **iv:intravenous route; *** im:intramuscular route

derivatives are the antibiotics of choice for these processes, provided there are no allergies or intolerances. However, there is less consensus regarding which drug belonging this family should be prescribed. While some authors consider the natural and semisynthetic penicillins (amoxicillin) to be the options of first choice,^[7] others prefer the association amoxicillin-clavulanate, due to the growing number of bacterial resistance, as well as its broad spectrum, pharmacokinetic profile, tolerance and dosing characteristics.^[8] As has been commented above,

some authors have proposed clindamycin as the drug of choice, in view of its good absorption, low incidence of bacterial resistances, and the high antibiotic concentrations reached in bone.^[9]

LOCAL INFECTION AND SYSTEMIC SPREAD

Prophylaxis of local infection is done to prevent bacterial proliferation and dissemination within and from the surgical wound. Some authors have reported its efficacy, with statistically significant differences in the frequency of infectious complications in surgical extractions of lower

Table 3: Antibiotic prophylaxis in oral procedures (AHA)

SITUATION	ANTIBIOTIC	REGIME
Standard general prophylaxis	Amoxicillin	2gm orally an hour before procedure
Allergic to Penicillin	Clindamycin	600mg orally an hour before procedure
	Cephalexin/Cefadroxil	2gm orally an hour before procedure
	Azithromycin/Clarithromycin	500mg orally an hour before procedure
Unable to take oral medication	Ampicillin	2gm IV/IM half an hour before procedure
Unable to take oral medication & allergic to Penicillin	Clindamycin	600mg IV half an hour before procedure
	Cefazolin	1gm IV/IM half an hour before procedure

third molars between patients who had received some form of antibiotic treatment and those without.^[10-15] prophylaxis in oral surgery in a healthy patient was only recommended in the case of the removal of impacted teeth, periapical surgery, bone surgery, implant surgery, bone grafting and surgery for benign tumors. In subjects with risk factors for local or systemic infection - including oncological patients, immune suppressed individuals, patients with metabolic disorders such as diabetes, and splenectomized patients, prophylactic antibiotic coverage should be provided before attempting any invasive procedure. The use of antibiotics in endodontics should be reserved for patients with signs of local infection, malaise or fever. Prophylactic or preventive use should be reserved for endocarditis and the systemic disorders commented above – avoiding indiscriminate antibiotic use.^[16]

DISCUSSION

Dentists and physicians are not always aware of the most current clinical guidelines regarding antibiotic prophylaxis, even though guidelines are widely available. The most common adverse effects of antibiotics are direct toxicity, hypersensitivity reactions, and the short or long term development of resistant microorganisms. Direct toxicity includes gastrointestinal (nausea, vomiting, diarrhea, and abdominal pain), hematological concerns (neutropenia, thrombocytopenia, and hemolysis), alterations in the body's normal flora leading to candidal infections or pseudomembranous colitis, nephrotoxicity (proteinuria or renal failure), neuropathy (nerve dysfunction or peripheral neuropathy), alterations in drug interactions, and finally hepatobiliary (jaundice or hepatitis) the legal and ethical impossibility of conducting clinical trials in humans to evaluate the risks of

antibiotic treatment during pregnancy has given rise to uncertainties as to the use of such drugs in these patients. The United States Food and Drug Administration (FDA) has established four levels of drug risk during pregnancy: (A) without demonstrated risk; (B) without effects in animals, though with undemonstrated innocuousness in humans; (C) no studies conducted in either animals or humans, or teratogenic effects recorded in animals without due evaluation in humans; and (D) teratogenic effects upon the fetus – use of the drug being conditioned to the obtainment of benefit that outweighs the risks. A final group (X) in turn contemplates teratogenic effects that outweigh any possible benefit derived from the drug. No antibiotic corresponds to group A. On the other hand, group B (i.e., warranting caution with treatment during pregnancy) contains the following antibiotics: azithromycin, cephalosporins, erythromycin, metronidazole and penicillins with or without beta-lactamase inhibitors. Group C in turn includes clarithromycin, the fluorquinolones and the sulfa drugs (including dapsone). Finally, group D contains the aminoglycosides and tetracyclines.^[17] Many antibiotics are actively eliminated through the kidneys. The presence of impaired renal function requires reduction of the drug dose in order to avoid excessively elevated plasma drug concentrations that could lead to toxicity. Dose adjustment can be carried out by reducing the amount administered in each dose or by increasing the interval between doses.^[18] Some antibiotics are metabolized in the liver, followed by elimination in bile. In patients with liver failure, the use of such antibiotics should be restricted in order to avoid toxicity secondary to overdose. Erythromycin, clindamycin, metronidazole and anti-tuberculosis drugs are antibiotics requiring dose adjustments when

administered to patients with liver failure. Regardless of the above considerations, some antibiotics are potentially hepatotoxic. As a result, and whenever possible, they should be avoided in patients with some active liver disorder. Specifically, tetracyclines and anti-tuberculosis drugs should be avoided.^[19]

CONCLUSION

Dentists and physicians exhibit varying levels of understanding of antibiotic prophylaxis prescribing with a tendency for dentists to be more correct in their evaluations. However, many professional associations, i.e., the Academy of Orthopaedic Surgeons (AAOS),^[20] American Dental Association (ADA) and the American Heart Association (AHA)^[21] have written guidelines regarding specific conditions in which it is important to prophylax and if these are followed and efforts are made to balance the cost-benefit ratio in patients, then the dental profession can hopefully curb the use of unnecessary antibiotics and keep antibiotic efficacy high for when they are truly necessary. All clinicians should make themselves aware of current guidelines available for antibiotic prophylaxis to ensure the highest degree of patient care.

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