

Role Of Antibiotics In The Treatment Of Periodontal Disease-An Overview

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Citation

S Kumar, M Mittal, P Khanna. *Role Of Antibiotics In The Treatment Of Periodontal Disease-An Overview*. The Internet Journal of Microbiology. 2012 Volume 10 Number 1.

Abstract

Drugs in periodontal diseases have antimicrobial properties and have the ability to improve resistance against infection. These antimicrobials can be used systemically or locally. In earlier times clinical success of periodontal therapy included oral hygiene education and surgical or mechanical root debridement to remove sub-gingival pathology. In severe cases, chemotherapeutic agents may prove beneficial.

INTRODUCTION

The drugs have a long history of use in the treatment of various human diseases. Antibiotics either suppress the growth of microorganism or destroy them. Drugs used to treat periodontal disease can have antimicrobial properties or those that improve host resistance. These antimicrobials can be used systemically or locally. Traditionally the foundation of clinical success in periodontal therapy included education of the patient in oral hygiene, surgical and mechanical root debridement to remove sub-gingival pathology and their accretions from root surface, and supportive periodontal therapy.

However, in certain types of periodontal disease including chronic advanced periodontitis, refractory periodontitis, aggressive periodontitis and periodontitis as a manifestation of systemic disease, adjunctive chemotherapeutic agents may be beneficial to control the disease¹.

GUIDELINES FOR USE OF ANTIBIOTICS IN PERIODONTAL THERAPY

The clinical diagnosis and situation dictate the need for antibiotic therapy as an adjunct in controlling active periodontal disease. Antibiotics are selected based on the microbial composition of plaque. Antibiotics have been shown to have value in reducing the need for periodontal surgery in patients with chronic periodontitis who are medically compromised. Also, cases of aggressive periodontitis and refractory disease may require antimicrobial therapy². However, drugs should not be used as a monotherapy. It must be a part of comprehensive

treatment plan. Therapy should also include debridement of root surfaces, optimal oral hygiene, and frequent supportive periodontal therapy.

SERIAL AND COMBINATION DRUG THERAPY

Since periodontal diseases contain a wide variety of microorganisms, a single antibiotic cannot eliminate all bacteria. Therefore, it may be beneficial to use more than one antibiotic, serially or in combination³. Bacteriostatic antibiotics should not be given in combination with bactericidal ones, since they do not function well. If both types of drugs are required, they should be given serially i.e. one after the other. E.g. Tetracycline (bacteriostatic) should not be combined with amoxicillin (bactericidal). However, amoxicillin can be given in combination with metronidazole. MTZ with ciprofloxacin and MTZ with Augmentin are very effective drug combinations against refractory and aggressive periodontitis^{3,4,5}.

SYSTEMICALLY USED ANTIBIOTICS IN PERIODONTICS

These are naturally occurring, semi-synthetic or synthetic types of antimicrobial agents that destroy or inhibit the growth of selective microorganisms, usually at low concentrations. The most common antibiotics used in periodontics have been listed below.

TETRACYCLINES

Tetracyclines are the most widely prescribed agents for periodontal therapy and are broad-spectrum antibiotics. Tetracyclines are bacteriostatic in action and retard the

growth of organisms by inhibiting protein synthesis. The adult dose for tetracycline is 250–500 mg q.i.d, doxycycline 100 mg o.d and minocycline 100 mg b.d. These antibiotics are secreted in the crevicular fluid in higher concentrations and are effective against a number of oral gram-negative and gram-positive cocci and bacilli⁶. These antibiotics are indicated in the treatment of generalized and localized aggressive periodontitis as well as periodontitis refractory to treatment. However, with the emergence of resistant species of bacteria, tetracyclines are currently replaced by more effective combination antibiotic therapy⁷.

Adverse effects of tetracycline include retardation of bone growth (transient), photosensitivity, permanent discoloration of developing teeth, teratogenesis, as well as hepatic and renal toxicity in susceptible individuals⁶.

METRONIDAZOLE

Metronidazole is a nitroimidazole compound, which is bactericidal to anaerobes and is believed to disrupt bacterial DNA synthesis. It is most effective against obligate anaerobic gram-negative bacilli (*Fusobacterium*). It is also active against obligate anaerobic cocci (*Peptostreptococcus* species)⁶. It is secreted in higher concentrations in the crevicular fluid; therefore, it has application in the field of periodontal medication. This drug administered systemically (750–1000 mg day for 14 days) reduces the growth of anaerobic flora and decreases the clinical and histopathologic signs of periodontitis⁸. The most common regimen is 250 mg t.d.s for 10–14 days. Clinically is used in the treatment of refractory periodontitis, especially in combination with amoxicillin. It is also used in treatment of acute necrotizing ulcerative gingivitis and severe odontogenic infections. The most common adverse effects are antabuse reaction when alcohol is ingested concomitantly. It also inhibits warfarin metabolism and prolongs prothrombin time. It should be avoided in patients taking lithium⁶.

AMOXICILLIN

Penicillins other than amoxicillin and Augmentin have not shown any clinical benefits in the management of periodontal disease and their use therefore is not justified⁹. Amoxicillin is broad-spectrum penicillin and for periodontal therapy, it is often combined with clavulanate, which inhibits beta-lactamases produced by some bacteria. It is highly acid stable and over 90% of administered dose is absorbed. It is a bactericidal drug that inhibits the synthesis of bacterial cell walls and results in cellular disruption due to

high osmotic pressure. Since penicillins act during the synthesis of cell walls, it is most effective against multiplying bacteria⁶. It is used in combination with metronidazole for treatment of chronic periodontitis¹⁰ and aggressive periodontitis⁷. In addition, Augmentin in doses of 250 – 500 mg t.d.s may be of value in treating periodontitis refractory to treatment³. Except for allergic reactions, penicillin toxicity is extremely low and it is one of the safest known drugs.

CLINDAMYCIN

This antibiotic inhibits bacterial protein synthesis and is usually bacteriostatic but bactericidal in high doses. This drug binds to a specific subunit of bacterial ribosome, thereby inhibiting protein synthesis. It is of particular efficacy in treating periodontal disease because of its ability to penetrate bone. Levels in the GCF are usually above the minimum inhibitory concentration for periodontal pathogens¹¹. Clindamycin is of value in the treatment of periodontitis refractory to therapy, either alone or in combination with Augmentin^{12,13}. The dose is 150 mg t.d.s or q.i.d for 7 – 10 days. Adverse effect of the drug is diarrhea and gastric upset if taken on empty stomach. Its use has been linked to the development of ulcerative colitis⁶.

CEPHALOSPORINS

They belong to the family of beta-lactams and are similar in action and structure to penicillin. Amoxicillin and Augmentin are superior to cephalosporins in their range of action against periodontopathic bacteria. Hence, their use is limited. Adverse effects include allergic reactions, fever and gastrointestinal upset⁶.

CIPROFLOXACIN

It is a quinolone, active against gram-negative rods including many periodontal pathogens. It does not suppress streptococcus species, which are associated with periodontal health, thus promoting a micro flora associated with periodontal health. Currently, this drug is the only one to which all strains of *Actinobacillus actinomycetemcomitans* are susceptible⁵. The recommended dosage is 500–750 mg b.d. for 7–10 days. This drug has been used in combination with metronidazole. The adverse effects include gastrointestinal upset, oral candidiasis, headache, restlessness, hypersensitivity, hyperpigmentation and photosensitivity⁶.

Figure 1

Table 1: Comparison of Spectrum of action

Narrow	Extended	Broad
Penicillin G, V	Cephalosporin	Tetracycline
Clindamycin	Extended spectrum penicillins	
Erythromycin		
Metronidazole		
Penicillinase resistant penicillin		
Vancomycin		

Figure 2

Table 2: Bactericidal vs. Bacteriostatic

Bactericidal	Bacteriostatic
Penicillin	Erythromycin
Cephalosporin	Tetracycline
Vancomycin	Clindamycin
Metronidazole	

HOST MODULATION

It is a treatment concept that aims to reduce tissue destruction and promote regeneration by downregulating the destructive aspect of host tissue responses while upregulating the reparative or regenerative mechanisms. Host modulation is a means of reducing/stopping the host-mediated aspect of periodontal tissue destruction, as most of the tissue destruction in periodontal disease is host-mediated (pro-inflammatory cytokines: IL-1, PGE2, TNF-alpha)¹⁴. The concept is to combine host modulation with conventional therapy to achieve best results.

Subantimicrobial Dose Doxycycline is the only FDA approved modality. 20 mg doxycycline is taken twice daily for 3-9 months. Its therapeutic effect is by collagenase, osteoclast and cytokine inhibition in alveolar bone, connective tissue and epithelium. At this low dose, there is no antimicrobial effect and hence no bacterial resistance and other side effects.

CONCLUSION

Periodontitis is a multifactorial disease, which might have a systemic or hereditary component in addition to its bacterial etiology. Conventional therapy alone may not be able to combat its progression. Therefore, the use of systemic drugs could be beneficial when used as adjuncts to conventional surgical and non-surgical therapy. It may be emphasized here that drugs, whether antimicrobials or host modulation agents, are not to be used as a monotherapy for the management of periodontal disease.

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